Document Title:	**Validity, Reliability, Accuracy, and Bias in Forensic Signature Identification**
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CHAPTER 1: PROJECT NARRATIVE

Introduction

The field of forensic document examination consists of a variety of specialized tasks related to the history and preparation of questioned documents. The wide array of tasks performed by forensic document examiners (FDEs) includes the ability to identify the source of handwriting and handprinting; distinguish among genuine, forged, traced, or disguised writing; to analyze inks, papers, and other substances related to documents; and other scientific or technical analyses requiring highly specialized skills (Lindblom, 2006).

The area of handwriting analysis is based on the premise that handwriting is based on physiological and neurological foundations. Handwriting is thought to be a behavioral artifact that is identifiable due to the presence of features and characteristics within the writing (e.g., signatures, hand printing, numerals). These features, when considered in combination, individualize the habit pattern of the writer. Thus, the two primary tenets of handwriting analysis are: (1) no two people write exactly alike in all features and characteristics when considered cumulatively and in combination (*inter*-writer variation); and (2) a person does not write exactly the same way twice (*intra*-writer variation).

According to Lindblom, a substantial portion of FDE training is devoted to signature comparisons, handwriting, and hand printing (2006). Among the wide variety of topics included in current training are methods of handwriting disguise and simulation, evaluating similarities and differences among specimens, and distortions due to old age, illness, time pressure, and other external factors. FDEs seek those features and characteristics which may be characterized as the document's identifying attributes or characteristics. The quantity and quality of these features observed to be present or absent when comparing specimens from a known source (commonly referred to as a "standard") and disputed specimens form the basis of the FDE's opinion. Thus, the individual features and characteristics FDEs are trained to extract from handwriting samples might be conceptualized as a form of index in which examiners first determine the presence or absence of features, and then qualitatively assign these features some degree of evidentiary weight in order to reach their decisions.

McClary (2006) provides an extensive description of the features of handwriting specimens that FDEs are trained to evaluate. These include such letter characteristics as arches, or convex curved strokes found in certain letters; ascenders, or the part of a letter that rises above the baseline; eyelets, or circular movements whose centers may be either open or closed; hooks, or curved or angular projections usually occurring in an initial or terminal stroke; shoulders, or the flat of sloping part of the letters; and troughs, or a hollow or concavity between two raised portions of a letter (a complete list of these features with their definitions and examples are presented in a figure below). Additional writing characteristics include alignment, or the habit of placing all written words above or below the baseline; connections, or strokes connecting adjacent letters of adjoining words; pen lifts, or the presence or absence of other patterns of interruptions in a pen stroke; rhythm, or the regularity in the curvature of the writing; size of the writing; the slope or slant of the letters; and a variety of other characteristics which provide evidence of an individual's writing habits (McClary, 2006). The number and quality of these features allow FDEs to make assertions about the authorship of the specimen and the extent of their confidence in their decisions.

Some of the possible outcomes determined by FDEs in handwriting analyses include whether or not questioned writing was produced by the known writer in that writer's normal handwriting; written by the known writer in an attempt to disguise his or her own handwriting habits; written by a different writer in that writer's normal handwriting; written by a different writer in an attempt to disguise the different writer's own handwriting habits; written by a different writer in an attempt to simulate the handwriting habits of someone else, using a genuine handwriting sample from that person as a model; or traced using a genuine handwriting sample as a model (Derek Hammond, personal communication).

Examiners are trained to look not only for substantial similarities or differences among writing samples, but also for repeated small characteristics which may be sufficient to establish clearly that writings are the work of two individuals even though they may contain a considerable number of general similarities. A few fundamental, repeated differences can be overwhelming and controlling. If two writings are by a single person, then no fundamental differences should exist (Lindblom, 2006).

This research empirically explored the reliability, measurement validity, and accuracy of established FDE procedures using a multi-method, multidisciplinary approach. We administered a brief telephone/web survey to gather information about the experience, education, and credentials of our participants, and their views about the strengths and weaknesses of education and training in forensic document examination. Following the survey, professional, fully-qualified FDEs and a comparison sample of lay participants underwent a series of experimental laboratory protocols during which eye-tracking equipment gathered information about salient and diagnostic signature features, including the length of time spent evaluating signature features, the sequence in which the features were examined, and the total length of time participants spent on the overall examination of each signature. Finally, we conducted an open-ended interview with participants following the eye-tracking task to discover how much evidential value they assigned the features of a sub-set of signatures, and how participants weighed the features in making their decisions.

Statement of the Problem

The extensive scrutiny of the methods and findings of numerous areas of expert testimony following what Margaret Berger (2000) called "the *Daubert* Trilogy" has prompted acrimonious debate among academicians, forensic practitioners, and legal professionals concerning what has been referred to by the Forensic Science Committee of the National Academy of Sciences ("Committee") as "faulty forensic science analyses" (Strengthening Forensic Science, 2009, p. 4).

According to the Committee, the admissibility of forensic expert testimony should rest on two questions: (1) to what extent is the forensic discipline based upon reliable scientific methodology which results in accurate analysis and reporting of findings; and (2) to what extent does the discipline rely on subjective interpretation of evidence, which may be subject to bias or error, rather than sound operational procedures and robust performance standards?

Recent descriptive research has illustrated the types of legal challenges that have been made to the admissibility of forensic document examination evidence, and the outcomes of such challenges (see Merlino, Springer, Kelly, Hammond, Sahota, & Haines, 2008). These authors identified 30 cases published on *Lexis* in which the admissibility of forensic document examination was challenged. Thirty-seven codeable proffers of expert testimony were identified among these cases. Five proffers were in civil cases, and 32 were in criminal cases.

In the four-year period between *Daubert* and *Joiner*, seven proffers of forensic document examination testimony were challenged, resulting in the exclusion of two proffers. In the two-year period between *Joiner* and *Kumho*, six more proffers were challenged, two of which were successful. The majority of challenges (n = 24) have come following the *Kumho* decision. Of these, nine challenges were successful.

The forensic document examination proffers were divided into two groups according to whether the case was decided before or after the *Kumho* decision and analyzed to determine whether there were any differences in judges' discussions of admissibility in terms of various rules of evidence. Significant differences were found pre- and post-*Kumho* in the number of mentions of the reliability of the basis of the testimony, the reliability of the principle or method upon which the evidence was based, falsifiability, error rate, and peer review and publication.

These findings demonstrate that although challenges to the admissibility of forensic document examination testimony have been made in a variety of circuits, the majority have been unsuccessful. Judges have generally been reluctant to exclude evidence which has been admissible for so many years without any empirical support for such a decision. Many judges believe that any flaws in the testimony of FDEs can be brought forward by attorneys during cross-examination. However, questions about the reliability, validity, and accuracy of the work of FDEs must be addressed in order to ensure that examiners are adequately trained and properly credentialed, and that the highest standards of quality and accuracy are achieved.

Those who are critical of the current state of knowledge in this area argue that members of the judiciary have failed to sufficiently address the shortcomings of the forensic science evidence proffered in criminal trials. Specifically, critics of forensic document examination argue that little empirical evidence exists to support the validity and reliability of the methodology and findings of forensic document examination (see Denbeaux & Risinger, 2003; Faigman, Kaye, Saks, Sanders & Cheng, 2006; Faigman, Kaye, Saks, & Sanders, 2002; Risinger, Denbeaux & Saks, 1989; Saks, 1989, 2003; Saks & Koehler, 2005; Saks & Vander Haar, 2005). Some scholars argue that too little research supports the claim that forensic document examiners (FDEs) outperform jury eligible lay people in successfully identifying the source of questioned handwriting samples (Denbeaux & Risinger, 2003; Risinger, et al., 1989). Others argue that the subjective methodology and inconsistent methods of reporting findings fail to reach the level of scientific methodology (see Faigman et al., 2006; Faigman et al., 2002; Risinger et al., 1989; Saks & Koehler, 2005; Saks & Vander Haar, 2005). Questions have also been raised both in court and in a number of scholarly treatises and articles that the conclusions of FDEs may be biased due to the lack of blind review of examination results (see Risinger et al., 1989).

While acknowledging the importance and utility of the forensic disciplines, the Committee also addressed the perceived flaws in such evidence. Specifically, advances in technology in various forensic disciplines, especially in the field of DNA testing, have demonstrated that erroneous or misleading forensic evidence has contributed to the wrongful conviction of innocent individuals (Strengthening Forensic Science, 2009). The report called for improvements in forensic science practices, arguing that increased and demonstrated reliability and validity in forensics will help law enforcement investigations by improving the reliability of identifications. Homeland security efforts will also improve as improvements are made in the methods and procedures of the forensic disciplines (2009).

The Committee's review revealed several challenges related to forensic document examination, including practitioner certification, accreditation, and the availability of skilled, well-trained personnel (Strengthening Forensic Science, 2009). Many areas of forensic science lack of uniformity in training, accreditation, and practice standards. The report stated that operational principles and procedures for many disciplines are not standardized between or within jurisdictions, and attempts at standardization are not viewed favorably in many instances, and that even protocols such as Scientific Working Group

(SWG) standards "often are vague and not enforced in any meaningful way…These shortcomings obviously pose a continuing and serious threat to the quality and credibility of forensic science practice" (Strengthening Forensic Science, 2009, p. 6).

Additionally, wide variability exists among disciplines concerning the Popperian considerations Justice Blackmun identified in *Daubert*—the availability of published materials (i.e., peer review and publication); the type and number of potential errors (i.e., error rate); the general acceptance of the method, technique, or finding among practitioners in the relevant discipline (i.e., general acceptance); the ability to generate testable hypotheses when conducting the examination (i.e., falsifiability). Although some laboratory-based disciplines are readily classified as objective, Popperian science, other forensic disciplines such as fingerprints, writing samples, toolmarks, bite marks, or hair analyses are based on subjective expert interpretation of observed patterns, and may be considered technical or other specialized knowledge. The Committee wrote that distinct differences exist in the education, training, skills, and experience "between forensic practitioners who have been trained in chemistry, biochemistry, biology, and medicine (and who bring these disciplines to bear in their work) and technicians who lend support to forensic science enterprises" (Strengthening Forensic Science, 2009, p. 7).

The Committee also discussed the lack of demonstrated validity and reliability within the interpretation-based disciplines:

> …no forensic method has been rigorously shown to have the capacity to consistently, and with a high degree of certainty, demonstrate a connection between evidence and a specific individual or source…The simple reality is that the interpretation of forensic evidence is not always based on scientific studies to determine its validity. This is a serious problem. Although research has been done in some disciplines, there is a notable dearth of peer-reviewed, published studies establishing the scientific bases and validity of many forensic methods. (Strengthening Forensic Science, 2009, p. 7-8)

The Committee concluded that research to establish the limits and measures of performance and the sources of variability and potential bias is badly needed, especially in those disciplines based on subjective assessments of similarity (2009). Interdisciplinary research encompassing expertise from forensic practice, social and cognitive psychology, vision science, and other areas is needed to establish the basis and extent of expertise, to develop rigorous protocols and measures, and to establish education and training programs that consistently and comprehensively address the knowledge and skills required to establish expertise in forensic fields. Thus, this research empirically explored a number of aspects of the reliability, measurement validity, and accuracy of established FDE procedures in handwritten signature identification.

Literature Review

<u>*Challenges to the Admissibility of Forensic Document Examination.*</u> Recent descriptive research has illustrated the types of challenges that have been made to the admissibility of forensic document examination evidence, and the outcomes of such challenges (see Merlino, Springer, Kelly, Hammond, Sahota, & Haines, 2008). These authors identified 30 cases published on *Lexis* in which the admissibility of forensic document examination was challenged.[1] Thirty-seven codeable proffers of expert testimony were identified among these cases. Five proffers were in civil cases, and 32 were in criminal cases.

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[1] The cases used in these analyses were a subset of the total number of cases published on *Lexis* in which the admissibility of expert testimony about forensic document examination was challenged. Not all cases published on

Of the 37 challenges to proffers of forensic document examination expert testimony in this sample, ten were in the Sixth Circuit. Seven occurred in the Ninth Circuit, five occurred in the Eleventh Circuit, three occurred in both the Second and Fourth Circuits, two occurred in both the First and Third Circuits, and one challenge each occurred in the Fifth, Seventh, and Tenth Circuits. At the time of publication, forensic document examination evidence had not been challenged in the Eighth Circuit.

Twenty-five of the 37 proffers were held to be admissible by the judges. Of these 25 proffers, three were admissible with restrictions. Of the 11 excluded proffers of forensic document examiner testimony, five were excluded in states which currently have adopted either the *Daubert* trilogy in its entirety, or *Daubert* alone. The remaining six proffers were excluded in *Frye* states.

Twenty-seven of the 37 proffers were made by the prosecution and ten were made by the defense. Six of the 27 proffers by the prosecution were excluded, and six of the ten proffers made by the defense were excluded.

In the four-year period between *Daubert* and *Joiner*, seven proffers of forensic document examination testimony were challenged, resulting in the exclusion of two proffers. In the two-year period between *Joiner* and *Kumho*, six more proffers of forensic document examination testimony were challenged, two of which were successful. The majority of challenges to proffers both forensic document examination (n = 24) have come following the *Kumho* decision. Of these proffers, nine of the 24 challenges were successful.

The forensic document examination proffers were divided into two groups according to whether the case was decided before or after the *Kumho* decision. The authors then conducted a series of analyses to determine whether there were any differences in judges' discussions of admissibility in terms of various rules of evidence. No significant differences were found in this sample in the number of mentions pre- and post-*Kumho* of the evidence's relevance, whether the evidence was more probative than prejudicial, whether the evidence was repetitive or a waste of time, whether the method or principle upon which the evidence was based was reliably applied to the facts of the case, the qualifications of the witness, or general acceptance. However, significant differences were found pre- and post-*Kumho* in the number of mentions of the reliability of the basis of the testimony, the reliability of the principle or method upon which the evidence was based, falsifiability, error rate, and peer review and publication.[2]

Judges in this sample mentioned expert qualifications unfavorably in nine of the twelve proffers in which the testimony of forensic document examiners was excluded. In three of the excluded proffers judges negatively evaluated the expert's training outside academia. In two excluded proffers, the expert's education was negatively evaluated, and in two the expert's skill or subject matter knowledge was negatively evaluated. Other negatively evaluated factors were the expert's experience, publication record, and reputation (each with one mention).

Eighteen unfavorable mentions of forensic document examination evidence characteristics were made by judges. Most frequently mentioned were the lack of general acceptance and peer review and publication (3 mentions each). Judges made two unfavorable mentions each of the known or potential rate of error, the existence of maintenance of standards controlling the technique's operation, and the

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Lexis were considered codeable. These cases do not represent the entire population of codeable published cases, as neither Lexis nor Westlaw publishes all cases in these areas.

[2] These analyses were conducted using independent-group *t*-tests with alpha = .05. Corrections for unequal variance were used. Statistically significant results were as follows: Reliability of the basis of the testimony, t (23) = -2.145, p = .043; Reliability of method or principle upon which evidence is based, t (23) = -3.715, p = .001; Falsifiability, t (23) = -2.769, p = .011; Error rate, t (23) = -2.460, p = .022; Peer review and publication, t (23) = -3.077, p = .005.

facts/data/studies underlying the testimony. Other factors unfavorably mentioned were falsifiability, control or consideration of possible confounds or alternative explanations, the use of findings or theories consistent with others, the use of facts or data reasonably relied on by others, the statistical significance of the finding, and the purpose for which the research was conducted (each with one mention).

Bivariate correlation analyses revealed a significant positive correlation between the number of evidence characteristics mentioned by judges and the length of time post-*Daubert* that the decision was handed down.[3] No statistically significant relationships were found between the number of expert characteristics discussed and the length of time post-*Daubert.*

These findings demonstrate that although challenges to the admissibility of forensic document examination testimony have been made in a variety of circuits, the majority have been unsuccessful. Judges have generally been reluctant to exclude evidence which has been admissible for so many years without any empirical support for such a decision. Many judges believe that any flaws in the testimony of FDEs can be brought forward by attorneys during cross-examination. However, questions about the reliability, validity, and accuracy of the work of FDEs must be addressed in order to ensure that examiners are adequately trained and properly credentialed, and that the highest standards of quality and accuracy are achieved.

Empirical Study of FDE Expertise. Studies of the nature of expertise have increased significantly over the past 40 years (Anderson, 2010). Researchers have investigated the nature and development of expertise in a variety of areas, hoping to better understand the relationship between experience and problem solving. Generally, expertise studies have identified seven dimensions of expertise development.

Proceduralization. According to Anderson (2010), proceduralization is the process of moving away from the need to actively think about the steps for solving a problem or performing a task (in cognitive terms, the deliberate use of declarative knowledge) to automatically knowing what to do next without having to think about it (the application of procedural knowledge). This process is considered one of the earlier stages of the development of expertise. Proceduralization allows one to drive a car or ride a bike without thinking about every step of the process (Anderson, 2010).

Tactical learning. This domain of expertise development involves the process of converting how to perform the actions needed to solve specific problems from a sequence of steps one needs to figure out (e.g., I am supposed to bake a cake—how do I turn on the mixer?) to a sequence of steps that one remembers (I am baking a cake, so I will flip the switch and turn on the mixer) (Anderson, 2010).

Strategic learning. According to Anderson, strategic learning involves recognizing that tactical learning can be applied to an entire class of problems rather than an isolated or specific instance (2010). Strategic learning allows one to use the structure of a class of problems to organize problem solving.

Problem perception. This domain of expertise allows one to recognize the similarities and difference among problems, and to recognize which problem-solving procedures would be the most effective given the problem features (Anderson, 2010). Problem perception development gives the expert the skill to perceive “richer” sets of features, whether they are indicative or counterindicative of a potential solution.

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[3] These analyses were conducted using the total number of mentions of different evidence characteristics in both the admissible and inadmissible proffers. The length of time post-*Daubert* was measured by entering the decision date in a YYYY/MM format, e.g., 200712 is a higher value than 199307. The bivariate correlation for the forensic document examination proffers was $r^2 = .333$, $p = .044$. Alpha was set at .05. Examination of scatterplots revealed that difference in the direction of the correlations can be accounted for by the number of challenges to forensic document examination evidence immediately following *Daubert.* The number of challenges post-*Kumho* tended to increase.

Pattern learning and memory. According to Anderson (2010), this domain of expertise enables one to "recognize patterns of elements that repeat in many problems, and know what to do in the presence of such patterns without having to think them through" (p. 261). For example, a chess master learns patterns of chess pieces on the board and the possible solutions to the threats present in the pattern. Once the pattern and solution are learned, the chess master no longer has to think through the next move because she already knows the proper solution to the problem.

Long-term memory and expertise. Research has demonstrated that the pattern learning and memory expertise which conserves cognitive effort also benefits the expert's ability to store and retrieve knowledge from long-term memory (Anderson, 2010). Experts organize information into units as expertise develops, and these chunks of information are more easily stored and accessed.

Deliberate practice. This domain of expertise is demonstrated by motivated learners who monitor their performance by seeking feedback about how to perform correctly, and who learn how not to make errors. Anderson stated that the majority of expertise development is demonstrably due to effort rather than talent (Anderson, 2010).

Daubert's most significant impact on the field of forensic document examination may be the strides made toward developing, consolidating, and publishing information about the methods, techniques, and standards used by FDEs. Prior to 1990, scientific analysis of the expertise of FDEs was practically non-existent. Since that time, only a handful of studies have been conducted to analyze what determines an expert in forensic document examination. Some critics opined prior to *Daubert* that "[f]rom the perspective of published empirical verification, handwriting identification expertise is almost nonexistent" (Risinger, Denbeaux, & Saks, 1989). The content analysis of case law described above demonstrates that attorneys have recognized the strategic possibilities afforded by the *Daubert* trilogy, and have begun to challenge proffers of forensic document examination testimony when they find that it may be advantageous to their clients to do so.

Lack of reliable research establishing forensic document examination as a field of expertise negatively impacted the field as individuals seeking to exclude forensic document examination evidence cited early proficiency testing data generated by Collaborative Testing Services (CTS).[4] For example, the reliability of the methodology used in forensic document examination has been questioned due to its subjectivity. Although Dror (2013b) argued that subjective, experience-based expert opinion remains valuable and useful, and that quantification and statistical tools do not necessarily make "objective" observation better or more desirable than "subjective" observation, there is still a strong emphasis within the adversary system and in academia on Popperian hypothesis testing and probabilistic measurements.

It is indisputable that FDEs subjectively apply the knowledge they obtain from education, training, and experience when comparing handwriting samples. To date, research has tended to support

[4] The CTS Advisory Council informed some individuals that the CTS proficiency tests may not suitable for gathering data on a forensic discipline because the test may not be treated equally among all participating laboratories. Some labs use the tests for training purposes, some for proficiency purposes, and some for screening purposes. Additionally, use of the test is not restricted to qualified forensic document examiners. Consequently, data generated from the test results are confounded by the inclusion of scores for untrained and unqualified subjects. Another inappropriate use of CTS scores involves the attempt to generalize the aggregate test scores for a single group administration to the entire body of non-test taking forensic document examiners as an indicator of the reliability of the field. The applicability of CTS with respect to known or potential error rates lies not with an analysis of the group of participants, but rather with a case by case assessment and evaluation of the individual participants. "Ecological fallacy" may be avoided by overall assessment and analysis of the performance of the individual test taker, which will provide data which can be used to evaluate claims of expertise for that specific examiner regarding the task(s) tested.

forensic document examination as a distinct field of expertise. FDEs are taught and trained to evaluate samples of handwriting as a gestalt (e.g., the overall examination of the signature or sample is greater than the sum of its parts), taking into consideration both quantitative and qualitative aspects of the sample. The reliability of handwriting analysis is increased by having additional examiners review the work of the original examiner.[5] Research has demonstrated that the reliability of forensic document examination is increased by internal technical (peer) review. Although preliminary sample sizes were small, Kam, Gorski, and Gaughan (2003) and Kam (2004) found that consultation between two FDEs tended to reduce error rates to zero.

Blake (2007) gave FDEs eight signatures of one writer and asked them to rank signature attributes. Although the study was quite small, Blake discovered a lack of consensus between examiners in 8% (n = 3) of the 40 attributes, with moderate to excellent consensus in the other 92% of the attributes. This study suggests that experts weigh and rank attributes differently and with more consensus than do novices, essentially suggesting the possibility of a different cognitive mechanistic framework.

In an earlier study Blake (1995) also attempted to find consensus among FDEs regarding the evidential valuation of handwriting characteristics. She distributed a survey and document problem (a robbery note) to attendees of the Southwestern Association of Forensic Document Examiner's seminar. Additionally, a control group of criminology students in a forensic science class was utilized. Ninety-one percent of FDEs were able to positively or highly probably identify the subject as the writer of the robbery note.

When asked to rank the significance of each letter used in the robbery note, strong consensus was shown among FDEs in both high and low evidential value of certain letters. For the student control group, only good agreement with certain letters with high evidential value was found. The survey results also provided further differences between the control group and the professional FDEs (Blake, 1995). The FDEs were able to utilize their prior knowledge of letter forms and other aspects of handwriting to inform their evaluative process. Students, on the other hand, had no background upon which to rely and tended to see significance when letter forms matched without analyzing less obvious aspects of handwriting that the FDEs utilized.

Kam, Wetstein and Conn (1994) similarly found that FDEs were more proficient than a control group at handwriting identification. Utilizing a pool of FDEs from the Federal Bureau of Investigation and a control group consisting of graduate students in engineering and business, Kam et al. administered a comprehensive writer identification test to both groups. They found a statistically significant difference in proficiency between the two groups.

In a similar study, Kam, Fielding and Conn (1997) compared the performance of FDEs and nonprofessionals in a task of determining whether two documents were written by the same person. They found that non-professionals were much more likely to over-associate and falsely match documents that were written by different people. Non-professionals made spurious matches of unknown documents to database documents almost six times more often than FDEs did (38.3% vs. 6.5%).

In 2001, Kam, Gummadidala, Fielding, and Conn conducted the first controlled study comparing the abilities of FDE abilities to those of lay people. The participants were given a signature authentication

[5] Forensic experts often refer to the internal review of casework as "technical reviews" or "peer reviews." Discrepancies between the initial examiner and the reviewer are typically resolved by a senior examiner or bench supervisor. This practice is analogous to coding, check-coding, and check-verification protocols often used in other areas of research. The extent of peer/technical review within a laboratory depends on the workload, lab budget and personnel, and other factors.

task in which six known signatures of an individual were provided along with six unknown signatures. Kam et al. found a much smaller error rate for the FDEs. Non-genuine signatures were claimed authentic by the FDEs in 0.49% of cases, compared to 6.47% of cases in the layperson group. Genuine signatures were declared non-authentic in by FDEs in 7.05% of cases, whereas laypersons made the same error in 26.1% of cases.

Other studies also tend to support the proficiency of FDEs. Sita, Found, and Rogers (2002) found that professional FDEs made errors in only 3.4% of cases, while 19.3% of the control group's opinions were incorrect. When signature complexity was considered, professional FDEs produced more correct opinions on high complexity signatures than low complexity signatures. Between FDEs, however, it was found that there was not much consensus based on skill. The number of years a FDE had worked in the field was not significantly related to rates of correct, inconclusive, or incorrect response.

Found and Rogers (2005) tested the accuracy of professional FDE opinions about whether photocopied signatures were fabricated or genuine. The overall error was found to be 0.9%, providing evidence that FDEs are accurate in their observations of photocopied handwriting. Using a data set from 1996, Kam and Lin (2003) found that FDE performance was better than lay people for hand-printed, photocopied, cursive, and non-cursive handwriting.

Taking a slightly different approach, Dyer, Found, and Rogers (2006) utilized eye tracking to study visual attention given to signatures by FDEs and a control group, noting eye movement, response time, and opinions. They found that FDE opinions were significantly more accurate than the control group. However, both FDEs and controls viewed features of signatures similarly, leading the researchers to suggest that FDEs may have a different cognitive process for questioned signatures.

Research by Droll and Hayhoe (2007) on the eye fixation behavior of participants who performed a virtual brick sorting task suggests that different cognitive processes may indeed account for the eye movement behavior or Dyer et al.'s participants. Droll and Hayhoe found differences in eye movement among participants who knew in advance that the information they were about to see was relevant to the next sorting task they would be performing. Droll and Hayhoe suggested that the changes in visual behavior were related to changes from participants' use working memory (in cognitive terms, information to which one is able to attend for a limited amount of time, and which is not permanently stored in long-term memory without some form of elaboration or rehearsal) to participants' reliance on gaze. They concluded that this trade-off is largely determined by the demands of the task, and that the participants' sensitivity to changes in the visual stimuli (sometimes referred to as "change blindness") is an important determinant of where the brain looks, what it attends to, and what it subsequently remembers (Droll & Hayhoe, 2007).

Busey, Yu, Wyatte, & Vanderkolk (2013), who studied temporal sequences of eye movements and the correspondence of eye movements across fingerprint views, found that fingerprint experts and lay participants performed similarly on the ground truth issues (i.e., were able to correctly identify true correspondences between points on two separate fingerprint images). The similarity in visual locations is consistent with the findings of Dyer et al., but Busey and colleagues noted a difference between experts and lay participants in the temporal sequences and length of their saccades. The shorter and more numerous visual saccades observed among the experts suggested that experts may have been identifying multiple corresponding points in an area, while the lay participants may have been limited to making point-by-point visual correspondences. According to Busey and colleagues, the shorter saccades are consistent with the expertise literature on pattern learning and memory, and provide indirect evidence of "a 'chunking' strategy in which several features are placed into working memory" (Busey et al., 2013, p.

21). Busey and colleagues concluded that examining these clusters of short-saccade fixations, which they referred to as a "bag of fixations approach" (p. 21), may be more diagnostic of individualizing characteristics than may focusing on fixation pairs separated by a single saccade.

Confirmation Bias and Forensic Evidence. Found and Ganas (2013) stated that domain irrelevant information has the potential to introduce bias into human decision making processes. Many researchers, forensic practitioners, and legal professionals have recognized the potential sources of bias which exist in the forensic casework environment, such as case exhibits, interactions with law enforcement officials or colleagues, implicit assumptions about the source of forensic specimens, and other extraneous sources of information (Found and Ganas, 2013). Although these sources of potential domain irrelevant information have been acknowledged, to date few agencies have attempted "context management" (Found & Ganas, 2013, p. 154) to minimize these possible sources of bias.

According to Risinger, Saks, Thompson, and Rosenthal (2002) the most obvious danger in forensic science is confirmation bias, or the risk that an examiner's observations and conclusions will be influenced by potentially biasing information. Confirmation bias is defined as a tendency to search for or interpret new information in a way that confirms one's preconceptions and avoids information and interpretations which contradict prior beliefs (Oswald & Grozjean, 2004). Confirmation bias is a type of expectancy effect that manifests as a cognitive bias, representing an error of inductive inference that favors either the confirmation of the hypothesis under study or disconfirmation of alternative explanations, and has long been believed by philosophers to be an important determinant of thought and behavior (Nickerson, 1998).

In his review of dozens of studies that assessed the existence and impact of confirmation bias, Nickerson highlighted two paths by which confirmation bias occurs: (1) the preferential treatment of evidence that supports existing beliefs, and (2) the overweighting of positive confirmatory instances. The preferential treatment of evidence that conforms to what an individual believes does not necessarily entail completely ignoring contrary information, but it has been empirically demonstrated that selective attention and selective information seeking do occur. This suggests that the negative information is not ignored, *per se*, but is cognitively countered by means of finding information that either explains the discrepancy or invalidates it. In much the same way, the overweighting of positive confirmatory evidence may occur as a complementary process to the underweighting of disconfirmatory evidence.

Empirical Study of Confirmation Bias. A substantial body of empirical evidence supports the idea that the influence of confirmation bias is extensive, potent, and that it may be manifested in a variety of ways (Nickerson, 1998). General research on confirmation bias in decision making has its roots in Festinger's (1957) dissonance theory, which stipulates that people will prefer information that supports a previously made decision compared to information that conflicts with the prior decision. Frey and Schulz-Hardt (2001) explain that in later versions of his theory, Festinger specified that selective exposure to information will only occur if the decision was made under free choice and if the decision-maker is committed to the decision. Under specific conditions, Festinger predicted that people would actively seek information that bolsters their argument or provides discordant findings that could easily be refuted. In this way, the decision-maker systematically builds a case for his or her decision by attending to present information that supports the argument (selective attention) and/or selectively seeking additional information that confirms it or easily disconfirms alternative explanations (selective information seeking; see Frey, 1986, for an overview of findings that support Festinger's predictions).

Frey and colleagues (as cited in Frey & Schulz-Hardt, 2001) have empirically demonstrated that generally people prefer supporting information if they have decided voluntarily for a particular alternative

(Frey, 1981d; Frey & Wicklund, 1978), and that this confirmation bias is amplified if commitment is heightened (Frey & Stahlberg, 1986; Schwarz, Frey & Kumpf, 1980), the sources of information are experts rather than lay people (Frey, 1981a), and if the decision is irreversible (Frey, 1981b; Frey & Rosch, 1984). Confirmation bias was also found to be stronger in anxious individuals (Frey, Stahlberg, & Fries, 1986) and increased if there were heightened costs associated with the information search (e.g., financial cost/price per additional source; Frey, 1981c).

An issue that is perhaps of greater concern for the results of forensic document examination is the potential to fall prey to confirmation bias when reviewing the work of another examiner during peer/technical review (Jonas, Schulz-Hard, Frey & Thelen, 2001). Jonas et al. found that a preliminary decision may in fact be sufficient to evoke confirmation bias in subsequent decisions. Recent experiments by Jonas et al. indicate that three processes appear to mediate a confirmation bias prior to the establishment of a final decision.

First, under conditions like time pressure or high complexity, a substantial confirmation bias occurred (Frey, Schulz-Hardt, von Haeften, & Bresnitz, 2000, as cited in Jonas et al., 2001). These results suggest that decisions made under suboptimal conditions may motivate the decision-maker to reach a definite decision based on the situational constraints, overriding the desire (or ability) to critically test the primary conclusion against all available evidence. Due to evidence backlogs and the time-sensitive nature of criminal investigations, FDEs are often faced with time constraints and other conditions that may enhance the potency of confirmation bias if it exists in their analyses. In line with the findings reported above, under these changing conditions, FDEs may differentially utilize information that is available to them (selective attention) and may additionally seek out further information that supports the initial evaluation (selective information seeking).

Second, the need to justify a decision to significant others (e.g., supervisors, other examiners) induces an “impression motivation” (Chaiken, Liberman, & Eagly, 1989). Consequently, supporting information is disproportionately requested because this information helps justify the decision (Jonas, 1999).

Finally, the utilization of available information and the seeking of certain kinds of information contribute significantly to the decisionmaker’s belief in the veracity of the argument itself. Arguments consistent with one’s beliefs are evaluated more favorably than arguments that contradict these beliefs (e.g., Edwards & Smith, 1996), supporting pieces of information also seem to be “better” (e. g., more credible and valid) pieces of information. This differential evaluation of supporting and conflicting arguments appears to induce a preference for supporting information even without any motivation to have one’s preferences or prior decisions confirmed.

Statement of Hypotheses/Rationale for the Study

As described above, FDEs conduct a variety of analyses when performing handwriting comparison tasks. One important issue which has not been adequately resolved by extant research is the lack of information about the validity of forensic document examination. If one conceptualizes the various features evaluated by FDEs as an index, then it is possible to examine them for validity, reliability, and accuracy. With respect to validity, we addressed the following research question:

<u>Research Question 1:</u> *To what extent does forensic document examination demonstrate construct, content, and criterion validity? In other words, do the features and characteristics observed and*

evaluated by FDEs actually measure the "habits" of individual writers such that it is possible to distinguish genuine signatures from questioned signatures?

- To what extent does forensic document examination demonstrate construct validity? In other words, do the features and characteristics observed and evaluated by FDEs actually measure the "habits" of individual writers such that it is possible to distinguish genuine signatures from questioned signatures?
- To what extent do these features demonstrate content validity, or their relevance to the task of determining the authenticity of signatures?
- To what extent do these features demonstrate predictive validity, or the ability to predict a degree of certainty or outcome in a signature task?
- Finally, to what extent do the outcomes of these examinations demonstrate criterion validity, or their degree of correlation with external criteria (e.g., accuracy)?

Handwriting is thought to be a behavioral artifact that is identifiable due to the presence or absence of features and characteristics within the writing. These features, when considered in combination, are believed to individualize the habit pattern of the writer. (A list of examples of these features and characteristics is included in the method section.)

FDEs are taught and trained to evaluate samples of handwriting as a gestalt, taking into consideration both quantitative and qualitative aspects of the sample. Thus, the individual features and characteristics FDEs are trained to extract from handwriting samples might be conceptualized as a form of index in which examiners first determine the presence or absence of features, and then qualitatively assign these features some degree of evidentiary weight. It can be argued that FDEs are trained and taught to apply an index of features to signature tasks, while laypeople without training apply a "commonsense" approach to the same task. In other words, FDEs apply a formalized index using expertise, while laypeople apply an informal methodology using a number of the same features as FDEs, but without the same expertise.

According to Anastasi and Urbina (1997), construct validity is "the extent to which the test may be said to measure a theoretical construct or trait" (p. 126). The document examiner index can be used to measure two theoretical constructs. The first is "identity", or the author of the signature. The second is "expertise". If the features and characteristics used in forensic document examination demonstrate adequate construct validity for identity, then FDEs should be able to consistently extract the same kinds of features as demonstrated by the eye-tracking methodology, afford the features approximately the same evidentiary weights as demonstrated by the number of times the examiner's gaze fixates on features, the length of time the examiner's gaze is fixated on the feature, and the weight assigned to the feature verbally during the post-eye-tracking interview (multi-method self-report and observation), and to arrive at consistently correct decisions across signatures and across examiners. Conversely, a significant degree of inconsistency across signatures and trained examiners in feature extraction, weighting, and outcomes would indicate low construct validity.

We predicted that high construct validity for identity would be demonstrated in the self-report and eye-tracking tasks for FDEs (intra-group) *(hypothesis 1)*. We also predicted that high convergent validity, or the extent to which identity is measured by two different methods (eye-tracking and self-report), would be found for FDEs *(hypothesis 2).* However, due to lack of formal training on all the features of the document examiner index and use of a commonsense index, lower construct validity for the index would be demonstrated for identity in laypeople, as measured by eye-tracking and self-report *(hypothesis 3),* and also lower convergent validity *(hypothesis 4).*

If FDEs are trained and taught to apply a formal index of features to signature tasks, while laypeople without training apply a "commonsense" approach to the same task, then this index can also be used to measure the hypothetical construct "expertise" by examining its discriminant validity. A finding that trained FDEs differ from laypeople across signatures and across examiners in feature extraction, weighting, and correct outcomes would provide evidence of high discriminant validity for this index. Conversely, a finding of little difference between the performance of laypeople and FDEs in this area would indicate low discriminant validity. Thus, we predicted that high discriminant validity will be demonstrated between FDEs and laypeople *(hypothesis 5).*

Content validity refers to the relevance of the items in an index or scale to the task at hand, or the internal consistency of the items. Four general questions should be answered in a content validity study (Rubio, Berg-Weger, Tebb, Lee, & Rausch, 2003): (1) how representative the items are in the content domain as described by their theoretical definitions; (2) how clear the items are, or how clearly are they worded; (3) are factors listed for the construct, and if so, do the items load on more than one factor; and (4) how comprehensive the measure is.

<u>Research Question 2:</u> *What is the extent of inter-rater and intra-rater reliability among FDEs and laypeople in signature tasks?*

- Are FDEs as a group consistently better at identifying or eliminating the source of questioned writings (e.g., obtain the same results) than are laypeople?
- When conducting their analyses, do the two groups differ methodologically in terms of the features they extract and the weight they assign this information?

Some research in this area has demonstrated that FDEs tend to perform better than laypeople (see Kam, Wetstein, & Conn, 1994; Kam, Fielding, & Conn, 1997; Kam, Fielding, & Conn, 1998; Kam, Gummadidala, Fielding, & Conn, 2001), but the bases for these observed differences are unclear. Thus, this study was study designed to determine what attributes of the signatures are central vs. peripheral to FDEs and a control sample of laypeople, whether these attributes are reliably applied across examiners/laypeople and across signatures, and how the comparison of attributes is related to the accuracy of decisions under conditions of four of the tasks described above (e.g., (1) whether the questioned writing was written by the known writer in that writer's normal handwriting; (2) written by the known writer in an attempt to disguise his or her own handwriting habits; (3) written by a different writer in an attempt to simulate the handwriting habits of someone else, using a genuine handwriting sample from that person as a model; and (4) traced using a genuine handwriting sample as a model).

Using the eye-tracking methodology employed by Dr. Dyer and Dr. Found in their previous research on visual attention in document examination, we explored how FDEs and laypeople extracted information from handwritten signatures. After the eye-tracking procedure we verbally elicited via semi-structured interviews information about examiners' and laypeople's opinions concerning the evidential value of the features within the signatures they evaluated. This combination of quantitative and qualitative information allowed us to quantitatively analyze the visual and cognitive steps that FDEs and laypeople employed to render decisions, and to obtain an understanding of the relationship between the kind and extent of evidential information contained in signature specimens and the accuracy of examiner and layperson decision making about the source of the questioned signatures.

Blake (1995) found that the majority of FDEs in her small study were able to positively or highly probably identify the subject as the writer of a robbery note. When asked to rank the significance of each letter used in the robbery note, strong consensus was shown among FDEs in both high and low evidential value of certain letters, while in a student control group, only good agreement with certain letters with high evidential value was found (1995). Blake also found that a small sample of trained examiners were in fairly high consensus (92%) about the evidential value of a set of 40 attributes (2007). These findings suggest that FDEs and laypeople find different features relevant to the task of identifying a handwriting sample. We predicedt that the formalized index used by FDEs would be more comprehensive than the commonsense index used by laypeople *(hypothesis 6).*

The FDEs were able to utilize their prior knowledge of letter forms and other aspects of handwriting to inform their evaluative process. Students, on the other hand, had no background upon which to rely and tended to see significance when letter forms matched without analyzing less obvious aspects of handwriting that the FDEs utilized. We predicted that FDEs would report that a greater variety of features carried high evidential weight than would lay people *(hypothesis 7).* We also predicted that lay people would report consistently high evidential weight for those features they identified, while the evidential weight of features would vary more for FDEs *(hypothesis 8).* In addition, we predicted that FDEs would identify a greater number of factors (e.g., make more distinctions among the features) than would laypeople *(hypothesis 9).*

Predictive/criterion validity refers to the ability of a measure to predict a specified outcome (criterion). In the case of a signature task, evidence of predictive validity for identity would be demonstrated if the presence of combinations of features and the evidential value afforded them by FDEs predicted a correct outcome (e.g., identification, exclusion, or no call/inconclusive). Kam and colleagues (2001; 1997; 1994), and Sita and colleagues (2001) found in a series of small studies that FDEs consistently outperformed laypeople in properly determining the genuineness of questioned writings in a number of writing tasks. Kam and Lin (2003) and Dyer and colleagues (2006) also found that FDEs made fewer errors than did laypeople.

Kam and colleagues (1997) found that non-professionals were much more likely to over-associate and falsely match documents that were written by different people. Non-professionals made spurious matches of unknown documents to database documents almost six times more often than FDEs did (38.3% vs. 6.5%). Dyer and colleagues (2006) found that FDE opinions were significantly more accurate than a control group. However, both FDEs and controls viewed features of signatures similarly, leading the researchers to suggest that FDEs may have a different cognitive process for questioned signatures. A finding that FDEs outperformed laypeople in making correct decisions about the genuineness of signatures would provide empirical support for the findings of these small studies, and would demonstrate predictive validity.

We predicted, as the research described above has demonstrated, that FDEs would make more accurate calls than would laypeople *(hypothesis 10).* However, we predicted that FDEs would make a greater number of qualified calls, indicating that they afforded different evidential weight to the features they evaluate *(hypothesis 11).*

A second important issue is the reliability of the methods used by FDEs. Reliability refers to the degree to which results obtained by a procedure can be replicated. Lack of reliability can arise from divergences between observers or measurement instruments, or instability in the attribute being measured. The amount and kind of training, education, and experience an examiner has had may influence the level of our dependent variables. We examined these possible influences by addressing the following research questions:

- Do the education, training, experience, and credentials of FDEs significantly influence the kind and number of features extracted in a signature task?

- Do the number of years of education, training, and experience reliably predict that FDEs outperform laypeople in a signature task?

We asked FDEs their views about the strengths and weaknesses of forensic document examiner training using a telephone/web survey. This survey accomplished two important goals. The first was to gather the above-mentioned data, which were included in our subsequent analyses. The second was to involve the examiners in the project by first asking them to complete a small, non-threatening task (a 10-minute survey asking their opinions), which allowed us to establish contact and rapport with participants who were hesitant to participate. This practice, which is referred to in social psychological literature as the "foot in the door" technique, has been demonstrated to increase compliance when participants are subsequently asked for further assistance.

We investigated the extent to which knowing the outcome of a previous examination influenced the outcome of the sequential technical (peer) review process. An experimental manipulation in which examiners and laypeople were asked to confirm or disconfirm a previous finding of an eye-tracking examination was incorporated within the eye-tracking and interview portion of the study. We addressed the following research question:

<u>Research Question 3:</u> *To what extent does knowing the outcome of a previous examination influence the outcome of the sequential technical (peer) review process?*

- Does information about the outcome of a prior examination systematically influence the extent of information extraction, the use of extracted information, and the amount of time spent by the examiner or layperson (selective attention, selective information seeking) when making a call on the signature comparison?
- Does information about the outcome of a prior examination influence the degree of confidence FDEs and laypeople have in their decisions?

Validity and reliability are related such that a measure can be reliable without being valid, but a measure cannot be valid unless it is also reliable. An established index such as that used by FDEs might produce unreliable results if inconsistently applied. There are two kinds of reliability related to examiners. Inter-rater reliability refers to the extent of agreement in the ratings between two independent examiners. Intra-rater reliability refers to the extent of agreement in repeated ratings of the same examiner.

As stated above, if the features and characteristics used in forensic document examination demonstrate adequate validity, then FDEs should be able to consistently extract the same kinds of features as demonstrated by the eye-tracking methodology, afford the features approximately the same evidentiary weights as demonstrated by the number of times the examiner's gaze fixates on features, the length of time the examiner's gaze is fixated on the feature, and the weight assigned to the feature verbally during the post-eye-tracking interview (multi-method self-report and observation), and to arrive at consistently correct decisions across signatures and across examiners. In other words, FDEs should demonstrate high inter-rater reliability because they have been taught and trained to look for the features in their index. Thus, we predicted that inter-rater reliability among FDEs would be higher than would inter-rater reliability among laypeople *(hypothesis 12).*

Many studies have demonstrated that FDEs are more proficient at correctly identifying or excluding signatures than are lay people (see Found & Rogers, 1995; Kam et al., 1994; Kam et al., 1997; Kam et al., 2001; Sita et al., 2002; Kam & Lin, 2003). This suggests that compared to lay people, trained examiners should use a greater number and variety of handwriting features in reaching their conclusions about the source of questioned signatures. However, Dyer and colleagues (2006) found using eye-tracking methodology that FDEs and lay people appeared to view signature features similarly, although FDE opinions were more accurate than those of the lay person control group. Dyer and colleagues suggested that this finding may be due to different cognitive processes used by FDEs and lay people for evaluating questioned signatures. We predicted that the extent and kind of training, education, and experience would be related the type and number of features FDEs extract and the weight they assign this information *(hypothesis 13).* We also predicedt that the number of years of education, training, and experience would reliably predict the extent to which FDEs outperform laypeople on signature tasks, such that examiners who have more years of training and experience would outperform both FDEs with fewer years of experience and laypeople *(hypothesis 14).*

The utilization of available information and the seeking of certain kinds of information contribute significantly to the decision maker's belief in the veracity of the argument itself. Arguments consistent with one's beliefs are evaluated more favorably than arguments that contradict these beliefs (e.g., Edwards & Smith, 1996), and supporting pieces of information also seem to be "better" (e. g., more credible and valid) pieces of information. This differential evaluation of supporting and conflicting arguments appears to induce a preference for supporting information even without any motivation to have one's preferences or prior decisions confirmed.

Frey and colleagues (as cited in Frey & Schulz-Hardt, 2001) have empirically demonstrated that generally people prefer supporting information if they have decided voluntarily for a particular alternative (Frey, 1981d; Frey & Wicklund, 1978), and that this confirmation bias is amplified if commitment is heightened (Frey & Stahlberg, 1986; Schwarz, Frey & Kumpf, 1980), or the sources of information are experts rather than lay people (Frey, 1981a).

This research suggests that FDEs may experience selective attention or selective information seeking if they are aware of the outcome of a colleague's signature task. However, a small body of research has demonstrated that the reliability of forensic document examination is increased by internal technical (peer) review. Although preliminary sample sizes were small, Kam, Gorski, and Gaughan (2003) and Kam (2004) found that consultation between two FDEs tended to reduce error rates to zero.

We predicted that information about the outcome of a prior examination would systematically influence the extent of information extraction, the use of extracted information, and the amount of time spent by the examiner or layperson (selective attention, selective information seeking) when making a call on the signature comparison *(hypothesis 15).*

We also predicted that information about the outcome of a prior examination would increase the degree of confidence FDEs and laypeople had in their decisions, while knowledge about a prior contrary outcome would decrease the confidence they had in their decisions *(hypothesis 16).*

CHAPTER 2: METHODS

Study Design

The study was conducted in three phases, and employed several methodologies. The first phase of the project was a multimodal (Internet/phone) survey designed to gather information about the experience, education, and credentials of our participants, and their views of the strengths and weaknesses of forensic education. The second phase of the project encompassed the four different experimental eye-tracking protocols (i.e., the single signature protocol, questioned/known signature comparison protocol, tachistoscope/extended view protocol, and peer review protocol), and was conducted under controlled laboratory conditions. The third phase of the study was an open-ended, qualitative interview with the FDE and Lay participants in which we elicited verbal descriptions about the participants' decision-making processes for a subset of eleven of the questioned/know signature comparisons. Each of these procedures will be described in depth below.

Phase 1: Internet/Phone Survey

FDE Sampling, Participant Recruiting, and Data Collection Procedures. The target number of participants was determined by consideration of several factors, including how many participants would be needed to achieve sufficient power for statistical analyses[1], the expected availability of the FDEs, the estimated amount of time required for participants to complete the tasks involved (12 hours), the availability (scheduling) of equipment and space, the budget required to cover the travel costs of FDEs and the amount of time and staff hours required to complete data collection, coding, check-coding, check-verification, and data analysis over the course of the project.

Our original goal was to randomly select 300 professional examiners from a sampling frame constructed using FDE contact information from membership lists provided by professional organizations such as the American Board of Forensic Document Examiners, the American Society of Questioned Document Examiners, and several regional organizations, of whom we hoped to achieve a target of 120 FDE participants. Both government lab affiliated and independent examiners were invited to participate.

FDE participants were recruited using a methodology described by Dillman (1978). A personalized letter explaining the project and requesting participation was sent to all the FDEs in the sample. This letter provided a description of the project and its sponsors, an estimate of the time involved in participating, and contact information for the PIs. Instructions for accessing the online survey site and a unique identifier were provided so that the examiner could take the survey online if he or she preferred. The letter alerted the examiners that they were selected to be invited to come to the research site to participate, and that a member of the research team would be contacting them to discuss the project and to schedule a date and time for the examiner to do the telephone survey (if the examiner preferred to do the survey by phone rather than by web), and to discuss making travel arrangements for the on-site data collection. The letter was followed up by a scripted telephone contact during which the project staff member answered any general questions the participant had about the project (e.g., how they were selected to participate, how much time might be involved, questions about confidentiality), and to make

[1] Power analysis using techniques described by Cohen and Cohen (1983) demonstrated that a minimum of 120 protocols must be completed to detect a medium effect size of 0.60 at a power of 0.80 for analyses of up to 4 variables.

scheduling arrangements. If the participant did not receive the introductory letter, then the scheduler described the project and made arrangements to fax or email a second letter if the participant asked. Once the FDE agreed to participate, project staff members worked with the FDE to make travel arrangements so that the FDE could participate at his or her convenience.

Although we were able to recruit several participants via our letters of invitation to participate, our initial attempt to obtain a random sample was unsuccessful, so we adjusted our study recruiting practices in order to obtain enough FDE participants to allow us to achieve adequate statistical power for our analyses. We recruited participants by attending various professional meetings and presenting information about the research, and we also utilized snowball sampling whereby examiners who did participate recommended other members of the field whom they felt would also be willing to participate. Using this combination of methods we ultimately obtained survey responses from 97 FDEs, and from among these 97 respondents, 49 FDE participants who continued into the eye-tracking and interview phases of the study.[2]

<u>Data Collection Procedures.</u> Interviews were administered from CRDA's computer assisted telephone interview (CATI) laboratory, located on the campus of UNR. Experienced telephone interviewers were given specific training with the survey instrument prior to the beginning of data collection. In the course of a CATI interview, the interviewer read questions verbatim from a computer screen and recorded the responses of the respondent. The CATI system automatically stored data on CRDA's secure server. These data were also securely stored on one of UNR's Computer Information System Windows servers.

Each sampled respondent was contacted by CRDA on up to four occasions with no contact (e.g., answering machine, ring no answers, busy signals), until the interview was completed, until the respondent gave two "soft" refusals, or until the respondent strongly refused to participate (called a "hard" refusal). Thus, CRDA called a respondent up to eight times with no contact or with one "hard refusal" or two "soft refusals." Interviewers left answering machine messages on the second, fourth, sixth, and final call attempts. Interviewers also provided CRDA's toll free telephone number, which respondents had the option to call at their convenience in order to complete the interview. An information website was also available, and the URL to the website was also left on the answering machine.

Refusal conversion strategies included the following: (1) use of a standardized, detailed description of the importance of the study; (2) an appeal to the respondent regarding the importance of participation as means of preserving the reliability of the data being collected, including the importance of their needs being recognized and represented; (3) an effort to establish the personal benefit which would accrue to respondent or his/her family based on participation; (4) a clear reassurance of our guarantee of respondent confidentiality; and (5) an explanation of how they were selected for the study. In addition to the use of our 800 number strategy, our attempts to avoid refusals in the first place included an information website with answers to frequently asked questions (FAQs), a protocol which included leaving messages on answering machines, and preprogrammed scheduling of re-call attempts for "ring-no-answers."

<u>Survey Data Cleaning.</u> Data from completed interviews were monitored and cleaned by CRDA staff throughout the data collection process. All contact information, including telephone numbers, along with any other uniquely identifying information, were kept separately from the interview responses, for

[2] Fifty FDEs participated in the study, but the data for one FDE participant had to be excluded from the study due to a protocol violation.

purposes of confidentiality. A complete and fully annotated data file was maintained for the duration of the study.

Survey Quality Assurance. Multiple procedures were employed to ensure quality control, including: (1) rigorous initial training covering the basics of good interviewing; (2) highly focused training specific to each interview instrument; (3) consistent on-going training for upgrading of interviewer skills based on the results of auditory monitoring; (4) optimized calling strategies, tailored to the region(s) being called; and, (4) high successful refusal conversion strategies, based on focused, rigorous refusal conversion training.

Training overview. All interviewers, prior to making their first call, were required to attend and complete a series of two rigorous 8-hour sessions which covered the basics of good interviewing techniques. The first of these consisted of exposure to general interviewing techniques, including the use of proper feedback, pace, confidentiality, anonymity, and other professional interviewer skills. Interviewers were also given the opportunity to role play both the interviewer and respondent role with different partners, and to provide input to other pairs of interviewer/respondent after each of these interviews was concluded. The second training session included CATI training, i.e. use of computer and telephone systems in conducting telephone interviews. CATI training involved hands-on training and familiarization with the computer, using specific CRDA training programs.

Institutional Review Board training. All CRDA interviewers, staff, and management who handle data must complete the on-line CITI IRB training course as required by the University of Nevada's Office of Human Research Protection.

Performance monitoring. CRDA uses WinCATI software, created by SawTooth Technologies. The WinCATI system enables interviewers to enter telephone survey response data directly into machine-readable files, assisted by standardized edit checks for value range and other validity verifications as required by the system operator. CATI systems are known to improve the quality and consistency of survey research data gathered by telephone interviewers due to increased efficiency in the data gathering and analysis process, as well as reduction in the number and types of error sources normally associated with the interviewing process.

Monitoring of interviewers during survey shifts is a major supervisory responsibility. Using the Center's auditory monitoring system, supervisors were allowed to listen in during the course of any interview without disturbing either interviewer or respondent. Each interviewer was monitored at least once per shift. Interviewers were evaluated in several areas, including effectiveness of introduction, naturalness, appropriateness of feedback and probes, and the degree to which all questions are read exactly as written. Performance feedback was immediately given to the interviewer after the conclusion of each monitored interview. This enabled supervisors to ensure that proper interviewing techniques were used throughout the data collection.

Phase 2: Experimental Eye-Tracking Protocols

FDE Participants. FDE participants were recruited as described above.

Lay Participant Recruiting. A control group of 50 lay community members was recruited from the local community using a temporary employment agency. Respondents were screened for eligibility to participate, such that respondents were U.S. citizens over 18 years of age, whose first language was English, and who had no visual impairments that would preclude their being able to visually evaluate the experimental stimuli. Forty-three of the 50 Lay participants completed the protocols.

We were unable to record eye-tracking data for two FDE and two Lay participants. In three instances, the eye-tracker was unable to calibrate due to the lenses of the participants' eyeglasses. In one instance, the structure of the participant's eyelids prevented adequate reflection of infrared light from the participant's retinas. In all instances these participants could see and evaluate the stimuli displayed on the eye-tracking system without any difficulty, so we proceeded with data collection and recorded their decisions and conducted their qualitative interviews using the same protocols and procedures as we used with all the other participants. The total number of participants on which the eye-tracking analyses are based is accordingly lower than the number of participants on which the call accuracy and confidence analyses are based.

Survey Instrument. The survey instrument consisted of a combination of closed- and open-ended questions concerning FDE participant education, training, experience, and certification.

Materials and Equipment. All eye-tracking protocols were conducted using Tobii T-60 model binocular eye tracker systems with 17" TFT, 1280 x 1024 pixel displays (Tobii Technology, Stockholm, Sweden), and Tobii Studio software. Audio recordings of the open-ended interviews were recorded using a Philips Voice Tracer (model LFH0662) and a Sony IC (model ICD-UX512) digital recorder. Audio recordings were transcribed using *Start Stop Universal Transcription* software by HTM Engineering. Signatures were produced using white A4 copy paper and Pilot Easy Touch Pro black ink ballpoint pens.

Signature stimuli. The signature stimuli were prepared to capture several different signature features that might be encountered as part of the FDE caseload. Most writers have more than one signature style and the style of signature utilized by the writer may depend on the nature of the document to be signed (Cassidy, 1955; Hilton, 1956). Historically, FDEs have classified signatures into three distinct types: (1) formal signatures, used for important documents such as wills or other legal documents; (2) informal signatures, used for routine documents and correspondence; and (3) receipt signatures, careless scribbles used for mail carrier, credit card receipts, autographs, etc. (Conway, 1959).

A more recently developed classification system was utilized to classify the styles of signatures used in this study. Rather than classifying the style of a signature based upon the type of document utilized, this contemporary system relies upon a more objective classification scheme that is based upon the number of allographs (i.e., a letter of an alphabet in a specific shape, such as capital or lower case, italic, or various handwritten forms of the letter that fall within that letter template) that are present and legible within the signature (Mohammed, Found, & Rogers, 2008; Nguyen, Hammand, & Salyards, 2011). This classification scheme identified three types of signature: (1) text-based, in which each allograph of the name is clearly written; (2) mixed, in which two or more allographs can be read; and (3) stylized, in which one or fewer allographs are legible.

Signatures are further classified according to their complexity. Dewhurst, Found, and Rogers (2007) describe complexity theory as the "theoretical relationship that is thought to exist between the complexity of an image, features of handwriting, the likelihood of two writers having identical handwriting characteristics, and the ease or difficulty with which an image can be simulated". In other words, "as complexity increases (as referenced by an increase in the number of features within the writing) the likelihood of someone being able to successfully simulate an image decreases".

One method of determining the complexity of signatures is to evaluate the number of turning points, line intersections, and retrace strokes in a signature. Found, Rogers, Rowe, and Dick (1998) and Sita, Rogers, and Found (2003) identify turning points (TP) as the number of direction changes and the number of starting points and terminating points of any continuous line. Line intersections or retraced strokes (INTRT) are determined by counting the number of times a line either intersects or is retraces a previously written stroke. We determined signature complexity using the following classification model equations described by Found et al. (1998) and Sita et al. (2003):

High complexity = (0.3407762 x #TP) + (0.2397084 x #INTRT) - 9.418039

Medium complexity = (0.1685134 x #TP) + (0.08713504 x #INTRT) – 2.915064

Low complexity = (0.09862483 x #TP) – (0.02637828 x #INTRT) – 1.508095

The complexity classification of a signature is determined by the equation that produces the highest positive value. Tables X-X present the resulting signature classifications for the eye-tracking protocols.

Table 2.1.
Single Signature Protocol Signature Type and Complexity

Genuine Signatures	**Complexity**	**Type**
M. Lynae Drake	High	Text
Boris Vasilyev	Low	Stylized
Nichol Galloway	High	Text
Kim Hammond	Low	Stylized
Jeremy Payne	Low	Mixed
Nicole Arrant	High	Text
Annie Penland	High	Text
Bekki Gowens	High	Text
Kevin Rickman	Low	Stylized
Cierra Alexander	Low	Mixed
Tedde Hamilton	High	Text
Forged Signatures	**Complexity**	**Type**
Harold Robinson	Low	Mixed
William Bailey	High	Text
Robert Walsh	High	Text
Tim Walls	Low	Stylized
Lisa Kilinc	High	Text
Christopher Wesley	High	Text
Debbie Hemingway	High	Mixed
Ted Bozeman	High	Text
Rick Boykin	Low	Mixed
Mark Bryant	High	Text
Gary Feilmeier	High	Stylized
Ronnie Argo	Low	Text
Mark Payne	Low	Mixed
Saint Reincher	High	Text
Clinton Kinsler	Low	Mixed

Arthur Harris	High	Text
Michael Thompson	High	Text
William Harper	Low	Mixed
Kimberly R. Conteras	High	Mixed

Table 2.2.
Questioned/Known Comparison Protocol Signature Type and Complexity

Signatures	**Complexity**	**Type**
Mary Nagle	High	Text
Michele Short	High	Text
Terry Lu	Low	Text
John Wulf	Low	Text
Will Atkinson	High	Mixed
Brian Albury	High	Mixed
Shawn Richards	Low	Mixed
Bryan Bouysou	Low	Mixed
Vilcise Tima	High	Stylized
Ricardo Vega	Low	Stylized
Jim LaBarbera	Low	Stylized

Table 2.3.
Tachistoscope/Extended View Protocol Signature Type and Complexity

Genuine Signatures	**Complexity**	**Type**
Rhonda Vinson	High	Text
Ricki Walls	High	Text
Mitch Hawkins	High	Mixed
Karen Crisler	Low	Mixed
Jaina Hawkins	High	Mixed
Kevin Backan	Low	Stylized
Amy Bedford	High	Text
Tommy Rouse	High	Text
Tami Groover	High	Text
Jessie Martin	High	Text
Forged Signatures	**Complexity**	**Type**
Paul Malizia	Low	Mixed
Juliet Oliver	High	Text
Cedric Caldwell	High	Text
Lorene Mosby	High	Text
Tiffany Wright	High	Mixed
Janice Ferguson	High	Text

Jermyn Barker	High	Mixed
Wesley Ellis	Low	Mixed
Kathy Schwarzer	High	Text
Nancy Korosi	High	Text

Signature collection procedure. Fifty signature writers participated in the signature collection process. All signature writers were unpaid volunteers who were over the age of 18 years. All volunteers were recruited by members of the research team from among friends, neighbors, colleagues, or students. None of the volunteers were police officers or investigators, and none of the volunteers had forensic training.

Writers were seated at a desk or table and instructed to "sit comfortably". They were further instructed that they were required to use the ball point pen provided, and that all signature specimens were to be produced on the white A4 copy paper provided. Signature writers were also provided two "backing" sheets of A4 copy paper to ensure a smooth, consistent writing surface.

Protocol 1: Single Signatures. When producing signatures genuine signatures for the single signature (1 Up) protocol, signature writers were given a sheet labeled "1 Up Genuine Signatures", which had four numbered signature lines on it, and instructed to place the backing sheets beneath this sheet. The writers were then instructed to write their signature once on each of the four numbered signature lines using their normal signature style, as if they were signing a check or signing their name to routine office/school work.

Forged (i.e., simulated) signatures were then created by asking each writer except the writer who produced the original signature to simulate the genuine signature of a previous writer, resulting in 49 "forgers". Each forger was provided with a sheet labeled "1 Up Forged Signatures", two backing sheets, and a ball point pen as described above, and the 1 Up Genuine Signature sheet previously completed by a different writer and bearing four (4) naturally written genuine signatures.

Writers were instructed to use the pen provided and attempt to simulate the genuine signature of the other writer. Writers were not allowed to trace any of the known signatures, and that they were not allowed to practice simulating any of the signatures. The forgers each produced three simulations using the genuine signatures provided as a model/guide.

Nineteen simulated signatures and eleven genuine signatures were then selected using an online random sequence generator.[3] Order of signature presentation was also determined by the random sequence generator. After the signatures were collected a certified forensic document examiner (FDE) classified the signatures as text-based, mixed, or stylized, and calculated the complexity of each writer's signature based on the classification model equations described above.

Protocol 2: Questioned/Known Comparison. A similar procedure was used to create the signatures for the questioned/known comparison protocol. Writers were seated at a desk or table and provided with pen, paper, and backing sheets. Writers were then given four sheets labeled "Normal Signatures" and instructed to write their signature on the page using their normal signature style, as if they were signing a check or signing their name to routine office or school work. Four signatures were collected per page, for a total of 16 genuine signatures. Writers were given one additional sheet of paper

[3] www.random.org

labeled “Model Signatures for Forgers”, on which they used the same procedure to produce three model signatures to be used by other writers to create forged specimens.

The writers were then asked to disguise their signature using the same procedure. The writers were provided with two sheets labeled “Disguised Signatures”, and asked to try to disguise their signature in a way that they thought would allow the signature to pass a transaction point inspection (e.g., a bank teller or retail store cashier), but could also form the basis for denying that they had written the signature later on. Three model signatures were collected for each writer.

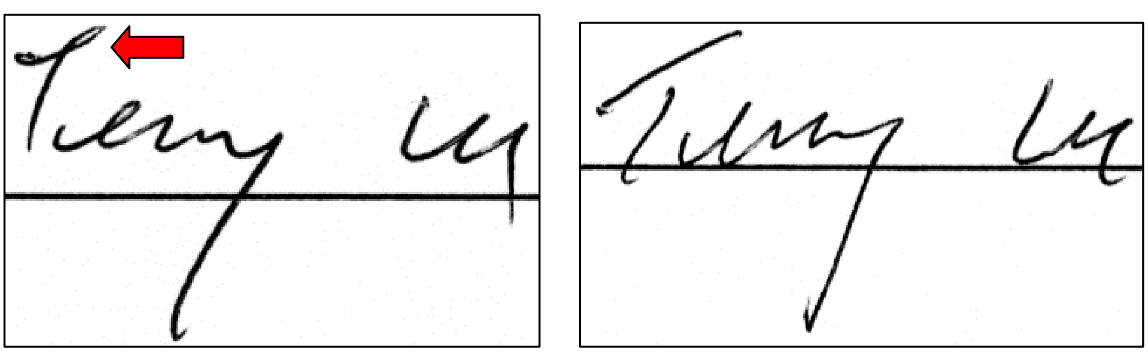
Simulated signatures were created by providing the writers with one sheet of the three model signatures for forgers. Writers were given two sheets labeled “Simulated Signatures” and instructed that they were not allowed to trace or to practice simulating any of the signatures model signatures. They were then asked to try to simulate the genuine signature of the other writer. The writers produced eight simulated signatures.

A slightly different protocol was used to produce the traced signature specimens. Writers were provided with one sheet upon which to trace the signatures from the “Model Signatures for Forgers” document previously used to collect the three naturally written signature specimens from other writers. Writers were also provided a transmitted light box. They were instructed to place the model signatures on the light box, and then to place the “Traced Signatures” sheet on top of the model signatures (no backing sheets were used, and no practice tracings were allowed). Writers then used the pen provided to produce direct tracings of any of the three model signatures. They could elect to trace one signature several times, or any combination of the three signatures on the model signature sheet.

Once the specimens were collected, they were classified by signature type and complexity using the procedures described above. Six signature specimens were selected for each of the eleven signature writers, for a total of 66 questioned/known comparisons (22 genuine signatures, 9 disguised signatures, 22 simulated signatures, and 13 traced signatures).

Sixty-two of the questioned signatures were randomly selected using the procedure described above. The remaining four signatures were genuine specimens specifically selected because of the presence of a feature or characteristic variation produced only in one genuine signature specimen produced by the writer. These features were identified as a rare or accidental characteristic produced by the writer. Figure 2.1 demonstrates an example of these “accidental” characteristics.

Figure 2.1. Genuine Terry Lu signature with “eyelet” in the T, which appeared in only one Lu signature. The T in the specimen on the right is a two-stroke letter form in which the staff and the crossbar are not connected.



Protocol 3: Tachistoscope/Extended View. Signatures for this protocol were obtained using the methodology described for the Single Signature protocol. Ten genuine and ten forged signatures were randomly selected using the random sequence generator described above. Once the 20 writers were identified, the random sequence generator was used to select which signature from among the four genuine signatures for that name would be used, or which signature from among the three forged signatures would be used. None of the signatures used in this protocol were previously used in either the single signature or the questioned/known comparison protocols.

Protocol 4: Peer Review. Signatures for this protocol were selected from among the previously-viewed single signature and questioned/known comparison protocol signatures during the pilot phase of the study. We asked three pilot participants to rank each set of six signatures from the questioned/known comparison protocol from 1 to 6, where 1= the easiest signature for two examiners to agree upon, and 6 = the most difficult for two examiners to agree upon. Signatures at each extreme were excluded, and one of the eleven signatures for the peer review protocol was selected from among the remaining four signatures. Eleven of the previously-viewed single signatures were randomly selected to be included in the peer review protocol.

Signature images were captured using Adobe Photoshop CS5-Extended and an Epson Expression 10000 XL flatbed scanner. Each image was scanned as an 8-bit grayscale image and captured at 300 ppi, and saved as a .tif image file. The final images were saved as .jpeg files and were enlarged or reduced as necessary to maximize the space available for display on the Tobii monitor. The final images were resized to 1024 x 768 pixels to achieve optimum resolution on the eye tracking system.

Phase 3: Qualitative Interview

We conducted an open-ended, qualitative interview with FDEs and Lay participants following the eye-tracking task to investigate how they reached their decisions. During the pilot phase of the study we asked our FDE pilot participants to rank order the six signature specimens for each name according to how difficult they believed it might be for two different examiners to reach a consensus on the process call (i.e., whether the signature was genuine or simulated in some way). Based on the opinions of the FDEs, we selected a subset of one of each of the eleven names in the questioned/known comparison protocol from among those signatures which fell at the center of the rankings. During the full study, participants were asked to describe in detail what features they felt were diagnostic in determining whether the signatures were genuine, disguised, or simulated, and how important these features were in reaching their decisions.

Procedures

<u>*Internet/Phone Survey.*</u> The Internet/phone surveys were administered from the University of Nevada, Reno Center for Research Design and Analysis computer assisted telephone interview (CATI) laboratory. Experienced telephone interviewers were given specific training with the survey instrument prior to the beginning of data collection. In the course of a CATI interview, the interviewer read questions verbatim from a computer screen and recorded the participant responses.

Each FDE participant was contacted by CRDA on up to four occasions with no contact (e.g., answering machine, ring no answers, busy signals), until the interview was completed, until the respondent gave two “soft” refusals, or until the respondent strongly refused to participate (called a “hard” refusal). Thus, CRDA staff called a respondent up to eight times with no contact, or with one “hard refusal”, or two “soft refusals.”

Interviewers left answering machine messages on the second, fourth, sixth, and final call attempts. Interviewers also provided CRDA’s toll free telephone number, which respondents could call at their convenience in order to complete the interview. Interviewers also provided the URL to the project information website on the answering machine.

Refusal conversion strategies included the following: (1) use of a standardized, detailed description of the importance of the study; (2) an appeal to the respondent regarding the importance of participation as means of preserving the reliability of the data being collected, including the importance of their needs being recognized and represented; (3) an effort to establish the personal benefit which will accrue to respondent or his/her family based on participation; (4) a clear reassurance of our guarantee of respondent confidentiality; and (5) an explanation of how they were selected for the study.

Upon completion of the survey, participants were requested to provide information about their availability and travel preferences for participating in the onsite phases of the project. Research staff from Kentucky State University then contacted the participants to schedule travel arrangements.

Eye-Tracking Protocols. All Lay participant data collection was conducted in the eye-tracking laboratory at Kentucky State University. FDE participants were given the option of either traveling to the KSU research facility, or having the research team come to their area. Offsite research conditions were similar to laboratory conditions (e.g., lighting conditions and workspace configuration and equipment were arranged to be consistent with the laboratory environment).

Upon arriving at the research site, all participants were given an extensive overview and training covering the purpose of the research and the research protocols. Lay participants were given more extensive instruction than were FDE participants about the kinds of features they might evaluate in the signatures. The training included an example of each of the protocols, including copies of the stimuli for each practice protocol.

Each research area was equipped with a Tobii T60 eye tracking system and computer. Participants were calibrated to a 9-point reference grid, which provided a resolution of subject gaze to better than 0.5 degree of visual angle. Calibrations were confirmed before the test phase of the experiment. A second calibration check was performed at the beginning and the end of each signature trial to help ensure the accuracy of the data.

Stimuli were displayed using an integrated Tobii T60 1280 x 1024 pixel TFT monitor. Participants viewed the screen from a distance of 57 cm so that the visual angle of the screen was 331 x 271 (W x H), and that the width of a typical questioned signature subtended a visual angle of approximately 281. Eye fixations were defined per the Tobii Clearview fixation filter, i.e., an eye position remaining within a 50 pixel area for a time of greater than 100 msec.

At the beginning of each eye-tracking protocol (single signature, questioned/known comparison, tachistoscope/extended view, and peer review), participants were given the opportunity to complete a practice eye-tracking trial to ensure that they understood the procedure prior to data collection.

Protocol 1: Single Signatures. Participants were seated before the eye-tracking monitor at a distance of 57 cm from the screen, and the 9-point calibration was conducted. Participants then completed a practice trial consisting of one signature example.

The single signature protocol consisted of five trials. Each trial began with a “shapes test” calibration in which participants were directed by the researcher to look at the center of each of four shapes, which were arranged in a square configuration at the four corners of the monitor. After the calibration, each single signature was presented sequentially in the following format:

1. A screen displaying a small "fixation cross" at the center was presented for three seconds. The purpose of the fixation cross was to locate the participant's gaze at the center of the screen so that the examination starting point was consistent across participants.
2. After three seconds, the screen automatically displayed the single signature specimen. Participants were allowed to examine the signature for as long as they chose. When they were finished with their examination, they verbally indicated this to the researcher, who immediately exited the signature stimulus screen.
3. The following screen displayed the definitions of the terms "genuine" and "simulated", and a confidence scale ranging from 1 (not at all confident) to 4 (extremely confident). The researcher asked the participant to verbally designate whether he or she felt that the signature was genuine or simulated, and to indicate the level of confidence in this decision. The responses were manually recorded by the researcher.

This procedure was repeated for all the signatures in the trial. After the final signature in the trial, another shapes test calibration was conducted. This procedure was repeated for each of the five trials in the protocol.

Protocol 2: Questioned/Known Signature Comparison. This protocol consisted of 11 trials, each containing six questioned/known signature comparisons. Each participant completed a practice trial for the protocol, and calibrations were completed as described above. Following the shapes test calibration, each signature comparison was presented in the following format:

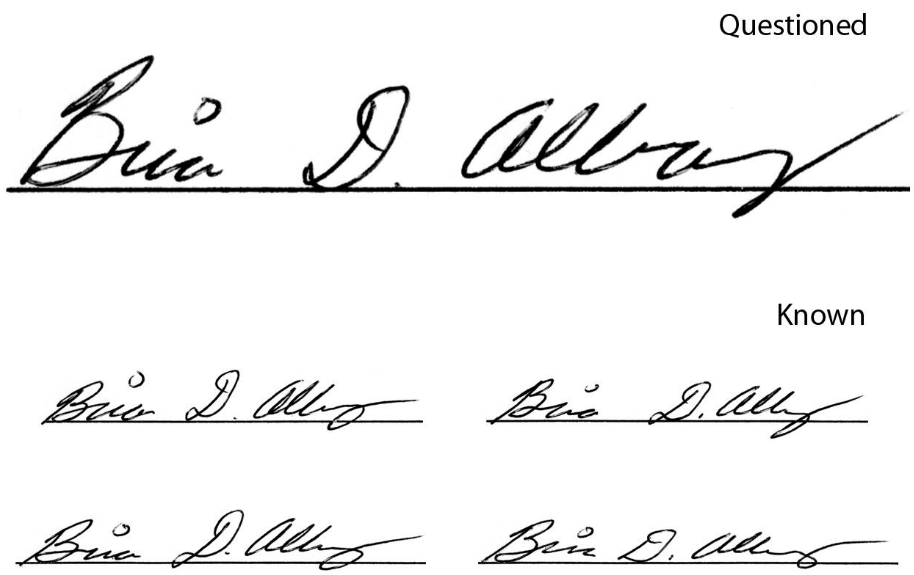
1. A fixation cross displayed for three seconds, then automatically changed to the "known signature" screen. The known signature screen displayed four examples of the signature writer's true, naturally-written signature in the lower half of the screen. Figure 2.2 presents an example of a known signature screen.

Figure 2.2. Known signature specimen view for Brian Albury. These same four known signatures preceded every presentation of a questioned signature for Brian Albury.

2. Participants were allowed to view this screen and study the known signatures for as long as they chose. When they were ready to view the next screen they indicated this verbally to the researcher, who immediately exited the known signature screen.
3. A second fixation cross was displayed for three seconds, then the screen automatically changed to the "questioned/known comparison" screen. This screen presented the four known signatures paired with a questioned signature. Participants were allowed to view this screen for as long as they chose. When they were finished with their comparison, they

verbally indicated this to the researcher, who immediately exited this screen. Figure 2.3 presents an example of the questioned/known comparison screen.

Figure 2.3. Questioned/known signature comparison view for Brian Albury. Each of the six questioned signatures for Brian Albury was paired with the same set of four known signatures presented on the previous slide.



4. The following screen presented the definitions for “genuine”, “disguised”, and “simulated” signatures. It also presented the nine-point bipolar “authorship scale” commonly used by FDEs to indicate the strength of their certainty in their decision. The center value of this scale (“inconclusive”) indicates that there is not enough information available in the questioned and known signatures to make any determination about the signature authorship. “Indications” signifies that there is some evidence to suggest that the questioned signature either was or was not created by the author of the know signatures. “Probably” signifies that there is strong evidence to suggest that the questioned signature either was or was not created by the author of the known signatures. “Strong Probably” indicates that the examiner is virtually certain that the questioned signature either was or was not created by the author of the known signatures. “Identification” indicates that the examiner is certain that the author of the questioned signature is the same person who produced the known signatures. “Elimination” indicates that the examiner is certain that the author of the questioned signature is *not* the author of the known signatures. Participants were asked whether they believed the questioned signature was genuine, disguised, or simulated, and asked to indicate their degree of certainty using the nine-point scale. If the participant responded that the signature was simulated, two follow-up questions were asked. Participants were asked to indicate whether they thought that the simulation was a freehand copy or a tracing. They were then asked to indicate on the four-point scale described in the single signature protocol how confident they

were in the freehand simulation/tracing decision. All responses were manually recorded by the researcher.

This procedure was repeated for all six signatures in the trial. After the final signature in the trial, another shapes test calibration was conducted. This procedure was repeated for each of the eleven trials in the questioned/known comparison protocol.

Protocol 3: Tachistoscope/Extended View Protocol. The tachistoscope/extended view protocol was designed as a distractor task to distance the participants from their decisions in the questioned/known comparison protocol. This protocol consisted of four trials. Each trial began with a "shapes test" calibration. After the calibration, each single signature was presented sequentially in the following format:

1. A screen displaying a small "fixation cross" at the center was presented for three seconds.
2. After three seconds, the screen automatically displayed a "visual noise" pattern designed to eliminate the afterimage of the fixation cross. This pattern displayed for three seconds, then the screen automatically switched to the tachistoscope view of the signature.
3. The signature was displayed for one second and the screen automatically changed.
4. The next screen displayed the definitions of the terms "genuine" and "simulated", and the same confidence scale ranging from 1 (not at all confident) to 4 (extremely confident) used in the single signature protocol. The researcher asked the participant to verbally designate whether he or she felt that the signature was genuine or simulated, and to indicate the level of confidence in this decision. The responses were manually recorded by the researcher.
5. The participants then viewed the same signature a second time, in a procedure identical to the single signature protocol. After viewing the fixation cross for three seconds, they were allowed to examine the signature for as long as they chose. Participants verbally indicated that they were finished viewing the signature, and then responded to the same follow-up questions about whether the signature was genuine or simulated, and how confident they were in this decision.
6. Each pair of signature presentations alternated between a right side up and upside down orientation. For example, signature one of trial one was presented right side up for one second, and then presented right side up for the extended view; signature two of trial one was presented upside down for one second, and then presented upside down for the extended view.

This procedure was repeated for all five signatures in the trial. After the final signature in the trial, another shapes test calibration was conducted. This procedure was repeated for each of the five trials in the protocol. Completion of this protocol ended the first day of data collection, allowing an extended period of time to pass before the participants viewed the signatures in the peer review protocol.

Protocol 4: Peer Review Protocol. The eleven questioned/known signature comparisons and eleven single signatures used in this protocol were selected from among the signatures used in the previous protocols using the procedure described above. The participant's original responses to these signatures were recorded on the peer review data collection sheet. We then manipulated these original responses in several different ways: (1) the determination of whether the signature was genuine, disguised, or simulated ("call") was either changed or left the same; (2) the authorship or confidence opinion was either changed or left the same; (3) both call and authorship/confidence opinion were changed; or (4) neither call nor authorship/confidence opinion was changed. The signatures were then displayed as described in the previous protocols.

1. After the presentation of the fixation cross, participants were allowed to view the signatures for as long as they chose, and then indicated verbally when they were finished.
2. The following slide displayed the call definitions and the authorship or confidence scale, depending on whether the stimulus had been a questioned/known comparison or a single signature.
3. Participants were given the manipulated version of their original call, and then asked to indicate whether they believed that the signature was genuine, disguised, or simulated. They were then given the manipulated version of their authorship or confidence opinion, and asked to indicate their current authorship or confidence opinion.

The single signature protocol consisted of five trials. Each trial began with a "shapes test" calibration in which participants were directed by the researcher to look at the center of each of four shapes, which were arranged in a square configuration at the four corners of the monitor. After the calibration, each single signature was presented sequentially in the following format:

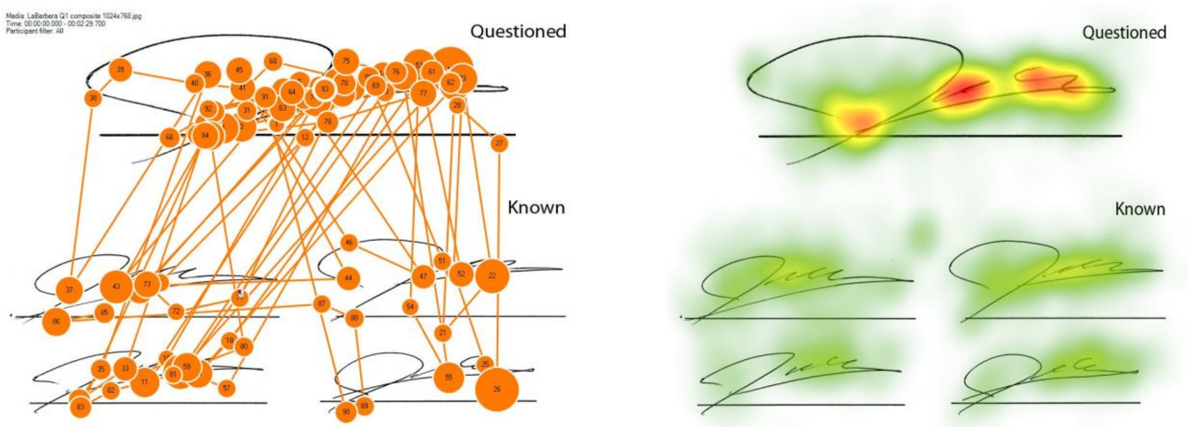
1. A screen displaying a small "fixation cross" at the center was presented for three seconds. The purpose of the fixation cross was to locate the participant's gaze at the center of the screen so that the examination starting point was consistent across participants.
2. After three seconds, the screen automatically displayed the single signature specimen. Participants were allowed to examine the signature for as long as they chose. When they were finished with their examination, they verbally indicated this to the researcher, who immediately exited the signature stimulus screen.
3. The following screen displayed the definitions of the terms "genuine" and "simulated", and a confidence scale ranging from 1 (not at all confident) to 4 (extremely confident). The researcher asked the participant to verbally designate whether he or she felt that the signature was genuine or simulated, and to indicate the level of confidence in this decision. The responses were manually recorded by the researcher.

This procedure was repeated for all the signatures in the trial. After the final signature in the trial, another shapes test calibration was conducted. This procedure was repeated for each of the four trials in the protocol.

Qualitative Interview. One signature from each of the eleven names in the questioned/known comparison trial was selected for the qualitative interview protocol. Three signatures (Albury, Tima, and LaBarbera) were genuine; five signatures (Bouysou, Vega, Lu, Wulf, and Richards) were freehand simulations; and three signatures (Nagle, Atkinson, and Short) were traced. No disguised signatures were included in this protocol. Copies of each of the eleven questioned/known signatures were made on grid sheets with X/Y coordinates.

After participants completed all day one protocols, the gaze plots, heat maps, and video eye-tracking recordings were downloaded for these eleven signatures and the computer files were placed in a separate folder created for that participant. The video eye-tracking recordings are animated visualizations that allow the viewer to observe the examination fixation by fixation. Gaze plots are visualizations of the gaze recording that display fixations as dots and saccades as connecting lines. Fixation sequence and duration can be determined by the numerical order and size of the dots. Heat maps are another form of gaze recording visualization in which the areas of gaze concentration are indicated by the intensity of the color overlaying the area. Red, orange, and yellow areas indicate areas of higher concentration, while green or blue areas indicate areas where little or no gaze activity has been recorded. Figure 2.4 presents examples of a gaze plot and heat map.

Figure 2.4. Individual FDE gaze plot and heat map for the genuine signature of Jim LaBarbera. Each numbered point on the gaze plot indicates a fixation, and the connecting lines indicate saccades (eye movements). The size of the dots indicates the duration of the fixation (the larger the dot, the longer the fixation duration). The areas which attracted the most visual attention are illustrated by the corresponding red, orange, and yellow areas on the heat map.



Participants were seated with the interviewer before a computer. The interviewer first showed the participant the gaze plot, heat map, and video recording of the examination. The interviewer activated the audio recorder and began the interview by instructing the participant to describe in detail what he or she was looking at during the examination, and how they used that feature or information to determine whether the signature was genuine, disguised, or simulated. As the participant described the examination process, the interviewer worked with the participant to mark on the grid sheet the location of the features being discussed, and also verbally indicated the location of the features. This procedure facilitated the coding process by directing the coders to the appropriate location of the features being discussed.

The interviewers were as non-directive as possible, leaving the participants to determine which features to discuss and the order in which they were mentioned. Interviewers were trained in the use of standardized probes and prompts, and facilitated the discussion by pointing out areas that appeared to elicit the participant’s attention. Any direction on the part of the interviewer occurred primarily during the discussion of the first signature, when participants seemed unsure about how to proceed with the discussion. In these instances, the interviewer might point out the location of the first fixation, and then help the participant identify the direction of the first saccade and subsequent fixations. Then the interviewer would suggest that the participant describe what he or she saw there, and what they were thinking about that feature. Interviewers were trained to use the standardized probe “is there anything else?” when the participant paused after a discussion. Participants were allowed to go into as much depth as they chose during the interview, and the interview for each signature was considered complete when the participant verbally indicated that he or she had no further information about that signature.

Content Analysis of Qualitative Interview Data. The qualitative data obtained from the voice recording semi-structured interview transcripts was content analyzed using systematic quantitative and qualitative content analysis procedures. These procedures, which are described in Holsti (1968), are classic content analysis techniques that are well established and still currently practiced. These techniques have been successfully utilized by the present investigators to analyze qualitative data in various national survey research projects in legal contexts. The unit of analysis for the content analysis was the full interview transcript for each participant. The unit of observation was the transcript for each separate signature comparison within the interview.

Thematic codes were empirically constructed using a 100% of the completed FDE interview transcripts, and were revised throughout the coding process. Coding guidelines (e.g., mutually exclusive and exhaustive categories) described in Holsti (1969) and other well-known research methodology texts were employed. Where appropriate, the coding accommodated multiple mentions (e.g., more than one code per variable). When the coding was completed, frequencies were calculated for all categorical variables, and codes were collapsed into broader conceptual categories if thematically and theoretically appropriate.

Coders and Coder Training. A minimum of three coders per transcript was used to accommodate coding, check-coding, and check-code verification. Coders were graduate or undergraduate students who had completed coursework in criminal justice, sociology, political science, or psychology (Merlino, Murray, & Richardson, 2008). Coders received a minimum of 8 hours of training, during which they were given an overview of the project, the process by which data were collected, and the methods and procedures of content analysis. After the purpose of the content analysis was described they were extensively trained on the definitions of all variables. All coders and interviewers were naïve to the hypotheses.

The coders coded several practice units of observation and check-coded and check-code verified these transcripts under the supervision of the PI and project supervisors. All coders were cross-trained to perform all three tasks. Problems with the codebook and coding protocol were addressed to ensure high inter-coder reliability.

Coding Procedure. Coders were instructed to read the transcript for each unit of observation (e.g., signature comparison) prior to coding that section of the transcript, and if necessary to listen to the recorded transcript for that interview. This helped the coder to identify and comprehend the information during the coding process (Dobbin, 1998; & Richardson et al., 1998; Merlino et al., 2008). Codes were entered directly onto a code sheet. Each feature identified by the participant was coded as a separate instance within the unit of observation, and treated as if it were a separate case (Merlino et al., 2008).

The units of observation were check-coded and check-verified. The check coder reviewed the original coding for the unit of observation, and if the check coder disagreed with the initial coder, the check coder specified which code he or she would have used instead. A third coder then check- verified the check coding discrepancies, specifying which of the two codes should be used. Coding discrepancies that were not resolved through check-coding and check-verification were resolved either by discussion among the coders, or by the PI (Merlino et al., 2008).

Key Independent and Dependent Measures. Table 2.4 presents a partial list of the handwriting features present among the signature specimens (from Purdy, 2006). Additional features were added to this list as they emerged from the qualitative information gathered in the decision analysis portion of the study. These features were accompanied by illustrations published in Purdy, 2006.

Table 2.4. Handwriting Features

Feature	Definition
Alignment	Placement of written words above or below the baseline
Arch	Convex curved strokes found in certain letters
Arrangement	Placement and organization of letters
Ascender	The part of the letter that rises above the baseline
Body	The remaining parts of a letter after the initial/terminal strokes and upper/lower extensions are removed
Bow	A curved stroke generally aligned in a vertical direction
Buckle/Knot	The part of a letter that ties itself to the staff
Cap	The stroke in a letter that crosses over the top of the staff stroke
Compound Curve	A curved stroke whose radius changes direction
Connecting Stroke	A stroke joining two letters or words together
Crossbar	A stroke that intersects the staff or main portion of a letter
Crowding	Letters written with little or no space between
Cusp	The crescent or crown of a letter
Descender	The part of a letter which drops below the baseline
Eyelet	A circular movement whose center can be either open or closed
Foot/feet	The parts of a letter that touch the baseline
Hiatus	A gap within a letter when the writing instrument leaves the paper
Hook	A curved or angular projection usually occurring in an initial or terminal stroke
Initial stroke	The first writing movement of a letter
Insertions	Placement of additional characters or letters within already written letters
Lower loop	A loop situated primarily below the baseline
Margins	Distance of writing from a real or imagined edge
Pen lifts	Interruptions in pen strokes caused by lifting the writing instrument from the paper
Retrace	A stroke within a letter that follows the same course as a preceding stroke
Rhythm	Regularity in the spacing characteristics and graphic patterns of the handwriting
Shoulder	The flat or sloping part of a letter
Size	Height and width of letters
Slope/Slant	The extent to which letters lean away from perpendicular
Spur	A small, angled appendage at the start or end of a stroke
Staff stroke or stem	A stroke forming the backbone of a letter
Terminal stroke	The stroke which forms the final portion of a letter
Trough	A hollow or concavity between two raised portions of a letter
Upper loop	A loop situated primarily above the baseline

The following four metrics were used in the majority of eye-tracking analyses, and were calculated as for each AOI (area of interest) in the signature specimens, as described above:

- ***Total Fixation Count (including zeroes) (TFC):*** A “fixation” is defined by the speed of the eye movement and the distance between adjacent data points. If the eye-movement speed falls below the velocity threshold, then a fixation is recorded. This metric measures the number of times the participant fixates on an AOI. As stated above, if the participant has not fixated on the AOI by the end of the recording, then the total fixation count is registered as zero.

- ***Total Fixation Duration (including zeroes) (TFD):*** This metric measures the sum of the duration for all fixations within an AOI. If, at the end of a recording, a participant has not fixated on the AOI, the total fixation duration is registered as zero.

- ***Total Visit Count (including zeroes) (TVC):*** A "visit" is defined as the duration of each individual visit within an AOI. This metric measures the time in seconds of the interval between the first fixation on an AOI and the last fixation within the AOI, where there have been no fixations outside the AOI boundary. If no fixations in the AOI are registered by the end of the recording, the total visit count is registered as zero.

- ***Total Visit Duration (including zeroes) (TVD):*** This metric measures the sum in seconds of all visits within an AOI. If the participant's gaze does not fall within the AOI by the end of the recording, total visit duration is registered as zero.

Table 2.5 presents a partial list of key variables. Additional variables were constructed empirically from the content analysis of the qualitative data from the semi-structured interview.

Table 2.5.
Partial List of Key Variables

Variable	Definition
Participant type	FDE or layperson
Eye-tracked feature	The feature evaluated by the participant (eye tracking)
Self-report feature	The feature evaluated by the participant (self-report)
Fixation duration	The sum of the duration in seconds for all fixations within an AOI (eye tracking)
Fixation count	The number of times the participant's gaze fixates on an AOI (eye tracking)
Visit duration	The duration in seconds of each individual visit within an AOI (eye tracking)
Visit count	The number of visits within an AOI (eye tracking)
Process decision	Genuine, disguised, or simulated signature specimen
Authorship decision	9-point bipolar rating from -4 (exclusion) to +4 (identification) with a zero point (inconclusive); recoded to two unipolar scales from 0 (inconclusive) to 5 (either identification or elimination)
Simulation decision	Whether the simulated signature was a freehand simulation or traced
Confidence	4-point Likert-type scale from 1 (not at all confident) to 4 (extremely confident)
Accuracy	Participant process decision is correct (yes/no)
Difficulty ranking	Participant ranking of Q/K signature specimens from 1 (least difficult for two examiners to reach consensus) to 6 (most difficult for two examiners to reach consensus); equal intervals not assumed
Signature type	Classification of the signature specimen as text-based, mixed, or stylized
Complexity	Classification of the signature as high- or low-complexity

Statistical Analyses

A variety of statistical analyses were selected, depending on the nature of the data. Unless otherwise stated, alpha was set at .05 for all analyses. Our analyses were limited in several instances by the sample size, which resulted in small cell sizes in some cases. For example, a number of the individual signature analyses had small numbers of incorrect responses, which reduced the power of our analyses to detect true differences. This was particularly true for the survey data analyses, where curvilinearity issues were revealed when we performed our diagnostics. The cell sizes were relatively small, and the loss of additional data resulting from data transformations to correct for non-linearity precluded us from performing regression analyses. Thus, we analyzed these data using simpler bivariate correlations.

Single signature analyses included a combination of factorial ANOVAs and chi-square analyses for the analyses of the full single signature data set. MANOVAs were conducted for the eye-tracking metrics for each individual signature. MANOVA was the appropriate statistical method for the individual signature analyses because of the multiple areas of interest within the signature. The areas of interest were highly correlated with each other (e.g., a smaller area of interest might be nested within a larger area of interest), so the MANOVA allowed us to account for the contribution of each separate area of interest to the overall result. Pillai's Trace was used as a measure of the overall model significance and a measure of the model's power.

Analyses of the questioned/known comparison data were similar to those conducted for the single signature data. Factorial ANOVAS, MANOVAs, and chi-square analyses were utilized as appropriate.

Analyses for the tachistoscope/extended view data also used a combination of chi-square and binomial logistic regression. We selected the logistic regression analyses because of the non-linearity among our variables, and because in some instances our predictor variables were categorical. Mertler and Vannatta (2005) recommended setting alpha at .10 for logistic regression analyses because the *Wald* statistic is an extremely conservative measure, so we followed this recommendation.

Analyses for the peer review data included chi-square analyses, factorial ANOVAS, and repeated measures ANOVAs for the analyses of the eye-tracking metrics. Repeated measures ANOVAs were appropriate for these analyses due to the comparisons of metrics for two different views of the same signature. Logistic regressions were conducted for the individual signature analyses to accommodate the analysis of multiple variables, some of which were categorical.

CHAPTER 3: RESULTS

SECTION 3.1: NIJ FORENSIC SURVEY RESULTS

Overall Survey Responses

The purpose of this survey was to elicit information from United States and Canadian FDEs about their background, training, and experience in the field. Survey questions addressed FDE memberships and affiliations with professional organizations, their educational background, their formal training and certification, their professional experience, and their practice environment. Ninety-seven professional FDEs who were members of regional and national professional organizations (e.g., the American Academy of Forensic Sciences, the American Society of Questioned Document Examiners, the American Board of Forensic Document Examiners, or other mainstream regional professional organizations) completed the survey. Of these, 50 FDEs agreed to participate in the on-site phases of the study.

The survey results are presented with the questions as they appeared to the participants.

S3: In what OTHER areas in the forensic sciences do you have TRAINING, EDUCATION, OR EXPERIENCE? *(select all that apply)*

Table 3.1.1

Areas of expertise, other than "Forensic Document Examination" (FDE) (select all that apply)	Frequency	Percent of Respondents
Questioned documents (QDE)	77	79.4%
Photography	44	45.4%
Imprints / impressions	30	30.9%
Microscopy	26	26.8%
Crime scene investigation	26	26.8%
Latent fingerprints	19	19.6%
Instrumental analysis	18	18.6%
Drug identification and quantification	15	15.5%
Reconstruction	10	10.3%
Trace evidence analysis	10	10.3%
Firearms / toolmarks	8	8.2%
Serology / DNA	6	6.2%
Analysis of arson debris	5	5.2%
Fire scene investigation	3	3.1%
Graphology	3	3.1%
Other	12	12.4%
Decline to answer	1	1.0%
Not applicable	4	4.1%

S4: Which of the following organizations do you belong to, if any, related to the forensic sciences? *(select all that apply)*

Table 3.1.2

Associations to which examiner belongs (select all that apply)	Frequency	Percent of Respondents
American Academy of Forensic Sciences (AAFS)	52	53.6%
American Society of Questioned Document Examiners (ASQDE)	45	46.4%
ASTM International	34	35.1%
Southwestern Association of Forensic Document Examiners (SWAFDE)	26	26.8%
Southeastern Association of Forensic Document Examiners (SAFDE)	22	22.7%
Midwestern Association of Forensic Scientists (MAAFS)	19	19.6%
International Association for Identification (IAI)	17	17.5%
Mid-Atlantic Association of Forensic Scientists (MAFS)	16	16.5%
Canadian Society of Forensic Sciences (CSFS)	7	7.2%
Forensic Science Society	4	4.1%
None (not a member of any organization)	1	1.0%
Other	20	20.6%

S5 What is your current job title?

Table 3.1.3

Current job title (categories – forensic or law enforcement)	Frequency	Percent of Respondents
Examiner (FDE / QDE)	53	54.6%
Forensic Scientist	8	8.2%
Analyst	7	7.2%
Senior title (FDE, QDE, Analyst, etc.)	7	7.2%
Supervising or Management	6	6.2%
Owner or Private practice	4	4.1%
Director	3	3.1%
Retired	3	3.1%
Chief or Section Head	2	2.1%
Law enforcement	2	2.1%
Could not be determined	2	2.1%
Total	97	100%

S6 In which state are you currently practicing?[1]

Examiners from 31 states and the District of Columbia participated in this research. The remaining examiners were from Canada (n=5) or declined to provide the state in which they practice (n=3).

S6a In which OTHER state do you practice?

NOTE: Please answer this question with respect to your primary practice.

S6b You answered NOT APPLICABLE for the question: "In which state are you currently practicing." Please explain why:

S7 What type(s) of lab, department, or organization do you work for?

Table 3.1.4

Type of laboratory, department, or organization (select all that apply)	Frequency	Percent of Respondents
Local	16	16.5%
State	23	23.7%
Federal	26	26.8%
Private	43	44.3%
Not applicable	1	.9%

S8 How many years have you been in your current position?

A total of 93 of the 97 examiners who participated in this survey (95.9%) provided information on the number of years they have been in their current position. For those examiners, the minimum amount of time in their current position was 1 year (as of 2013), and a maximum of 48 years. The average amount of time these examiners had been in their current positions was 16.2 years (SD=11.5).

S9 What was the last position you held before your current position?

Table 3.1.5

Last position (before current) job title	Frequency	Percent of Respondents
Could not be determined	3	3.1%
Director	3	3.1%
Chief or Section Head	4	4.1%
Analyst	11	11.3%
Examiner (FDE / QDE)	23	23.7%
Supervising or Management	6	6.2%
Forensic Scientist	5	5.2%
Senior title (FDE, QDE, Analyst, etc.)	4	4.1%

[1] Tables S6, S6a, and S6b were redacted to protect the confidentiality of the participants.

Law enforcement	6	6.2%
Agent or Special Agent	4	4.1%
Student, Intern, or Trainee	9	9.3%
Other forensic area, crime investigation, or technician	12	12.4%
Not related to forensics or law enforcement	7	7.2%
Total	97	100%

S9a How many years were you in that position?

A total of 92 of the 97 examiners who participated in this survey (94.8%) provided information on the number of years they had been in the last position that they held prior to their current job. For those examiners, the minimum amount of time in their last position was less than one year (as of 2013), and a maximum of 38 years. The average amount of time these examiners had been in their last position was 9.8 years (SD=8.8).

S10 How many years, total, have you been a forensic document examiner?

S11 How many years, total, have you been practicing in the forensic sciences?

Table 3.1.6

Years of experience	Minimum	Maximum	Average (Mean)	Standard Deviation
Forensic document examiner	1	48	23.2	11.4
Practicing in forensic sciences	3	49	25.3	11.0

The survey results indicate that the examiners who participated in this portion of the study have an average of 23.2 years of experience as forensic document examiners and 25.3 years of experience practicing in the forensic sciences (any area).

S12 What is the highest academic degree you have completed?

Table 3.1.7

Highest academic degree (categories)	Frequency	Percent of Respondents
High School Diploma or GED	2	2.1%
Associate Degree	3	3.1%
Bachelors Degree (BA / BS)	49	50.5%
Masters Degree (all types)	38	39.2%
Doctorate (PhD)	2	2.1%
Other	3	3.1%
Total	97	100%

S13 In what year did you receive your highest degree?

The number of years since the FDE earned his or her highest academic degree (as of 2013) ranged from 1 to 53, with a mean of 25.59 and standard deviation of 12.33 years.

S14 In what field is your highest degree?

(Examples: Biology, Chemistry, Forensic Science, Medical Laboratory Science, broadly defined and specifically defined)

Table 3.1.8

Highest degree field (broadly defined)	Frequency	Percent of Respondents
Physical Sciences	45	46.4%
Criminal Justice, Law, Police	20	20.6%
Marketing, Business, Economics	15	15.5%
Liberal Arts	12	12.4%
Computer Science, Math	4	4.1%
Could not be determined	1	1.0%
Total	97	100%

Table 3.1.9

Highest degree field (specifically defined)	Frequency	Percent of Respondents
Forensic Science	23	23.7%
Criminal Justice	14	14.4%
Biology	10	10.3%
Business, Administration, Management	10	10.3%
Education	5	5.2%
Chemistry	5	5.2%
Criminal Justice (admin)	3	3.1%
Science	3	3.1%
Computer Science	3	3.1%
Economics / Accounting	3	3.1%
History	2	2.1%
English	2	2.1%
Legal Studies	2	2.1%
Sociology	2	2.1%
Physics	2	2.1%
Zoology	2	2.1%
Communications	2	2.1%
Liberal Arts	1	1.0%
Criminalistics	1	1.0%
Information Systems	1	1.0%

Could not be determined	1	1.0%
Total	97	100%

S15 What was your undergraduate major? (broadly and specifically defined)

Table 3.1.10

Undergraduate degree field (broadly defined)	Frequency	Percent of Respondents
Criminal Justice, Law, Police	30	31.6%
Physical Sciences	20	21.1%
Liberal Arts	12	12.6%
Art, Photography	11	11.6%
Behavioral Science, Psychology	10	10.5%
Marketing, Business, Economics	8	8.4%
Computer Science, Math	4	4.2%
Could not be determined	2	2.1%
Total	97	100%

Table 3.1.11

Undergraduate degree field (specific)	Frequency	Percent of Respondents
Liberal Arts	2	2.0%
Social Studies	1	1.0%
History	2	2.0%
English	3	3.1%
Interdisciplinary Studies	1	1.0%
General Studies	2	2.0%
Education	1	1.0%
Criminal Justice	20	20.4%
Criminal Justice (admin)	1	1.0%
Criminalistics	1	1.0%
Criminology	3	3.1%
Legal Studies	1	1.0%
Police Administration	1	1.0%
Law Enforcement	3	3.1%
Behavioral Sciences	1	1.0%
Psychology	4	4.1%
Forensic Psychology	1	1.0%
Political Science	2	2.0%
Sociology	2	2.0%
Physics	2	2.0%
Chemistry	10	10.2%
Forensic Science	5	5.1%
Military Science	1	1.0%

Science	2	2.0%
Applied Mathematics	1	1.0%
Information Systems	1	1.0%
Computer Science	2	2.0%
Zoology	2	2.0%
Biology	9	9.2%
Physiology	1	1.0%
Medical Tech	1	1.0%
Physical Education	1	1.0%
Photography	1	1.0%
Art	1	1.0%
Marketing	1	1.0%
Communications	2	2.0%
Business, Administration, Management	1	1.0%
International Relations	1	1.0%
Economics / Accounting	1	1.0%
Total	97	100%

S16 In years (including half years), how long was your FDE training?

(For example, 1 year, 1.5 years, and so on)

S17 In years (including half years), how long has it been since you completed your FDE training?

(For example, 1 year, 1.5 years, and so on)

Table 3.1.12

Forensic Document Examination Training	Minimum	Maximum	Average (Mean)	Standard Deviation
Length of FDE training	1	6	2.5	.79
Years since FDE training completed	0	42	19.9	11.5

The survey results indicate that the examiners who participated in this portion of the study have an average of 2.5 years of formal training as forensic document examiners. On average, examiners completed their training 19.9 years ago.

S18 Was your training in Forensic Document Examination conducted in accordance with ASTM International?

NOTE: ASTM International's ASTM E2388 is the “Minimum Training Requirements for Forensic Document Examiners.”

S19 As part of your training, did you undergo any internal or external proficiency testing on handwriting comparison?

S19a How many handwriting comparison proficiency tests per year did you take?

Table 3.1.13

Training and testing	Yes	No	Not Sure	N
Training in accordance with ASTM International	84.5%	14.4%	2.1%	97
Proficiency testing on handwriting comparisons	93.8%	4.1%	2.1%	97

Proficiency testing (n=90)	Minimum	Maximum	Average (Mean)	Standard Deviation
Proficiency tests per year during training	0	500	19.8	64.0

S19b What kind of proficiency tests have you taken?

Table 3.1.14

Types of proficiency tests (from open-ended responses)	Frequency	Percent of Respondents
CTS	37	42.5%
Handwriting	34	39.1%
Non-handwriting	32	36.8%
Internal / In-House	23	26.4%
External	13	14.9%
Other	8	9.2%
Star	7	8.0%
Actual or mock casework	6	6.9%
LaTrobe	5	5.7%

S20 Do you have any of the following certifications?

(Please select all that apply)

Table 3.1.15

Examiner certifications (select all that apply)	Frequency	Percent of Respondents
American Board of Forensic Document Examiners (ABFDE)	60	50.0%
Federal certification (FBI, DOJ, SS, military)	10	8.3%
Board of Forensic Document Examiners	4	3.3%
State certification	4	3.3%
Forensic Science Society (FSS)	3	2.5%
Footwear certification	3	2.5%
American Board of Forensic Examiners	2	1.7%
Other	34	28.3%

S21 Do you attend workshops or other continuing education (CE) courses related to questioned document examination?

S21a Approximately how many workshops or continuing education courses have you attended within the last five years?

S21b In what year did you attend your most recent workshop or continuing education course?

(Used to calculate years since most recent workshop – as of 2013)

Table 3.1.16

Workshops and continuing education	Yes	No	Not Sure	N
Attend workshops or continuing education for FDE	95.9%	4.1%	---	97

Examiners attending workshops / CE (n=93)	Minimum	Maximum	Average (Mean)	Standard Deviation
Number of workshops / CE in last five years	0	24	7.7	5.0
Years since most recent workshop / CE	1	14	1.9	1.9

S22 Have you ever provided expert testimony?

S22a How many times have you provided expert testimony?

Table 3.1.17

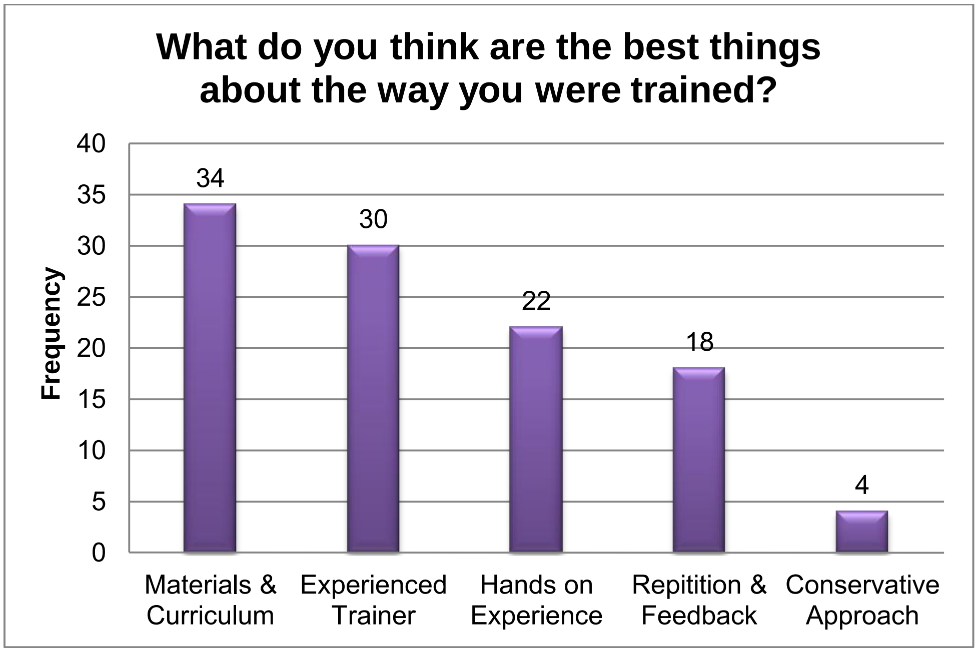
Expert testimony	Yes	No	Not Sure	N
Every provided expert testimony	95.9%	4.1%	---	97

Examiners providing expert testimony (n=93)	Minimum	Maximum	Average (Mean)	Standard Deviation
Number of times provided expert testimony	1	1,000	130.27	177.8

S23 What do you think are the best things about the way you were trained?

The most common factor that FDEs cited as a positive contributor to their training was access to high-quality materials (n = 34). For instance, the availability of textbooks, publications, and actual cases allowed FDEs to build upon the knowledge and experience of experts. Hands-on experience with trainers (n = 22) as well as working with highly skilled trainers (n = 30) were also among the most common things listed contributing to high-quality FDE training. Finally, FDEs reported that the repetition inherent in working through a large number of cases gave FDEs experience that directly applied to work that they would be doing in the field (n = 18). A few participants (n = 4) indicated that being taught to take a conservative approach to document examination ensured that their opinions and conclusions were defensible and supported by evidence.

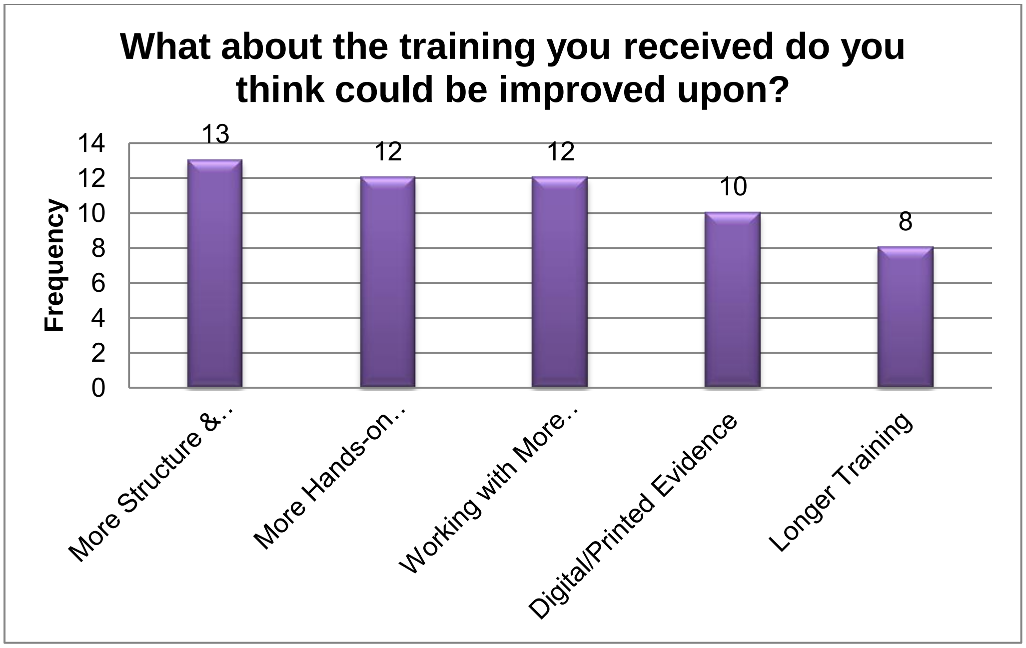
Figure 3.1.2



S24 What about the training you received do you think could be improved upon?

Many of the areas recommended for improvement parallel factors that FDEs listed above as what made for high quality training. Twelve FDEs recommended that training should include more hands-on practice and practical experience. In addition to this, FDEs recommended that programs provide more structure throughout the training process and that this structure should be standardized across training programs (n = 13). Twelve participants stated that they would have liked to get more experience with outside laboratories and experts in order to maximize the variety of experiences and viewpoints from which trainees can learn. Ten participants stated that training needs to account for the increased use of digital means through which many questioned documents are originally created (e.g., the ability to critically examine documents existing in digital form or created from a printer). Finally, eight participants suggested that the training process should be longer in order to better prepare FDEs for work in the field.

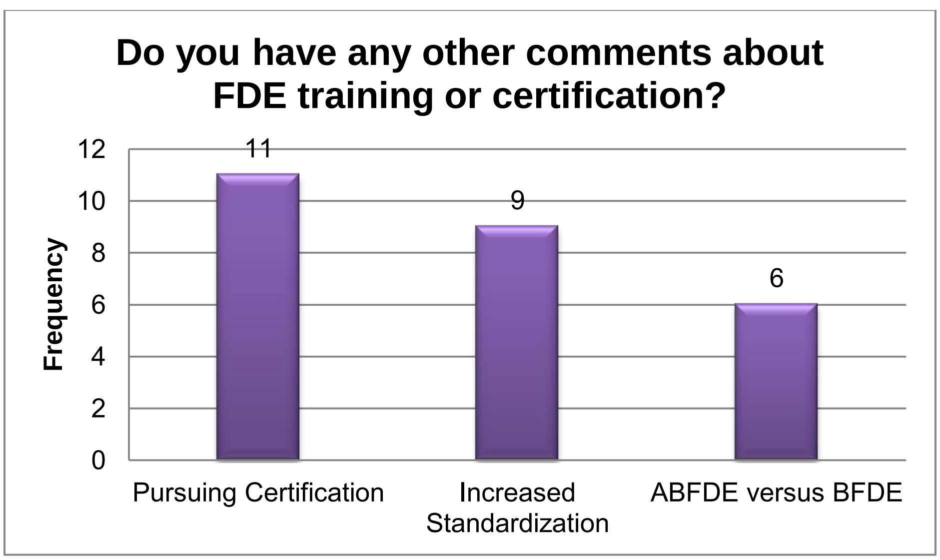
Figure 3.1.2



S25 Do you have any other comments about FDE training or certification?

The most frequent comment about FDE certification was the belief that certification is absolutely necessary and should be pursued following training and prior to working with any court cases (n = 11). Nine FDEs said that they believe the training and certification process should be standardized and six FDEs believed that ABFDE standards (compared to BFDE standards) are the only acceptable standards on which certification should be based.

Figure 3.1.3



Education and Experience Analyses

We conducted a series of four independent-groups *t*-tests to investigate the overall call accuracy for FDEs and Lay participants across the single signature, questioned/known comparison, and tachistoscope/extended view procedures. The results of these analyses are presented in Table 3.1.18.

Table 3.1.18
Overall Correct Call *T*-Test Analysis Results by Experimental Protocol

Protocol	Participant	*t*	df	*p*	*M*	*SD*	n
Questioned/Known	FDE	6.74	87	< .001	45.00	6.12	46
	Lay				35.58	7.06	43
Single Signature	FDE	5.66	87	< .001	20.26	2.65	46
	Lay				16.74	3.2	43
Tachistoscope	FDE	2.98	87	.004	13.61	1.81	46
	Lay				12.44	1.88	43
Extended View	FDE	3.77	87	< .001	14.78	1.81	46
	Lay				13.35	1.77	43

These results indicate that FDEs significantly outperformed Lay participants in all four experimental eye-tracking tasks.

We conducted a series of bivariate correlations using *Pearson's Product Moment* to investigate the relationships between education, training, and experience and the number of correct process decisions for single signature calls, questioned/known comparison calls, tachistoscope calls, and extended view calls among FDEs. We included the following variables in these analyses:

- Number of correct single signature process calls
- Number of correct questioned/known comparison calls
- Number of correct tachistoscope calls
- Number of correct extended view calls
- Number of years of FDE training
- Number of times FDE has provided expert testimony
- Number of meetings/workshops/continuing education courses attended in the past five years
- Number of professional organization memberships
- Number of years as a professional FDE
- Number of handwriting comparison proficiency tests taken

Single signature process calls. The number of correct single signature process calls was positively correlated to the number of correct tachistoscope calls $r(46) = .54$, $p < .001$; and the number of correct extended view calls $r(46) = .40$, $p = .006$. No additional significant correlations were identified among the other variables.

Tachistoscope calls. In addition to the correlation with the number of correct single signature calls, the number of correct tachistoscope calls was positively correlated with the number of correct extended view calls, $r(46) = .61$, $p < .001$. No additional significant correlations were identified from among the remaining variables.

Extended view calls. No additional significant correlations were identified from among the variables beyond those identified above.

Length of FDE training. This variable was not significantly correlated with any of the other variables.

Expert testimony experience. The number of times the FDE presented expert testimony was positively correlated with the number of professional organization memberships held by the participants, $r(43) = .37$, $p < .015$. A positive correlation with the number of years the FDE had been practicing in the field was also identified, $r(43) = .67$, $p < .001$. No other significant correlations were identified.

Professional organization memberships. In addition to the relationship with expert testimony experience, this variable was significantly correlated to the number of workshops, meetings, or continuing education courses the FDE had attended in the past five years, $r(46) = .41$, $p = .005$. It was also related to the number of years the FDE had been a member of the field, $r(55) = .32$, $p < .031$. No other significant relationships were identified.

Number of years as an FDE. In addition to the relationships identified above, this factor was related to the number of handwriting proficiency tests taken, $r(42) = .33$, $p < .030$.

Number of handwriting comparison proficiency tests taken. Other than the relationship between this factor and the number of years as an FDE, no significant relationships were identified for this factor.

Among Lay participants, positive correlations were found between the number of correct questioned/known process calls and the number of correct single signature process calls, $r(43) = .32$, $p = .039$; the number of correct tachistoscope process calls, $r(43) = .30$, $p < .05$; and the number of correct extended view process calls, $r(43) = .31$, $p = .04$.

These results indicate that, contrary to our predictions, the extent of training, education, or experience among FDEs is unrelated to the number of correct process calls made in the single signature, questioned/known comparison, and tachistoscope/extended view protocols. Further, call accuracy among FDEs in the questioned/known comparison protocol is unrelated to call accuracy in any of the other three tasks.

CHAPTER 3: RESULTS

SECTION 3.2: EYE-TRACKING ANALYSES

Single Signature Protocol

The single signature protocol was designed to investigate the evidentiary value of limited information such as line quality, speed and fluidity of execution, and other indicators of writing skill. According to McClary (2006), FDEs are taught and trained to evaluate a wide variety of writing characteristics. Features such as rhythm, or the regularity in the curvature of the writing, the size of the writing, and the slope or slant of the letters provide evidence of an individual's writing habits (McClary, 2006). Writing speed and fluidity, line quality, or the presence or absence of other patterns which point to the habits of the signature writer allow FDEs to make assertions about the authorship of the specimen and the extent of their confidence in their decisions.

Although a preliminary part of the decision making process involved in FDE casework is to determine whether a sufficient quantity of questioned and/or known writing has been provided to form an opinion about whether the writing is genuine or simulated, even a small sample of writing may provide useful information. Examining the eye-tracking behavior of FDEs and Lay participants as they examined single signature specimens provided information about how the two groups used such limited evidence.

The single signature protocol also allowed us to investigate the influence of contextual cues on the deployment of attentional resources. As previously mentioned, a substantial literature exists on the effects of top-down processing on visual word recognition. In pattern recognition, top-down processing occurs when the context or high-level general knowledge of a word influences the interpretation of lower-level perceptual units such as letters or parts of letters (Anderson, 2010). Reicher (1969, as cited in Revlin, 2013) demonstrated that letters are better recalled when they are presented in a real word than by themselves. This "word superiority" effect is so pervasive that even when every other letter in a sentence is missing, the sentence can still be read.

Signatures vary in terms of the semantic content they contain. A text-based signature containing a relatively high number of identifiable letters carries more semantic information than a highly stylized signature. Semantic information, such as informing the examiner of the writer's name prior to an examination, may influence the interpretation of signature features by producing a context that affects the examiner's perception of the stimulus. This influence may occur due to cognitive phenomena such as top-down processing, perceptual set, and confirmation bias.

FDEs and Lay participants may experience selective attention or selective information seeking if they are aware of the name of the contributor of the known signatures. We investigated the possible influences of these attentional phenomena by manipulating the amount of information available for selective attention and selective information seeking, presenting signatures that varied according to signature style and signature complexity.

Overall Analyses

Accuracy. A crosstab with Pearson's chi square statistic was performed to investigate whether there was a significant difference in call accuracy for FDE and Lay participants. This analysis demonstrated that FDEs were significantly more accurate overall in the single comparison than were Lay participants (χ^2 (1, N = 2,746) = 44.21, $p < .001$). Figure 3.2.SS.1 presents overall call accuracy by participant type.

Figure 3.2.SS.1

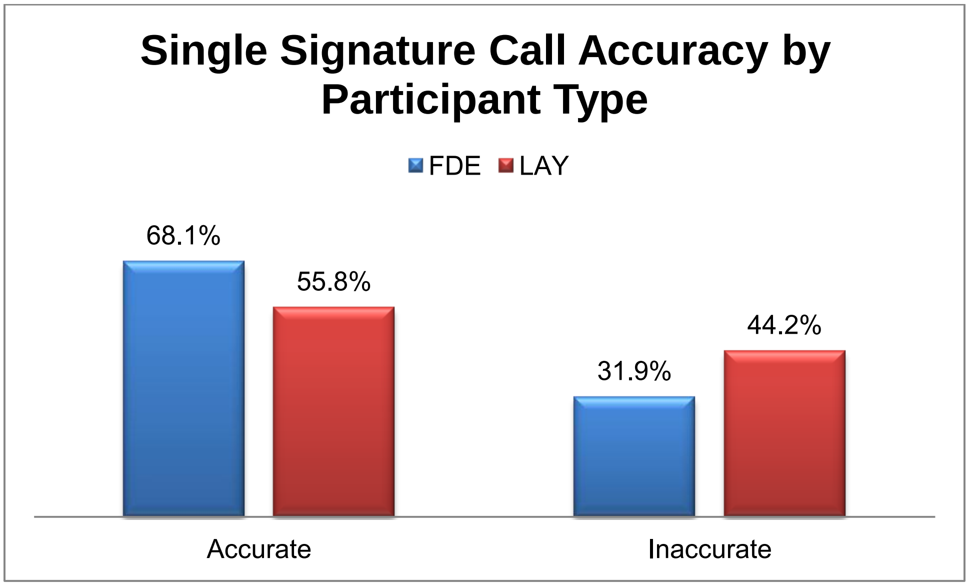


Table 3.2.SS.1 presents correct calls by individual signature and participant type. Pearson's chi square analyses revealed statistically significant differences by participant type for 20 of the 30 signature specimens. Lay participants were more accurate than FDEs in 6 of the 30 signatures. Of these 6 signatures, 3 were mixed, 2 were stylized, and 1 was text-based. Four were low complexity, and 2 were high complexity. This difference in accuracy was statistically significant in only 3 of the 6 instances.

Table 3.2.SS.1
Correct Call by Signature Type, Signature Complexity, and Participant Type

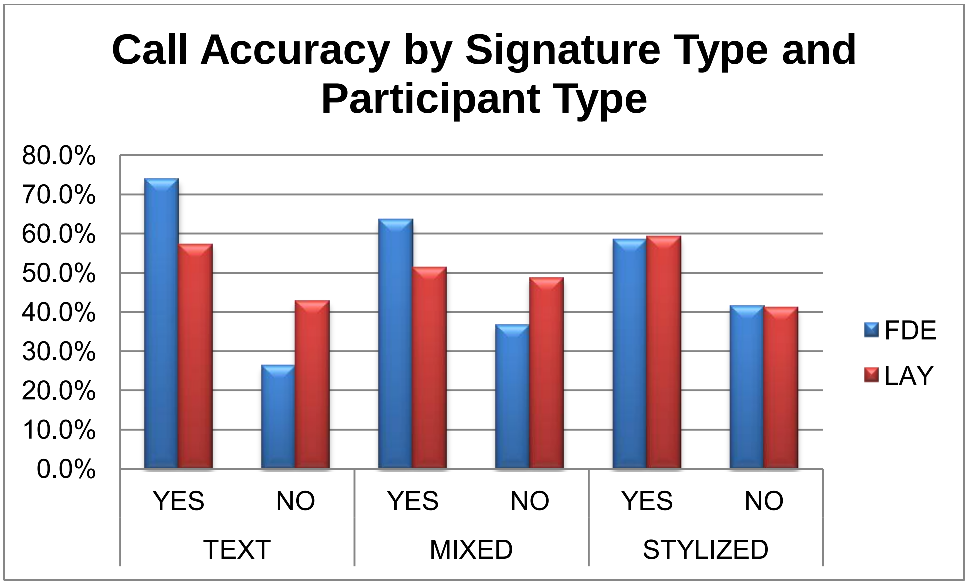
	Type	Comp	FDE		Lay		
Signature			**N**	**Percent**	**N**	**Percent**	***p***
M Payne	Mixed	Low	45	91.8%	22	51.2%	<.001*
Feilmeier**	Stylized	High	0	0.0%	13	30.2%	<.001*
Arrant	Text	High	47	95.9%	27	62.8%	<.001*
Hemmingway	Mixed	High	48	98.0%	29	67.4%	<.001*
Argo	Text	Low	44	89.8%	25	58.1%	<.001*
Bryant	Text	High	48	98.0%	32	74.4%	.001*
Hamilton	Text	High	38	80.9%	21	48.8%	.001*
Galloway	Text	High	42	85.7%	24	55.8%	.001*
Hammond	Stylized	Low	49	100.0%	35	81.4%	.002*
Vasilyev	Stylized	Low	46	95.8%	31	72.1%	.002*
Wesley	Text	High	46	95.8%	31	72.1%	.002*

Drake	Text	High	49	100.0%	37	86.0%	.007*
Alexander	Mixed	Low	43	89.6%	29	67.4%	.009*
Gowens	Text	High	48	98.0%	36	83.7%	.016*
Walls**	Stylized	Low	16	33.3%	25	58.1%	.018*
Contrares	Mixed	High	26	54.2%	13	30.2%	.021*
Robinson	Mixed	Low	33	70.2%	20	46.5%	.022*
Boykin**	Mixed	Low	2	4.1%	8	18.6%	.026*
Thompson	Text	High	32	65.3%	19	44.2%	.042*
Bailey	Text	High	35	71.4%	22	51.2%	.046*
Reincher**	Text	High	3	6.1%	8	18.6%	.066
Harris	Text	High	23	47.9%	16	37.2%	.303
J Payne**	Mixed	Low	23	47.9%	25	58.1%	.329
Rickman	Stylized	Low	31	63.3%	23	53.5%	.342
Walsh	Text	High	38	77.6%	30	69.8%	.396
Kinsler**	Mixed	Low	24	50.0%	25	58.1%	.437
Bozeman	Text	High	25	52.1%	19	44.2%	.452
Kilinc	Text	High	25	52.1%	21	48.8%	.757
Penland	Text	High	31	63.3%	26	60.5%	.783
Harper	Mixed	Low	32	65.3%	28	65.1%	.985

*Significant at p <.05; **Lay participants were more accurate than FDEs

Accuracy by Signature Type. We investigated whether there were any significant differences in call accuracy according to signature type and participant type. Pearson's chi square analysis revealed significant differences for participant type, indicating that FDEs were more accurate than Lays for text and stylized signatures, χ^2 (1, N = 1,466) = 44.38, $p < .001$, and χ^2 (1, N = 822) = 12.14, $p < .001$, respectively. Lay participants were slightly more accurate than FDEs in the stylized signature, but this difference was not statistically significant, χ^2 (1, N = 458) = .019, $p = .891$, *ns**. These results are presented in Figure 3.2.SS.2.

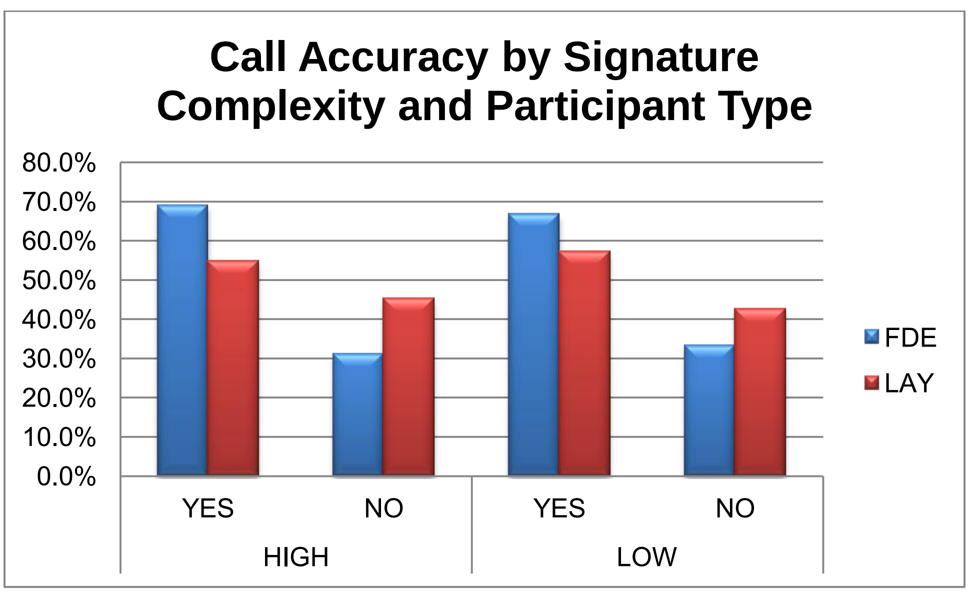
Figure 3.2.SS.2



*Only one stylized signature was included in this single signature sample.

Accuracy by Signature Complexity. We also investigated whether there were significant differences in call accuracy according to signature complexity. Significant differences were again found, such that FDEs were more accurate than Lay participants for high-complexity and low-complexity signatures, χ^2 (1, N = 1,649) = 35.51, $p < .001$, and χ^2 (1, N = 1,097) = 10.32, $p = .001$, respectively. Figure 3.2.SS.3 presents these findings.

Figure 3.2.SS.3



The findings that FDEs outperformed Lay participants when signatures were text-based or mixed (e.g., higher in semantic content), and that FDEs also outperformed Lay participants regardless of signature complexity suggest that the amount of semantic information present in a signature may be a more impactful factor among professionally trained FDEs than among non-professionals.

<u>*Single Signature Overall Confidence Analyses*</u>

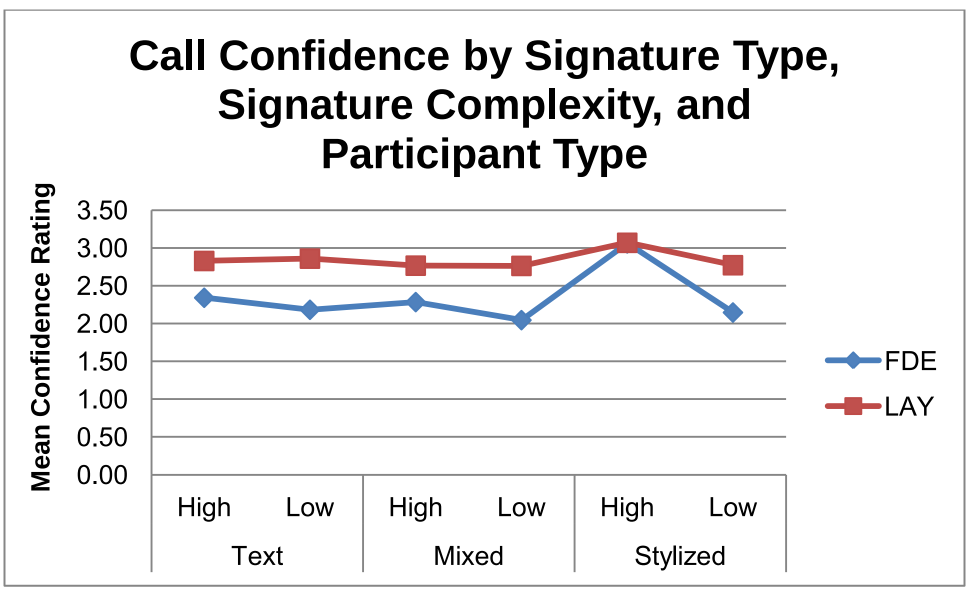
Confidence, Signature Type, and Signature Complexity. Participant confidence in the process decision (genuine or simulated) was measured on a scale from 1 (not at all confident) to 4 (extremely confident). A 3 x 2 x 2 factorial ANOVA was conducted to investigate whether there was a significant difference between FDE and Lay participants in the level of confidence they expressed for their process decisions. The analysis revealed that the overall model was statistically significant, F (11, 2748) = 31.64, p < .001, partial η^2 = .112.

Overall, Lay participants were significantly more confident than were FDEs in their process decisions, except in the case of the high complexity, stylized signature category. Significant main effects were found for Participant Type, F (1, 2748) = 90.81, p < .001, partial η^2 = .032, Signature Type, F (2, 2748) = 11.19, p < .001, partial η^2 = .008, and Signature Complexity, F (1, 2748) = 25.26, p < .001, partial η^2 = .009.

Two-way interaction effects were found for Participant Type x Signature Complexity, F (2, 2748) = 11.00, p = .001, partial η^2 = .004, and Signature Type x Complexity, F (2, 2748) = 9.37, p < .001, partial η^2 = .007. No significant difference was found for Participant Type x Signature Type, p = .063, *ns.*

The three-way interaction effect was not significant, p = .234, *ns.* Figure 3.2.SS.4 presents the call confidence level by signature type, signature complexity, and participant type.

Figure 3.2.SS.4



Post hoc analysis using the *Bonferroni* correction revealed that the confidence level for text-based signatures was significantly higher than that for mixed signatures (p < .001). Mean confidence level was greater for stylized signatures than for text-based, signatures, but this difference was not statistically significant (p = 1.00). The mean confidence level was significantly greater for stylized than for mixed signatures (p = .007). Table 3.2.SS.2 presents the means and standard deviations by signature type, signature complexity, and participant type. Table 3.2.SS.2 presents the mean confidence call by signature type, signature complexity, and participant type.

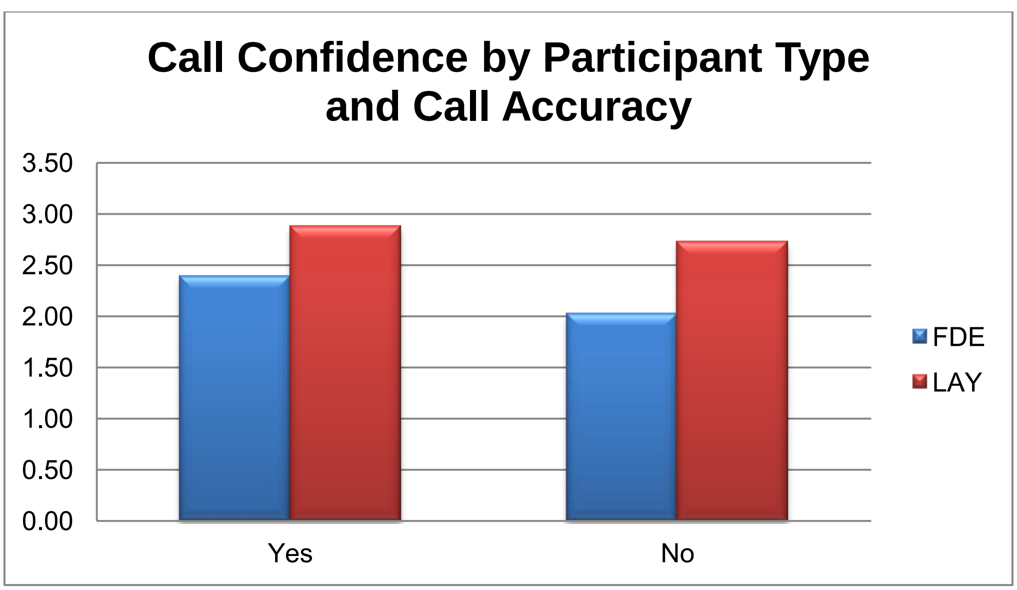
Table 3.2.SS.2

Mean Call Confidence by Signature Type, Signature Complexity, and Participant Type

		FDE			LAY		
		M	***SD***	**n**	***M***	***SD***	**n**
Text	**High**	2.34	.929	735	2.83	.815	645
	Low	2.18	.808	49	2.86	.833	43
Mixed	**High**	2.29	1.015	98	2.77	.746	86
	Low	2.05	.847	343	2.76	.771	301
Stylized	**High**	3.06	.899	49	3.07	.828	43
	Low	2.15	1.049	196	2.77	.866	172

Confidence and Call Accuracy. A 2 (Participant Type) x 2 (Call Accuracy) factorial ANOVA was conducted to investigate whether there was a significant difference in mean confidence level for accurate and inaccurate calls. The overall model was statistically significant, F (3, 2742) = 108.22, p < .001, partial η^2 = .106.

Figure 3.2.SS.5



A significant main effect was found for Participant Type (F (1, 2742) = 295.65, p < .001, partial η^2 = .097), indicating that on average FDEs were less confident in their calls than were Lay participants. A significant main effect was also found for Call Accuracy (F (2, 2742) = 55.20, p < .001, partial η^2 = .020), indicating that on average, confidence was greater for correct calls than for incorrect calls.

The significant two-way interaction effect for Participant Type x Call Accuracy (F (1, 2742) = 10.84, p = .001, partial η^2 = .004) indicated that confidence was lower among FDEs who made incorrect calls than among FDEs who made correct calls, while call confidence remained fairly consistent among Lay participants. Figure 3.2.SS.5 presents the call confidence level by participant type and call accuracy. Table 3.2.SS.3 presents the mean call confidence level by participant type and call accuracy.

Table 3.2.SS.3
Mean Call Confidence by Participant Type and Call Accuracy

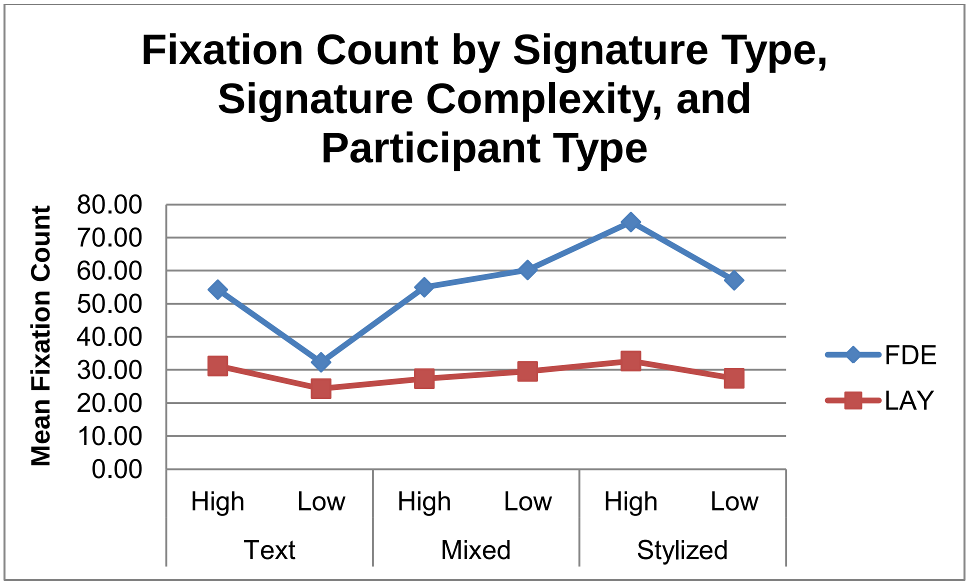
	FDE			LAY		
Accuracy	***M***	***SD***	**n**	***M***	***SD***	**n**
Yes	2.39	.937	992	2.88	.801	720
No	2.02	.908	464	2.73	.813	570

Single Signature Overall Eye-Tracking Analyses

We conducted a series of 3 (Signature Type) x 2 (Signature Complexity) x 2 (Participant Type) factorial ANOVAs to investigate the effect of these factors on each of the four eye-tracking metrics (fixation count, fixation duration, visit count, and visit duration). The AOIs used for the dependent variable in all analyses consisted of the entire signature image for all 30 single signature specimens.

Fixation Count. Fixation count is defined as the number of times the participant's gaze fixates within the AOI. A 3 x 2 x 2 factorial ANOVA revealed that the overall model was statistically significant, F (11, 2648) = 26.89, p < .001, partial η^2 = .100. Figure 3.2.SS.6 presents the mean fixation count by signature type, signature complexity, and participant type.

Figure 3.2.SS.6



Significant main effects were found for Participant Type, F (1, 2648) = 113.96, $p < .001$, partial $\eta^2 = .041$, Signature Type, F (2, 2648) = 7.30, $p = .001$, partial $\eta^2 = .005$, and Signature Complexity, F (1, 2648) = 8.60, $p = .003$, partial $\eta^2 = .003$. These main effects reveal that fixation count among FDEs was significantly greater than that among Lay participants, and that fixation count among FDEs was significantly greater for high complexity signatures than for low complexity signatures. *Post hoc* analysis using the *Bonferroni* correction revealed that the mean fixation count for text-based signatures was significantly lower than that for mixed signatures ($p = .009$), and for stylized signatures ($p < .001$). No significant differences were found between mixed and stylized signatures ($p = .102$). Table 3.2.SS.4 presents the means and standard deviations by signature type, signature complexity, and participant type.

A two-way interaction effect was found for Participant Type x Signature Type (F (2, 2648) = 5.06, $p = .006$, partial $\eta^2 = .004$), indicating that fixation count was significantly different between FDE and Lay participants, depending on whether the signature was text-based, mixed, or stylized. The significant two-way interaction for Signature Type x Complexity (F (2, 2648) = 6.08, $p = .002$, partial $\eta^2 = .005$) revealed that on average, fixation count also decreased when the signatures were low-complexity text-based or low-complexity stylized, while fixation count increased when the signatures were low-complexity mixed. No significant difference was found for Participant Type x Complexity, $p = .105$, *ns*.

The three-way interaction effect was not significant, $p = .215$, *ns*.

Table 3.2.SS.4

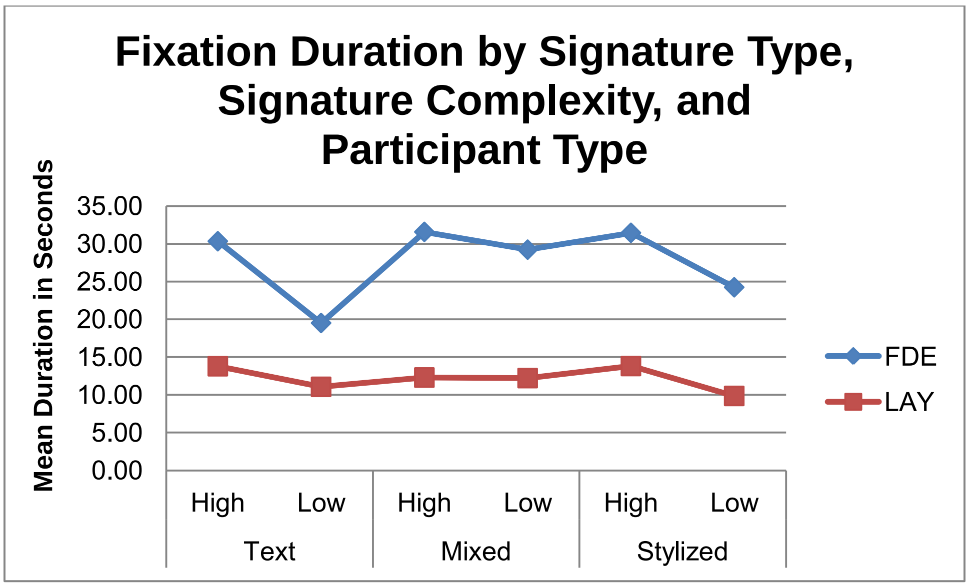
Mean Fixation Count by Signature Type, Signature Complexity, and Participant Type

		FDE			LAY		
Sig Type		***M***	***SD***	**n**	***M***	***SD***	**n**
Text	High	54.26	46.15	705	31.18	37.83	619
	Low	32.31	19.89	49	24.33	26.21	43
Mixed	High	54.98	47.09	94	27.35	24.06	83

	Low	60.22	45.86	328	29.54	26.85	292
Stylized	High	74.70	78.18	47	32.69	42.91	42
	Low	57.09	51.86	188	27.45	26.11	170

Fixation Duration. Fixation duration is defined as the sum of the duration for all within the AOI. A 3 x 2 x 2 factorial ANOVA revealed that the overall model was statistically significant, F (11, 2648) = 41.08, p < .001, partial η^2 = .146. Figure 3.2.SS.5 presents the mean fixation duration by signature type, signature complexity, and participant type.

Figure 3.2.SS.7



Significant main effects were found for Participant Type (F (1, 2648) = 157.06, p < .001, partial η^2 = .056), and Signature Complexity (F (1, 2648) = 13.30, p < .001, partial η^2 = .005), indicating that fixation duration among FDEs was significantly greater than that among Lay participants, and that fixation duration among FDEs was significantly greater for high complexity signatures than for low complexity signatures. No main effect was found for Signature Type, p = .162, *ns*. Table 3.2.SS.5 presents the means and standard deviations by signature type, signature complexity, and participant type.

No significant two-way interaction effects were found for Participant Type x Signature Type, p = .135, *ns*, for Participant Type x Signature Complexity, p = .067, *ns*, or for Signature Type x Signature Complexity, p = .104, *ns*.

The three-way interaction was also not significant, p = .573, *ns*.

Table 3.2.SS.5

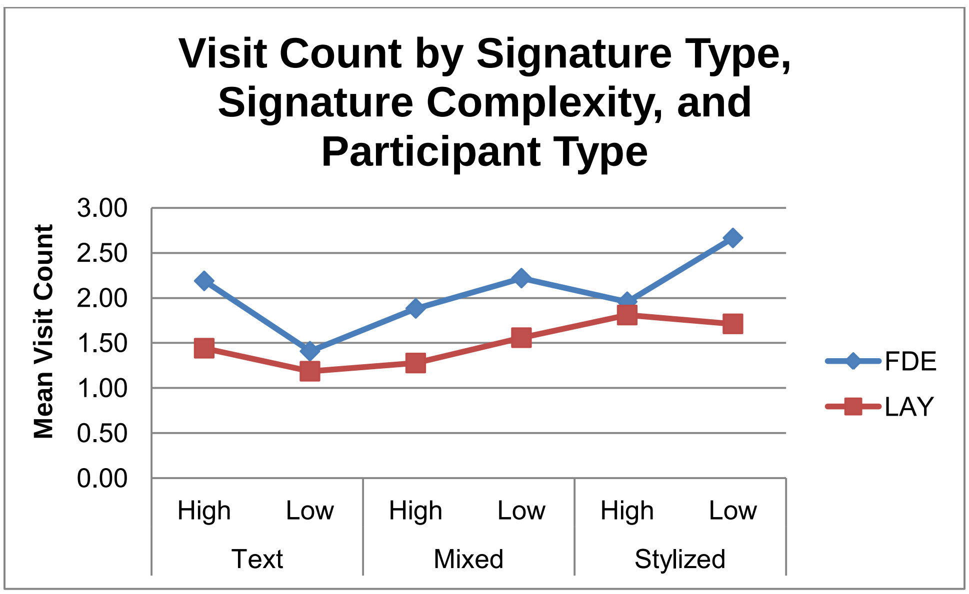
Mean Fixation Duration by Signature Type, Signature Complexity, and Participant Type

	FDE	**LAY**

Sig Type		*M*	*SD*	n	*M*	*SD*	n
Text	High	30.34	26.21	705	13.79	14.29	619
	Low	19.51	15.49	49	11.06	13.88	43
Mixed	High	31.57	28.28	94	12.29	10.87	83
	Low	29.22	23.97	328	12.22	10.87	292
Stylized	High	31.45	31.14	47	13.82	20.43	42
	Low	24.24	22.60	188	9.86	10.20	170

Visit Count. Visit count is defined as the time in seconds of the interval between the first fixation on an AOI and the last fixation within the AOI, where there have been no fixations outside the AOI boundary. A 3 x 2 x 2 factorial ANOVA revealed that the overall model was statistically significant, F (11, 2652) = 12.67, p < .001, partial η^2 = .050. Figure 3.2.SS.8 presents the mean fixation count by signature type, signature complexity, and participant type.

Figure 3.2.SS.8



Significant main effects were found for Participant Type (F (1, 2652) = 26.84, p < .001, partial η^2 = .010), and Signature Type (F (2, 2652) = 26.84, p = .003, partial η^2 = .004), indicating that visit count among FDEs was significantly greater than that among Lay participants, and that visit count differed significantly according to whether the signature was text-based, mixed, or stylized. *Post hoc* analysis using the *Bonferroni* correction revealed that the mean visit count for text-based signatures was significantly lower than that for stylized signatures (p = .002). No significant differences were found between text-based and mixed signatures (p = .432), or between mixed and stylized signatures (p = .060). No significant difference was found for Signature Complexity, p = .756, *ns*.

A significant two-way interaction effect was found for Signature Type x Complexity (F (2, 2652) = 6.58, p = .001, partial η^2 = .005), indicating that visit count was significantly different between high and low complexity signatures, depending on whether the signature was text-based, mixed, or stylized. No significant two-way interactions were found for Signature Type x Participant Type, p = .825, *ns*, or Participant Type x Complexity, p = .603, *ns*.

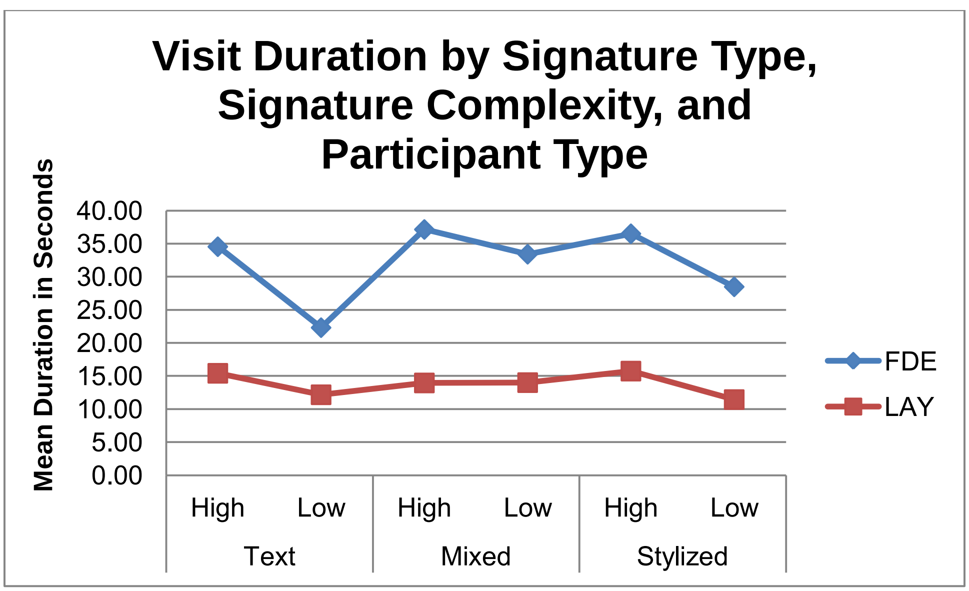
The three-way interaction effect was not significant, p = .065, *ns*. Table 3.2.SS.6 presents the means and standard deviations by signature type, signature complexity, and participant type.

Table 3.2.SS.6
Mean Visit Count by Signature Type, Signature Complexity, and Participant Type

		FDE			LAY		
Sig Type		***M***	***SD***	**n**	***M***	***SD***	**n**
Text	**High**	2.19	2.23	705	1.44	1.06	623
	Low	1.41	0.91	49	1.19	0.79	43
Mixed	**High**	1.88	1.82	94	1.28	0.67	83
	Low	2.22	2.13	328	1.56	0.88	292
Stylized	**High**	2.14	2.07	422	1.50	0.84	375
	Low	1.96	2.26	47	1.81	2.48	42

Visit Duration. Visit duration is defined as the sum in seconds of all visits within an AOI. A 3 x 2 x 2 factorial ANOVA revealed that the overall model was statistically significant, F (11, 2647) = 43.67, p < .001, partial η^2 = .154. Figure 3.2.SS.9 presents the mean fixation duration by signature type, signature complexity, and participant type.

Figure 3.2.SS.9



Significant main effects were found for Participant Type (*F* (1, 2647) = 172.59, $p < .001$, partial $\eta^2 = .061$), and Signature Complexity (*F* (1, 2647) = 14.23, $p < .001$, partial $\eta^2 = .005$), indicating that visit duration among FDEs was significantly greater than that among Lay participants, and that visit duration decreased significantly according to whether the signature was high complexity or low complexity. No main effect was found for Signature Type, $p = .083$, *ns*.

A significant two-way interaction was found for Signature Complexity x Participant Type (*F* (1, 2647) = 3.91, $p = .048$, partial $\eta^2 = .001$), indicating that visit duration was significantly different between high and low complexity signatures, depending on whether the signature was text-based, mixed, or stylized. No two-way interactions were found for Signature Type x Signature Complexity $p = .142$, *ns*, or for Signature Type x Participant Type, $p = .109$, *ns*.

No significant three-way interaction effects were found, $p = .676$, *ns*. Table 3.2.SS.9 presents the means and standard deviations by signature type, signature complexity, and participant type.

Table 3.2.SS.7

Mean Visit Duration by Signature Type, Signature Complexity, and Participant Type

Sig Type		FDE			LAY		
		M	***SD***	**n**	***M***	***SD***	**n**
Text	**High**	34.55	28.95	705	15.41	16.05	619
	Low	22.31	16.86	49	12.17	15.40	43
Mixed	**High**	37.15	32.58	94	13.95	12.00	83
	Low	33.41	27.28	327	14.00	12.41	292
Stylized	**High**	36.51	35.64	47	15.74	21.45	42
	Low	28.49	25.94	188	11.44	11.58	170

Conclusions

As predicted, FDEs were significantly more accurate overall in the single comparison than were Lay participants. FDEs outperformed Lay participants in 24 of the 30 signature examinations, while Lay participants outperformed the FDEs in six of the 30 examinations. Analyses of each individual signature revealed that for 20 of the 30 signature specimens, a statistically significant different was found, and that FDEs were significantly more accurate than were Lay participants in 17 of these 20 cases, while Lay participants were more accurate than were FDEs in the other three statistically significant cases. In nearly all the cases in which Lay participants outperformed FDEs, the call accuracy for both groups was quite low.

Overall, Lay participants were significantly more confident than were FDEs in their process decisions, except in the case of the high complexity, stylized signature category. On average, confidence among both groups was higher for correct calls than for incorrect calls, but confidence was lower among FDEs who made incorrect calls than among FDEs who made correct calls, while call confidence remained fairly consistent among Lay participants.

According to Anderson (2010), top-down (or "large chunk") processing occurs when we form perceptions (or focus our attention) by starting with the larger concept or idea and then working our way down to the finer details of that concept or idea. One who learns new ideas and concepts (or forms impressions) by starting first with the high-level aspects and then working down to the fine details is a top-down processor. Conversely, one who begins with the smaller, finer details of an element and then builds upward until achieving a solid mental representation of the element is engaging in bottom-up (or "small chunk") processing.

In pattern recognition, top-down processing occurs when the context or high-level general knowledge of a word influences the interpretation of lower-level perceptual units such as letters or parts of letters (Anderson, 2010). Reicher (1969, as cited in Revlin, 2013) demonstrated that letters are better recalled when they are presented in a real word than by themselves. This "word superiority" effect is so pervasive that even when every other letter in a sentence is missing, the sentence can still be read.

FDEs were more accurate than were Lay participants for the text-based and mixed signatures. Lay participants were slightly more accurate than FDEs in the stylized signature (only one stylized signature was used in this procedure), but this difference was not statistically significant. The findings that FDEs outperformed Lay participants when signatures were text-based or mixed (e.g., higher in semantic content), and that FDEs also outperformed Lay participants regardless of signature complexity, suggest that the participants relied to a greater extent on top-down processing in some contexts, and bottom-up processing in others.

Eye-tracking results provide some support for the idea that different attentional and cognitive processes were deployed by FDEs and Lay participants. Fixation count among FDEs was significantly greater than that among Lay participants. Fixation count among FDEs remained fairly consistent between the high complexity text-based and mixed signatures, but was significantly higher for the high complexity stylized signature. This suggests that the semantic context provided by the text-based and mixed signatures allowed a greater extent of top-down processing and required fewer fixations, while the lack of semantic context increased the need to engage in bottom-up processing, requiring a greater number of fixations.

Fixation duration among FDEs was also significantly greater than that among Lay participants, and was significantly greater among FDEs for high complexity signatures than for low complexity signatures, while fixation duration stayed fairly consistent among Lay participants across all signature types and both levels of signature complexity.

Visit count was significantly greater among FDEs than among Lay participants, and differed significantly according to whether the signature was text-based, mixed, or stylized. Visit count was significantly different between high and low complexity signatures, depending on whether the signature was text-based, mixed, or stylized.

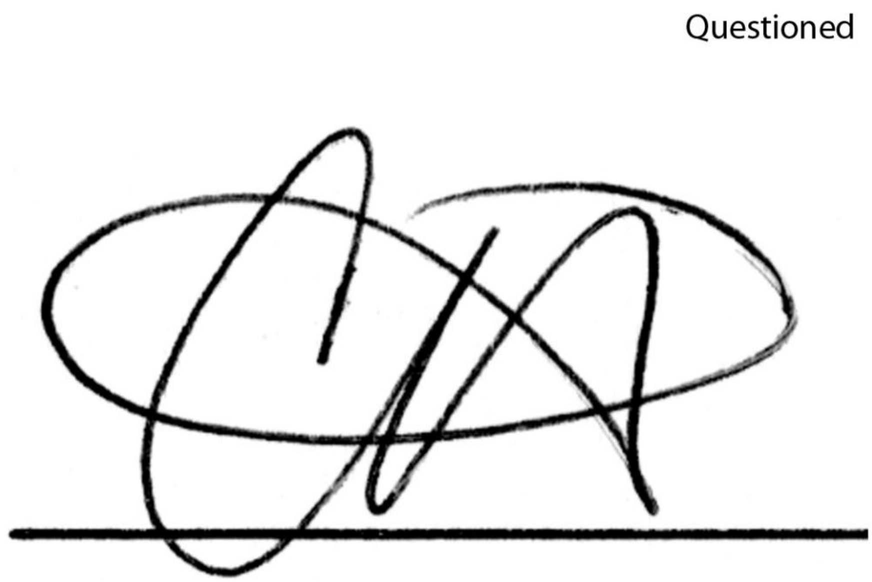
As with the other eye-tracking metrics, visit duration among FDEs was significantly greater than that among Lay participants. Visit duration remained fairly consistent among Lay participants, while among FDEs visit duration decreased significantly among the low complexity text-based and low complexity stylized signatures.

Individual single signature analyses are presented in the following sections.

SIGNATURE: Cierra Alexander (Geniune)

The signature of Cierra Alexander is characterized as a low-complexity mixed signature. Of the 49 FDE participants, 43 responded correctly that the signature was genuine, and 5 responded that the signature was simulated. Of the 43 Lay participants, 29 responded correctly that the signature was genuine, and 14 responded that it was simulated. This difference was statistically significant, χ^2 (1, N = 91) = 6.73, p = .009. Figure Alexander 1 presents the view of this signature.

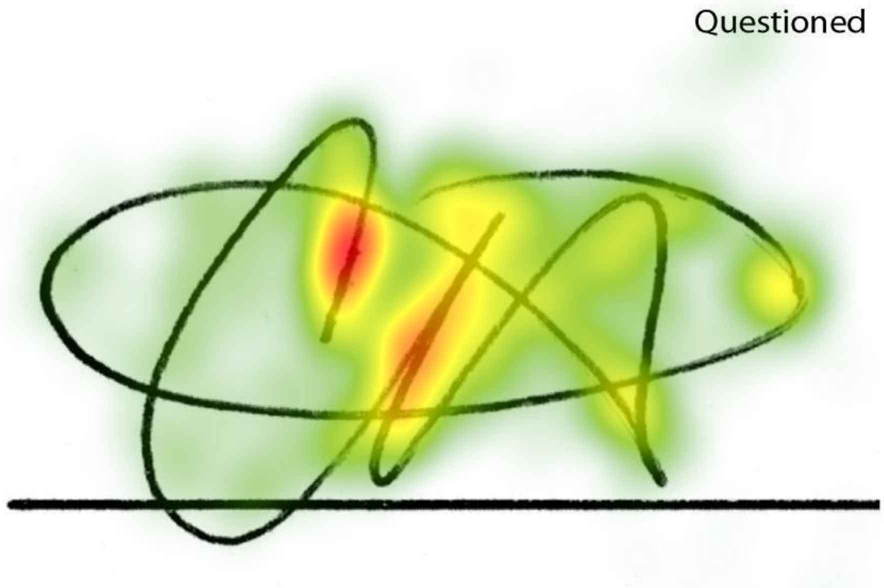
Figure Alexander1. Single Signature Stimulus for Cierra Alexander.



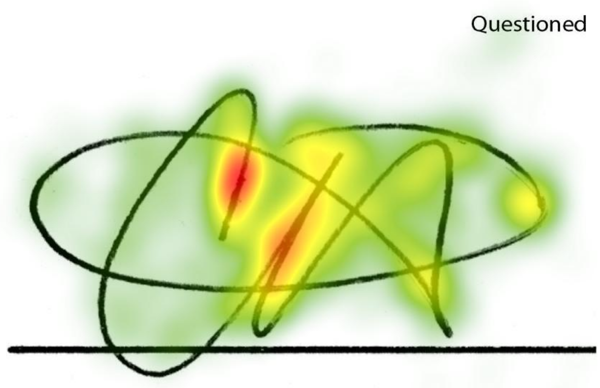
Selection of Areas of Interest (AOIs)

Figure Alexander 2 presents the heat map for this slide. Empirical examination of the heat map revealed that there was one location indicated by red "hot spot" within the signature that elicited significant attention from the participants. AOI was created for this specific hot spot. Larger, secondary AOIs incorporating the smaller hot spots were created to include the orange "warm spots", creating a total of four AOIs (including the AOI for the questioned signature) for this stimulus.

Figure Alexander 2. Heat maps for Alexander Signature demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs. The overall heat map is displayed below. Separate heat maps for FDEs and Lay Participants are displayed underneath.



FDE



LAY

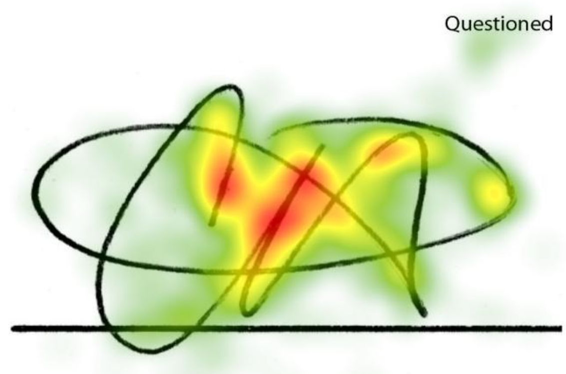
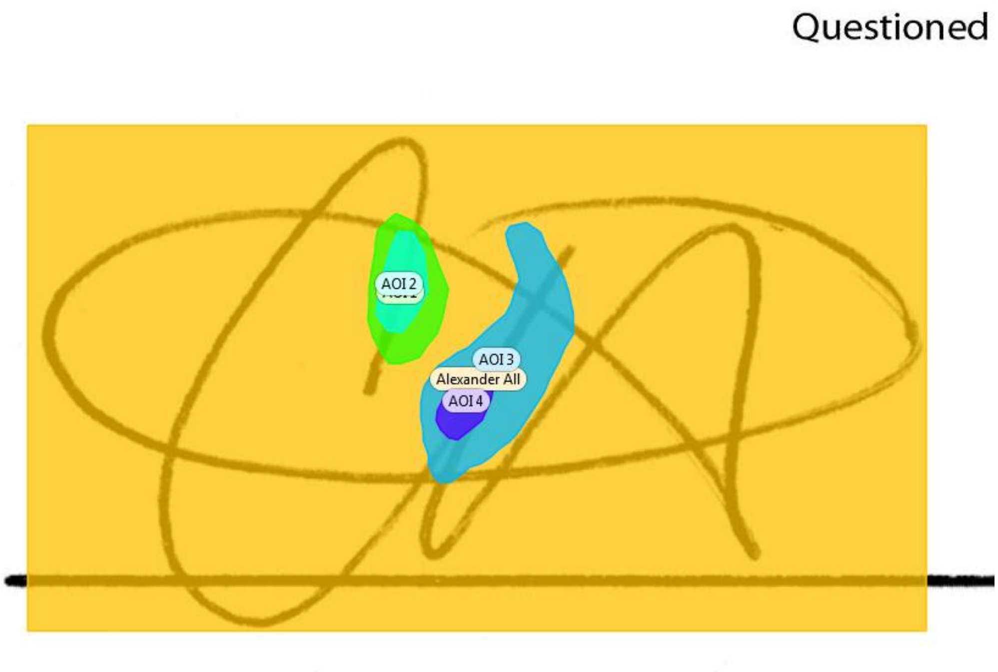


Figure Alexander 3. Areas of Interest (AOIs) for Signature Cierra Alexander.



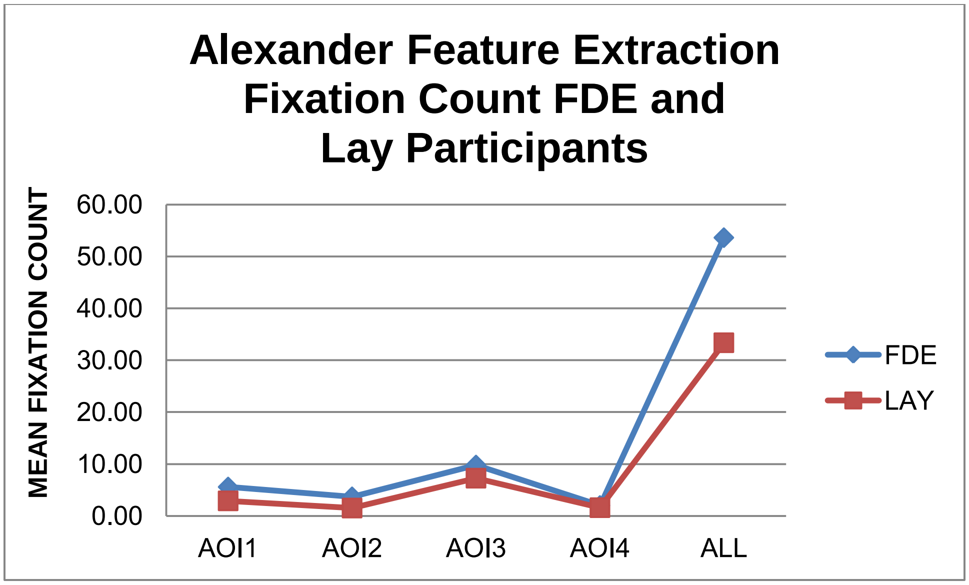
Eye-Tracking Metrics Analyses

These analyses investigate the participants' overall utilization of characteristics in the signature stimulus, and the participants' deployment of attentional resources to specific characteristics that the heat map indicated were particularly diagnostic during the examination. The examination process analyses are based on AOIs in the signature, and the overall signature analysis (the AOI overlaying the entire signature designated *Alexander all*). Figure Alexander 3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .688, F (5, 82) = 36.08, p < .001, multivariate η^2 = .688. Figure Alexander 4 presents the mean fixation counts by AOI.

Figure Alexander 4.



Follow-up ANOVAS conducted on each dependent variable revealed that fixation counts were greater among FDEs than among Lay participants for AOI 1, $F(1, 86) = 5.62$, $p = .02$, partial $\eta^2 = .061$; AOI 2, $F(1, 86) = 6.44$, $p = .013$, partial $\eta^2 = .07$; and AOI ALL, $F(1, 86) = 6.85$, $p = .01$, partial $\eta^2 = .07$).

Although fixation count was again greater among FDEs than among Lay participants, no significant differences were found for AOI 3, ($p = .052$, *ns*), or AOI 4, ($p = .198$, *ns*). Table Alexander 1 presents the means and standard deviations for areas of interest by participant type.

Table Alexander 1

Fixation Counts for FDE and Lay Participants

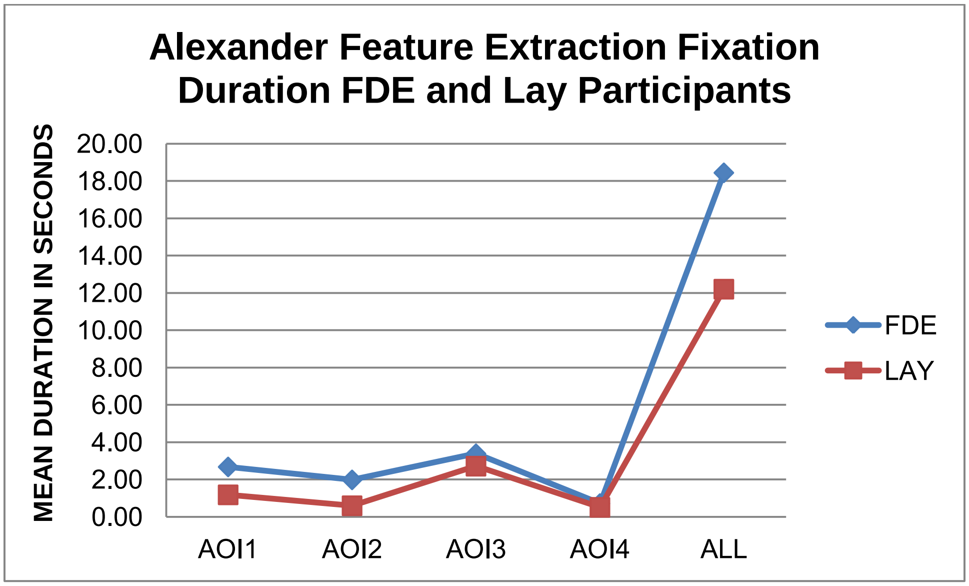
	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	5.57	6.62	3.68	5.23	9.81	6.20
Lay	2.90	3.06	1.51	1.72	7.27	5.85

	AOI4		ALL	
Participant	***M***	***SD***	***M***	***SD***
FDE	2.00	1.46	53.62	36.56
Lay	1.59	1.53	33.37	35.78

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .719, $F(5, 82) = 42.01$, $p = .001$, multivariate $\eta^2 = .719$. Figure Alexander 5 presents the mean fixation duration by AOI.

Figure Alexander 5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for only one AOI. Fixation duration was significantly greater for FDEs than for Lay participants for AOI ALL, $F(1, 88) = 4.42$, $p = .038$, partial $\eta^2 = .049$).

Although the fixation duration was greater among FDEs was than among Lay participants in the remaining AOIs, no statistically significant differences were identified for AOI 1, ($p = .07$, *ns*); AOI 2, ($p = .057$, *ns*); AOI 3, ($p = .135$, *ns*); or AOI 4, ($p = .08$, *ns*). Table Alexander 2 presents the means and standard deviations for areas of interest by participant type.

Table Alexander 2

Process Analysis Fixation Durations for FDE and Lay Participants

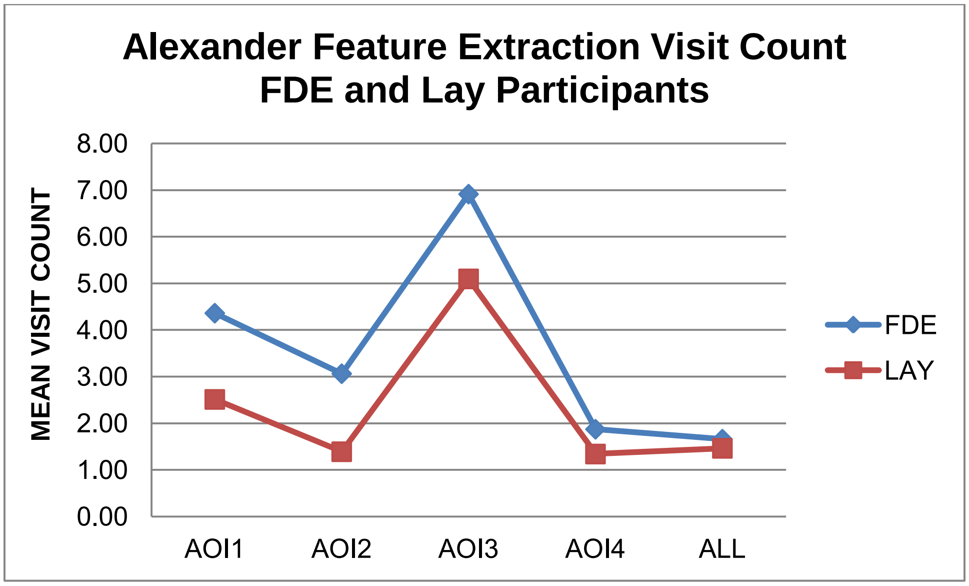
	AOI1		**AOI2**		**AOI3**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.68	5.00	1.99	4.52	3.39	1.94
Lay	1.18	1.61	0.60	0.87	2.72	2.21

	AOI4		**ALL**	
Participant	***M***	***SD***	***M***	***SD***
FDE	0.72	0.57	18.45	13.51
Lay	0.51	0.51	12.21	14.30

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .811, F (5, 82) = 70.25, p < .001, multivariate η^2 = .811. Figure Alexander 6 presents the mean visit counts by AOI.

Figure Alexander 6



Follow-up ANOVAS conducted on each dependent variable revealed that visit count was significantly greater among FDEs than among Lay participants for AOI 1, F(1, 86) = 4.65, p = .034, partial η^2 = .051; AOI 2, F(1, 86) = 5.39, p = .023, partial η^2 = .059; AOI 3, F(1, 86) = 3.95, p = .05, partial η^2 = .044; AOI 4, F(1, 86) = 4.07, p = .047, partial η^2 = .045.

No significant difference was found for AOI ALL, (p = .346, *ns*). Table Alexander 3 presents the means and standard deviations for areas of interest by participant type.

Table Alexander 3
Visit Counts for FDE and Lay Participants

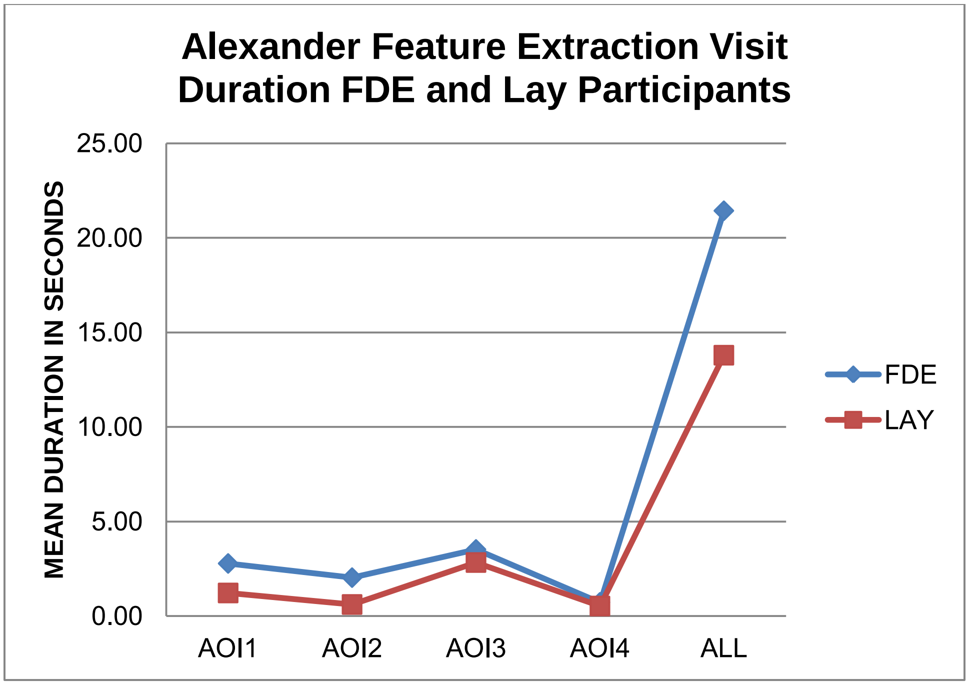
	AOI1		**AOI2**		**AOI3**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	4.36	4.83	3.06	4.34	6.91	4.52
Lay	2.51	2.79	1.39	1.67	5.10	3.97

	AOI4		**ALL**	
Participant	***M***	***SD***	***M***	***SD***
FDE	1.87	1.26	1.66	1.11
Lay	1.34	1.20	1.46	0.78

<u>Total Visit Duration</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .720, F (5, 82) = 42.25, p < .001, multivariate η^2 = .720. Figure Alexander 7 presents the mean visit durations by AOI.

Figure Alexander 7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant in only one AOI. Mean visit duration was significantly greater among FDEs than among lay participants in AOI ALL, F(1, 86) = 5.05, p = .027, partial η^2 = .055.

Although fixation duration was greater for FDEs than Lay participants in all the remaining AOIs, these differences were not statistically significant, AOI 1, (p = .074, *ns*); AOI 2, (p = .055, *ns*); AOI 3, (p = .132, *ns*); AOI 4, (p = .099, *ns*). Table Alexander 4 presents the means and standard deviations for areas of interest by participant type.

Table Alexander 4
Process Analysis Visit Durations for FDE and Lay Participants

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.78	5.31	2.03	4.59	3.52	2.02
Lay	1.21	1.64	0.61	0.87	2.82	2.26

	AOI4		ALL	
Participant	***M***	***SD***	***M***	***SD***

FDE	0.72	0.57	21.43	15.89
Lay	0.52	0.53	13.79	15.93

Decision Confidence Analysis

A 2 (FDE vs. Lay participant) x 2 (correct vs. incorrect call) univariate factorial ANOVA was conducted to investigate whether significant differences in level of *call confidence* existed between FDE and Lay participants, and whether significant differences existed according to the accuracy of the call. Table Alexander 5 presents the results of the omnibus analysis.

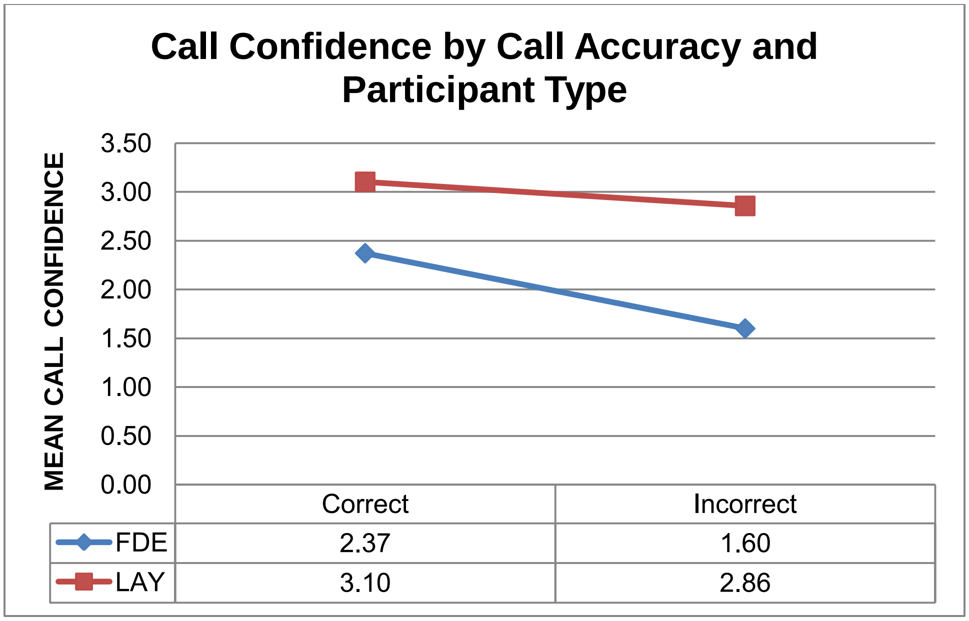
Table Alexander 5

Two-Way ANOVA Summary Table

Source	***SS***	***df***	***MS***	***F***	***p***	η^2
Between treatments						
Participant Type	12.01	1.00	12.01	18.78	.000	.178
Call Accuracy	3.15	1.00	3.15	4.93	.029	.054
Participant Type x Call Accuracy	0.84	1.00	0.84	1.31	.255	.015
Within treatments	55.65	87.00	0.64			
Total	704.00	91.00				

Main effect results revealed that call confidence was significantly greater among Lay participants than among FDEs, $F(1, 87) = 18.78$, $p < .001$, partial $\eta^2 = .178$. Figure Alexander 8 demonstrates the mean confidence ratings by call accuracy and participant type.

Figure Alexander 8



Call confidence among FDEs was even lower than was the call confidence for Lay participants (F(1, 87) = 4.93, p = .029, partial η^2 = .054), indicating that FDEs were even less confident in their incorrect calls than they were in their correct calls. No significant interaction effect was found between participant type and call accuracy, (p = .255, ns).

<u>*Conclusions*</u>

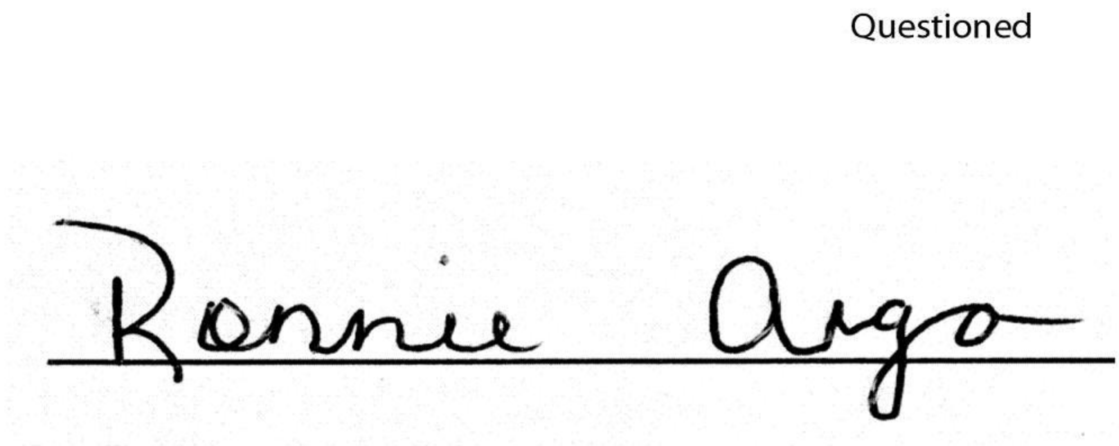
These findings indicate that although FDEs were significantly more accurate than were Lay participants, they were also significantly less confident in the accuracy of their calls, on average rating their confidence level for correct calls at *somewhat confident* and their incorrect calls as *not at all confident*, compared to Lay participants, who on average rated their correct call confidence at the *moderately confident* level, and their incorrect call confidence at the *somewhat confident* level.

Four areas of interest were empirically identified by examining the full sample heat map for this signature. The four eye tracking metrics revealed that overall, FDEs examined the signature significantly more extensively than did Lay participants, fixating a greater number of times on all AOIs, and fixating on those AOIs for a greater period of time. The significant differences in fixation count, fixation duration, and visit duration observed in the AOI “ALL” indicated that FDEs also examined a greater variety of signature features, and spent more time evaluating them, than did Lay participants.

SIGNATURE: Ronnie Argo (Simulated)

The signature of Ronnie Argo is characterized as a low-complexity text based signature. Of the 49 FDE participants, 44 responded correctly that the signature was simulated, and 5 responded that the signature was geniune. Of the 43 Lay participants, 25 responded correctly that the signature was simulated, and 18 responded that it was genuine. This difference was statistically significant, χ^2 (1, N = 91) = 12.24, p < .001. Figure Argo 1 presents the view of this signature.

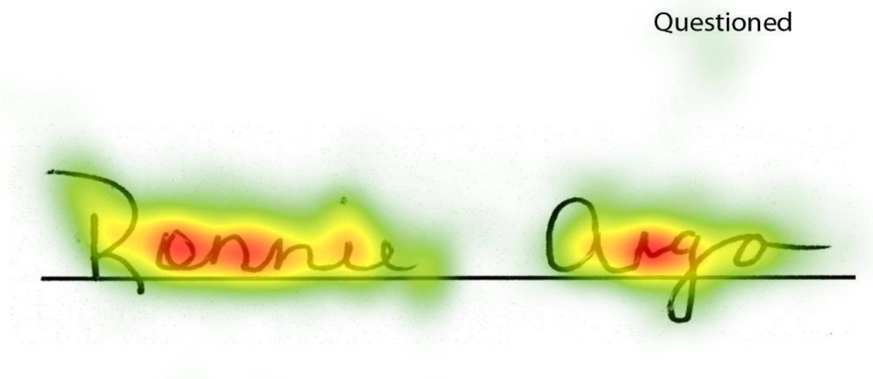
Figure Argo1. Single Signature Stimulus for Ronnie Argo.



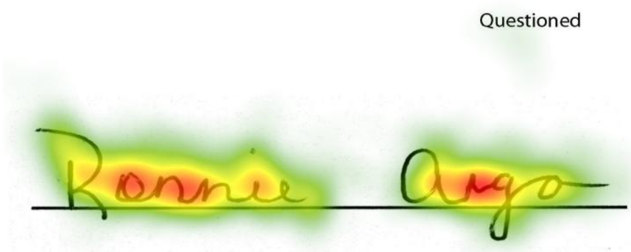
Selection of Areas of Interest (AOIs)

Figure Argo 2 presents the heat map for this slide. Empirical examination of the heat map revealed that there were three locations indicated by red "hot spots" within the signature that elicited significant attention from the participants. An AOI was created for this specific hot spot. Larger, secondary AOI incorporating the smaller hot spot was created to include the orange "warm spot," creating a total of five AOIs (including the AOI for the questioned signature) for this stimulus.

Figure Argo 2. Heat maps for Argo Signature demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs. The overall heat map is displayed below. Separate heat maps for FDEs and Lay Participants are displayed underneath.



FDE



LAY

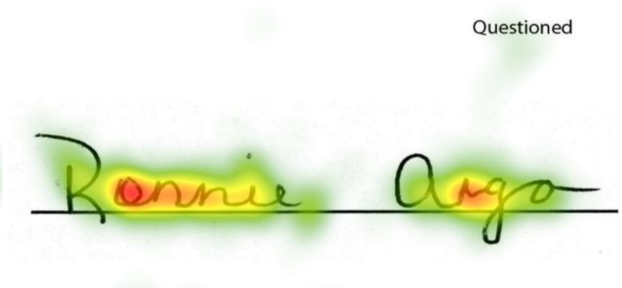
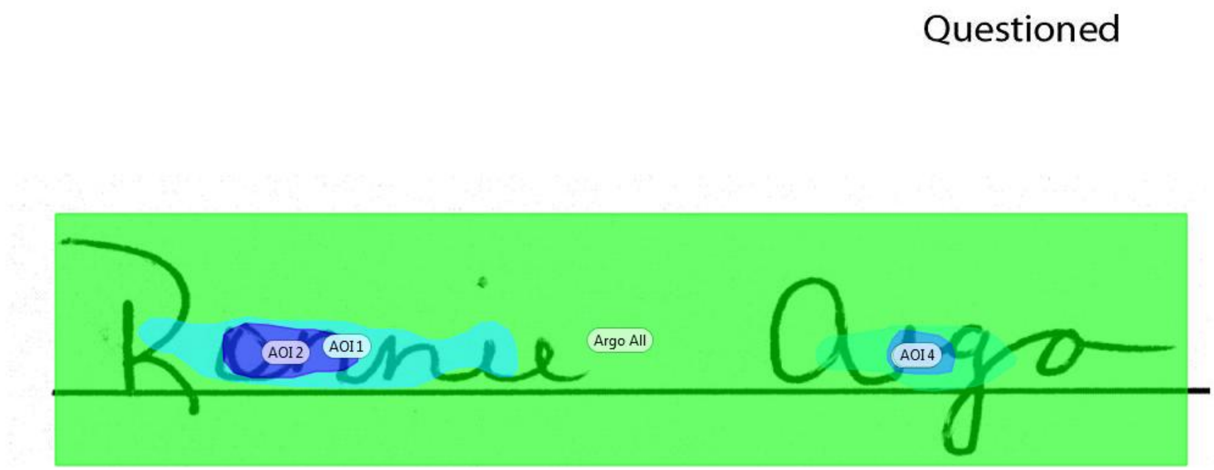


Figure Argo 3. Areas of Interest (AOIs) for Signature Ronnie Argo.



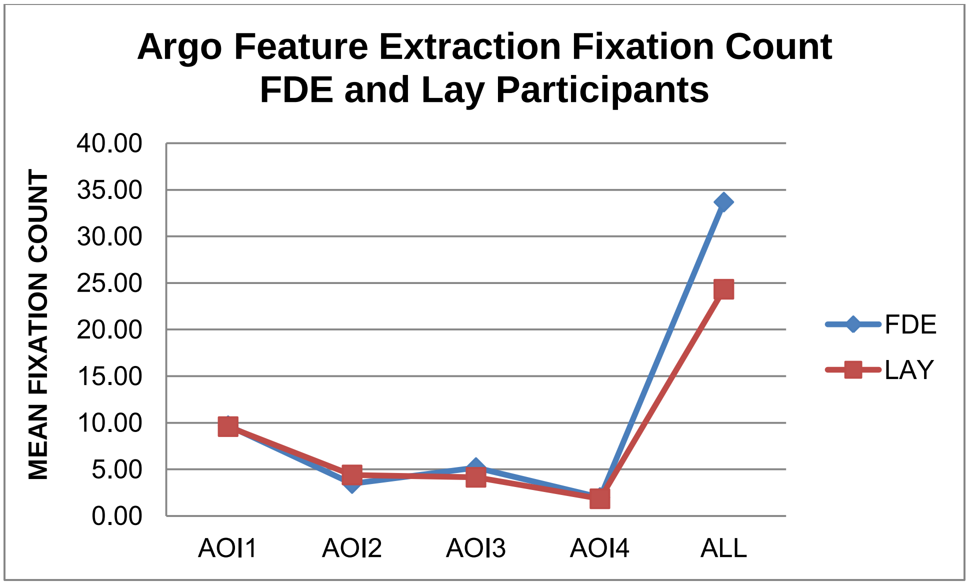
Eye-Tracking Metrics Analyses

These analyses investigate the participants' overall utilization of characteristics in the signature stimulus, and the participants' deployment of attentional resources to specific characteristics that the heat map indicated were particularly diagnostic during the examination. The examination process analyses are based on AOIs in the signature, and the overall signature analysis (the AOI overlaying the entire signature designated *Argo all*). Figure Argo 3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .169, F (5, 84) = 3.409, p = .007, multivariate η^2 = .169. Figure Argo 5 presents the mean fixation count by AOI.

Figure Argo 5



Although the overall model was statistically significant, follow-up ANOVAS conducted on each dependent variable revealed that participant type differences in fixation counts were not significant for any of the AOIs (AOI 1, p = .966, *ns*; AOI 2, p = .476, *ns;* AOI 3, p = .297, *ns;* AOI 4, p = .773, *ns;* AOI ALL, p = .055, *ns*). Table Argo 2 presents the means and standard deviations for areas of interest by participant type.

Table Argo 2

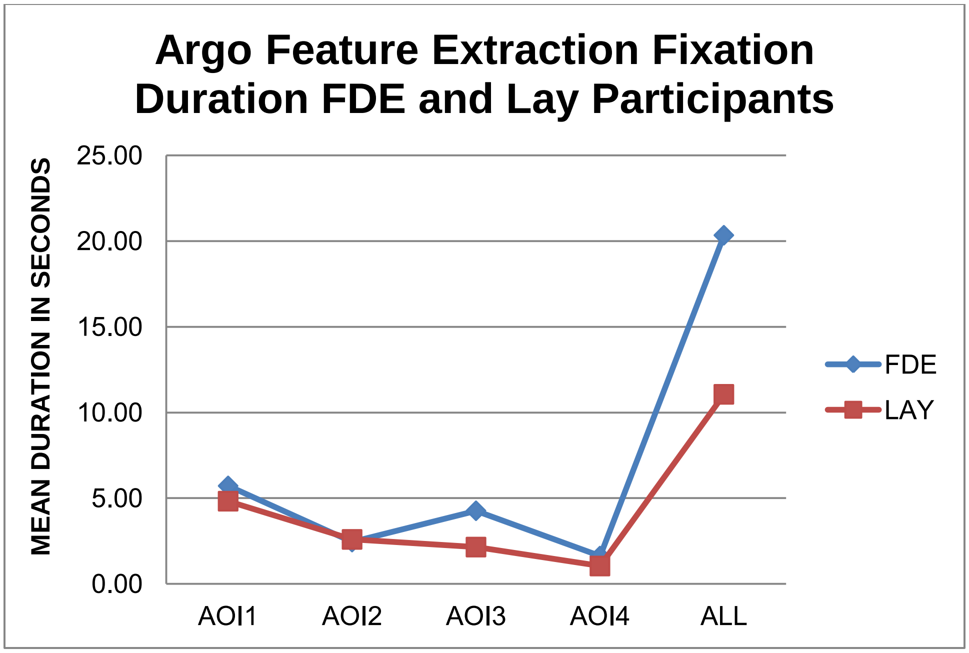
	AOI1		**AOI2**		**AOI3**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	9.68	7.88	3.47	3.58	5.19	5.23
Lay	9.58	13.70	4.40	8.06	4.14	4.17

	AOI4		**ALL**	
Participant	***M***	***SD***	***M***	***SD***
FDE	1.98	2.35	33.68	19.12
Lay	1.84	2.29	24.33	26.21

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .625, F (5, 84) = 28.06, p < .001, multivariate η^2 = .625. Figure Argo 4 presents the mean fixation counts by AOI.

Figure Argo 4.



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for two of the AOI. Fixation durations in all significant AOIs were greater for FDEs than for lay participants (AOI 3, $F(1, 88) = 7.87$, $p = .006$, partial $\eta^2 = .082$; AOI ALL, $F(1, 88) = 9.06$, $p = .003$, partial $\eta^2 = .093$).

Although fixation duration was greater among FDEs than among Lay participants in the remainder of the AOIs, no significant differences were found for AOI 1, ($p = .527$, *ns*); or for AOI 2, ($p = .873$, *ns*); or for AOI 4, ($p = .164$, *ns*). Table Argo 1 presents the means and standard deviations for areas of interest by participant type.

Table Argo 1

Fixation Duration for FDE and Lay Participants

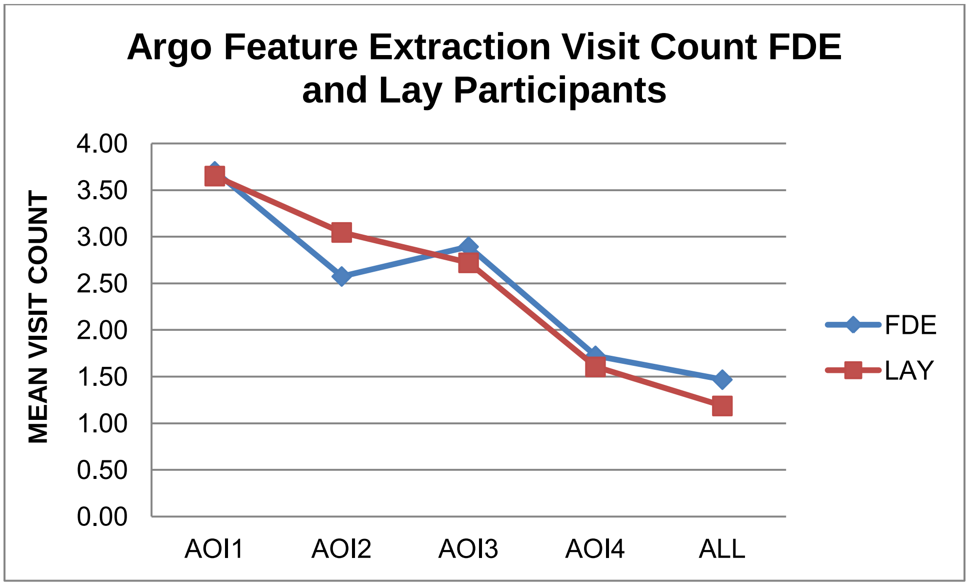
	AOI1		**AOI2**		**AOI3**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	5.72	4.86	2.44	2.81	4.27	4.36
Lay	4.83	8.19	2.60	5.90	2.15	2.46

	AOI4		**ALL**	
Participant	***M***	***SD***	***M***	***SD***
FDE	1.62	2.36	20.34	15.27
Lay	1.04	1.39	11.06	13.88

Total Visit Count

MANOVA results revealed no significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .062, F (5, 88) = 1.105, p = .364, multivariate η^2 = .062. Figure Argo 8 presents the mean fixation count by AOI.

Figure Argo 8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were not significant for any of the AOIs; AOI 1, p = .938, *ns*; AOI 2, p = .528, *ns;* AOI 3, p = .757, *ns;* AOI 4, p = .768, *ns;* AOI ALL, p = .116, *ns*. Table Argo 5 presents the means and standard deviations for areas of interest by participant type.

Table Argo 5

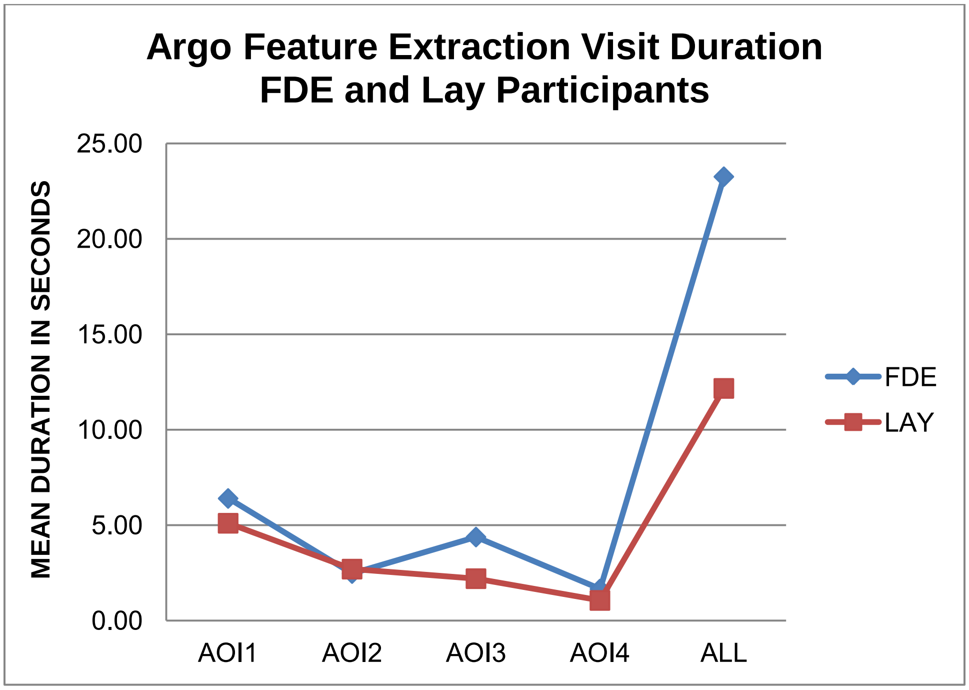
	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	3.70	2.64	2.57	2.47	2.89	2.56
Lay	3.65	3.55	3.05	4.41	2.72	2.72

	AOI4		ALL	
Participant	***M***	***SD***	***M***	***SD***
FDE	1.72	1.87	1.47	0.88
Lay	1.60	1.94	1.19	0.79

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .233, F (5, 84) = 5.106, p < .001, multivariate η^2 = .233. Figure Argo 6 presents the mean visit duration by AOI.

Figure Argo 6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for two AOIs. Visit durations in both significant AOIs were greater for FDEs than for lay participants (AOI 3, F(1, 88) = 8.00, p = .006, partial η^2 = .083; AOI ALL, F(1, 88) = 10.78, p = .001, partial η^2 = .109).

No significant differences were found for AOI 1, p = .401, ns; AOI 2, p = .820, *ns*; or AOI 4, p = .160, *ns*. Table Argo 3 presents the means and standard deviations for areas of interest by participant type.

Table Argo 3

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	6.40	5.23	2.46	2.85	4.38	4.44
Lay	5.10	9.02	2.70	6.28	2.20	2.54

	AOI4		ALL	
Participant	***M***	***SD***	***M***	***SD***
FDE	1.65	2.42	23.26	16.56
Lay	1.06	1.42	12.17	15.40

Decision Confidence Analysis

A 2 (FDE vs. Lay participant) x 2 (correct vs. incorrect call) univariate factorial ANOVA was conducted to investigate whether significant differences in level of *call confidence* existed between FDE and Lay participants, and whether significant differences existed according to the accuracy of the call. Table Argo 6 presents the results of the omnibus analysis.

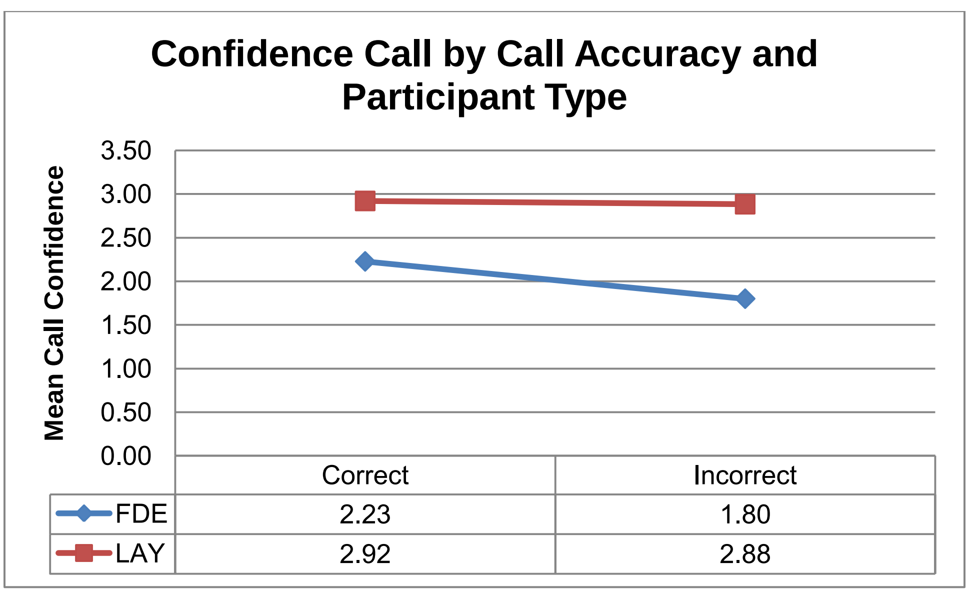
Table Argo 6

Two-Way ANOVA Summary Table

Source	*SS*	*df*	*MS*	*F*	*p*	η^2
Between treatments						
Participant Type	9.80	1.00	9.80	15.19	.000	.149
Call Accuracy	0.67	1.00	0.67	1.04	.310	.012
Participant Type x Call Accuracy	0.47	1.00	0.47	0.73	.395	.008
Within treatments	56.13	87.00	0.65			
Total	645.00	91.00				

Main effect results revealed that call confidence was significantly greater among Lay participants than among FDEs, $F(1, 87) = 15.19$, $p < .001$, partial $\eta^2 = .149$; however, no other significant differences were found. Figure Alexander 9 demonstrates the mean confidence ratings by call accuracy and participant type.

Figure Argo 9



Conclusions

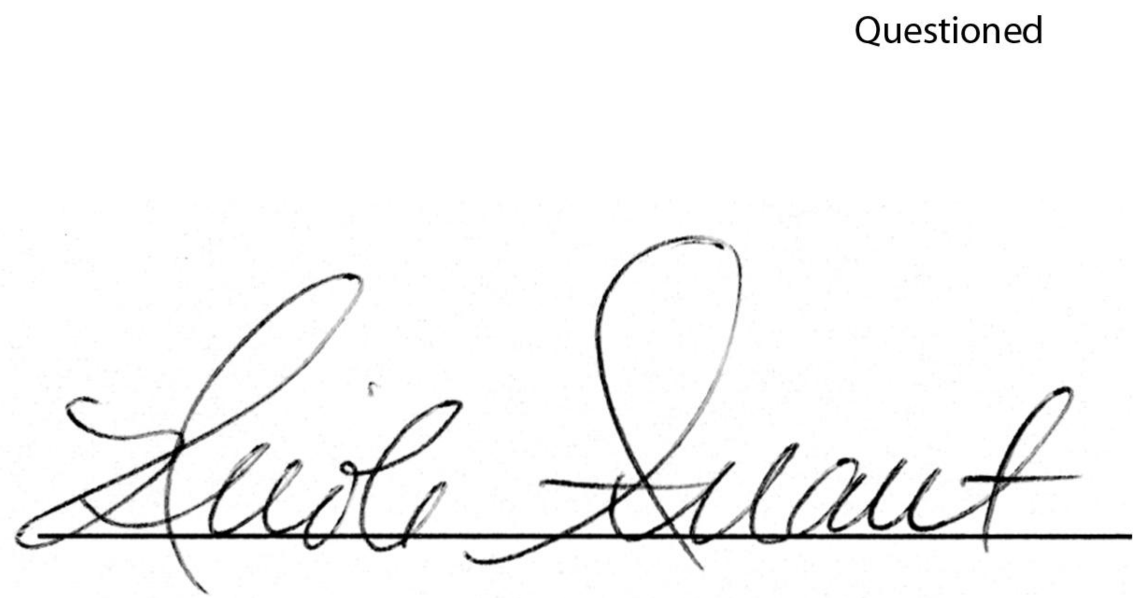
These findings indicate that although FDEs were significantly more accurate than were Lay participants, they were also significantly less confident in the accuracy of their calls, on average rating their confidence level for correct calls at *somewhat confident* and their incorrect calls as *not at all confident,* compared to Lay participants, who on average rated their call confidence nearly at the *moderately confident* level, regardless of whether their calls were correct or incorrect.

Four areas of interest were empirically identified by examining the full sample heat map for this signature. The four eye tracking metrics revealed that overall, FDEs examined the signature significantly more extensively than did Lay participants, fixating a greater number of times on all AOIs but AOI2, and with the exception of AOI2, fixating on those AOIs for a greater period of time. Lay participants spent slightly more attentional resources on AOI2 than did FDEs, but these differences were not statistically significant. The significant differences in fixation count, fixation duration, and visit duration observed in the AOI "ALL" indicated that FDEs also examined a greater variety of signature features, and spent more time evaluating them, than did Lay participants.

SIGNATURE: Nicole Arrant (Genuine)

The signature of Nicole Arrant is characterized as a high-complexity text based signature. Of the 49 FDE participants, 47 responded correctly that the signature was genuine, and 2 responded that the signature was simulated. Of the 43 Lay participants, 27 responded correctly that the signature was genuine, and 16 responded that it was simulated. This difference was statistically significant, χ^2 (1, N = 92) = 15.97, p < .001. Figure Arrant 1 presents the view of this signature.

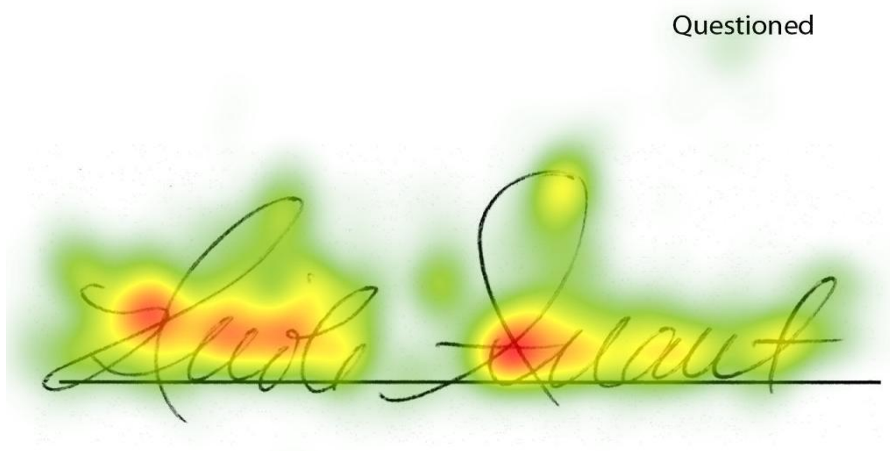
Figure Arrant 1. Single Signature Stimulus for Nicole Arrant.



Selection of Areas of Interest (AOIs)

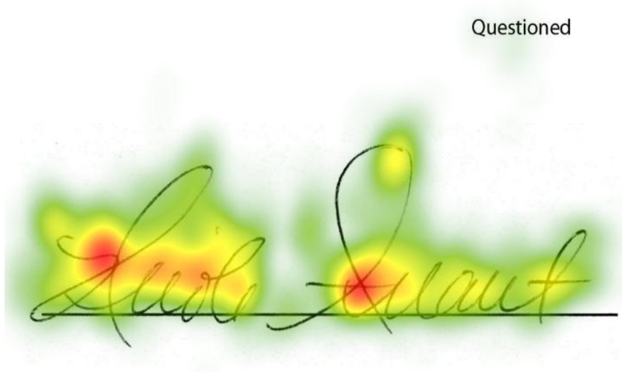
Figure Arrant 2 presents the heat map for this slide. Empirical examination of the heat map revealed that there were three locations indicated by red “hot spots” within the signature that elicited significant attention from the participants. AOIs were created for these specific hot spots. Larger, secondary AOI incorporating the smaller hot spot was created to include the orange “warm spot,” creating a total of five AOIs (including the AOI for the questioned signature) for this stimulus.

Figure Arrant 2. Heat maps for Arrant Signature demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs. The overall heat map is displayed below. Separate heat maps for FDEs and Lay Participants are displayed underneath.



FDE

LAY



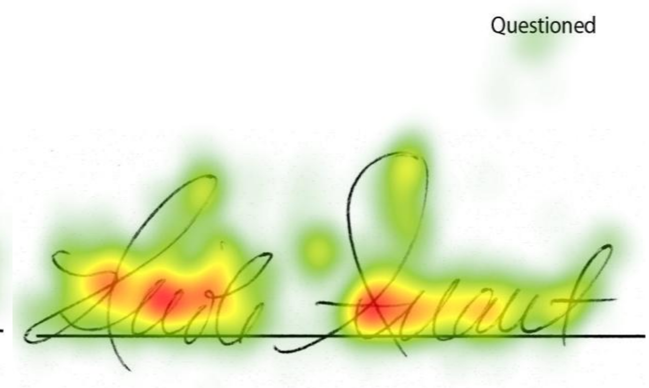
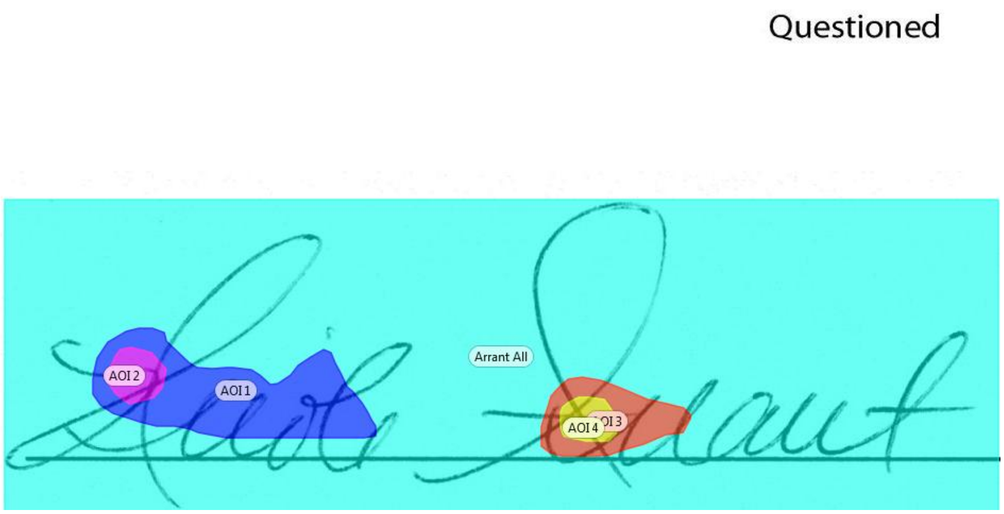


Figure Arrant 3. Areas of Interest (AOIs) for Signature Ronni Argo.



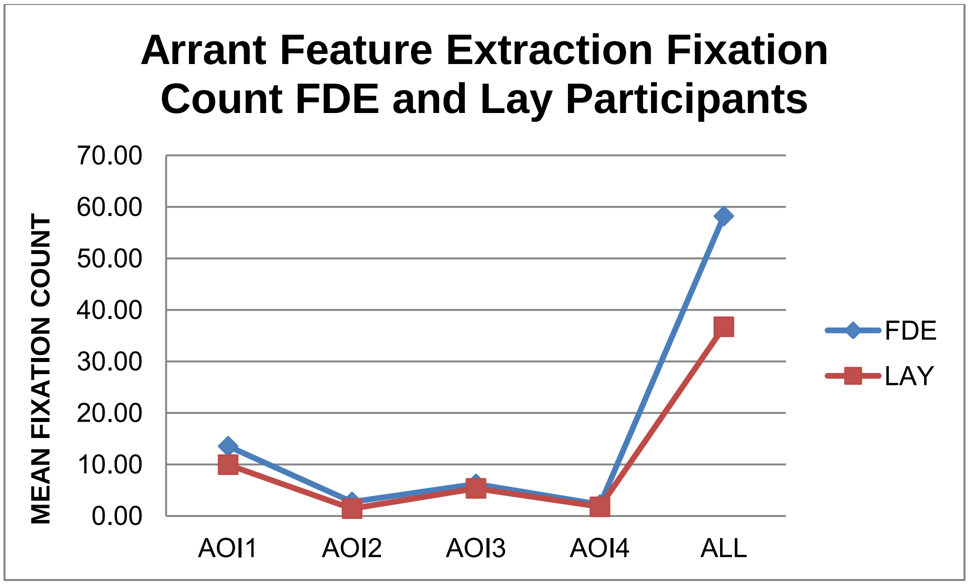
Eye-Tracking Metrics Analyses

These analyses investigate the participants' overall utilization of characteristics in the signature stimulus, and the participants' deployment of attentional resources to specific characteristics that the heat map indicated were particularly diagnostic during the examination. The examination process analyses are based on AOIs in the signature, and the overall signature analysis (the AOI overlaying the entire signature designated *Arrant all*). Figure Arrant 3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed no significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .569, F (5, 82) = 1.16, p < .001, multivariate η^2 = .569. Figure Arrant 5 presents the mean fixation count by AOI.

Figure Arrant 5.



Follow-up ANOVAS conducted on each dependent variable revealed that although fixation count was greater among FDEs than among Lay participants, none of these differences were statistically significant, AOI 1, p = .295, *ns*; AOI 2, p = .197, *ns;* AOI 3, p = .558, *ns;* AOI 4, p = .525, *ns;* and AOI ALL, p = .106, *ns*. Table Arrant 2 presents the means and standard deviations for areas of interest by participant type.

Table Arrant 2

Fixation Counts for FDE and Lay Participants

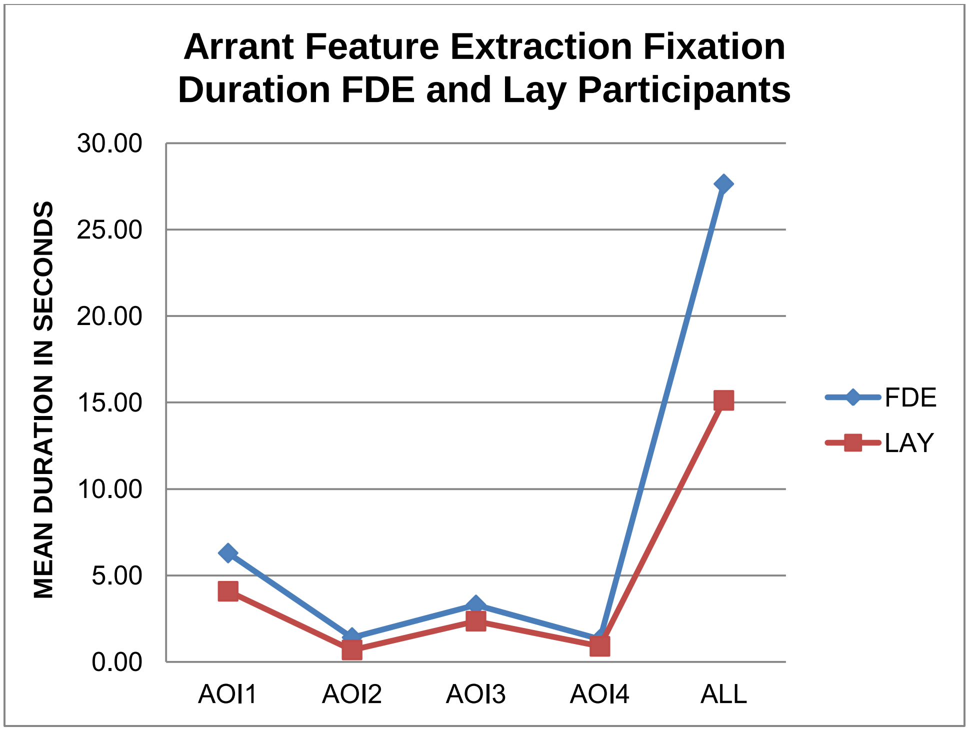
	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	13.53	19.98	2.70	5.84	6.21	7.97
Lay	9.95	9.24	1.41	2.65	5.34	5.51

	AOI4		ALL	
Participant	***M***	***SD***	***M***	***SD***
FDE	2.19	3.73	58.23	58.23
Lay	1.76	2.43	36.73	36.73

Total Fixation Duration

MANOVA results did not reveal significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .064, F (5, 82) = 1.13, p = .351, multivariate η^2 = .064. Figure Arrant 4 presents the mean fixation counts by AOI.

Figure Arrant 4.



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for only one of the AOIs. Fixation duration in AOI ALL was greater for FDEs than for lay participants, $F(1, 86) = 3.50$, $p = .021$, partial $\eta^2 = .061$.

Although fixation duration in the remaining AOIs was greater on average among FDEs than among Lay participants, these differences were not statistically significant, AOI 1, $p = .065$, *ns*; AOI 2, $p = .090$, *ns*; AOI 3, $p = .199$, *ns;* and AOI 4, $p = .251$, *ns*. Table Arrant 1 presents the means and standard deviations for areas of interest by participant type.

Table Arrant 1

Process Analysis Fixation Durations for FDE and Lay Participants

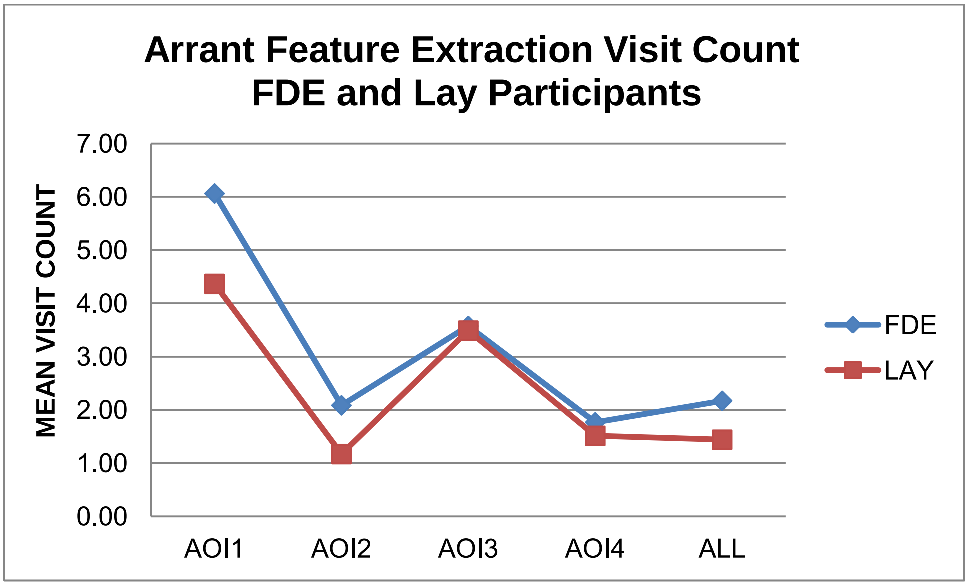
	AOI1		**AOI2**		**AOI3**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	6.30	7.10	1.41	2.47	3.30	4.08
Lay	4.08	2.77	0.69	1.16	2.36	2.40

	AOI4		**ALL**	
Participant	***M***	***SD***	***M***	***SD***
FDE	1.30	1.95	27.64	31.69
Lay	0.90	1.19	15.12	13.10

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .668, F (5, 82) = 32.98, p < .001, multivariate η^2 = .668. Figure Arrant 7 presents the mean fixation count by AOI.

Figure Arrant 7



Follow-up ANOVAS conducted on each dependent variable revealed that although visit count was on average greater among FDEs than among Lay participants, none of these differences was statistically significant, AOI 1, p = .155, *ns*; AOI 2, p = .152, *ns;* AOI 3, p = .899, *ns;* AOI 4, p = .572, *ns;* and AOI ALL, p = .093, *ns*. Table Arrant 4 presents the means and standard deviations for areas of interest by participant type.

Table Arrant 4
Visit Counts for FDE and Lay Participants

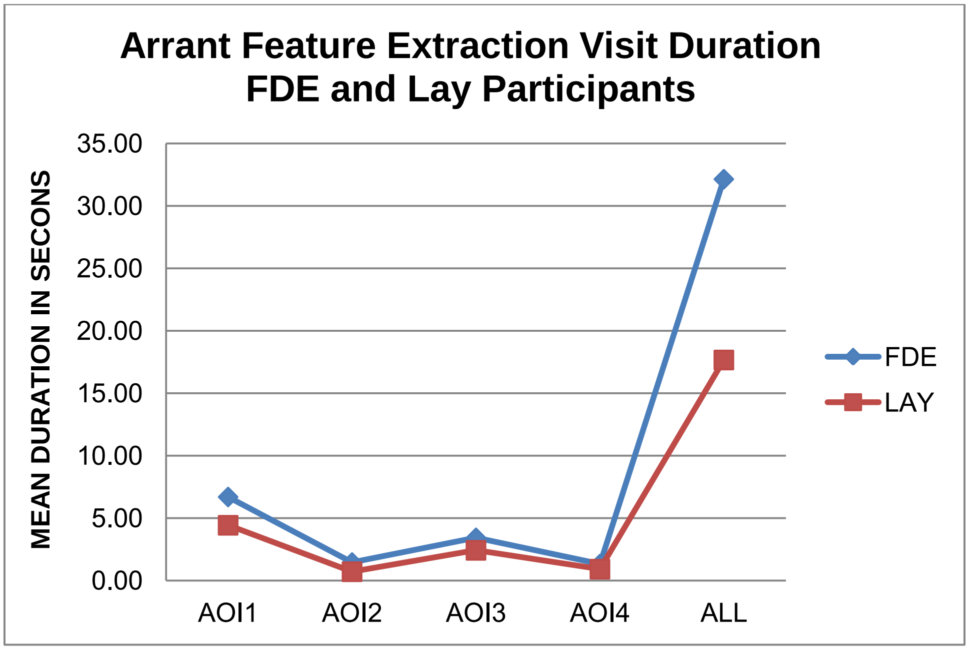
	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	6.06	7.10	2.09	3.63	3.57	3.37
Lay	4.37	2.81	1.17	1.92	3.49	2.94

	AOI4		ALL	
Participant	***M***	***SD***	***M***	***SD***
FDE	1.77	2.40	2.17	2.65
Lay	1.51	1.68	1.44	0.81

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .543, F (5, 82) = 19.46, p < .001, multivariate η^2 = .543. Figure Arrant 6 presents the mean visit duration by AOI.

Figure Arrant 6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant only for AOI ALL. Visit duration was significantly greater among FDEs than among Lay participants, F(1, 86) = 5.81, p = .018, partial η^2 = .063.

No significant differences were found for AOI 1, p = .080, *ns*; AOI 2, p = .093, *ns*; AOI 3, p = .195, *ns*; or AOI 4, p = .258, *ns*. Table Arrant 3 presents the means and standard deviations for areas of interest by participant type.

Table Arrant 3

Process Analysis Visit Durations for FDE and Lay Participants

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	6.70	7.67	1.45	2.57	3.42	4.33
Lay	4.43	3.07	0.71	1.17	2.42	2.48

	AOI4		ALL	
Participant	***M***	***SD***	***M***	***SD***
FDE	1.32	2.01	32.14	35.61
Lay	0.91	1.22	17.66	15.48

Decision Confidence Analysis

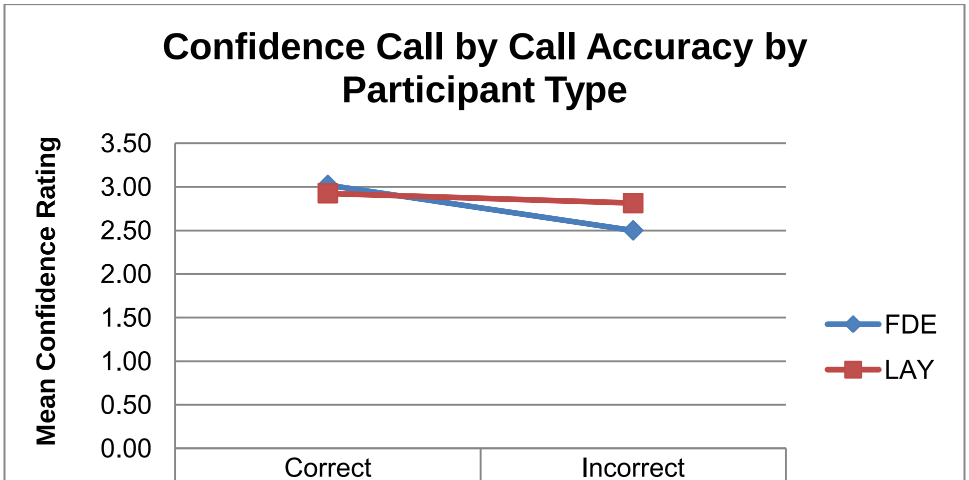
A 2 (FDE vs. Lay participant) x 2 (correct vs. incorrect call) univariate factorial ANOVA was conducted to investigate whether significant differences in level of *call confidence* existed between FDE and Lay participants, and whether significant differences existed according to the accuracy of the call. Table Arrant 5 presents the results of the omnibus analysis.

Table Arrant 5
Two-Way ANOVA Summary Table

Source	***SS***	***df***	***MS***	***F***	***p***	η^2
Between treatments						
Participant Type	.08	1.00	.08	.10	.754	.001
Call Accuracy	.65	1.00	.65	.84	.361	.009
Participant Type x Call Accuracy	.27	1.00	.27	.35	.557	.004
Within treatments	67.77	88.00	.77			
Total	867.00	92.00				

The analysis revealed that both FDEs and Lay participants reported on average that their confidence fell near the Moderately Confident level. Those FDEs who did not make a correct call were slightly less confident that were Lay participants, but no statistically significant differences were found. Figure Arrant 8 demonstrates the mean confidence ratings by call accuracy and participant type.

Figure Arrant 8



	Correct	Incorrect
FDE	3.02	2.50
LAY	2.93	2.81

Conclusions

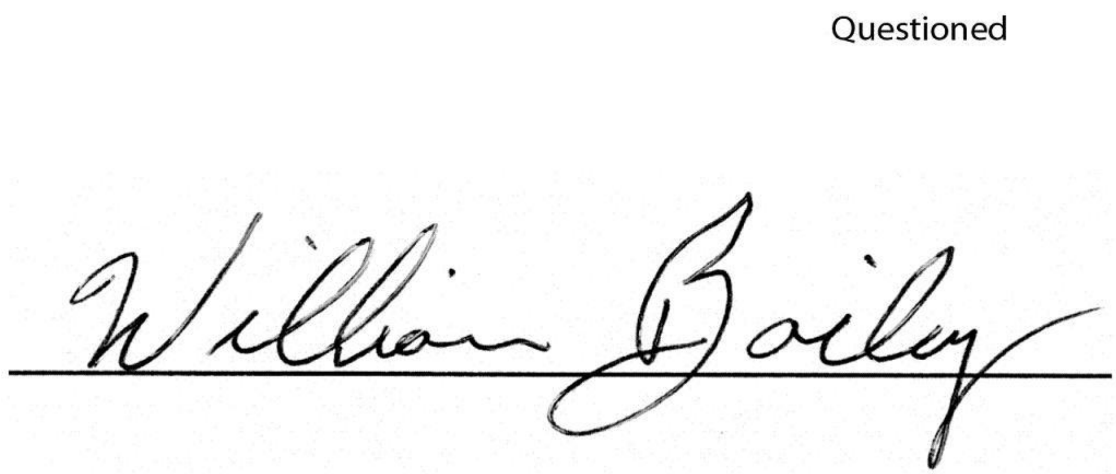
These findings indicate that although FDEs were significantly more accurate than were Lay participants, on average both groups were moderately confident in the accuracy of their calls

Four areas of interest were empirically identified by examining the full sample heat map for this signature. The four eye tracking metrics revealed that overall, FDEs examined the signature significantly more extensively than did Lay participants, fixating a greater number of times on all AOIs (although fixation count was not significantly different between the two groups), and fixating on those AOIs for a greater period of time. The significant differences in fixation duration and visit duration observed in the AOI “ALL” indicated that FDEs also examined a greater variety of signature features, and spent more time evaluating them, than did Lay participants.

SIGNATURE: William Bailey (Simulated)

The signature of William Bailey is characterized as a high-complexity text based signature. Of the 49 FDE participants, 35 responded correctly that the signature was simulated, and 14 responded that the signature was genuine. Of the 43 Lay participants, 22 responded correctly that the signature was simulated, and 21 responded that it was genuine. This difference was statistically significant, χ^2 (1, N = 92) = 3.99, p = .046. Figure Bailey 1 presents the view of this signature.

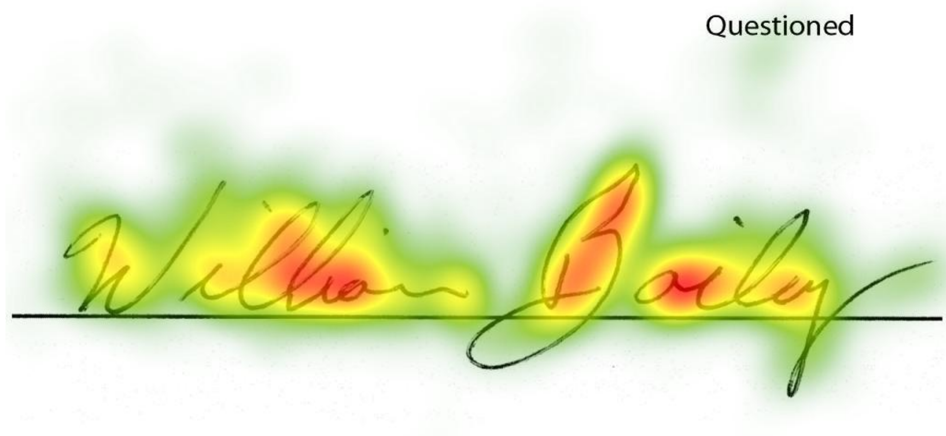
Figure Bailey1. Single Signature Stimulus for William Bailey.



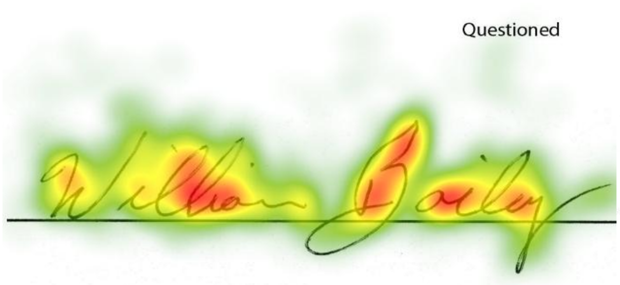
Selection of Areas of Interest (AOIs)

Figure Bailey 2 presents the heat map for this slide. Empirical examination of the heat map revealed that there were seven locations indicated by red “hot spots” within the signature that elicited significant attention from the participants. AOIs were created for these specific hot spots. Larger, secondary AOIs incorporating the smaller hot spots were created to include the orange “warm spots”, creating a total of eight AOIs (including the AOI for the questioned signature) for this stimulus.

Figure Bailey 2. Heat maps for Bailey Signature demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs. The overall heat map is displayed below. Separate heat maps for FDEs and Lay Participants are displayed underneath.



FDE



LAY

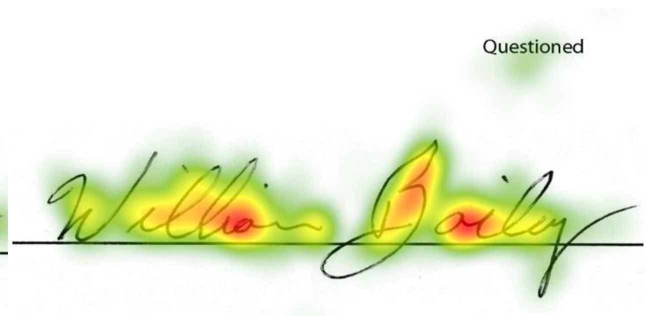
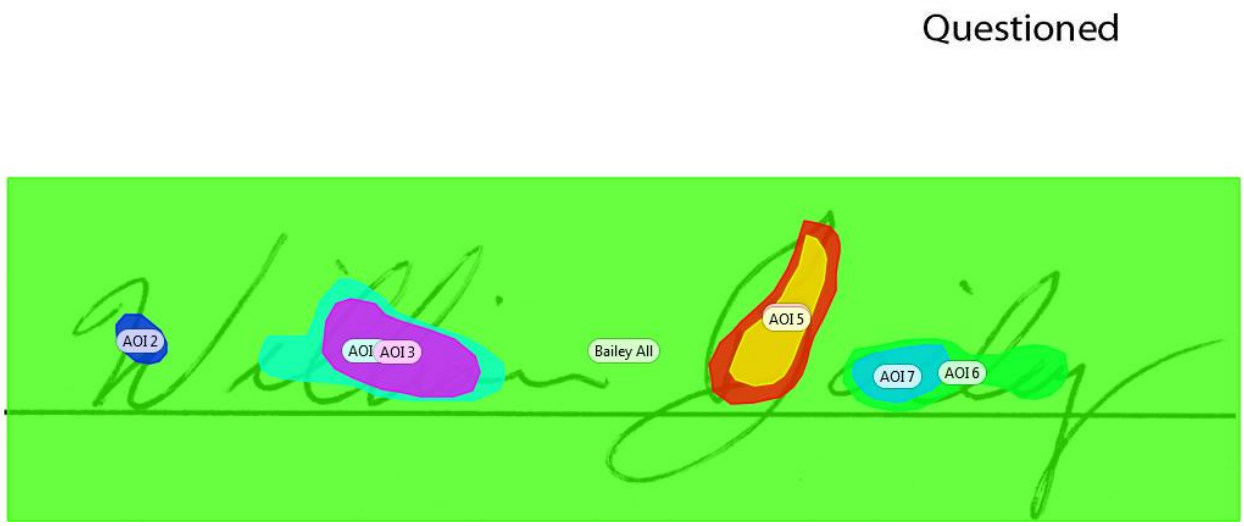


Figure Bailey 3. Areas of Interest (AOIs) for Signature William Bailey.



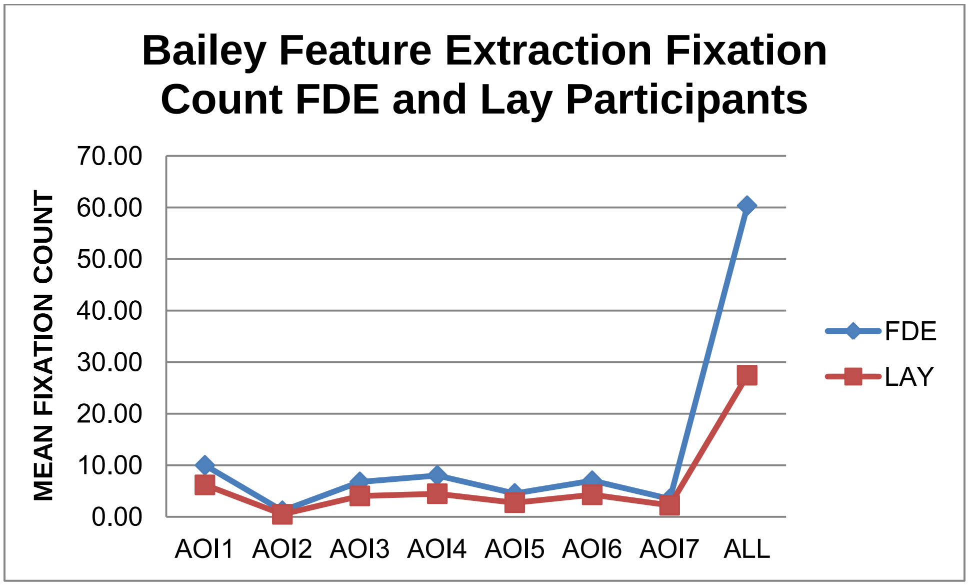
Eye-Tracking Metrics Analyses

These analyses investigate the participants' overall utilization of characteristics in the signature stimulus, and the participants' deployment of attentional resources to specific characteristics that the heat map indicated were particularly diagnostic during the examination. The examination process analyses are based on AOIs in the signature, and the overall signature analysis (the AOI overlaying the entire signature designated *Bailey all*). Figure Bailey 3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .335, F (8, 79) = 4.98, p < .001, multivariate η^2 = .335. Figure Bailey 4 presents the mean fixation counts by AOI.

Figure Bailey 4.



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for all but one AOI. Fixations counts in all significant AOIs were greater for FDEs than for lay participants (AOI 1, F(1, 86) = 8.40, p = .005, partial η^2 = .089; AOI 2, F(1, 86) = 5.49, p = .021, partial η^2 = .050; AOI 3, F(1, 86) = 7.56, p = .007, partial η^2 = .081; AOI 4, F(1, 86) = 10.51, p = .002, partial η^2 = .109; AOI 5, F(1, 86) = 6.40, p = .013, partial η^2 = .069; AOI 6, F(1, 86) = 5.90, p = .017, partial η^2 = .064; AOI ALL, F(1, 86) = 28.97, p < .001, partial η^2 = .252).

No significant difference was found for AOI 7, p = .066, *ns*. Table Bailey 1 presents the means and standard deviations for areas of interest by participant type.

Table Bailey 1

Fixation Counts for FDE and Lay Participants

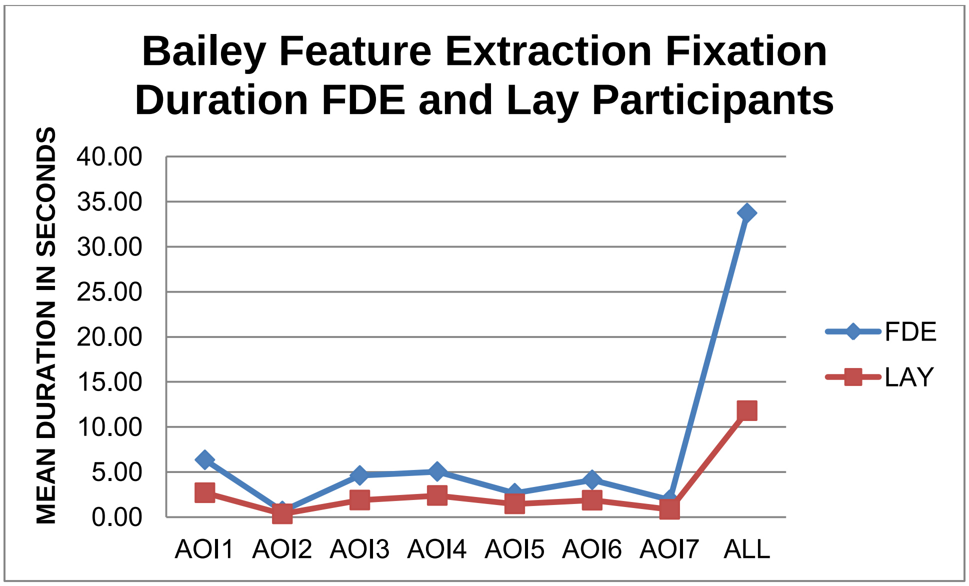
	AOI1		**AOI2**		**AOI3**		**AOI4**	
	M	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	9.98	7.71	1.15	1.71	6.76	6.02	8.02	6.18
LAY	6.17	3.80	0.45	0.94	4.02	2.43	4.45	3.73
	AOI5		**AOI6**		**AOI7**		**ALL**	
	M	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	4.52	3.87	6.98	6.17	3.46	3.42	60.35	36.69

LAY	2.71	2.66	4.24	4.10	2.21	2.77	27.45	15.58

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .282, F (8, 79) = 3.87, p = .001, multivariate η^2 = .282. Figure Bailey 5 presents the mean fixation duration by AOI.

Figure Bailey 5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for all but one AOI. Fixations counts in all significant AOIs were greater for FDEs than for lay participants (AOI 1, F(1, 86) = 14.12, p < .001, partial η^2 = .141; AOI 3, F(1, 86) = 11.26, p = .001, partial η^2 = .116; AOI 4, F(1, 86) = 12.73, p = .001, partial η^2 = .129; AOI 5, F(1, 86) = 6.47, p = .013, partial η^2 = .070; AOI 6, F(1, 86) = 9.93, p = .002, partial η^2 = .103; AOI 7, F(1, 86) = 7.07, p = .009, partial η^2 = .076; AOI ALL, F(1, 86) = 28.37, p < .001, partial η^2 = .248).

No significant difference was found for AOI 2, p = .074, *ns*. Table Bailey 2 presents the means and standard deviations for areas of interest by participant type.

Table Bailey 2

Process Analysis Fixation Durations for FDE and Lay Participants

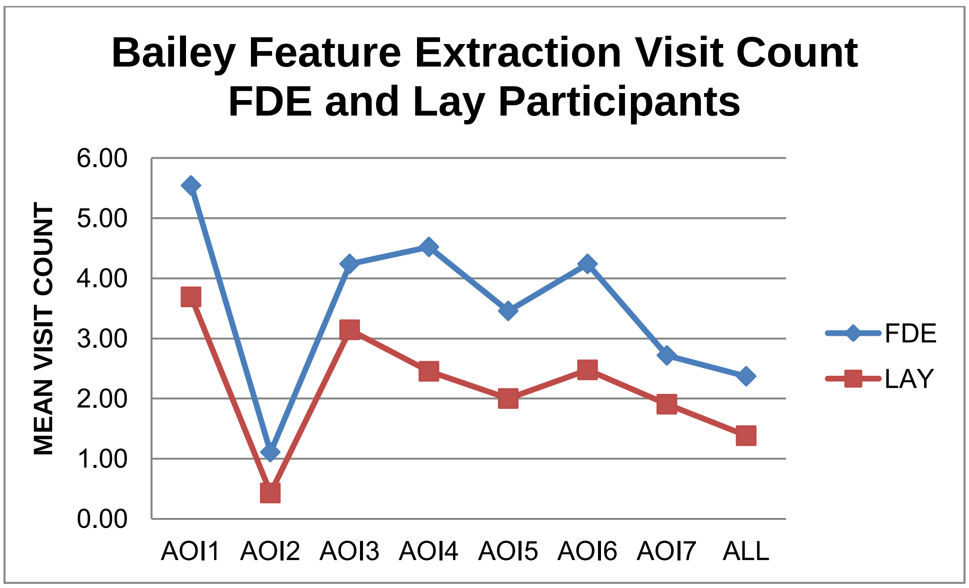
	AOI1		AOI2		AOI3		AOI4	
	M	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	6.34	5.88	0.66	0.94	4.61	4.97	5.04	4.30
LAY	2.69	2.37	0.34	0.69	1.88	1.84	2.38	2.31

	AOI5		AOI6		AOI7		ALL	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	2.64	2.52	4.12	4.35	1.90	2.42	33.73	25.60
LAY	1.45	1.72	1.86	1.74	0.84	0.97	11.79	7.86

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .258, F (8, 79) = 3.43, p = .002, multivariate η^2 = .258. Figure Bailey 6 presents the mean visit counts by AOI.

Figure Bailey 6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for all but one AOI. Fixations counts in all significant AOIs were greater for FDEs than for lay participants (AOI 1, F(1, 86) = 10.52, p = .002, partial η^2 = .109; AOI 2, F(1, 86) = 5.79, p = .018, partial η^2 = .063; AOI 3, F(1, 86) = 4.65, p = .034, partial η^2 = .051; AOI 4, F(1, 86) = 14.49, p < .001, partial η^2 = .144; AOI 5, F(1, 86) = 9.20, p = .003, partial η^2 = .097; AOI 6, F(1, 86) = 8.40, p = .005, partial η^2 = .089; AOI ALL, F(1, 86) = 8.76, p = .004, partial η^2 = .092).

No significant difference was found for AOI 7, p = .090, *ns*. Table Bailey 3 presents the means and standard deviations for areas of interest by participant type.

Table Bailey 3

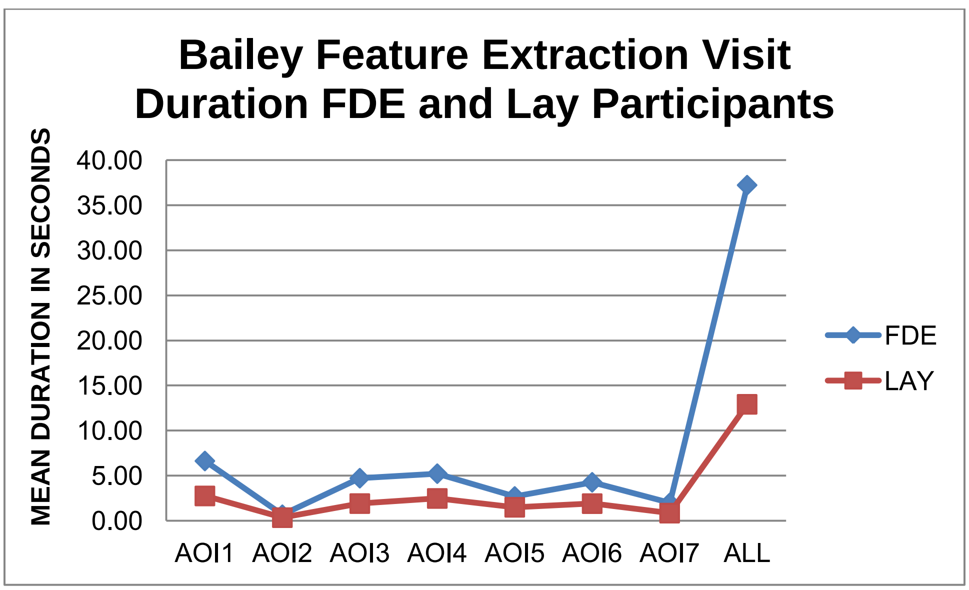
Visit Counts for FDE and Lay Participants

	AOI1		AOI2		AOI3		AOI4	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	5.54	3.11	1.11	1.61	4.24	2.76	4.52	3.10
LAY	3.69	2.10	0.43	0.91	3.14	1.88	2.45	1.76
	AOI5		**AOI6**		**AOI7**		**ALL**	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	3.46	2.65	4.24	3.60	2.72	2.47	2.37	2.07
LAY	2.00	1.71	2.48	1.67	1.90	1.90	1.38	0.66

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .310, F (8, 79) = 4.44, p < .001, multivariate η^2 = .310. Figure Bailey 7 presents the mean visit durations by AOI.

Figure Bailey 7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for all but one AOI. Fixations counts in all significant AOIs were greater for FDEs than for lay participants (AOI 1, F(1, 86) = 15.24, p < .001, partial η^2 = .151; AOI 3, F(1, 86) = 11.52, p = .001, partial η^2 = .118; AOI 4, F(1, 86) = 13.27, p < .001, partial η^2 = .134; AOI 5, F(1, 86) = 6.43, p = .013, partial η^2 = .070; AOI 6, F(1, 86) = 10.47, p = .002, partial η^2 = .109; AOI 7, F(1, 86) = 7.74, p = .007, partial η^2 = .083; AOI ALL, F(1, 86) = 32.10, p < .001, partial η^2 = .272).

No significant difference was found for AOI 2, p = .073, *ns*. Table Bailey 4 presents the means and standard deviations for areas of interest by participant type.

Table Bailey 4
Process Analysis Visit Durations for FDE and Lay Participants

	AOI1		**AOI2**		**AOI3**		**AOI4**	
	M	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	6.63	6.01	0.67	0.95	4.72	5.07	5.23	4.32
LAY	2.75	2.42	0.34	0.69	1.90	1.86	2.47	2.41
	AOI5		**AOI6**		**AOI7**		**ALL**	
	M	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.70	2.56	4.26	4.42	1.97	2.44	37.24	26.68
LAY	1.49	1.79	1.90	1.79	0.85	0.98	12.92	8.23

Decision Confidence Analysis

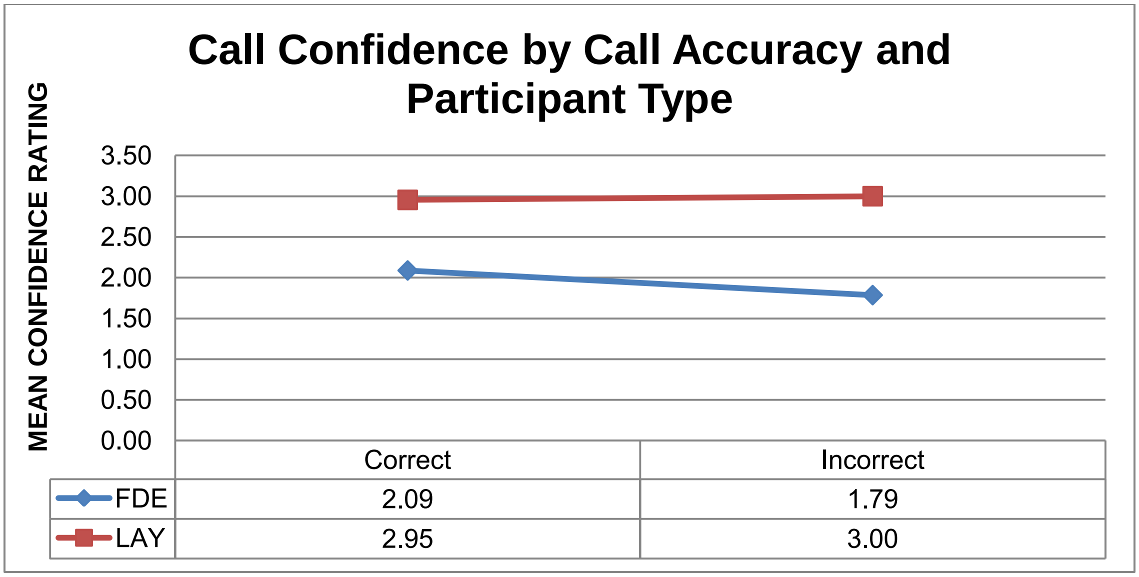
A 2 (FDE vs. Lay participant) x 2 (correct vs. incorrect call) univariate factorial ANOVA was conducted to investigate whether significant differences in level of *call confidence* existed between FDE and Lay participants, and whether significant differences existed according to the accuracy of the call. Table Bailey 5 presents the results of the omnibus analysis.

Table Bailey 5
Two-Way ANOVA Summary Table

Source	***SS***	***df***	***MS***	***F***	***p***	η^2
Between treatments						
Participant Type	22.32	1	22.32	48.50	.000	.358
Call Accuracy	0.34	1	0.34	0.74	.392	.008
Participant Type x Call Accuracy	0.62	1	0.62	1.36	.247	.015
Within treatments	40.05	87	0.46			
Total	614.00	91				

Main effect results revealed that call confidence was significantly different between the two participant types, $F(1, 87) = 48.50$, $p < .001$, partial $\eta^2 = .358$. No significant difference was found in confidence for call accuracy, $p = .392$, *ns*. No significant interaction effect was found between participant type and call accuracy, $p = .247$, *ns*. Figure Bailey 8 demonstrates the mean confidence ratings by call accuracy and participant type.

Figure Bailey 8



Conclusions

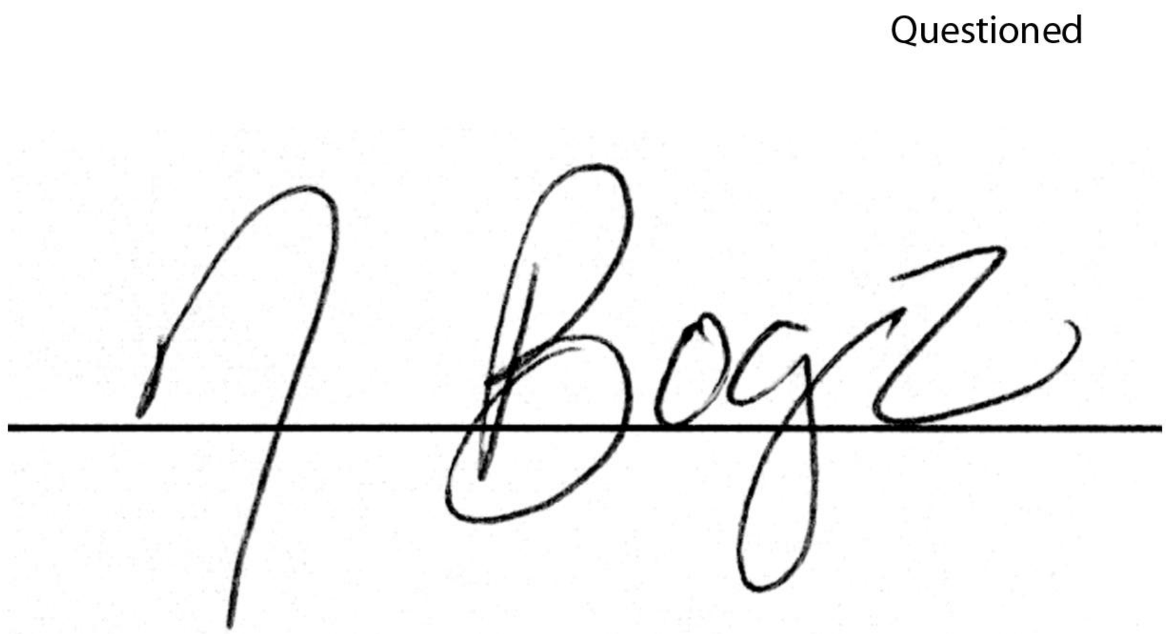
These findings indicate that although FDEs were significantly more accurate than were Lay participants, they were also significantly less confident in the accuracy of their calls, on average rating their confidence level for correct calls at *somewhat confident* and their incorrect calls as *not at all confident*, compared to Lay participants, who on average rated their correct call confidence at the *moderately confident* level.

Seven areas of interest were empirically identified by examining the full sample heat map for this signature. The seven eye tracking metrics revealed that overall, FDEs examined the signature significantly more extensively than did Lay participants, fixating a greater number of times on all AOIs, and fixating on those AOIs for a greater period of time. The significant differences in fixation count, fixation duration, visit count, and visit duration observed in the AOI “ALL” indicated that FDEs also examined a greater variety of signature features, and spent more time evaluating them, than did Lay participants.

SIGNATURE: Rick Boykin (Simulated)

The signature of Rick Boykin is characterized as a low-complexity mixed signature. Of the 49 FDE participants, 2 responded correctly that the signature was simulated, and 47 responded that the signature was genuine. Of the 43 Lay participants, 8 responded correctly that the signature was simulated, and 35 responded that it was genuine. This difference was statistically significant, χ^2 (1, N = 92) = 4.99, p = .026. Figure Boykin 1 presents the view of this signature.

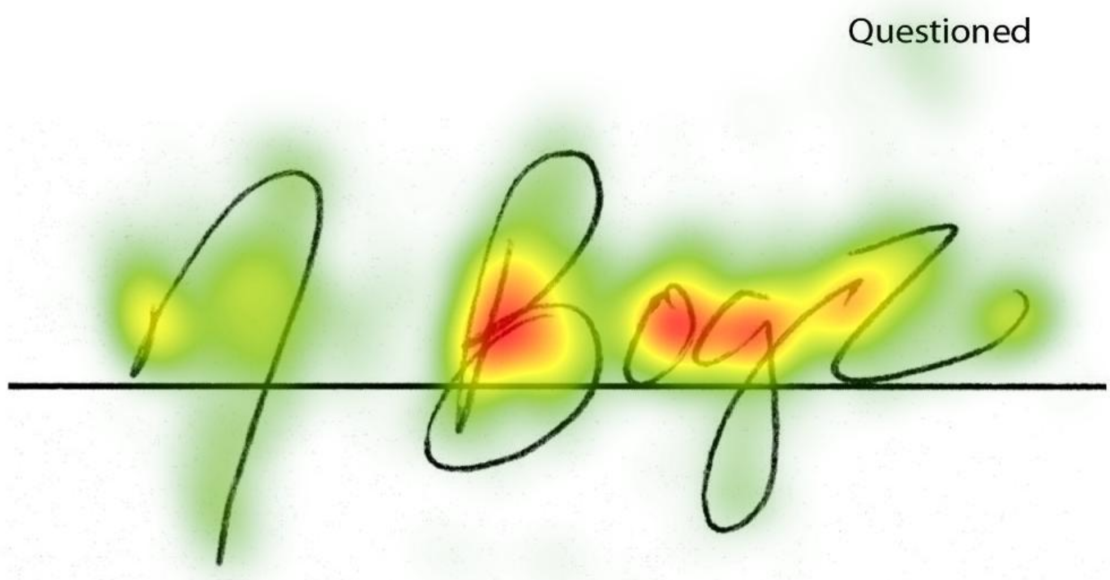
Figure Boykin1. Single Signature Stimulus for Boykin.



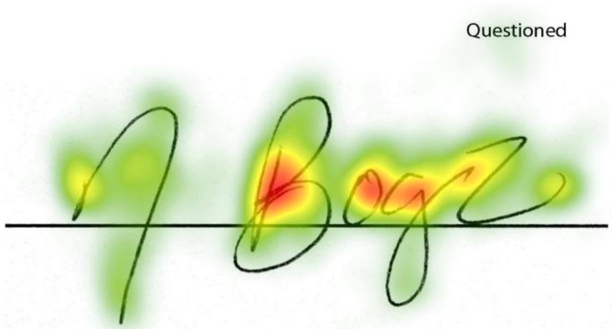
Selection of Areas of Interest (AOIs)

Figure Boykin 2 presents the heat map for this slide. Empirical examination of the heat map revealed that there were three locations indicated by red "hot spots" within the signature that elicited significant attention from the participants. AOIs were created for these specific hot spots. Larger, secondary AOIs incorporating the smaller hot spots were created to include the orange "warm spots," creating a total of six AOIs (including the AOI for the questioned signature) for this stimulus.

Figure Boykin 2. Heat maps for Boykin Signature demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs. The overall heat map is displayed below. Separate heat maps for FDEs and Lay Participants are displayed underneath.



FDE



LAY

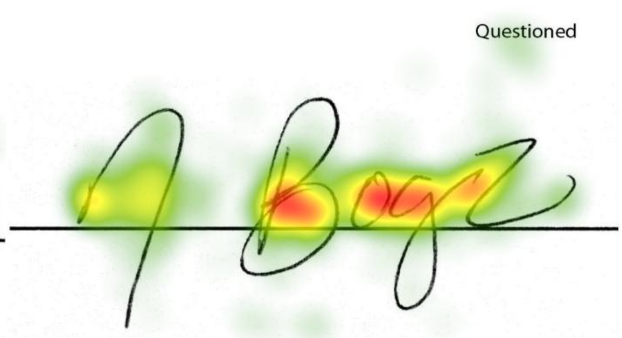
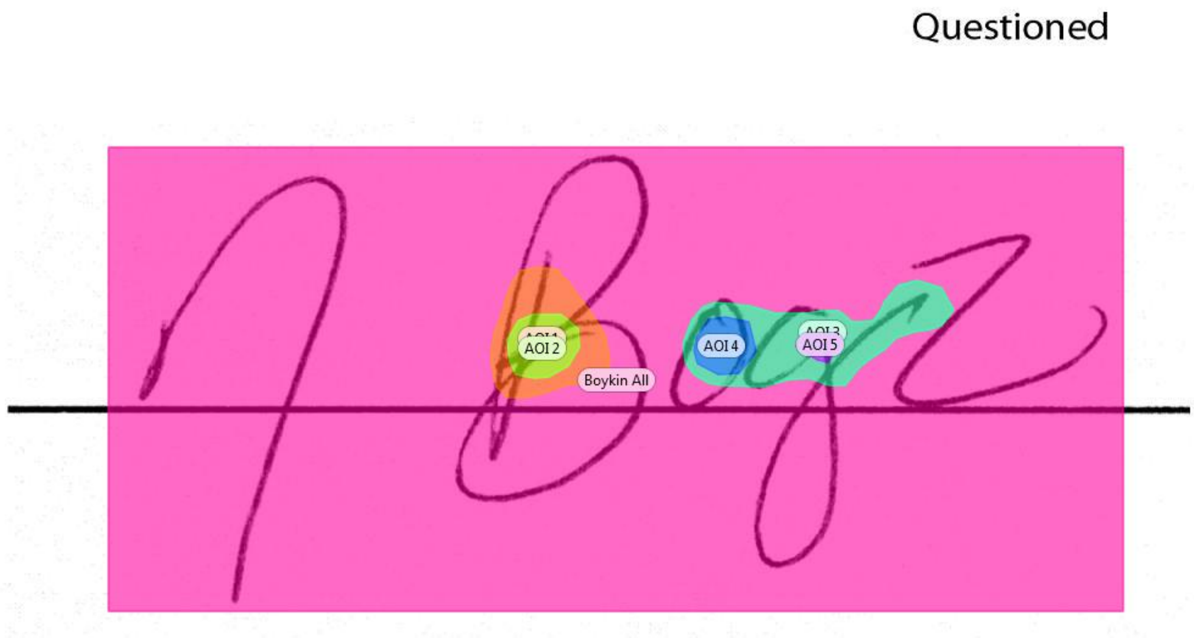


Figure Boykin 3. Areas of Interest (AOIs) for Signature Rick Boykin.



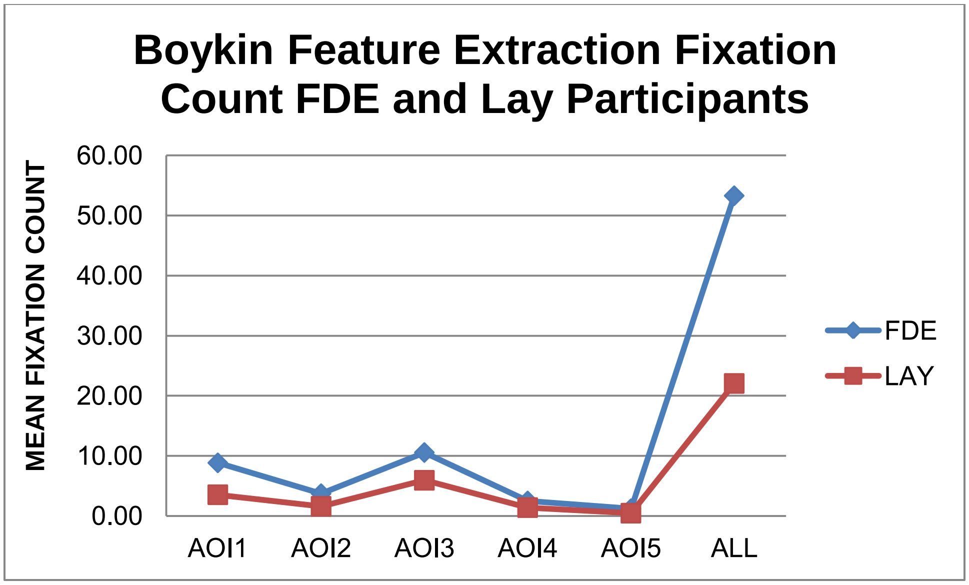
Eye-Tracking Metrics Analyses

These analyses investigate the participants' overall utilization of characteristics in the signature stimulus, and the participants' deployment of attentional resources to specific characteristics that the heat map indicated were particularly diagnostic during the examination. The examination process analyses are based on AOIs in the signature, and the overall signature analysis (the AOI overlaying the entire signature designated *Boykin All*). Figure Boykin 3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .251, F (6, 82) = 4.57, p < .001, multivariate η^2 = .251. Figure Boykin 5 presents the mean fixation counts by AOI.

Figure Boykin 5.



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for all but two AOIs. Fixations counts in all significant AOIs were greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 21.11$, $p < .001$, partial $\eta^2 = .195$; AOI 2, $F(1, 87) = 10.37$, $p = .002$, partial $\eta^2 = .107$; AOI 3, $F(1, 87) = 4.61$, $p = .035$, partial $\eta^2 = .050$; AOI ALL, $F(1, 87) = 20.18$, $p < .001$, partial $\eta^2 = .188$).

No statistically significant differences were found for AOI 4, $p = .070$, *ns*; and AOI 5, $p = .102$, *ns*. Table Boykin 2 presents the means and standard deviations for areas of interest by participant type.

Table Boykin 2

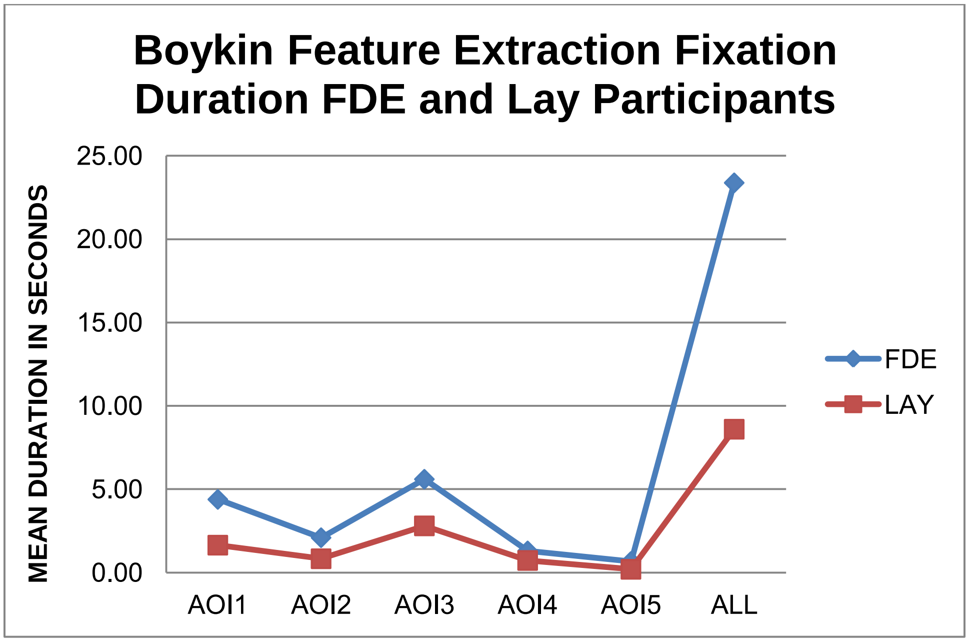
Fixation Counts for FDE and Lay Participants

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	8.83	6.73	3.70	3.96	10.55	13.37
Lay	3.52	3.45	1.60	1.59	5.93	4.22
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.49	3.78	1.19	2.81	53.30	43.46
Lay	1.38	1.41	0.45	0.74	22.05	12.59

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .659, $F(6, 82) = 26.36$, $p < .001$, multivariate $\eta^2 = .659$. Figure Boykin 4 presents the mean fixation duration by AOI.

Figure Boykin 4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for all but one AOI. Fixations duration counts in all significant AOIs were greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 21.57$, $p < .001$, partial $\eta^2 = .199$; AOI 2, $F(1, 87) = 10.58$, $p = .002$, partial $\eta^2 = .108$; AOI 3, $F(1, 87) = 10.17$, $p = .002$, partial $\eta^2 = .105$; AOI 5, $F(1, 87 = 5.84$, $p = .018$, partial $\eta^2 = .063$; AOI ALL, $F(1, 87) = 25.43$, $p < .001$, partial $\eta^2 = .226$).

No significant difference was found for AOI 4, $p = .071$, *ns*. Table Boykin 1 presents the means and standard deviations for areas of interest by participant type.

Table Boykin 1

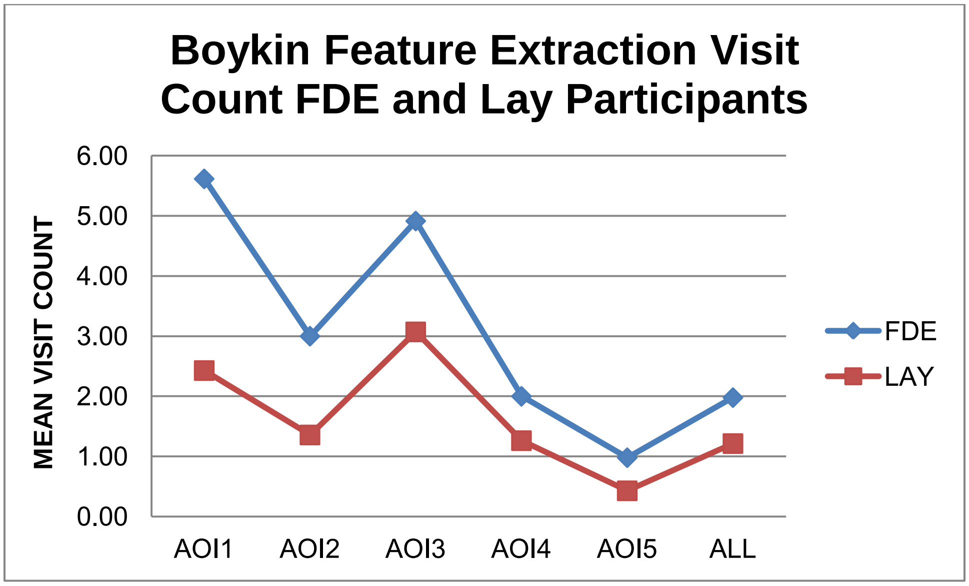
Process Analysis Fixation Durations for FDE and Lay Participants

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	4.39	3.55	2.10	2.32	5.60	5.29
Lay	1.65	1.50	0.83	1.03	2.80	2.20
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.30	1.80	0.67	1.20	23.38	18.33
Lay	0.73	1.01	0.20	0.39	8.60	5.22

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .214, F (6, 82) = 3.72, p = .003, multivariate η^2 = .214. Figure Boykin 7 presents the mean visit counts by AOI.

Figure Boykin 7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for all but two AOIs. Fixations counts in all significant AOIs were greater for FDEs than for Lay participants (AOI 1, F(1, 87) = 21.29, p < .001, partial η^2 = .197; AOI 2, F(1, 87) = 12.24, p = .001, partial η^2 = .123; AOI 3, F(1, 87) = 8.51, p = .004, partial η^2 = .089; AOI ALL, F(1, 87) = 10.06, p = .002, partial η^2 = .104).

No significant differences were found for AOI 4, p = .069, *ns*; or AOI 5, p = .073, *ns*. Table Boykin 4 presents the means and standard deviations for areas of interest by participant type.

Table Boykin 4

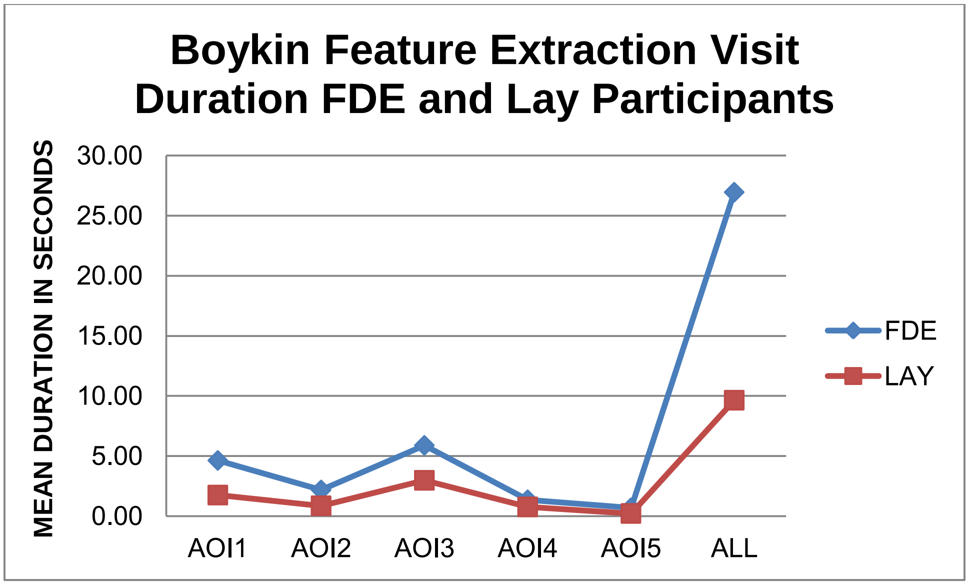
Visit Counts for FDE and Lay Participants

	AOI1		**AOI2**		**AOI3**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	5.62	4.15	3.00	2.81	4.91	3.62
Lay	2.43	1.78	1.36	1.25	3.07	2.03
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.00	2.32	0.98	1.86	1.98	1.51
Lay	1.26	1.23	0.43	0.67	1.21	0.42

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .271, F (6, 82) = 5.07, p < .001, multivariate η^2 = .271. Figure Boykin 6 presents the mean visit durations by AOI.

Figure Boykin 6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for all but one AOI. Fixations duration counts in all significant AOIs were greater for FDEs than for Lay participants (AOI 1, F(1, 87) = 22.33, p < .001, partial η^2 = .204; AOI 2, F(1, 87) = 10.78, p = .001, partial η^2 = .110; AOI 3, F(1, 87) = 9.10, p = .003, partial η^2 = .095; AOI 5, F(1, 87) = 5.60, p = .020, partial η^2 = .060; AOI ALL, F(1, 87) = 27.89, p < .001, partial η^2 = .243).

No significant difference was found for AOI 4, p = .079, *ns*. Table Boykin 3 presents the means and standard deviations for areas of interest by participant type.

Table Boykin 3

Process Analysis Visit Durations for FDE and Lay Participants

	AOI1		**AOI2**		**AOI3**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	4.62	3.65	2.16	2.39	5.88	5.85
Lay	1.74	1.59	0.85	1.06	2.97	2.33
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.35	1.91	0.67	1.22	26.94	20.57
Lay	0.75	1.08	0.21	0.41	9.63	5.56

Decision Confidence Analysis

A 2 (FDE vs. Lay participant) x 2 (correct vs. incorrect call) univariate factorial ANOVA was conducted to investigate whether significant differences in level of *call confidence* existed between FDE and Lay participants, and whether significant differences existed according to the accuracy of the call. Table Boykin 5 presents the results of the omnibus analysis.

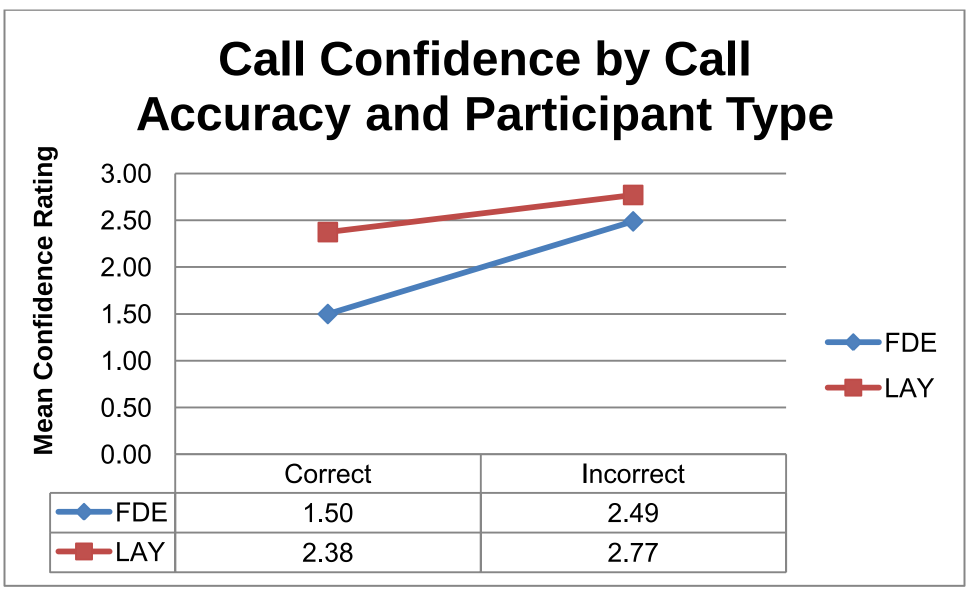
Table Boykin 5

Two-Way ANOVA Summary Table

Source	*SS*	*df*	*MS*	*F*	*p*	η^2
Between treatments						
Participant Type	1.98	1.00	1.98	2.56	.113	.028
Call Accuracy	2.85	1.00	2.85	3.67	.059	.040
Participant Type x Call Accuracy	0.52	1.00	0.52	0.67	.415	.008
Within treatments	68.29	88.00	0.78			
Total	678.00	92.00				

Main effect results revealed that call confidence was not significantly different between the two participant types, $p = .113$, *ns*. No significant difference was found in confidence for call accuracy, $p = .059$, *ns*. No significant interaction effect was found between participant type and call accuracy, $p = .415$, *ns*. Figure Boykin 8 demonstrates the mean confidence ratings by call accuracy and participant type.

Figure Boykin 8



Conclusions

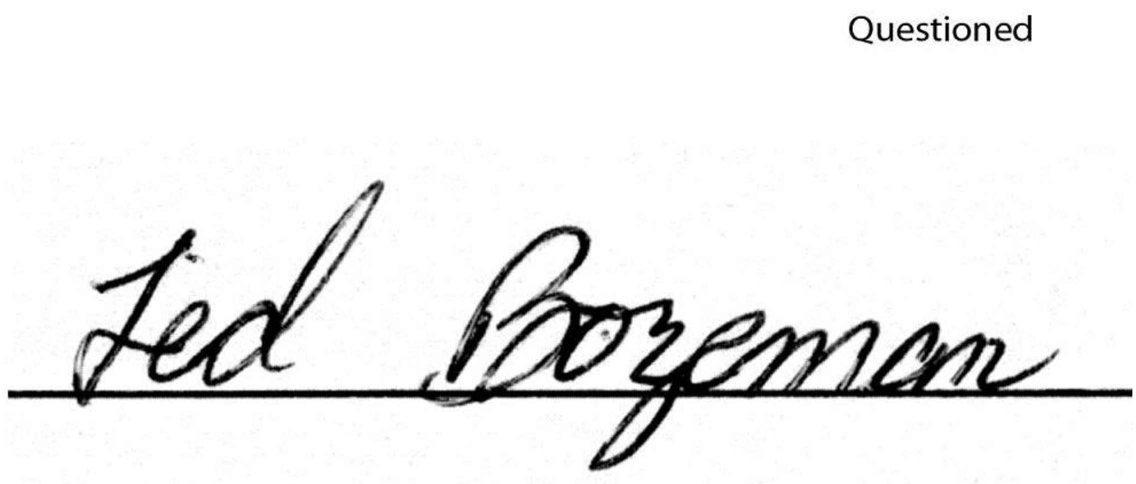
These findings indicate that FDEs were significantly more accurate than were Lay participants, and that they were less confident in the accuracy of their calls, but their confidence ratings were not significantly lower than those of the Lay participants. On average, the confidence rating for both FDE and Lay participants fell within the *somewhat confident* range, and members of both groups who made inaccurate calls were slightly more confident in their calls than were those who made correct calls.

Five areas of interest were empirically identified by examining the full sample heat map for this signature. The four eye tracking metrics revealed that overall, FDEs examined the signature significantly more extensively than did Lay participants, fixating a greater number of times on all AOIs, and fixating on those AOIs for a greater period of time. The significant differences in fixation count, fixation duration, and visit count, and visit duration observed in the AOI "ALL" indicated that FDEs also examined a greater variety of signature features, and spent more time evaluating them, than did Lay participants.

SIGNATURE: Ted Bozeman (Simulated)

The signature of Ted Bozeman is characterized as a high-complexity text based signature. Of the 49 FDE participants, 25 responded correctly that the signature was simulated, and 23 responded that the signature was genuine. Of the 43 Lay participants, 19 responded correctly that the signature was simulated, and 24 responded that it was genuine. This difference was not statistically significant, $\chi^2(1, N = 92) = 0.57$, $p = .452$. Figure Bozeman 1 presents the view of this signature.

Figure Bozeman1. Single Signature Stimulus for Bozeman.



Selection of Areas of Interest (AOIs)

Figure Bozeman 2 presents the heat map for this slide. Empirical examination of the heat map revealed that there were two locations indicated by red “hot spots” within the signature that elicited significant attention from the participants. AOIs were created for these specific hot spots. Larger, secondary AOIs incorporating the smaller hot spots were created to include the orange “warm spots,” creating a total of six AOIs (including the AOI for the questioned signature) for this stimulus.

Figure Bozeman 2. Heat maps for Bozeman Signature demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs. The overall heat map is displayed below. Separate heat maps for FDEs and Lay Participants are displayed underneath.

FDE

LAY

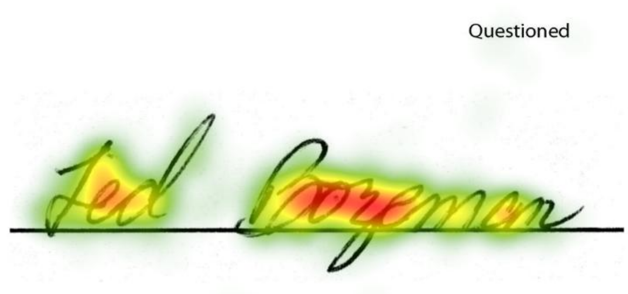
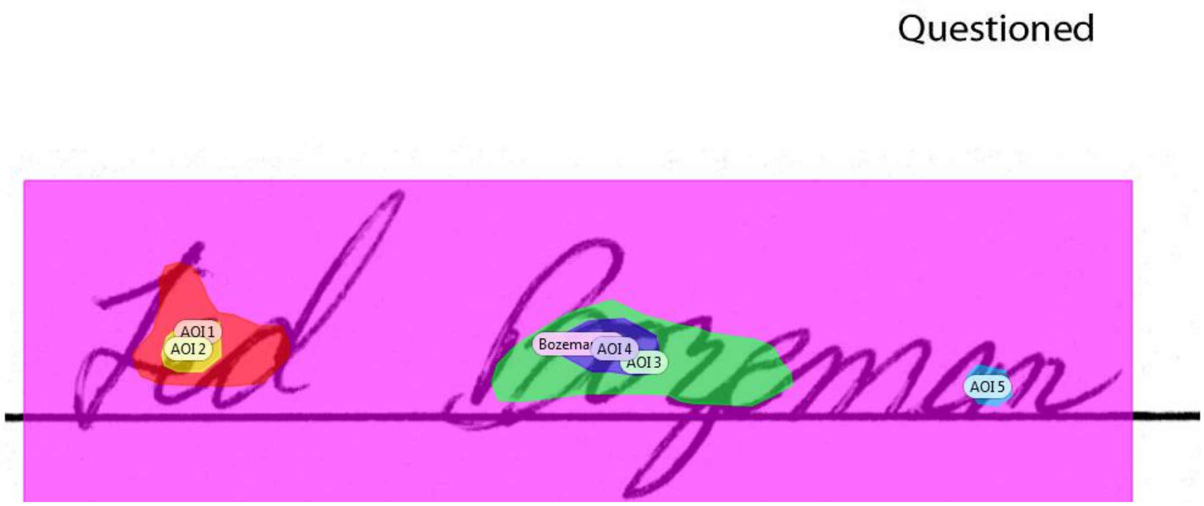


Figure Bozeman 3. Areas of Interest (AOIs) for Signature Ted Bozeman.



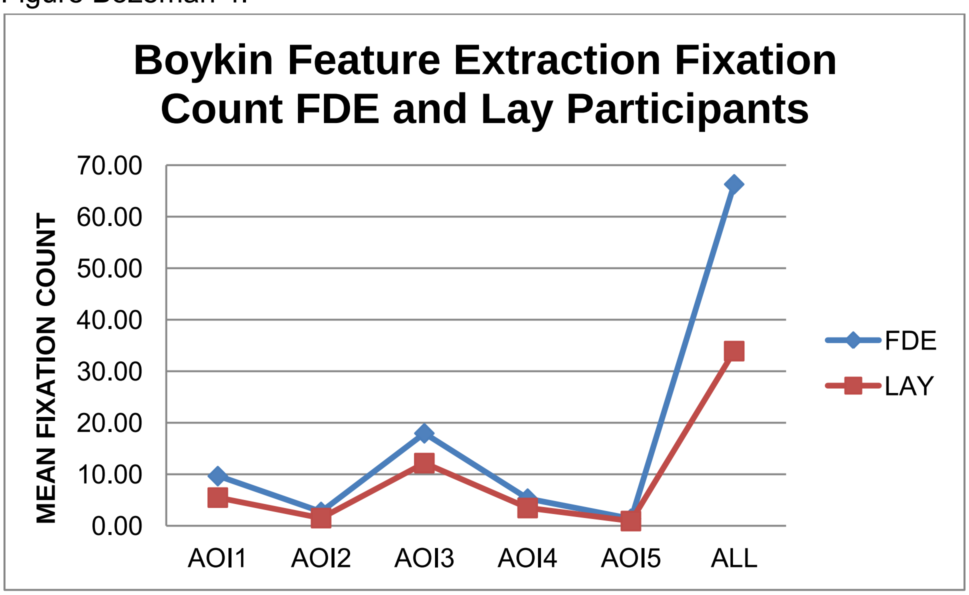
Eye-Tracking Metrics Analyses

These analyses investigate the participants' overall utilization of characteristics in the signature stimulus, and the participants' deployment of attentional resources to specific characteristics that the heat map indicated were particularly diagnostic during the examination. The examination process analyses are based on AOIs in the signature, and the overall signature analysis (the AOI overlaying the entire signature designated *Bozeman All*). Figure Boykin 3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .268, F (6, 79) = 4.81, p < .001, multivariate η^2 = .269. Figure Bozeman 4 presents the mean fixation counts by AOI.

Figure Bozeman 4.



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for two AOIs. Fixations counts in both significant AOIs were greater for FDEs than for lay participants (AOI 1, $F(1, 84) = 5.32$, $p = .024$, partial $\eta^2 = .060$; and AOI ALL, $F(1, 84) = 9.21$, $p = .003$, partial $\eta^2 = .099$).

Although fixation counts were greater among FDEs than among Lay participants in all AOIs, no statistically significant differences were found for AOI 2, $p = .118$, *ns*; AOI 3, $p = .199$, *ns*; AOI 4, $p = .229$, *ns*; and AOI 5, $p = .236$, *ns*. Table Bozeman 1 presents the means and standard deviations for areas of interest by participant type.

Table Bozeman 1

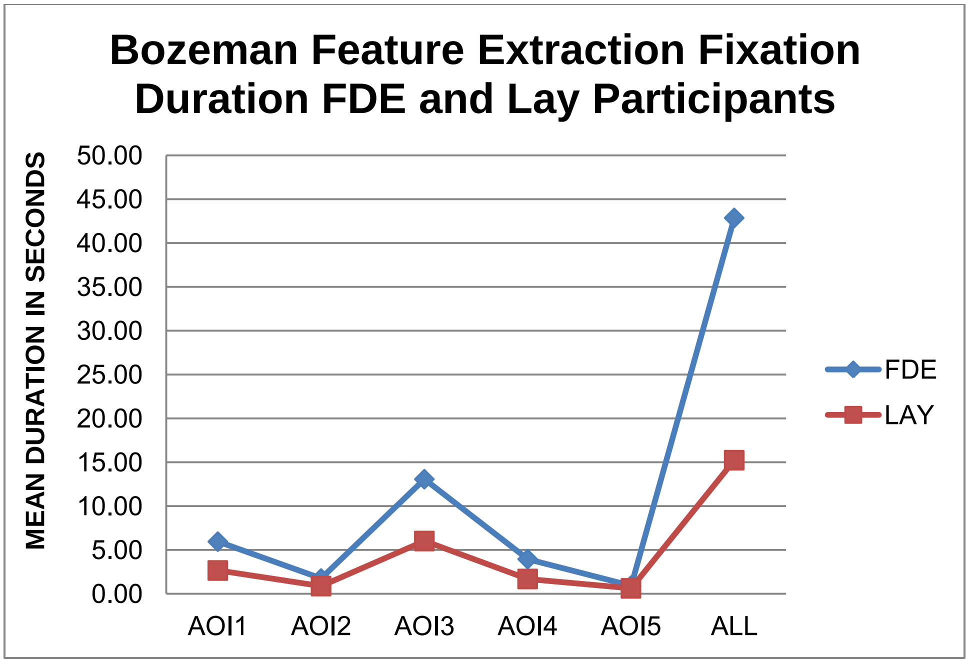
Fixation Counts for FDE and Lay Participants

	AOI1		**AOI2**		**AOI3**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	9.65	9.76	2.70	4.38	17.96	23.73
Lay	5.48	6.42	1.50	2.05	12.18	16.46
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	5.28	7.49	1.37	1.92	66.33	59.66
Lay	3.45	6.38	0.93	1.46	33.93	33.86

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .261, $F(6, 79) = 4.65$, $p < .001$, multivariate $\eta^2 = .261$. Figure Bozeman 5 presents the mean fixation duration by AOI.

Figure Bozeman 5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for all but one AOI. Fixations duration counts in all significant AOIs were greater for FDEs than for Lay participants (AOI 1, $F(1, 84) = 17.46$, $p < .001$, partial $\eta^2 = .172$; AOI 2, $F(1, 84) = 5.50$, $p = .021$, partial $\eta^2 = .061$; AOI 3, $F(1, 84) = 7.22$, $p = .009$, partial $\eta^2 = .079$; AOI 4, $F(1, 84) = 4.89$, $p = .030$, partial $\eta^2 = .055$; AOI ALL, $F(1, 84) = 19.95$, $p < .001$, partial $\eta^2 = .192$).

Although fixation durations were greater among FDEs than among Lay participants in all AOIs, no statistically significant difference was found for AOI 5, $p = .295$, *ns*. Table Bozeman 2 presents the means and standard deviations for areas of interest by participant type.

Table Bozeman 2

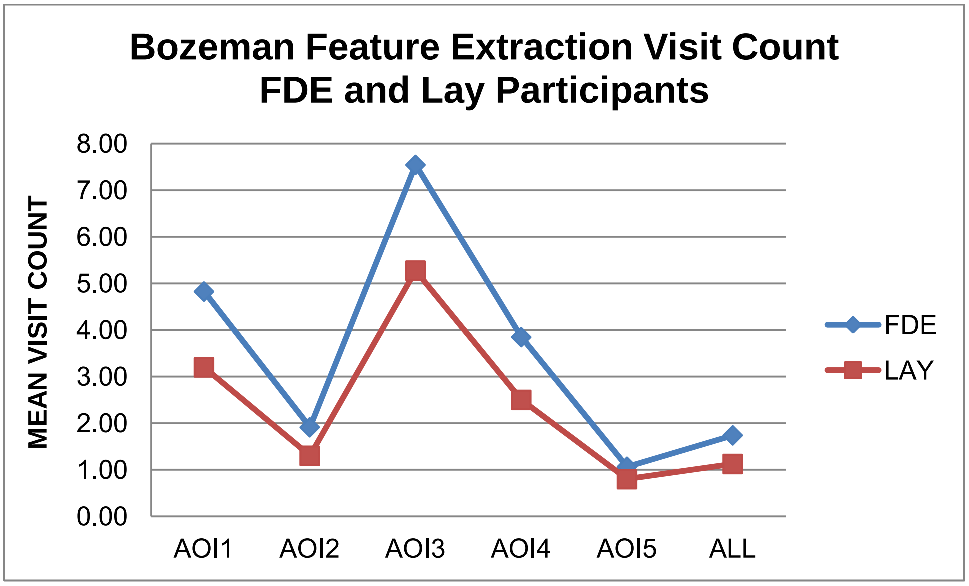
Process Analysis Fixation Durations for FDE and Lay Participants

	AOI1		**AOI2**		**AOI3**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	5.96	4.50	1.76	1.93	13.08	15.26
Lay	2.67	2.29	0.89	1.39	6.03	6.96
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	3.96	6.03	0.93	1.49	42.87	37.19
Lay	1.70	2.53	0.63	1.13	15.25	12.95

Total Visit Count

MANOVA results revealed no significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .786, F (6, 79) = 48.25, p < .001, multivariate η^2 = .786. Figure Bozeman 6 presents the mean visit counts by AOI.

Figure Bozeman 6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for two AOIs. Visit counts in all significant AOIs were greater for FDEs than for lay participants (AOI 1, F(1, 84) = 8.21, p = .005, partial η^2 = .089; AOI ALL, F(1, 84) = 5.09, p = .027, partial η^2 = .057).

Although visit counts were greater among FDEs than among Lay participants in all AOIs, no statistically significant differences were found for AOI 2, p = .122, *ns*; AOI 3, p = .052, *ns*; AOI 4, p = .088, *ns*; or AOI 5, p = .329, *ns*. Table Bozeman 3 presents the means and standard deviations for areas of interest by participant type.

Table Bozeman 3

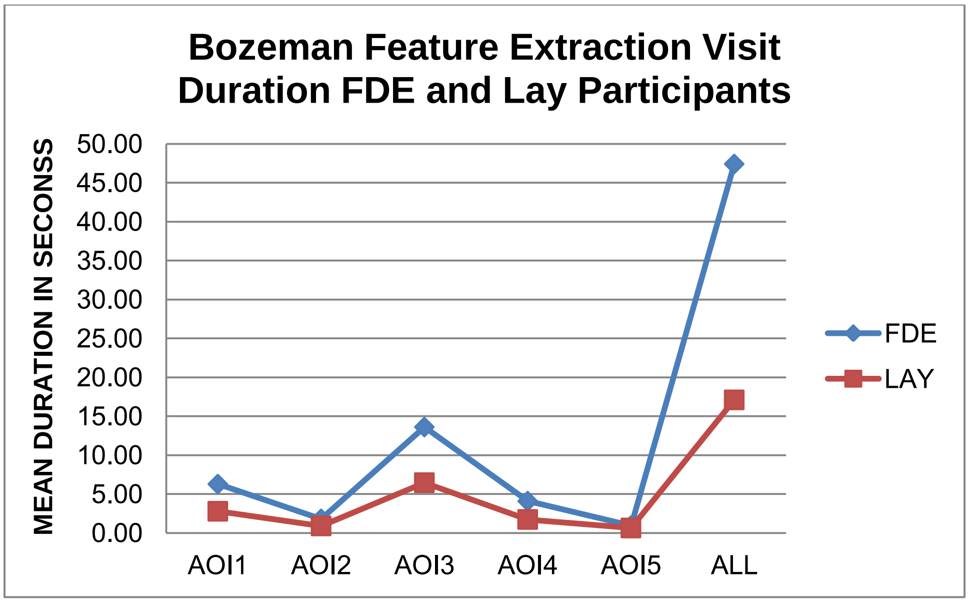
Visit Counts for FDE and Lay Participants

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	4.83	2.98	1.91	1.99	7.54	6.06
Lay	3.20	2.15	1.30	1.59	5.28	4.30
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	3.85	3.87	1.07	1.31	1.74	1.67
Lay	2.50	3.30	0.80	1.18	1.13	0.46

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .666, F (6, 79) = 26.28, p < .001, multivariate η^2 = .666. Figure Bozeman 7 presents the mean visit durations by AOI.

Figure Bozeman 7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for all but one AOI. Visit durations in all significant AOIs were greater for FDEs than for lay participants (AOI 1, F(1, 84) = 16.53, p < .001, partial η^2 = .164; AOI 2, F(1, 84) = 5.43, p = .022, partial η^2 = .061; AOI 3, F(1, 84) = 6.34, p = .014, partial η^2 = .070; AOI 4, F(1, 84) = 4.69, p = .034, partial η^2 = .053; AOI ALL, F(1, 84) = 19.79, p < .001, partial η^2 = .191).

Although visit durations were greater among FDEs than among Lay participants in all AOIs, no statistically significant difference was found for AOI 5, p = .298, *ns*. Table Bozeman 4 presents the means and standard deviations for areas of interest by participant type.

Table Bozeman 4

Process Analysis Visit Durations for FDE and Lay Participants

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	6.28	4.87	1.82	2.08	13.61	16.41
Lay	2.79	2.57	0.91	1.41	6.46	7.81
	AOI4		**AOI5**		**ALL**	

Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	4.09	6.44	0.94	1.51	47.42	40.89
Lay	1.74	2.62	0.64	1.15	17.11	14.53

Decision Confidence Analysis

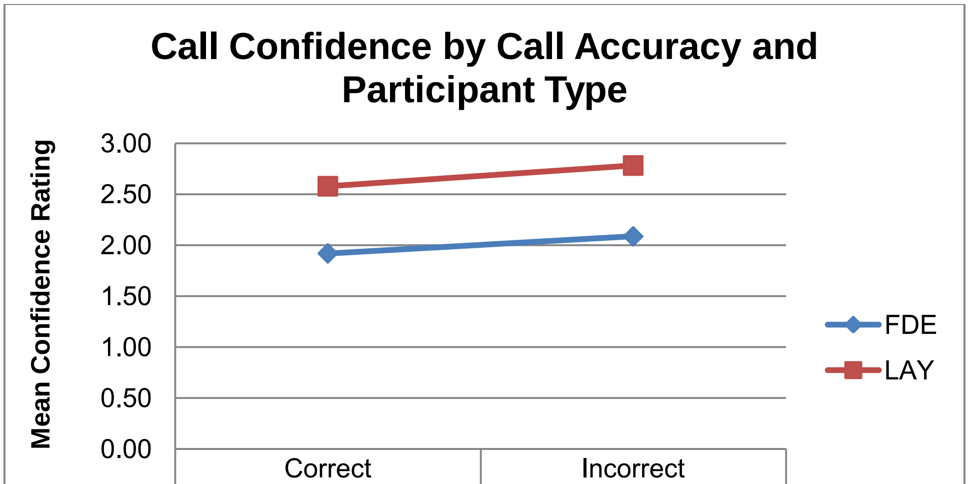
A 2 (FDE vs. Lay participant) x 2 (correct vs. incorrect call) univariate factorial ANOVA was conducted to investigate whether significant differences in level of *call confidence* existed between FDE and Lay participants, and whether significant differences existed according to the accuracy of the call. Table Bozeman 5 presents the results of the omnibus analysis.

Table Bozeman 5
Two-Way ANOVA Summary Table

Source	*SS*	*df*	*MS*	*F*	*p*	η^2
Between treatments						
Participant Type	10.22	1.00	10.22	16.21	.000	.159
Call Accuracy	0.76	1.00	0.76	1.21	.274	.014
Participant Type x Call Accuracy	0.01	1.00	0.01	0.01	.913	.000
Within treatments	54.21	86.00	0.63			
Total	551.00	90.00				

Main effect results revealed that call confidence was greater among Lay participants than among FDEs, $F(1, 86) = 16.21$, $p < .001$, partial $\eta^2 = .159$. No significant difference was found in confidence for call accuracy, $p = .274$, *ns*. No significant interaction effect was found between participant type and call accuracy, $p = .913$, *ns*. Figure Bozeman 8 demonstrates the mean confidence ratings by call accuracy and participant type.

Figure Bozeman 8



	Correct	Incorrect
FDE	1.92	2.09
LAY	2.58	2.78

Conclusions

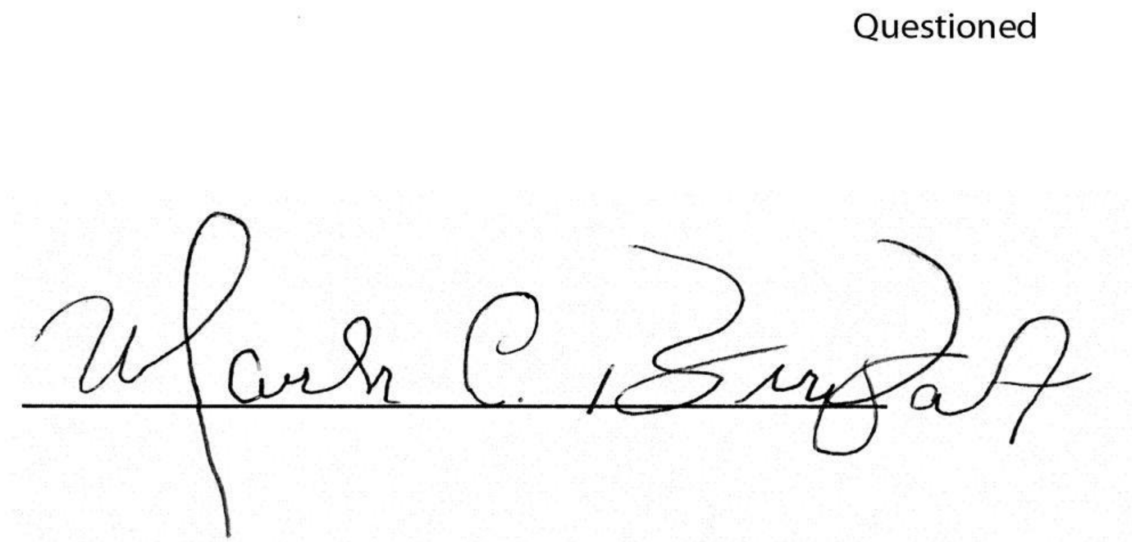
These findings indicate that FDEs were more accurate than were Lay participants, but that this difference was not statistically significant. FDEs were significantly less confident in the accuracy of their calls, on average rating their confidence level for both correct in incorrect calls just at *somewhat confident*, compared to Lay participants, who on average also rated their call confidence at the *somewhat confident* level.

Five areas of interest were empirically identified by examining the full sample heat map for this signature. The four eye tracking metrics revealed that overall, FDEs examined the signature significantly more extensively than did Lay participants, fixating a greater number of times on all AOIs, and fixating on those AOIs for a greater period of time. The significant differences in fixation count, fixation duration, visit count, and visit duration observed in the AOI “ALL” indicated that FDEs also examined a greater variety of signature features, and spent more time evaluating them, than did Lay participants.

<u>SIGNATURE: Mark Bryant (Simulated)</u>

The signature of Mark Bryant is characterized as a high-complexity text based signature. Of the 49 FDE participants, 48 responded correctly that the signature was simulated, and 1 responded that the signature was genuine. Of the 43 Lay participants, 32 responded correctly that the signature was simulated, and 11 responded that it was genuine. This difference was statistically significant, χ^2 (1, N = 92) = 11.19, *p* = .001. Figure Bryant 1 presents the view of this signature.

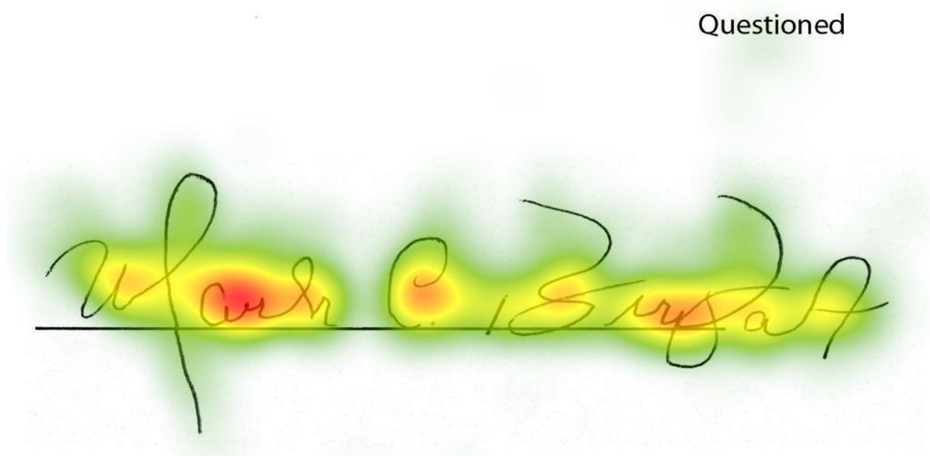
Figure Bryant1. Single Signature Stimulus for Bryant.



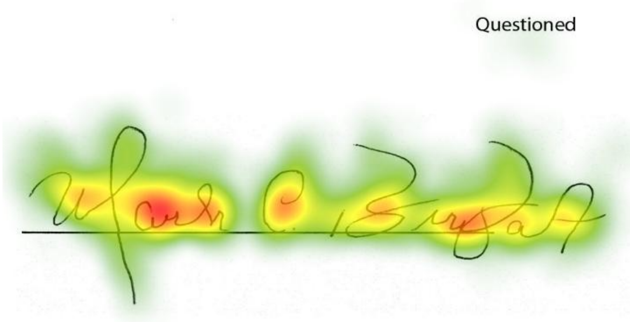
Selection of Areas of Interest (AOIs)

Figure Bryant 2 presents the heat map for this slide. Empirical examination of the heat map revealed that there were two locations indicated by red "hot spots" within the signature that elicited significant attention from the participants. AOIs were created for these specific hot spots. Larger, secondary AOIs incorporating the smaller hot spots were created to include the orange "warm spots," creating a total of seven AOIs (including the AOI for the entire questioned signature, labeled *Bryant All*) for this stimulus.

Figure Bryant 2. Heat maps for Bryant Signature demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs. The overall heat map is displayed below. Separate heat maps for FDEs and Lay Participants are displayed underneath.



FDE LAY



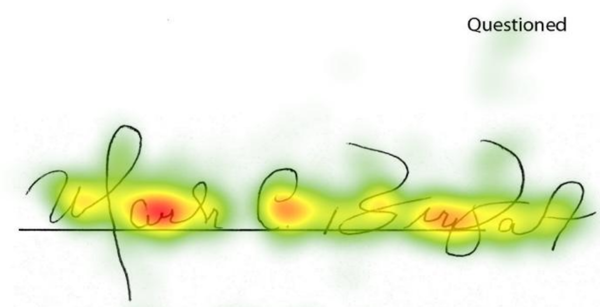
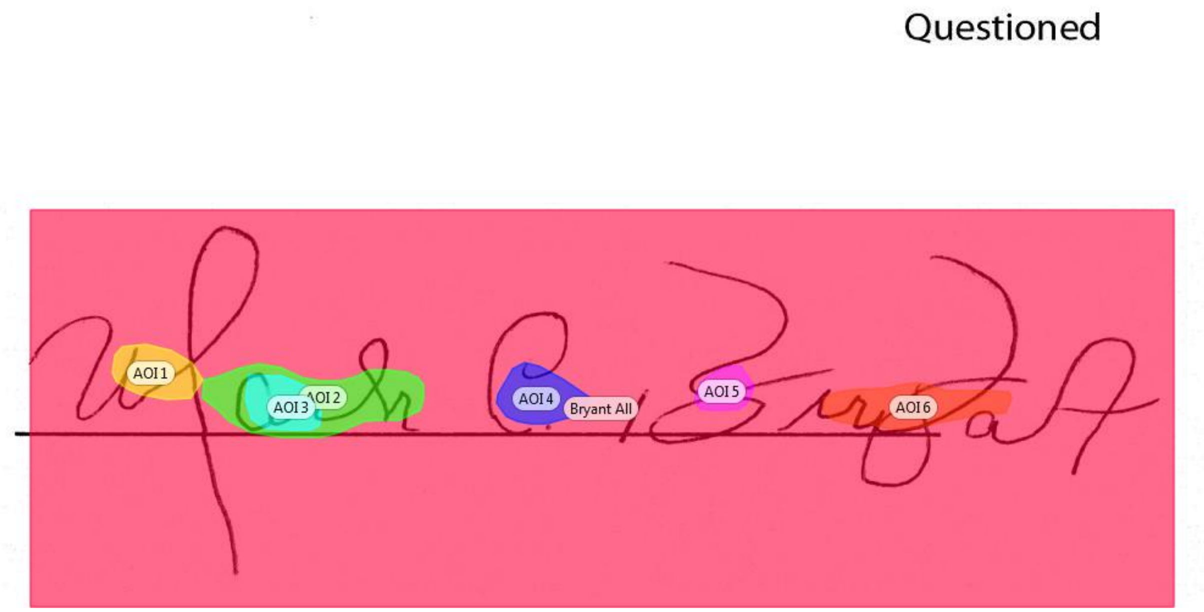


Figure Bryant 3. Areas of Interest (AOIs) for Signature Mark Bryant.



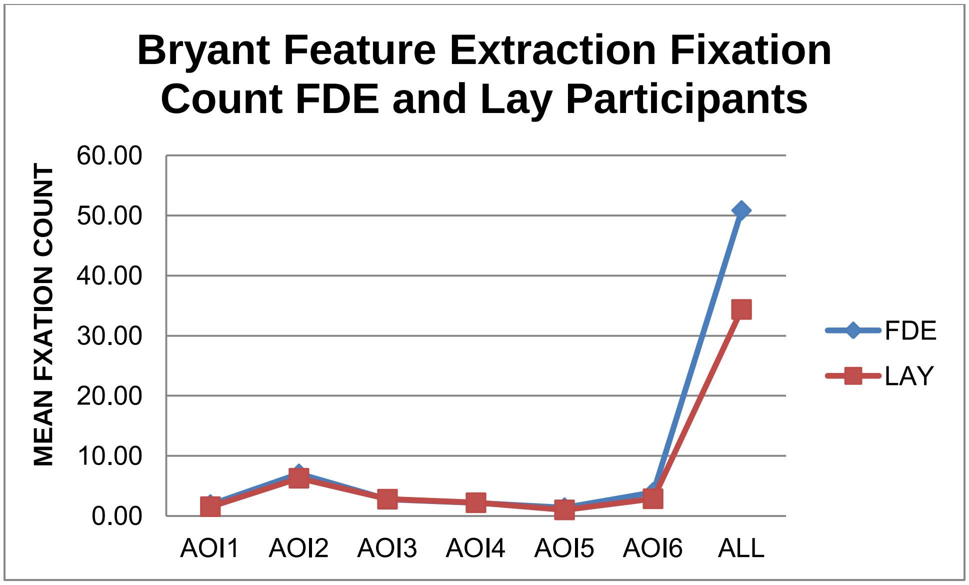
Eye-Tracking Metrics Analyses

These analyses investigate the participants' overall utilization of characteristics in the signature stimulus, and the participants' deployment of attentional resources to specific characteristics that the heat map indicated were particularly diagnostic during the examination. The examination process analyses are based on AOIs in the signature, and the overall signature analysis (the AOI overlaying the entire signature designated *Bryant all*). Figure Bryant 3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .606, F (7, 80) = 17.54, p < .001, multivariate η^2 = .606. Figure Bryant 4 presents the mean fixation counts by AOI.

Figure Bryant 4.



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were not significant for any of the AOIs (AOI 1, p = .392, *ns*; AOI 2, p = .719, *ns*; AOI 3, p = .989, *ns*; AOI 4, p = .964, *ns*; AOI 5, p = .391, *ns;* AOI 6, p = .318, *ns*; and AOI ALL, p = .063, *ns*). Table Bryant 1 presents the means and standard deviations for areas of interest by participant type.

Table Bryant 1

Fixation Counts for FDE and Lay Participants

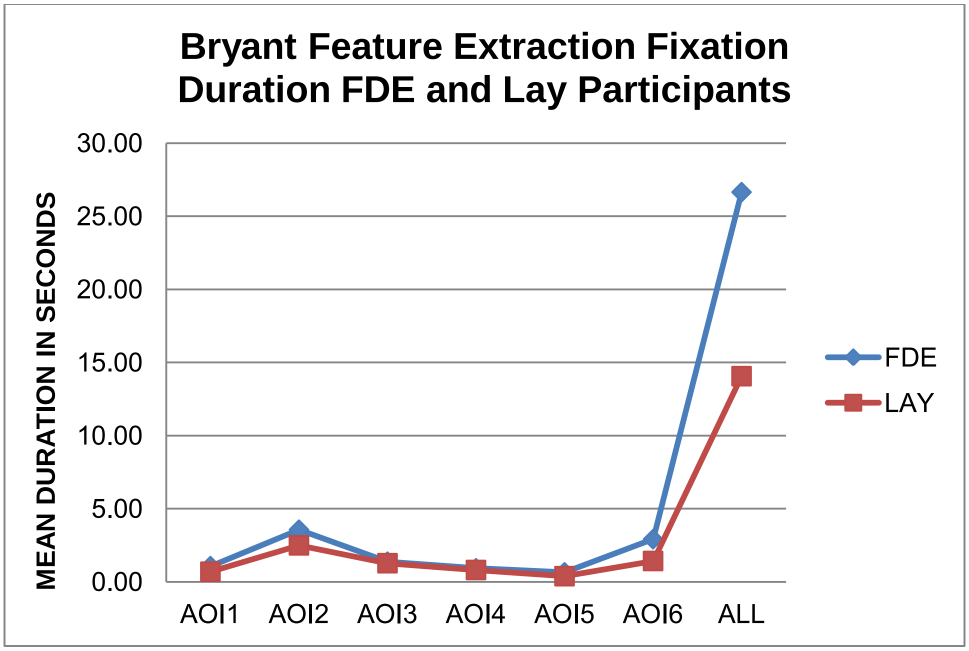
	AOI1		AOI2		AOI3		AOI4	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.89	2.09	7.00	10.21	2.77	4.87	2.17	2.50
Lay	1.54	1.76	6.27	8.56	2.78	4.63	2.20	2.65

	AOI5		AOI6		ALL	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.38	1.82	3.91	4.81	50.85	39.36
Lay	1.00	2.33	2.85	5.09	34.37	42.82

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .590, F (7, 80) = 16.42, p < .001, multivariate η^2 = .590. Figure Bryant 5 presents the mean fixation duration by AOI.

Figure Bryant 5



Follow-up ANOVAS conducted on each dependent variable revealed that fixation durations in all significant AOIs were greater for FDEs than for Lay participants, but these differences were statistically significant only for AOI ALL, $F(1, 86) = 7.96$, $p = .006$, partial $\eta^2 = .085$.

No significant differences were found for AOI 1, $p = .106$, *ns*; AOI 2, $p = .199$, *ns*; AOI 3, $p = .817$, *ns*; AOI 4, $p = .591$, *ns;* AOI 5, $p = .180$, *ns;* or AOI 6, $p = .068$, *ns*. Table Bryant 2 presents the means and standard deviations for areas of interest by participant type.

Table Bryant 2

Process Analysis Fixation Durations for FDE and Lay Participants

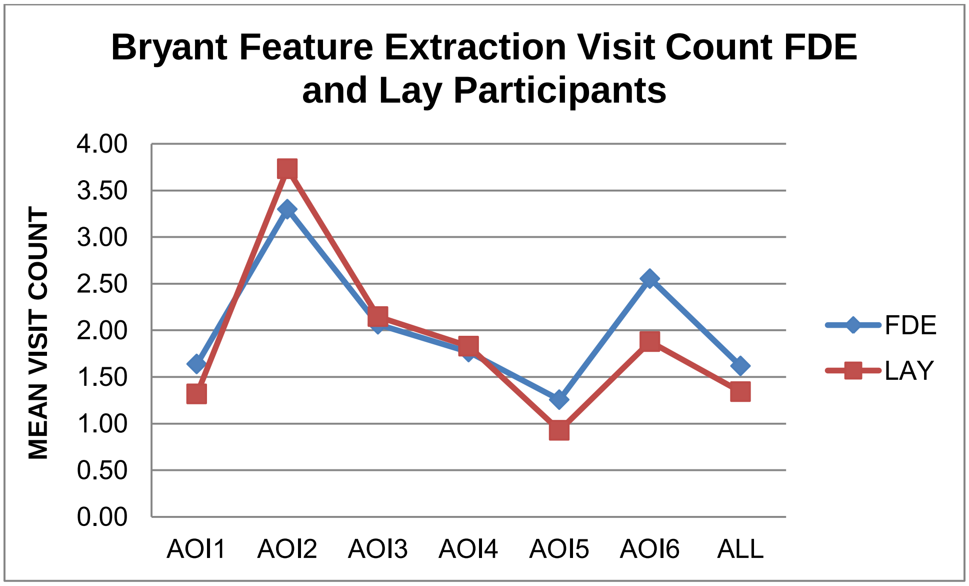
	AOI1		AOI2		AOI3		AOI4	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.08	1.21	3.57	4.69	1.38	2.51	0.93	0.97
Lay	0.70	0.95	2.50	2.63	1.28	1.57	0.81	1.04

	AOI5		AOI6		ALL	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	.66	.82	2.92	4.39	26.65	24.22
Lay	.39	1.03	1.43	2.89	14.07	16.18

Total Visit Count

MANOVA results revealed no significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .805, $F(7, 80) = 47.05$, $p = .805$, multivariate $\eta^2 = .805$. Figure Bryant 6 presents the mean visit counts by AOI.

Figure Bryant 6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were not significant for any AOIs (AOI 1, p = .345, *ns*; AOI 2, p = .585, *ns*; AOI 3, p = .890, *ns*; AOI 4, p = .879, *ns*; AOI 5, p = .395, *ns*, AOI 6, p = .277, *ns;* AOI ALL, p = .134, *ns*). Table Bryant 3 presents the means and standard deviations for areas of interest by participant type.

Table Bryant 3
Visit Counts for FDE and Lay Participants

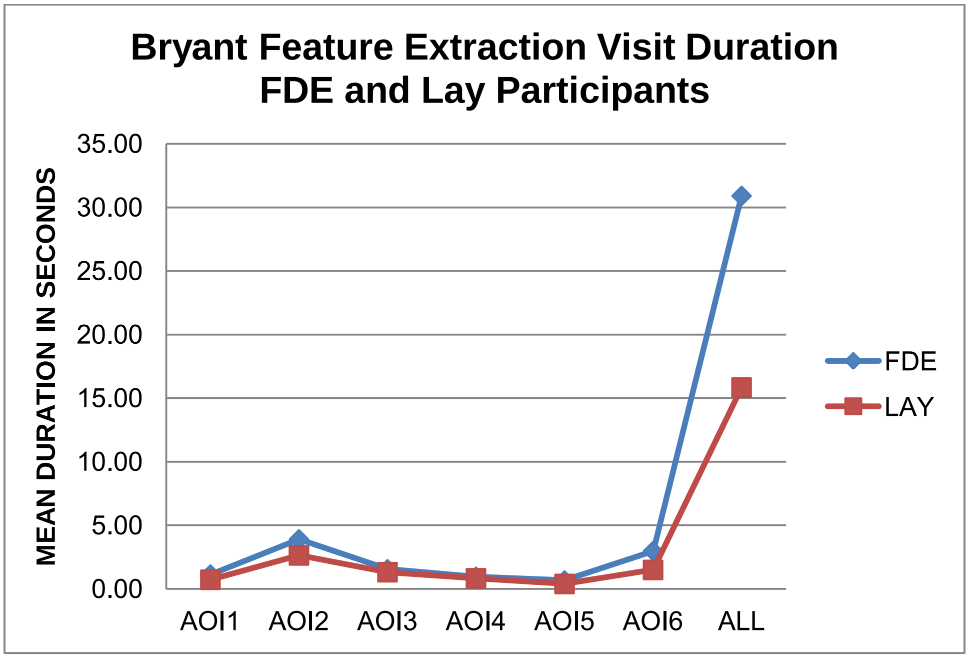
	AOI1		**AOI2**		**AOI3**		**AOI4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.64	1.69	3.30	3.37	2.06	2.98	1.77	1.84
Lay	1.32	1.46	3.73	4.05	2.15	2.56	1.83	2.05

	AOI5		**AOI6**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.26	1.47	2.55	2.66	1.62	1.01
Lay	0.93	2.11	1.88	3.12	1.34	0.62

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .589, F (7, 80) = 2.281, p < .001, multivariate η^2 = .589. Figure Bryant 7 presents the mean visit durations by AOI.

Figure Bryant 7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences statistically significant in only one AOI. Visit duration was significantly greater among FDEs than among Lay participants in AOI ALL, F (1, 86) = 9.38, p = .003, partial η^2 = .098.

Visit durations were greater among FDEs than among Lay participants in all the remaining AOIs, but these differences were not significantly different, AOI 1, p = .106, *ns*; AOI 2, p = .171, *ns*; AOI 3, p = .640, *ns*; AOI 4, p = .575, *ns*; AOI 5, p = .171, *ns;* AOI 6, p = .075, *ns*. Table Bryant 4 presents the means and standard deviations for areas of interest by participant type.

Table Bryant 4

Process Analysis Visit Durations for FDE and Lay Participants

	AOI1		AOI2		AOI3		AOI4	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.13	1.32	3.90	5.18	1.54	2.73	0.96	1.01
Lay	0.72	0.98	2.64	2.93	1.31	1.66	0.83	1.05

	AOI5		AOI6		ALL	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	.67	.84	2.97	4.47	30.91	26.21
Lay	.39	1.03	1.49	2.98	15.84	18.70

Decision Confidence Analysis

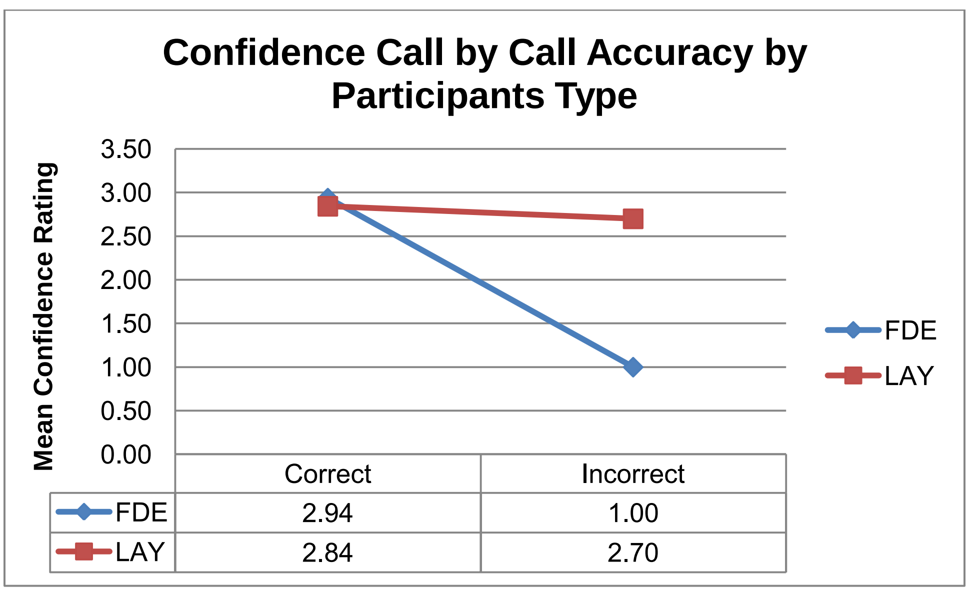
A 2 (FDE vs. Lay participant) x 2 (correct vs. incorrect call) univariate factorial ANOVA was conducted to investigate whether significant differences in level of *call confidence* existed between FDE and Lay participants, and whether significant differences existed according to the accuracy of the call. Table Bryant 5 presents the results of the omnibus analysis.

Table Bryant 5
Two-Way ANOVA Summary Table

Source	*SS*	*df*	*MS*	*F*	*p*	η^2
Between treatments						
Participant Type	2.24	1.00	2.24	3.53	.063	.039
Call Accuracy	3.76	1.00	3.76	5.93	.017	.064
Participant Type x Call Accuracy	2.79	1.00	2.79	4.41	.039	.048
Within treatments	55.13	87.00	0.63			
Total	802.00	91.00				

There was a main effect difference found in confidence for call accuracy, $F(1, 88) = 5.93$, $p = .017$, partial $\eta^2 = .064$, such that mean call confidence was lower when the call was incorrect. Main effect results revealed that call confidence was not significantly different between the two participant types, $p = .063$, *ns*. A significant interaction effect was found for participant type and call accuracy, $F(1, 87) = 4.41$, $p = .039$, partial $\eta^2 = .048$, indicating that FDEs who made incorrect calls were significantly less confident than were Lay participants who made incorrect calls. Figure Bryant 8 demonstrates the mean confidence ratings by call accuracy and participant type.

Figure Bryant 8



Conclusions

These findings indicate that although FDEs were significantly more accurate than were Lay participants, those FDEs who made incorrect calls were also significantly less confident in the accuracy of their calls than were Lay participants who made incorrect calls. Both groups on average rated their confidence level for correct calls near the *moderately confident* level. FDEs who made incorrect calls rated their call confidence at the *not at all confident* level, while Lay participant confidence remained near the *moderately confident* level.

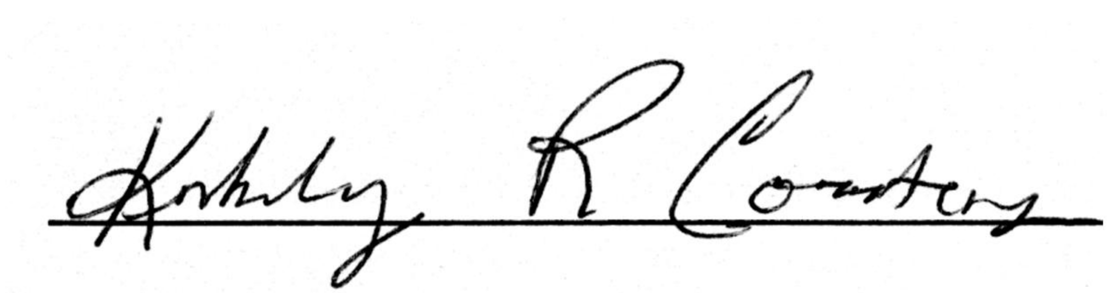
Six areas of interest were empirically identified by examining the full sample heat map for this signature. The four eye tracking metrics revealed that FDEs and Lay participants displayed similar patterns of analysis according to the mean number of fixations on the AOIs and the mean number of visits to the AOIs. The statistically significant differences observed in the fixation durations and visit durations for the AOI "ALL" indicated that FDEs and spent more time evaluating the overall signature than did Lay participants.

SIGNATURE: Kimberly Contrares (Simulated)

The signature of Kimberly Contrares is characterized as a high-complexity mixed signature. Of the 49 FDE participants, 26 responded correctly that the signature was simulated, and 22 responded that the signature was genuine. Of the 43 Lay participants, 13 responded correctly that the signature was simulated, and 30 responded that it was genuine. This difference was statistically significant, χ^2 (1, N = 92) = 5.311, p = .021. Figure Contrares 1 presents the view of this signature.

Figure Contrares 1. Single Signature Stimulus for Contrares.

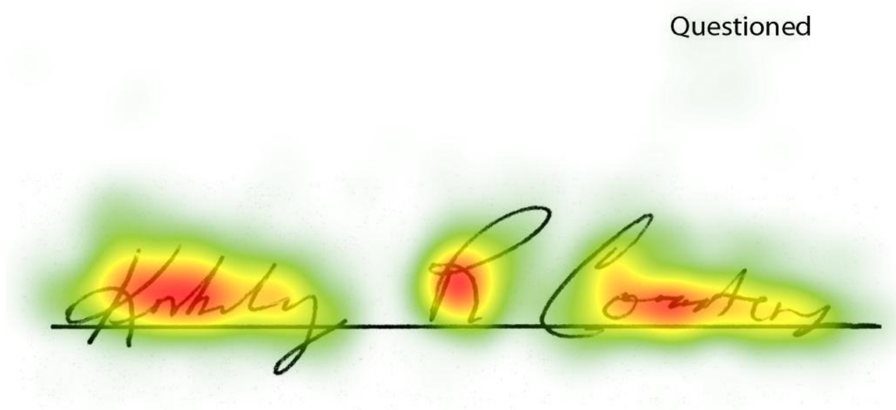
Questioned



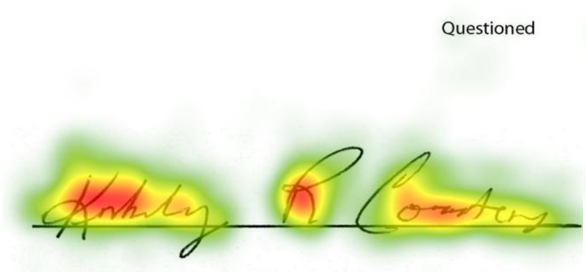
Selection of Areas of Interest (AOIs)

Figure Contrares 2 presents the heat map for this slide. Empirical examination of the heat map revealed that there were three locations indicated by red “hot spots” within the signature that elicited significant attention from the participants. AOIs were created for these specific hot spots. Larger, secondary AOIs incorporating the smaller hot spots were created to include the orange “warm spots,” creating a total of seven AOIs (including the AOI for the questioned signature, labeled *Contrares All*) for this stimulus.

Figure Contrares 2. Heat maps for Contrares Signature demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs. The overall heat map is displayed below. Separate heat maps for FDEs and Lay Participants are displayed underneath.

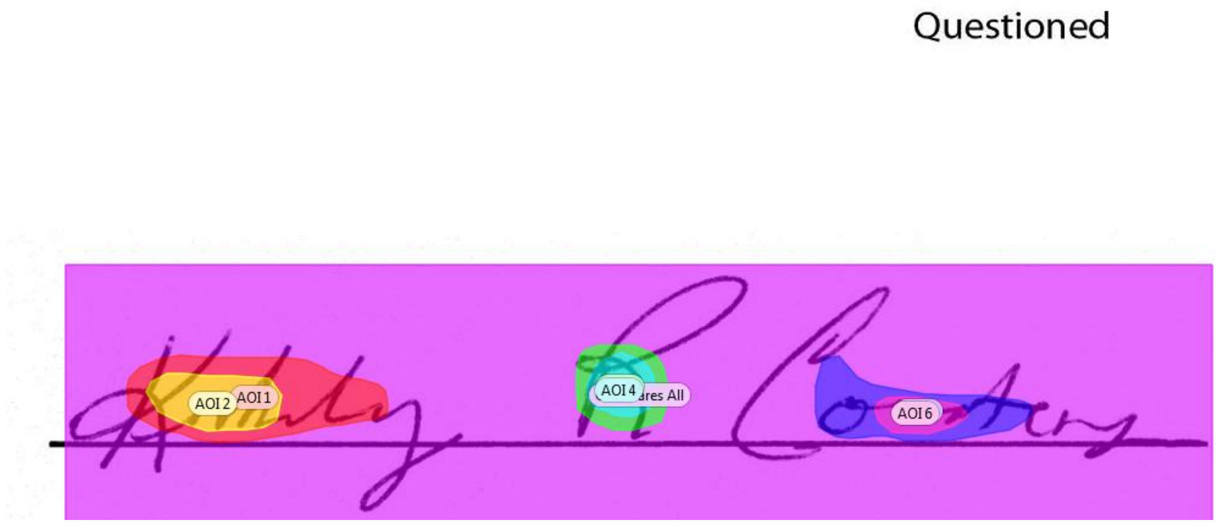


FDE



LAY

Figure Contrares 3. Areas of Interest (AOIs) for Signature Kimberly Contrares.



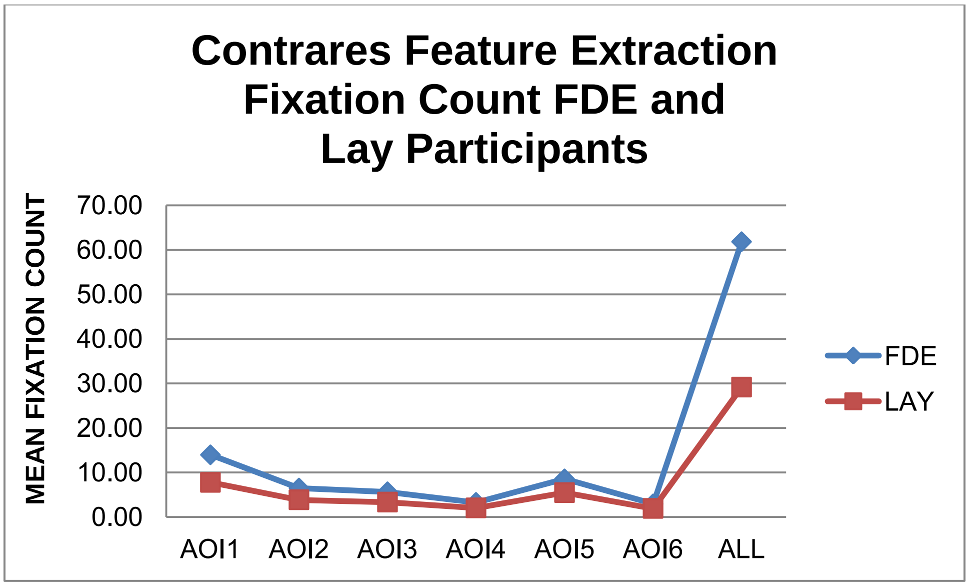
Eye-Tracking Metrics Analyses

These analyses investigate the participants' overall utilization of characteristics in the signature stimulus, and the participants' deployment of attentional resources to specific characteristics that the heat map indicated were particularly diagnostic during the examination. The examination process analyses are based on AOIs in the signature, and the overall signature analysis (the AOI overlaying the entire signature designated *Contrares all*). Figure Contrares 3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .646, F (7, 79) = 20.60, p < .001, multivariate η^2 = .646. Figure Contrares 4 presents the mean fixation counts by AOI.

Figure Contrares 4.



Follow-up ANOVAS conducted on each dependent variable revealed that fixation counts for FDEs were significantly greater than those for Lay participants in three of the AOIs (AOI 1, $F(1, 85) = 5.04$, $p = .027$, partial $\eta^2 = .056$; AOI 3, $F(1, 85) = 6.16$, $p = .015$, partial $\eta^2 = .068$; and AOI ALL, $F(1, 85) = 13.68$, $p < .001$, partial $\eta^2 = .139$.)

Although fixation counts were on average greater among FDEs than among Lay participants in the remaining AOIs, no significant differences were found for AOI 2, $p = .108$, *ns*; AOI 4, $p = .081$, *ns;* AOL 5, $p = .069$, *ns*; and AOI 6, $p = .125$, *ns*). Table Contrares 1 presents the means and standard deviations for areas of interest by participant type.

Table Contrares 1

Fixation Counts for FDE and Lay Participants

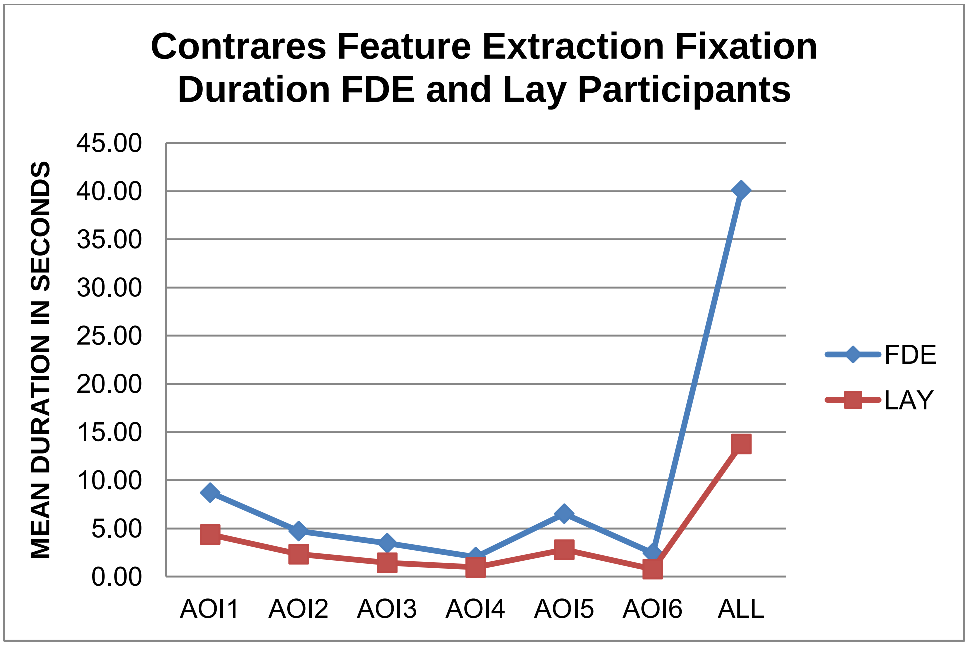
	AOI1		**AOI2**		**AOI3**		**AOI4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	13.91	15.98	6.45	9.67	5.62	5.42	3.23	4.11
Lay	7.73	7.54	3.83	3.49	3.30	2.53	2.00	1.75

	AOI5		**AOI6**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	8.51	9.50	2.89	3.52	61.79	51.94
Lay	5.43	5.09	1.88	2.41	29.13	22.19

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .646, $F(7, 79) = 20.60$, $p < .001$, multivariate $\eta^2 = .646$. Figure Contrares 5 presents the mean fixation duration by AOI.

Figure Contrares 5



Follow-up ANOVAS conducted on each dependent variable revealed that fixation durations were significantly greater among FDEs than among Lay participants in all AOIs (AOI 1, F (1, 85) = 9.45, p = .003, partial η^2 = .100; AOI 2, F (1, 85) = 5.98, p = .017, partial η^2 = .066; AOI 3, F (1, 85) = 15.05, p < .001, partial η^2 = .150; AOI 4, F (1, 85) = 7.68, p = .007, partial η^2 = .083; AOI 5, F (1, 85) = 8.93, p = .004, partial η^2 = .095; AOI 6, F (1, 85) = 8.84, p =.004, partial η^2 = .094; AOI ALL, F (1, 85) = 26.05, p <.001, partial η^2 = .235). Table Contrares 2 presents the means and standard deviations for areas of interest by participant type.

Table Contrares 2

Process Analysis Fixation Durations for FDE and Lay Participants

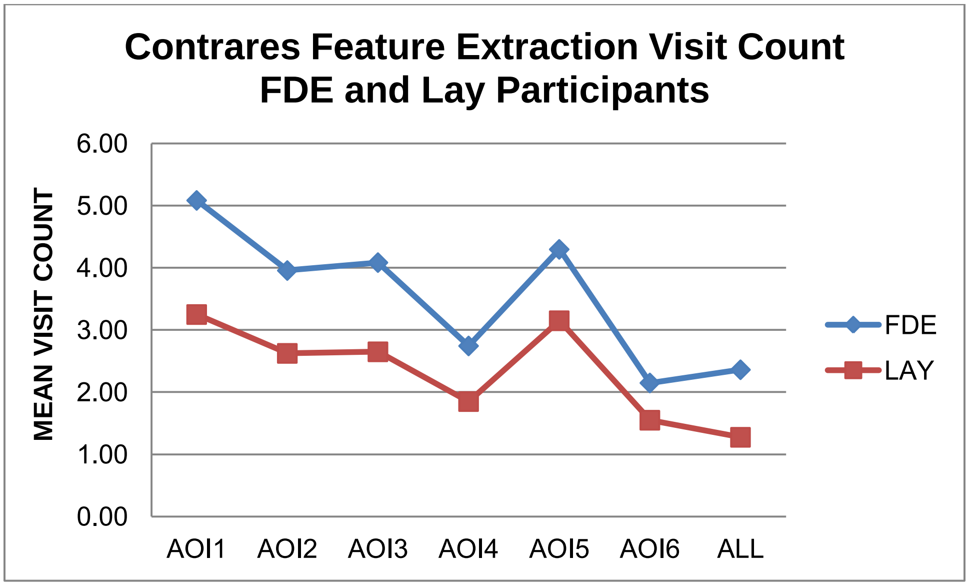
	AOI1		AOI2		AOI3		AOI4	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	8.71	8.22	4.73	5.84	3.48	3.05	2.03	2.27
Lay	4.37	3.81	2.33	2.31	1.44	1.42	0.96	1.01

	AOI5		AOI6		ALL	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	6.53	7.52	2.45	3.39	40.10	31.49
Lay	2.79	2.64	0.78	1.08	13.77	9.17

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .787, F (7, 79) = 41.72, p < .001, multivariate η^2 = .787. Figure Contrares 6 presents the mean visit counts by AOI.

Figure Contrares 6



Follow-up ANOVAS conducted on each dependent variable revealed that visit counts were significantly greater among FDEs than among Lay participants in three AOIs (AOI 1, F(1, 85) = 4.99, p = .028, partial η^2 = .055; AOI 3, F(1, 85) = 7.10, p = .009, partial η^2 = .077; and AOI ALL, F(1, 85) = 7.84, p = .006, partial η^2 = .084).

Although visit counts were on average greater among FDEs than among Lay participants in the remaining AOIs, no significant differences were found for AOI 2, p = .091, *ns*; AOI 4, p = .079, *ns;* AOI 5, p = .106, *ns;* AOI 6, p = .169, *ns*. Table Contrares 3 presents the means and standard deviations for areas of interest by participant type.

Table Contrares 3
Visit Counts for FDE and Lay Participants

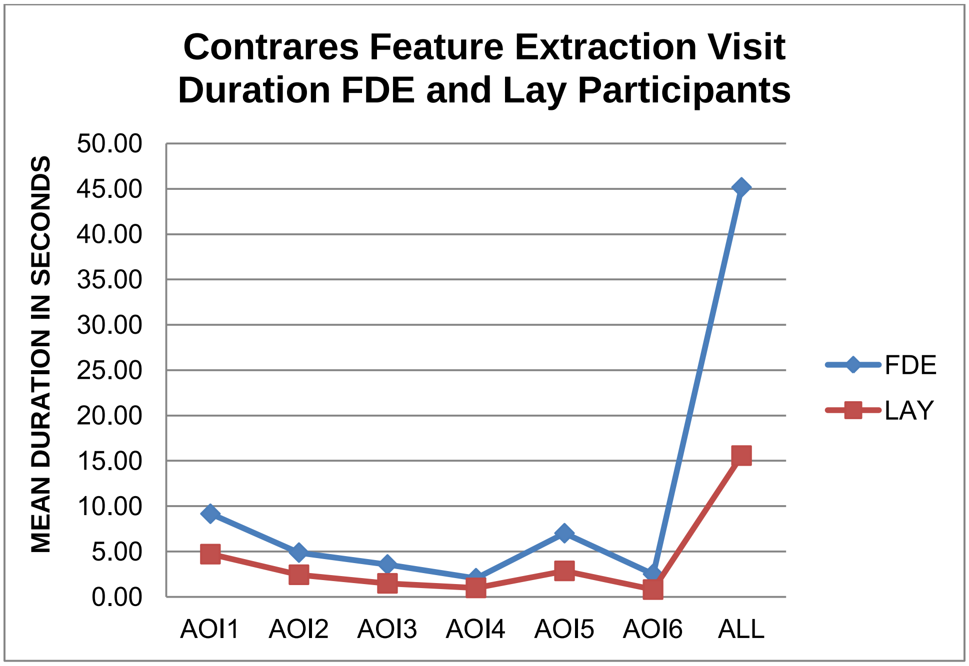
	AOI1		AOI2		AOI3		AOI4	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	5.09	4.53	3.96	4.54	4.09	2.91	2.74	2.78
Lay	3.25	2.74	2.63	2.08	2.65	1.92	1.85	1.67

	AOI5		AOI6		ALL	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	4.30	3.74	2.15	2.16	2.36	2.39
Lay	3.15	2.61	1.55	1.81	1.28	0.60

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .695 F (7, 79) = 4.730, p < .001, multivariate η^2 = .659. Figure Contrares 7 presents the mean visit durations by AOI.

Figure Contrares 7



Follow-up ANOVAS conducted on each dependent variable revealed that visit durations were significantly greater among FDEs than among Lay participants for all AOIs (AOI 1, F (1, 85) = 8.80, p = .004, partial η^2 = .094; AOI 2, F (1, 85) = 5.69, p = .019, partial η^2 = .063; AOI 3, F (1, 85) = 14.76, p < .001, partial η^2 = .148; AOI 4, F (1, 85) = 7.50, p = .008, partial η^2 = .081; AOI 5, F (1, 85) = 7.90, p = .006, partial η^2 = .085; AOI 6, F(1, 85) = 8.64, p = .004, partial η^2 = .092; AOI ALL, F (1, 85) = 27.89, p < .001, partial η^2 = .247). Table Contrares 4 presents the means and standard deviations for areas of interest by participant type.

Table Contrares 4

Process Analysis Visit Durations for FDE and Lay Participants

	AOI1		AOI2		AOI3		AOI4	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	9.16	8.71	4.87	6.06	3.56	3.15	2.05	2.28
Lay	4.70	4.10	2.43	2.47	1.48	1.47	0.98	1.04

	AOI5		AOI6		ALL	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***

FDE	7.01	9.00	2.51	3.53	45.16	34.00
Lay	2.86	2.72	0.80	1.11	15.57	10.71

Decision Confidence Analysis

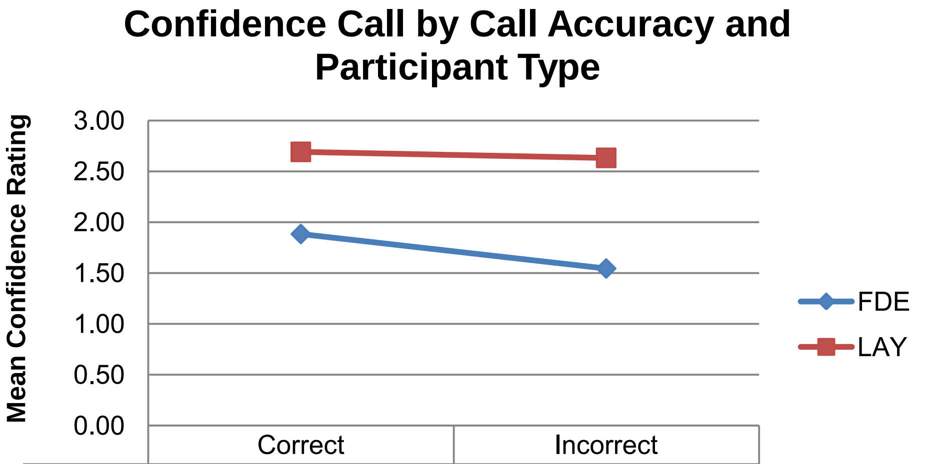
A 2 (FDE vs. Lay participant) x 2 (correct vs. incorrect call) univariate factorial ANOVA was conducted to investigate whether significant differences in level of *call confidence* existed between FDE and Lay participants, and whether significant differences existed according to the accuracy of the call. Table Contrares 5 presents the results of the omnibus analysis.

Table Contrares 5
Two-Way ANOVA Summary Table

Source	***SS***	***df***	***MS***	***F***	***p***	η^2
Between treatments						
Participant Type	18.51	1.00	18.51	32.30	.000	.271
Call Accuracy	0.82	1.00	0.82	1.42	.236	.016
Participant Type x Call Accuracy	0.40	1.00	0.40	0.71	.403	.008
Within treatments	49.84	87.00	0.57			
Total	497.00	91.00				

Main effect results revealed that call confidence was significantly greater among Lay participants than among FDEs, $F(1, 87) = 32.30$, $p < .001$, partial $\eta^2 = .271$. There was no main effect difference in call confidence according to call accuracy, $p = .236$, *ns*. No significant interaction effect was found between participant type and call accuracy, $p = .403$, *ns*. Figure Contrares 8 demonstrates the mean confidence ratings by call accuracy and participant type.

Figure Contrares 8



	Correct	Incorrect
FDE	1.88	1.55
LAY	2.69	2.63

Conclusions

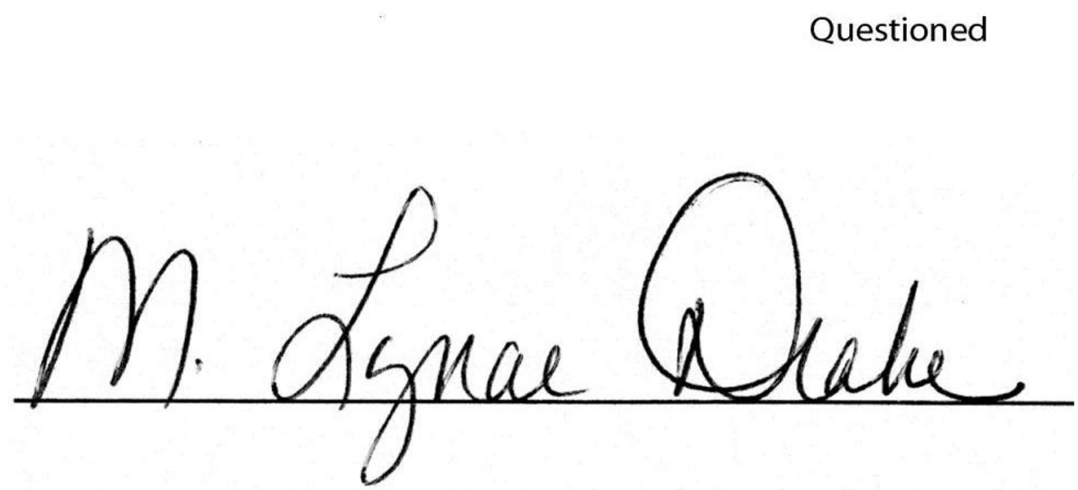
These findings indicate that although FDEs were significantly more accurate than were Lay participants, they were also significantly less confident in the accuracy of their calls, on average rating their confidence level for both correct calls and incorrect calls as *not at all confident*, compared to Lay participants, who on average rated their correct call confidence at the *somewhat confident* level.

Six areas of interest in addition to the ALL area of interest were empirically identified by examining the full sample heat map for this signature. The four eye tracking metrics revealed that overall, FDEs examined the signature significantly more extensively than did Lay participants, fixating a greater number of times on all AOIs, and fixating on those AOIs for a greater period of time. The significant differences in fixation count, fixation duration, visit count, and visit duration observed in the AOI "ALL" indicated that FDEs also examined a greater variety of signature features, and spent more time evaluating them, than did Lay participants.

<u>SIGNATURE: M. Lynae Drake (Genuine)</u>

The signature of M. Lynae Drake is characterized as a high-complexity text based signature. Of the 49 FDE participants, 49 responded correctly that the signature was genuine, and 0 responded that the signature was simulated. Of the 43 Lay participants, 37 responded correctly that the signature was genuine, and 6 responded that it was simulated. This difference was statistically significant, χ^2 (1, N = 92) = 7.31, p = .007. Figure Drake 1 presents the view of this signature.

Figure Drake 1. Single Signature Stimulus for M. Lynae Drake.



Selection of Areas of Interest (AOIs)

Figure Drake 2 presents the heat map for this slide. Empirical examination of the heat map revealed that there were three locations indicated by red "hot spots" within the signature that elicited significant attention from the participants. AOIs were created for these specific hot spots. Larger, secondary AOIs incorporating the smaller hot spots were created to include the orange "warm spots," creating a total of eight AOIs (including the AOI for the questioned signature) for this stimulus.

Figure Drake 2. Heat maps for Drake Signature demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs. The overall heat map is displayed below. Separate heat maps for FDEs and Lay Participants are displayed underneath.

FDE LAY

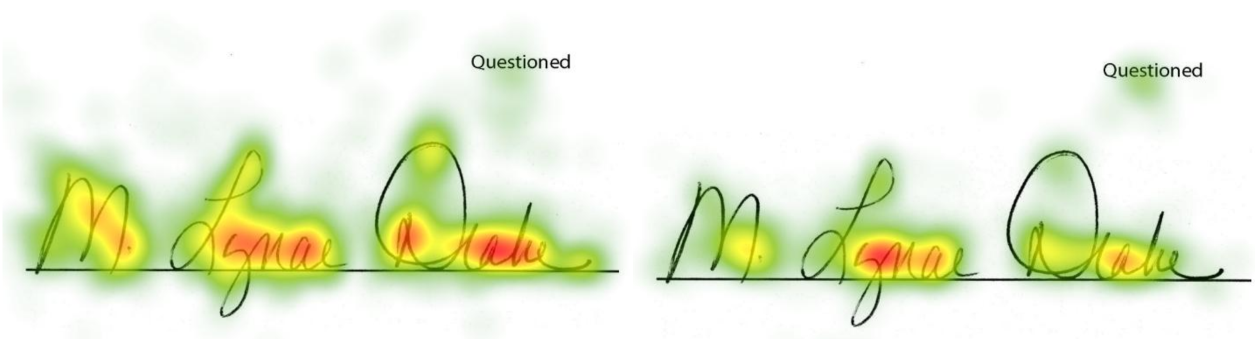
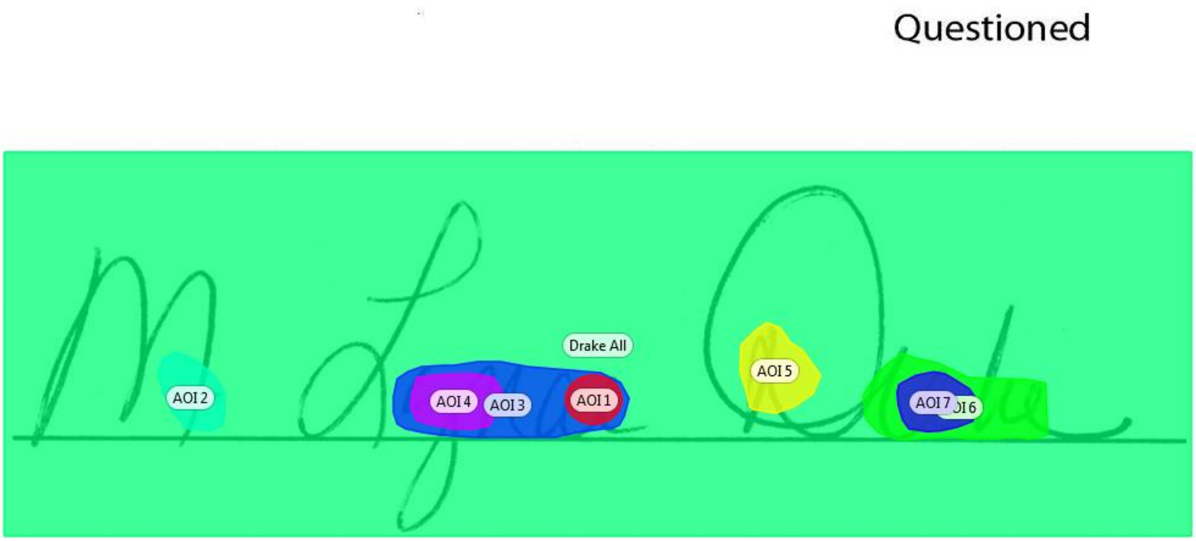


Figure Drake 3. Areas of Interest (AOIs) for Signature M. Lynae Drake



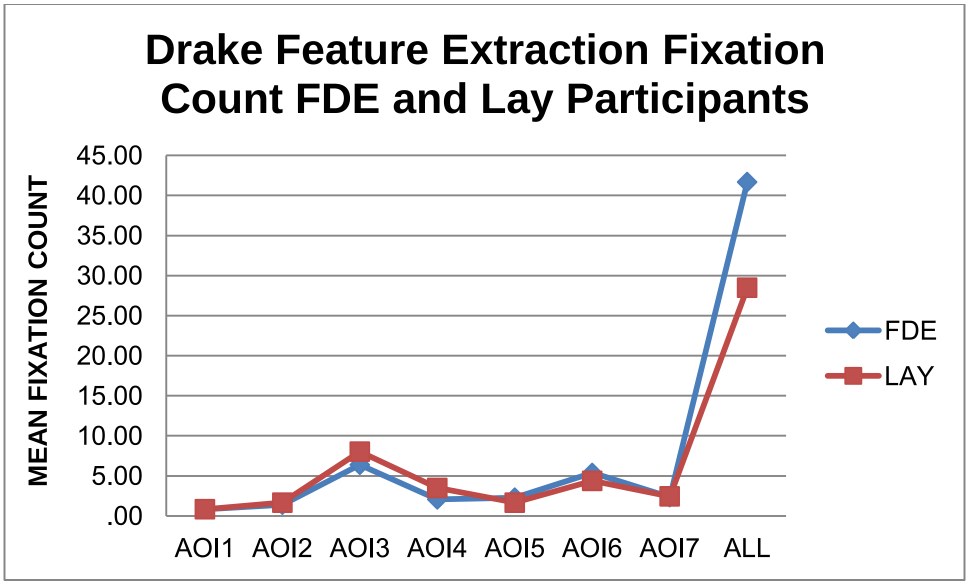
Eye-Tracking Metrics Analyses

These analyses investigate the participants' overall utilization of characteristics in the signature stimulus, and the participants' deployment of attentional resources to specific characteristics that the heat map indicated were particularly diagnostic during the examination. The examination process analyses are based on AOIs in the signature, and the overall signature analysis (the AOI overlaying the entire signature designated Drake *all*). Figure Drake 3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .722, F (8, 81) = 26.26, p < .001, multivariate η^2 = .722. Figure Drake 4 presents the mean fixation counts by AOI.

Figure Drake 4.



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for two of the AOIs. Fixation count was significantly greater among Lay participants than among FDEs in AOI 4, $F(1, 88) = 6.33$, $p = .014$, partial $\eta^2 = .067$. Fixation count was significantly greater among FDEs than among Lay participants in AOI ALL, $F(1, 88) = 4.01$, $p = .048$, partial $\eta^2 = .044$.

No significant differences were found for AOI 1, $p = .984$, *ns*; AOI 2, $p = .516$, *ns*; AOI 3, $p = .253$, *ns;* AOL 5, $p = .308$, *ns*; AOI 6, $p = .418$, *ns*; and AOI 7, $p = .874$, *ns*. Table Drake 1 presents the means and standard deviations for areas of interest by participant type.

Table Drake 1
Fixation Counts for FDE and Lay Participants

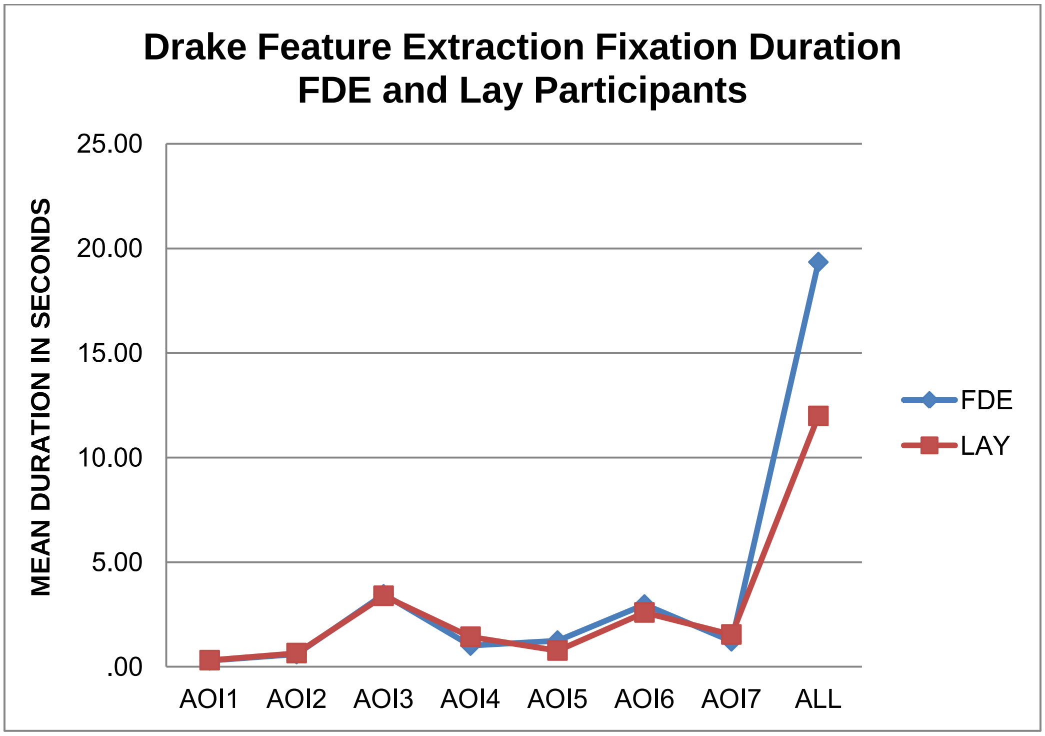
	AOI1		AOI2		AOI3		AOI4	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	.83	1.66	1.40	1.79	6.38	6.81	2.06	2.41
Lay	.84	1.91	1.65	1.80	8.02	6.68	3.49	2.95

	AOI5		AOI6		AOI7		ALL	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.28	3.39	5.36	6.67	2.34	3.36	41.68	34.59
Lay	1.65	2.22	4.37	4.57	2.44	2.61	28.49	27.07

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .664, F (8, 81) = 20.05, $p < .001$, multivariate $\eta^2 = .664$. Figure Drake 5 presents the mean fixation duration by AOI.

Figure Drakes 5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for only one AOI. Fixation duration among FDEs was significantly greater than among Lay participants in AOI ALL, F (1, 88) = 6.95, p = .010, partial η^2 = .073.

No significant differences were found for AOI 1, p = .919, *ns*; AOI 2, p = .753, *ns*; AOI 3, p = .918, *ns;* AOL 4, *ns*; AOI 5, p = .170, *ns*; AOI 6, p = .539, *ns;* and AOI 7, p = .357, *ns*. Table Drake 2 presents the means and standard deviations for areas of interest by participant type.

Table Drake 2

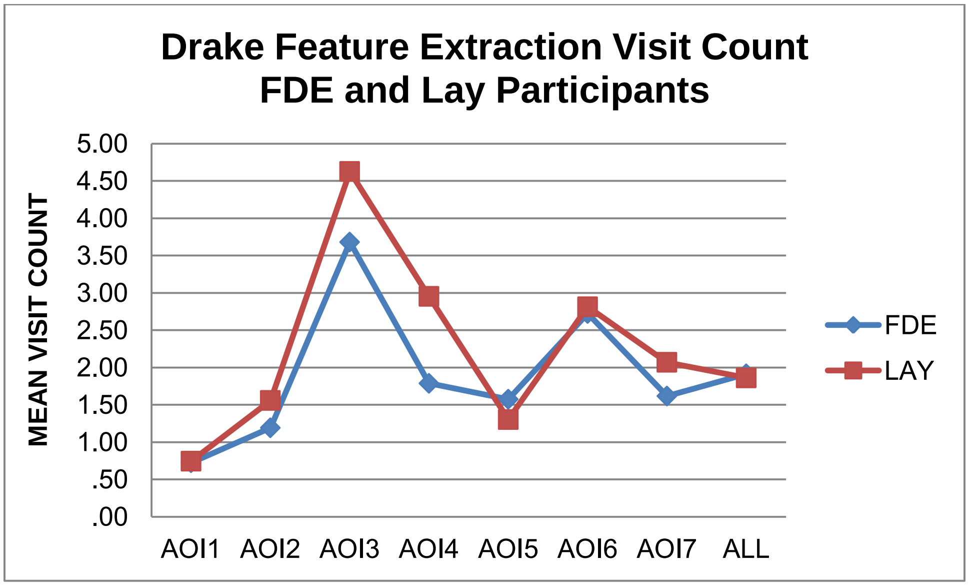
Process Analysis Fixation Durations for FDE and Lay Participants

	AOI1		AOI2		AOI3		AOI4	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	.30	.64	.60	.71	3.46	3.84	1.01	1.28
Lay	.31	.56	.65	.81	3.39	2.40	1.43	1.22
	AOI5		**AOI6**		**AOI7**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.25	1.95	2.97	3.14	1.21	1.57	19.34	15.18
Lay	0.78	1.16	2.59	2.66	1.54	1.79	11.99	10.66

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .821, *F* (8, 81) = 46.35, $p < .001$, multivariate $\eta^2 = .821$. Figure Drake 6 presents the mean visit counts by AOI.

Figure Drake 6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for only AOI 4. Visit count was significantly greater among Lay participants than among FDEs, *F* (1, 88) = 6.6.17, $p = .015$, partial $\eta^2 = .065$.

No significant differences were found for AOI 1, $p = .943$, *ns*; AOI 2, $p = .264$, *ns*; AOI 3, $p = .150$, *ns*; AOI 5, $p = .467$, *ns;* AOI 6, $p = .862$, *ns;* AOI 7, $p = .250$, *ns;* and AOI ALL, $p = .823$, *ns*. Table Drake 3 presents the means and standard deviations for areas of interest by participant type.

Table Drake 3

Visit Counts for FDE and Lay Participants

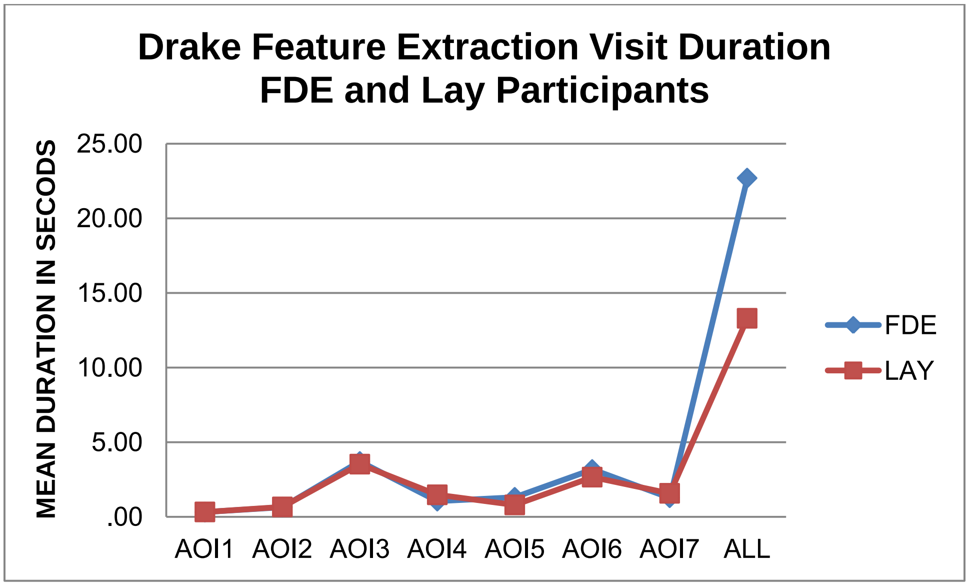
	AOI1		**AOI2**		**AOI3**		**AOI4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	.72	1.26	1.19	1.33	3.68	3.42	1.79	2.05
Lay	.74	1.50	1.56	1.75	4.63	2.68	2.95	2.40

	AOI5		**AOI6**		**AOI7**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.57	1.93	2.72	2.58	1.62	1.75	1.91	1.32
Lay	1.30	1.57	2.81	2.32	2.07	1.96	1.86	0.94

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .637, F (8, 81) = 17.80, p < .001, multivariate η^2 = .637. Figure Drake 7 presents the mean visit counts by AOI.

Figure Drake 7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for only one AOI. Visit duration was significantly greater among FDEs than among Lay participants in AOI ALL, F (1, 88) = 7.47, p = .008, partial η^2 = .078.

No significant differences were found for AOI 1, p = .932, *ns*; AOI 2, p = .927, *ns*; AOI 3, p = .803, *ns*; AOI 5, p = .155, *ns;* AOI 6, p = .430, *ns;* and AOI 7, p = .416, *ns*. Table Drake 4 presents the means and standard deviations for areas of interest by participant type.

Table Drake 4
Process Analysis Visit Durations for FDE and Lay Participants

	AOI1		AOI2		AOI3		AOI4	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	.31	.65	.64	.81	3.70	3.98	1.04	1.30
Lay	.32	.57	.65	.81	3.52	2.58	1.47	1.25
	AOI5		**AOI6**		**AOI7**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.30	2.03	3.16	3.36	1.27	1.63	22.69	19.58
Lay	0.79	1.17	2.65	2.72	1.57	1.81	13.30	11.64

Decision Confidence Analysis

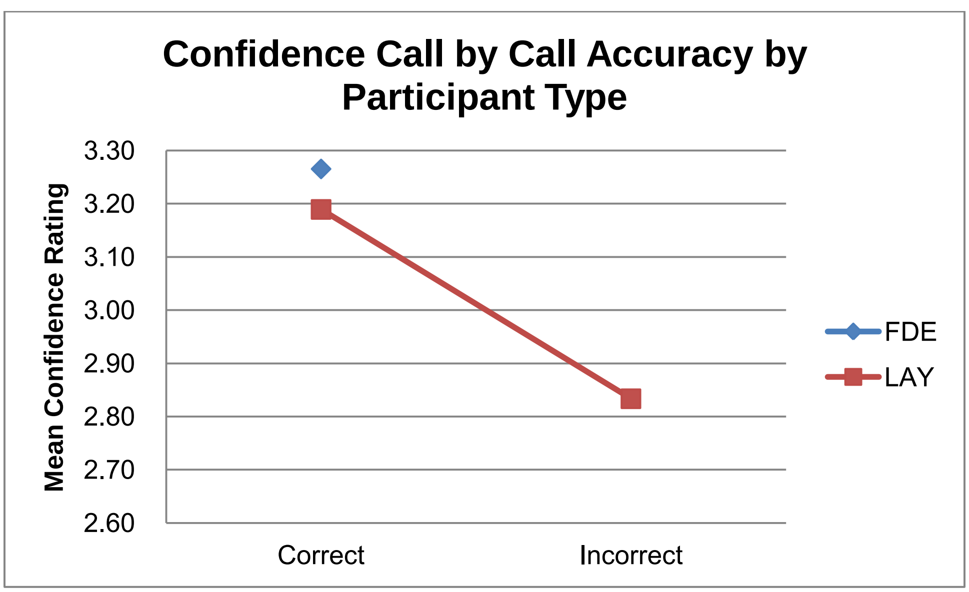
A 2 (FDE vs. Lay participant) x 2 (correct vs. incorrect call) univariate factorial ANOVA was conducted to investigate whether significant differences in level of *call confidence* existed between FDE and Lay participants, and whether significant differences existed according to the accuracy of the call. Table Drake 5 presents the results of the omnibus analysis.

Table Drake 5
Two-Way ANOVA Summary Table

Source	***SS***	***df***	***MS***	***F***	***p***	η^2
Between treatments						
Participant Type	.12	1.00	.12	.19	.661	.002
Call Accuracy	.65	1.00	.65	1.04	.311	.012
Participant Type x Call Accuracy	.00	.00				0.000
Within treatments	56.06	89.00	.63			
Total	1003.00	92.00				

Main effect results revealed that call confidence was not significantly different between the two participant types, p = .661, *ns*. There was no main effect found in confidence for call accuracy, p = .311, *ns*. The interaction effect could not be calculated in this instance because call accuracy was constant among FDEs. Figure Drake 8 demonstrates the mean confidence ratings by call accuracy and participant type.

Figure Drake 8



Conclusions

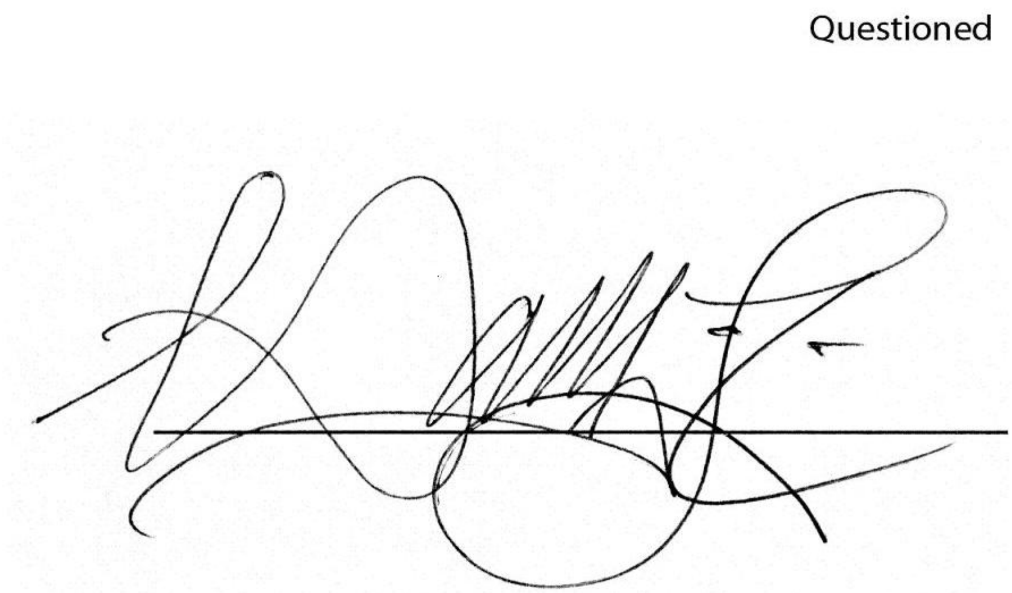
These findings indicate that FDEs were significantly more accurate than were Lay participants, and were slightly more confident in the accuracy of their calls, although this difference was not statistically significant.

Seven areas of interest in addition to the ALL AOI were empirically identified by examining the full sample heat map for this signature. The four eye tracking metrics revealed that although visit count tended to be greater among Lay participants than among FDEs, this difference was only statistically significant in one AOI. The significant differences in fixation count, fixation duration, and visit duration observed in the AOI "ALL" indicated that FDEs examined a greater variety of signature features, and spent more time evaluating them, than did Lay participants.

<u>SIGNATURE: Gary Feilmeier (Simulated)</u>

The signature of Gary Feilmeier is characterized as a high-complexity stylized signature. Of the 49 FDE participants, 0 responded correctly that the signature was simulated, and 49 responded that the signature was genuine. Of the 43 Lay participants, 13 responded correctly that the signature was simulated, and 30 responded that it was genuine. This difference was statistically significant, χ^2 (1, N = 92) = 17.25, p < .001. Figure Feilmeier 1 presents the view of this signature.

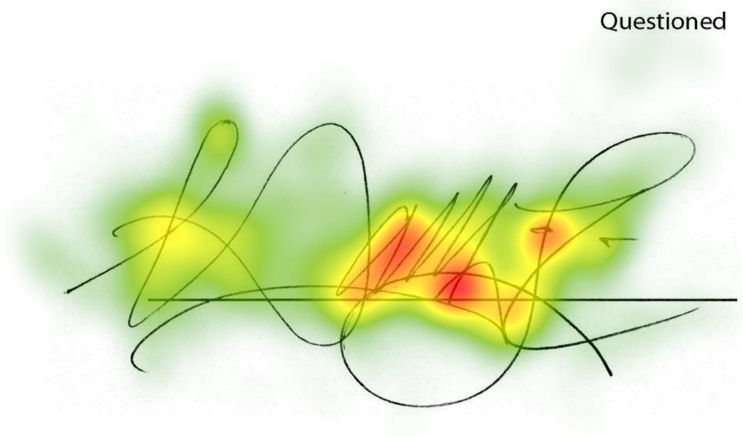
Figure Feilmeier 1. Single Signature Stimulus for Gary Feilmeier.



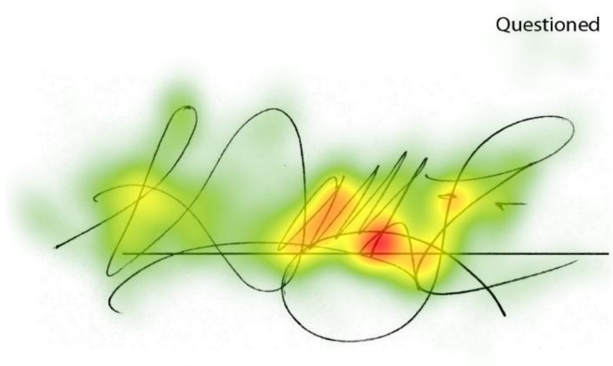
Selection of Areas of Interest (AOIs)

Figure Feilmeier 2 presents the heat map for this slide. Empirical examination of the heat map revealed that there were three locations indicated by red “hot spots” within the signature that elicited significant attention from the participants. AOIs were created for these specific hot spots. Larger, secondary AOIs incorporating the smaller hot spots were created to include the orange “warm spots,” creating a total of six AOIs (including the AOI for the questioned signature, labeled *Feilmeier All*) for this stimulus.

Figure Feilmeier 2. Heat maps for Feilmeier Signature demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs. The overall heat map is displayed below. Separate heat maps for FDEs and Lay Participants are displayed underneath.



FDE



LAY

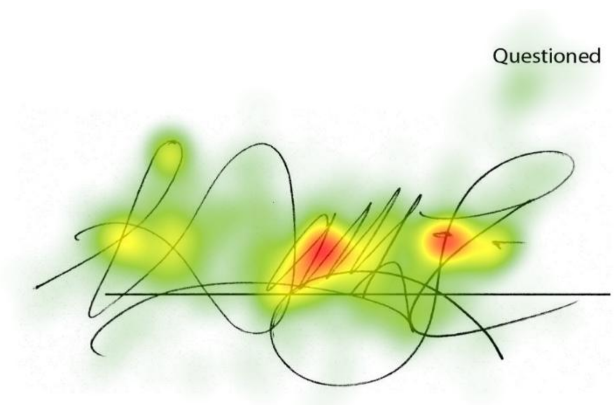
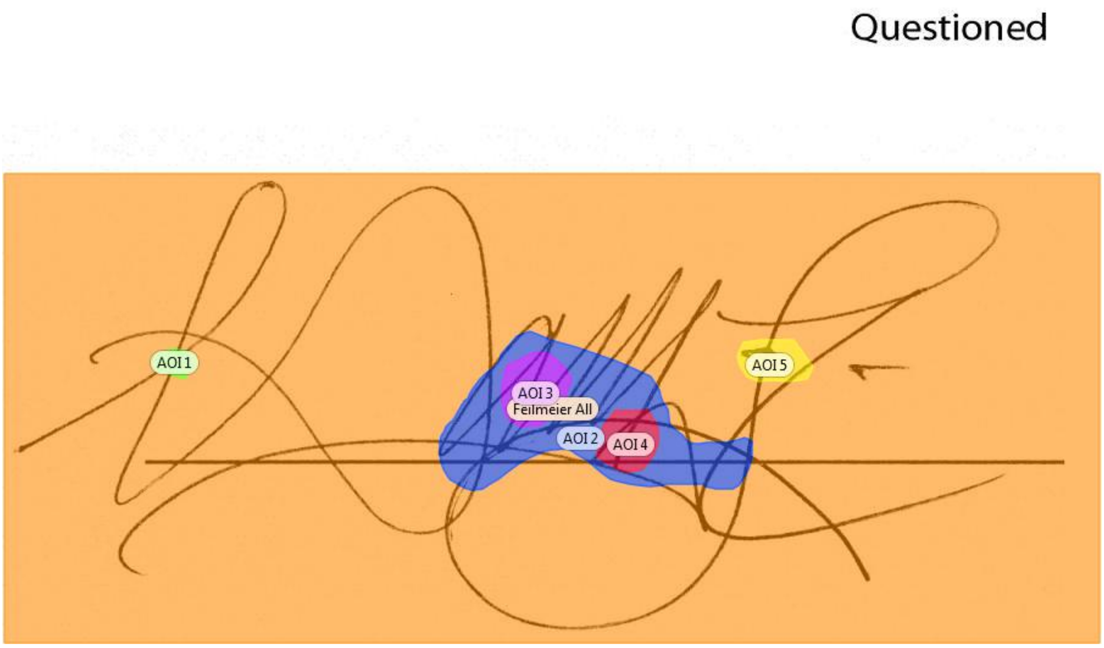


Figure Feilmeier 3. Areas of Interest (AOIs) for Signature Gary Feilmeier



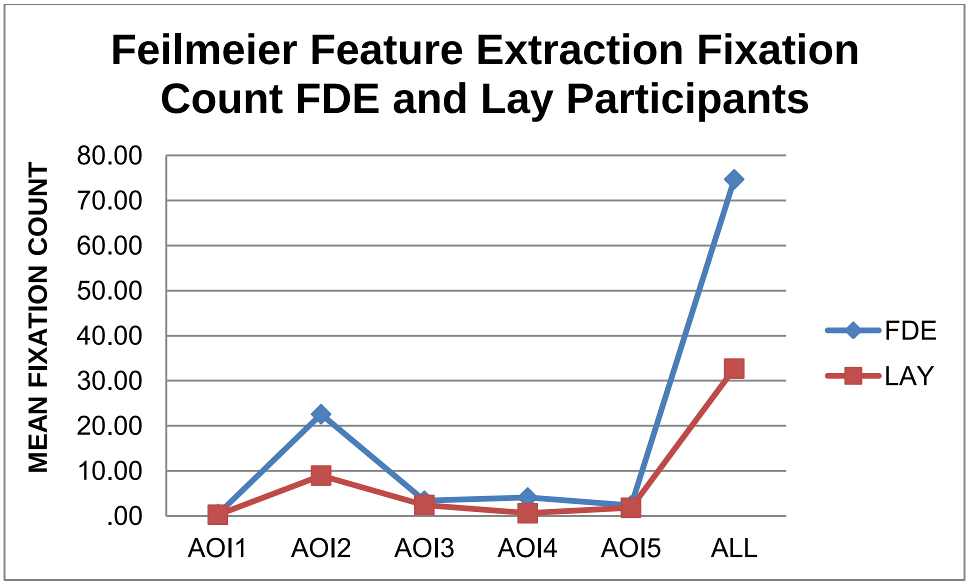
Eye-Tracking Metrics Analyses

These analyses investigate the participants' overall utilization of characteristics in the signature stimulus, and the participants' deployment of attentional resources to specific characteristics that the heat map indicated were particularly diagnostic during the examination. The examination process analyses are based on AOIs in the signature, and the overall signature analysis (the AOI overlaying the entire signature designated Feilmeier *all*). Figure Feilmeier 3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .594, F (6, 82) = 20.00, p <= .001, multivariate η^2 = .594. Figure Feilmeier 4 presents the mean fixation counts by AOI.

Figure Drake 4.



Follow-up ANOVAS conducted on each dependent variable revealed that fixation count among FDEs was significantly greater than that among Lay participants for three of the AOIs (AOI 2, $F(1, 87) = 9.48$, $p = .003$, partial $\eta^2 = .098$; AOI 4, $F(1, 87) = 10.42$, $p = .002$, partial $\eta^2 = .107$; and AOI ALL, $F(1, 87) = 9.55$, $p = .003$, partial $\eta^2 = .099$).

No significant differences were found for AOI 1, $p = .279$, *ns*; AOI 3, $p = .002$, *ns*; or AOI 5, $p = .453$, *ns*. Table Feilmeier 1 presents the means and standard deviations for areas of interest by participant type.

Table Feilmeier 1

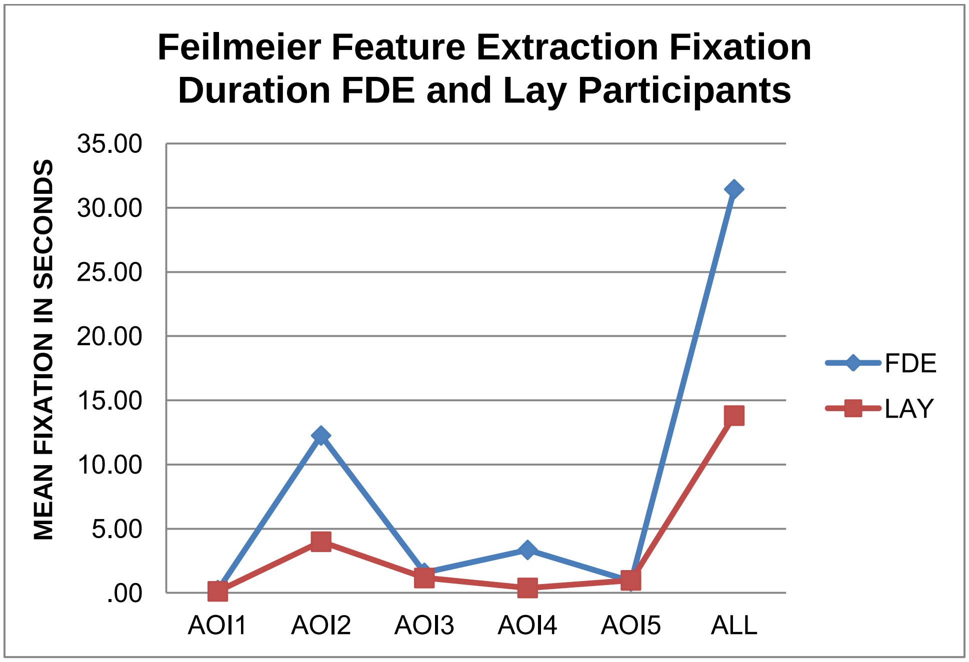
Fixation Counts for FDE and Lay Participants

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	.43	.77	22.57	27.13	3.36	3.27
Lay	.26	.63	8.95	9.78	2.43	2.75
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	4.09	6.86	2.30	3.37	74.70	78.18
Lay	0.60	1.47	1.81	2.65	32.69	42.91

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .495, $F(6, 82) = 3.99$, $p < .001$, multivariate $\eta^2 = .495$. Figure Feilmeier 5 presents the mean fixation duration by AOI.

Figure Feilmeier 5



Follow-up ANOVAS conducted on each dependent variable revealed that fixation durations among FDEs was significantly greater than that among Lay participants for three of the AOIs (AOI 2, F (1, 87) = 14.58, p < .001, partial η^2 = .144; AOL 4, F (1,87) = 14.00, p < .001, η^2 = .139; and AOI ALL, F (1, 87) = 9.72, p = .002, partial η^2 = .101).

No significant differences were found for AOI 1, p = .420, *ns*; AOI 3, p = .235, *ns*; or AOI 5, p = .780, *ns*. Table Feilmeier 2 presents the means and standard deviations for areas of interest by participant type.

Table Feilmeier 2

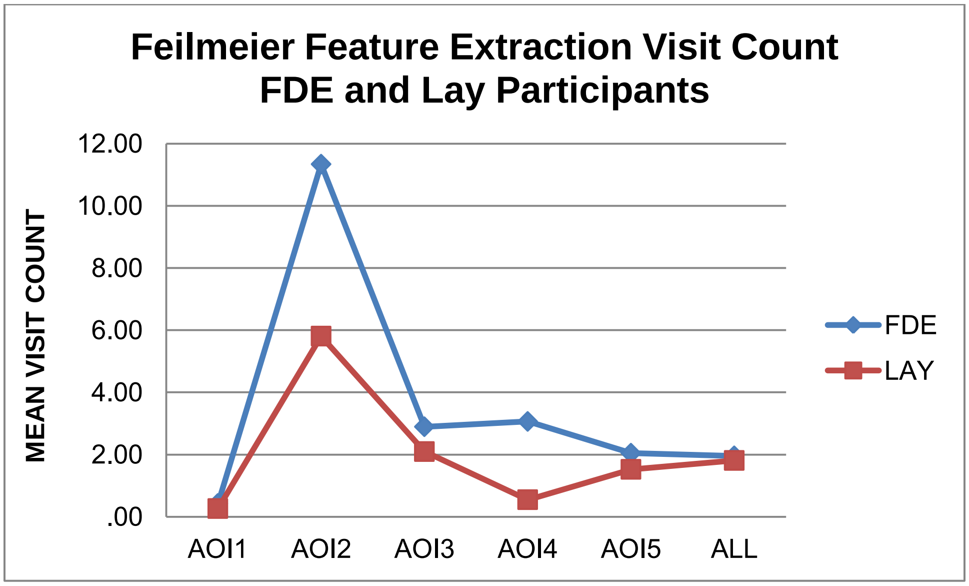
Process Analysis Fixation Durations for FDE and Lay Participants

	AOI1		**AOI2**		**AOI3**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	.23	.76	12.26	13.03	1.57	1.44
Lay	.13	.30	4.00	5.50	1.17	1.72
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	3.36	4.97	0.90	1.16	31.45	31.14
Lay	0.39	1.35	0.98	1.72	13.82	20.43

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .600, F (6, 82) = 20.50, p < .001, multivariate η^2 = .600. Figure Feilmerier 6 presents the mean visit counts by AOI.

Figure Feilmerier 6



Follow-up ANOVAS conducted on each dependent variable revealed that visit counts among FDEs were significantly greater than that among Lay participants for two of the AOIs (AOI 2, F (1, 87) = 7.75, p = .007, partial η^2 = .082; and AOI 4, F (1, 87) = 12.15, p = .001, partial η^2 = .123).

No significant differences were found for AOI 1, p = .279, *ns*; AOI 3, p = .126, *ns*; AOI 5, p = .333, *ns;* or AOI ALL, p = .769, *ns*. Table Feilmeier 3 presents the means and standard deviations for areas of interest by participant type.

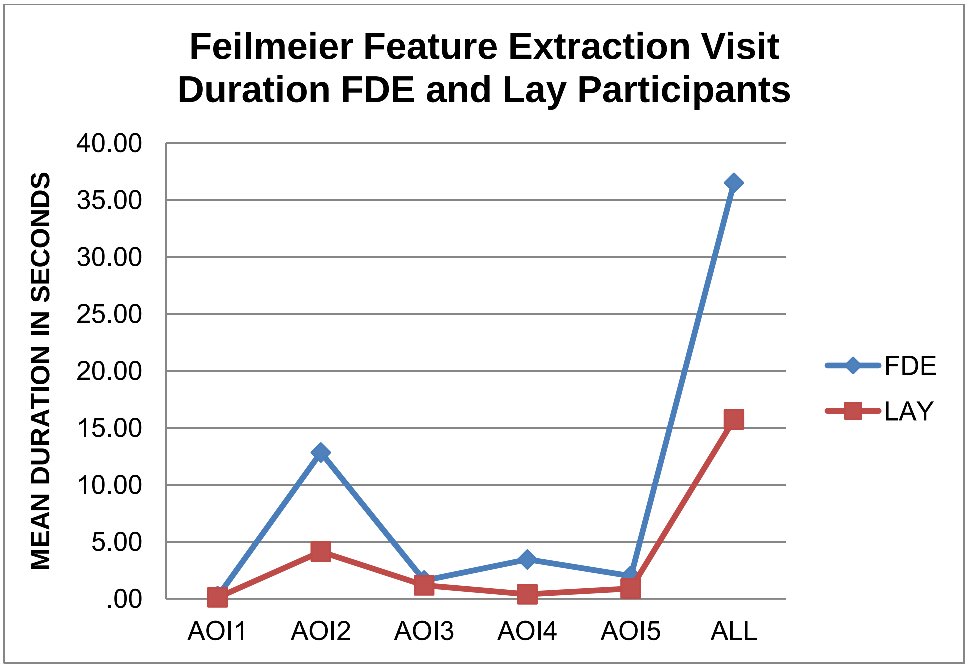
Table Feilmeier 3
Visit Counts for FDE and Lay Participants

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	.43	.77	11.34	11.49	2.89	2.66
Lay	.26	.63	5.81	6.13	2.10	2.15
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	3.06	4.50	2.04	2.65	1.96	2.26
Lay	0.55	1.35	1.52	2.35	1.81	2.48

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .499, F (6, 82) = 13.62, p < .001, multivariate η^2 = .499. Figure Feilmeier 7 presents the mean visit counts by AOI.

Figure Feilmeier 7



Follow-up ANOVAS conducted on each dependent variable revealed that visit duration among FDEs was significantly greater than that among Lay participants in three AOIs (AOI 2, F (1, 87) = 15.25, p < .001, partial η^2 = .149; AOI 4, F (1, 87) = 14.58, p < .001, partial η^2 = .110, and AOI ALL, F (1, 87) = 10.76, p = .001, partial η^2 = .110).

No significant differences were found for AOI 1, p < .001, *ns*; AOI 3, p = .213, *ns*; or AOI 5, p = .716, *ns*. Table Feilmeier 4 presents the means and standard deviations for areas of interest by participant type.

Table Feilmeier 4

Process Analysis Visit Durations for FDE and Lay Participants

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	.23	.76	12.84	13.40	1.60	1.45
Lay	.13	.30	4.14	5.63	1.18	1.72
	AOI4		**AOI5**		**ALL**	

Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	3.45	5.02	2.01	4.04	36.51	35.64
Lay	0.40	1.35	0.91	1.19	15.74	21.45

Decision Confidence Analysis

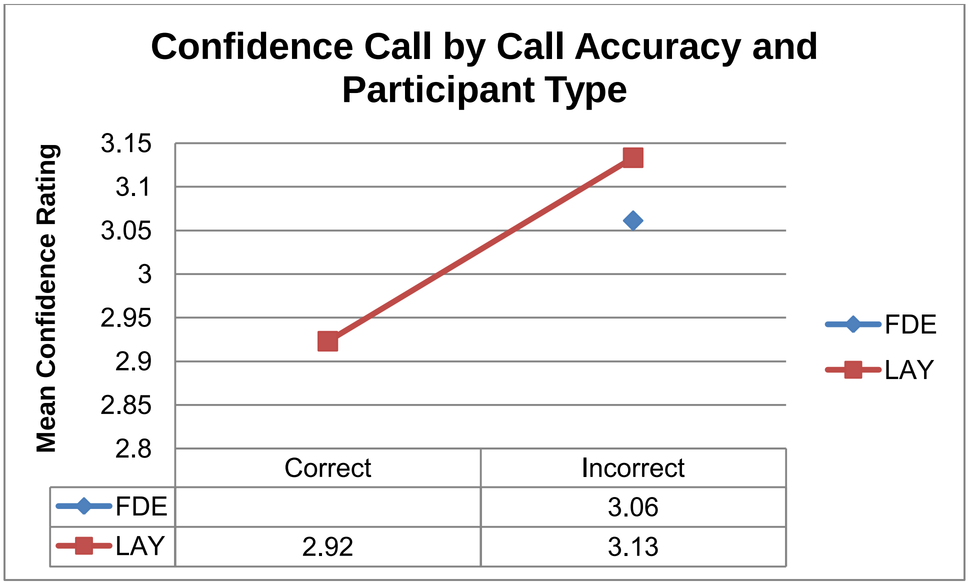
A 2 (FDE vs. Lay participant) x 2 (correct vs. incorrect call) univariate factorial ANOVA was conducted to investigate whether significant differences in level of *call confidence* existed between FDE and Lay participants, and whether significant differences existed according to the accuracy of the call. Table Feilmeier 5 presents the results of the omnibus analysis.

Table Feilmerier 5
Two-Way ANOVA Summary Table

Source	*SS*	*df*	*MS*	*F*	*p*	η^2
Between treatments						
Participant Type	.10	1.00	.10	.13	.721	.001
Call Accuracy	.40	1.00	.40	.53	.468	.006
Participant Type x Call Accuracy	.00	.00				0.000
Within treatments	67.21	89.00	.76			
Total	932.00	92.00				

Main effect results revealed that call confidence was not significantly different between the two participant types, p = .721, *ns*. There was no main effect found in confidence for call accuracy, p = .468, *ns*. The interaction effect could not be calculated in this instance because call accuracy was constant among FDEs. Figure Feilmeier 8 demonstrates the mean confidence ratings by call accuracy and participant type.

Figure Feilmeier 8



Conclusions

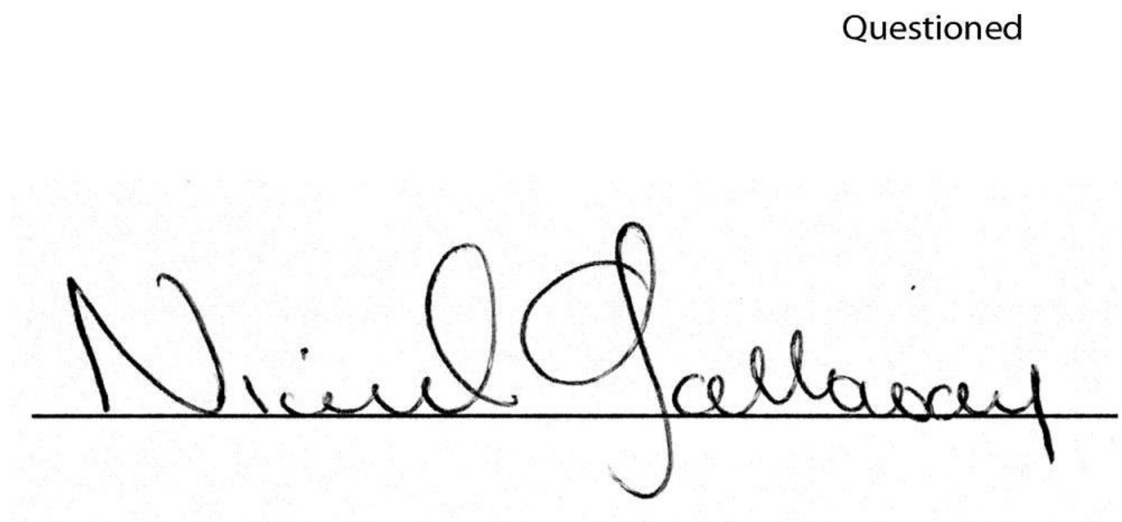
These findings indicate that FDEs were significantly less accurate than were Lay participants, and were slightly less confident in the accuracy of their calls, although this difference was not statistically significant.

Five areas of interest in addition to the AOI ALL were empirically identified by examining the full sample heat map for this signature. The four eye tracking metrics revealed that overall, FDEs examined the signature significantly more extensively than did Lay participants, fixating a greater number of times on nearly all AOIs, and fixating on those AOIs for a greater period of time. The significant differences in fixation count, fixation duration, visit count, and visit duration observed in the AOI "ALL" indicated that FDEs also examined a greater variety of signature features, and spent more time evaluating them, than did Lay participants.

SIGNATURE: Nichol Galloway (Genuine)

The signature of Nichol Galloway characterized as a high-complexity text-based signature. Of the 49 FDE participants, 42 responded correctly that the signature was genuine, and 7 responded that the signature was simulated. Of the 43 Lay participants, 24 responded correctly that the signature was genuine, and 19 responded that it was simulated. This difference was statistically significant, χ^2 (1, N = 92) = 10.10, p = .001. Figure Galloway 1 presents the view of this signature.

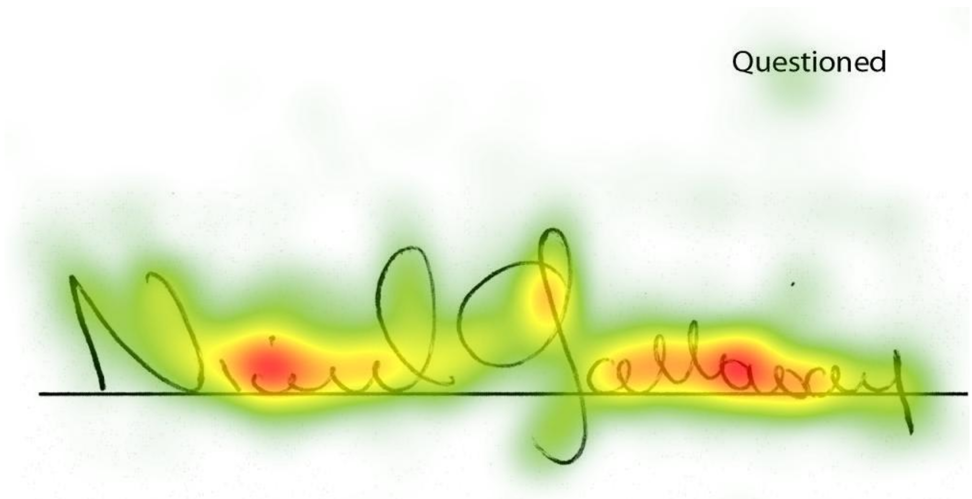
Figure Galloway 1. Single Signature Stimulus for Nichol Galloway.



Selection of Areas of Interest (AOIs)

Figure Galloway 2 presents the heat map for this slide. Empirical examination of the heat map revealed that there were two locations indicated by red “hot spots” within the signature that elicited significant attention from the participants. AOIs were created for these specific hot spots. Larger, secondary AOIs incorporating the smaller hot spots were created to include the orange “warm spots,” creating a total of six AOIs (including the AOI for the questioned signature, labeled *Galloway All*) for this stimulus.

Figure Galloway 2. Heat maps for Galloway Signature demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs. The overall heat map is displayed below. Separate heat maps for FDEs and Lay Participants are displayed underneath.



FDE LAY

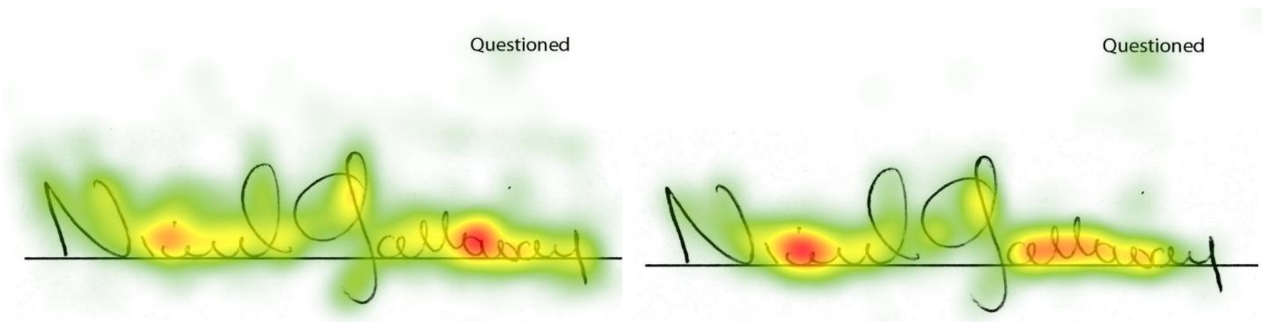
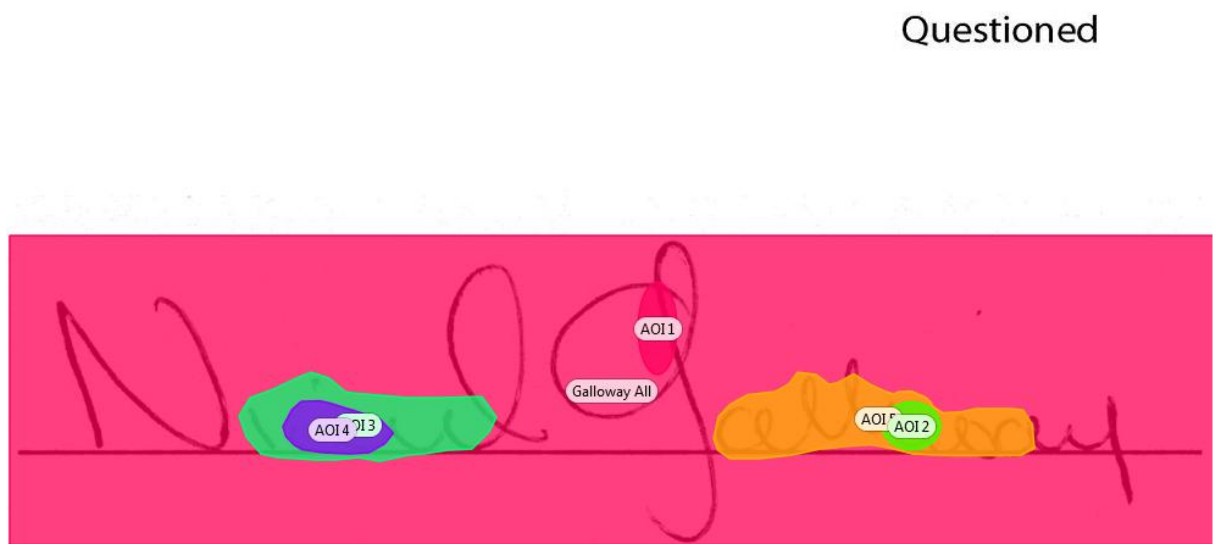


Figure Galloway 3. Areas of Interest (AOIs) for Signature Nichol Galloway



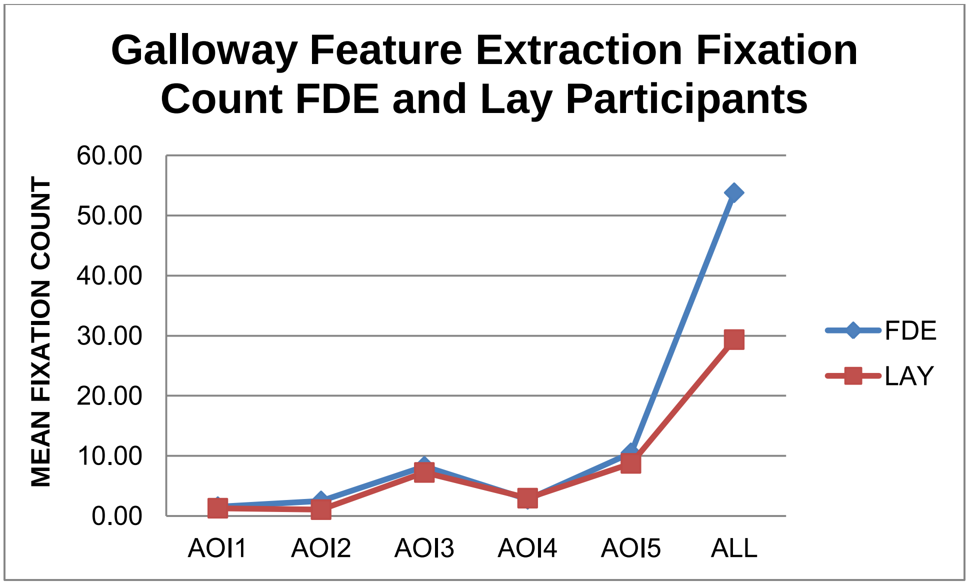
Eye-Tracking Metrics Analyses

These analyses investigate the participants' overall utilization of characteristics in the signature stimulus, and the participants' deployment of attentional resources to specific characteristics that the heat map indicated were particularly diagnostic during the examination. The examination process analyses are based on AOIs in the signature, and the overall signature analysis (the AOI overlaying the entire signature designated *Galloway All*). Figure Galloway 3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .659, F (6, 82) = 26.40, p < .001, multivariate η^2 = .659. Figure Galloway 4 presents the mean fixation counts by AOI.

Figure Galloway 4.



Follow-up ANOVAS conducted on each dependent variable revealed that fixation count among FDEs was significantly greater than that among Lay participants for only one AOI (AOI ALL, F (1, 87) = 11.94, p = .001, partial η^2 = .121).

No significant differences were found for AOI 1, p = .461, *ns*; AOI 2, p = .065, *ns*; AOI 3, p = .516, *ns;* AOI 4, p = .762, *ns*; or AOI 5, p = .433, *ns*. Table Galloway 1 presents the means and standard deviations for areas of interest by participant type.

Table Galloway 1

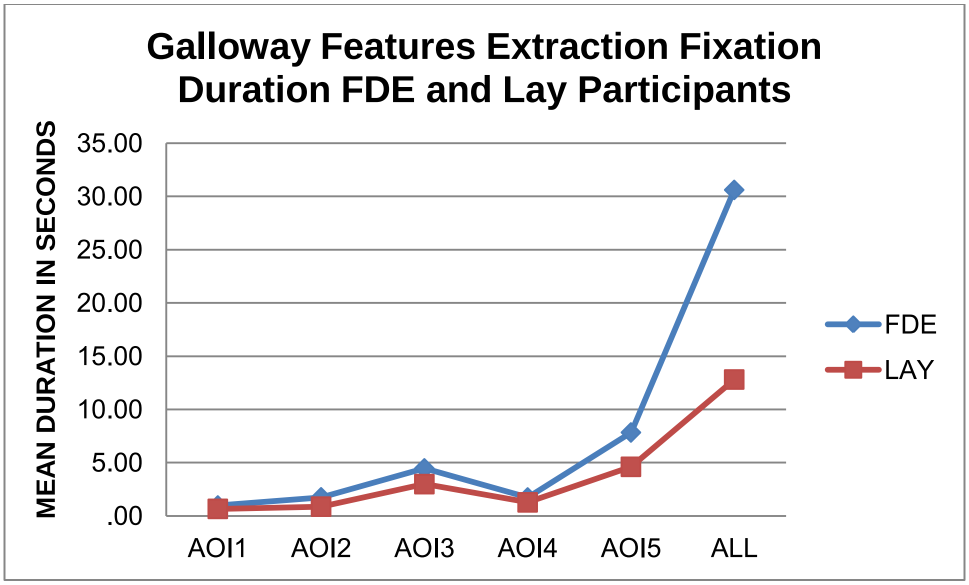
Fixation Counts for FDE and Lay Participants

	AOI1		**AOI2**		**AOI3**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.54	1.79	2.50	4.92	8.26	8.61
LAY	1.28	1.56	1.05	1.41	7.23	5.93
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.76	3.01	10.50	11.93	53.80	41.91
LAY	2.95	2.96	8.74	8.70	29.35	20.60

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .645, F (6, 82) = 24.85, p < .001, multivariate η^2 = .645. Figure Galloway 5 presents the mean fixation duration by AOI.

Figure Galloway 5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for three of the AOIs. Fixation durations in all significant AOIs were greater for FDEs than for lay participants (AOI 3, F (1, 87) = 4.27, p = .042, partial η^2 = .047; AOI 5, F (1, 87) = 5.26, p = .024, η^2 = .057; AOI ALL, F (1, 87) = 20.23, p < .001, partial η^2 = .189).

No significant differences were found for AOI 1, p = .139, *ns;* AOI 2, p = .065, *ns;* or AOI 4, p = .241, *ns*. Table Galloway 2 presents the means and standard deviations for areas of interest by participant type.

Table Galloway 2

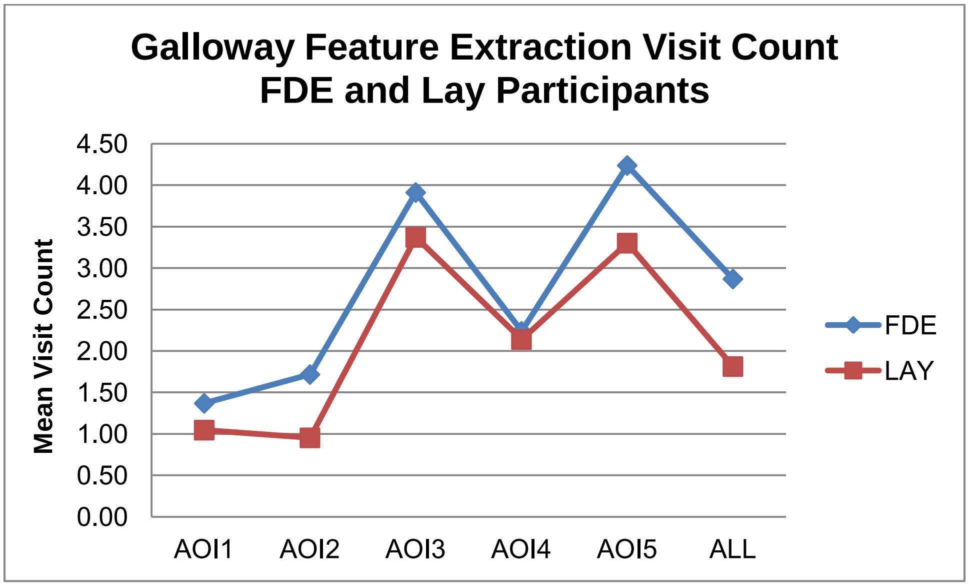
Process Analysis Fixation Durations for FDE and Lay Participants

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	.98	1.12	1.74	2.18	4.46	4.10
LAY	.66	.86	.87	2.23	2.98	2.38
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.73	2.30	7.83	7.74	30.61	24.08
LAY	1.27	1.16	4.61	5.18	12.81	10.02

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .756, F (6, 82) = 42.39, p < .001, multivariate η^2 = .756. Figure Galloway 6 presents the mean visit count by AOI.

Figure Galloway 6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type difference approached significance for only one AOI (AOI 2, p = .05, *ns*).

No significant differences were found for AOI 1, p = .274, *ns*; AOI 3, p = .336, *ns*; AOI 4, p = .835, *ns;* AOI 5, p = .229, *ns*; or AOI ALL, p = .073, *ns*). Table Galloway 3 presents the means and standard deviations for areas of interest by participant type.

Table Galloway 3

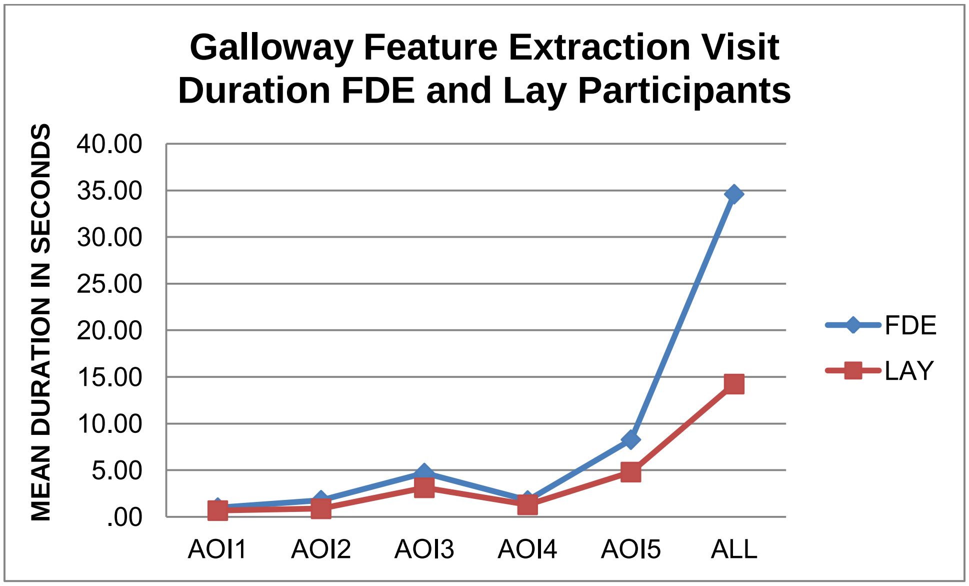
Visit Counts for FDE and Lay Participants

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.37	1.47	1.72	2.24	3.91	2.99
LAY	1.05	1.29	0.95	1.19	3.37	2.20
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.24	2.43	4.24	4.57	2.87	3.66
LAY	2.14	2.03	3.30	2.27	1.81	1.12

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .653, F (6, 82) = 25.68, p < .001, multivariate η^2 = .232. Figure Galloway 7 presents the mean visit duration by AOI.

Figure Galloway 7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for three of the AOIs. Visit durations in all significant AOIs were greater for FDEs than for lay participants (AOI 3, F (1, 87) = 4.45, p = .038, partial η^2 = .049; AOI 5, F (1, 87) = 5.51, p = .021, partial η^2 = .060; and AOI ALL, F (1, 87) = 21.25, p < .001, partial η^2 = .196).

There were no significant differences found for AOI 1, p = .139, *ns*; AOI 2, p = .056, *ns;* or AOI 4, p = .239, *ns*). Table Galloway 4 presents the means and standard deviations for areas of interest by participant type.

Table Galloway 4

Process Analysis Visit Durations for FDE and Lay Participants

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.00	1.13	1.79	2.26	4.71	4.30
LAY	.67	.88	.87	2.23	3.12	2.49
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.76	2.32	8.28	8.17	34.61	27.09
LAY	1.29	1.19	4.81	5.41	14.24	10.60

Decision Confidence Analysis

A 2 (FDE vs. Lay participant) x 2 (correct vs. incorrect call) univariate factorial ANOVA was conducted to investigate whether significant differences in level of *call confidence* existed between FDE

and Lay participants, and whether significant differences existed according to the accuracy of the call. Table Galloway 5 presents the results of the omnibus analysis.

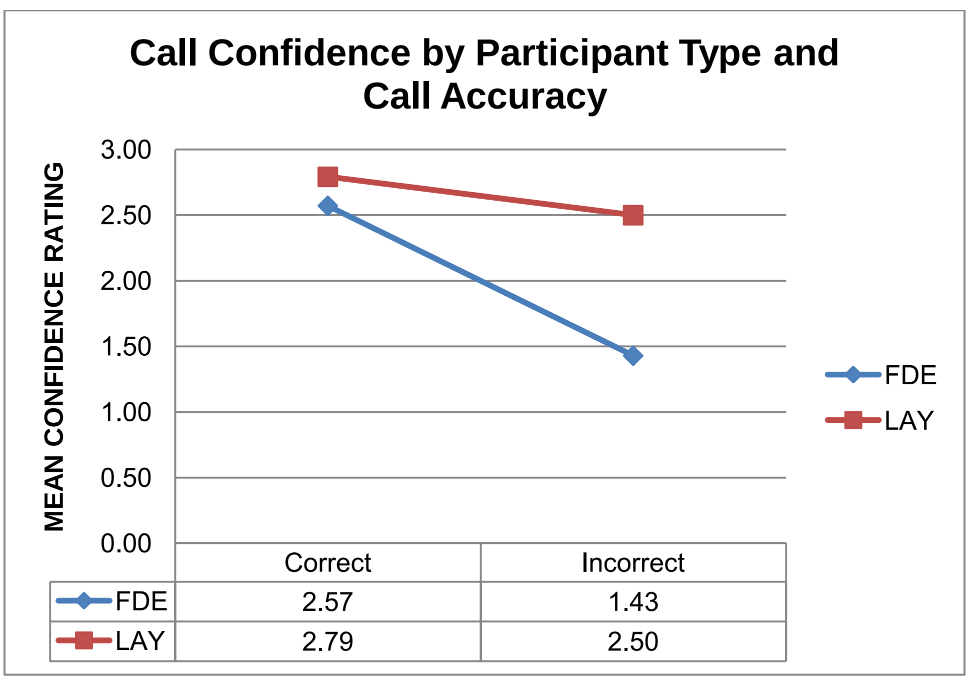
Table Galloway 5

Two-Way ANOVA Summary Table

Source	*SS*	*df*	*MS*	*F*	*p*	η^2
Between treatments						
Participant Type	6.32	1.00	6.32	9.10	.003	.10
Call Accuracy	7.80	1.00	7.80	11.22	.001	.11
Participant Type x Call Accuracy	2.75	1.00	2.75	3.95	.050	.043
Within treatments	60.46	87.00	0.70			
Total	70.68	90.00				

Main effect results revealed that call confidence was significantly greater among Lay participants than among FDEs, F (1, 90) = 9.10, p = .003, partial η^2 = .095. Call confidence was on average lower for incorrect calls than for correct calls, F (1, 90) = 11.22, p = .001, partial η^2 = .114. This was particularly the case among FDEs who made incorrect calls, although this interaction effect did not reach statistical significance, p =.05, *ns*. Figure Galloway 8 demonstrates the mean confidence ratings by call accuracy and participant type.

Figure Galloway 8



Conclusions

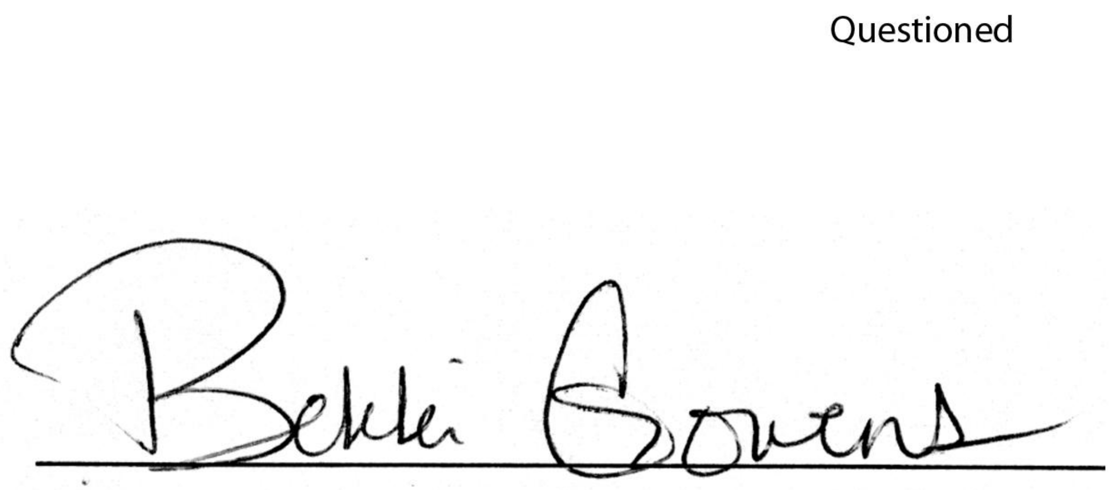
These findings indicate that although FDEs were significantly more accurate than were Lay participants, they were also significantly less confident in the accuracy of their calls, on average rating their confidence level for correct calls at *somewhat confident* and their incorrect calls as *not at all confident*, compared to Lay participants, who on average rated both their correct call confidence and their incorrect call confidence at the *somewhat confident* level.

Five areas of interest in addition to AOI ALL were empirically identified by examining the full sample heat map for this signature. The four eye tracking metrics revealed that overall, FDEs examined the signature significantly more extensively than did Lay participants, fixating a greater number of times on all AOIs, and fixating on those AOIs for a greater period of time. The significant differences in fixation count, fixation duration, and visit duration observed for AOI ALL indicated that FDEs also examined a greater variety of signature features, and spent more time evaluating them, than did Lay participants.

<u>SIGNATURE: Bekki Gowens (Genuine)</u>

The signature of Bekki Gowens is characterized as a low-complexity text-based signature. Of the 49 FDE participants, 48 responded correctly that the signature was genuine, and 1 responded that the signature was simulated. Of the 43 Lay participants, 36 responded correctly that the signature was genuine, and 7 responded that it was simulated. This difference was statistically significant, χ^2 (1, N = 92) = 5.848, p = .016. Figure Gowens 1 presents the view of this signature.

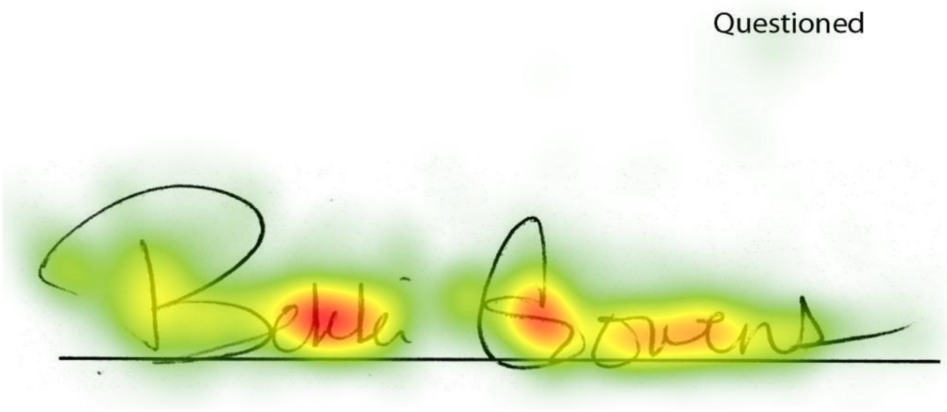
Figure Gowens 1. Single Signature Stimulus for Bekki Gowens.



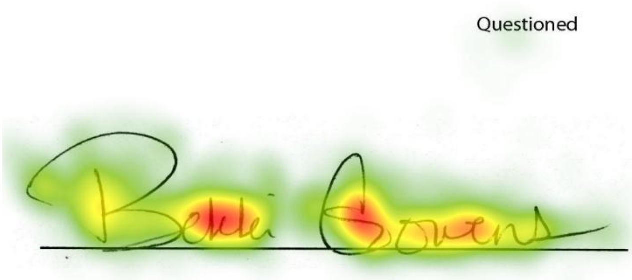
Selection of Areas of Interest (AOIs)

Figure Gowens 2 presents the heat map for this slide. Empirical examination of the heat map revealed that there were two locations indicated by red "hot spots" within the signature that elicited significant attention from the participants. AOIs were created for these specific hot spots. Larger, secondary AOIs incorporating the smaller hot spots were created to include the orange "warm spots," creating a total of five AOIs (including the AOI for the questioned signature, labeled *Gowens All*) for this stimulus.

Figure Gowens 2. Heat maps for Gowens Signature demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs. The overall heat map is displayed below. Separate heat maps for FDEs and Lay Participants are displayed underneath.

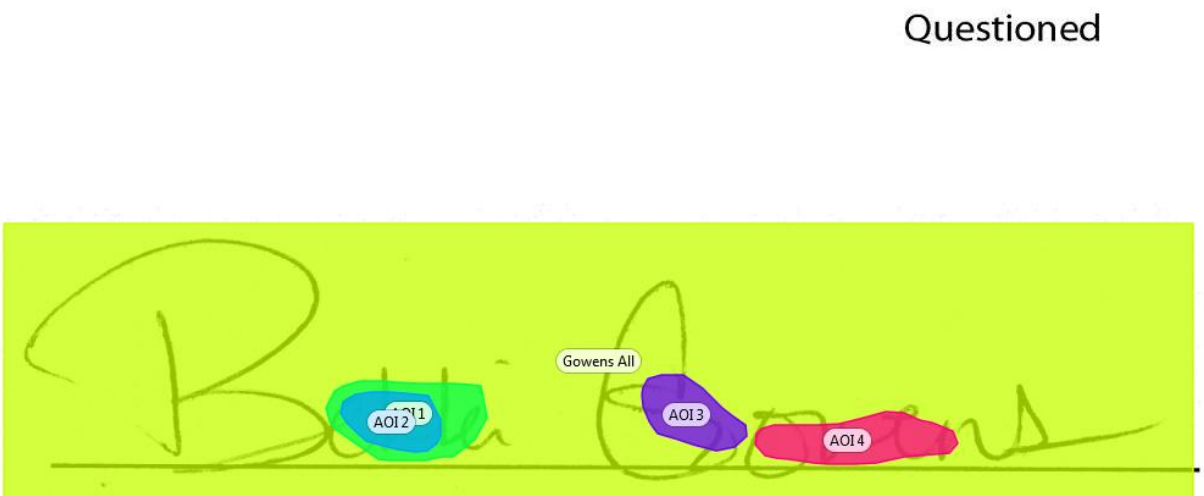


FDE



LAY

Figure Gowens 3. Areas of Interest (AOIs) for Signature Bekki Gowens



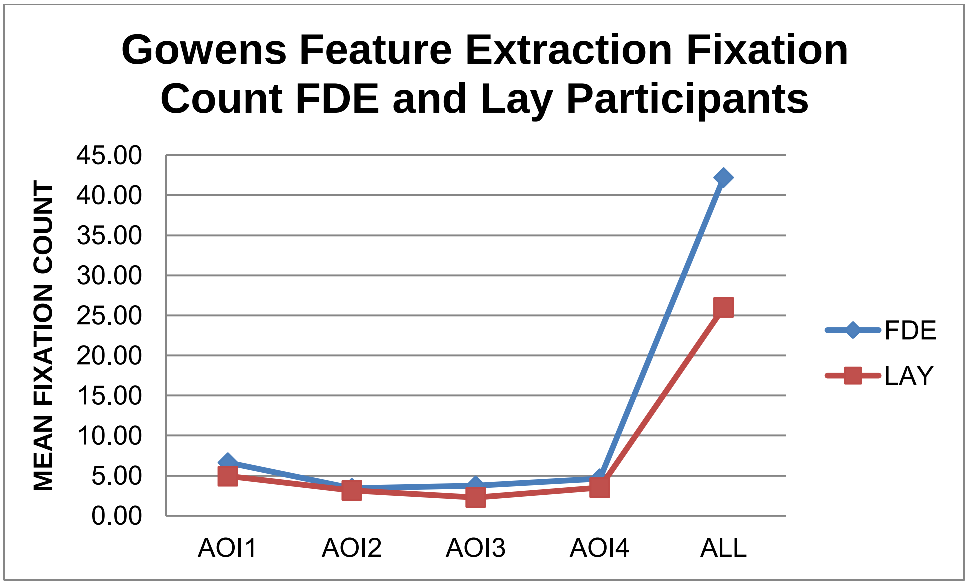
Eye-Tracking Metrics Analyses

These analyses investigate the participants' overall utilization of characteristics in the signature stimulus, and the participants' deployment of attentional resources to specific characteristics that the heat map indicated were particularly diagnostic during the examination. The examination process analyses are based on AOIs in the signature, and the overall signature analysis (the AOI overlaying the entire signature designated *Gowens All*). Figure Gowens 3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .687, F (5, 81) = 35.51, p < .001, multivariate η^2 = .687. Figure Gowens 4 presents the mean fixation counts by AOI.

Figure Gowens 4.



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for only one AOI. Fixation counts were greater among FDEs than among Lay participants for AOI ALL, F (1, 85) = 9.884, p = .002, partial η^2 = .104.

No significant differences were found for AOI 1, p = .216, *ns*; AOI 2, p = .771, *ns*; AOI 3, p = .052, *ns;* or AOI 4, p = .237, *ns*. Table Gowens 1 presents the means and standard deviations for areas of interest by participant type.

Table Gowens 1

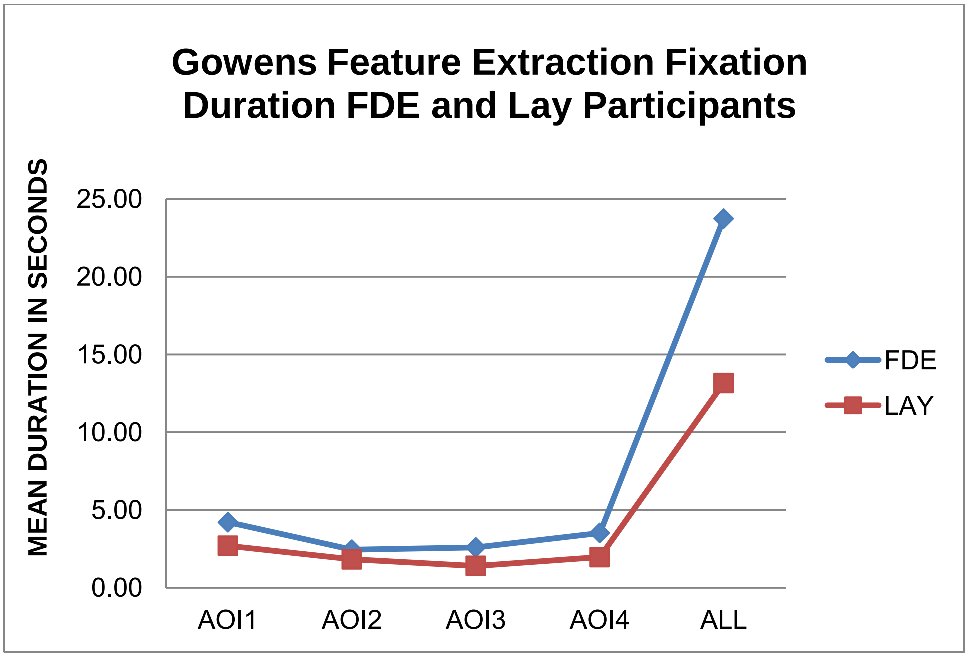
Fixation Counts for FDE and Lay Participants

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	6.62	7.80	3.43	5.32	3.72	3.84
Lay	4.93	3.90	3.15	2.95	2.28	2.84
	AOI4		**ALL**			
Participant	***M***	***SD***	***M***	***SD***		
FDE	4.62	5.04	42.21	26.78		
Lay	3.50	3.40	26.00	20.16		

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .626, F (5, 81) = 27.12, p < .001, multivariate η^2 = .115. Figure Gowens 5 presents the mean fixation duration by AOI.

Figure Gowens 5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for three AOIs. Fixations duration counts in all significant AOIs were greater for FDEs than for lay participants (AOI 1, F (1, 85) = 4.76, p = .032, partial η^2 = .053; AOL 3, F (1,85) = 1.41, p = .021, η^2 = .061; and AOI ALL, F (1, 85) = 8.28, p = .005, partial η^2 = .089).

No significant differences were found for AOI 2, p = .239, *ns*; AOI 4, p = .059, *ns*. Table Gowens 2 presents the means and standard deviations for areas of interest by participant type.

Table Gowens 2

Process Analysis Fixation Durations for FDE and Lay Participants

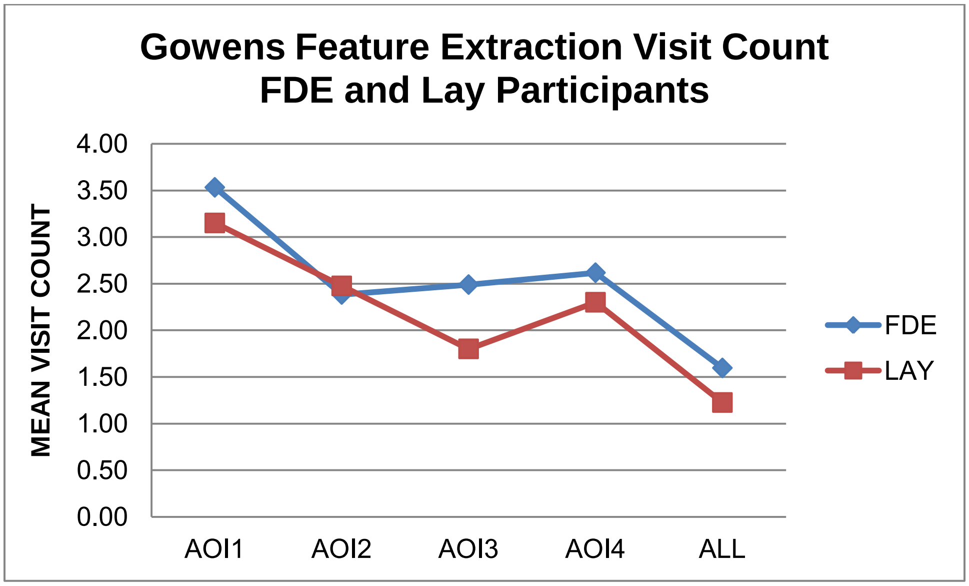
	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	4.21	3.86	2.44	2.84	2.59	2.49
Lay	2.70	2.23	1.82	1.82	1.40	2.15

	AOI4		ALL	
Participant	***M***	***SD***	***M***	***SD***
FDE	3.52	4.44	23.74	20.17
Lay	1.97	2.80	13.16	12.52

Total Visit Count

MANOVA results revealed no significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .837, F (5, 81) = 83.37, p < .001, multivariate η^2 = .837. Figure Gowens 6 presents the mean visit counts by AOI.

Figure Gowens 6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant in only one AOI. Mean visit count was significantly greater among FDEs than among lay participants in AOI ALL, $F(1, 87) = 4.05$, $p = .047$, partial $\eta^2 = .046$.

Although fixation duration was greater for FDEs than Lay participants in all but one of the remaining AOIs, these differences were not statistically significant, AOI 1, $p = .473$, *ns*; AOI 2, $p = .839$, *ns*; AOI 3, $p = .126$, *ns;* and AOI 4, $p = .513$, *ns*). Table Gowens 3 presents the means and standard deviations for areas of interest by participant type.

Table Gowens 3

Visit Counts for FDE and Lay Participants

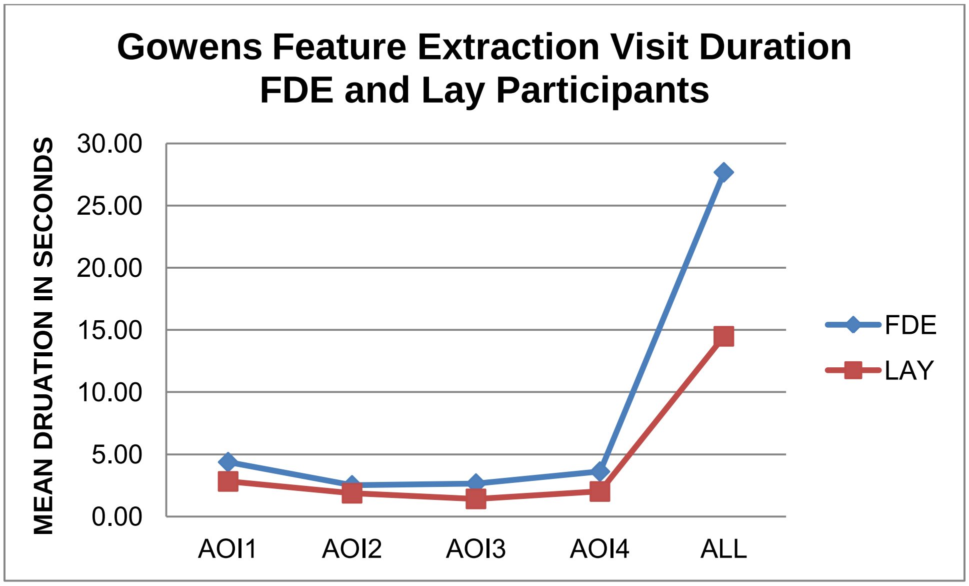
	AOI1		**AOI2**		**AOI3**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	3.53	2.77	2.38	2.25	2.49	1.89
Lay	3.15	2.06	2.48	1.89	1.80	2.28

	AOI4		**ALL**	
Participant	***M***	***SD***	***M***	***SD***
FDE	2.62	2.46	1.60	1.04
Lay	2.30	1.95	1.23	0.58

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .632, F (5, 81) = 27.85, p < .001, multivariate η^2 = .632. Figure Gowens 7 presents the mean visit durations by AOI.

Figure Gowens 7



Follow-up ANOVAS conducted on each dependent variable revealed that visit duration was significantly greater among FDEs than among Lay participants in three of the AOIs (AOI 1, F (1, 85) = 4.41, p = .039, partial η^2 = .049; AOI 3, F (1, 85) = 5.69, p = .019, partial η^2 = .063; and AOI ALL, F (1, 85) = 10.80, p = .001, partial η^2 = .113).

No significant differences were found for AOI 2, p = .839, *ns*; or AOI 4, p = .531, *ns*. Table Gowens 4 presents the means and standard deviations for areas of interest by participant type.

Table Gowens 4

Process Analysis Visit Durations for FDE and Lay Participants

	AOI1		**AOI2**		**AOI3**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	4.38	4.13	2.51	3.00	2.65	2.57
Lay	2.83	2.36	1.88	1.94	1.42	2.19

	AOI4		**ALL**	
Participant	***M***	***SD***	***M***	***SD***
FDE	3.62	4.54	27.69	22.14
Lay	2.02	2.86	14.50	13.44

Decision Confidence Analysis

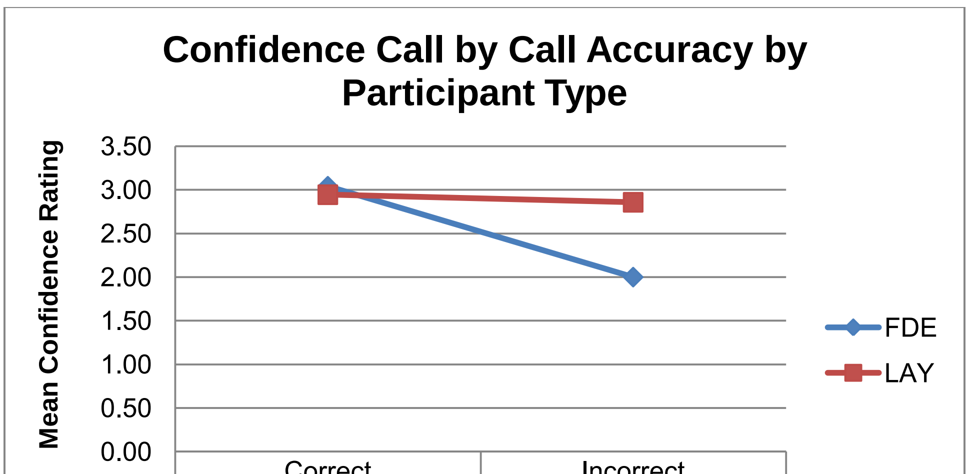
A 2 (FDE vs. Lay participant) x 2 (correct vs. incorrect call) univariate factorial ANOVA was conducted to investigate whether significant differences in level of *call confidence* existed between FDE and Lay participants, and whether significant differences existed according to the accuracy of the call. Table Gowens 5 presents the results of the omnibus analysis.

Table Gowens 5
Two-Way ANOVA Summary Table

Source	*SS*	*df*	*MS*	*F*	*p*	η^2
Between treatments						
Participant Type	.48	1.00	.48	.66	.419	.007
Call Accuracy	1.07	1.00	1.07	1.46	.231	.016
Participant Type x Call Accuracy	.76	1.00	.76	1.04	.311	.012
Within treatments	64.66	88.00	.73			
Total	882.00	92.00				

No significant main effects or significant interaction effects were identified (participant type, p = .419, *ns;* call accuracy, p = .231, *ns;* and participant type by call accuracy, p = .311, *ns*). Figure Gowens 8 demonstrates the mean confidence ratings by call accuracy and participant type.

Figure Gowens 8



	Correct	Incorrect
FDE	3.04	2.00
LAY	2.94	2.86

Conclusions

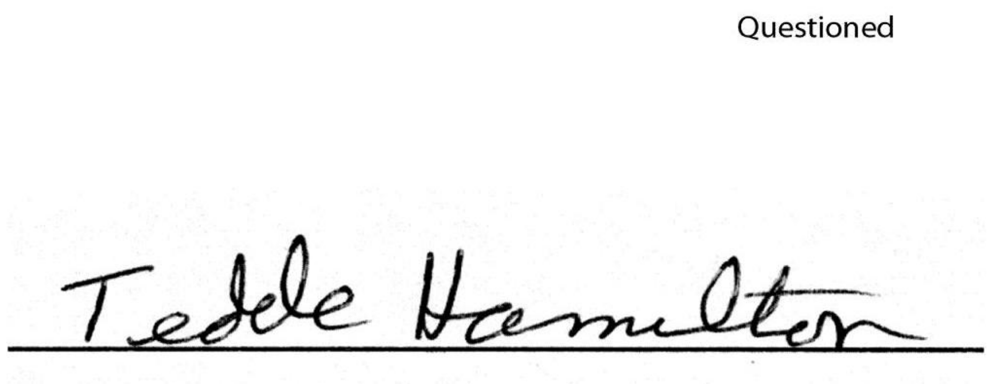
These findings indicate that although FDEs were significantly more accurate than were Lay participants, there was very little difference in their confidence in the accuracy of their calls. Although FDEs who made incorrect calls were less confident than were Lay participants who made incorrect calls, this difference was not statistically significant.

Four areas of interest in addition to the AOI ALL were empirically identified by examining the full sample heat map for this signature. The four eye tracking metrics revealed that overall, FDEs examined the signature significantly more extensively than did Lay participants, fixating a greater number of times on nearly all AOIs, and fixating on those AOIs for a greater period of time. The significant differences in fixation count, fixation duration, and visit duration observed in the AOI "ALL" indicated that FDEs also examined a greater variety of signature features, and spent more time evaluating them, than did Lay participants.

SIGNATURE: Tedde Hamilton (Genuine)

The signature of Tedde Hamilton characterized as a high-complexity text-based signature. Of the 49 FDE participants, 38 responded correctly that the signature was genuine, and 9 responded that the signature was simulated. Of the 43 Lay participants, 21 responded correctly that the signature was genuine, and 22 responded that it was simulated. This difference was statistically significant, χ^2 (1, N = 92) = 10.19, *p* = .001. Figure Hamilton 1 presents the view of this signature.

Figure Hamilton 1. Single Signature Stimulus for Tedde Hamilton.



Selection of Areas of Interest (AOIs)

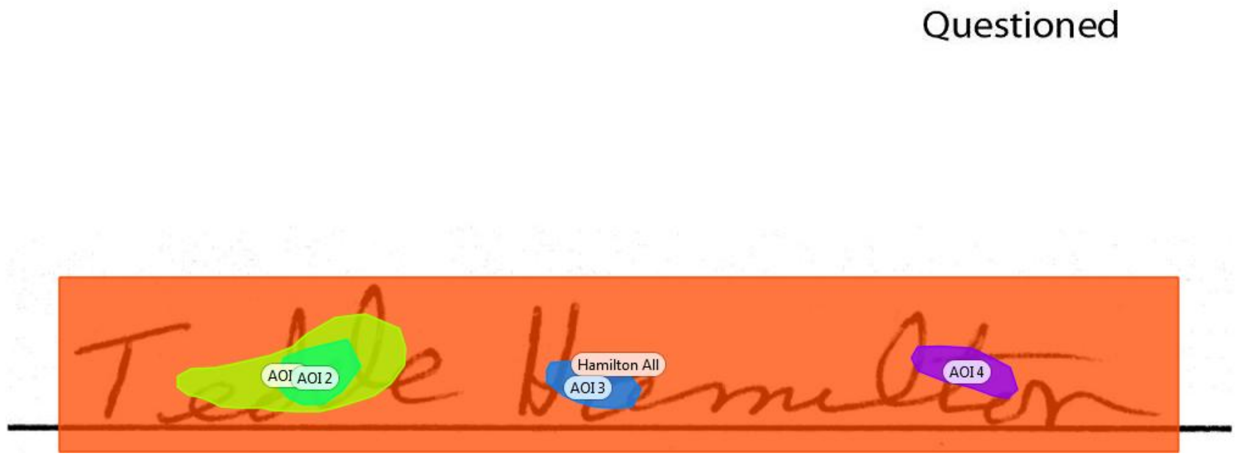
Figure Hamilton 2 presents the heat map for this slide. Empirical examination of the heat map revealed that there was one location indicated by red "hot spots" within the signature that elicited significant attention from the participants. AOIs were created for these specific hot spots. Larger, secondary AOIs incorporating the smaller hot spots were created to include the orange "warm spots," creating a total of five AOIs (including the AOI for the questioned signature, labeled *Hamilton All*) for this stimulus.

Figure Hamilton 2. Heat maps for Hamilton Signature demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs. The overall heat map is displayed below. Separate heat maps for FDEs and Lay Participants are displayed underneath.

FDE

LAY

Figure Hamilton 3. Areas of Interest (AOIs) for Signature Tedde Hamilton



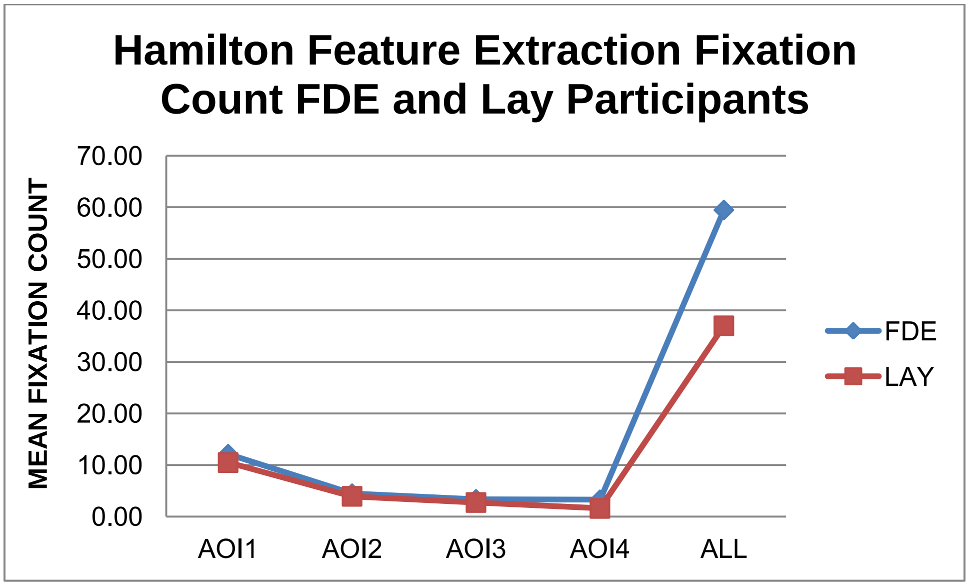
Eye-Tracking Metrics Analyses

These analyses investigate the participants' overall utilization of characteristics in the signature stimulus, and the participants' deployment of attentional resources to specific characteristics that the heat map indicated were particularly diagnostic during the examination. The examination process analyses are based on AOIs in the signature, and the overall signature analysis (the AOI overlaying the entire signature designated *Hamilton All*). Figure Hamilton 3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .637, F (5, 82) = 28.81, p < .001, multivariate η^2 = .637. Figure Hamilton 4 presents the mean fixation counts by AOI.

Figure Hamilton 4.



Follow-up ANOVAS conducted on each dependent variable revealed that although fixation count was greater among FDEs than among Lay participants in all AOIs, no significant differences by participant type were identified (AOI 1, p = .684, *ns*; AOI 2, p = .680, *ns*; AOI 3, p = .449, *ns*; AOI 4, p = .070, *ns*; and AOI ALL, p = .074, *ns*). Table Hamilton 1 presents the means and standard deviations for areas of interest by participant type.

Table Hamilton 1
Fixation Counts for FDE and Lay Participants

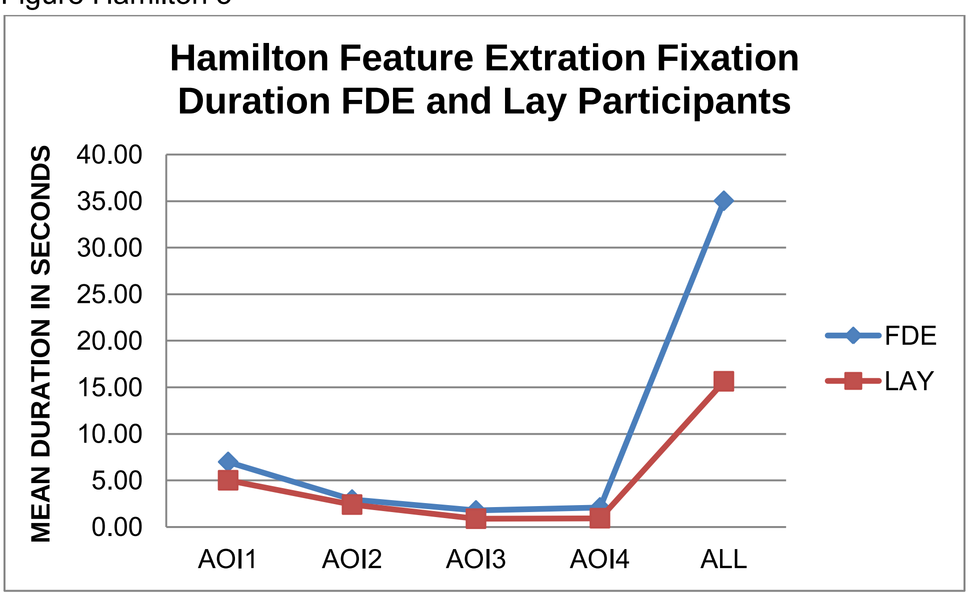
	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	12.11	21.06	4.45	7.10	3.36	4.12
Lay	10.49	15.15	3.93	4.03	2.73	3.57

	AOI4		ALL	
Participant	***M***	***SD***	***M***	***SD***
FDE	3.26	5.24	59.49	59.33
Lay	1.59	2.72	37.02	56.78

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .538, F (5, 82) = 19.08, p < .001, multivariate η^2 = .538. Figure Hamilton 5 presents the mean fixation duration by AOI.

Figure Hamilton 5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for two of the AOIs. Fixation durations were significantly greater among FDEs than among Lay participants in AOI 3, F (1, 86) = 5.49, p = .021, partial η^2 = .060; and AOI ALL, F (1, 86) = 11.63, p = .001, η^2 = .119.

No significant differences were found for AOI 1, p = .218, *ns*; AOI 2, p = .466, *ns;* or AOI 4, p = .055, *ns*. Table Hamilton 2 presents the means and standard deviations for areas of interest by participant type.

Table Hamilton 2

Process Analysis Fixation Durations for FDE and Lay Participants

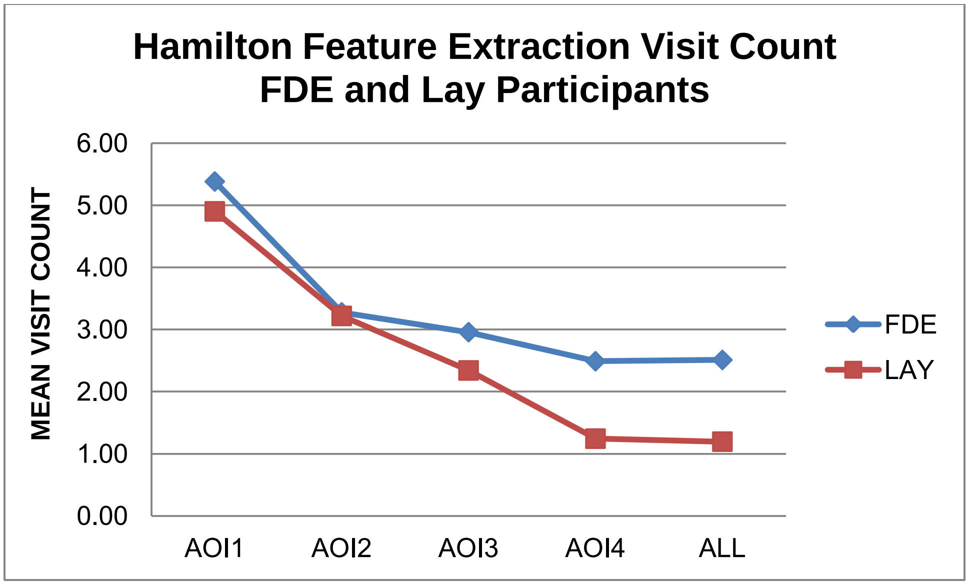
	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	6.97	8.72	2.93	3.66	1.76	2.15
Lay	5.00	5.63	2.39	3.19	0.87	1.21

	AOI4		ALL	
Participant	***M***	***SD***	***M***	***SD***
FDE	2.08	3.47	35.02	31.92
Lay	0.92	1.67	15.63	18.74

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .683, F (5, 82) = 35.38, p < .001, multivariate η^2 = .683. Figure Hamilton 6 presents the mean visit counts by AOI.

Figure Hamilton 6



Follow-up ANOVAS conducted on each dependent variable revealed visit count was significantly greater among FDEs than among Lay participants in two AOIs (AOI 4, F (1, 86) = 4.54, p = .036, partial η^2 = .050; and AOI ALL, F (1, 86) = 9.36, p = .003, partial η^2 = .098).

No significant differences were found for AOI 1, F (1, 86) = 0.17, p = .684, partial η^2 = .002, *ns*; AOI 2, F (1, 86) = 0.01, p = .943, partial η^2 = .000, *ns*; AOI 3, F (1, 86) = 0.85, p = .360, partial η^2 = .010, *ns*. Table Hamilton 3 presents the means and standard deviations for areas of interest by participant type.

Table Hamilton 3
Visit Counts for FDE and Lay Participants

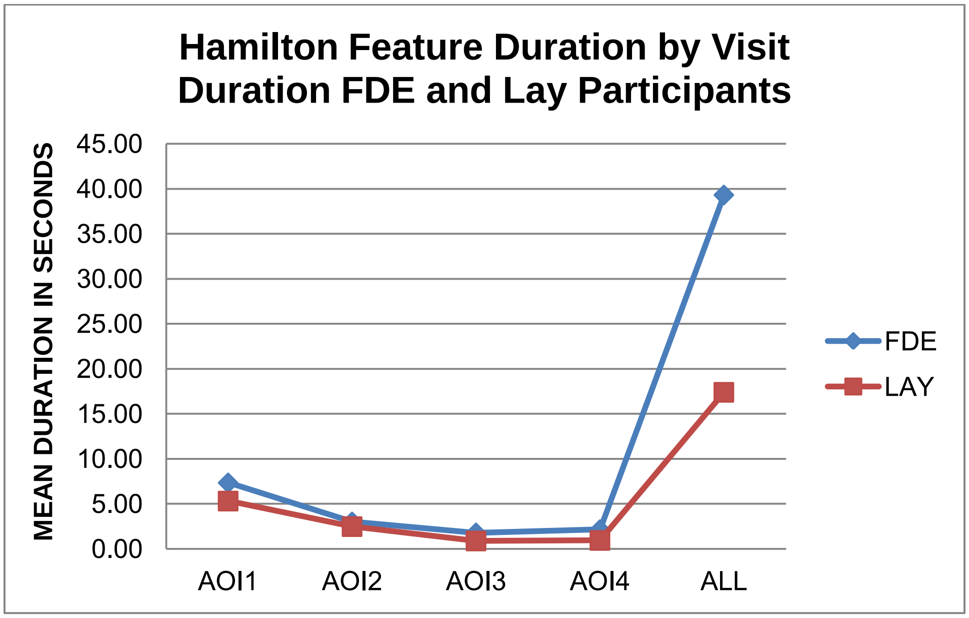
	AOI1		**AOI2**		**AOI3**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	5.38	4.96	3.28	4.28	2.96	3.39
Lay	4.90	6.08	3.22	3.05	2.34	2.82

	AOI4		**ALL**	
Participant	***M***	***SD***	***M***	***SD***
FDE	2.49	3.11	2.51	2.71
Lay	1.24	2.23	1.20	0.51

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .567, F (5, 82) = 21.47, p < .001, multivariate η^2 = .567. Figure Hamilton 7 presents the mean visit counts by AOI.

Figure Hamilton 7



Follow-up ANOVAS conducted on each dependent variable revealed visit duration was significantly greater among FDEs than among Lay participants in AOI 3, F (1, 86) = 5.48, p = .022, partial η^2 = .060; and AOI ALL, F (1, 86) = 12.35, p = .001, partial η^2 = .126.

There were no significant differences found for AOI 1, p = .254, *ns;* AOI 2, p = .495, *ns*; or AOI 4, although this difference approached significance, p = .052, *ns*). Table Hamilton 4 presents the means and standard deviations for areas of interest by participant type.

Table Hamilton 4

Process Analysis Visit Durations for FDE and Lay Participants

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	7.34	9.78	3.00	3.78	1.78	2.18
Lay	5.31	6.04	2.48	3.34	0.88	1.23

	AOI4		ALL	
Participant	***M***	***SD***	***M***	***SD***
FDE	2.15	3.57	39.32	34.66
Lay	0.94	1.68	17.40	21.24

Decision Confidence Analysis

A 2 (FDE vs. Lay participant) x 2 (correct vs. incorrect call) univariate factorial ANOVA was conducted to investigate whether significant differences in level of *call confidence* existed between FDE

and Lay participants, and whether significant differences existed according to the accuracy of the call. Table Hamilton 5 presents the results of the omnibus analysis.

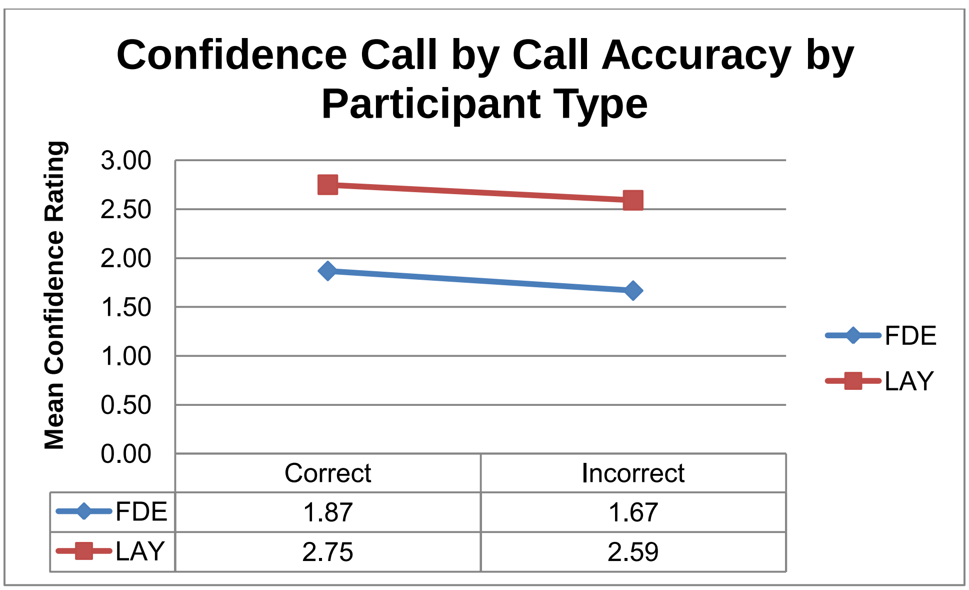
Table Hamilton 5

Two-Way ANOVA Summary Table

Source	*SS*	*df*	*MS*	*F*	*p*	η^2
Between treatments						
Participant Type	14.00	1.00	14.00	31.82	.000	.272
Call Accuracy	0.56	1.00	0.56	1.27	.263	.015
Participant Type x Call Accuracy	0.01	1.00	0.01	0.02	.894	.000
Within treatments	37.41	85.00	0.44			
Total	494.00	89.00				

Call confidence was significantly greater among Lay participants than among FDEs, $F\ (1, 89) = 31.82$, $p < .001$, partial $\eta^2 = .272$. There was no main effect for call accuracy, $p = .263$, *ns;* and no significant interaction effect for participant type by call accuracy, $p = .894$, *ns*. Figure Hamilton 8 demonstrates the mean confidence ratings by call accuracy and participant type.

Figure Hamilton 8



Conclusions

These findings indicate that although FDEs were significantly more accurate than were Lay participants, they were also significantly less confident in the accuracy of their calls, on average rating their confidence level for both correct calls and incorrect calls at *not at all confident*, compared to Lay participants, who on average rated both their correct call and incorrect call confidence at the *somewhat confident* level.

Four areas of interest in addition to AOI ALL were empirically identified by examining the full sample heat map for this signature. The four eye tracking metrics revealed that overall, FDEs examined the signature significantly more extensively than did Lay participants, fixating a greater number of times on all AOIs, and fixating on those AOIs for a greater period of time. The significant differences in fixation duration, visit count, and visit duration observed in the AOI "ALL" indicated that FDEs also examined a greater variety of signature features, and spent more time evaluating them, than did Lay participants.

SIGNATURE: Kim Hammond (Genuine)

The signature of Kim Hammond is characterized as a low-complexity stylized signature. Of the 49 FDE participants, all responded correctly that the signature was genuine. Of the 43 Lay participants, 35 responded correctly that the signature was genuine, and 8 responded that it was simulated. This difference was statistically significant, χ^2 (1, N = 92) = 9.98, p = .002. Figure Hammond 1 presents the view of this signature.

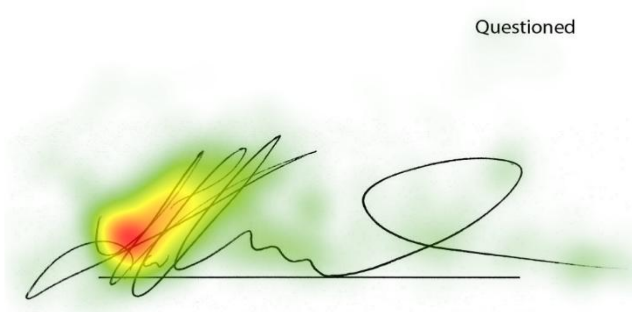
Figure Hammond 1. Single Signature Stimulus for Kim Hammond.

Selection of Areas of Interest (AOIs)

Figure Hammond 2 presents the heat map for this slide. Empirical examination of the heat map revealed that there was one location indicated by a red "hot spot" within the signature that elicited significant attention from the participants. AOIs were created for these specific hot spots. Larger, secondary AOIs incorporating the smaller hot spots were created to include the orange "warm spots", creating a total of three AOIs (including the AOI for the questioned signature, labeled *Hammond All*) for this stimulus.

Figure Hammond 2. Heat maps for Hammond Signature demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs. The overall heat map is displayed below. Separate heat maps for FDEs and Lay Participants are displayed underneath.

FDE



LAY

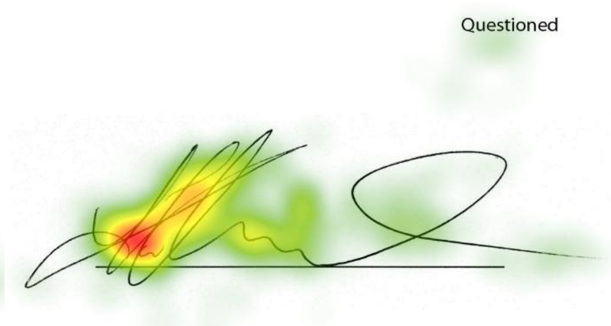
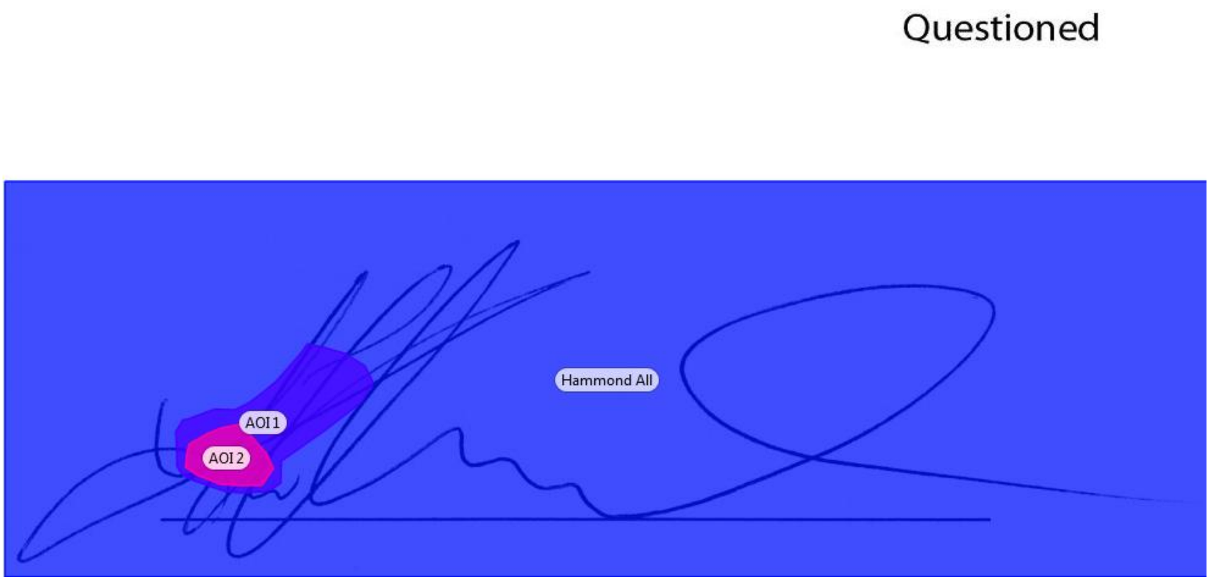


Figure Hammond 3. Areas of Interest (AOIs) for Signature Kim Hammond.



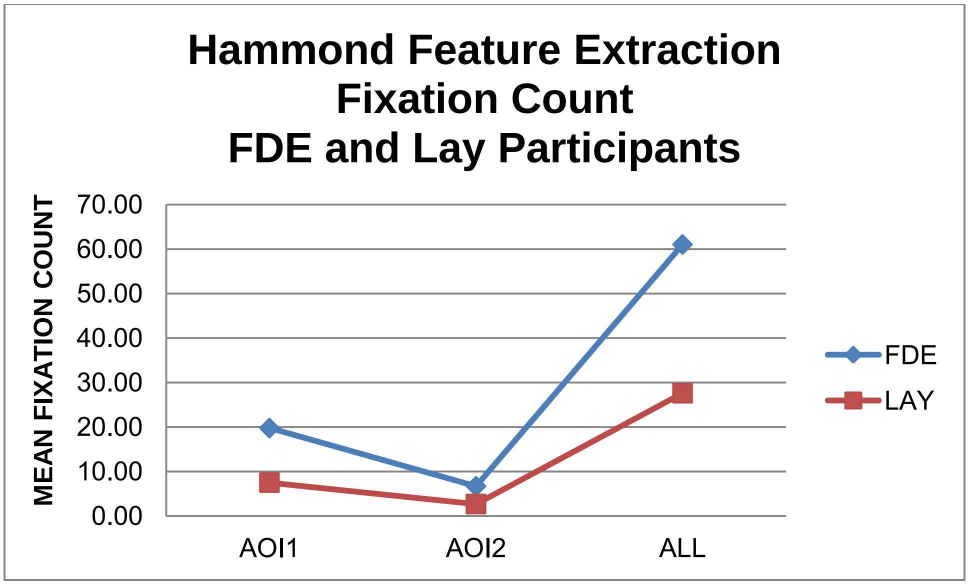
Eye-Tracking Metrics Analyses

These analyses investigate the participants' overall utilization of characteristics in the signature stimulus, and the participants' deployment of attentional resources to specific characteristics that the heat map indicated were particularly diagnostic during the examination. The examination process analyses are based on AOIs in the signature, and the overall signature analysis (the AOI overlaying the entire signature designated *Hammond All*). Figure Hammond 3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .634, F (3, 85) = 49.23, p < .001, multivariate η^2 = .634. Figure Hammond 4 presents the mean fixation counts by AOI.

Figure Hammond 4.



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for all AOIs. Fixations counts in all significant AOIs were greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 8.47$, $p = .005$, partial $\eta^2 = .089$; AOI 2, $F(1, 87) = 6.75$, $p = .011$, partial $\eta^2 = .072$; and AOI ALL, $F(1, 87) = 16.26$, $p < .001$, partial $\eta^2 = .157$). Table Hammond 1 presents the means and standard deviations for areas of interest by participant type.

Table Hammond 1

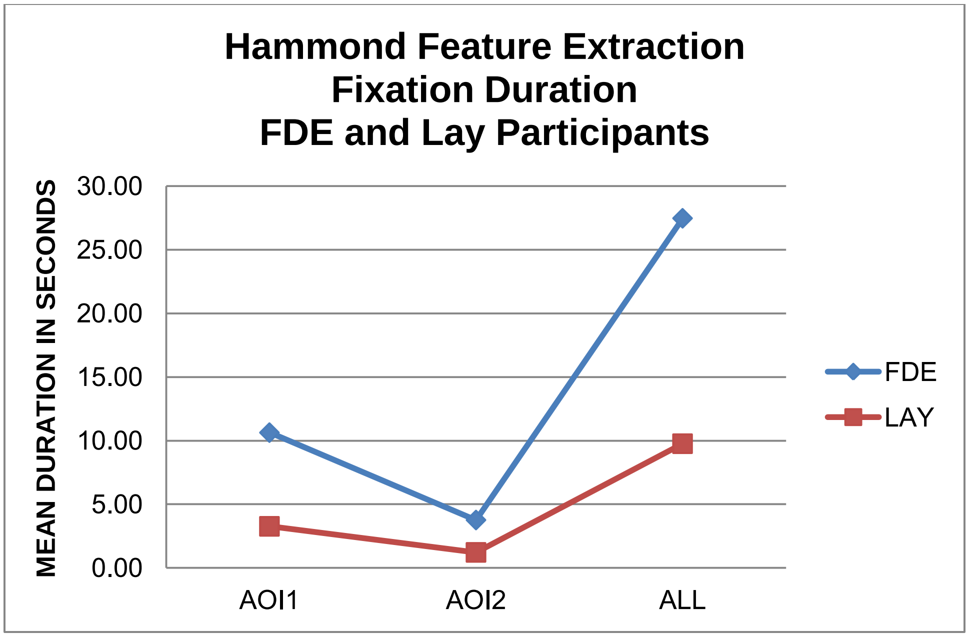
Fixation Counts for FDE and Lay Participants

	AOI1		**AOI2**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	19.74	26.30	6.67	9.55	61.02	50.03
LAY	7.49	8.64	2.67	3.36	27.58	22.00

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .566, $F(3, 85) = 37.02$, $p < .001$, multivariate $\eta^2 = .566$. Figure Hammond 5 presents the mean fixation duration by AOI.

Figure Hammond 5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for all AOIs. Fixation durations in all significant AOIs were greater for FDEs than for lay participants (AOI 1, $F(1, 87) = 12.46$, $p = .001$, partial $\eta^2 = .125$; AOI 2, $F(1, 87) = 12.58$, $p = .001$, partial $\eta^2 = .126$; and AOI ALL, $F(1, 87) = 20.83$, $p < .001$, partial $\eta^2 = .193$). Table Hammond 2 presents the means and standard deviations for areas of interest by participant type.

Table Hammond 2

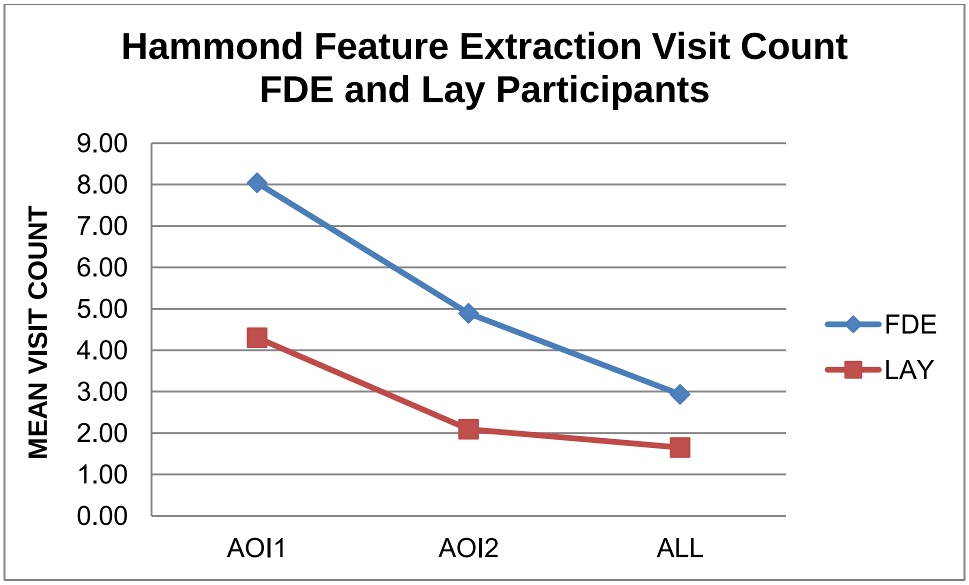
Process Analysis Fixation Durations for FDE and Lay Participants

	AOI1		AOI2		ALL	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	10.63	13.00	3.76	4.25	27.47	24.07
LAY	3.27	4.42	1.22	2.07	9.76	8.51

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .642, $F(3, 85) = 50.70$, $p < .001$, multivariate $\eta^2 = .642$. Figure Hammond 6 presents the mean visit counts by AOI.

Figure Hammond 6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for all AOIs. Fixations counts in all significant AOIs were greater for FDEs than for lay participants (AOI 1, $F(1, 87) = 8.86$, $p = .004$, partial $\eta^2 = .092$; AOI 2, $F(1, 87) = 8.88$, $p = .004$, partial $\eta^2 = .093$; AOI ALL, $F(1, 87) = 5.64$, $p = .020$, partial $\eta^2 = .061$). Table Hammond 3 presents the means and standard deviations for areas of interest by participant type.

Table Hammond 3

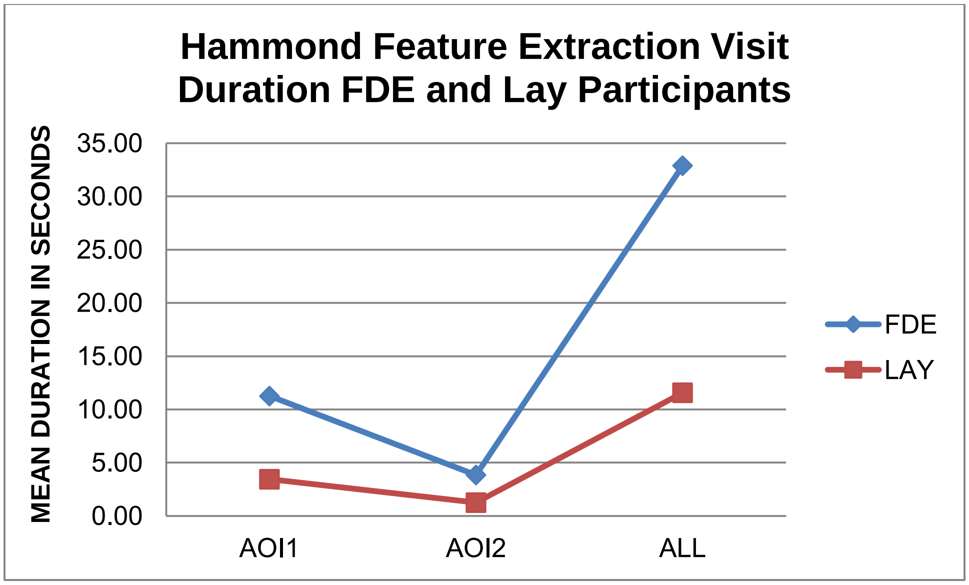
Visit Counts for FDE and Lay Participants

	AOI1		**AOI2**		**ALL**	
Participants	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	8.04	7.01	4.89	5.71	2.93	3.42
LAY	4.30	4.49	2.09	2.38	1.65	0.97

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .591, F (3, 85) = 40.94, $p < .001$, multivariate $\eta^2 = .591$. Figure Hammond 7 presents the mean visit durations by AOI.

Figure Hammond 7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for all AOIs. Fixation counts in all significant AOIs were greater for FDEs than for lay participants (AOI 1, $F(1, 87) = 12.73$, $p = .001$, partial $\eta^2 = .128$; AOI 2, $F(1, 87) = 12.66$, $p = .001$, partial $\eta^2 = .127$; and AOI ALL, $F(1, 87) = 23.88$, $p < .001$, partial $\eta^2 = .215$). Table Hammond 4 presents the means and standard deviations for areas of interest by participant type.

Table Hammond 4
Process Analysis Visit Durations for FDE and Lay Participants

	AOI1		**AOI2**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	11.25	13.64	3.84	4.34	32.89	27.06
LAY	3.44	4.59	1.24	2.08	11.56	9.60

Decision Confidence Analysis

A 2 (FDE vs. Lay participant) x 2 (correct vs. incorrect call) univariate factorial ANOVA was conducted to investigate whether significant differences in level of *call confidence* existed between FDE and Lay participants, and whether significant differences existed according to the accuracy of the call. Table Hammond 5 presents the results of the omnibus analysis.

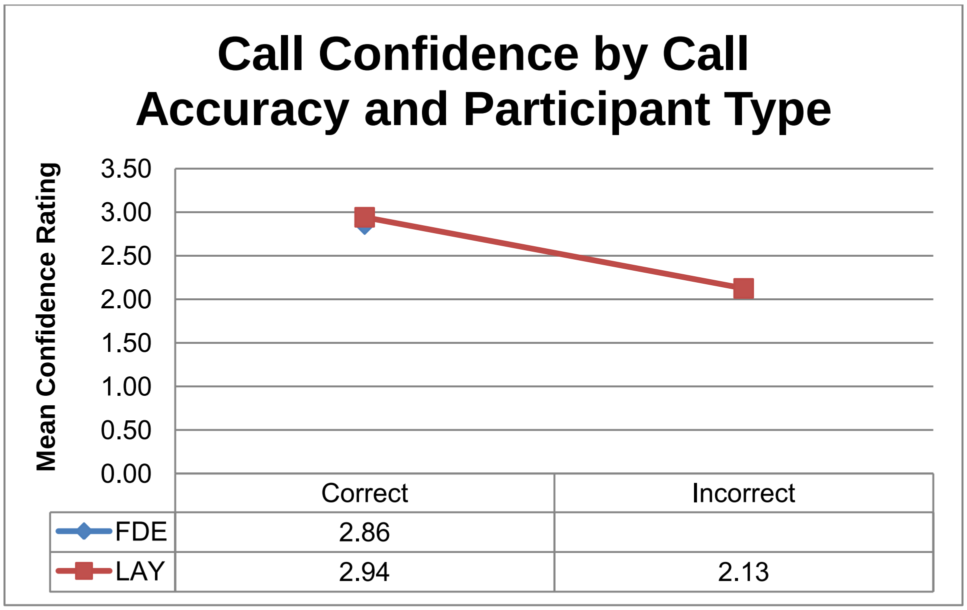
Table Hammond 5
Two-Way ANOVA Summary Table

Source	***SS***	***df***	***MS***	***F***	***p***	η^2
Between treatments						

Participant Type	.14	1.00	.14	.19	.662	.002
Call Accuracy	4.31	1.00	4.31	5.86	.018	.062
Participant Type x Call Accuracy	.00	.00				0.000
Within treatments	64.76	88.00	.74			
Total	795.00	91.00				

Main effect results revealed that call confidence was significantly different between the two participant types, $F(1, 87) = 48.50$, $p < .001$, partial $\eta^2 = .358$. No significant difference was found in confidence for call accuracy, $F(1, 87) = 0.74$, $p = .392$, partial $\eta^2 = .008$, *ns*. No significant interaction effect was found between participant type and call accuracy, $F(1, 87) = 1.36$, $p = .247$, partial $\eta^2 = .015$. Figure Hammond 8 demonstrates the mean confidence ratings by call accuracy and participant type.

Figure Hammond 8



Conclusions

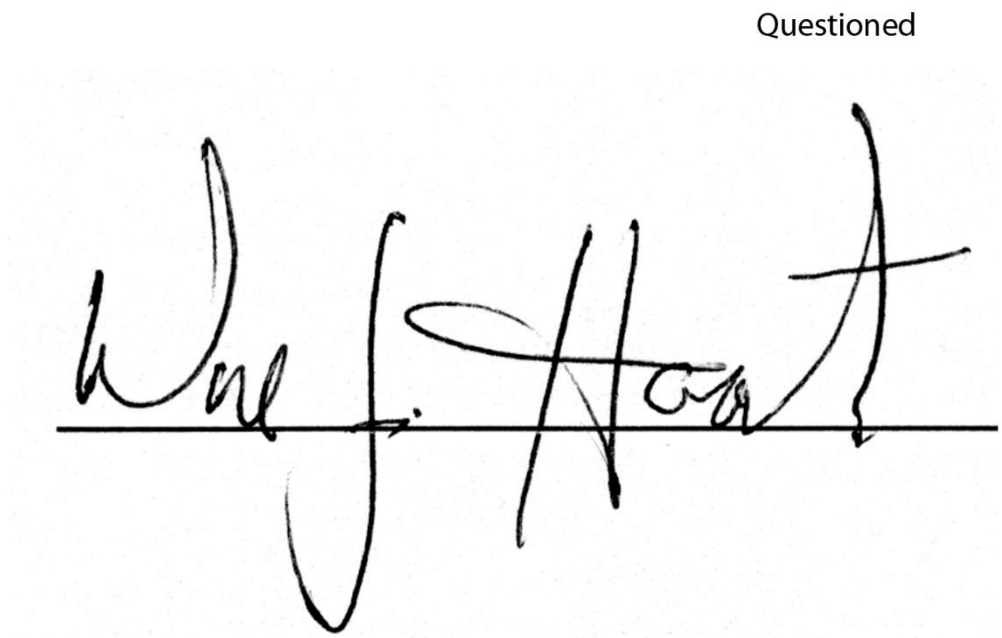
These findings indicate that FDEs were significantly more accurate than were Lay participants. A significant main effect was found for call accuracy, such that Lay participants who made correct calls were rated their confidence near the *moderately confident* level, while those who made incorrect calls rated their confidence at the *somewhat confident* level. FDEs who made correct calls also rated their confidence near the *moderately confident* level. No main effect or interaction effects were calculated because call accuracy was constant for FDEs.

Two areas of interest in addition to the AOI ALL were empirically identified by examining the full sample heat map for this signature. The four eye tracking metrics revealed that in every instance, FDEs examined the signature significantly more extensively than did Lay participants, fixating a greater number of times on all AOIs, and fixating on those AOIs for a greater period of time. The significant differences in fixation count, fixation duration, visit count, and visit duration observed in the AOI “ALL” indicated that FDEs also examined a greater variety of signature features, and spent more time evaluating them, than did Lay participants.

SIGNATURE: William Harper (Simulated)

The signature of William Harper is characterized as a low-complexity mixed signature. Of the 49 FDE participants, 32 responded correctly that the signature was simulated, and 17 responded that the signature was genuine. Of the 43 Lay participants, 28 responded correctly that the signature was simulated, and 15 responded that it was genuine. This difference was not statistically significant, χ^2 (1, N = 92) = 0.00, p = .985. Figure Harper 1 presents the view of this signature.

Figure Harper 1. Single Signature Stimulus for William Harper.



Selection of Areas of Interest (AOIs)

Figure Harper 2 presents the heat map for this slide. Empirical examination of the heat map revealed that there was one location indicated by a red "hot spots" within the signature that elicited significant attention from the participants. An AOI was created for this specific hot spot. Larger, secondary AOIs incorporating the smaller hot spots were created to include the orange "warm spots," creating a total of five AOIs (including the AOI for the questioned signature, labeled *Harper All*) for this stimulus.

Figure Harper 2. Heat maps for Harper Signature demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs. The overall heat map is displayed below. Separate heat maps for FDEs and Lay Participants are displayed underneath.

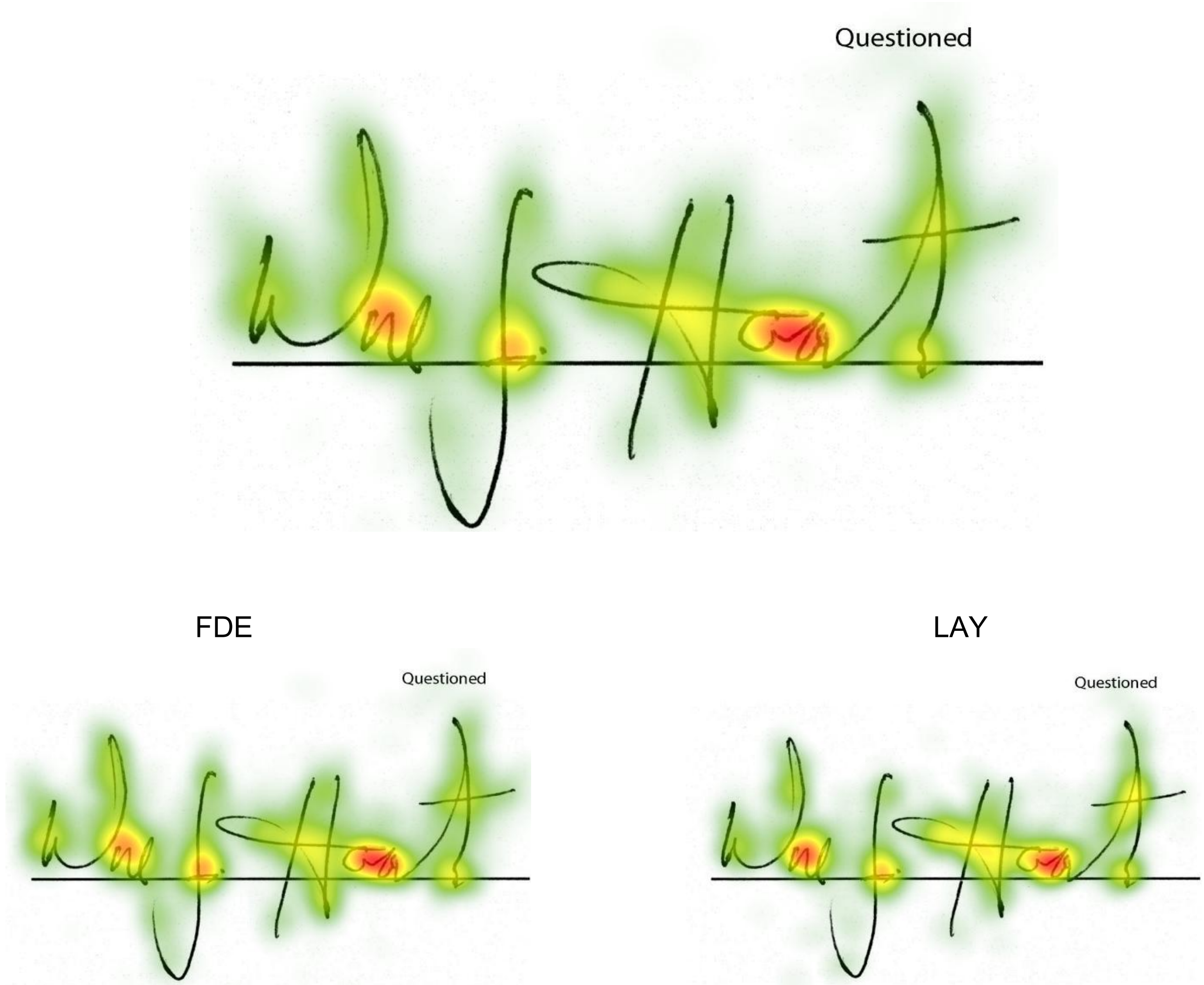


Figure Harper 3. Areas of Interest (AOIs) for Signature William Harper

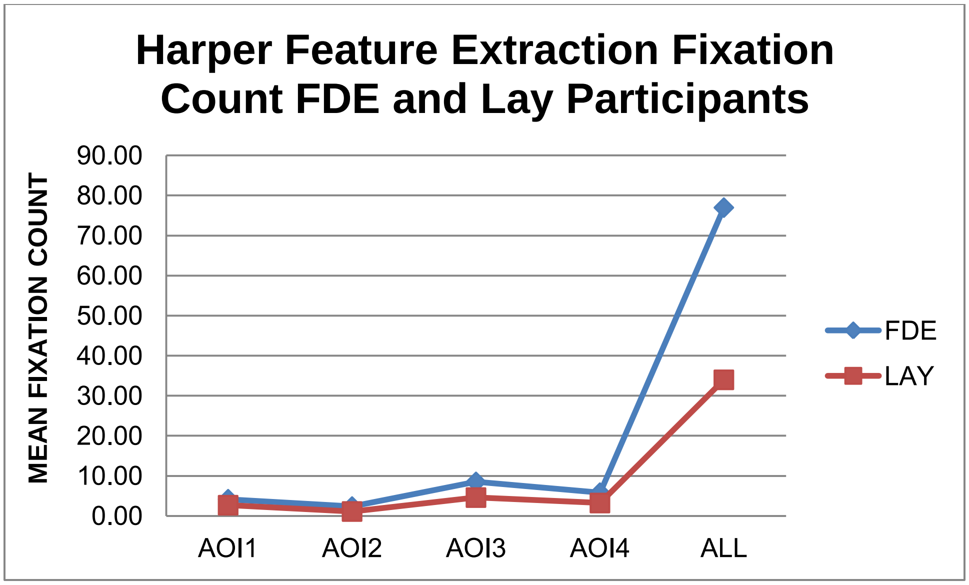
Eye-Tracking Metrics Analyses

These analyses investigate the participants' overall utilization of characteristics in the signature stimulus, and the participants' deployment of attentional resources to specific characteristics that the heat map indicated were particularly diagnostic during the examination. The examination process analyses are based on AOIs in the signature, and the overall signature analysis (the AOI overlaying the entire signature designated *Harper All*). Figure Harper 3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .651, F (5, 83) = 31.00, p < .001, multivariate η^2 = .651. Figure Harper 4 presents the mean fixation counts by AOI.

Figure Harper 4.



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for all but one of the AOIs. Fixation counts were significantly greater among FDEs than among Lay participants in AOI 2, F (1, 87) = 5.86, p = .018, partial η^2 = .063; AOI 3, F (1, 87) = 7.32, p = .008, partial η^2 = .078; AOI 4, F(1, 87) = 6.01, p = .016, partial η^2 = .065; and AOI ALL, F (1, 87) = 19.65, p < .001, partial η^2 = .184.

No significant differences was found for AOI 1, p = .211, *ns*. Table Harper 1 presents the means and standard deviations for areas of interest by participant type.

Table Harper 1

Fixation Counts for FDE and Lay Participants

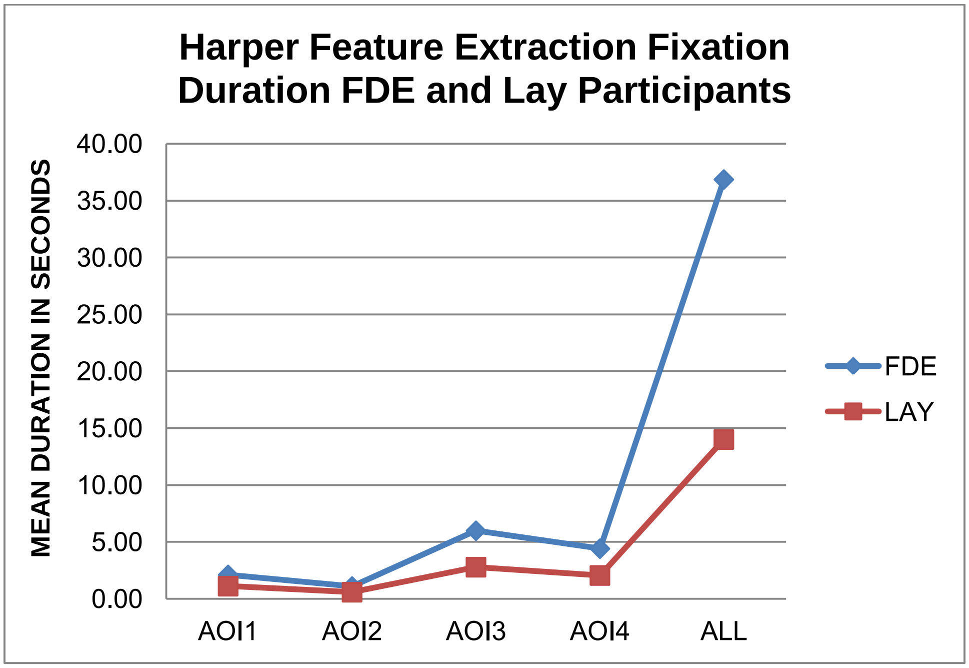
	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	4.17	7.17	2.34	3.12	8.49	8.58
Lay	2.67	3.07	1.10	1.23	4.57	4.01

	AOI4		ALL	
Participant	***M***	***SD***	***M***	***SD***
FDE	5.81	6.26	76.98	56.45
Lay	3.21	2.95	33.98	29.20

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .649, F (5, 83) = 30.64, p < .001, multivariate η^2 = .649. Figure Harper 5 presents the mean fixation duration by AOI.

Figure Harper 5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for all but one of the AOIs. Fixation durations in all significant AOIs were greater for FDEs than for lay participants (AOI 1, F (1, 87) = 6.58, p = .012, partial η^2 = .070; AOI 3, F (1,87) = 16.40, p < .001, η^2 = .159; AOI 4, F (1, 87) = 11.65, p < .001, partial η^2 = .118; and AOI ALL, F (1, 87) = 25.02, p < .001, partial η^2 = .223).

No significant differences were found for AOI 2, p = .051, *ns*. Table Harper 2 presents the means and standard deviations for areas of interest by participant type.

Table Harper 2

Process Analysis Fixation Durations for FDE and Lay Participants

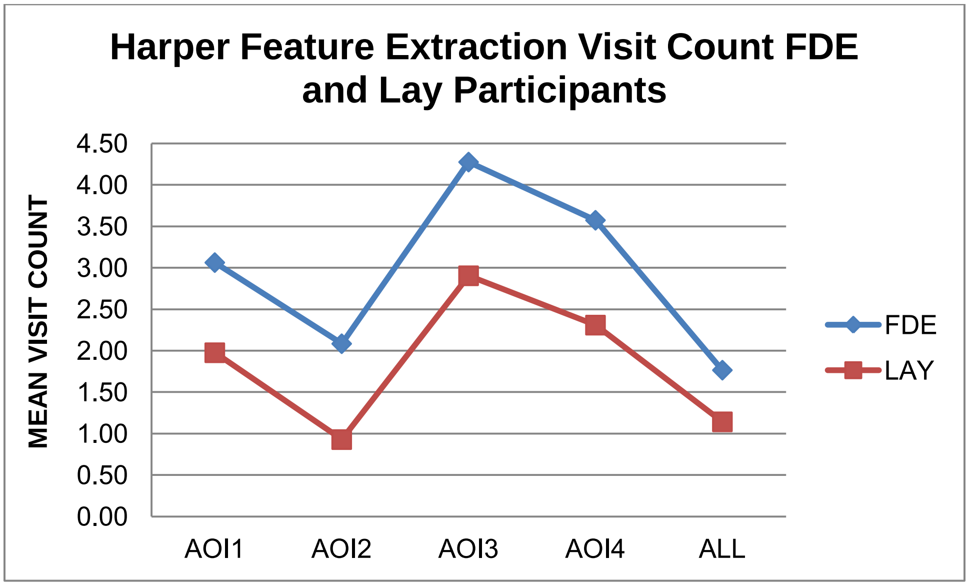
	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.11	2.27	1.09	1.17	5.99	4.43
Lay	1.12	1.11	0.59	1.23	2.79	2.73

	AOI4		ALL	
Participant	***M***	***SD***	***M***	***SD***
FDE	4.41	3.92	36.86	27.39
Lay	2.06	2.25	14.02	11.83

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .748, F (5, 83) = 49.39, p < .001, multivariate η^2 = .748. Figure Harper 6 presents the mean visit counts by AOI.

Figure Harper 6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for all but one AOI (AOI 2, F (1, 87) = 6.26, p = .014, partial η^2 = .067; AOI 3, F (1, 87) = 4.07, p = .047, partial η^2 = .045; AOI 4, F (1, 87) = 4.29, p = .041, partial η^2 = .047; AOI ALL, F (1, 87) = 8.18, p = .005, partial η^2 = .086).

No significant differences were found for AOI 1, p = .014, *ns*. Table Harper 3 presents the means and standard deviations for areas of interest by participant type.

Table Harper 3

Visit Counts for FDE and Lay Participants

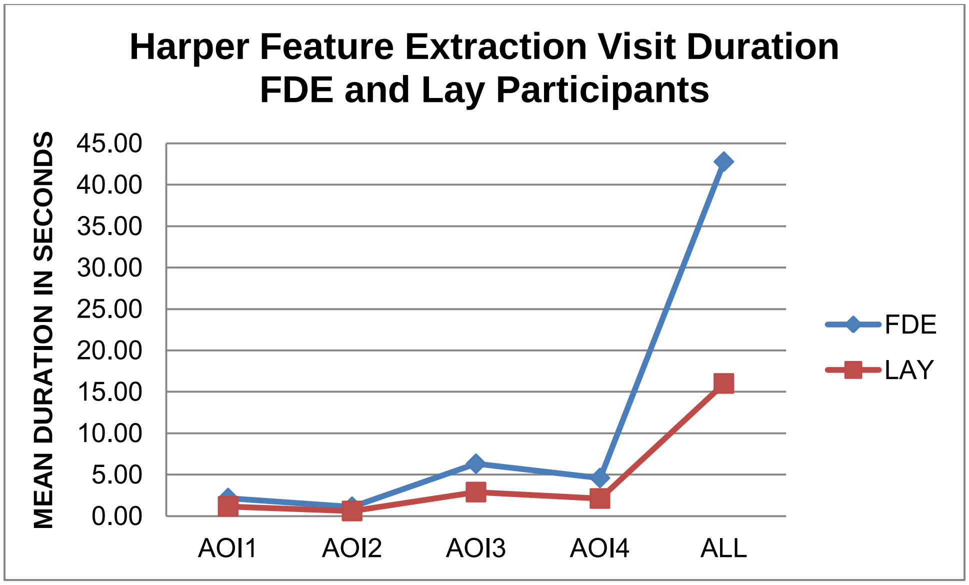
	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	3.06	3.70	2.09	2.85	4.28	3.79
Lay	1.98	1.46	0.93	0.97	2.90	2.39

	AOI4		ALL	
Participant	***M***	***SD***	***M***	***SD***
FDE	3.57	3.54	1.77	1.35
Lay	2.31	1.88	1.14	0.42

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .656, F (5, 83) = 31.77, p < .001, multivariate η^2 = .656. Figure Harper 7 presents the mean visit counts by AOI.

Figure Harper 7



Follow-up ANOVAS conducted on each dependent variable revealed that visit durations were significantly greater among FDEs than among Lay participants for all the AOIs (AOI 1, F (1, 87) = 5.85, p = .018, partial η^2 = .063; AOI 2, F (1, 87) = 4.06, p = .047, partial η^2 = .045; AOI 3, F (1, 87) = 17.17, p < .001, partial η^2 = .165; AOI 4, F (1, 87) = 12.12, p = .001, partial η^2 = .122; AOI ALL, F (1, 87) = 28.04, p < .001, partial η^2 = .244). Table Harper 4 presents the means and standard deviations for areas of interest by participant type.

Table Harper 4

Process Analysis Visit Durations for FDE and Lay Participants

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.16	2.47	1.12	1.19	6.31	4.67
Lay	1.16	1.16	0.60	1.24	2.88	2.77

	AOI4		ALL	
Participant	***M***	***SD***	***M***	***SD***
FDE	4.58	4.09	42.78	30.40
Lay	2.10	2.28	15.99	12.93

Decision Confidence Analysis

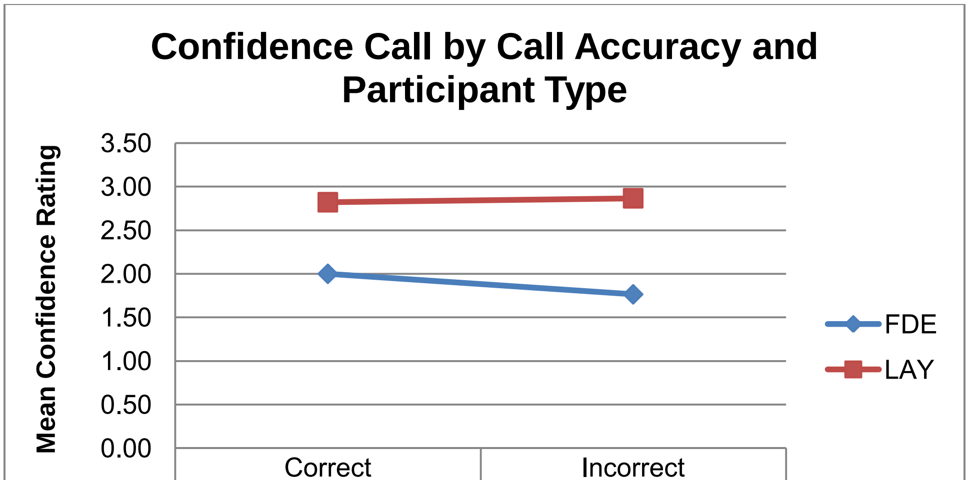
A 2 (FDE vs. Lay participant) x 2 (correct vs. incorrect call) univariate factorial ANOVA was conducted to investigate whether significant differences in level of *call confidence* existed between FDE and Lay participants, and whether significant differences existed according to the accuracy of the call. Table Harper 5 presents the results of the omnibus analysis.

Table Harper 5
Two-Way ANOVA Summary Table

Source	*SS*	*df*	*MS*	*F*	*p*	η^2
Between treatments						
Participant Type	19.22	1.00	19.22	31.98	.000	.267
Call Accuracy	0.19	1.00	0.19	0.31	.578	.004
Participant Type x Call Accuracy	0.41	1.00	0.41	0.68	.412	.008
Within treatments	52.90	88.00	0.60			
Total	580.00	92.00				

There was a significant main effect for participant type, F (1, 92) = 31.98, $p < .001$, partial η^2 = .267. There was no main effect for call accuracy, p = .578, *ns*. No significant interaction effect was found for participant type by call accuracy, p =.412, *ns*. Figure Harper 8 demonstrates the mean confidence ratings by call accuracy and participant type.

Figure Harper 8



	Correct	Incorrect
FDE	2.00	1.76
LAY	2.82	2.87

Conclusions

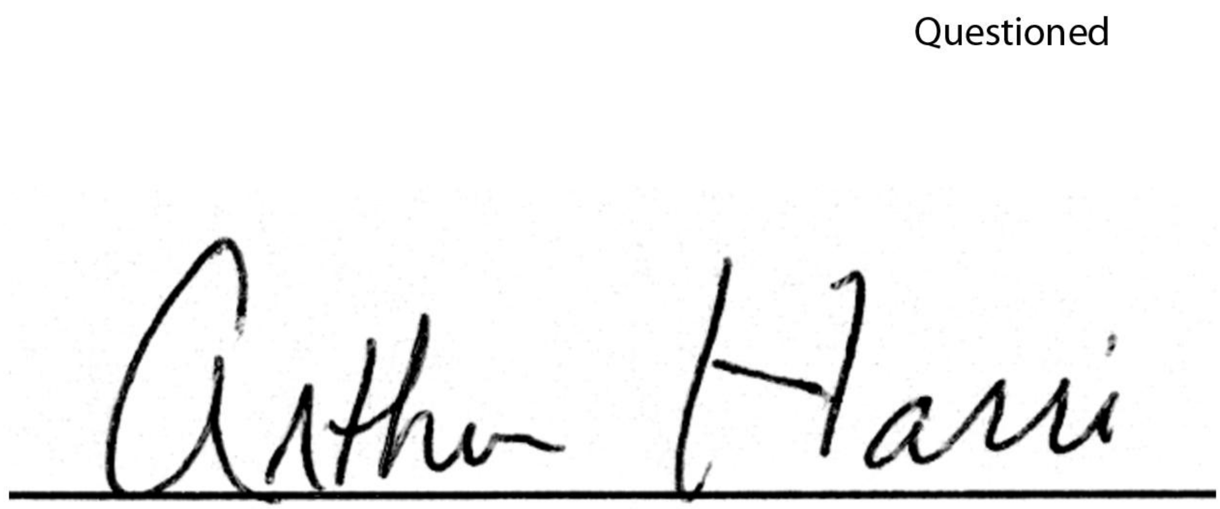
These findings indicate that FDEs were statistically no more accurate than were Lay participants. FDEs were significantly less confident in the accuracy of their calls, on average rating their confidence level for correct calls at *somewhat confident* and their incorrect calls slightly lower, at the *not at all confident* level. Conversely, Lay participants, rated both their correct call and incorrect call confidence nearer the *moderately confident* level.

Four areas of interest in addition to the AOI ALL were empirically identified by examining the full sample heat map for this signature. The four eye tracking metrics revealed that overall, FDEs examined the signature significantly more extensively than did Lay participants, fixating a greater number of times on all AOIs, and fixating on those AOIs for a greater period of time. The significant differences in fixation count, fixation duration, visit count, and visit duration observed in the AOI "ALL" indicated that FDEs also examined a greater variety of signature features, and spent more time evaluating them, than did Lay participants.

<u>SIGNATURE: Arthur Harris (Simulated)</u>

The signature of Arthur Harris characterized as a high-complexity text-based signature. Of the 49 FDE participants, 23 responded correctly that the signature was simulated, and 25 responded that the signature was genuine. Of the 43 Lay participants, 16 responded correctly that the signature was simulated, and 27 responded that it was genuine. This difference was not statistically significant, $\chi^2(1, N = 92) = 1.06$, $p = .303$, *ns*. Figure Haris 1 presents the view of this signature.

Figure Harris 1. Single Signature Stimulus for Arthur Harris.

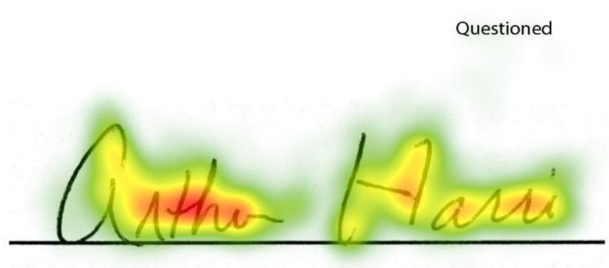


Selection of Areas of Interest (AOIs)

Figure Harris 2 presents the heat map for this slide. Empirical examination of the heat map revealed that there were two locations indicated by red "hot spots" within the signature that elicited significant attention from the participants. AOIs were created for these specific hot spots. Larger, secondary AOIs incorporating the smaller hot spots were created to include the orange "warm spots," creating a total of five AOIs (including the AOI for the questioned signature, labeled *Harris All*) for this stimulus.

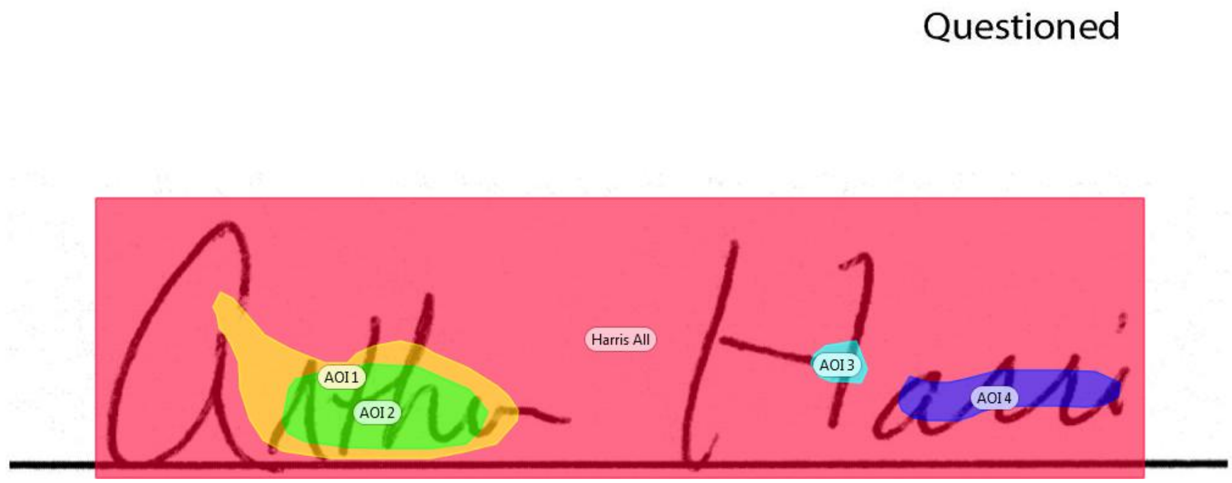
Figure Harris 2. Heat maps for Harris Signature demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs. The overall heat map is displayed below. Separate heat maps for FDEs and Lay Participants are displayed underneath.

FDE



LAY

Figure Harris 3. Areas of Interest (AOIs) for Signature Arthur Harris



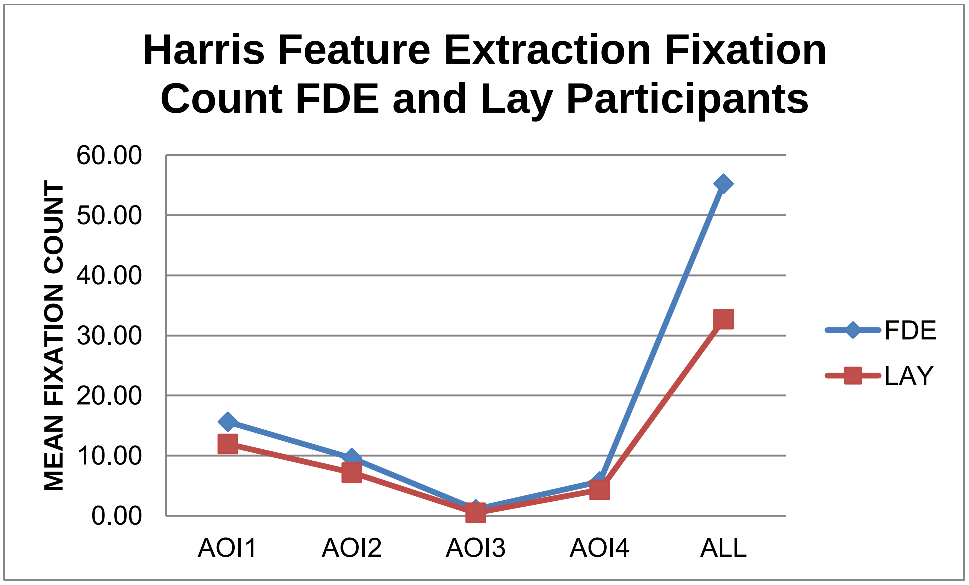
Eye-Tracking Metrics Analyses

These analyses investigate the participants' overall utilization of characteristics in the signature stimulus, and the participants' deployment of attentional resources to specific characteristics that the heat map indicated were particularly diagnostic during the examination. The examination process analyses are based on AOIs in the signature, and the overall signature analysis (the AOI overlaying the entire signature designated *Harris All*). Figure Harris 3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .634, F (5, 83) = 28.70, p < .001, multivariate η^2 = .634. Figure Harris 4 presents the mean fixation counts by AOI.

Figure Harris 4.



Follow-up ANOVAS conducted on each dependent variable revealed statistically significant participant type differences only for AOI ALL, F (1, 87) = 4.67, p = .034, partial η^2 = .051.

No significant differences were found for AOI 1, p = .306, *ns*; AOI 2, p = .201, *ns*; AOI 3, p = .093, *ns;* or AOI 4, p = .372, *ns*. Table Harris 1 presents the means and standard deviations for areas of interest by participant type.

Table Harris 1

Fixation Counts for FDE and Lay Participants

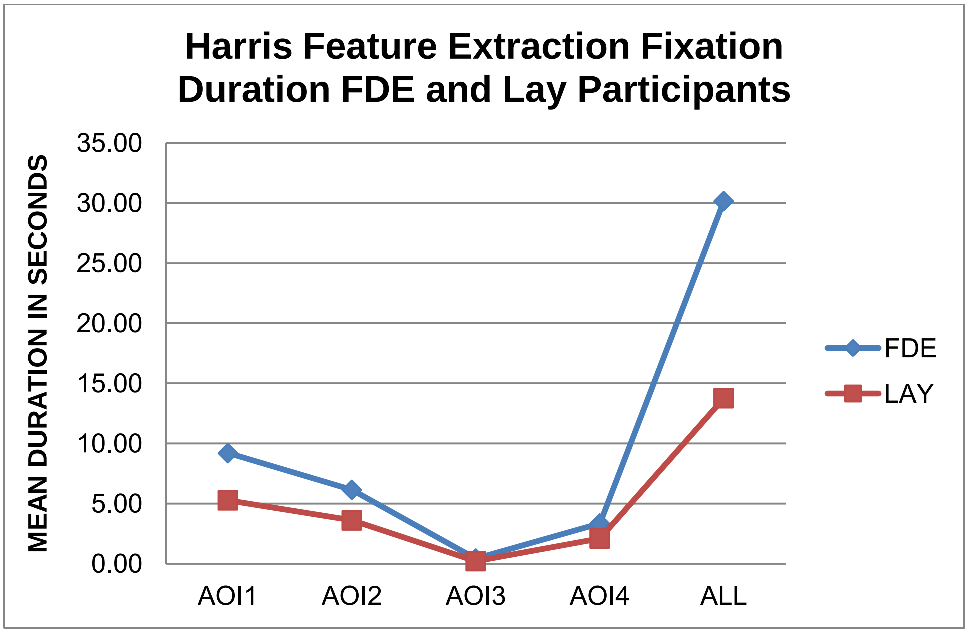
	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	15.62	14.84	9.60	10.26	1.04	1.67
Lay	11.93	18.90	7.17	6.99	0.48	1.45

	AOI4		ALL	
Participant	***M***	***SD***	***M***	***SD***
FDE	5.68	6.09	55.26	38.61
Lay	4.29	8.48	32.71	58.75

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .580, F (5, 83) = 22.90, p < .001, multivariate η^2 = .580. Figure Harris 5 presents the mean fixation duration by AOI.

Figure Harris 5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for three AOIs. Fixation durations in all significant AOIs were greater for FDEs than for Lay participants (AOI 1, F (1, 87) = 7.09, p = .009, partial η^2 = .075; AOI 2, F (1, 87) = 4.82, p = .031, η^2 = .053; and AOI ALL, F (1, 87) = 13.42, p < .001, partial η^2 = .134).

No significant differences were found for AOI 3, p = .131, *ns;* or AOI 4, p = .132, *ns.* Table Harris 2 presents the means and standard deviations for areas of interest by participant type.

Table Harris 2

Process Analysis Fixation Durations for FDE and Lay Participants

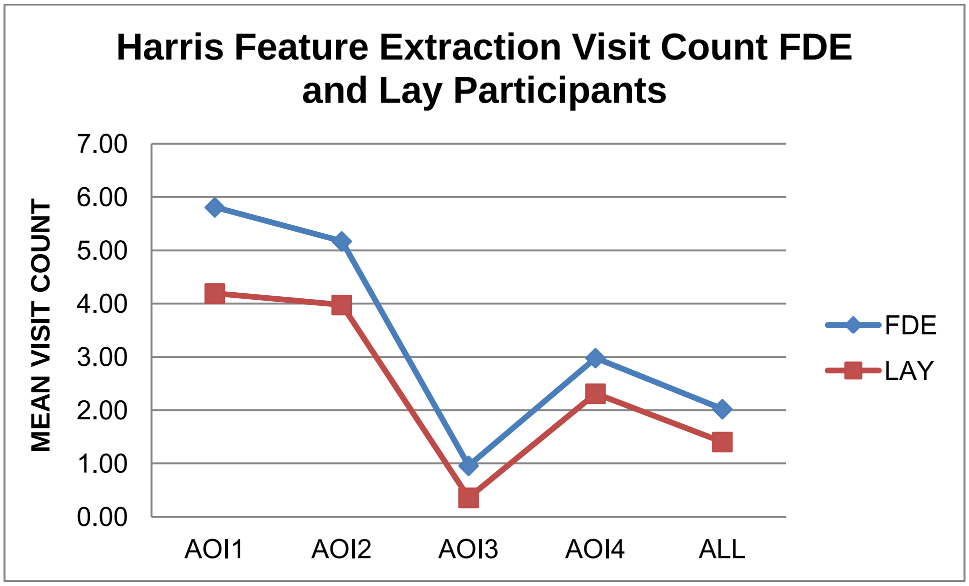
	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	9.19	7.35	6.14	5.89	0.42	0.63
Lay	5.28	6.41	3.60	4.89	0.21	0.65

	AOI4		ALL	
Participant	***M***	***SD***	***M***	***SD***
FDE	3.34	4.31	30.16	22.65
Lay	2.10	3.28	13.77	19.16

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .776, F (5, 83) = 57.43 p < .001, multivariate η^2 = .776. Figure Harris 6 presents the mean visit counts by AOI.

Figure Harris 6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for two AOIs. Visit count was significantly greater among FDEs than among Lay participants in AOI 3, F (1, 87) = 6.12, p = .015, partial η^2 = .066; and AOI ALL, F (1, 87) = 5.68, p = .019, partial η^2 = .061.

No significant differences were found for AOI 1, p = .112, *ns*; AOI 2, p = .173, *ns*; or AOI 4, p = .383, partial η^2 = .009, *ns*. Table Harris 3 presents the means and standard deviations for areas of interest by participant type.

Table Harris 3

Visit Counts for FDE and Lay Participants

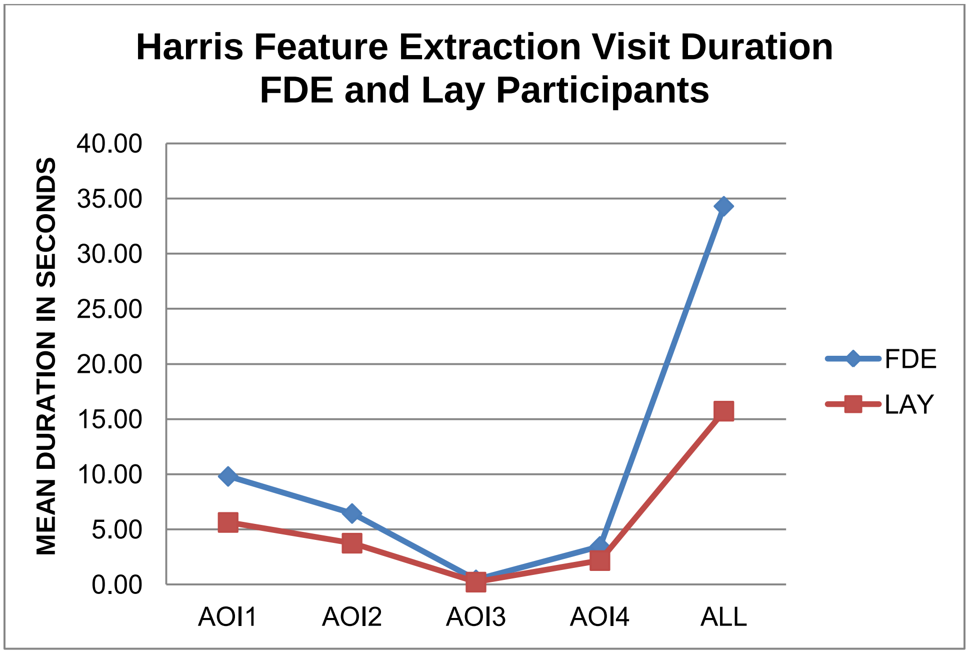
	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	5.81	3.95	5.17	4.18	0.96	1.33
Lay	4.19	5.51	3.98	3.98	0.36	0.88

	AOI4		ALL	
Participant	***M***	***SD***	***M***	***SD***
FDE	2.98	2.77	2.02	1.50
Lay	2.31	4.34	1.40	0.80

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .565, F (5, 83) = 21.60, p < .001, multivariate η^2 = .565. Figure Harris 7 presents the mean visit counts by AOI.

Figure Harris 7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for all but two of the AOIs. Fixation durations were significantly greater among FDEs than among Lay participants in AOI 1, F (1, 87) = 6.76, p = .011, partial η^2 = .072; AOI 2, F (1, 87) = 4.85, p = .030, partial η^2 = .053; and AOI ALL, F (1, 87) = 13.35, p < .001, partial η^2 = .133.

There were no significant differences found for AOI 3, p = .148, *ns*; or AOI 4, p = .135, *ns*. Table Harris 4 presents the means and standard deviations for areas of interest by participant type.

Table Harris 4

Process Analysis Visit Durations for FDE and Lay Participants

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	9.81	8.00	6.45	6.27	0.43	0.66
Lay	5.64	7.03	3.76	5.11	0.22	0.67

	AOI4		ALL	
Participant	***M***	***SD***	***M***	***SD***
FDE	3.46	4.50	34.31	25.51
Lay	2.18	3.38	15.73	22.07

Decision Confidence Analysis

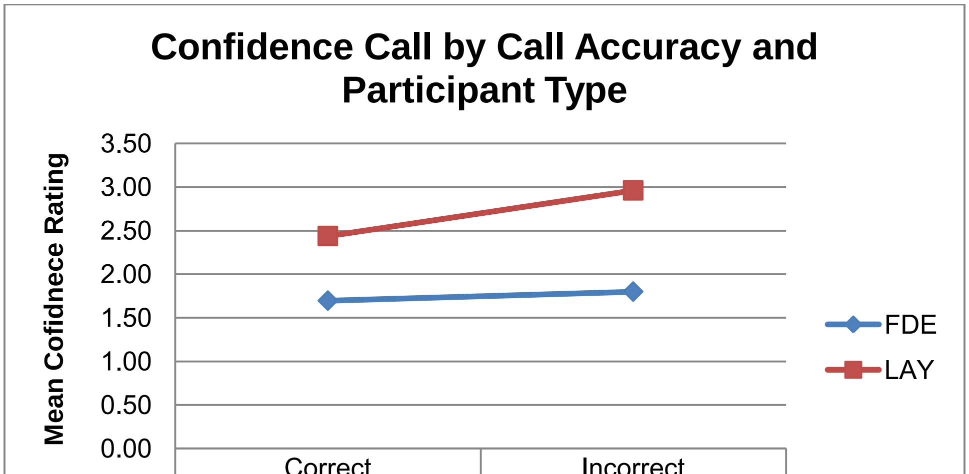
A 2 (FDE vs. Lay participant) x 2 (correct vs. incorrect call) univariate factorial ANOVA was conducted to investigate whether significant differences in level of *call confidence* existed between FDE and Lay participants, and whether significant differences existed according to the accuracy of the call. Table Harris 5 presents the results of the omnibus analysis.

Table Harris 5
Two-Way ANOVA Summary Table

Source	*SS*	*df*	*MS*	*F*	*p*	η^2
Between treatments						
Participant Type	19.64	1.00	19.64	38.60	.000	.310
Call Accuracy	2.14	1.00	2.14	4.21	.043	.047
Participant Type x Call Accuracy	0.96	1.00	0.96	1.88	.174	.021
Within treatments	43.77	86.00	0.51			
Total	514.00	90.00				

Significant main effects were found for participant type, F (1, 86) = 38.60, p < .001, partial η^2 = .310, and for call accuracy, F (1, 86) = 4.21, p = .043, partial η^2 = .047. No significant interaction was found for participant type by call accuracy, p =.174, *ns*. Figure Harris 8 demonstrates the mean confidence ratings by call accuracy and participant type.

Figure Harris 8



	Correct	Incorrect
FDE	1.70	1.80
LAY	2.44	2.96

<u>*Conclusions*</u>

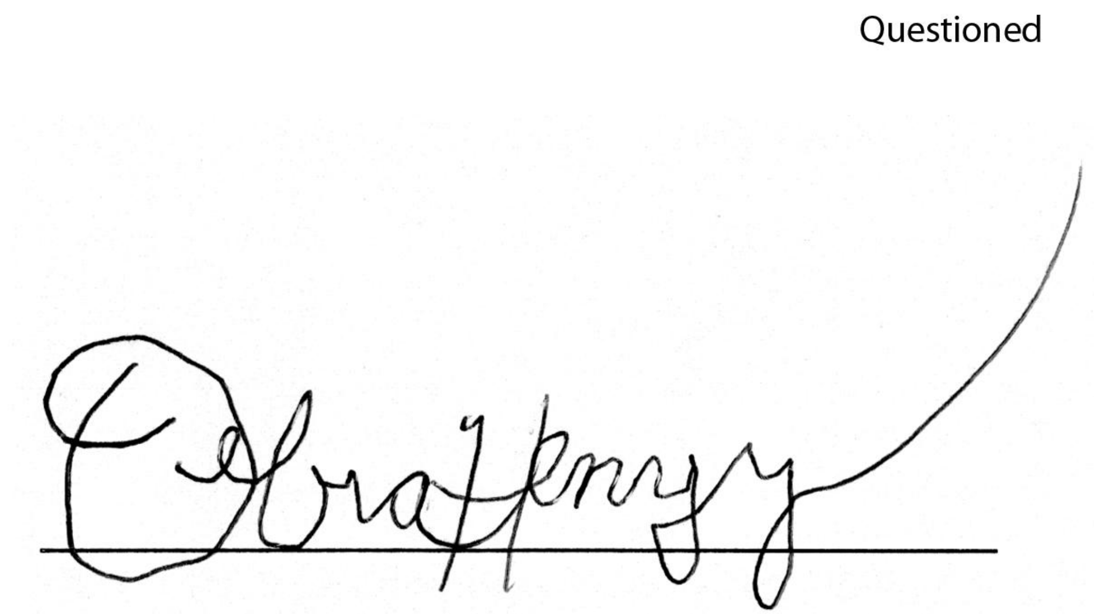
These findings indicate that although FDEs were no more accurate than were Lay participants, they were also significantly less confident in the accuracy of their calls, on average rating their confidence level for both correct calls and incorrect calls at *not at all confident*, compared to Lay participants, who on average rated their correct call confidence at the *somewhat confident* level, and their incorrect call confidence near the *moderately confident* level.

Four areas of interest in addition to AOI ALL were empirically identified by examining the full sample heat map for this signature. The four eye tracking metrics revealed that overall, FDEs examined the signature significantly more extensively than did Lay participants, fixating a greater number of times on all AOIs, and fixating on those AOIs for a greater period of time. The significant differences in fixation count, fixation duration, visit count, and visit duration observed in the AOI “ALL” indicated that FDEs also examined a greater variety of signature features, and spent more time evaluating them, than did Lay participants.

SIGNATURE: Debra Hemingway (Simulated)

The signature of Debra Hemingway characterized as a high-complexity mixed signature. Of the 49 FDE participants, 23 responded correctly that the signature was simulated, and 25 responded that the signature was genuine. Of the 43 Lay participants, 16 responded correctly that the signature was simulated, and 27 responded that it was genuine. This difference was not statistically significant, χ^2 (1, N = 92) = 1.062, p = .303. Figure Hemingway 1 presents the view of this signature.

Figure Hemingway 1. Single Signature Stimulus for Debra Hemingway.



Selection of Areas of Interest (AOIs)

Figure Hemingway 2 presents the heat map for this slide. Empirical examination of the heat map revealed that there were two locations indicated by red "hot spots" within the signature that elicited significant attention from the participants. AOIs were created for these specific hot spots. A larger, secondary AOI incorporating the smaller hot spots was created to include the orange "warm spots," creating a total of four AOIs (including the AOI for the questioned signature, labeled *Hemingway All*) for this stimulus.

Figure Hemingway 2. Heat maps for Hemingway Signature demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs. The overall heat map is displayed below. Separate heat maps for FDEs and Lay Participants are displayed underneath.

FDE

LAY

Figure Hemingway Areas of Interest (AOIs) for Signature Debra Hemingway

Questioned

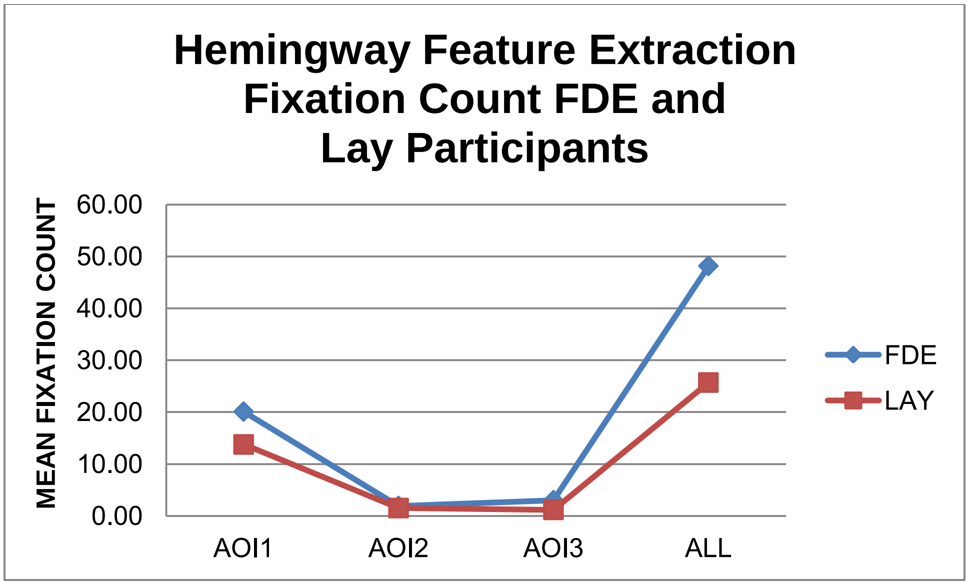
Eye-Tracking Metrics Analyses

These analyses investigate the participants' overall utilization of characteristics in the signature stimulus, and the participants' deployment of attentional resources to specific characteristics that the heat map indicated were particularly diagnostic during the examination. The examination process analyses are based on AOIs in the signature, and the overall signature analysis (the AOI overlaying the entire signature designated *Hemingway All*). Figure Hemingway 3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .556, F (4, 85) = 26.60, p < .001, multivariate η^2 = .556. Figure Hemingway 4 presents the mean fixation counts by AOI.

Figure Hemingway 4.



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for two AOIs. Fixation count was significantly greater among FDEs than among Lay participants in AOI 3, F (1, 88) = 8.12, p = .005, partial η^2 = .084; and AOI ALL, F (1, 88) = 9.43, p = .003, partial η^2 = .097.

No significant differences were found for AOI 1, p = .132, *ns*; or AOI 2, p = .417, *ns*. Table Hemingway 1 presents the means and standard deviations for areas of interest by participant type.

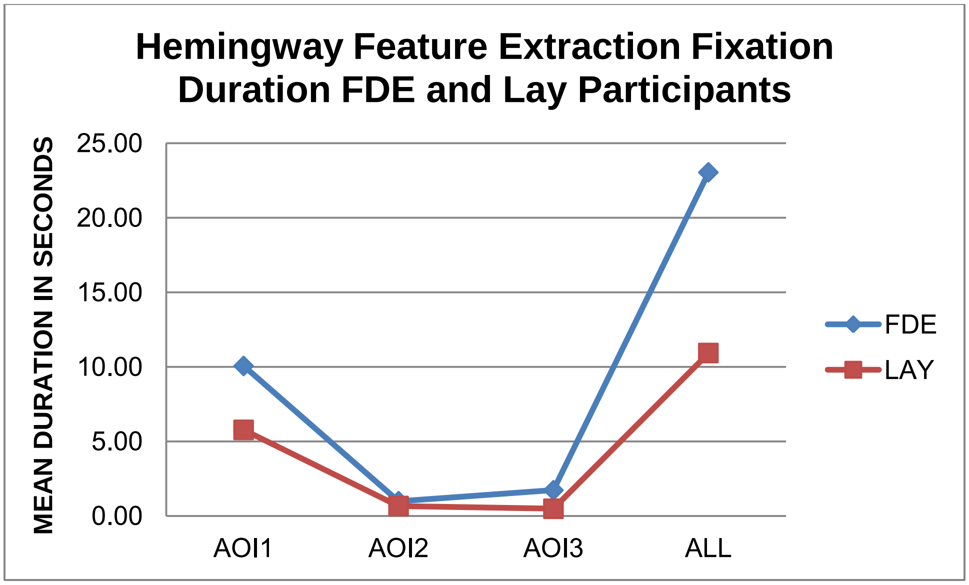
Table Hemingway 1
Fixation Counts for FDE and Lay Participants

	AOI1		AOI2	
Participant	***M***	***SD***	***M***	***SD***
FDE	20.11	22.73	1.91	2.80
Lay	13.77	15.89	1.51	1.70
	AOI3		**ALL**	
Participant	***M***	***SD***	***M***	***SD***
FDE	3.02	3.86	48.17	41.12
Lay	1.16	1.91	25.70	25.83

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .512, F (4, 85) = 22.31, p < .001, multivariate η^2 = .512. Figure Hemingway 5 presents the mean fixation duration by AOI.

Figure Hemingway 5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for all but one of the AOIs. Fixation durations in all significant AOIs were greater for FDEs than for Lay participants (AOI 1, F (1, 88) = 4.77, p = .032, partial η^2 = .051; AOL 3, F (1, 88) = 10.47, p = .002, η^2 = .106; AOI ALL, F (1, 88) = 10.31, p = .002, partial η^2 = .105).

No significant differences were found for AOI 2, p = .236, *ns*. Table Hemingway 2 presents the means and standard deviations for areas of interest by participant type.

Table Hemingway 2

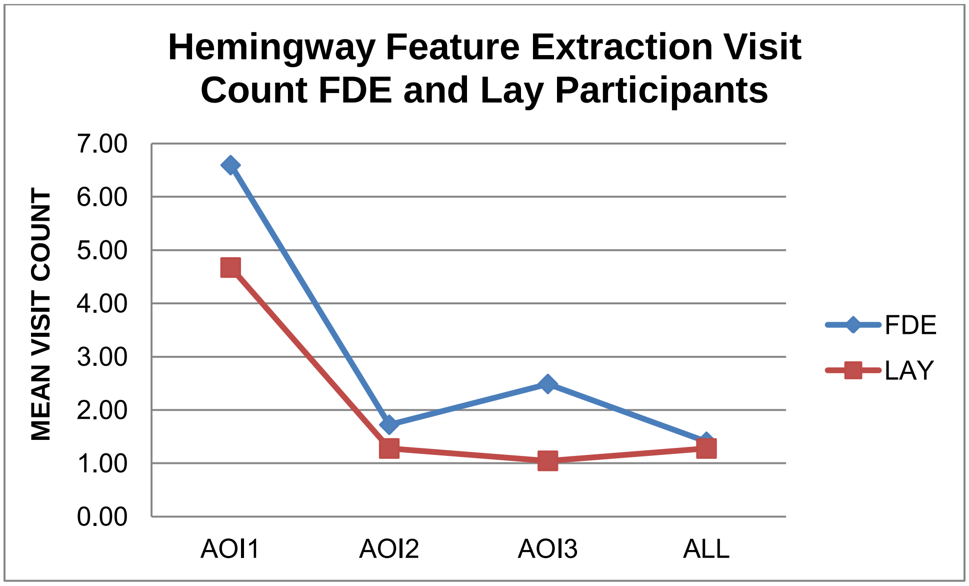
Process Analysis Fixation Durations for FDE and Lay Participants

	AOI1		**AOI2**	
Participant	***M***	***SD***	***M***	***SD***
FDE	10.06	10.84	0.99	1.59
Lay	5.77	7.24	0.66	0.85
	AOI3		**ALL**	
Participant	***M***	***SD***	***M***	***SD***
FDE	1.72	2.32	23.05	21.83
Lay	0.48	1.03	10.92	12.19

Total Visit Count

MANOVA results revealed no significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .809, F (4, 85) = 89.73, p < .001, multivariate η^2 = .809. Figure Hemingway 6 presents the mean visit counts by AOI.

Figure Hemingway 6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for only one AOI. Fixation count among FDEs was significantly greater than that among Lay participants in AOI 3, F (1, 88) = 8.33, p = .005, partial η^2 = .087.

No significant differences were found for AOI 1, p = .067, *ns*; AOI 2, p = .303, *ns*; or AOI ALL, p = .414, *ns*. Table Hemingway 3 presents the means and standard deviations for areas of interest by participant type.

Table Hemingway 3

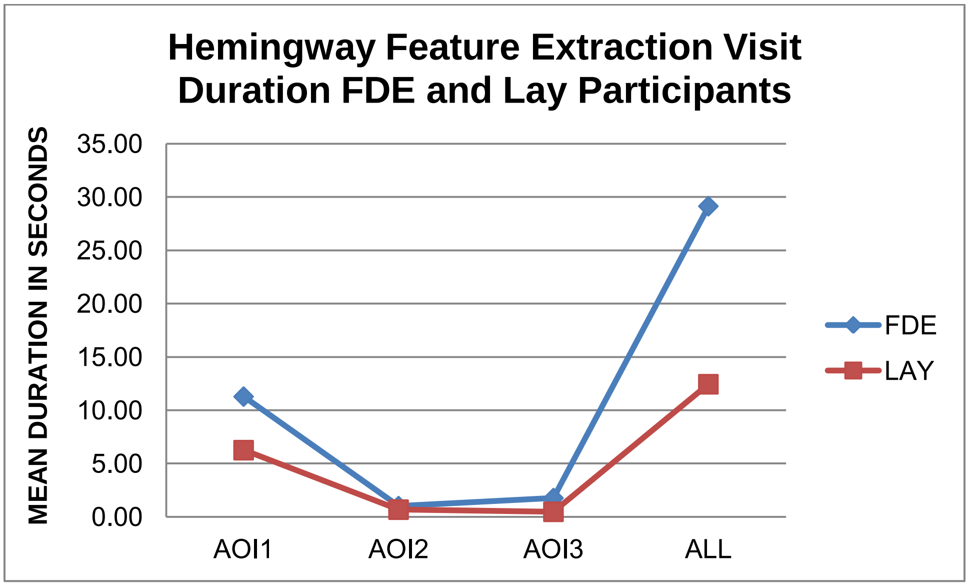
Visit Counts for FDE and Lay Participants

	AOI1		AOI2	
Participant	***M***	***SD***	***M***	***SD***
FDE	6.60	5.73	1.72	2.51
Lay	4.67	3.80	1.28	1.33
	AOI3		**ALL**	
Participant	***M***	***SD***	***M***	***SD***
FDE	2.49	2.78	1.40	0.71
Lay	1.05	1.81	1.28	0.73

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .487, F (4, 85) = 20.17, p < .001, multivariate η^2 = .487. Figure Hemingway 7 presents the mean visit duration by AOI.

Figure Hemingway 7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for all but one of the AOIs. Visit durations among FDEs were significantly greater than those for Lay participants in AOI 1, F (1, 88) = 5.29, p = .024, partial η^2 = .057; AOI 3, F (1, 88) = 10.91, p = .001, partial η^2 = .110; and AOI ALL, F (1, 88) = 11.82, p = .001, partial η^2 = .118.

There were no significant differences found for AOI 2, p = .233, *ns*. Table Hemingway 4 presents the means and standard deviations for areas of interest by participant type.

Table Hemingway 4

Process Analysis Visit Durations for FDE and Lay Participants

	AOI1		AOI2	
Participant	***M***	***SD***	***M***	***SD***
FDE	11.29	12.21	1.01	1.63
Lay	6.26	7.82	0.68	0.87
	AOI3		**ALL**	
Participant	***M***	***SD***	***M***	***SD***
FDE	1.77	2.36	29.15	29.30
Lay	0.48	1.03	12.45	13.04

Decision Confidence Analysis

A 2 (FDE vs. Lay participant) x 2 (correct vs. incorrect call) univariate factorial ANOVA was conducted to investigate whether significant differences in level of *call confidence* existed between FDE

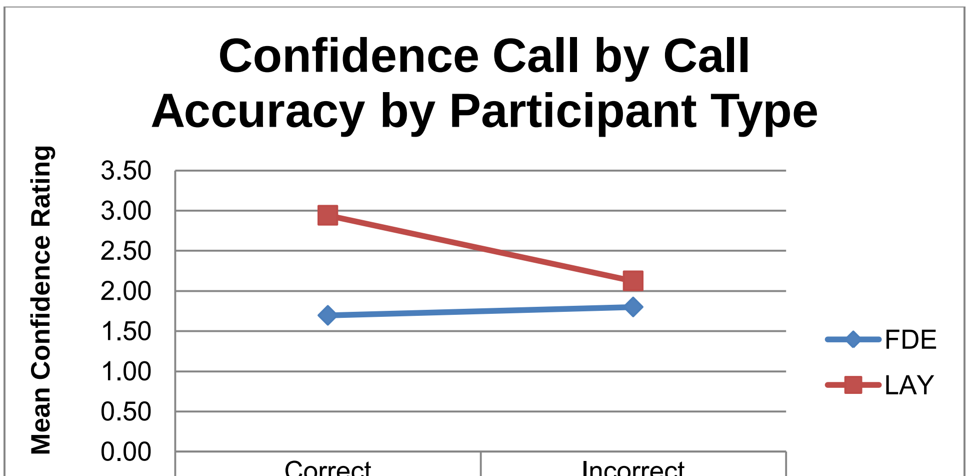
and Lay participants, and whether significant differences existed according to the accuracy of the call. Table Hemingway 5 presents the results of the omnibus analysis.

Table Hemingway 5
Two-Way ANOVA Summary Table

Source	***SS***	***df***	***MS***	***F***	***p***	η^2
Between treatments						
Participant Type	19.64	1.00	19.64	38.60	.000	.310
Call Accuracy	2.14	1.00	2.14	4.21	.043	.047
Participant Type x Call Accuracy	0.96	1.00	0.96	1.88	.174	.021
Within treatments	43.77	86.00	0.51			
Total	514.00	90.00				

There was a significant main effect for participant type, F (1, 86) = 38.60, $p < .001$, partial η^2 = .310. There was a main effect for call accuracy, F (1, 86) = 4.21, p = .043, partial η^2 = .047. There was no significant interaction for participant type by call accuracy, p =.174, *ns*. Figure Hemingway 8 demonstrates the mean confidence ratings by call accuracy and participant type.

Figure Hemingway 8



	Correct	Incorrect
FDE	1.70	1.80
LAY	2.94	2.13

<u>*Conclusions*</u>

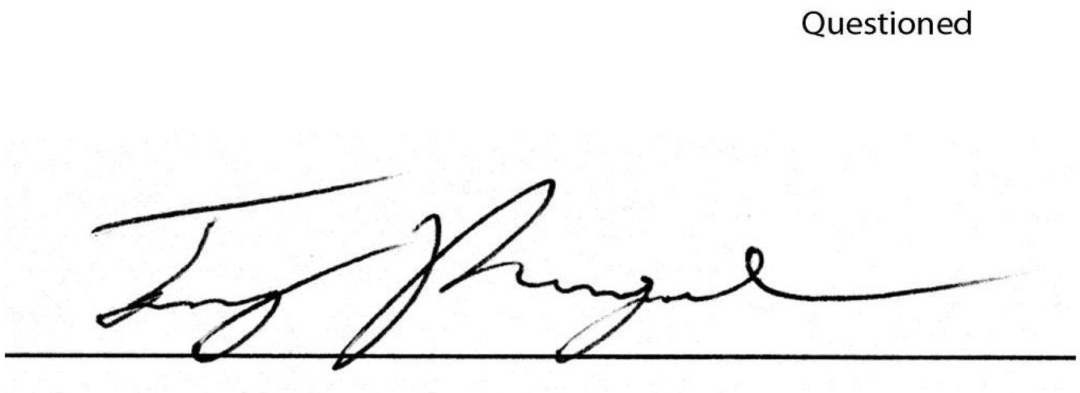
These findings indicate that although FDEs were significantly more accurate than were Lay participants, they were also significantly less confident in the accuracy of their calls, on average rating their confidence level for both correct calls and incorrect calls at *not at all confident*, compared to Lay participants, who on average rated their correct call confidence at the *moderately confident* level, and their incorrect call confidence at the *somewhat confident* level.

Three areas of interest in addition to AOI ALL were empirically identified by examining the full sample heat map for this signature. The four eye tracking metrics revealed that overall, FDEs examined the signature significantly more extensively than did Lay participants, fixating a greater number of times on all AOIs, and fixating on those AOIs for a greater period of time. The significant differences in fixation count, fixation duration, and visit duration observed in the AOI "ALL" indicated that FDEs also examined a greater variety of signature features, and spent more time evaluating them, than did Lay participants.

<u>SIGNATURE: Jeremy Payne (Genuine)</u>

The signature of Jeremy Payne is characterized as a low-complexity mixed signature. Of the 49 FDE participants, 23 responded correctly that the signature was genuine, and 25 responded that the signature was simulated. Of the 43 Lay participants, 25 responded correctly that the signature was genuine, and 18 responded that it was simulated. This difference was not statistically significant, χ^2 (1, N = 91) = 0.951, *p* = .329. Figure Jeremy Payne 1 presents the view of this signature.

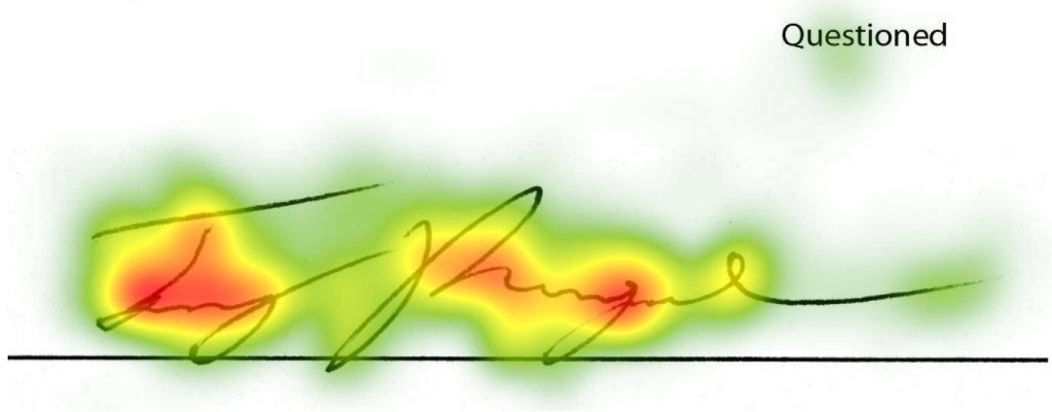
Figure Jeremy Payne 1. Single Signature Stimulus for Jeremy Payne.



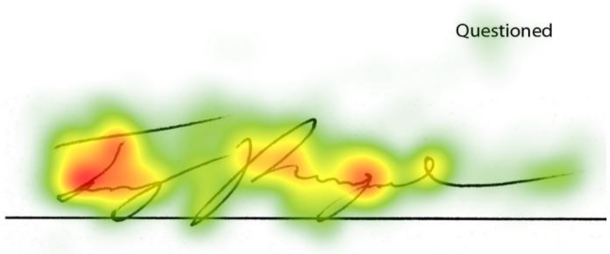
Selection of Areas of Interest (AOIs)

Figure Jeremy Payne 2 presents the heat map for this slide. Empirical examination of the heat map revealed that there were three locations indicated by red "hot spots" within the signature that elicited significant attention from the participants. AOIs were created for these specific hot spots. Larger, secondary AOIs incorporating the smaller hot spots were created to include the orange "warm spots," creating a total of six AOIs (including the AOI for the questioned signature, labeled *Payne All*) for this stimulus.

Figure Jeremy Payne 2. Heat maps for Jeremy Payne Signature demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs. The overall heat map is displayed below. Separate heat maps for FDEs and Lay Participants are displayed underneath.



FDE



LAY

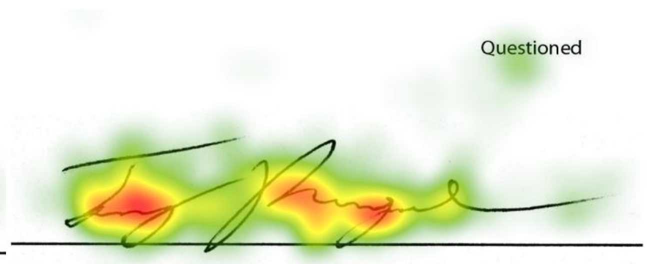
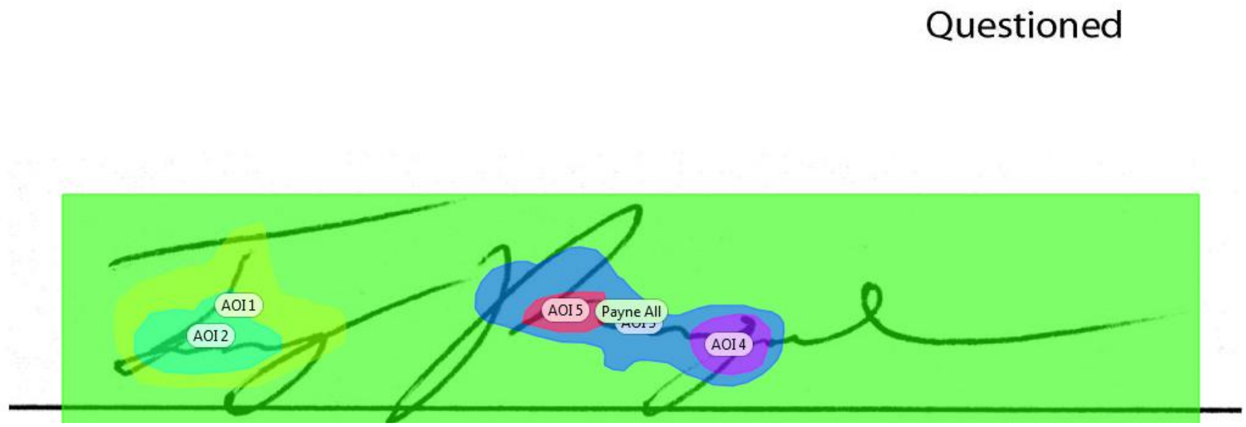


Figure Jeremy Payne 3 Areas of Interest (AOIs) for Signature Jeremy Payne



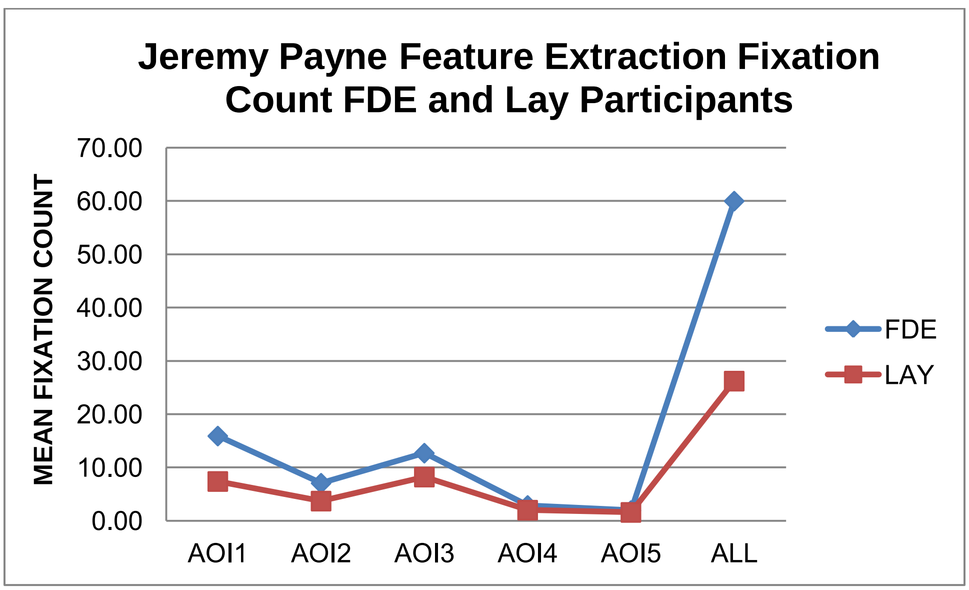
Eye-Tracking Metrics Analyses

These analyses investigate the participants' overall utilization of characteristics in the signature stimulus, and the participants' deployment of attentional resources to specific characteristics that the heat map indicated were particularly diagnostic during the examination. The examination process analyses are based on AOIs in the signature, and the overall signature analysis (the AOI overlaying the entire signature designated *Payne All*). Figure Jeremy Payne 3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .681, F (6, 81) = 28.88, p < .001, multivariate η^2 = .681. Figure Jeremy Payne 4 presents the mean fixation counts by AOI.

Figure Jeremy Payne 4.



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences was significant for all but two of the AOIs. Fixation count was significantly greater among FDEs than among Lay participants in AOI 1, F (1, 86) = 15.21, p < .001, partial η^2 = .150; AOI 2, F (1, 86) = 7.30, p = .008, partial η^2 = .078; AOI 3, F (1, 86) = 5.65, p = .020, partial η^2 = .062; and AOI ALL, F (1, 86) = 25.92, p < .001, partial η^2 = .232.

No significant differences were found for AOI 4, p = .138, *ns*; AOI 5, p = .444, *ns*. Table Jeremy Payne 1 presents the means and standard deviations for areas of interest by participant type.

Table Jeremy Payne 1

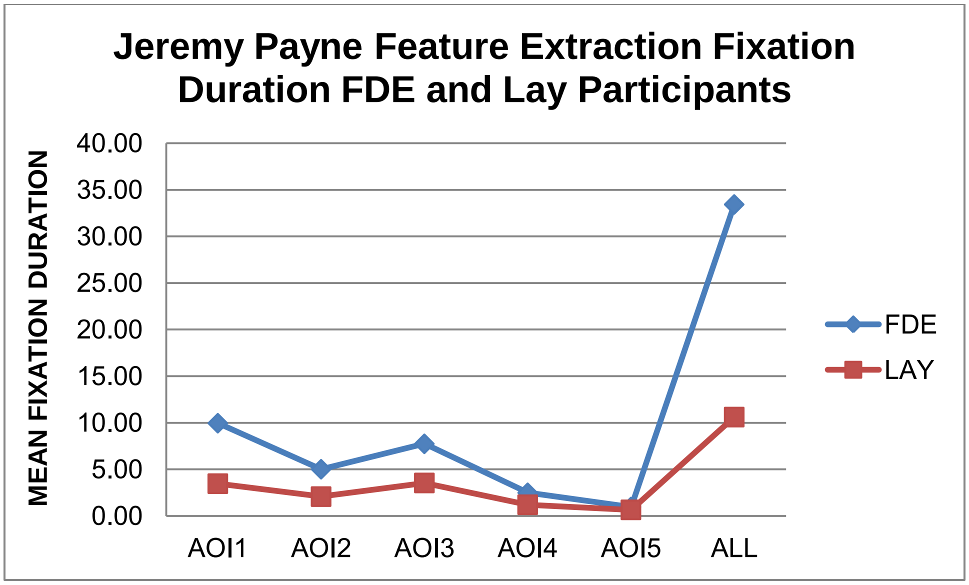
Process Analysis Fixation Counts for FDE and Lay Participants

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	15.91	12.67	7.06	7.21	12.70	11.16
Lay	7.39	6.34	3.71	3.59	8.22	4.91
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.89	3.41	1.94	2.22	60.00	39.60
Lay	2.00	1.84	1.59	2.04	26.22	16.42

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .639, F (6, 81) = 23.87, p < .001, multivariate η^2 = .639. Figure Jeremy Payne 5 presents the mean fixation duration by AOI.

Figure Jeremy Payne 5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for all but one of the AOIs. Fixation duration was significantly greater among FDEs than among Lay participants in AOI 1, F (1, 86) = 22.22, p < .001, partial η^2 = .205; AOI 2, F (1, 86) = 14.14, p < .001, partial η^2 = .141; AOI 3, F (1, 86) = 14.42, p < .001, partial η^2 = .144; AOI 4, F (1, 86) = 5.71, p = .019, partial η^2 = .062; and AOI ALL, F (1, 86) = 29.27, p < .001, partial η^2 = .254.

No significant differences were found for AOI 5, p = .193, *ns*. Table Jeremy Payne 2 presents the means and standard deviations for areas of interest by participant type.

Table Jeremy Payne 2

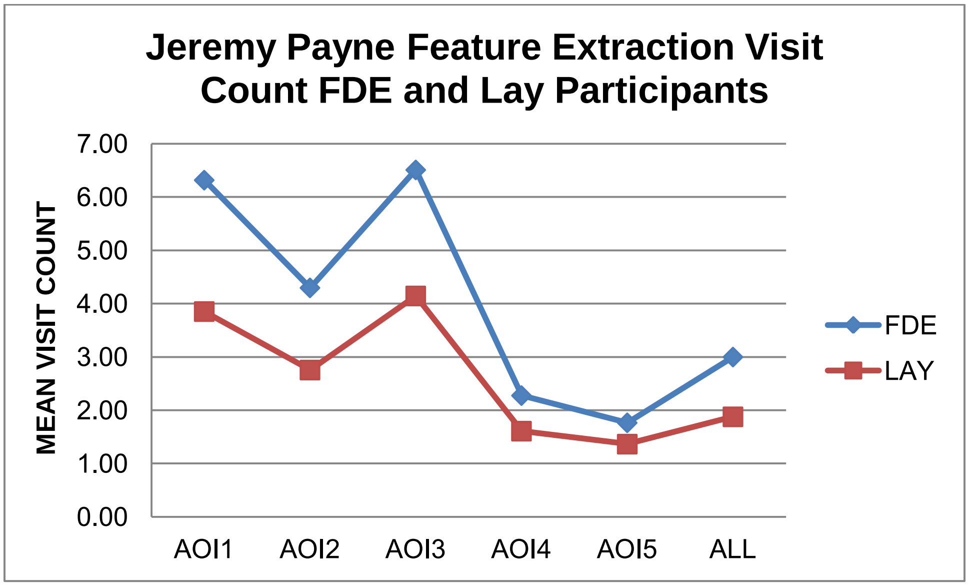
Process Analysis Fixation Durations for FDE and Lay Participants

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	9.95	8.44	5.01	4.69	7.73	6.71
Lay	3.46	2.67	2.07	1.85	3.54	2.41
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.48	3.16	0.95	1.20	33.42	26.24
Lay	1.20	1.45	0.65	0.91	10.61	6.78

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .796, F (6, 81) = 52.53, p <.001, multivariate η^2 = .796. Figure Jeremy Payne 6 presents the mean visit counts by AOI.

Figure Jeremy Payne 6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for three of the AOIs. Visit count was significantly greater among FDEs than among Lay participants in AOI 1, F (1, 86) = 8.72, p = .004, partial η^2 = .092; AOI 2, F (1, 86) = 7.11, p = .009, partial η^2 = .076; AOI 3, F (1, 86) = 8.87, p = .004, partial η^2 = .093; AOI ALL, F (1, 86) = 5.69, p = .019, partial η^2 = .062.

No significant differences were found for AOI 4, p = .114, *ns*; or AOI 5, p = .295, partial η^2 = .013, *ns*. Table Jeremy Payne 3 presents the means and standard deviations for areas of interest by participant type.

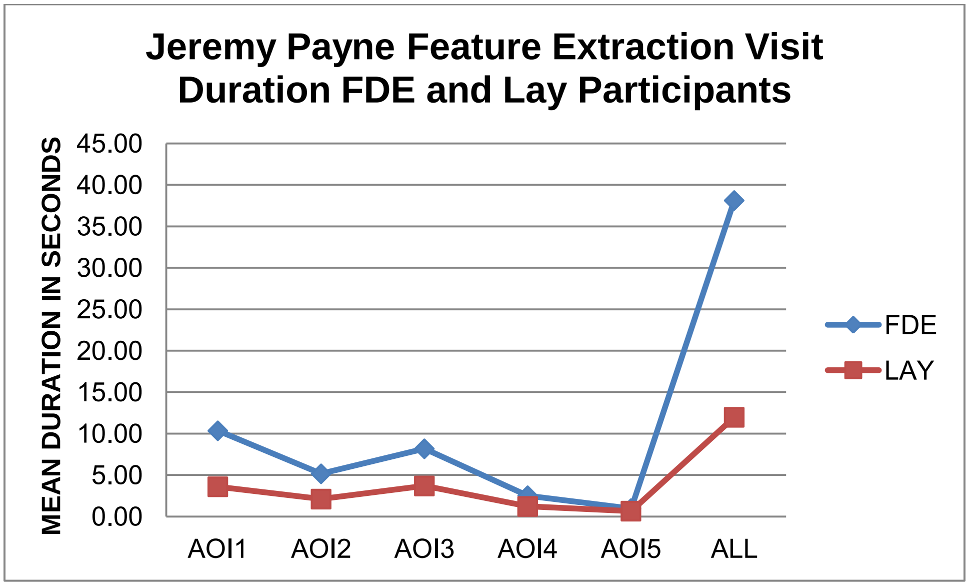
Table Jeremy Payne 3
Visit Counts for FDE and Lay Participants

	AOI1		**AOI2**		**AOI3**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	6.32	5.08	4.30	3.29	6.51	4.56
Lay	3.85	1.77	2.76	1.81	4.15	2.39
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.28	2.40	1.77	2.00	3.00	2.86
Lay	1.61	1.26	1.37	1.48	1.88	1.00

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .646, F (6, 81) = 24.60, p < .001, multivariate η^2 = .646. Figure Jeremy Payne 7 presents the mean visit counts by AOI.

Figure Jeremy Payne 7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences was significant for all but one of the AOIs. Visit duration was significantly greater among FDEs than among Lay participants in AOI 1, F (1, 86) = 23.10, p < .001, partial η^2 = .212; AOI 2, F (1, 86) = 14.35, p < .001, partial η^2 = .143; AOI 3, F (1, 86) = 14.70, p < .001, partial η^2 = .146; AOI 4, F (1, 86) = 5.64, p = .020, partial η^2 = .062; and AOI ALL, F (1, 86) = 32.65, p < .001, partial η^2 = .275.

No significant differences were found for AOI 5, p = .196, *ns*. Table Jeremy Payne 4 presents the means and standard deviations for areas of interest by participant type.

Table Jeremy Payne 4
Process Analysis Visit Durations for FDE and Lay Participants

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	10.35	8.61	5.16	4.85	8.18	7.11
Lay	3.60	2.74	2.10	1.89	3.69	2.52
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.52	3.22	0.96	1.20	38.13	28.50
Lay	1.22	1.47	0.65	0.92	11.97	7.23

Decision Confidence Analysis

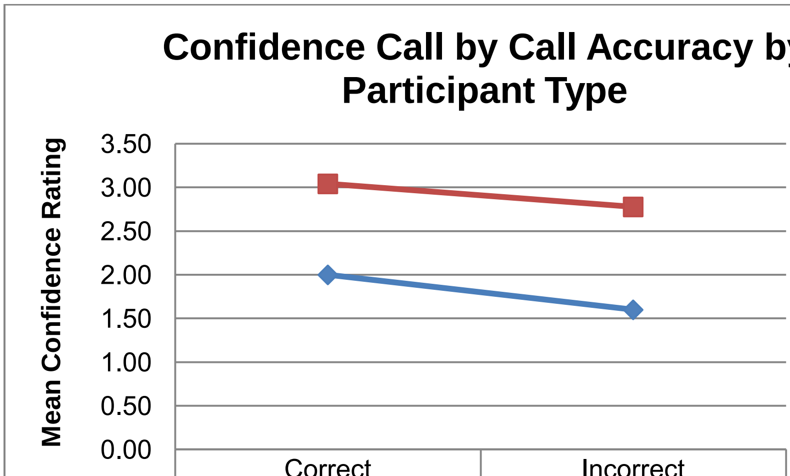
A 2 (FDE vs. Lay participant) x 2 (correct vs. incorrect call) univariate factorial ANOVA was conducted to investigate whether significant differences in level of *call confidence* existed between FDE and Lay participants, and whether significant differences existed according to the accuracy of the call. Table Jeremy Payne 5 presents the results of the omnibus analysis.

Table Jeremy Payne 5
Two-Way ANOVA Summary Table

Source	***SS***	***df***	***MS***	***F***	***p***	η^2
Between treatments						
Participant Type	27.26	1.00	27.26	53.20	.000	.382
Call Accuracy	2.44	1.00	2.44	4.76	.032	.052
Participant Type x Call Accuracy	0.10	1.00	0.10	0.20	.656	.002
Within treatments	44.07	86.00	0.51			
Total	561.00	90.00				

There was a significant main effect for participant type, F (1, 86) = 53.20, p < .001, partial η^2 = .384. There was also a main effect for call accuracy, F (1, 86) = 4.76, p = .032, partial η^2 = .052. There was no significant interaction for participant type by call accuracy, p =.656, *ns*. Figure Jeremy Payne 8 demonstrates the mean confidence ratings by call accuracy and participant type.

Figure Jeremy Payne 8



	Correct	Incorrect
FDE	2.00	1.60
LAY	3.04	2.78

<u>*Conclusions*</u>

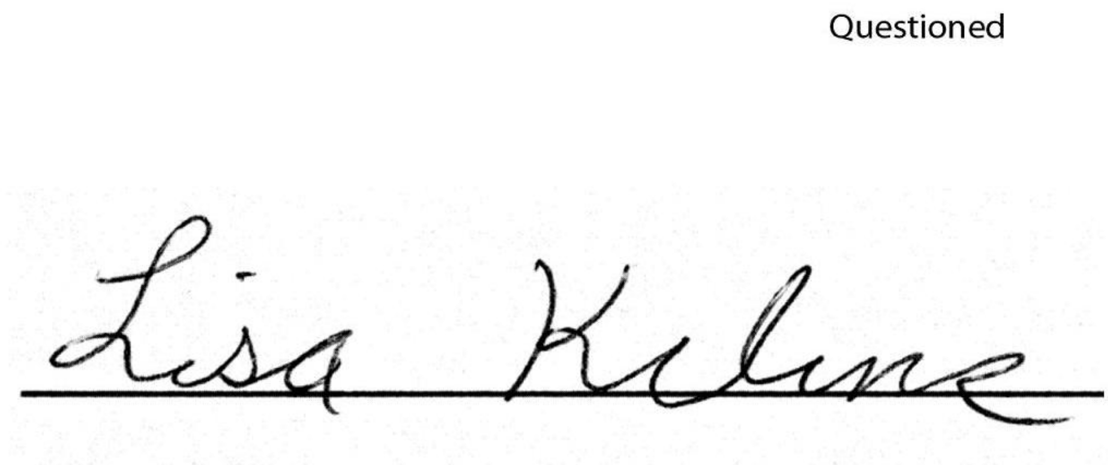
These findings indicate that although FDEs were significantly more accurate than were Lay participants, they were also significantly less confident in the accuracy of their calls, on average rating their confidence level for correct calls at *somewhat confident* and their incorrect calls as *not at all confident*, compared to Lay participants, who on average rated their correct call confidence at the *moderately confident* level, and their incorrect call confidence slightly lower, at the *somewhat confident* level.

Five areas of interest in addition to AOI ALL were empirically identified by examining the full sample heat map for this signature. The four eye tracking metrics revealed that overall, FDEs examined the signature significantly more extensively than did Lay participants, fixating a greater number of times on all AOIs, and fixating on those AOIs for a greater period of time. The significant differences in fixation count, fixation duration, visit count, and visit duration observed in the AOI "ALL" indicated that FDEs also examined a greater variety of signature features, and spent more time evaluating them, than did Lay participants.

SIGNATURE: Lisa Kilinc (Simulated)

The signature of Lisa Kilinc is characterized as a high-complexity text-based signature. Of the 49 FDE participants, 25 responded correctly that the signature was simulated, and 23 responded that the signature was genuine. Of the 43 Lay participants, 21 responded correctly that the signature was simulated, and 22 responded that it was genuine. This difference was not statistically significant, $\chi^2(1, N = 92) = 0.096$, $p = .757$, *ns*. Figure Kilinc 1 presents the view of this signature.

Figure Kilinc 1. Single Signature Stimulus for Lisa Kilinc.



Selection of Areas of Interest (AOIs)

Figure Kilinc 2 presents the heat map for this slide. Empirical examination of the heat map revealed that there were two locations indicated by red “hot spots” within the signature that elicited significant attention from the participants. AOIs were created for these specific hot spots. Larger, secondary AOIs incorporating the smaller hot spots were created to include the orange “warm spots,” creating a total of six AOIs (including the AOI for the questioned signature, labeled *Kilinc All*) for this stimulus.

Figure Kilinc 2. Heat map for Lisa Kilinc Signature demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

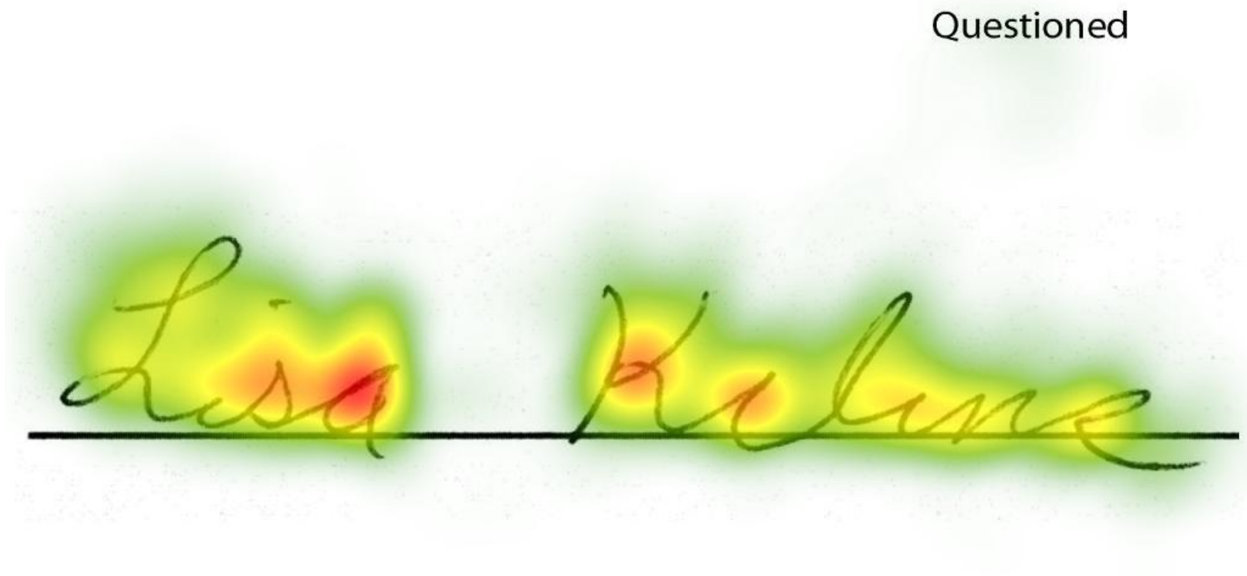
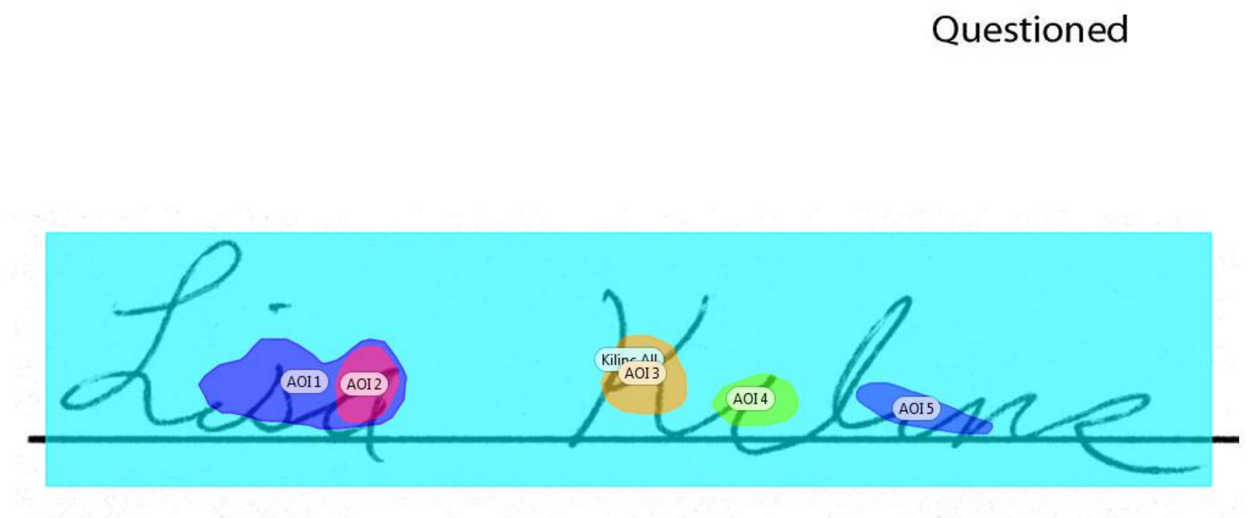


Figure Hemingway Areas of Interest (AOIs) for Signature Lisa Kilinc



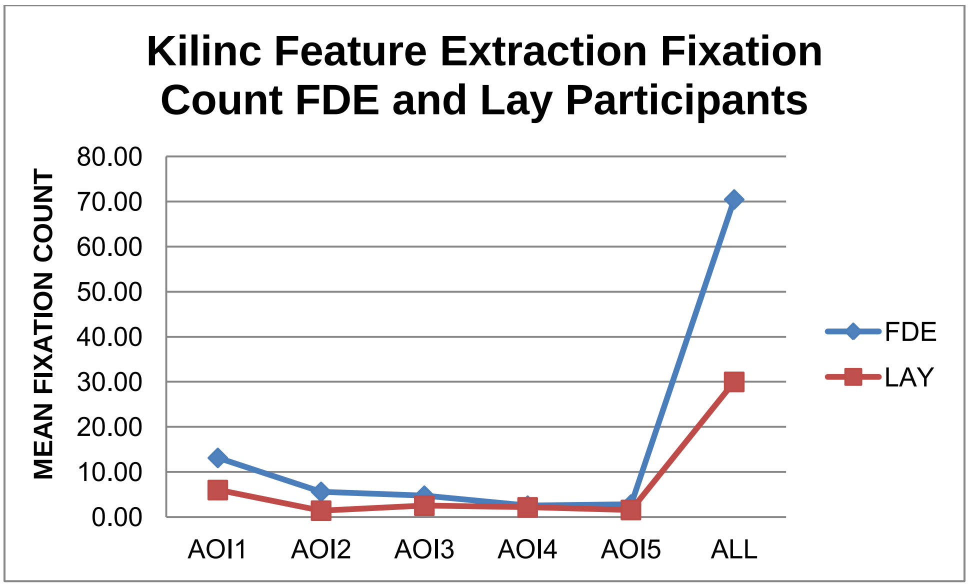
Eye-Tracking Metrics Analyses

These analyses investigate the participants' overall utilization of characteristics in the signature stimulus, and the participants' deployment of attentional resources to specific characteristics that the heat map indicated were particularly diagnostic during the examination. The examination process analyses are based on AOIs in the signature, and the overall signature analysis (the AOI overlaying the entire signature designated *Kilinc All*). Figure Kilinc 3 demonstrates all AOIs identified for this signature.

<u>*Total Fixation Count*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .673, F (6, 80) = 27.448, p < .001, multivariate η^2 = .673. Figure Kilinc 4 presents the mean fixation counts by AOI.

Figure Kilinc 4.



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for all but two AOIs. Fixation count was significantly greater among FDEs than among Lay participants in AOI11, F (1, 85) = 8.64, p = .004, partial η^2 = .092*;* AOI 2, F (1, 85) = 10.09, p = .002, partial η^2 = .106*;* AOI 3, F (1, 85) = 10.74, p = .002, partial η^2 = .112*;* and AOI ALL, F (1, 85) = 23.19, p < .001, partial η^2 = .214).

No significant differences were found for AOI 4, p = .539, *ns*; or AOI 5, p = .061, partial η^2 = .041, *ns*. Table Kilinc 1 presents the means and standard deviations for areas of interest by participant type.

Table Kilinc 1
Fixation Counts for FDE and Lay Participants

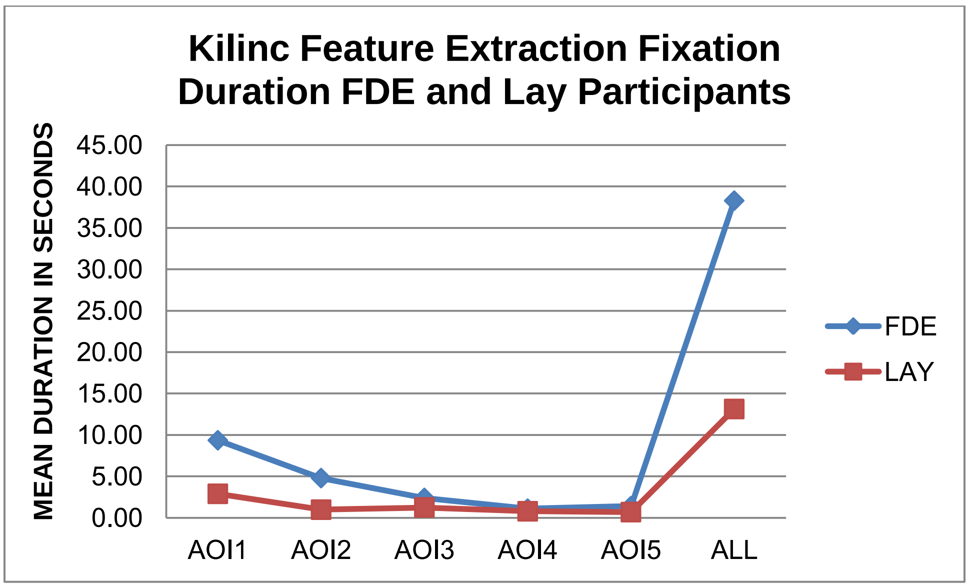
	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	13.13	14.67	5.60	8.13	4.74	3.81
Lay	6.00	4.83	1.43	1.82	2.53	2.12

Participant	AOI4		AOI5		ALL	
	M	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.53	2.74	2.79	3.36	70.49	47.81
Lay	2.15	3.03	1.58	2.45	30.00	25.17

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .656, F (6, 80) = 25.45, p < .001, multivariate η^2 = .656. Figure Kilinc 5 presents the mean fixation duration by AOI.

Figure Kilinc 5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for all but two AOIs. Fixation durations were significantly greater among FDEs than among Lay participants in AOI 1, F (1, 85) = 21.02, p < .001, partial η^2 = .198; AOI 2, F (1, 85) = 16.52, p < .001, partial η^2 = .163; AOI 3, F (1, 85) = 6.81, p = .011, partial η^2 = .074; and AOI ALL, F (1, 85) = 34.27, p < .001, partial η^2 = .287.

No significant differences were found for AOI 4, p = .230, *ns*; or AOI 5, p = .055, *ns*. Table Kilinc 2 presents the means and standard deviations for areas of interest by participant type.

Table Kilinc 2
Process Analysis Fixation Durations for FDE and Lay Participants

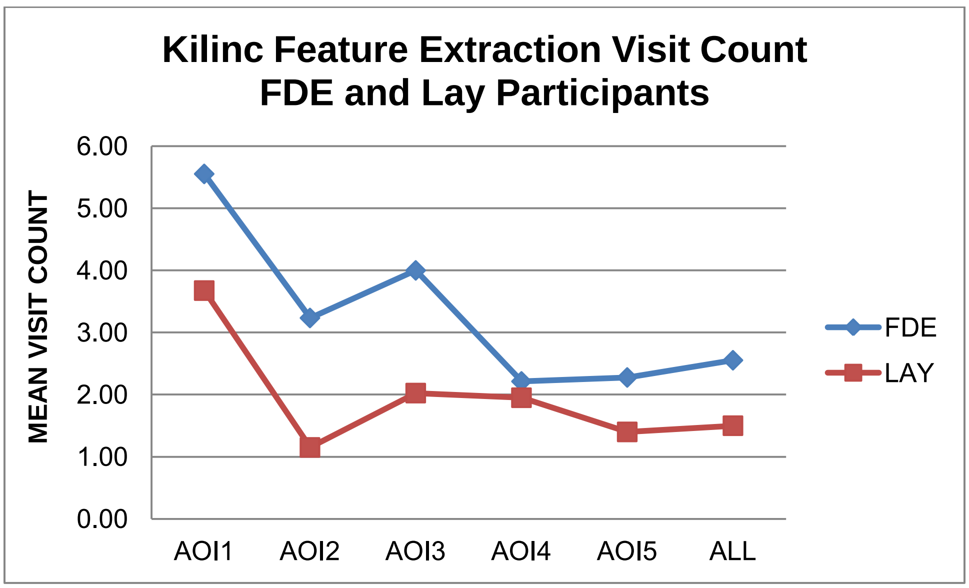
Participant	AOI1		AOI2		AOI3	
	M	***SD***	***M***	***SD***	***M***	***SD***

FDE	9.35	8.62	4.79	5.68	2.39	2.43
Lay	2.89	2.45	0.98	1.84	1.24	1.48
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.09	1.28	1.40	2.12	38.28	25.66
Lay	0.78	1.10	0.68	1.08	13.13	9.63

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .790, F (6, 80) = 50.29, p <.001, multivariate η^2 = .790. Figure Kilinc 6 presents the mean visit counts by AOI.

Figure Kilinc 6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for all but two AOIs. Visit count was significantly greater among FDEs than among Lay participants in AOI 1, F (1, 85) = 5.41, p = .022, partial η^2 = .060*;* AOI 2, F (1, 85) = 14.68, p < .001, partial η^2 = .147*;* AOI 3, F (1, 85) = 14.71, p < .001, partial η^2 = .148*;* and AOI ALL, F (1, 85) = 7.03, p = .010, partial η^2 = .076.

No significant differences were found for AOI 4, p = .598, *ns*; or AOI 5, p = .096, *ns*. Table Kilinc 3 presents the means and standard deviations for areas of interest by participant type.

Table Kilinc 3

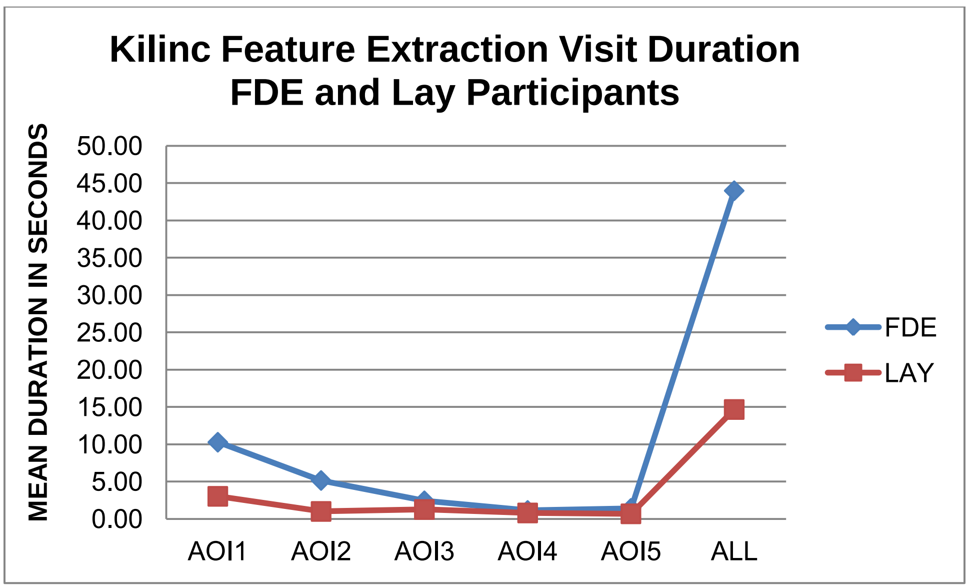
Visit Counts for FDE and Lay Participants

	AOI1		AOI2		AOI3	
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	5.55	4.51	3.23	3.18	4.00	2.99
Lay	3.68	2.61	1.15	1.42	2.03	1.40
	AOI4		**AOI5**		**ALL**	
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	2.21	2.24	2.28	2.55	2.55	2.40
Lay	1.95	2.40	1.40	2.25	1.50	0.78

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .648, F (6, 80) = 24.60, p < .001, multivariate η^2 = .648. Figure Kilinc 7 presents the mean visit duration by AOI.

Figure Kilinc 7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for all but two AOIs. Visit duration was significantly greater among FDEs than among Lay participants in AOI 1, F (1, 85) = 22.12, p < .001, partial η^2 = .207*;* AOI 2, F (1, 85) = 17.95, p < .001, partial η^2 = .174*;* AOI 3, F (1, 85) = 6.87, p = .010, partial η^2 = .075*;* and AOI ALL, F (1, 85) = 34.00, p < .001, partial η^2 = .292.

No significant differences were found for AOI 4, p = .221, *ns*; or AOI 5, p = .054, *ns*. Table Kilinc 4 presents the means and standard deviations for areas of interest by participant type.

Table Kilinc 4

Process Analysis Visit Durations for FDE and Lay Participants

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	10.28	9.45	5.16	5.93	2.43	2.45
Lay	3.03	2.59	1.00	1.93	1.26	1.52
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.14	1.39	1.42	2.15	44.00	29.63
Lay	0.80	1.15	0.69	1.09	14.67	11.04

Decision Confidence Analysis

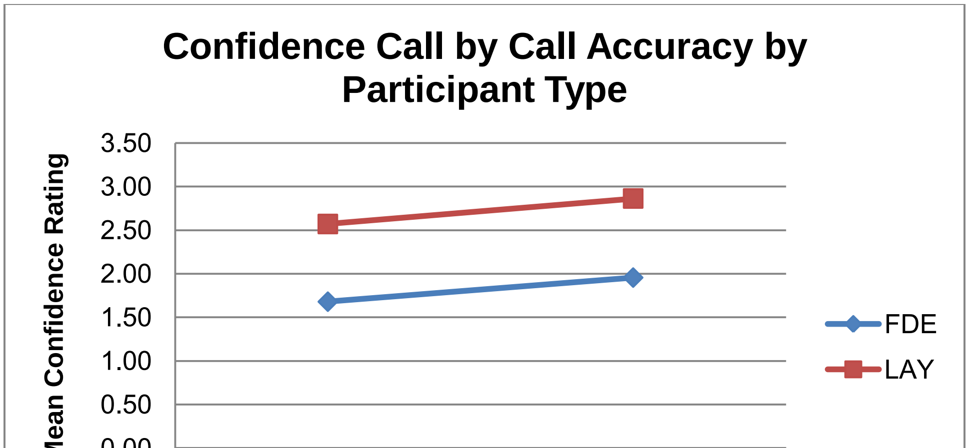
A 2 (FDE vs. Lay participant) x 2 (correct vs. incorrect call) univariate factorial ANOVA was conducted to investigate whether significant differences in level of *call confidence* existed between FDE and Lay participants, and whether significant differences existed according to the accuracy of the call. Table Kilinc 5 presents the results of the omnibus analysis.

Table Kilinc 5
Two-Way ANOVA Summary Table

Source	*SS*	*df*	*MS*	*F*	*p*	η^2
Between treatments						
Participant Type	18.32	1.00	18.32	36.12	.000	.293
Call Accuracy	1.83	1.00	1.83	3.61	.061	.040
Participant Type x Call Accuracy	0.00	1.00	0.00	0.00	.958	.000
Within treatments	44.13	87.00	0.51			
Total	522.00	91.00				

There was a significant main effects for participant type, F (1, 87) = 36.12, p < .001, partial η^2 = .293. There was no main effect for call accuracy, p = .061, *ns*, and no significant interaction of participant type by call accuracy, p =.958, *ns*. Figure Kilinc 8 demonstrates the mean confidence ratings by call accuracy and participant type.

Figure Kilinc 8



	Correct	Incorrect
FDE	1.68	1.96
LAY	2.57	2.86

<u>*Conclusions*</u>

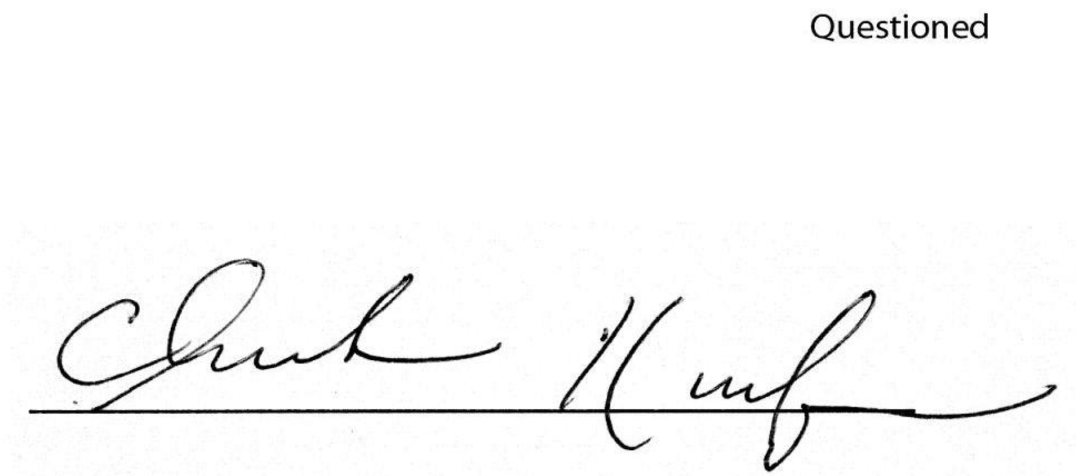
These findings indicate that although FDEs were no more accurate than were Lay participants, they were significantly less confident in the accuracy of their calls, on average rating their confidence level for both correct calls and incorrect calls at *not at all confident,* compared to Lay participants, who on average rated both their correct calls and incorrect call confidence at the *somewhat confident* level.

Six areas of interest (including AOI ALL) were empirically identified by examining the full sample heat map for this signature. The four eye tracking metrics revealed that overall, FDEs examined the signature significantly more extensively than did Lay participants, fixating a greater number of times on all AOIs, and fixating on those AOIs for a greater period of time. The significant differences in fixation count, fixation duration, visit count, and visit duration observed in the AOI “ALL” indicated that FDEs also examined a greater variety of signature features, and spent more time evaluating them, than did Lay participants.

SIGNATURE: Clinton Kinsler (Simulated)

The signature of Clinton Kinsler is characterized as a low-complexity mixed signature. Of the 49 FDE participants, 24 responded correctly that the signature was simulated, and 24 responded that the signature was genuine. Of the 43 Lay participants, 25 responded correctly that the signature was simulated, and 18 responded that it was genuine. This difference was not statistically significant, χ^2 (1, N = 91) = 0.61, p = .437, *ns*. Figure Kinsler 1 presents the view of this signature.

Figure Kinsler 1. Single Signature Stimulus for Clinton Kinlser.



Selection of Areas of Interest (AOIs)

Figure Kinsler 2 presents the heat map for this slide. Empirical examination of the heat map revealed that there were two locations indicated by red "hot spots" within the signature that elicited significant attention from the participants. AOIs were created for these specific hot spots. Larger, secondary AOIs incorporating the smaller hot spots were created to include the orange "warm spots," creating a total of six AOIs (including the AOI for the questioned signature) for this stimulus.

Figure Kinsler 2. Heat map for Clinton Kinsler Signature demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

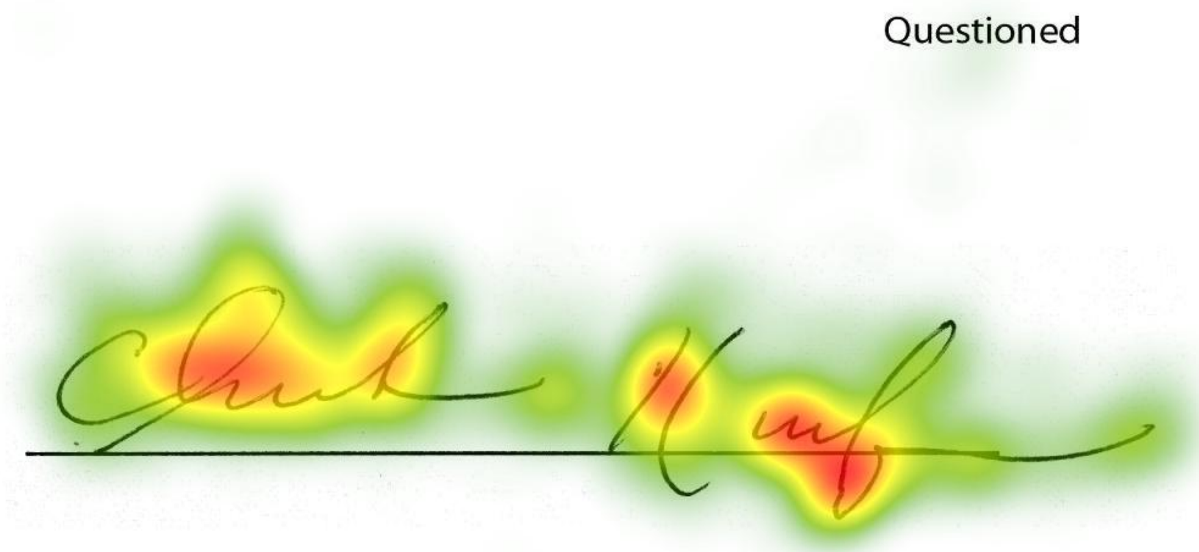
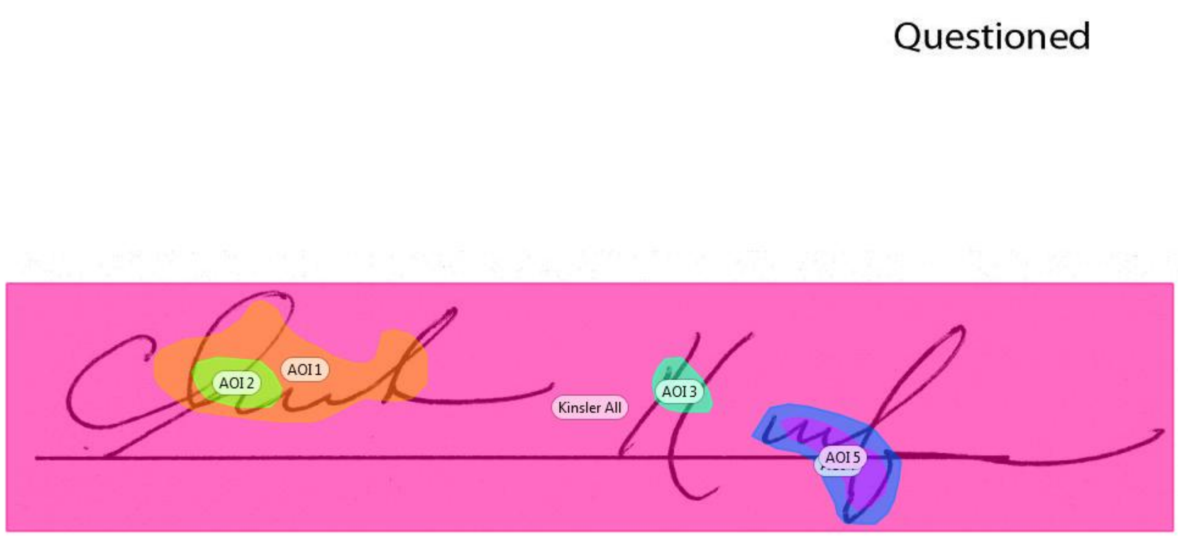


Figure Kinsler 3 Areas of Interest (AOIs) for Signature Clinton Kinsler



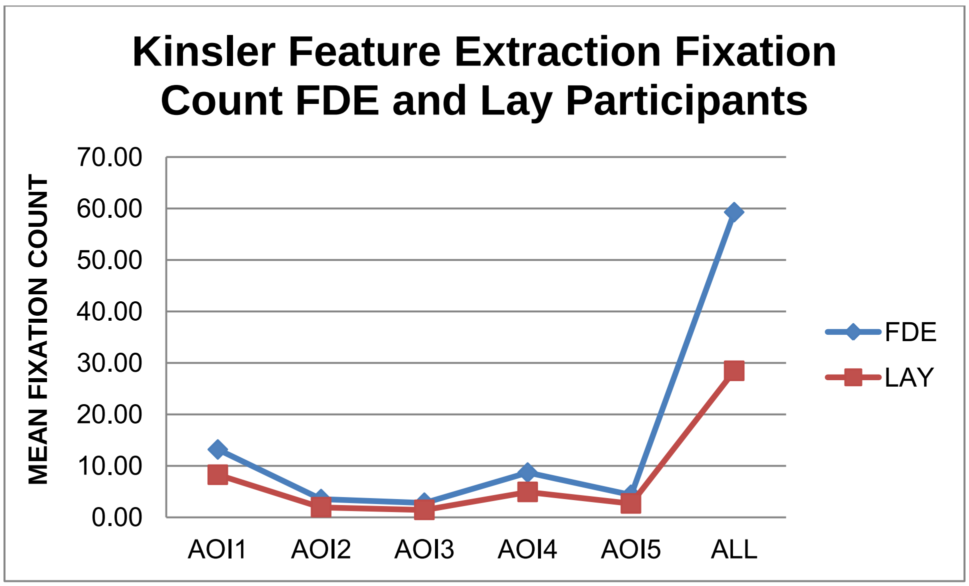
Eye-Tracking Metrics Analyses

These analyses investigate the participants' overall utilization of characteristics in the signature stimulus, and the participants' deployment of attentional resources to specific characteristics that the heat map indicated were particularly diagnostic during the examination. The examination process analyses are based on AOIs in the signature, and the overall signature analysis (the AOI overlaying the entire signature designated *Kinsler All*). Figure Kinsler 3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .703, F (6, 81) = 32.02, p < .001, multivariate η^2 = .703. Figure Kinsler 4 presents the mean fixation counts by AOI.

Figure Kinsler 4.



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for three of the AOIs. Fixation count was significantly greater among FDEs than among Lay participants in AOI 2, F (1, 86) = 4.88, p = .030, partial η^2 = .054; AOI 3, F (1, 86) = 7.83, p = .030, partial η^2 = .054; and AOI ALL, F (1, 86) = 10.39, p = .002, partial η^2 = .108.

No significant differences were found for AOI 1, p = .082, *ns;* AOI 4, p = .085, *ns*; or p = .147, *ns*. Table Kinsler 1 presents the means and standard deviations for areas of interest by participant type.

Table Kinsler 1

Process Analysis Fixation Count for FDE and Lay Participants

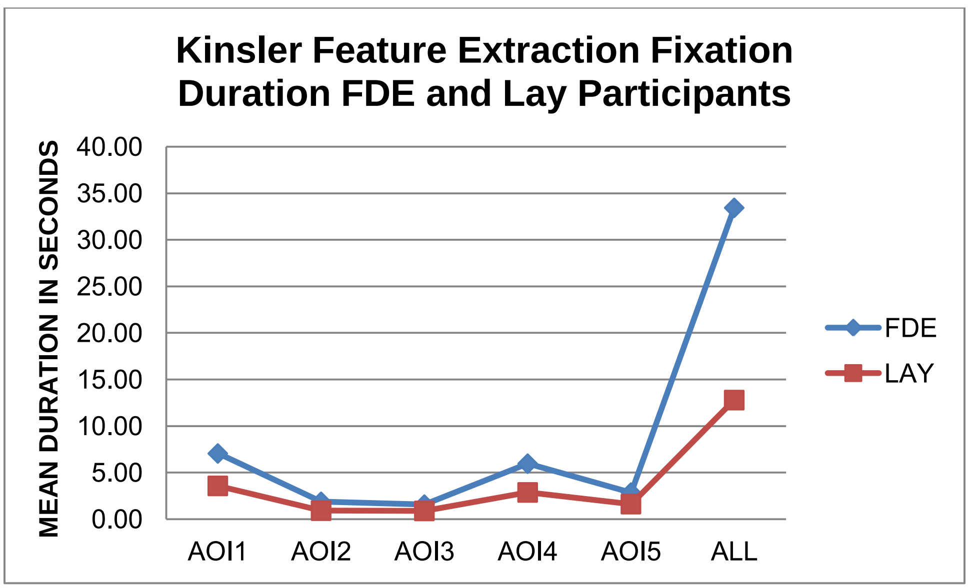
	AOI1	AOI2	AOI3

Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	13.15	14.89	3.51	4.43	2.81	2.95
Lay	8.24	10.50	1.93	1.27	1.41	1.30
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	8.66	12.41	4.34	6.53	59.28	51.20
Lay	4.90	6.43	2.66	3.64	28.44	35.97

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .615, F (6, 81) = 21.52, p < .001, multivariate η^2 = .615. Figure Kinsler 5 presents the mean fixation duration by AOI.

Figure Kinsler 5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for all but one AOI. Fixation duration was significantly greater among FDEs than among Lay participants in AOI 1, F (1, 86) = 8.96, p = .004, partial η^2 = .094; AOI 2, F (1, 86) = 7.19, p = .009, partial η^2 = .077; AOI 3, F (1, 86) = 4.14, p = .045, partial η^2 = .046; AOI 4, F (1, 86) = 4.39, p = .039, partial η^2 = .049; and AOI ALL, F (1, 86) = 16.50, p < .001, partial η^2 = .161.

No significant differences were found for AOI 5, p = .135, *ns*. Table Kinlser 2 presents the means and standard deviations for areas of interest by participant type.

Table Kinsler 2

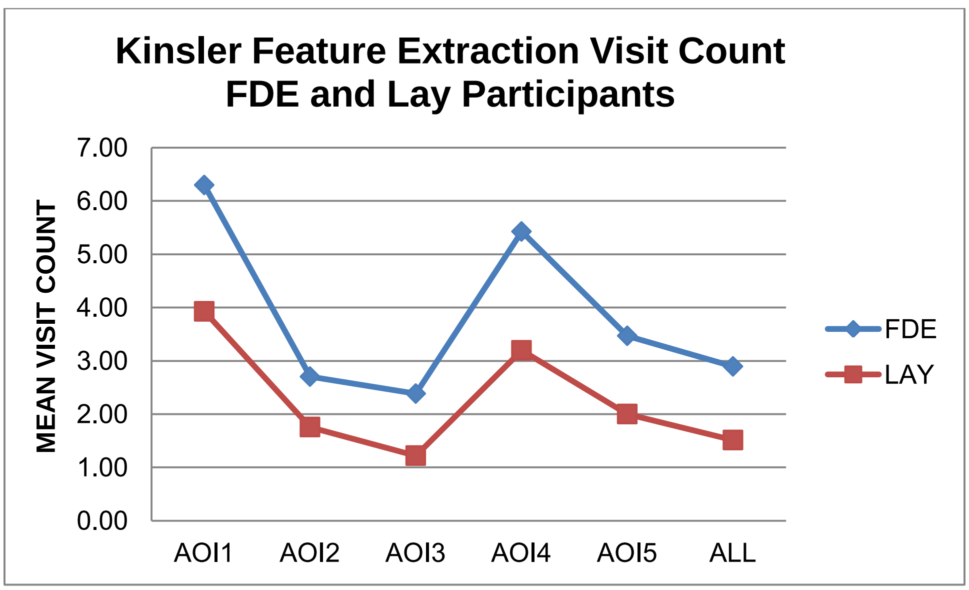
Process Analysis Fixation Durations for FDE and Lay Participants

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	7.05	6.74	1.86	2.14	1.56	1.88
Lay	3.57	3.37	0.91	0.83	0.88	1.08
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	5.96	9.06	2.85	4.92	33.44	31.03
Lay	2.87	2.85	1.62	1.98	12.79	10.45

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .709, F (6, 81) = 3.14, p =.008, multivariate η^2 = .709. Figure Kinsler 6 presents the mean visit counts by AOI.

Figure Kinsler 6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for three of the AOIs. Visit count was significantly greater among FDEs than among Lay participants in AOI 1, F (1, 88) = 4.00, p = .049, partial η^2 = .044; AOI 3, F (1, 88) = 8.49, p = .005, partial η^2 = .090; and AOI ALL, F (1, 88) = 6.62, p = .012, partial η^2 = .071.

No significant differences were found for AOI 2, p = .074, ns; AOI 4, p = .062, *ns*; or AOI 5, p = .089, *ns*. Table Kinsler 3 presents the means and standard deviations for areas of interest by participant type.

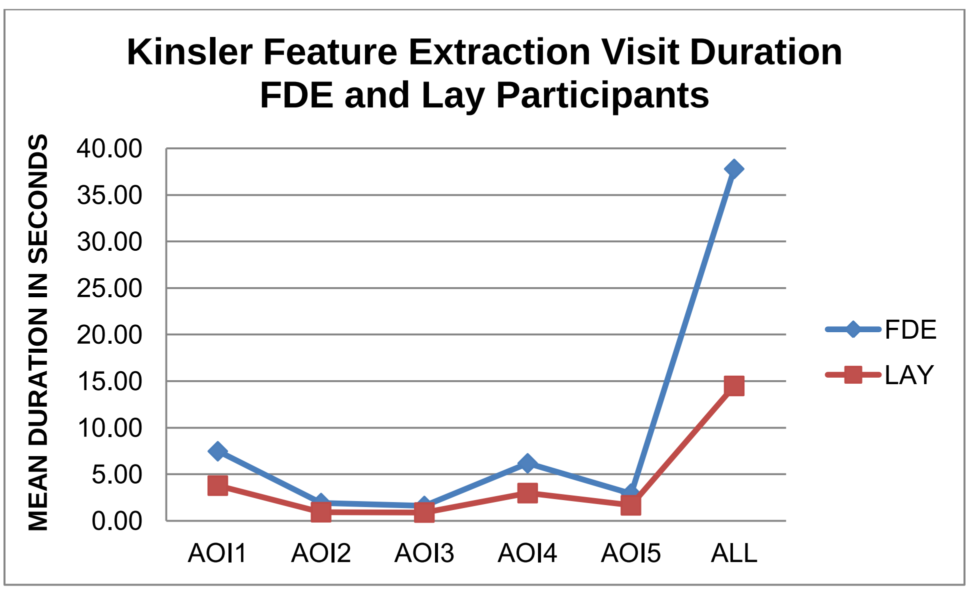
Table Kinsler 3
Visit Counts for FDE and Lay Participants

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	6.30	6.47	2.70	3.16	2.38	2.31
Lay	3.93	4.24	1.76	1.18	1.22	1.17
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	5.43	7.04	3.47	5.09	2.89	3.24
Lay	3.20	2.87	2.00	2.10	1.51	1.23

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .631, F (6, 81) = 23.07, p < .001, multivariate η^2 = .631. Figure Kinsler 7 presents the mean visit durations by AOI.

Figure Kinsler 7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for all but one AOI. Visit duration was significantly greater among FDEs than among Lay participants in AOI 1, F (1, 86) = 8.90, p = .004, partial η^2 = .094; AOI 2, F (1, 86) = 7.20, p = .009, partial η^2 = .077; AOI 3, F (1, 86) = 4.36, p = .040, partial η^2 = .048; AOI 4, F (1, 86) = 4.17, p = .044, partial η^2 = .046; and AOI ALL, F (1, 86) = 16.01, p < .001, partial η^2 = .157.

No significant differences were found for AOI 5, p = .139, *ns*. Table Kinsler 4 presents the means and standard deviations for areas of interest by participant type.

Table Kinsler 4
Process Analysis Visit Durations for FDE and Lay Participants

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	7.46	7.17	1.90	2.21	1.59	1.91
Lay	3.77	3.60	0.92	0.83	0.89	1.09
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	6.17	9.63	2.92	5.05	37.79	35.58
Lay	2.97	2.94	1.66	2.03	14.48	11.91

Decision Confidence Analysis

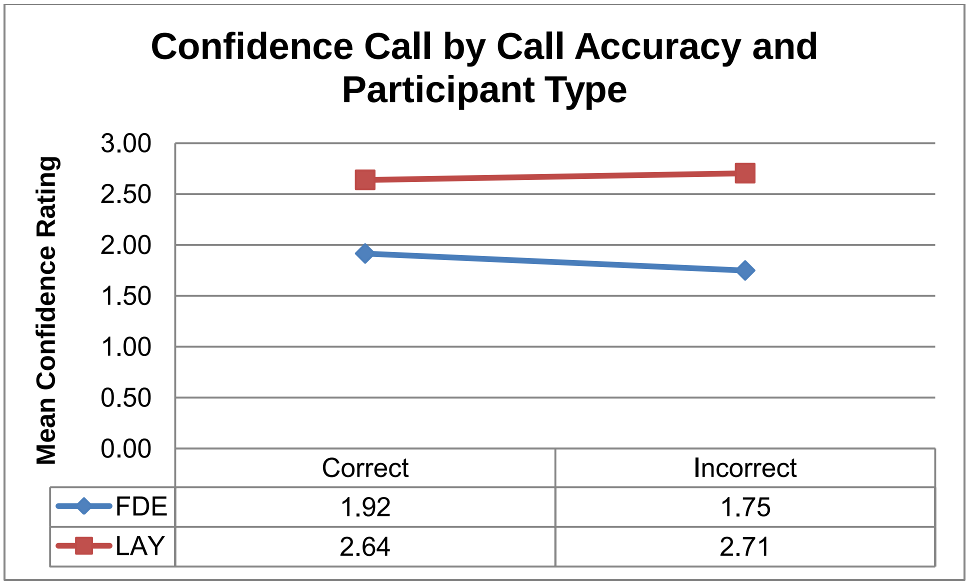
A 2 (FDE vs. Lay participant) x 2 (correct vs. incorrect call) univariate factorial ANOVA was conducted to investigate whether significant differences in level of *call confidence* existed between FDE and Lay participants, and whether significant differences existed according to the accuracy of the call. Table Kinsler 5 presents the results of the omnibus analysis.

Table Kinsler 5
Two-Way ANOVA Summary Table

Source	*SS*	*df*	*MS*	*F*	*p*	η^2
Between treatments						
Participant Type	15.48	1.00	15.48	25.79	.000	.231
Call Accuracy	0.06	1.00	0.06	0.09	.761	.001
Participant Type x Call Accuracy	0.30	1.00	0.30	0.49	.484	.006
Within treatments	51.62	86.00	0.60			
Total	512.00	90.00				

There was a significant main effect for participant type, F (1, 86) = 25.79, $p < .001$, partial η^2 = .231. There was no main effect for call accuracy, p = .761, *ns*, and there was no significant interaction of participant type by call accuracy, p =.484, *ns*. Figure Kinsler 8 demonstrates the mean confidence ratings by call accuracy and participant type.

Figure Kinsler 8



Conclusions

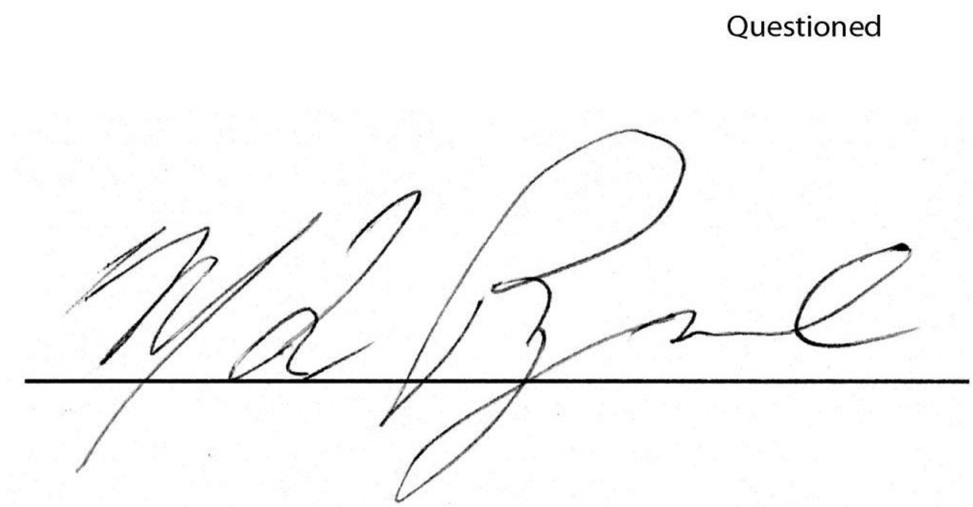
These findings indicate that although FDEs were no more accurate than were Lay participants, they were significantly less confident in the accuracy of their calls, on average rating their confidence level for both correct calls and incorrect calls at *not at all confident,* compared to Lay participants, who on average rated both their correct calls and incorrect call confidence at the *somewhat confident* level.

Six areas of interest (including AOI ALL) were empirically identified by examining the full sample heat map for this signature. The four eye tracking metrics revealed that overall, FDEs examined the signature significantly more extensively than did Lay participants, fixating a greater number of times on all AOIs, and fixating on those AOIs for a greater period of time. The significant differences in fixation count, fixation duration, visit count, and visit duration observed in the AOI "ALL" indicated that FDEs also examined a greater variety of signature features, and spent more time evaluating them, than did Lay participants.

SIGNATURE: Mark Payne (Simulated)

The signature of Mark Payne is characterized as a low-complexity mixed signature. Of the 49 FDE participants, 45 responded correctly that the signature was simulated, and 4 responded that the signature was genuine. Of the 43 Lay participants, 22 responded correctly that the signature was simulated, and 21 responded that it was genuine. This difference was statistically significant, χ^2 (1, N = 92 = 19.15, p < .001. Figure Mark Payne 1 presents the view of this signature.

Figure Mark Payne 1. Single Signature Stimulus for Mark Payne.



Selection of Areas of Interest (AOIs)

Figure Mark Payne 2 presents the heat map for this slide. Empirical examination of the heat map revealed that there were two locations indicated by red "hot spots" within the signature that elicited significant attention from the participants. AOIs were created for these specific hot spots. Larger, secondary AOIs incorporating the smaller hot spots were created to include the orange "warm spots," creating a total of six AOIs (including the AOI for the questioned signature, labeled *Payne All*) for this stimulus.

Figure Mark Payne 2. Heat maps for Mark Payne Signature demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs. The overall heat map is displayed below. Separate heat maps for FDEs and Lay Participants are displayed underneath.

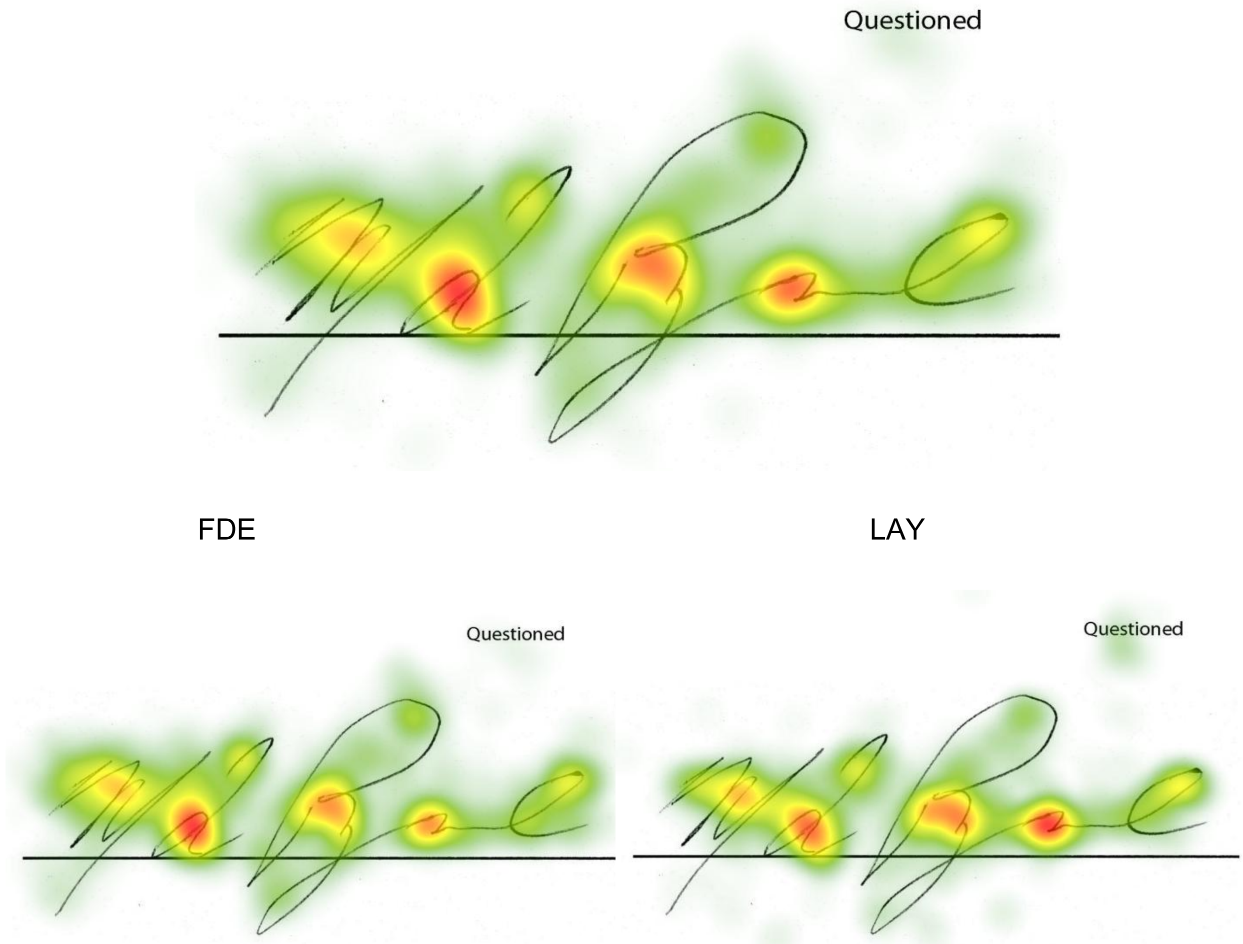
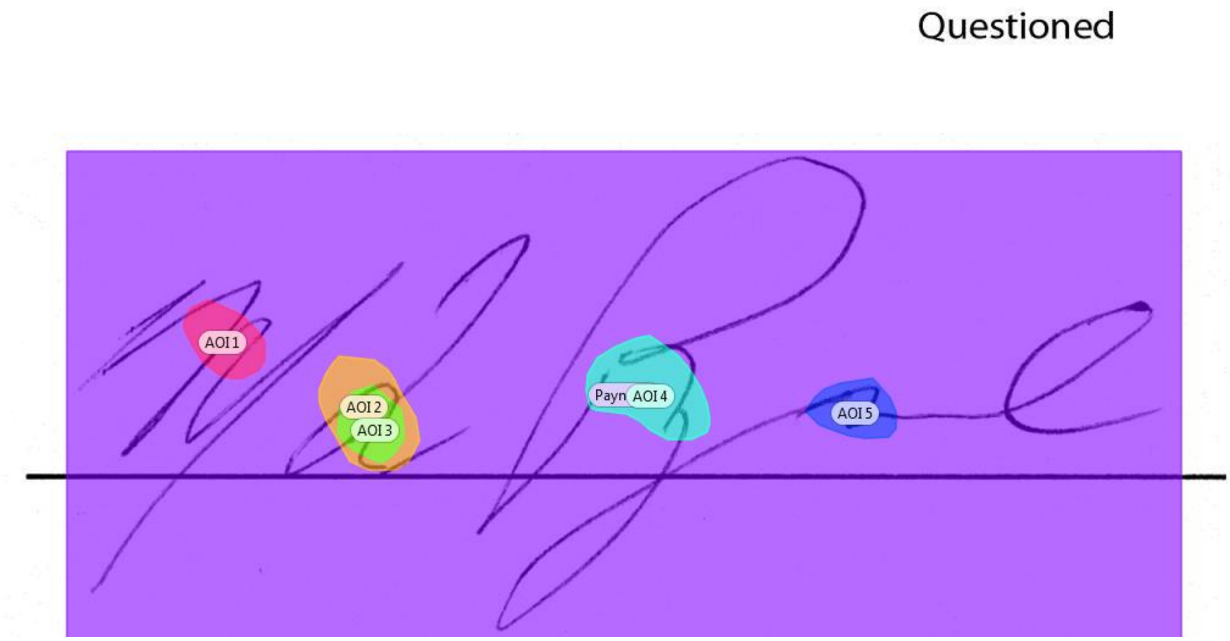


Figure Mark Payne 3 Areas of Interest (AOIs) for Signature Mark Payne



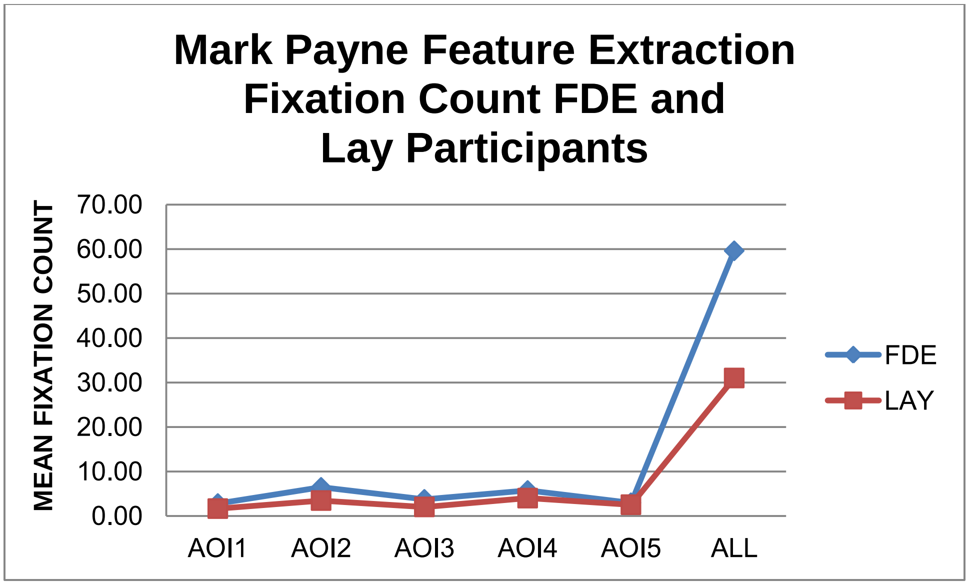
Eye-Tracking Metrics Analyses

These analyses investigate the participants' overall utilization of characteristics in the signature stimulus, and the participants' deployment of attentional resources to specific characteristics that the heat map indicated were particularly diagnostic during the examination. The examination process analyses are based on AOIs in the signature, and the overall signature analysis (the AOI overlaying the entire signature designated *Payne All*). Figure Mark Payne 3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .604, F (6, 82) = 20.83, p < .001, multivariate η^2 = .604. Figure Mark Payne 4 presents the mean fixation counts by AOI.

Figure Mark Payne 4.



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for all but two of the AOIs. Fixation count was greater among FDEs than among Lay participants in AOI 1, F (1, 87) = 4.81, p = .031, partial η^2 = .052; AOI 2, F (1, 87) = 8.35, p = .005, partial η^2 = .088; AOI 3, F (1, 87) = 5.27, p = .024, partial η^2 = .057; and AOI ALL, F (1, 87) = 12.84, p = .001, partial η^2 = .129.

No significant differences were found for AOI 4, p = .098, *ns*; AOI 5, p = .487, *ns*. Table Mark Payne 1 presents the means and standard deviations for areas of interest by participant type.

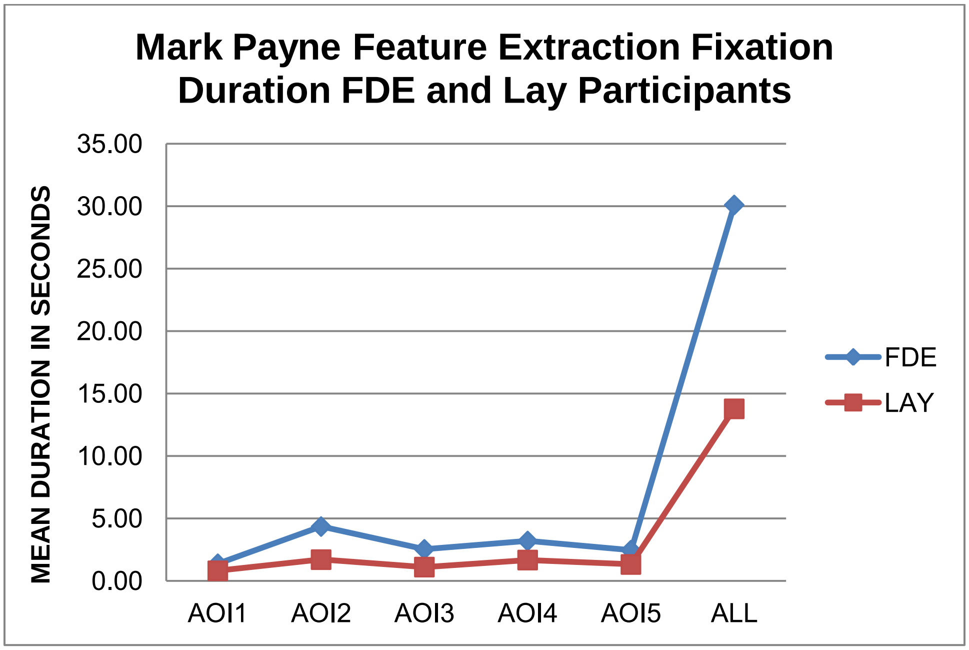
Table Mark Payne 1
Process Analysis Fixation Counts for FDE and Lay Participants

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.79	2.65	6.43	5.82	3.72	4.26
Lay	1.64	2.22	3.45	3.43	2.02	2.33
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	5.72	5.54	2.96	3.29	59.60	45.32
Lay	4.00	3.94	2.52	2.45	31.00	26.30

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .612, F (6, 81) = 21.54, p < .001, multivariate η^2 = .612. Figure Mark Payne 5 presents the mean fixation duration by AOI.

Figure Mark Payne 5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for all but one of the AOIs. Fixation duration was greater among FDEs than among Lay participants in AOI 2, F (1, 87) = 3.52, p = .064, partial η^2 = .039; AOI 3, F (1, 87) = 8.56, p = .004, partial η^2 = .090; AOI 4, F (1, 87) = 9.44, p = .003, partial η^2 = .098; AOI 5, F (1, 87) = 5.55, p = .021, partial η^2 = .060; and AOI ALL, F (1, 87) = 17.96, p < .001, partial η^2 = .171.

No significant differences were found for AOI 1, F (1, 87) = 3.52, p = .064, partial η^2 = .039. Table Mark Payne 2 presents the means and standard deviations for areas of interest by participant type.

Table Mark Payne 2

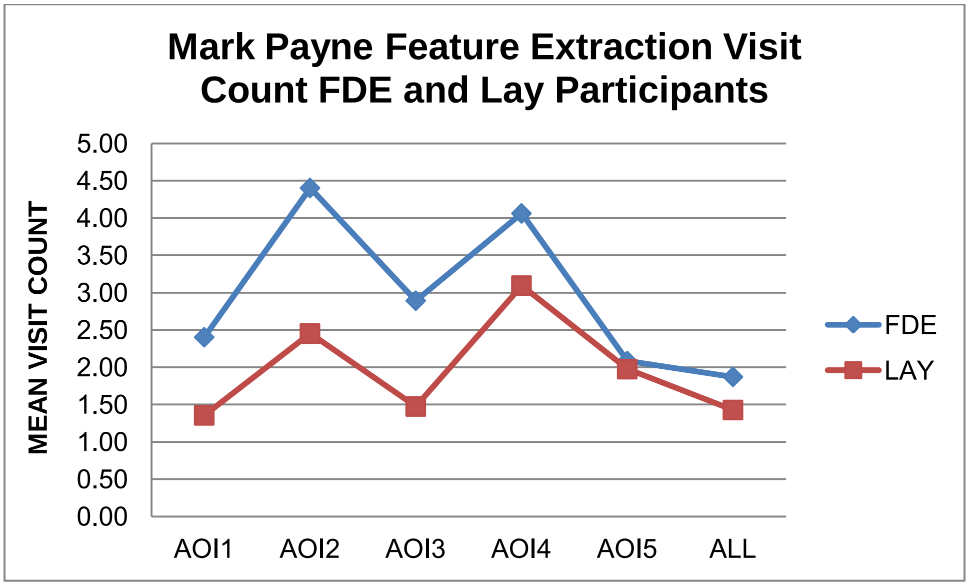
Process Analysis Fixation Durations for FDE and Lay Participants

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.38	1.51	4.35	3.68	2.53	2.79
Lay	0.81	1.31	1.70	1.92	1.11	1.55
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	3.20	2.75	2.46	2.68	30.11	21.61
Lay	1.67	1.77	1.32	1.76	13.78	13.23

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .741, F (6, 82) = 39.12, p <. 001, multivariate η^2 = .741. Figure Mark Payne 6 presents the mean visit counts by AOI.

Figure Mark Payne 6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for three of the AOIs. Visit count was greater among FDEs than among Lay participants in AOI 1, F (1, 87) = 6.80, p = .011, partial η^2 = .073; AOI 2, F (1, 87) = 11.64, p = .001, partial η^2 = .118; and AOI 3, F (1, 87) = 8.52, p = .004, partial η^2 = .089.

No significant differences were found for AOI 4, p = .120, *ns*; AOI 5, p = .795, *ns*; or AOI ALL, p = .131, *ns*. Table Mark Payne 3 presents the means and standard deviations for areas of interest by participant type.

Table Mark Payne 3

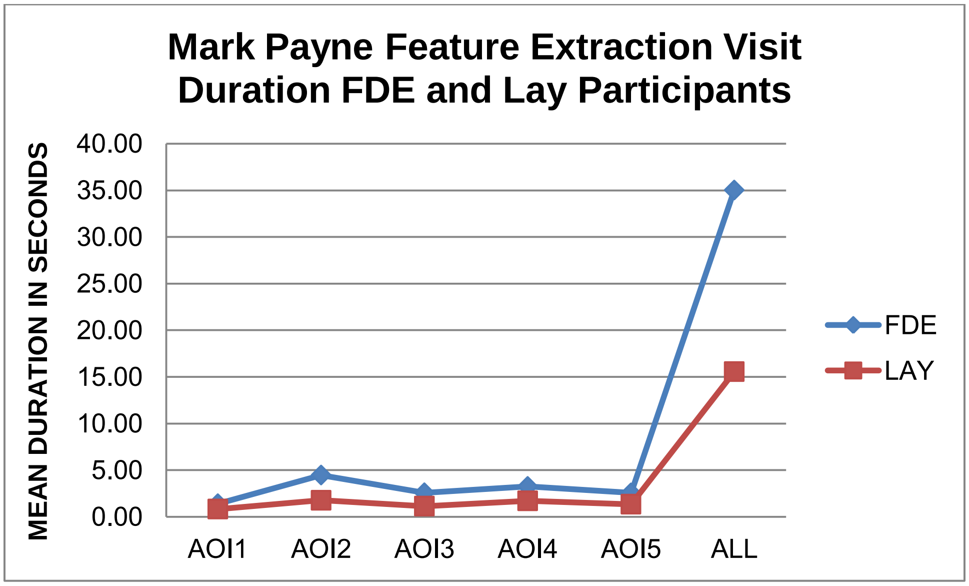
Visit Counts for FDE and Lay Participants

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.40	2.14	4.40	3.19	2.89	2.87
Lay	1.36	1.56	2.45	2.00	1.48	1.37
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	4.06	3.10	2.09	2.06	1.87	1.79
Lay	3.10	2.67	1.98	1.87	1.43	0.63

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .612, F (6, 82) = 21.59, p < .001, multivariate η^2 = .612. Figure Mark Payne 7 presents the mean visit duration by AOI.

Figure Mark Payne 7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for all but one of the AOIs. Fixation durations were significantly greater among FDEs than among Lay participants in AOI 2, F (1, 87) = 16.97, p < .001, partial η^2 = .163; AOI 3, F (1, 87) = 8.22, p = .005, partial η^2 = .086; AOI 4, F (1, 87) = 9.29, p = .003, partial η^2 = .096; AOI 5, F (1, 87) = 5.70, p = .019, partial η^2 = .062; and AOI ALL, F (1, 87) = 17.13, p < .001, partial η^2 = .165.

No significant differences were found for AOI 1, p = .065, *ns*. Table Mark Payne 4 presents the means and standard deviations for areas of interest by participant type.

Table Mark Payne 4

Process Analysis Visit Durations for FDE and Lay Participants

	AOI1		**AOI2**		**AOI3**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.40	1.53	4.47	3.81	2.57	2.86
Lay	0.82	1.34	1.76	2.00	1.14	1.61
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	3.25	2.80	2.55	2.80	35.03	27.25
Lay	1.70	1.81	1.34	1.80	15.56	14.42

Decision Confidence Analysis

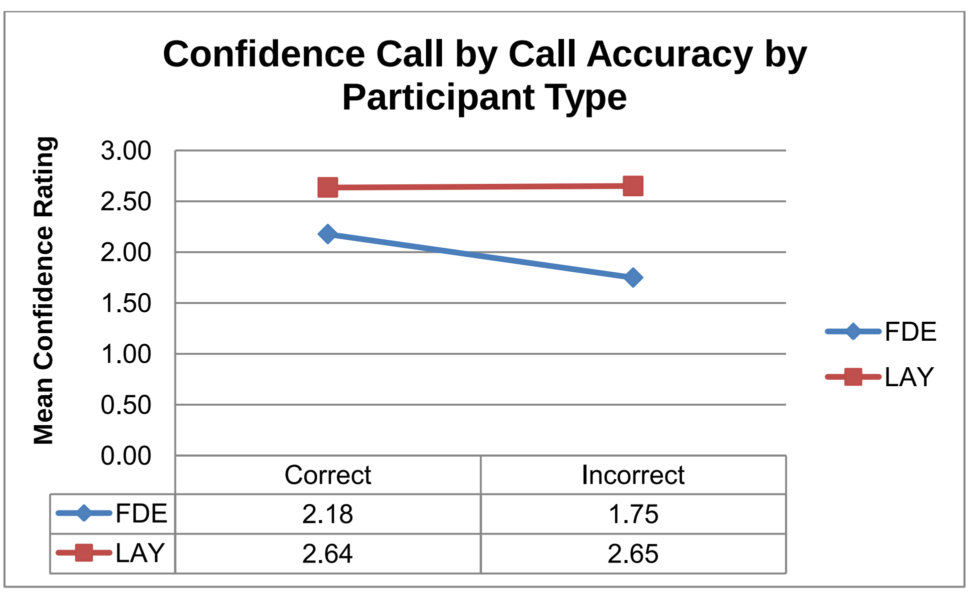
A 2 (FDE vs. Lay participant) x 2 (correct vs. incorrect call) univariate factorial ANOVA was conducted to investigate whether significant differences in level of *call confidence* existed between FDE and Lay participants, and whether significant differences existed according to the accuracy of the call. Table Mark Payne 5 presents the results of the omnibus analysis.

Table Mark Payne 5
Two-Way ANOVA Summary Table

Source	*SS*	*df*	*MS*	*F*	*p*	η^2
Between treatments						
Participant Type	5.02	1.00	5.02	7.95	.006	.084
Call Accuracy	0.47	1.00	0.47	0.74	.393	.008
Participant Type x Call Accuracy	0.53	1.00	0.53	0.84	.362	.010
Within treatments	54.97	87.00	0.63			
Total	574.00	91.00				

There was a significant main effects for participant type, F (1, 87) = 7.95, p = .006, partial η^2 = .084. There was no main effect for call accuracy, p = .393, *ns*, and there was no significant interaction of participant type by call accuracy, p =.362, *ns*. Figure Mark Payne 8 demonstrates the mean confidence ratings by call accuracy and participant type.

Figure Mark Payne 8



Conclusions

These findings indicate that although FDEs were significantly more accurate than were Lay participants, they were also significantly less confident in the accuracy of their calls. Although on average FDEs were who made correct calls rated their confidence level at *somewhat confident* and those who made incorrect calls rated their confidence as *not at all confident*, this interaction was not statistically significant. Lay participants, on average, rated their both their correct call confidence and incorrect call confidence at the *somewhat confident* level.

Six areas of interest including the AOI ALL were empirically identified by examining the full sample heat map for this signature. The four eye tracking metrics revealed that overall, FDEs examined the signature significantly more extensively than did Lay participants, fixating a greater number of times on all AOIs, and fixating on those AOIs for a greater period of time. The significant differences in fixation count, fixation duration, and visit duration observed in the AOI "ALL" indicated that FDEs also examined a greater variety of signature features, and spent more time evaluating them, than did Lay participants.

SIGNATURE: Annie Penland (Genuine)

The signature of Jeremy Payne is characterized as a high-complexity text-based signature. Of the 49 FDE participants, 31 responded correctly that the signature was genuine, and 18 responded that the signature was simulated. Of the 43 Lay participants, 26 responded correctly that the signature was genuine, and 17 responded that it was simulated. This difference was not statistically significant, χ^2 (1, N = 92) = 0.08, p = .783. Figure Penland 1 presents the view of this signature.

Figure Penland 1. Single Signature Stimulus for Annie Penland.

Selection of Areas of Interest (AOIs)

Figure Annie Penland 2 presents the heat map for this slide. Empirical examination of the heat map revealed that there were two locations indicated by red "hot spots" within the signature that elicited significant attention from the participants. AOIs were created for these specific hot spots. Larger, secondary AOIs incorporating the smaller hot spots were created to include the orange "warm spots," creating a total of five AOIs (including the AOI for the questioned signature, labeled *Penland All*) for this stimulus.

Figure Penland 2. Heat maps for Penland Signature demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs. The overall heat map is displayed below. Separate heat maps for FDEs and Lay Participants are displayed underneath.

FDE

LAY

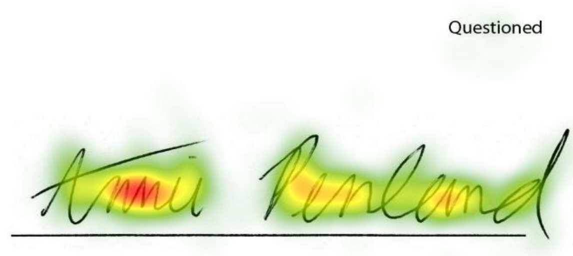


Figure Penland 3 Areas of Interest (AOIs) for Signature Annie Penland

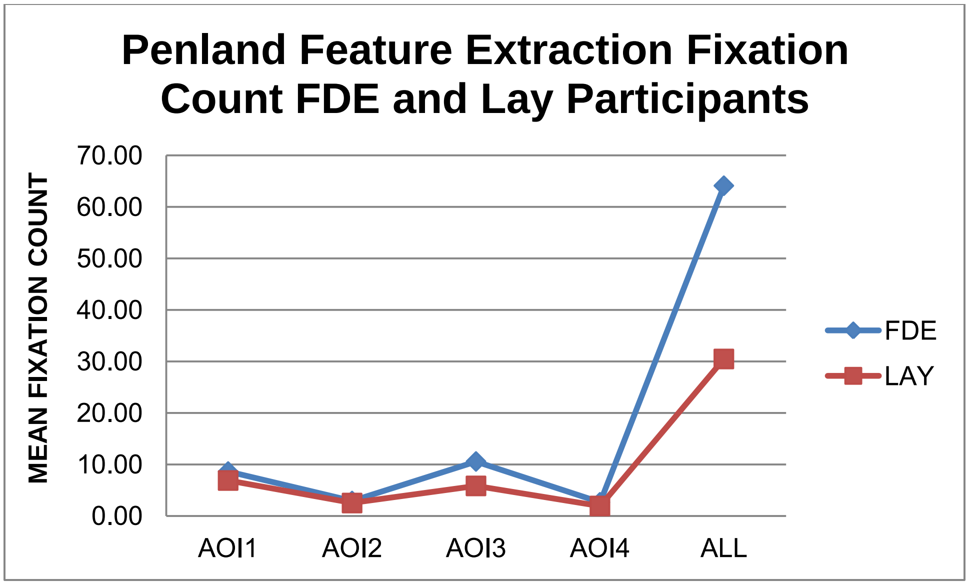
Eye-Tracking Metrics Analyses

These analyses investigate the participants' overall utilization of characteristics in the signature stimulus, and the participants' deployment of attentional resources to specific characteristics that the heat map indicated were particularly diagnostic during the examination. The examination process analyses are based on AOIs in the signature, and the overall signature analysis (the AOI overlaying the entire signature designated *Penland All*). Figure Penland 3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .650, F (5, 81) = 30.15, p < .001, multivariate η^2 = .650. Figure Penland 4 presents the mean fixation counts by AOI.

Figure Penland 4.



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for two of the AOIs. Fixation count was greater among FDEs than among Lay participants in AOI 3, F (1, 85) = 5.13, p = .026, partial η^2 = .057; and AOI ALL, F (1, 85) = 19.16, p < .001, partial η^2 = .184).

No significant differences were found for AOI 1, p = .331, *ns;* AOI 2, p = .613, *ns;* AOI 4, p = .313, *ns*. Table Penland 1 presents the means and standard deviations for areas of interest by participant type.

Table Penland 1

Process Analysis Fixation Counts for FDE and Lay Participants

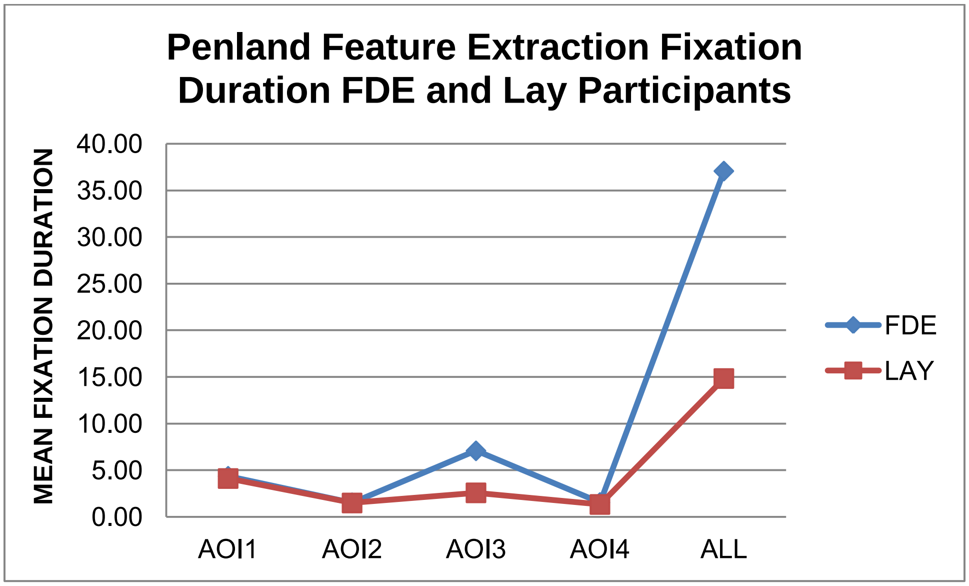
	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	8.62	9.18	2.89	4.03	10.57	12.46
Lay	6.88	7.09	2.50	3.01	5.83	4.90

	AOI4		ALL	
Participant	***M***	***SD***	***M***	***SD***
FDE	2.64	3.72	64.13	43.60
Lay	1.93	2.63	30.48	23.27

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .619, F (5, 81) = 26.30, p < .001, multivariate η^2 = .619. Figure Penland 5 presents the mean fixation duration by AOI.

Figure Penland 5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for two of the AOIs. Fixation duration was significantly greater among FDEs than among Lay participants in AOI 3, F (1, 85) = 14.57, p < .001, partial η^2 = .146; and AOI ALL, F (1, 85) = 21.28, p < .001, partial η^2 = .200).

No significant differences were found for AOI 1, p = .796, *ns;* AOI 2, p = .963, *ns;* and AOI 4, p = .615, *ns*. Table Penland 2 presents the means and standard deviations for areas of interest by participant type.

Table Penland 2
Process Analysis Fixation Durations for FDE and Lay Participants

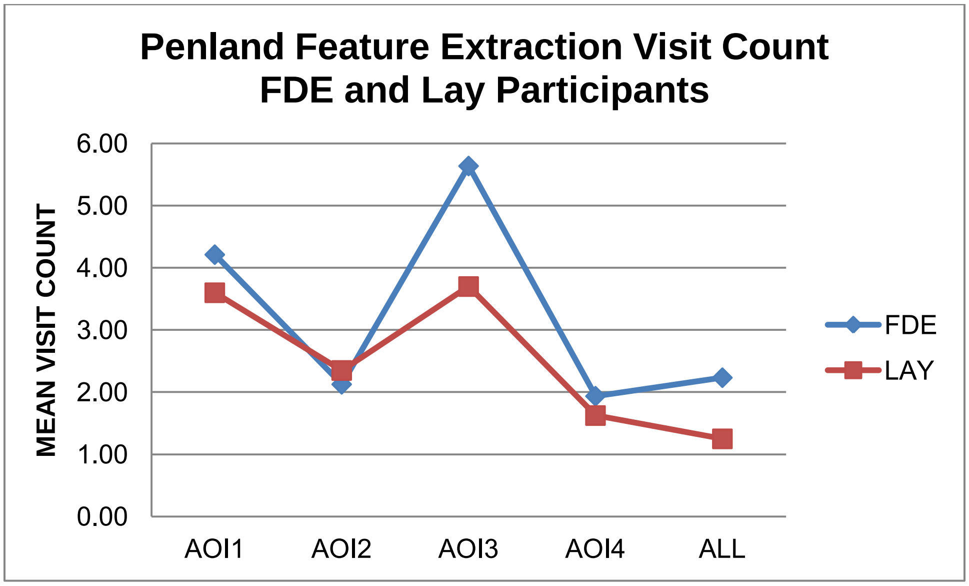
	AOI1		**AOI2**		**AOI3**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	4.36	4.65	1.51	2.19	7.09	7.13
Lay	4.12	3.91	1.49	2.10	2.58	2.37

	AOI4		**ALL**	
Participant	***M***	***SD***	***M***	***SD***
FDE	1.54	2.03	37.09	28.54
Lay	1.34	1.77	14.84	11.61

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .780, F (5, 81) = 57.37, p < .001, multivariate η^2 = .780. Figure Penland 6 presents the mean visit counts by AOI.

Figure Penland 6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for two of the AOIs. Visit counts were significantly greater among FDEs than among Lay participants in AOI 3, F (1, 85) = 5.93, p = .017, partial η^2 = .065*;* and AOI ALL, F (1, 85) = 8.09, p = .006, partial η^2 = .087.

No significant differences were found for AOI 1, p = .402, *ns;* AOI 2, p = .689, *ns*; or AOI 4, p = .497, *ns*. Table Penland 3 presents the means and standard deviations for areas of interest by participant type.

Table Penland 3
Visit Counts for FDE and Lay Participants

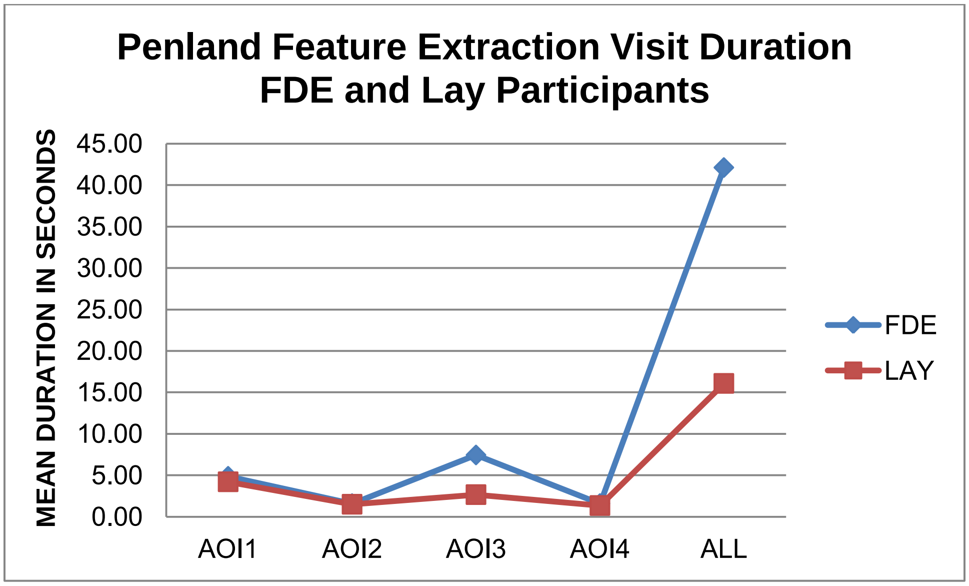
	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	4.21	3.58	2.13	2.38	5.64	4.45
Lay	3.60	3.13	2.35	2.78	3.70	2.54

	AOI4		ALL	
Participant	***M***	***SD***	***M***	***SD***
FDE	1.94	2.35	2.23	2.12
Lay	1.63	1.81	1.25	0.59

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .629, F (5, 81) = 27.46, p < .001, multivariate η^2 = .629. Figure Penland 7 presents the mean visit duration by AOI.

Figure Penland 7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for two of the AOIs. Visit duration was greater among FDEs than among Lay participants in AOI 3, F (1, 85) = 15.43, p < .001, partial η^2 = .154; and AOI ALL, F (1, 85) = 24.55, p < .001, partial η^2 = .224.

No significant differences were found for AOI 1, p = .508, *ns;* AOI 2, p = .866, *ns;* or AOI 4, p = .572, *ns*. Table Penland 4 presents the means and standard deviations for areas of interest by participant type.

Table Penland 4

Process Analysis Visit Durations for FDE and Lay Participants

	AOI1		**AOI2**		**AOI3**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	4.87	5.10	1.58	2.29	7.44	7.36
Lay	4.21	4.04	1.50	2.13	2.66	2.42

	AOI4		**ALL**	
Participant	***M***	***SD***	***M***	***SD***
FDE	1.58	2.05	42.12	31.28
Lay	1.35	1.78	16.08	12.12

Decision Confidence Analysis

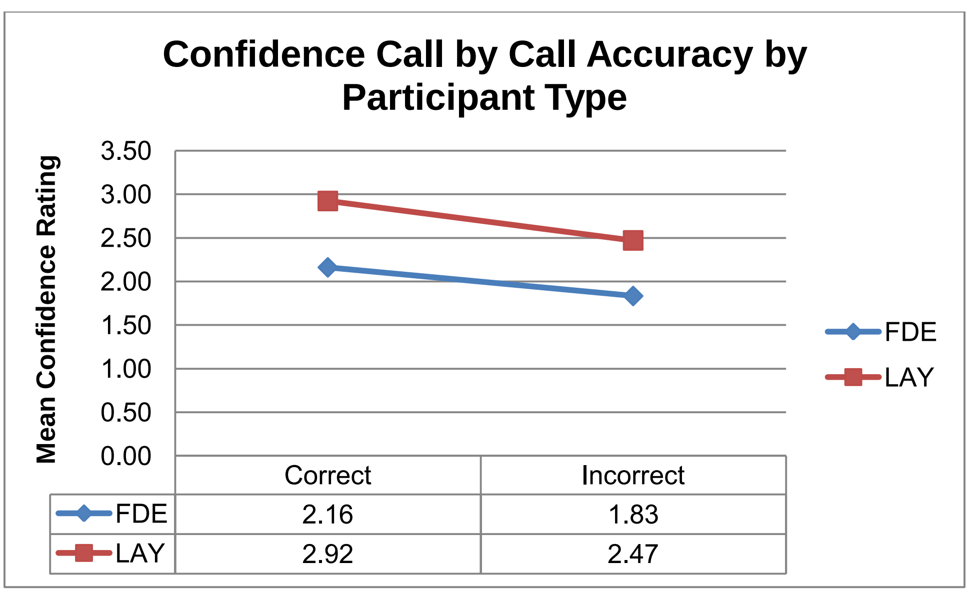
A 2 (FDE vs. Lay participant) x 2 (correct vs. incorrect call) univariate factorial ANOVA was conducted to investigate whether significant differences in level of *call confidence* existed between FDE and Lay participants, and whether significant differences existed according to the accuracy of the call. Table Penland 5 presents the results of the omnibus analysis.

Table Penland 5
Two-Way ANOVA Summary Table

Source	*SS*	*df*	*MS*	*F*	*p*	η^2
Between treatments						
Participant Type	10.57	1.00	10.57	15.83	.000	.152
Call Accuracy	3.29	1.00	3.29	4.93	.029	.053
Participant Type x Call Accuracy	0.08	1.00	0.08	0.13	.724	.001
Within treatments	58.77	88.00	0.67			
Total	590.00	92.00				

There was a significant main effect for participant type, F (1, 88) = 15.83, p < .001, partial η^2 = .152, and for call accuracy, F (1, 88) = 4.93, p = .029, partial η^2 = .053. No significant interaction was identified for participant type by call accuracy, p =.724, *ns*. Figure Penland 8 demonstrates the mean confidence ratings by call accuracy and participant type.

Figure Penland 8



Conclusions

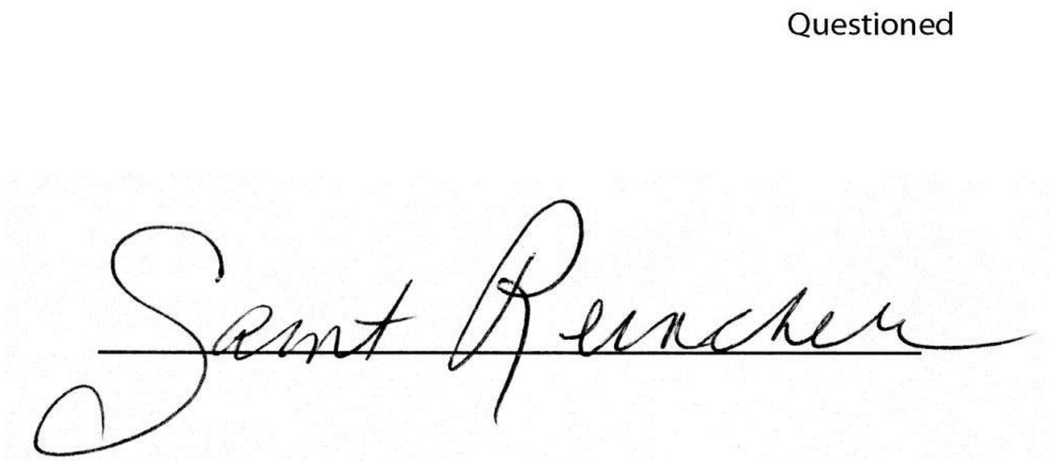
These findings indicate that although FDEs were no more accurate than were Lay participants, they were also significantly less confident in the accuracy of their calls, on average rating their confidence level for correct calls at *somewhat confident* and their incorrect calls as *not at all confident,* compared to Lay participants, who on average rated their correct call confidence near the *moderately confident* level, and their incorrect call confidence at the *somewhat confident* level.

Four areas of interest in addition to AOI ALL were empirically identified by examining the full sample heat map for this signature. The four eye tracking metrics revealed that overall, FDEs examined the signature significantly more extensively than did Lay participants, fixating a greater number of times on all AOIs, and fixating on those AOIs for a greater period of time. The significant differences in fixation count, fixation duration, visit count, and visit duration observed in the AOI "ALL" indicated that FDEs also examined a greater variety of signature features, and spent more time evaluating them, than did Lay participants.

<u>SIGNATURE: Saint Reincher (Simulated)</u>

The signature of Saint Reincher Payne is characterized as a high-complexity text-based signature. Of the 49 FDE participants, 3 responded correctly that the signature was simulated, and 46 responded that the signature was genuine. Of the 43 Lay participants, 8 responded correctly that the signature was simulated, and 35 responded that it was genuine. This difference was not statistically significant, χ^2 (1, N = 92) = 3.39, p = .066. Figure Reincher 1 presents the view of this signature.

Figure Reincher 1. Single Signature Stimulus for Saint Reincher.



Selection of Areas of Interest (AOIs)

Figure Saint Reincher 2 presents the heat map for this slide. Empirical examination of the heat map revealed that there were two locations indicated by red “hot spots” within the signature that elicited significant attention from the participants. AOIs were created for these specific hot spots. Larger, secondary AOIs incorporating the smaller hot spots were created to include the orange “warm spots,” creating a total of five AOIs (including the AOI for the questioned signature) for this stimulus.

Figure Reincher 2. Heat maps for Reincher Signature demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs. The overall heat map is displayed below. Separate heat maps for FDEs and Lay Participants are displayed underneath.

FDE

LAY

Figure Reincher 3 Areas of Interest (AOIs) for Signature Saint Reincher

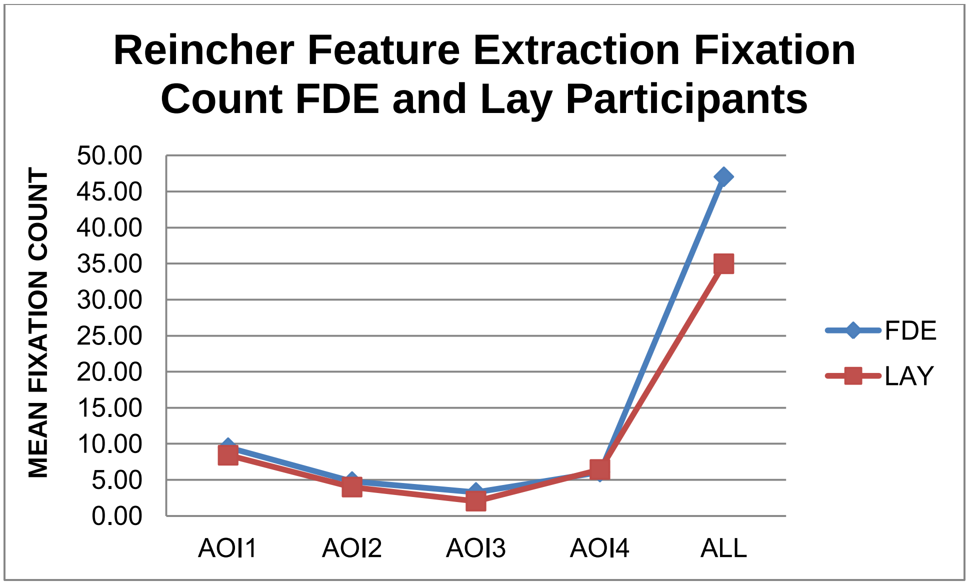
Eye-Tracking Metrics Analyses

These analyses investigate the participants' overall utilization of characteristics in the signature stimulus, and the participants' deployment of attentional resources to specific characteristics that the heat map indicated were particularly diagnostic during the examination. The examination process analyses are based on AOIs in the signature, and the overall signature analysis (the AOI overlaying the entire signature designated *Reincher All*). Figure Reincher 3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .607, F (5, 82) = 25.30, p < .001, multivariate η^2 = .607. Figure Reincher 4 presents the mean fixation counts by AOI.

Figure Reincher 4.



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for only one of the AOIs (AOI 3, F (1, 86) = 4.70, p = .033, partial η^2 = .052).

No significant differences were found for AOI 1, p = .662, *ns;* AOI 2, p = .486, *ns;* AOI 4, p = .857, *ns;* or AOI ALL, p = .200, *ns*. Table Reincher 1 presents the means and standard deviations for areas of interest by participant type.

Table Reincher 1

Process Analysis Fixation Count for FDE and Lay Participants

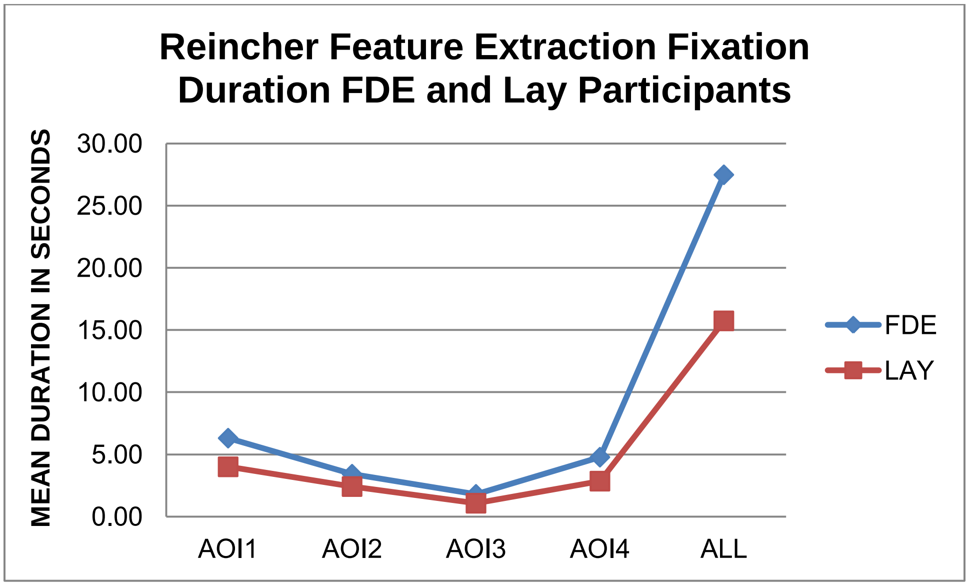
	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	9.47	7.76	4.77	4.47	3.26	2.61
Lay	8.41	14.20	4.00	5.78	2.05	2.60

	AOI4		ALL	
Participant	***M***	***SD***	***M***	***SD***
FDE	6.09	5.51	47.04	29.49
Lay	6.44	12.08	34.98	55.78

<u>*Total Fixation Duration*</u>

MANOVA results revealed no significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .569, F (5, 82) = 21.68, p < .001, multivariate η^2 = .569. Figure Reincher 5 presents the mean fixation duration by AOI.

Figure Reincher 5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for two of the AOIs. Fixation duration was significantly greater among FDEs than among Lay participants in AOI 1, F (1, 86) = 4.71, p = .033, partial η^2 = .052*;* and AOI ALL, F (1, 86) = 7.36, p = .008, partial η^2 = .079.

No significant differences were found for AOI 2, p = .179, *ns;* AOI 3, p = .064, *ns;* or AOI 4, p = .068, *ns*. Table Reincher 2 presents the means and standard deviations for areas of interest by participant type.

Table Reincher 2

Process Analysis Fixation Durations for FDE and Lay Participants

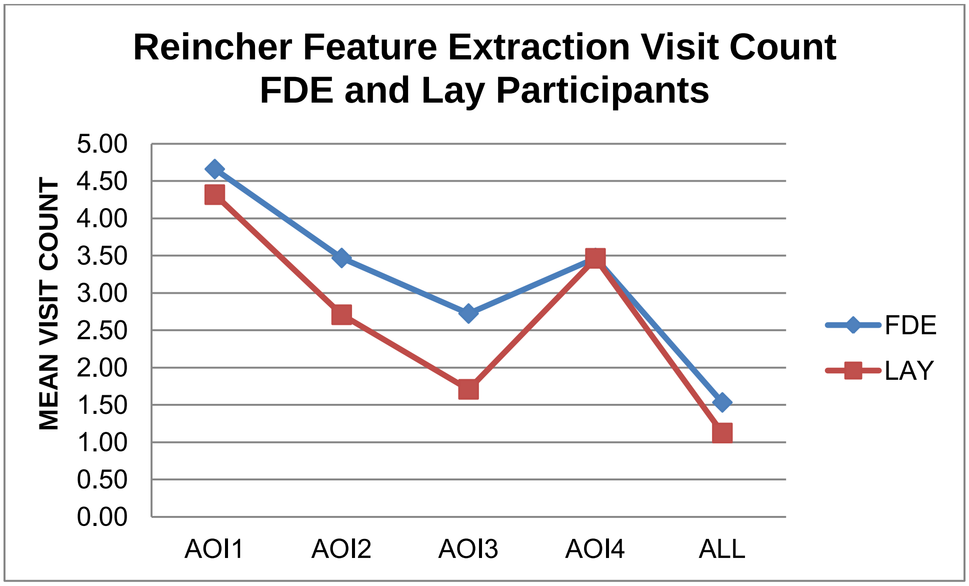
	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	6.31	5.15	3.41	3.55	1.79	1.90
Lay	4.00	4.75	2.42	3.29	1.08	1.65

	AOI4		ALL	
Participant	***M***	***SD***	***M***	***SD***
FDE	4.78	4.86	27.49	20.11
Lay	2.85	4.89	15.74	20.44

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .756, F (5, 82) = 50.80, p < .001, multivariate η^2 = .756. Figure Reincher 6 presents the mean visit counts by AOI.

Figure Reincher 6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences was significant for AOI 3, F (1, 86) = 5.43, p = .022, partial η^2 = .059.

No significant differences were found for AOI 1, p = .731, *ns;* AOI 2, p = .246, *ns*; AOI 4, p = .996, *ns;* or AOI ALL, p = .073, *ns*. Table Reincher 3 presents the means and standard deviations for areas of interest by participant type.

Table Reincher 3

Visit Counts for FDE and Lay Participants

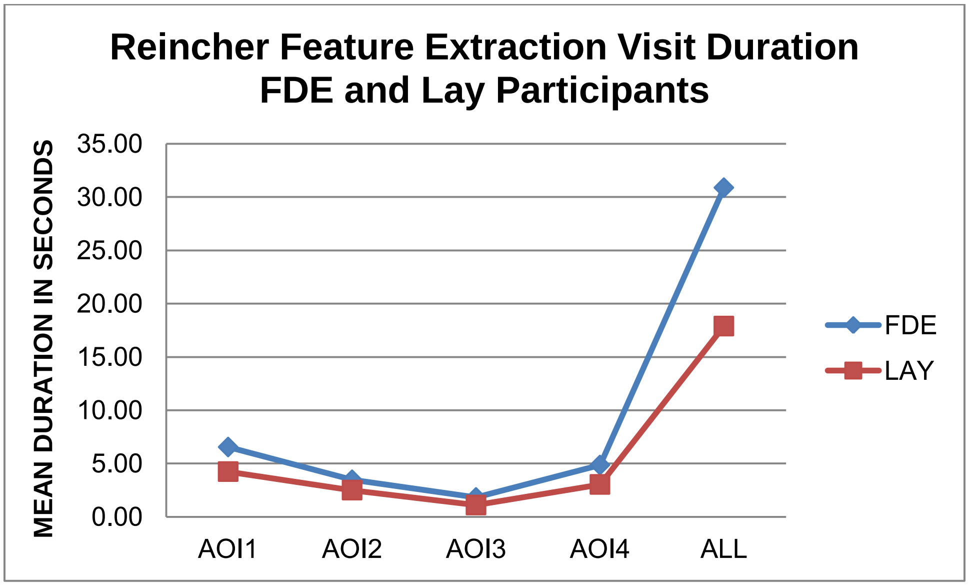
	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	4.66	3.55	3.47	2.80	2.72	2.09
Lay	4.32	5.65	2.71	3.30	1.71	1.98

	AOI4		ALL	
Participant	***M***	***SD***	***M***	***SD***
FDE	3.47	2.69	1.53	1.40
Lay	3.46	5.45	1.12	0.40

Total Visit Duration

MANOVA results revealed no significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .583, F (5, 82) = 22.87, p < .001, multivariate η^2 = .583. Figure Reincher 7 presents the mean visit duration by AOI.

Figure Reincher 7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for two of the AOIs. Visit duration was greater among FDEs than among Lay participants in AOI 1, F (1, 86) = 4.16, p = .045, partial η^2 = .146; and AOI ALL, F (1, 86) = 7.49, p = .008, partial η^2 = .080.

No significant differences were found for AOI 2, p = .200, *ns;* AOI 3, p = .068, *ns;* or AOI 4, p = .094, *ns*. Table Reincher 4 presents the means and standard deviations for areas of interest by participant type.

Table Reincher 4

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	6.54	5.31	3.47	3.61	1.81	1.93
Lay	4.24	5.25	2.50	3.41	1.10	1.66

	AOI4		ALL	
Participant	***M***	***SD***	***M***	***SD***
FDE	4.85	4.90	30.88	21.04
Lay	3.03	5.17	17.89	23.50

Decision Confidence Analysis

A 2 (FDE vs. Lay participant) x 2 (correct vs. incorrect call) univariate factorial ANOVA was conducted to investigate whether significant differences in level of *call confidence* existed between FDE

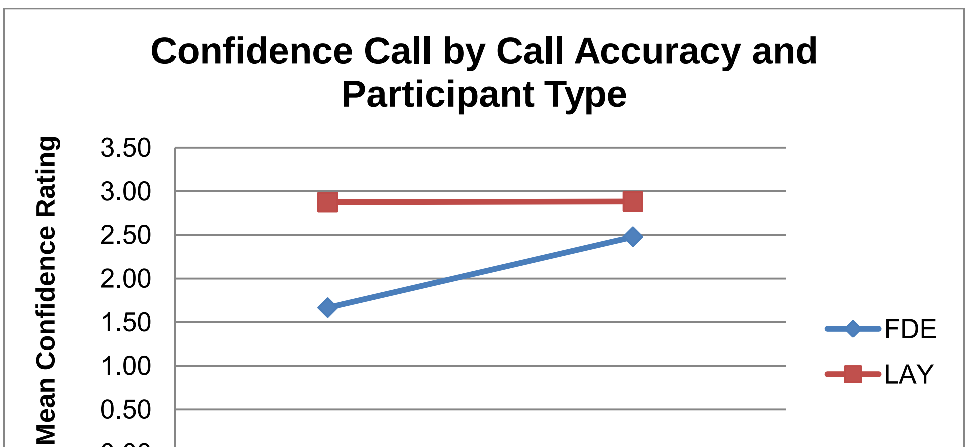
and Lay participants, and whether significant differences existed according to the accuracy of the call. Table Reincher 5 presents the results of the omnibus analysis.

Table Reincher 5
Two-Way ANOVA Summary Table

Source	*SS*	*df*	*MS*	*F*	*p*	η^2
Between treatments						
Participant Type	5.10	1.00	5.10	8.45	.005	.089
Call Accuracy	1.32	1.00	1.32	2.18	.143	.024
Participant Type x Call Accuracy	1.27	1.00	1.27	2.10	.151	.024
Within treatments	52.55	87.00	0.60			
Total	692.00	91.00				

There was a significant main effect for participant type, F (1, 87) = 8.45, p = .005, partial η^2 = .089. There was no main effect for call accuracy, p = .143, *ns*; and no significant interaction of participant type by call accuracy, p =.151, *ns*. Figure Reincher 8 demonstrates the mean confidence ratings by call accuracy and participant type.

Figure Reincher 8



	Correct	Incorrect
FDE	1.67	2.48
LAY	2.88	2.88

Conclusions

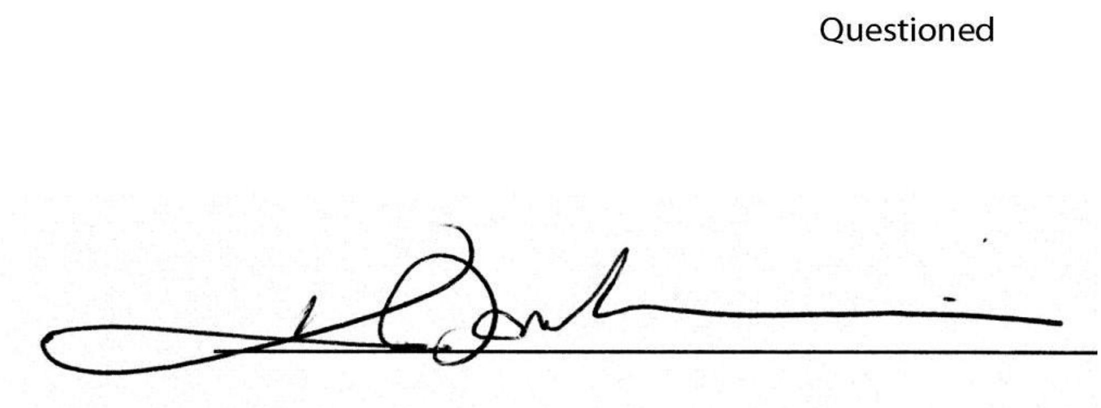
These findings indicate that neither FDE nor Lay participant calls were very accurate. FDEs were significantly less confident in the accuracy of their calls than were Lay participants, particularly among those FDEs whose calls were correct. FDEs who made incorrect calls on average rated their confidence level for correct calls at *somewhat confident,* while those who made correct calls rated their confidence as *not at all confident.* Confidence level among Lay participants remained near the *moderately confident* level whether the call was correct or incorrect.

Four areas of interest in addition to AOI ALL were empirically identified by examining the full sample heat map for this signature. The four eye tracking metrics revealed that overall, FDEs examined the signature significantly more extensively than did Lay participants, fixating a greater number of times on all AOIs (although fixation count and visit count were not statistically significant), and fixating on those AOIs for a greater period of time. The significant differences in fixation duration and visit duration observed in the AOI "ALL" indicated that FDEs spent more time evaluating signature features than did Lay participants.

<u>SIGNATURE: Kevin Rickman (Genuine)</u>

The signature of Kevin Rickman is characterized as a low-complexity stylized signature. Of the 49 FDE participants, 31 responded correctly that the signature was genuine, and 18 responded that the signature was simulated. Of the 43 Lay participants, 23 responded correctly that the signature was genuine, and 20 responded that it was simulated. This difference was not statistically significant, $\chi^2(1, N = 92) = 0.90$, $p = .342$. Figure Rickman 1 presents the view of this signature.

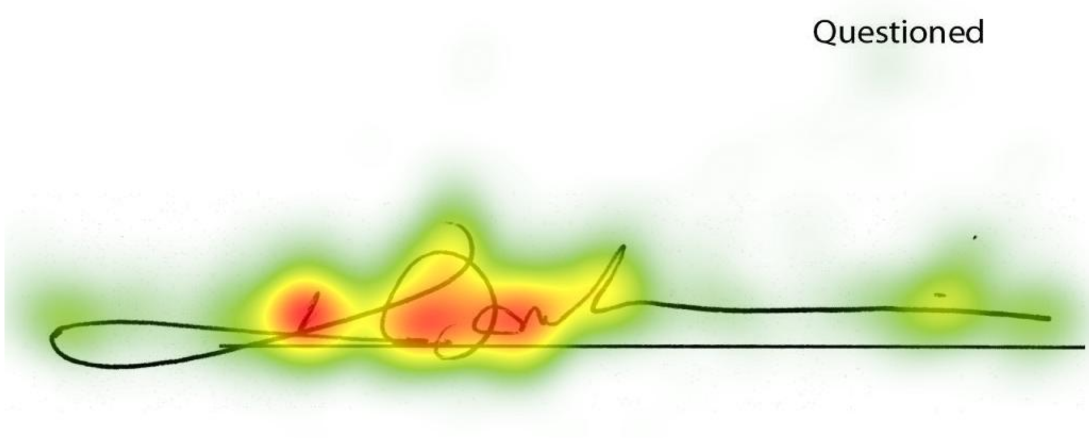
Figure Rickman 1. Single Signature Stimulus for Kevin Rickman.



Selection of Areas of Interest (AOIs)

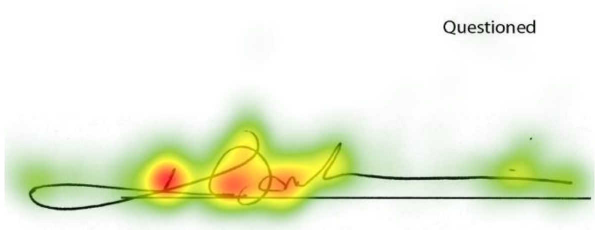
Figure Kevin Rickman 2 presents the heat map for this slide. Empirical examination of the heat map revealed that there were two locations indicated by red “hot spots” within the signature that elicited significant attention from the participants. AOIs were created for these specific hot spots. Larger, secondary AOIs incorporating the smaller hot spots were created to include the orange “warm spots,” creating a total of five AOIs (including the AOI for the questioned signature) for this stimulus.

Figure Rickman 2. Heat maps for Rickman Signature demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs. The overall heat map is displayed below. Separate heat maps for FDEs and Lay Participants are displayed underneath.



FDE

LAY



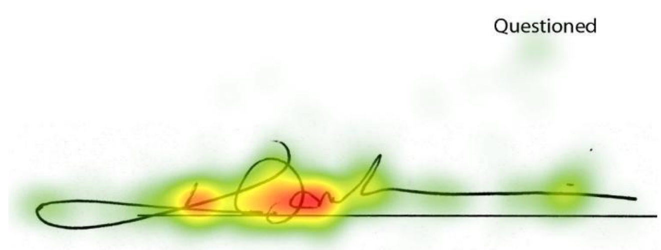
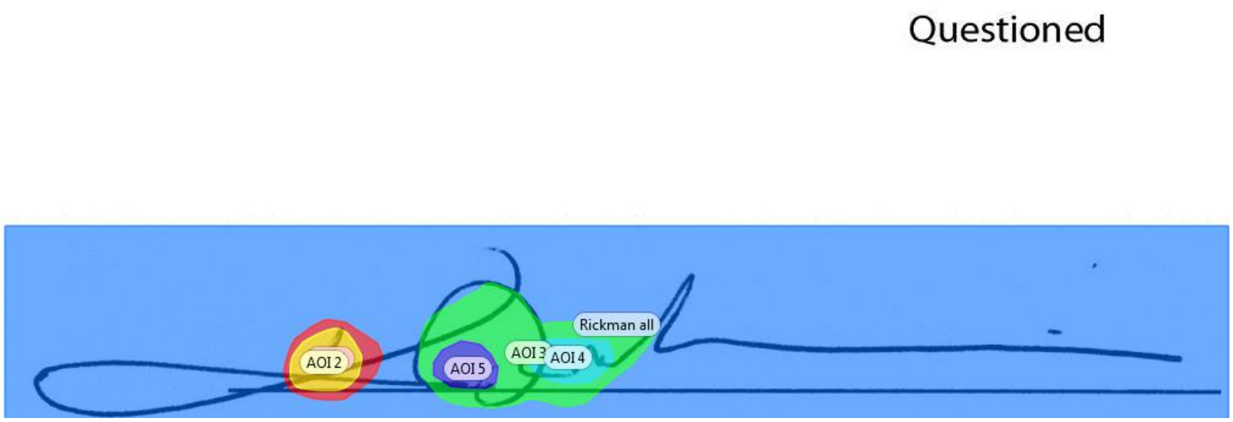


Figure Rickman 3 Areas of Interest (AOIs) for Signature Kevin Rickman



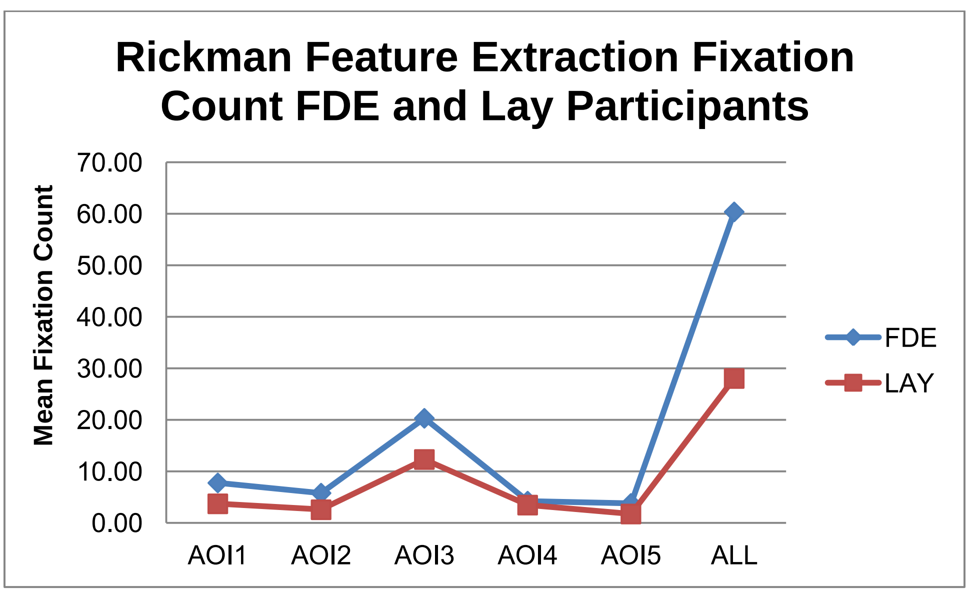
Eye-Tracking Metrics Analyses

These analyses investigate the participants' overall utilization of characteristics in the signature stimulus, and the participants' deployment of attentional resources to specific characteristics that the heat map indicated were particularly diagnostic during the examination. The examination process analyses are based on AOIs in the signature, and the overall signature analysis (the AOI overlaying the entire signature designated *Rickman All*). Figure Rickman 3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .546, F (6, 81) = 16.22, p < .001, multivariate η^2 = .546. Figure Rickman 4 presents the mean fixation counts by AOI.

Figure Rickman 4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for three of the AOIs. Fixation count was greater among FDEs than among Lay participants in AOI 1, F (1, 86) = 4.18, p = .044, partial η^2 = .046; AOI 2, F (1, 86) = 5.14, p = .026, partial η^2 = .056; and AOI ALL, F (1, 86) = 9.82, p = .002, partial η^2 = .102.

No significant differences were found for AOI 3, p = .033, *ns;* AOI 4, p = .434, *ns;* or AOI 5, p = .053, *ns*. Table Rickman 1 presents the means and standard deviations for areas of interest by participant type.

Table Rickman 1

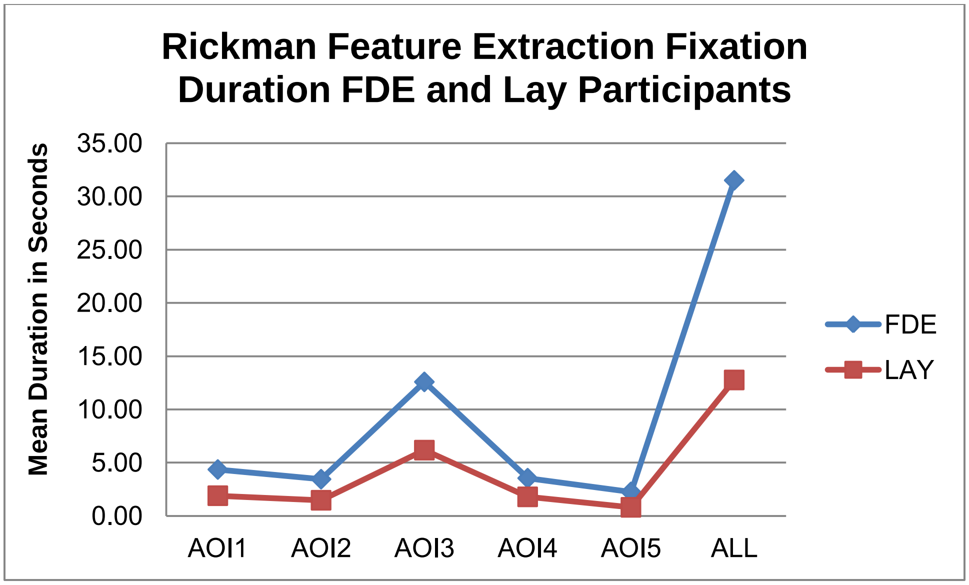
Process Analysis Fixation Count for FDE and Lay Participants

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	7.77	11.88	5.79	8.52	20.32	23.59
Lay	3.71	4.83	2.56	3.44	12.32	13.93
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	4.23	4.60	3.79	6.15	60.40	57.79
Lay	3.46	4.58	1.73	2.87	28.05	34.32

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .578, F (6, 81) = 18.51, p < .001, multivariate η^2 = .578. Figure Rickman 5 presents the mean fixation duration by AOI.

Figure Rickman 5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significantly greater among FDEs than among Lay participants for all of the AOIs (AOI 1, F (1, 86) = 6.93, p = .010, partial η^2 = .075; AOI 2, F (1, 86) = 6.79, p = .011, partial η^2 = .073; AOI 3, F (1, 86) = 9.66, p = .003, partial η^2 = .101; AOI 4, F (1, 86) = 7.86, p = .006, partial η^2 = .084; AOI 5, F (1, 86) = 10.11, p = .002, partial η^2 = .105; and AOI ALL, F (1, 86) = 15.66, p = .000, partial η^2 = .154). Table Rickman 2 presents the means and standard deviations for areas of interest by participant type.

Table Rickman 2

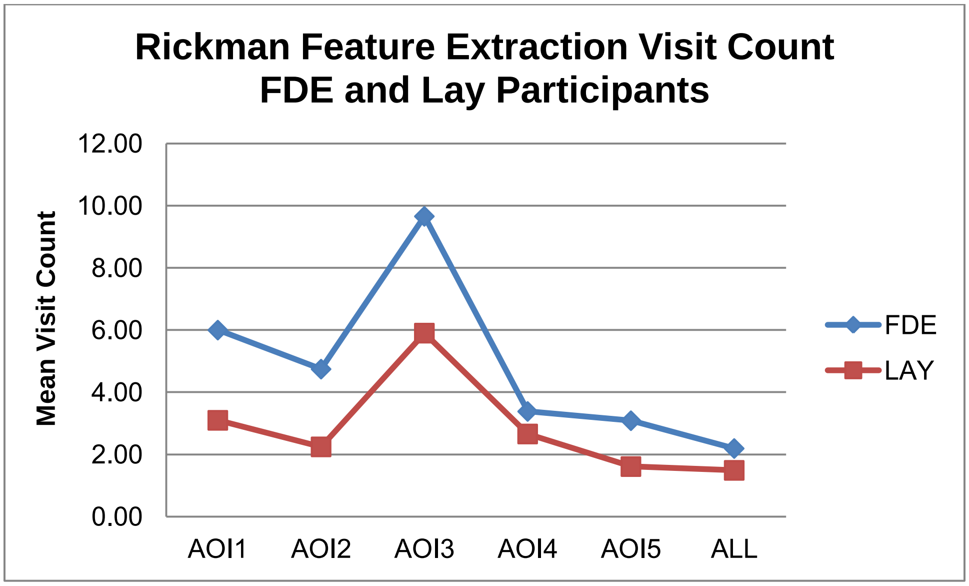
Process Analysis Fixation Durations for FDE and Lay Participants

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	4.36	5.47	3.45	4.42	12.58	11.58
Lay	1.90	2.60	1.47	2.17	6.17	6.79
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	3.54	3.41	2.26	2.59	31.51	26.59
Lay	1.79	2.26	0.81	1.44	12.77	15.61

Total Visit Count

MANOVA results revealed no significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .646, F (6, 81) = 24.08, p < .001, multivariate η^2 = .648. Figure Rickman 6 presents the mean visit counts by AOI.

Figure Rickman 6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for three of the AOIs. Fixation count was greater among FDEs than among Lay participants in AOI 1, F (1, 86) = 4.94, p = .029, partial η^2 = .054; AOI 2, F (1, 86) = 5.84, p = .018, partial η^2 = .064; and AOI 3, F (1, 86) = 5.47, p = .022, partial η^2 = .060.

No significant differences were found for AOI 4, p = .280, *ns;* AOI 5, p = .051, *ns;* or AOI ALL, p = .075, *ns*. Table Rickman 3 presents the means and standard deviations for areas of interest by participant type.

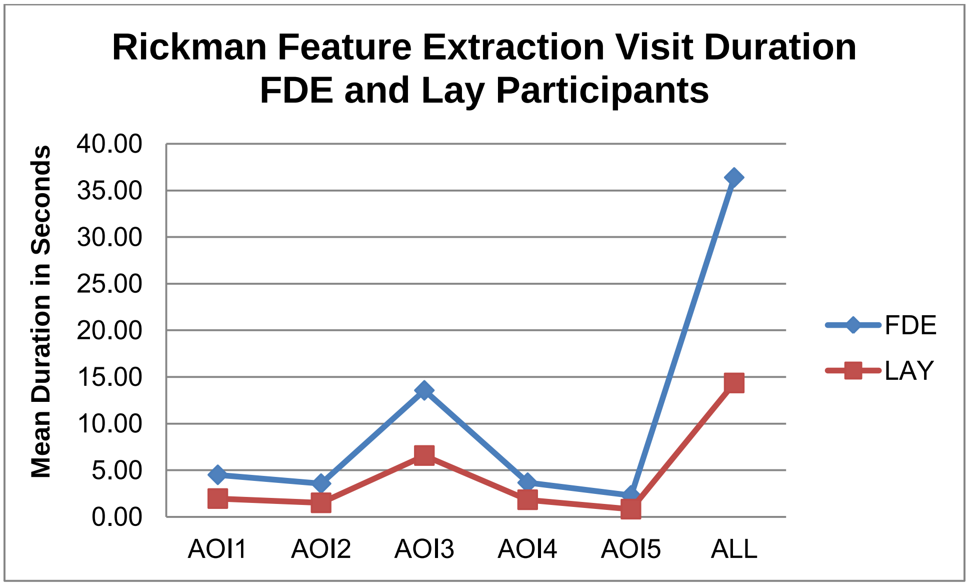
Table Rickman 3
Visit Counts for FDE and Lay Participants

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	6.00	7.55	4.74	6.07	9.66	8.44
Lay	3.10	3.85	2.24	2.84	5.90	6.29
	AOI4		**AOL5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	3.38	2.94	3.09	4.14	2.19	2.21
Lay	2.66	3.31	1.61	2.56	1.49	1.25

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .577, F (6, 81) = 18.44, p < .001, multivariate η^2 = .577. Figure Rickman 7 presents the mean visit duration by AOI.

Figure Rickman 7



Follow-up ANOVAS conducted on each dependent variable revealed that visit duration was significantly greater among FDEs than among Lay participants in all AOIs (AOI 1, F (1, 86) = 7.00, p = .010, partial η^2 = .075; AOI 2, F (1, 86) = 7.06, p = .009, partial η^2 = .076; AOI 3, F (1, 86) = 9.99, p = .002, partial η^2 = .104; AOI 4, F (1, 86) = 8.11, p = .006, partial η^2 = .086; AOI 5, F (1, 86) = 9.99, p = .002, partial η^2 = .104; and AOI ALL, F (1, 86) = 16.74, p < .001, partial η^2 = .163). Table Rickman 4 presents the means and standard deviations for areas of interest by participant type.

Table Rickman 4

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	4.49	5.63	3.55	4.51	13.55	12.49
Lay	1.95	2.67	1.49	2.21	6.56	7.12
	AOI4		**AIO5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	3.65	3.51	2.29	2.66	36.38	30.55
Lay	1.82	2.28	0.81	1.44	14.34	17.10

Decision Confidence Analysis

A 2 (FDE vs. Lay participant) x 2 (correct vs. incorrect call) univariate factorial ANOVA was conducted to investigate whether significant differences in level of *call confidence* existed between FDE

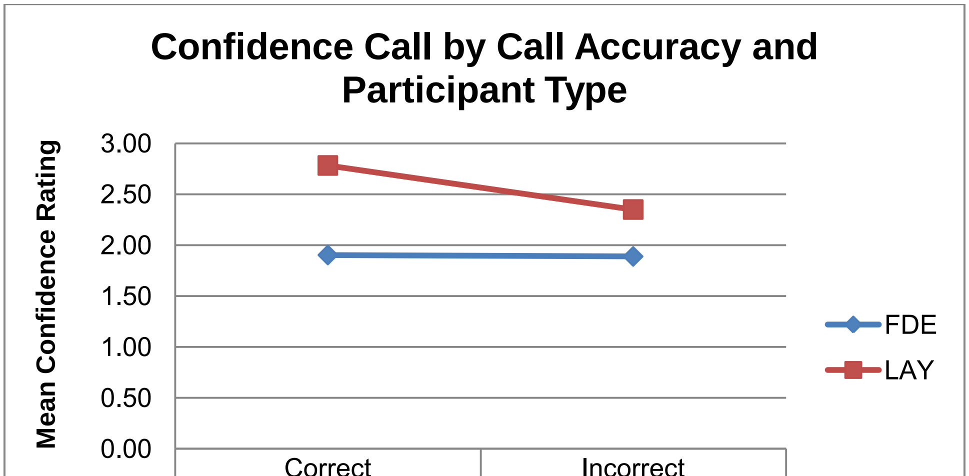
and Lay participants, and whether significant differences existed according to the accuracy of the call. Table Rickman 5 presents the results of the omnibus analysis.

Table Rickman 5
Two-Way ANOVA Summary Table

Source	***SS***	***df***	***MS***	***F***	***p***	***η²***
Between treatments						
Participant Type	9.91	1.00	9.91	17.12	.000	.163
Call Accuracy	1.10	1.00	1.10	1.90	.171	.021
Participant Type x Call Accuracy	0.97	1.00	0.97	1.67	.200	.019
Within treatments	50.95	88.00	0.58			
Total	516.00	92.00				

There was a significant main effects for participant type, F (1, 88) = 17.12, p < .001, partial η^2 = .163. There was no main effect for call accuracy, p = .171, *ns*; and no significant interaction of participant type by call accuracy, p =.200, *ns*. Figure Rickman 8 demonstrates the mean confidence ratings by call accuracy and participant type.

Figure Rickman 8



	Correct	Incorrect
FDE	1.90	1.89
LAY	2.78	2.35

<u>*Conclusions*</u>

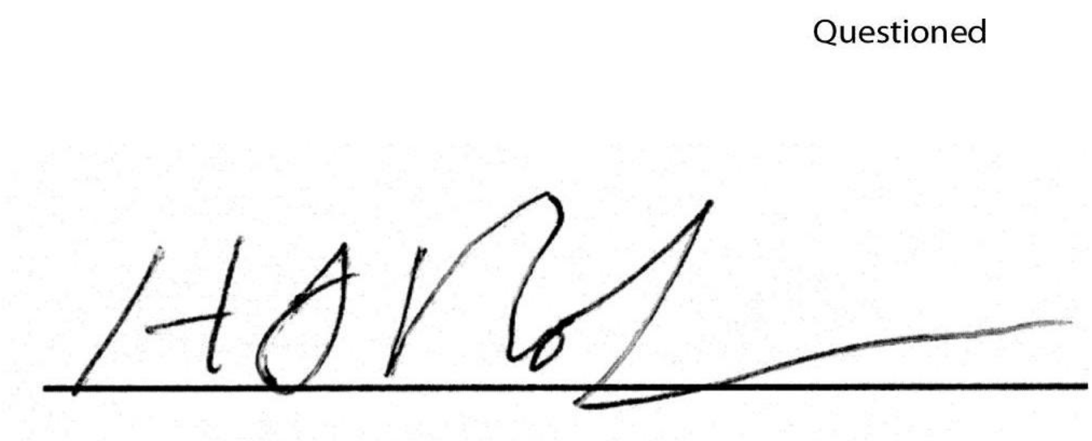
These findings indicate that although FDEs were more accurate than were Lay participants, this difference was not statistically significant. FDEs were significantly less confident in the accuracy of their calls than were Lay participants. On average, FDEs who made correct calls, as well as those who made incorrect calls, rated their confidence level just under the *somewhat confident* level. Lay participants on average rated their both their correct call confidence and incorrect call confidence at the *somewhat confident* level.

Six areas of interest including the AOI ALL were empirically identified by examining the full sample heat map for this signature. The four eye tracking metrics revealed that overall, FDEs examined the signature significantly more extensively than did Lay participants, fixating a greater number of times on all AOIs, and fixating on those AOIs for a greater period of time. The significant differences in fixation count, fixation duration, visit count, and visit duration observed in the AOI “ALL” indicated that FDEs also examined a greater variety of signature features, and spent more time evaluating them, than did Lay participants.

SIGNATURE: Harold Robinson (Simulated)

The signature of Harold Robinson is characterized as a low-complexity mixed signature. Of the 49 FDE participants, 33 responded correctly that the signature was simulated, and 14 responded that the signature was genuine. Of the 43 Lay participants, 20 responded correctly that the signature was simulated, and 23 responded that it was genuine. This difference was statistically significant, χ^2 (1, N = 90) = 5.21, p = .022. Figure Robinson 1 presents the view of this signature.

Figure Robinson 1. Single Signature Stimulus for Harold Robinson.

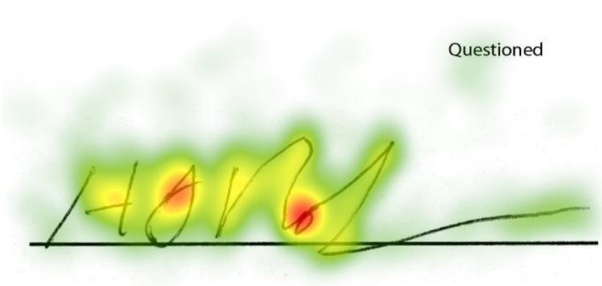


Selection of Areas of Interest (AOIs)

Figure Harold Robinson 2 presents the heat map for this slide. Empirical examination of the heat map revealed that there were two locations indicated by red "hot spots" within the signature that elicited significant attention from the participants. AOIs were created for these specific hot spots. Larger, secondary AOIs incorporating the smaller hot spots were created to include the orange "warm spots," creating a total of six AOIs (including the AOI for the questioned signature, labeled *Robinson All*) for this stimulus.

Figure Robinson 2. Heat maps for Robinson Signature demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs. The overall heat map is displayed below. Separate heat maps for FDEs and Lay Participants are displayed underneath.

FDE



LAY

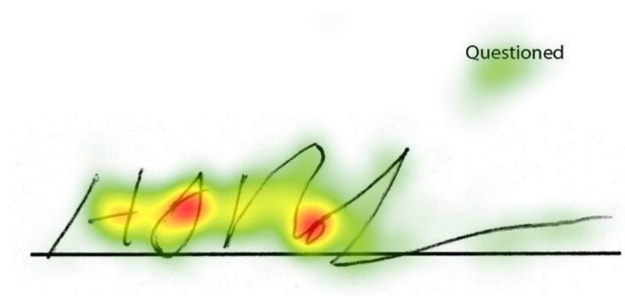
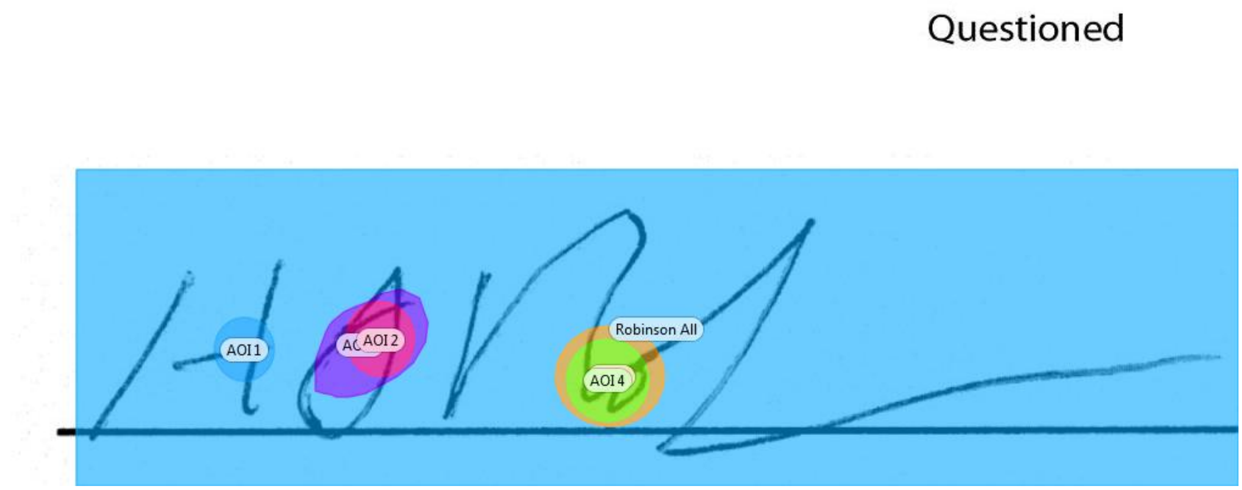


Figure Robinson 3 Areas of Interest (AOIs) for Signature Harold Robinson



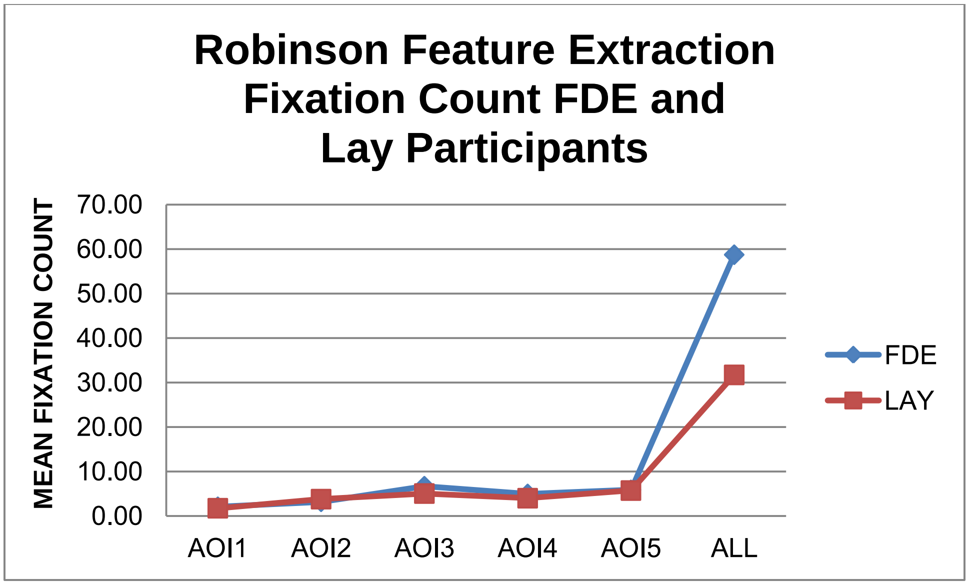
Eye-Tracking Metrics Analyses

These analyses investigate the participants' overall utilization of characteristics in the signature stimulus, and the participants' deployment of attentional resources to specific characteristics that the heat map indicated were particularly diagnostic during the examination. The examination process analyses are based on AOIs in the signature, and the overall signature analysis (the AOI overlaying the entire signature designated *Robinson All*). Figure Robinson 3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .685, F (6, 82) = 29.76, p < .001, multivariate η^2 = .685. Figure Robinson 4 presents the mean fixation counts by AOI.

Figure Robinson 4.



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for only one of the AOIs (AOI ALL, F (1, 87) = 12.88, p = .001, partial η^2 = .129.

No significant differences were found for AOI 1, p = .406, *ns;* AOI 2, p = .381, *ns*; AOI 3, p = .164, *ns;* AOI 4, p = .286, *ns;* or AOI 5, p = .882, *ns*. Table Robinson 1 presents the means and standard deviations for areas of interest by participant type.

Table Robinson 1

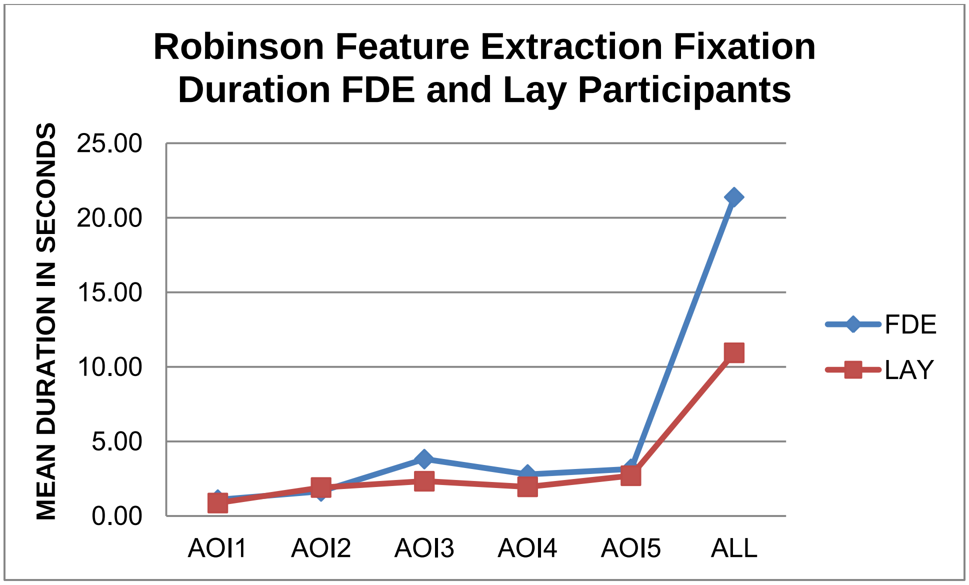
Process Analysis Fixation Duration for FDE and Lay Participants

	AOI1		**AOI2**		**AOI3**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.04	1.87	3.17	3.23	6.67	6.96
LAY	1.72	1.76	3.77	3.12	5.02	3.42
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	4.93	5.11	5.85	5.05	58.72	44.21
LAY	3.98	2.96	5.70	4.42	31.70	22.71

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .647, F (6, 82) = 25.10, p < .001, multivariate η^2 = .647. Figure Robinson 5 presents the mean fixation duration by AOI.

Figure Robinson 5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for two of the AOIs. Fixation duration was greater among FDEs than among Lay participants in AOI 3, F (1, 87) = 5.01, p = .028, partial η^2 = .054*;* and AOI ALL, F (1, 87) = 17.90, p < .001, partial η^2 = .171.

There were no significant differences for AOI 1, p = .369, *ns;* AOI 2, p = .510, *ns;* AOI 4, p = .088, *ns*; or AOI 5, p = .432, *ns.* Table Robinson 2 presents the means and standard deviations for areas of interest by participant type.

Table Robinson 2

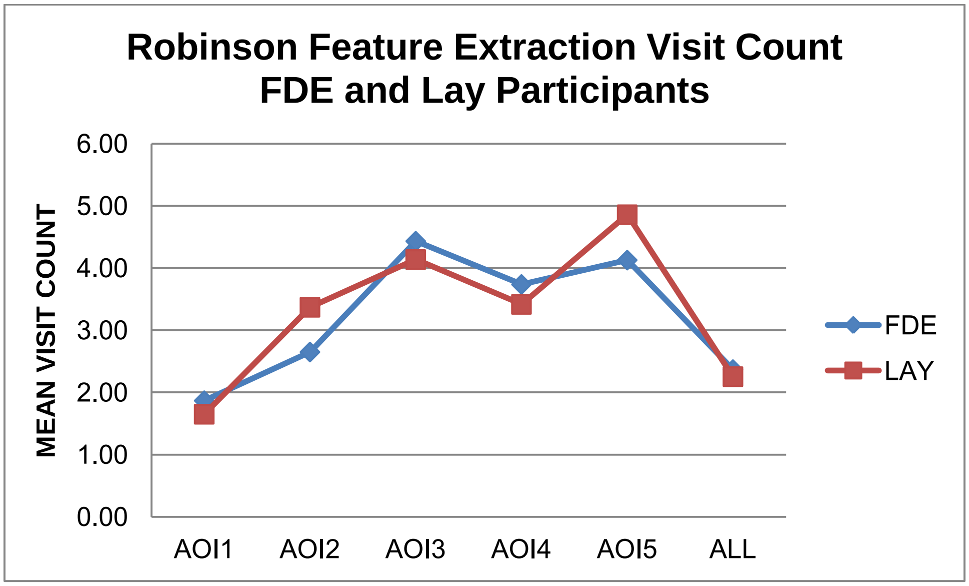
Process Analysis Fixation Durations for FDE and Lay Participants

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.09	1.35	1.64	2.01	3.81	3.99
LAY	0.86	1.01	1.90	1.74	2.32	1.79
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.78	2.69	3.16	3.17	28.86	21.38
LAY	1.95	1.70	2.69	2.23	13.47	10.94

Total Visit Count

MANOVA results revealed no significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .834, F (6, 82) = 68.88, p < .001, multivariate η^2 = .834. Figure Robinson 6 presents the mean visit counts by AOI.

Figure Robinson 6



Follow-up ANOVAS conducted on each dependent variable revealed no significant differences in visit count by participant type (AOI 1, p = .555, *ns;* AOI 2, p = .223, *ns*; AOI 3, p = .619, *ns;* AOI 4, p = .574, *ns;* AOI 5, p = .333, *ns;* and AOI ALL, p = .714, *ns*. Table Robinson 3 presents the means and standard deviations for areas of interest by participant type.

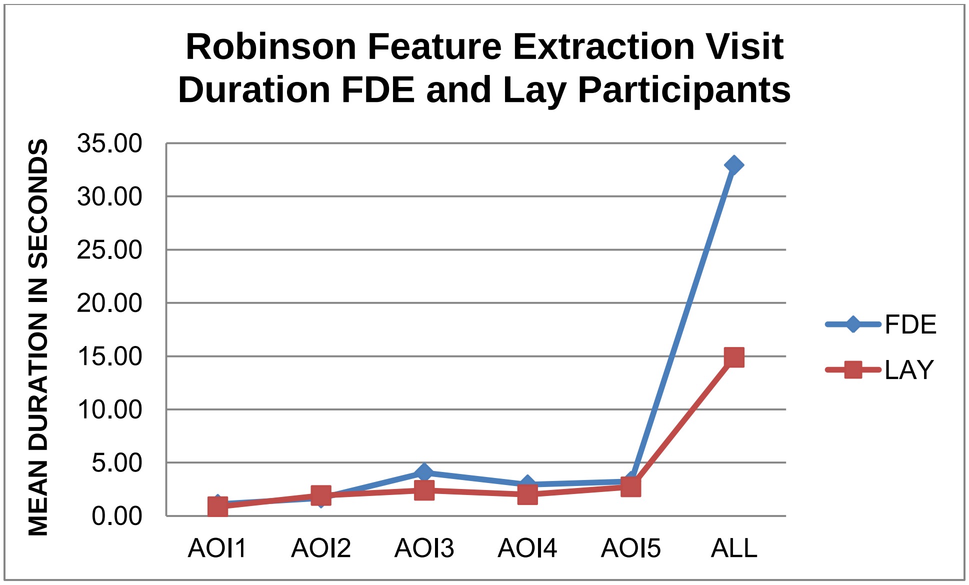
Table Robinson 3
Visit Counts for FDE and Lay Participants

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.87	1.75	2.65	2.59	4.43	3.00
LAY	1.65	1.73	3.37	2.94	4.14	2.55
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	3.74	2.98	4.13	3.27	2.37	1.85
LAY	3.42	2.30	4.86	3.80	2.26	0.85

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .663, F (6, 82) = 29.89, p < .001, multivariate η^2 = .663. Figure Robinson 7 presents the mean visit durations by AOI.

Figure Robinson 7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for two of the AOIs. Visit duration was significantly greater among FDEs than among Lay participants in AOI 3, F (1, 87) = 5.71, p = .019, partial η^2 = .062; and AOI ALL, F (1, 87) = 20.53, p < .001, partial η^2 = .191.

There were no significant differences for AOI 1, p = .368, *ns*; AOI 2, p = .550, *ns;* AOI 4, p = .062, *ns*; or AOI 5, p = .383, *ns*. Table Robinson 4 presents the means and standard deviations for areas of interest by participant type.

Table Robinson 4

Visit Duration for FDE and Lay Participants

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.09	1.35	1.67	2.05	4.06	4.20
LAY	0.86	1.01	1.92	1.74	2.40	1.82
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.93	2.81	3.25	3.25	32.95	23.81
LAY	1.99	1.73	2.73	2.24	14.89	11.16

Decision Confidence Analysis

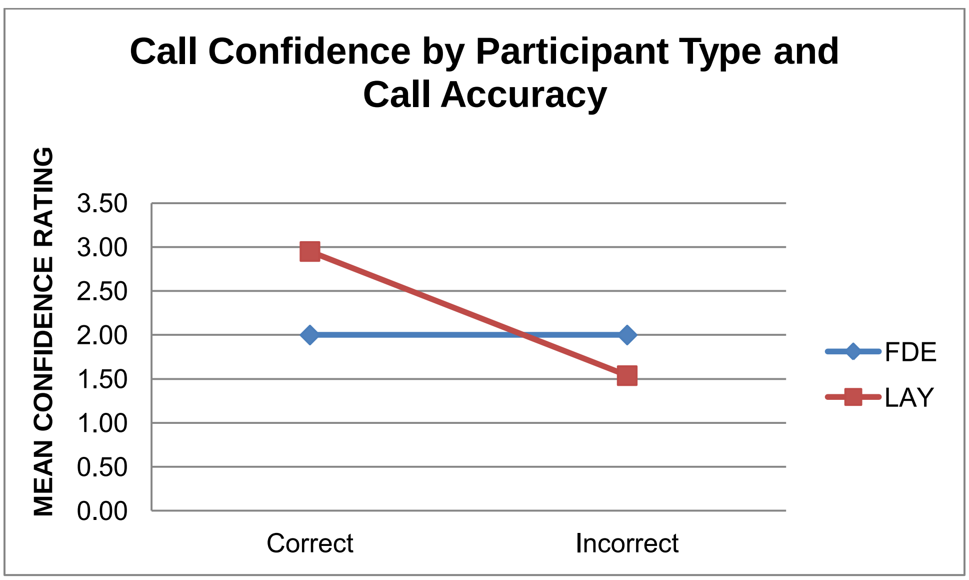
A 2 (FDE vs. Lay participant) x 2 (correct vs. incorrect call) univariate factorial ANOVA was conducted to investigate whether significant differences in level of *call confidence* existed between FDE and Lay participants, and whether significant differences existed according to the accuracy of the call. Table Robinson 5 presents the results of the omnibus analysis.

Table Robinson 5
Two-Way ANOVA Summary Table

Source	*SS*	*df*	*MS*	*F*	*p*	η^2
Between treatments						
Participant Type	11.10	1.00	11.10	10.52	.002	.109
Call Accuracy	0.94	1.00	0.94	0.89	.348	.010
Participant Type x Call Accuracy	0.94	1.00	0.94	0.89	.348	.010
Within treatments	90.69	86.00	1.05			
Total	599.00	90.00				

There was a significant main effect for participant type, F (1, 86) = 10.52, p = .002, partial η^2 = .109. There was no main effect for call accuracy, p = .348, *ns*; and no significant interaction of participant type by call accuracy, p =.348, *ns*. Figure Robinson 8 demonstrates the mean confidence ratings by call accuracy and participant type.

Figure Robinson 8



<u>*Conclusions*</u>

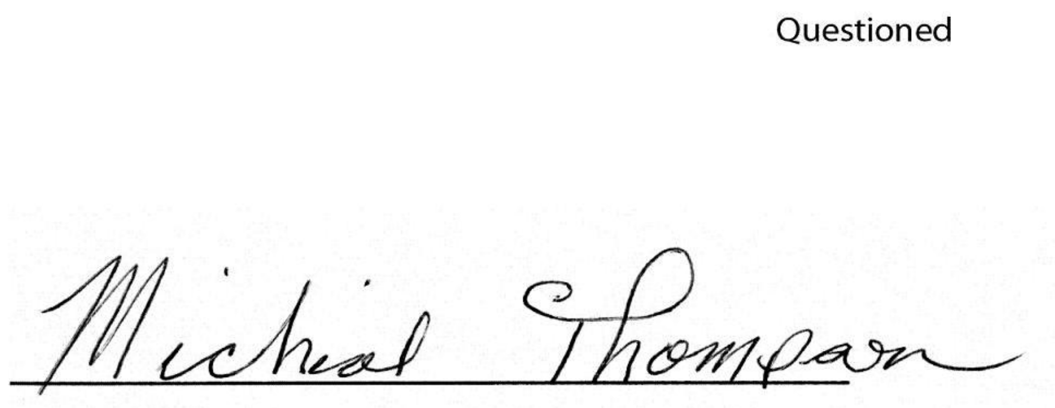
These findings indicate that although FDEs were more accurate than were Lay participants, this difference was not statistically significant. Those FDEs who made correct calls were significantly less confident in the accuracy of their calls than were Lay participants, but FDEs who made incorrect calls were more confident than were Lay participants. This interaction was not statistically significant. On average, FDEs who made correct calls, as well as those who made incorrect calls, rated their confidence level just at the *somewhat confident* level. Lay participants on average rated their correct call confidence at the *moderately confident* level, and their incorrect call confidence at the *not at all confident* level.

Six areas of interest including the AOI ALL were empirically identified by examining the full sample heat map for this signature. The four eye tracking metrics revealed that overall, FDEs examined the signature significantly more extensively than did Lay participants, fixating a greater number of times on all AOIs, and fixating on those AOIs for a greater period of time. The significant differences in fixation count, fixation duration, and visit duration observed in the AOI “ALL” indicated that FDEs also examined a greater variety of signature features, and spent more time evaluating them, than did Lay participants.

<u>SIGNATURE: Michael Thompson (Simulated)</u>

The signature of Michael Thompson is characterized as a high-complexity text-based signature. Of the 49 FDE participants, 32 responded correctly that the signature was simulated, and 17 responded that the signature was genuine. Of the 43 Lay participants, 19 responded correctly that the signature was simulated, and 24 responded that it was genuine. This difference was statistically significant, χ^2 (1, N = 92) = 4.14, p = .042. Figure Thompson 1 presents the view of this signature.

Figure Thompson 1. Single Signature Stimulus for Michael Thompson.

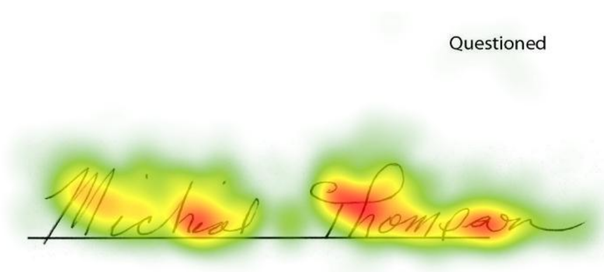


Selection of Areas of Interest (AOIs)

Figure Michael Thompson 2 presents the heat map for this slide. Empirical examination of the heat map revealed that there were three locations indicated by red “hot spots” within the signature that elicited significant attention from the participants. AOIs were created for these specific hot spots. Larger, secondary AOIs incorporating the smaller hot spots were created to include the orange “warm spots,” creating a total of six AOIs (including the AOI for the questioned signature, labeled *Thompson All*) for this stimulus.

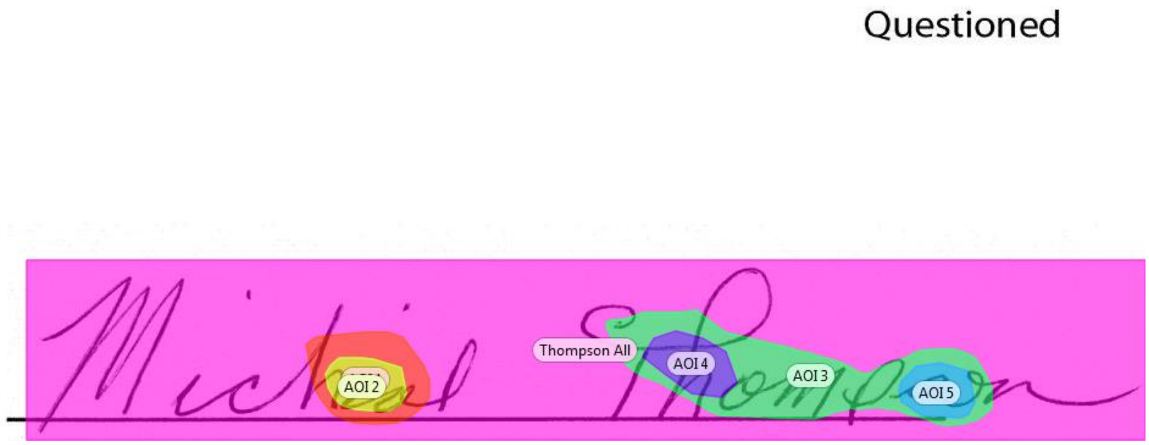
Figure Thompson 2. Heat maps for Thompson Signature demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs. The overall heat map is displayed below. Separate heat maps for FDEs and Lay Participants are displayed underneath.

FDE



LAY

Figure Thompson 3 Areas of Interest (AOIs) for Signature Michael Thompson



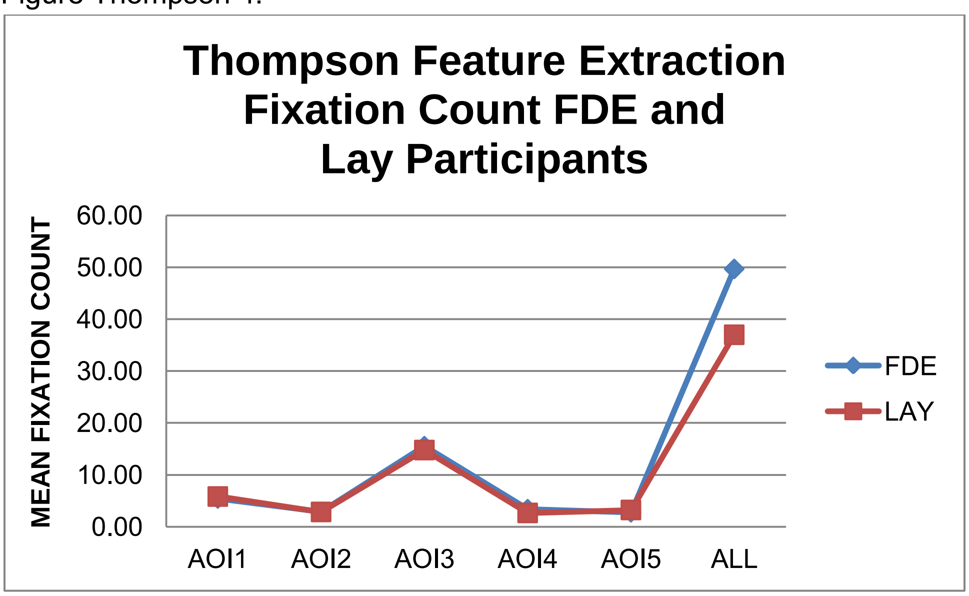
Eye-Tracking Metrics Analyses

These analyses investigate the participants' overall utilization of characteristics in the signature stimulus, and the participants' deployment of attentional resources to specific characteristics that the heat map indicated were particularly diagnostic during the examination. The examination process analyses are based on AOIs in the signature, and the overall signature analysis (the AOI overlaying the entire signature designated *Thompson All*). Figure Thompson 3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .684, F (6, 82) = 29.62, p < .001, multivariate η^2 = .684. Figure Thompson 4 presents the mean fixation counts by AOI.

Figure Thompson 4.



Follow-up ANOVAS conducted on each dependent variable revealed no significant differences for participant type (AOI 1, p = .803, *ns;* AOI 2, p = .978, *ns*; AOI 3, p = .883, *ns;* AOI 4, p = .594, *ns;* AOI 5, p = .636, *ns;* and AOI ALL, p = .276, *ns*). Table Thompson 1 presents the means and standard deviations for areas of interest by participant type.

Table Thompson 1

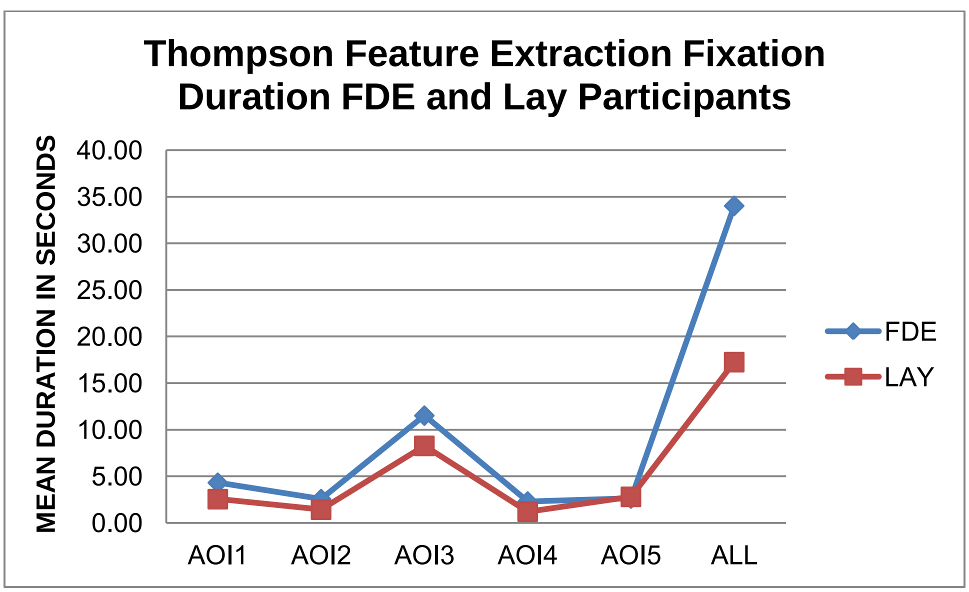
Process Analysis Fixation Count for FDE and Lay Participants

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	5.43	4.83	2.85	3.30	15.51	24.34
Lay	5.81	9.22	2.83	2.78	14.76	23.32
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	3.36	6.12	2.77	4.89	49.66	49.62
Lay	2.64	6.54	3.21	3.88	36.98	59.43

<u>Total Fixation Duration</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .609, F (6, 82) = 21.29, p < .001, multivariate η^2 = .609. Figure Thompson 5 presents the mean fixation duration by AOI.

Figure Thompson 5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for two of the AOI. Fixation duration was significantly greater among FDEs than among Lay participants in AOI 1, F (1, 87) = 5.95, p = .017, partial η^2 = .064; and AOI ALL, F (1, 87) = 9.18, p = .003, partial η^2 = .094.

There were no significant differences for AOI 2, p = .052, *ns;* AOI 3, p = .220, *ns;* AOI 4, p = .091, *ns*; or AOI 5, p = .831, *ns*. Table Thompson 2 presents the means and standard deviations for areas of interest by participant type.

Table Thompson 2

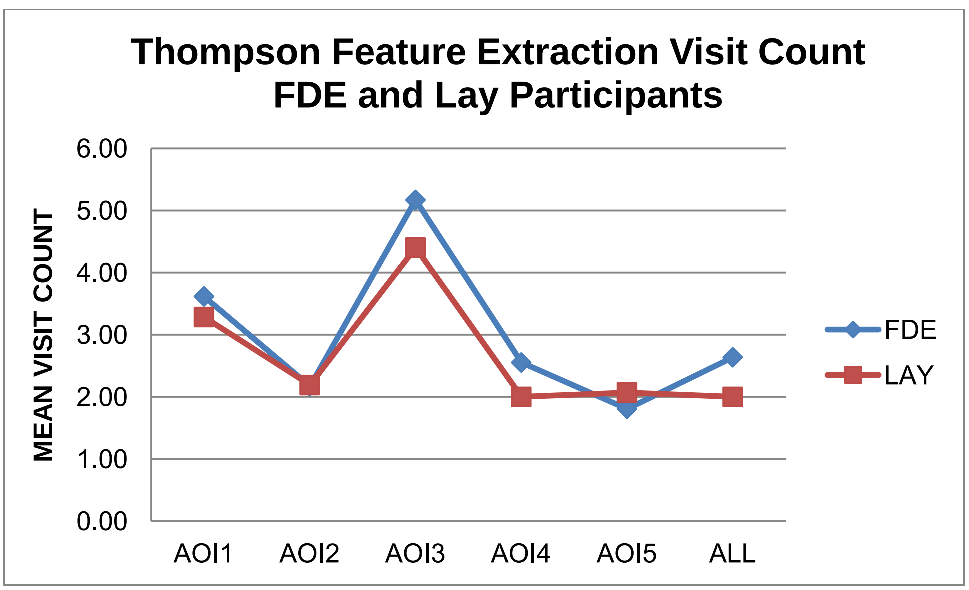
Process Analysis Fixation Durations for FDE and Lay Participants

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	4.31	4.00	2.56	3.49	11.52	13.48
Lay	2.55	2.58	1.42	1.41	8.27	11.03
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.30	3.48	2.62	3.67	34.03	29.96
Lay	1.21	2.36	2.80	4.30	17.25	20.85

Total Visit Count

MANOVA results revealed no significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .712, F (6, 82) = 33.74, p < .001, multivariate η^2 = .712. Figure Thompson 6 presents the mean visit counts by AOI.

Figure Thompson 6



Follow-up ANOVAS conducted on each dependent variable revealed no participant type differences on any of the AOIs (AOI 1, p = .682, *ns;* AOI 2, p = .963, *ns*; AOI 3, p = .601, *ns;* AOI 4, p = .523, *ns;* AOI 5, p = .550, *ns;* and AOI ALL, F p = .331, *ns*. Table Thompson 3 presents the means and standard deviations for areas of interest by participant type.

Table Thompson 3

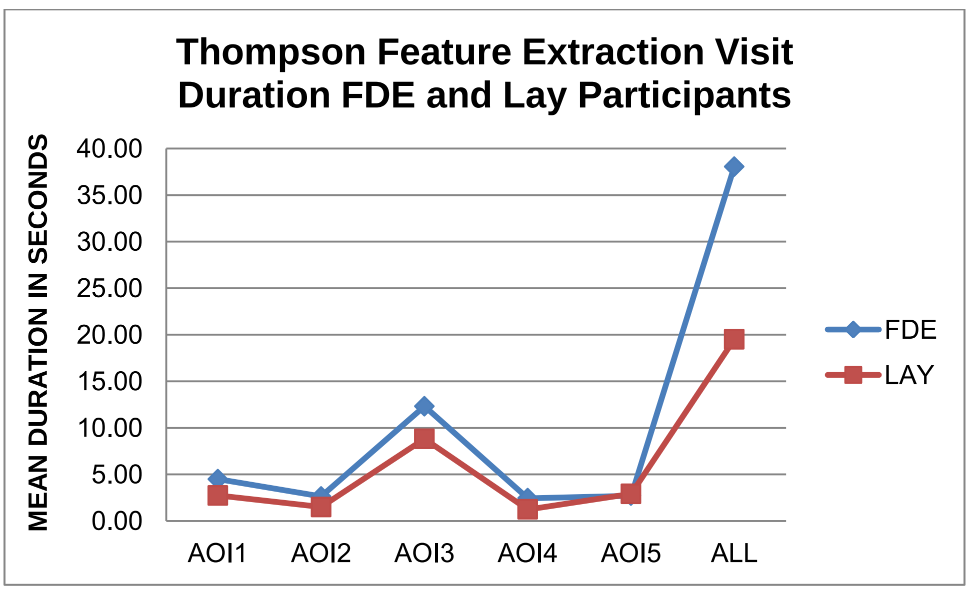
Visit Counts for FDE and Lay Participants

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	3.62	2.83	2.17	2.26	5.17	5.33
Lay	3.29	4.63	2.19	1.85	4.40	8.25
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.55	3.58	1.81	1.92	2.64	3.27
Lay	2.00	4.54	2.07	2.21	2.00	2.84

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .637, F (6, 82) = 23.99, p < .001, multivariate η^2 = .637. Figure Thompson 7 presents the mean visit durations by AOI.

Figure Thompson 7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for two of the AOIs. Visit duration was significantly greater among FDEs than among Lay participants in AOI 1, F (1, 87) = 5.29, p = .058, partial η^2 = .041; and AOI ALL, F (1, 87) = 9.70, p = .002, partial η^2 = .100.

No significant differences were found for AOI 2, p = .058, *ns;* AOI 3, p = .219, *ns;* AOI 4, p = .076, *ns*; or AOI 5, p = .829, *ns*. Table Thompson 4 presents the means and standard deviations for areas of interest by participant type.

Table Thompson 4

Process Analysis Visit Durations for FDE and Lay Participants

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	4.48	4.13	2.62	3.54	12.31	14.63
Lay	2.72	2.86	1.49	1.53	8.81	11.58
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.44	3.69	2.71	3.87	38.05	31.81
Lay	1.24	2.40	2.90	4.47	19.50	23.09

Decision Confidence Analysis

A 2 (FDE vs. Lay participant) x 2 (correct vs. incorrect call) univariate factorial ANOVA was conducted to investigate whether significant differences in level of *call confidence* existed between FDE and Lay participants, and whether significant differences existed according to the accuracy of the call. Table Thompson 5 presents the results of the omnibus analysis.

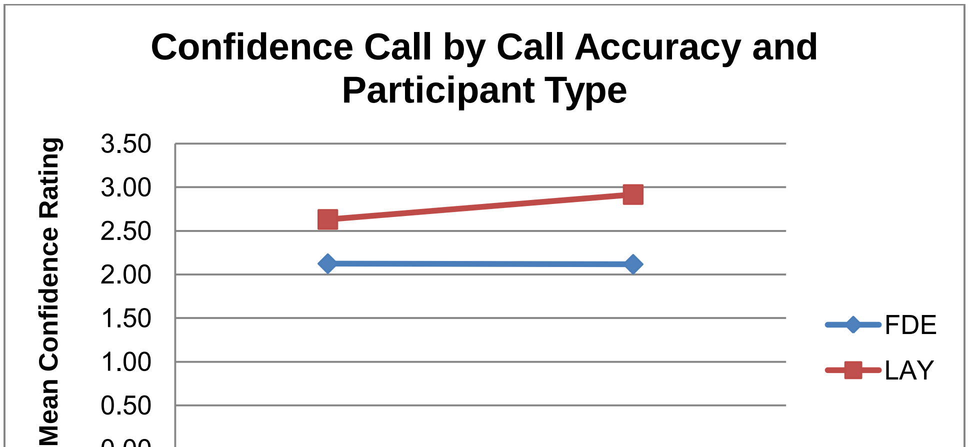
Table Thompson 5

Two-Way ANOVA Summary Table

Source	***SS***	***df***	***MS***	***F***	***p***	η^2
Between treatments						
Participant Type	9.25	1.00	9.25	18.70	.000	.175
Call Accuracy	0.42	1.00	0.42	0.85	.360	.010
Participant Type x Call Accuracy	0.46	1.00	0.46	0.94	.335	.011
Within treatments	43.52	88.00	0.49			
Total	600.00	92.00				

There was a significant main effects for participant type, F (1, 88) = 18.70, p < .001, partial η^2 = .175. There was no main effect for call accuracy, p = .360, *ns*; and no significant interaction for participant type by call accuracy, p =.335, *ns*. Figure Thompson 8 demonstrates the mean confidence ratings by call accuracy and participant type.

Figure Thompson 8



	Correct	Incorrect
FDE	2.13	2.12
LAY	2.63	2.92

<u>*Conclusions*</u>

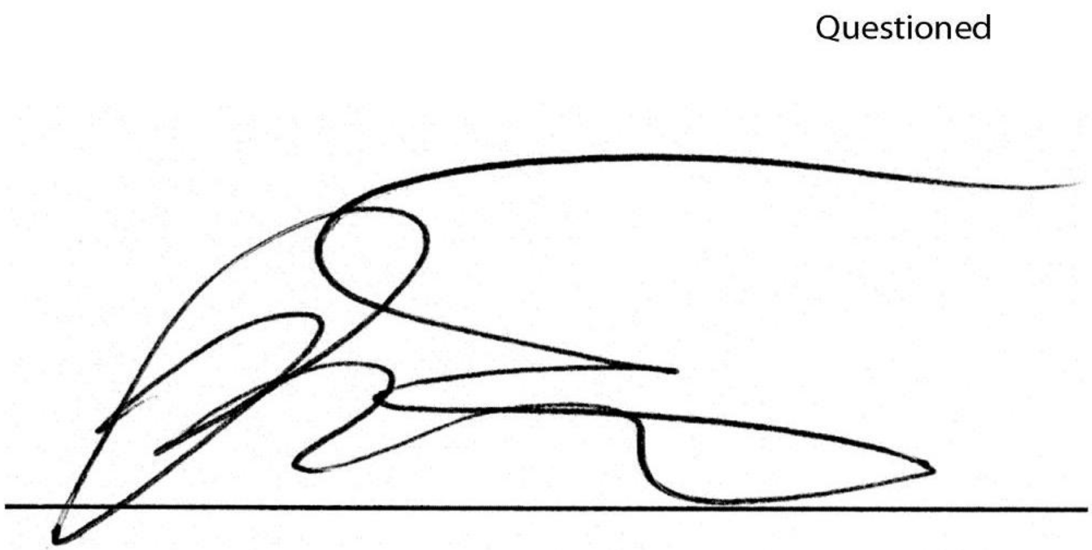
These findings indicate that although FDEs were significantly more accurate than were Lay participants, they were also significantly less confident in the accuracy of their calls. Both FDEs who made correct calls and those who made incorrect calls on average rated their confidence level just at *somewhat confident*. Lay participants, who on average rated their correct call confidence at the *somewhat confident* level, rated their incorrect call confidence at nearly the *moderately confident* level, although this interaction was not statistically significant.

Six areas of interest including the AOI ALL were empirically identified by examining the full sample heat map for this signature. The four eye tracking metrics revealed that FDEs examined the signature significantly more extensively than did Lay participants, fixating on AOIs for a greater period of time. The significant differences in fixation duration and visit duration observed in the AOI ALL indicated that FDEs spent more time evaluating the entire signature than did Lay participants.

SIGNATURE: Boris Vasilyev (Genuine)

The signature of Arthur Harris characterized as a low-complexity stylized signature. Of the 49 FDE participants, 46 responded correctly that the signature was genuine, and 2 responded that the signature was simulated. Of the 43 Lay participants, 31 responded correctly that the signature was simulated, and 12 responded that it was genuine. This difference was statistically significant, χ^2 (1, N = 92) = 9.82, p = .002. Figure Vasilyev 1 presents the view of this signature.

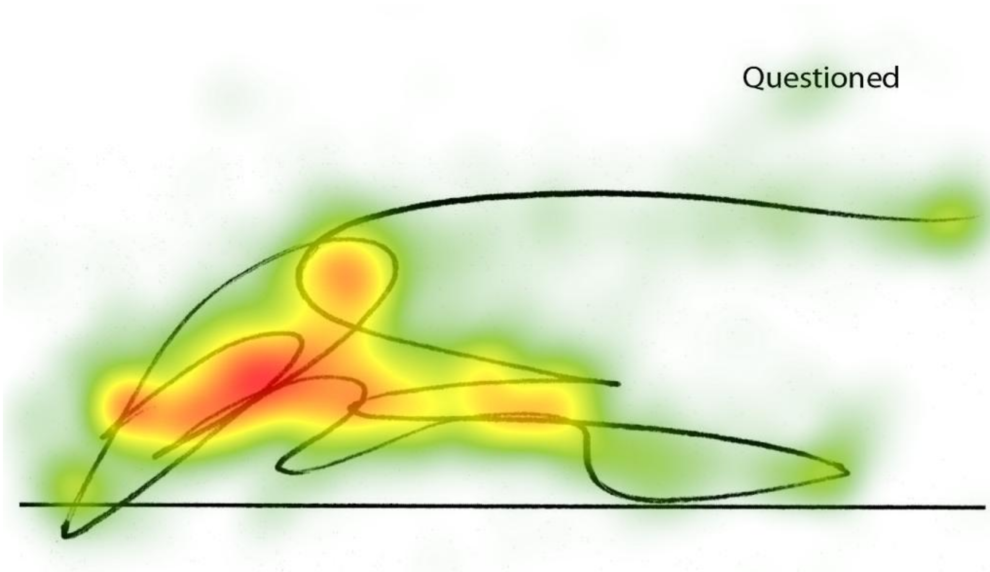
Figure Vasilyev 1. Single Signature Stimulus for Boris Vasilyev.



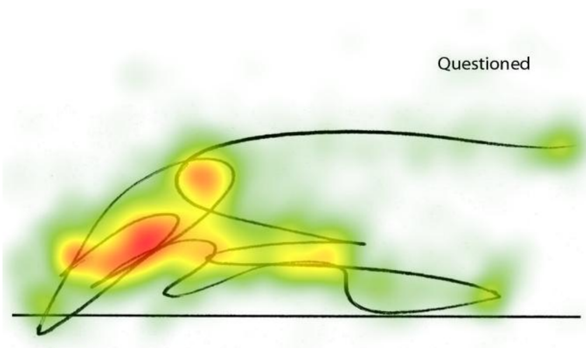
Selection of Areas of Interest (AOIs)

Figure Vasilyev 2 presents the heat map for this slide. Empirical examination of the heat map revealed that there were two locations indicated by red “hot spots” within the signature that elicited significant attention from the participants. AOIs were created for these specific hot spots. Larger, secondary AOIs incorporating the smaller hot spots were created to include the orange “warm spots,” creating a total of four AOIs (including the AOI for the questioned signature, labeled *Vasilyev All*) for this stimulus.

Figure Vasilyev 2. Heat maps for Vasilyey Signature demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs. The overall heat map is displayed below. Separate heat maps for FDEs and Lay Participants are displayed underneath.



FDE



LAY

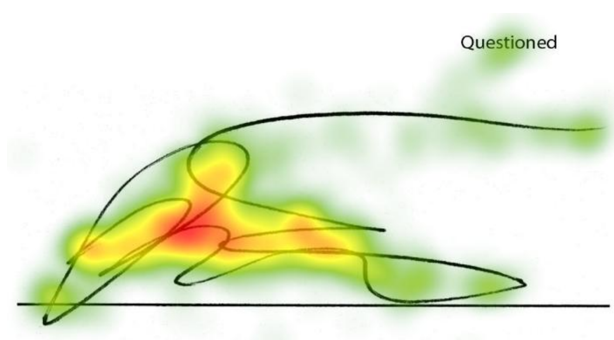
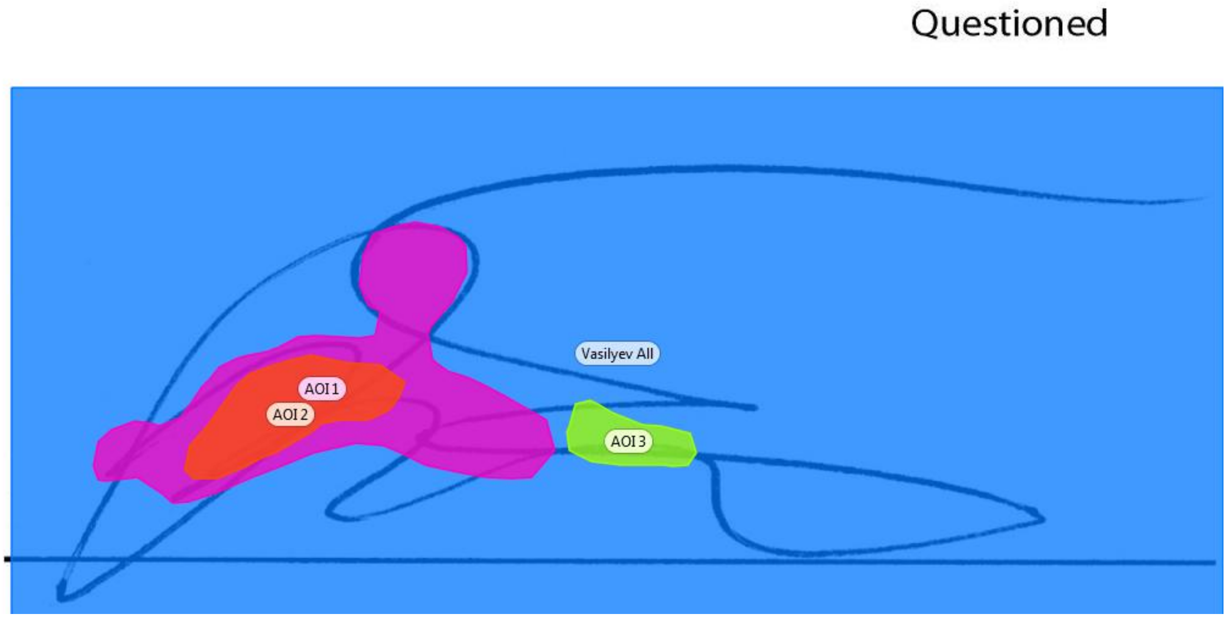


Figure Vasilyev 3. Areas of Interest (AOIs) for Signature Boris Vasilyev



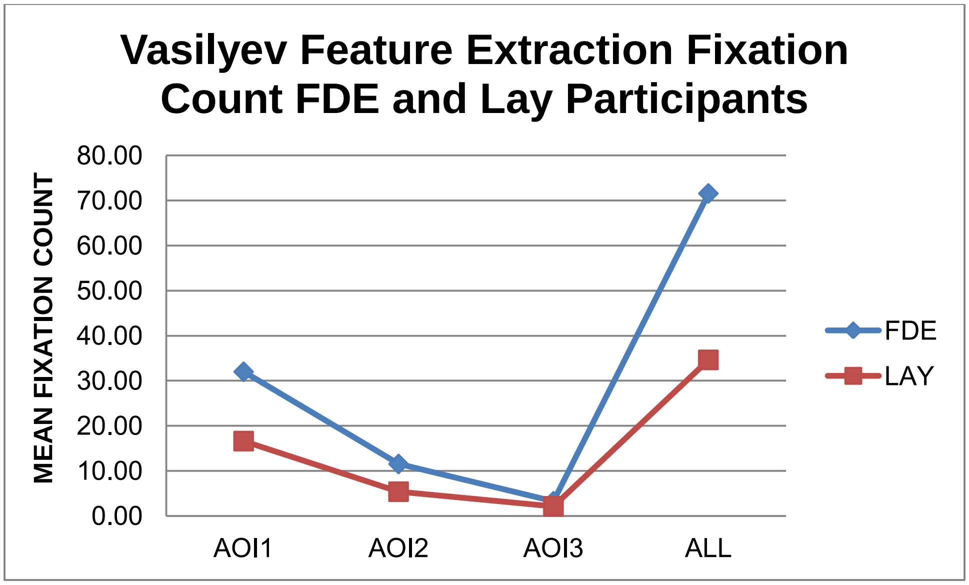
Eye-Tracking Metrics Analyses

These analyses investigate the participants' overall utilization of characteristics in the signature stimulus, and the participants' deployment of attentional resources to specific characteristics that the heat map indicated were particularly diagnostic during the examination. The examination process analyses are based on AOIs in the signature, and the overall signature analysis (the AOI overlaying the entire signature designated *Vasilyev All*). Figure Vasilyev 3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .662, F (4, 84) = 41.04, p < .001, multivariate η^2 = .662. Figure Vasilyev 4 presents the mean fixation counts by AOI.

Figure Vasilyev 4.



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for all but one AOI. Fixation counts were greater among FDEs than among Lay participants in AOI 1, F (1, 87) = 6.76, p = .011, partial η^2 = .072; AOI 2, F (1, 87) = 7.37, p = .008, partial η^2 = .078; and AOI ALL, F (1, 87) = 12.57, p = .001, partial η^2 = .126.

No significant differences were found for AOI 3, p = .064, partial *ns*. Table Vasilyev 1 presents the means and standard deviations for areas of interest by participant type.

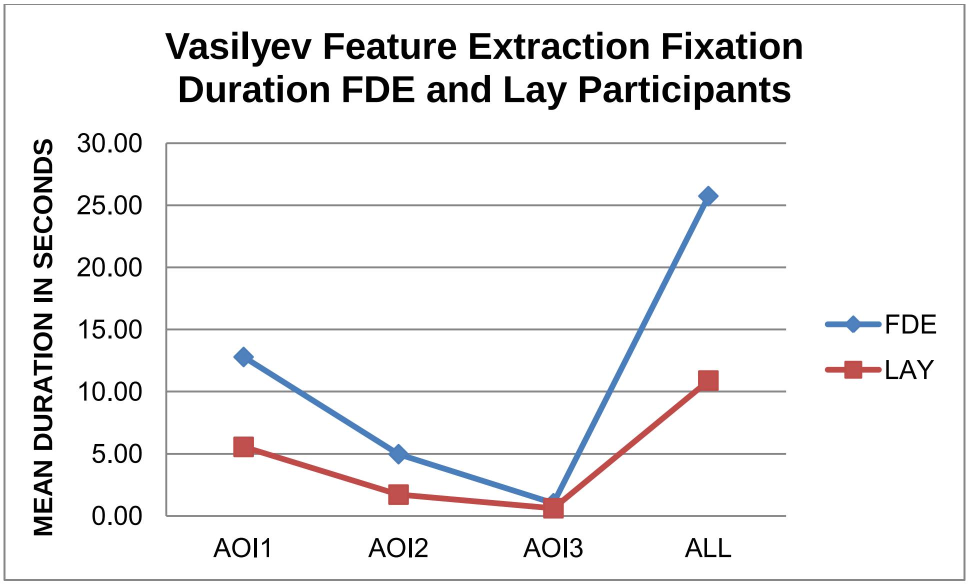
Table Vasilyev 1
Fixation Counts for FDE and Lay Participants

	AOI1		AOI2		AOI3		ALL	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	32.00	35.83	11.52	13.89	3.24	3.57	71.57	62.37
LAY	16.60	15.47	5.37	5.42	2.12	1.69	34.63	28.77

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .660, F (4, 84) = 40.73, p < .001, multivariate η^2 = .660. Figure Vasilyev 5 presents the mean fixation duration by AOI.

Figure Vasilyev 5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for all of the AOIs. Fixations duration counts in all significant AOIs were greater for FDEs than for lay participants (AOI 1, F (1, 87) = 11.20, p = .001, partial η^2 = .114; AOL 2, F (1, 87) = 13.00, p = .001, η^2 = .130; AOI 3, F (1, 87) = 5.02, p = .028, partial η^2 = .055; and AOI ALL, F (1, 87) = 16.38, p < .001, partial η^2 = .158). Table Vasilyev 2 presents the means and standard deviations for areas of interest by participant type.

Table Vasilyev 2

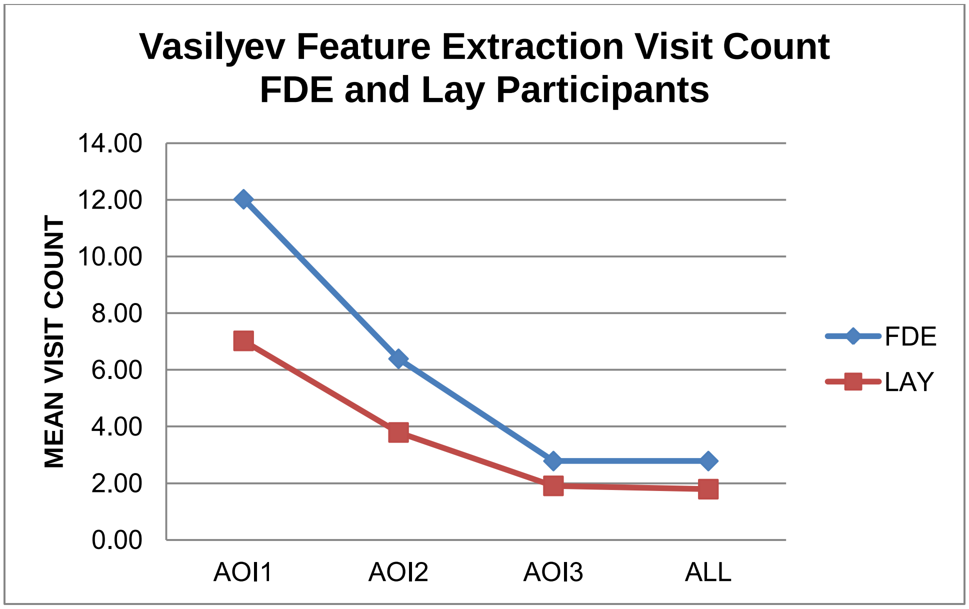
Process Analysis Fixation Durations for FDE and Lay Participants

	AOI1		AOI2		AOI3		ALL	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	12.79	13.33	4.97	5.70	1.02	1.04	25.74	22.54
LAY	5.55	4.98	1.71	1.65	0.62	0.54	10.89	8.67

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .762, F (4, 84) = 67.12, p < .001, multivariate η^2 = .762. Figure Vasilyev 6 presents the mean visit counts by AOI.

Figure Vasilyev 6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significantly greater among FDEs than among Lay participants for three of the AOIs (AOI 1, F (1, 87) = 6.24, p = .014, partial η^2 = .067; AOI 2, F (1, 87) = 5.87, p = .017, partial η^2 = .063; and AOI ALL, F (1, 87) = 4.99, p = .028, partial η^2 = .054).

No significant differences were found for AOI 3, p = .072, *ns*. Table Vasilyev 3 presents the means and standard deviations for areas of interest by participant type.

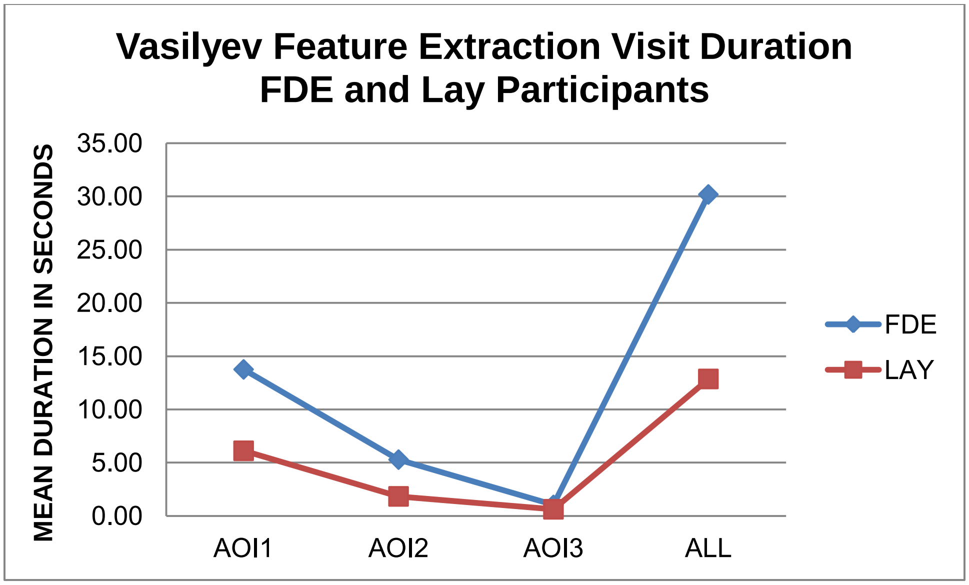
Table Vasilyev 3
Visit Counts for FDE and Lay Participants

	AOI1		AOI2		AOI3		ALL	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	12.02	11.84	6.39	6.27	2.78	2.84	2.78	2.80
LAY	7.02	5.84	3.79	3.31	1.91	1.41	1.79	0.83

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .640, F (4, 84) = 37.32, p < .001, multivariate η^2 = .640. Figure Vasilyev 7 presents the mean visit counts by AOI.

Figure Vasilyev 7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences was significantly greater among FDEs than among Lay participants for all of the AOIs (AOI 1, F (1, 87) = 10.54, p = .002, partial η^2 = .108; AOI 2, F (1, 87) = 13.05, p = .001, partial η^2 = .130; AOI 3, F (1, 87) = 5.18, p = .025, partial η^2 = .056; and AOI ALL, F (1, 87) = 15.99, p < .001, partial η^2 = .155). Table Vasilyev 4 presents the means and standard deviations for areas of interest by participant type.

Table Vasilyev 4

Process Analysis Visit Durations for FDE and Lay Participants

	AOI1		**AOI2**		**AOI3**		**ALL**	
Participants	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	13.76	14.37	5.29	5.97	1.03	1.05	30.19	26.41
LAY	6.11	5.79	1.83	1.96	0.62	0.54	12.86	10.83

Decision Confidence Analysis

A 2 (FDE vs. Lay participant) x 2 (correct vs. incorrect call) univariate factorial ANOVA was conducted to investigate whether significant differences in level of *call confidence* existed between FDE and Lay participants, and whether significant differences existed according to the accuracy of the call. Table Vasilyev 5 presents the results of the omnibus analysis.

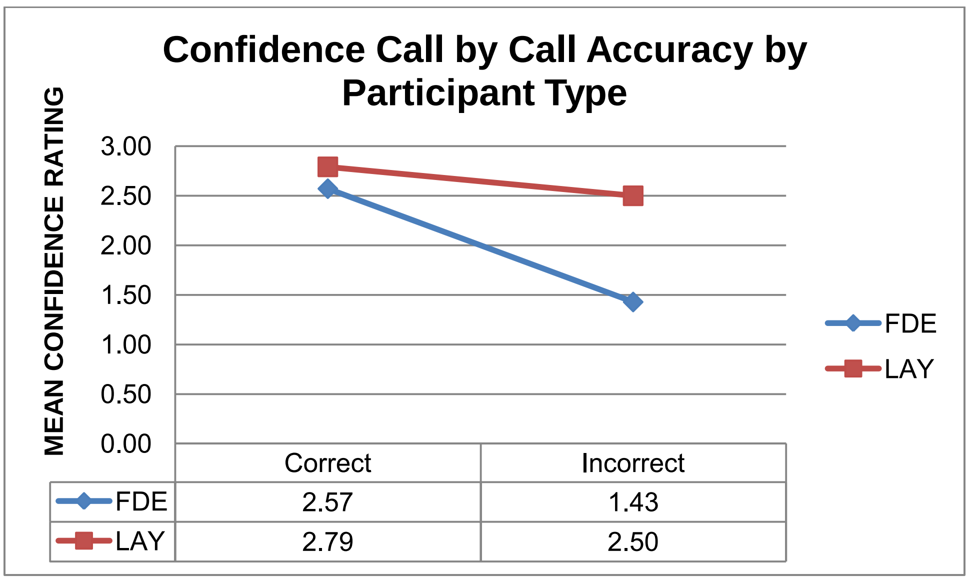
Table Vasilyev 5

Two-Way ANOVA Summary Table

Source	*SS*	*df*	*MS*	*F*	*p*	η^2
Between treatments						
Participant Type	2.58	1.00	2.58	3.06	.084	.034
Call Accuracy	4.62	1.00	4.62	5.47	.022	.060
Participant Type x Call Accuracy	1.22	1.00	1.22	1.45	.232	.017
Within treatments	72.62	86.00	0.84			
Total	789.00	90.00				

There was no significant main effects for participant type, p = .084, *ns*. There was a main effect for call accuracy, F (1, 86) = 5.47, p = .022, partial η^2 = .060*;* however, there was no significant interaction of participant type by call accuracy, p =.232, *ns*. Figure Vasilyev 8 demonstrates the mean confidence ratings by call accuracy and participant type.

Figure Vasilyev 8



Conclusions

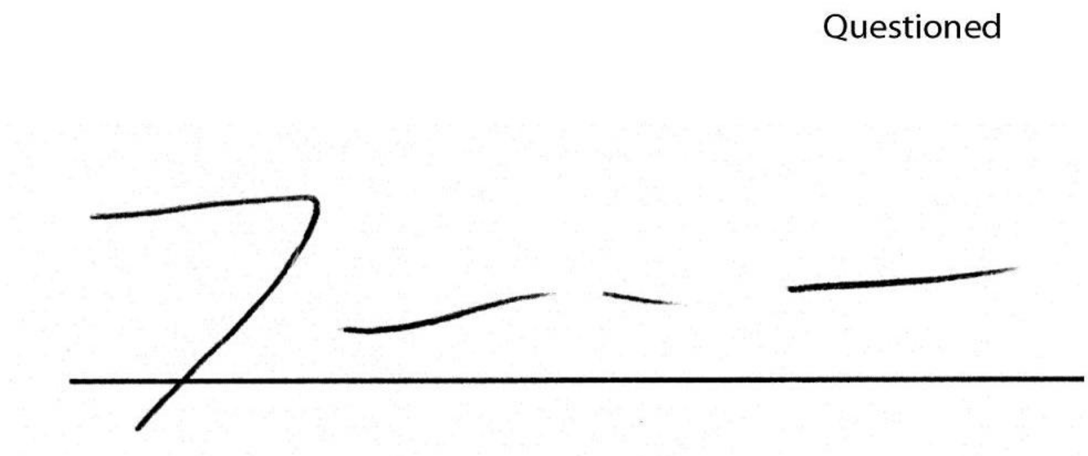
These findings indicate that although FDEs were significantly more accurate than were Lay participants, they were less confident in the accuracy of their calls, on average rating their confidence level for correct calls at *somewhat confident* and their incorrect calls as *not at all confident*, compared to Lay participants, who on average rated their both correct call and incorrect call confidence at the *somewhat confident* level.

Four areas of interest including the AOI ALL were empirically identified by examining the full sample heat map for this signature. The four eye tracking metrics revealed that overall, FDEs examined the signature significantly more extensively than did Lay participants, fixating a greater number of times on all AOIs, and fixating on those AOIs for a greater period of time. The significant differences in fixation count, fixation duration, visit count, and visit duration observed in the AOI ALL indicated that FDEs also examined a greater variety of signature features, and spent more time evaluating them, than did Lay participants.

SIGNATURE: Tim Walls (Simulated)

The signature of Tim Walls is characterized as a low-complexity stylized signature. Of the 49 FDE participants, 16 responded correctly that the signature was simulated, and 32 responded that the signature was genuine. Of the 43 Lay participants, 25 responded correctly that the signature was simulated, and 18 responded that it was genuine. This difference was statistically significant, χ^2 (1, N = 91) = 5.64, p = .018. Figure Walls 1 presents the view of this signature.

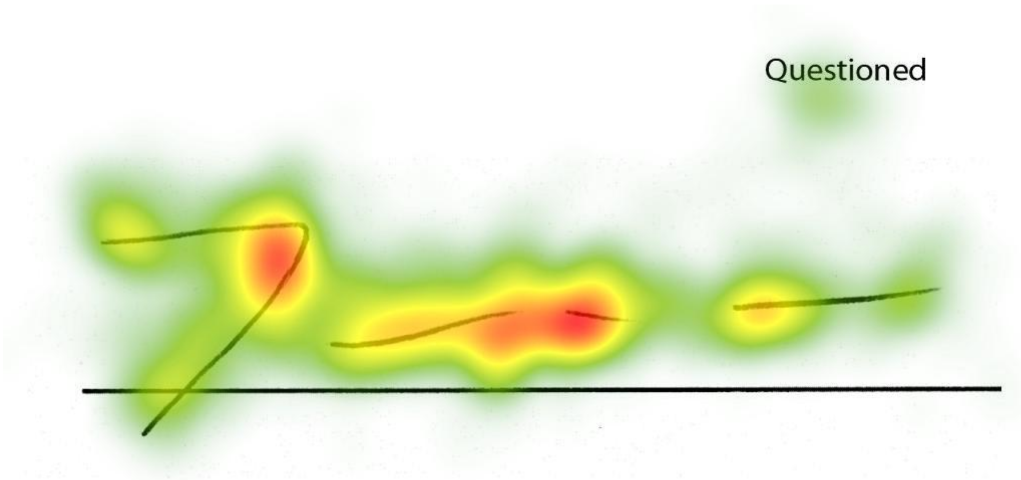
Figure Walls 1. Single Signature Stimulus for Tim Walls.



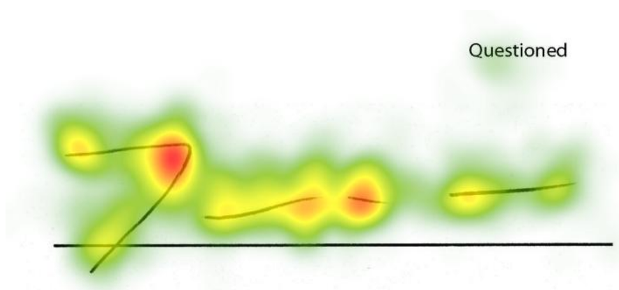
Selection of Areas of Interest (AOIs)

Figure Walls 2 presents the heat map for this slide. Empirical examination of the heat map revealed that there were two locations indicated by red "hot spots" within the signature that elicited significant attention from the participants. AOIs were created for these specific hot spots. Larger, secondary AOIs incorporating the smaller hot spots were created to include the orange "warm spots," creating a total of six AOIs (including the AOI for the questioned signature, labeled *Walls All*) for this stimulus.

Figure Walls 2. Heat maps for Walls Signature demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs. The overall heat map is displayed below. Separate heat maps for FDEs and Lay Participants are displayed underneath.



FDE



LAY

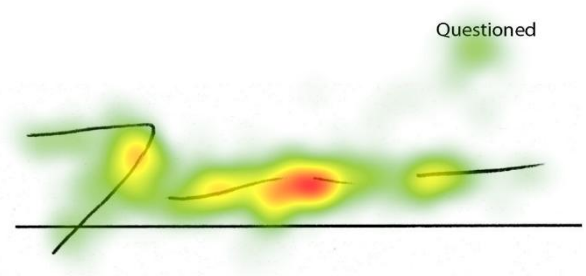
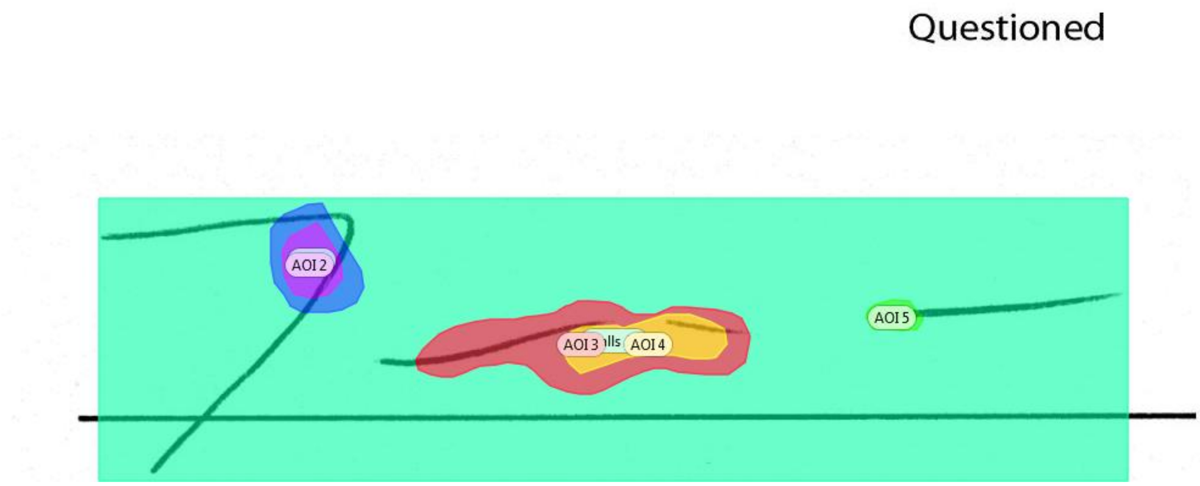


Figure Walls 3. Areas of Interest (AOIs) for Signature Tim Walls



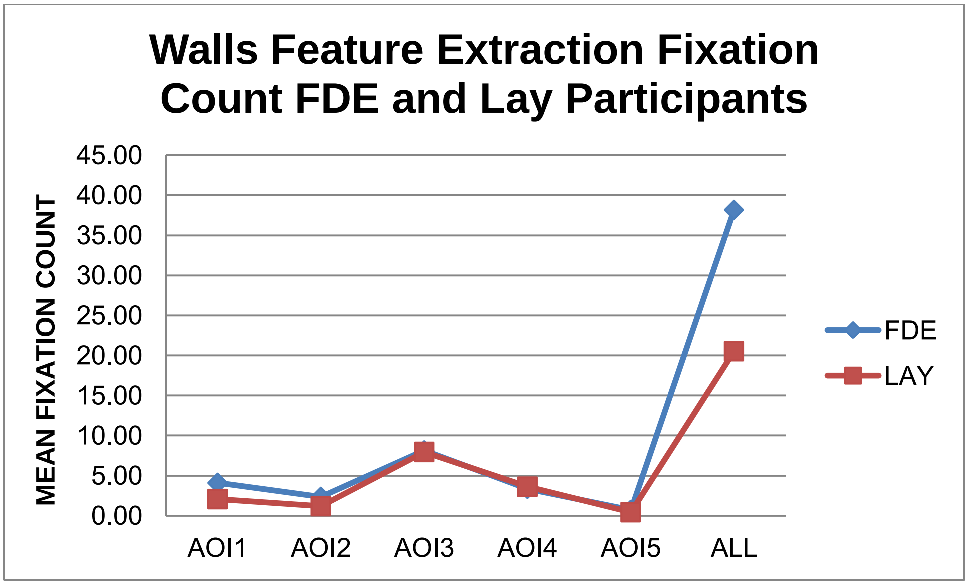
Eye-Tracking Metrics Analyses

These analyses investigate the participants' overall utilization of characteristics in the signature stimulus, and the participants' deployment of attentional resources to specific characteristics that the heat map indicated were particularly diagnostic during the examination. The examination process analyses are based on AOIs in the signature, and the overall signature analysis (the AOI overlaying the entire signature designated Walls *all*). Figure Walls 3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .715, F (6, 81) = 33.83, p < .001, multivariate η^2 = .715. Figure Walls 4 presents the mean fixation counts by AOI.

Figure Walls 4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for three of the AOIs. Fixation counts were greater among FDEs than among Lay participants in AOI 1, F (1, 86) = 9.38, p = .003, partial η^2 = .098; AOI 2, F (1, 86) = 6.01, p = .016, partial η^2 = .065; and AOI ALL, F (1, 86) = 16.86, p < .001, partial η^2 = .164.

No significant differences were found for AOI 3, p = .905, *ns;* AOI 4, p = .756, *ns;* and AOI 3, p = .237, *ns*. Table Walls 1 presents the means and standard deviations for areas of interest by participant type.

Table Walls 1

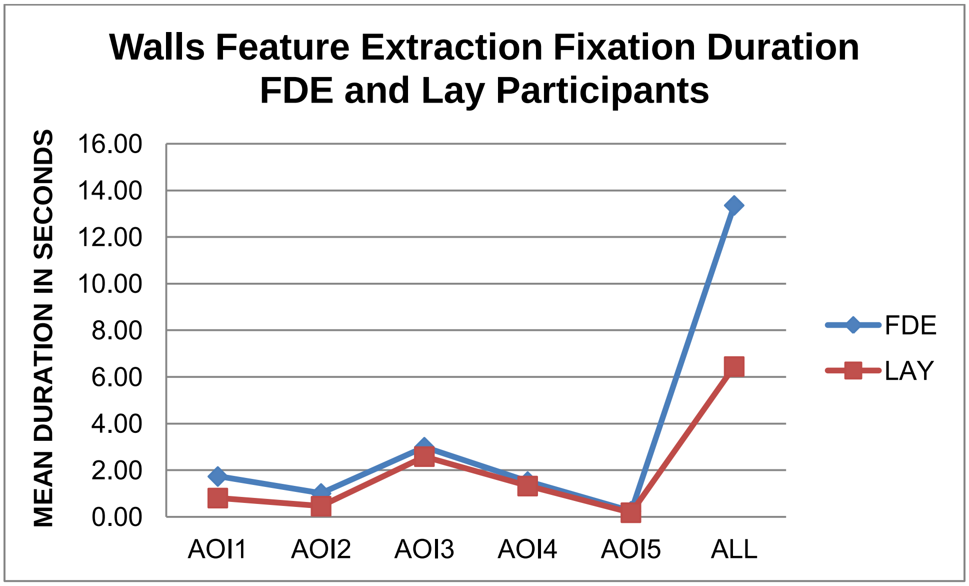
Fixation Counts for FDE and Lay Participants

	AOI1		**AOI2**		**AOI3**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	4.09	3.75	2.34	2.66	8.13	8.14
Lay	2.07	2.03	1.20	1.47	7.95	5.09
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	3.36	4.21	0.70	1.16	38.17	24.44
Lay	3.61	3.08	0.44	0.87	20.54	13.47

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .683 F (6, 81) = 29.13, p < .001, multivariate η^2 = .683. Figure Walls 5 presents the mean fixation duration by AOI.

Figure Walls 5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for three of the AOIs. Fixations durations in all significant AOIs were greater for FDEs than for lay participants (AOI 1, F (1, 86) = 8.97, p = .004, partial η^2 = .094; AOI 2, F (1, 86) = 6.12, p = .015, η^2 = .066; and AOI ALL, F (1, 86) = 18.53, p < .001, η^2 = .177).

There were no significant difference for AOI 3, p = .476, *ns;* AOI 4, p = .599, *ns;* AOI 5, p = .530, *ns.* Table Walls 2 presents the means and standard deviations for areas of interest by participant type.

Table Walls 2

Process Analysis Fixation Durations for FDE and Lay Participants

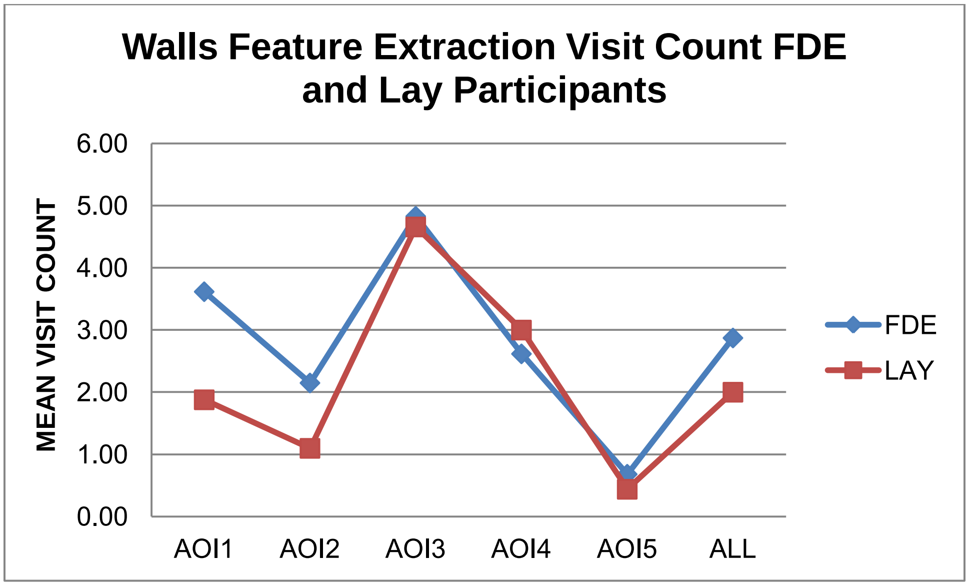
	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.73	1.81	1.01	1.29	2.99	3.22
Lay	0.81	0.85	0.46	0.62	2.59	1.78

	AOI4		AOI5		ALL	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.52	1.98	0.24	0.44	13.36	9.64
Lay	1.32	1.33	0.18	0.48	6.45	3.82

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .811, F (6, 81) = 57.87, p < .001, multivariate η^2 = .811. Figure Walls 6 presents the mean visit counts by AOI.

Figure Walls 6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for three of the AOIs (AOI 1, F (1, 86) = 9.31, p = .003, partial η^2 = .098; AOI 2, F (1, 86) = 6.20, p = .015, partial η^2 = .067; and AOI ALL, F (1, 86) = 5.84, p = .018, partial η^2 = .064).

No significant differences were found for AOI 3, p = .830, *ns;* AOI 4, p = .491, *ns;* or AOI 5, p = .262, *ns*. Table Walls 3 presents the means and standard deviations for areas of interest by participant type.

Table Walls 3

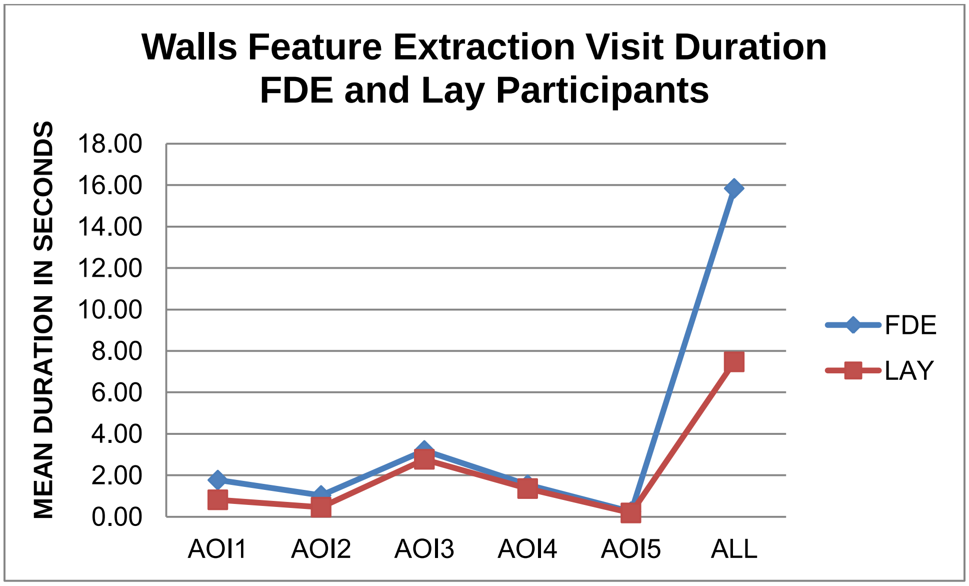
Process Analysis Visit Counts for FDE and Lay Participants

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	3.62	3.28	2.15	2.44	4.83	4.39
Lay	1.88	1.71	1.10	1.24	4.66	2.77
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.62	2.78	0.68	1.11	2.87	2.02
Lay	3.00	2.36	0.44	0.87	2.00	1.20

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .693, F (6, 81) = 30.42, p < .001, multivariate η^2 = .693. Figure Walls 7 presents the mean visit duration by AOI.

Figure Walls 7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for three of the AOIs. Visit duration was greater among FDEs than among Lay participants in AOI 1, F (1, 86) = 8.97, p = .004, partial η^2 = .094; AOI 2, F (1, 86) = 6.26, p = .014, partial η^2 = .068; and AOI ALL, F (1, 86) = 20.98, p < .001, partial η^2 = .196.

There were no significant differences for AOI 3, p = .479, *ns*; AOI 4, p = .627, *ns;* and AOI 5, p = .527, *ns*. Table Walls 4 presents the means and standard deviations for areas of interest by participant type.

Table Walls 4
Process Analysis Visit Durations for FDE and Lay Participants

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.77	1.87	1.02	1.33	3.20	3.42
Lay	0.81	0.85	0.46	0.62	2.77	1.93
	AOI4		**AOI5**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.54	2.03	0.24	0.44	15.84	10.91
Lay	1.36	1.40	0.18	0.48	7.47	4.53

Decision Confidence Analysis

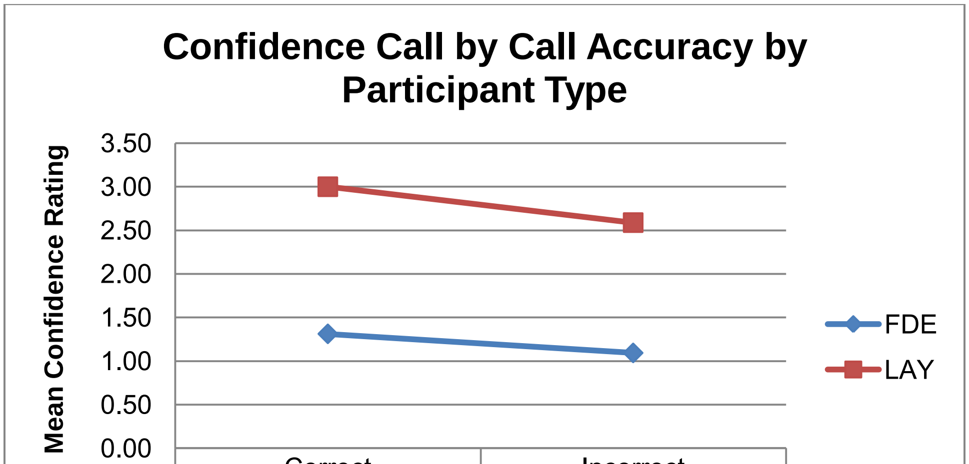
A 2 (FDE vs. Lay participant) x 2 (correct vs. incorrect call) univariate factorial ANOVA was conducted to investigate whether significant differences in level of *call confidence* existed between FDE and Lay participants, and whether significant differences existed according to the accuracy of the call. Table Walls 5 presents the results of the omnibus analysis.

Table Walls 5
Two-Way ANOVA Summary Table

Source	*SS*	*df*	*MS*	*F*	*p*	η^2
Between treatments						
Participant Type	52.58	1.00	52.58	102.13	.000	.543
Call Accuracy	2.06	1.00	2.06	4.01	.048	.045
Participant Type x Call Accuracy	0.19	1.00	0.19	0.38	.541	.004
Within treatments	44.27	86.00	0.51			
Total	449.00	90.00				

There was a significant main effects for participant type, F (1, 86) = 102.13, p < .001, partial η^2 = .543. There was a main effect for call accuracy, F (1, 86) = 4.01, p = .048, partial η^2 = .045*;* however, there was no significant interaction of participant type by call accuracy, p =.541, *ns*. Figure Walls 8 demonstrates the mean confidence ratings by call accuracy and participant type.

Figure Walls 8



	Correct	Incorrect
FDE	1.31	1.09
LAY	3.00	2.59

Conclusions

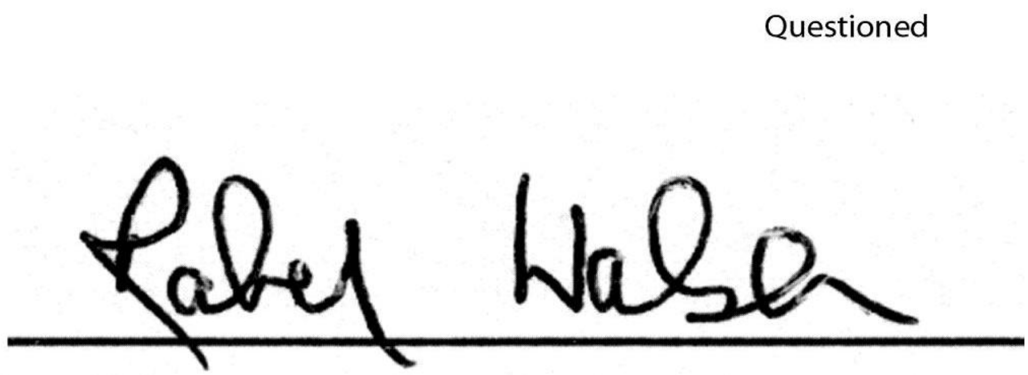
These findings indicate that although FDEs were significantly more accurate than were Lay participants, they were also significantly less confident in the accuracy of their calls, on average rating their confidence level for correct calls at *not at all confident* and their incorrect calls as *not at all confident*, compared to Lay participants, who on average rated their correct call confidence at the *moderately confident* level, and their incorrect call confidence at the *somewhat confident* level. The means for the incorrect call group were significantly lower among both FDEs and Lay participants than the means for the correct call group.

Four areas of interest were empirically identified by examining the full sample heat map for this signature. The four eye tracking metrics revealed that overall, FDEs examined the signature significantly more extensively than did Lay participants, fixating a greater number of times on all AOIs, and fixating on those AOIs for a greater period of time. The significant differences in fixation count, fixation duration, visit count, and visit duration observed in the AOI ALL indicated that FDEs also examined a greater variety of signature features, and spent more time evaluating them, than did Lay participants.

SIGNATURE: Rob Walsh (Simulated)

The signature of Rob Walsh Harris characterized as a high-complexity text-based signature. Of the 49 FDE participants, 38 responded correctly that the signature was simulated, and 11 responded that the signature was genuine. Of the 43 Lay participants, 30 responded correctly that the signature was simulated, and 13 responded that it was genuine. This difference was not statistically significant, χ^2 (1, N = 92) = 0.72, *p* = .396, *ns*. Figure Walsh 1 presents the view of this signature.

Figure Walsh 1. Single Signature Stimulus for Rob Walsh.



Selection of Areas of Interest (AOIs)

Figure Walsh 2 presents the heat map for this slide. Empirical examination of the heat map revealed that there were two locations indicated by red “hot spots” within the signature that elicited significant attention from the participants. AOIs were created for these specific hot spots. Larger, secondary AOIs incorporating the smaller hot spots were created to include the orange “warm spots,” creating a total of five AOIs (including the AOI for the questioned signature, labeled *Walsh All*) for this stimulus.

Figure Walsh 2. Heat maps for Walsh Signature demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs. The overall heat map is displayed below. Separate heat maps for FDEs and Lay Participants are displayed underneath.

FDE

LAY

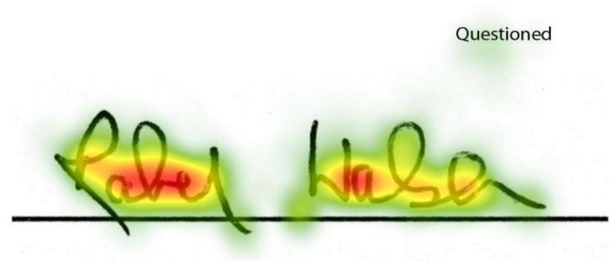
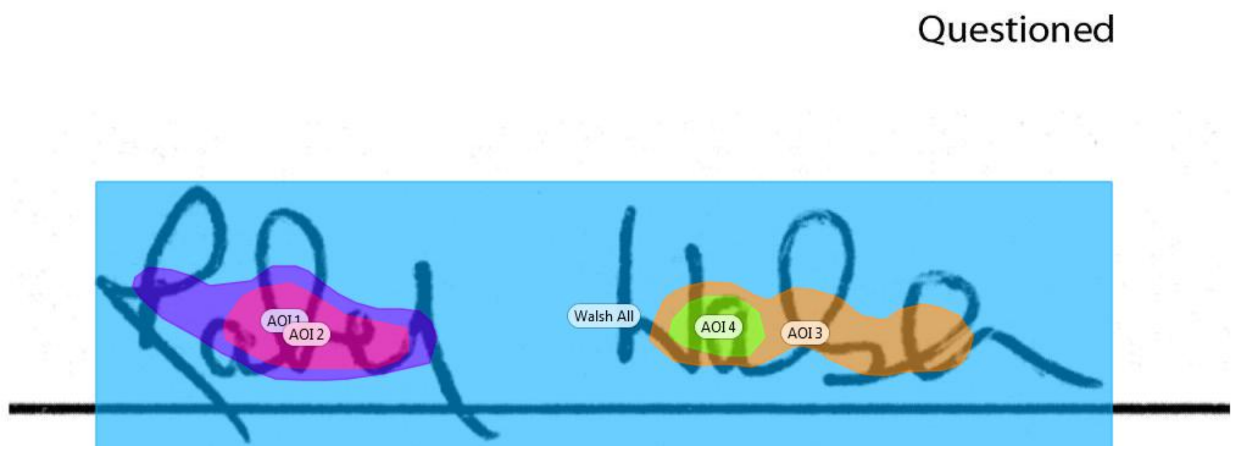


Figure Walls 3. Areas of Interest (AOIs) for Signature Rob Walsh



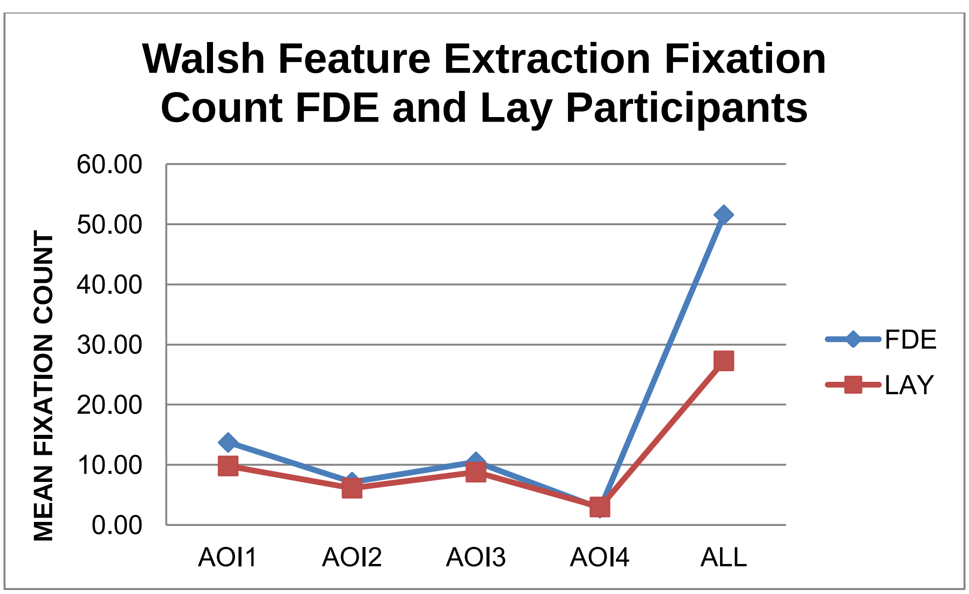
Eye-Tracking Metrics Analyses

These analyses investigate the participants' overall utilization of characteristics in the signature stimulus, and the participants' deployment of attentional resources to specific characteristics that the heat map indicated were particularly diagnostic during the examination. The examination process analyses are based on AOIs in the signature, and the overall signature analysis (the AOI overlaying the entire signature designated *Walsh All*). Figure Walsh 3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .642, F (5, 81) = 29.03, p < .001, multivariate η^2 = .297. Figure Walsh 4 presents the mean fixation counts by AOI.

Figure Walsh 4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significantly greater among FDEs than among Lay participants for only AOI ALL, F (1, 85) = 13.73, p < .001, partial η^2 = .139.

No significant differences were found for AOI 1, F p = .097, *ns*; AOI 2, p = .468, *ns*; AOI 3, p = .344, *ns;* or AOI 4, p = .729, *ns*. Table Walsh 1 presents the means and standard deviations for areas of interest by participant type.

Table Walsh 1

Fixation Counts for FDE and Lay Participants

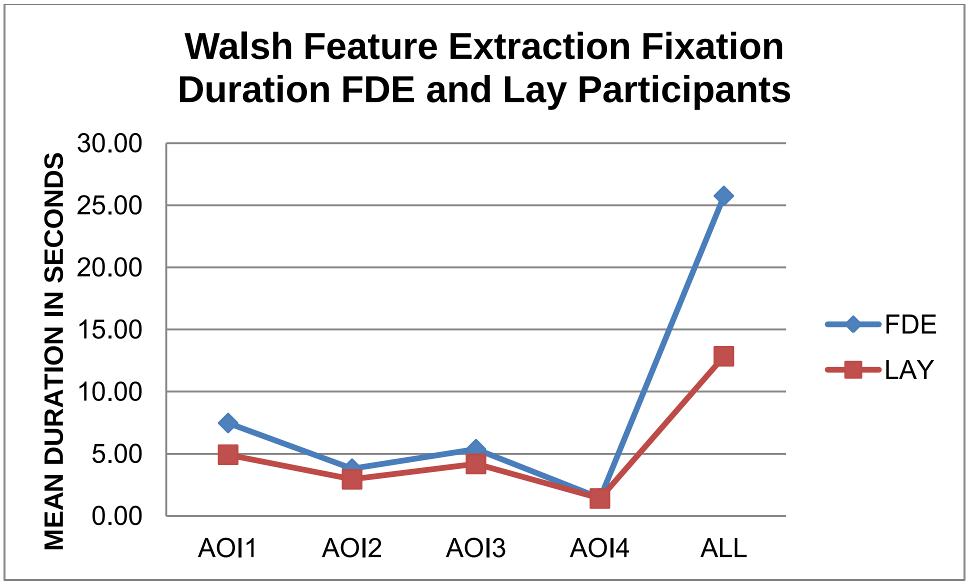
	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	13.70	12.49	7.13	7.48	10.49	8.50
Lay	9.80	8.39	6.10	5.24	8.78	8.23

	AOI4		ALL	
Participant	***M***	***SD***	***M***	***SD***
FDE	2.77	2.70	51.57	35.53
Lay	2.98	2.90	27.28	23.16

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .652, F (5, 81) = 30.31, p < .001, multivariate η^2 = .652. Figure Walsh 5 presents the mean fixation duration by AOI.

Figure Walsh 5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for only one of the AOIs. Fixations duration was greater for FDEs than for Lay participants in AOI ALL, F (1, 85) = 16.44, p < .001, η^2 = .162.

There were no significant difference for AOI 1, p = .051, *ns*; AOL 2, p = .264, *ns*; AOI 3, p = .183, *ns;* or AOI 4, p = .952, *ns*. Table Walsh 2 presents the means and standard deviations for areas of interest by participant type.

Table Walsh 2

Process Analysis Fixation Durations for FDE and Lay Participants

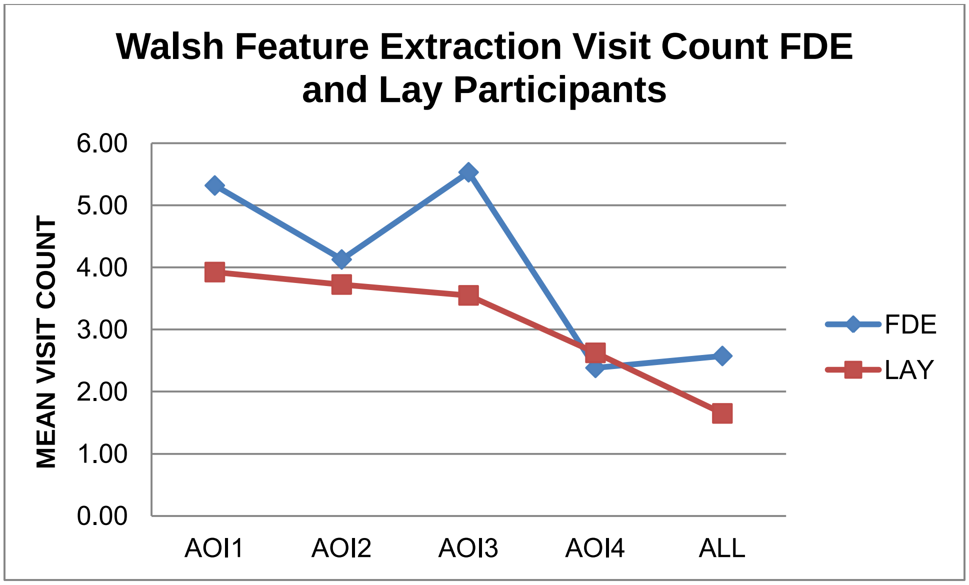
	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	7.47	6.38	3.80	3.79	5.37	4.06
Lay	4.92	5.49	2.94	3.26	4.18	4.18

	AOI4		ALL	
Participant	***M***	***SD***	***M***	***SD***
FDE	1.42	1.58	25.76	16.15
Lay	1.40	1.87	12.85	13.03

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .774, F (5, 81) = 55.53, p < .001, multivariate η^2 = .774. Figure Walsh 6 presents the mean visit counts by AOI.

Figure Walsh 6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for three of the AOIs. Fixation counts were significantly greater among FDEs than among Lay participants in AOI 1, F (1, 85) = 4.68, p = .033, partial η^2 = .052; AOI 3, F (1, 85) = 6.78, p = .011, partial η^2 = .074; and AOI ALL, F (1, 85) = 6.81, p = .011, partial η^2 = .074.

No significant differences were found for AOI 2, p = .547, *ns;* AOI 4, p = .628, *ns*. Table Walsh 3 presents the means and standard deviations for areas of interest by participant type.

Table Walsh 3

Process Analysis Visit Counts for FDE and Lay Participants

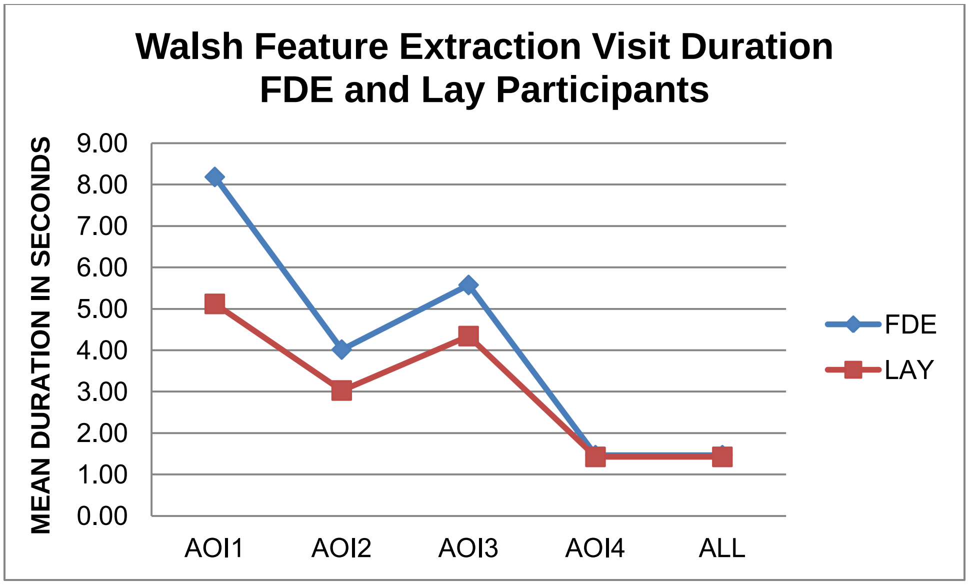
	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	5.32	3.40	4.13	3.37	5.53	4.06
Lay	3.93	2.43	3.73	2.74	3.55	2.80

	AOI4		ALL	
Participant	***M***	***SD***	***M***	***SD***
FDE	2.38	2.19	2.57	2.02
Lay	2.63	2.45	1.65	1.05

<u>*Total Visit Duration*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .646, F (5, 81) = 29.80, p < .001, multivariate η^2 = .646. Figure Walsh 7 presents the mean visit duration by AOI.

Figure Walsh 7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for two of the AOIs. Visit duration was significantly greater among FDEs than Lay participants in AOI 1, F (1, 85) = 4.87, p = .030, partial η^2 = .054; and AOI ALL, F (1, 85) = 17.97, p < .001, partial η^2 = .175.

There were no significant differences for AOI 2, p = .221, *ns*; AOI 3, p = .183, *ns*; AOI 4, p = .912, *ns*. Table Walsh 4 presents the means and standard deviations for areas of interest by participant type.

Table Walsh 4

Process Analysis Visit Durations for FDE and Lay Participants

	AOI1		AOI2		AOI3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	8.19	6.97	4.02	3.93	5.58	4.22
Lay	5.12	5.80	3.03	3.47	4.34	4.36

	AOI4		ALL	
Participant	***M***	***SD***	***M***	***SD***
FDE	1.47	1.61	1.47	1.61
Lay	1.43	1.89	1.43	1.89

Decision Confidence Analysis

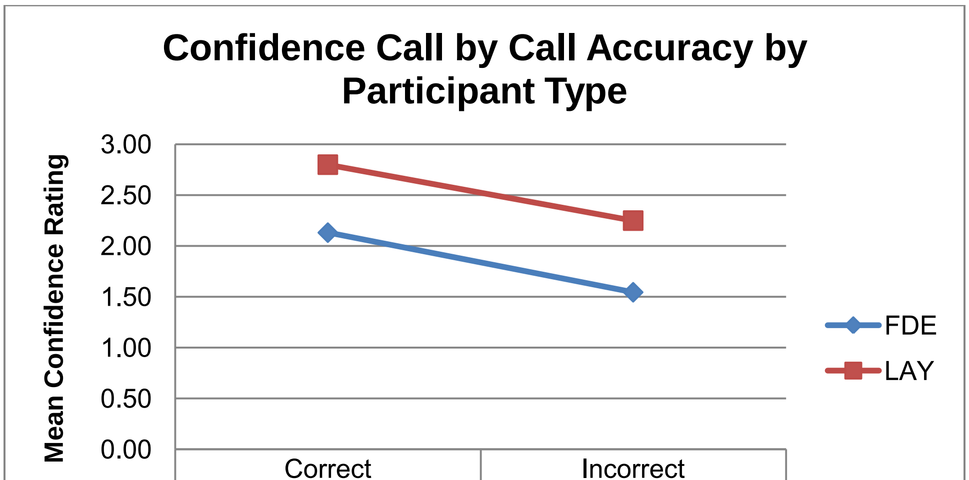
A 2 (FDE vs. Lay participant) x 2 (correct vs. incorrect call) univariate factorial ANOVA was conducted to investigate whether significant differences in level of *call confidence* existed between FDE and Lay participants, and whether significant differences existed according to the accuracy of the call. Table Walsh 5 presents the results of the omnibus analysis.

Table Walsh 5
Two-Way ANOVA Summary Table

Source	*SS*	*df*	*MS*	*F*	*p*	η^2
Between treatments						
Participant Type	8.06	1.00	8.06	10.94	.001	.112
Call Accuracy	5.52	1.00	5.52	7.49	.008	.079
Participant Type x Call Accuracy	0.01	1.00	0.01	0.01	.931	.000
Within treatments	64.12	87.00	0.74			
Total	559.00	91.00				

There was a significant main effect for participant type, F (1, 87) = 10.94, p = .001, partial η^2 = .112. There was a main effect for call accuracy, F (1, 87) = 7.49, p = .008, partial η^2 = .079; however, there was no significant interaction of participant type by call accuracy, p =.931, *ns*. Figure Walsh 8 demonstrates the mean confidence ratings by call accuracy and participant type.

Figure Walsh 8



	Correct	Incorrect
FDE	2.13	1.55
LAY	2.80	2.25

<u>*Conclusions*</u>

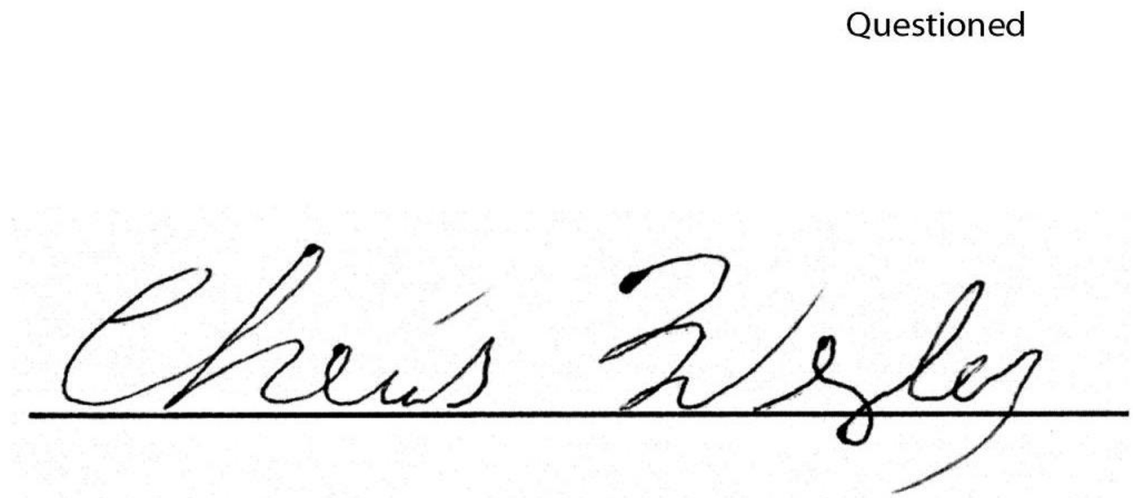
These findings indicate that although FDEs were more accurate than were Lay participants, this difference was not statistically significant. FDEs were significantly less confident in the accuracy of their calls, on average rating their confidence level for correct calls at *somewhat confident* and their incorrect calls as *not at all confident,* compared to Lay participants, who on average rated their correct call confidence nearer the *moderately confident* level, and their incorrect call confidence at the *somewhat* *confident* level. The means for the incorrect call group were significantly lower among both FDEs and Lay participants than the means for the correct call group.

Five areas of interest including AOI ALL were empirically identified by examining the full sample heat map for this signature. The four eye tracking metrics revealed that overall, FDEs examined the signature significantly more extensively than did Lay participants, fixating a greater number of times on all AOIs, and fixating on those AOIs for a greater period of time. The significant differences in fixation count, fixation duration, visit count, and visit duration observed in the AOI ALL indicated that FDEs also examined a greater variety of signature features, and spent more time evaluating them, than did Lay participants.

SIGNATURE: Christopher Wesley (Simulated)

The signature of Rob Walsh Harris characterized as a high-complexity text-based signature. Of the 49 FDE participants, 46 responded correctly that the signature was simulated, and 2 responded that the signature was genuine. Of the 43 Lay participants, 31 responded correctly that the signature was simulated, and 12 responded that it was genuine. This difference was statistically significant, χ^2 (1, N = 91) = 9.82, *p* = .002. Figure Wesley 1 presents the view of this signature.

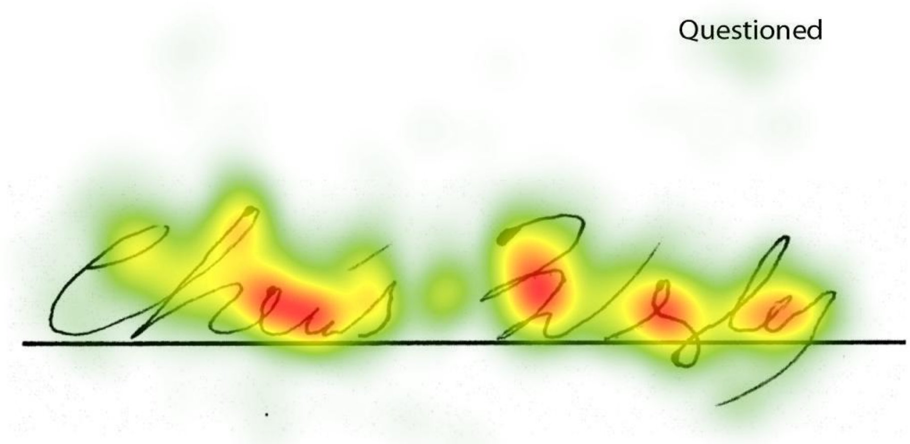
Figure Wesley 1. Single Signature Stimulus for Christopher Wesley.



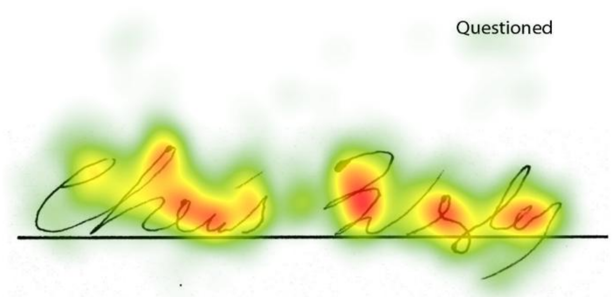
Selection of Areas of Interest (AOIs)

Figure Wesley 2 presents the heat map for this slide. Empirical examination of the heat map revealed that there were four locations indicated by red "hot spots" within the signature that elicited significant attention from the participants. AOIs were created for these specific hot spots. Larger, secondary AOIs incorporating the smaller hot spots were created to include the orange "warm spots," creating a total of eight AOIs (including the AOI for the questioned signature, labeled *Wesley All*) for this stimulus.

Figure Wesley 2. Heat maps for Wesley Signature demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs. The overall heat map is displayed below. Separate heat maps for FDEs and Lay Participants are displayed underneath.



FDE



LAY

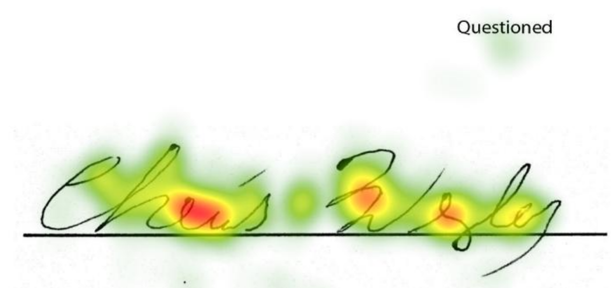
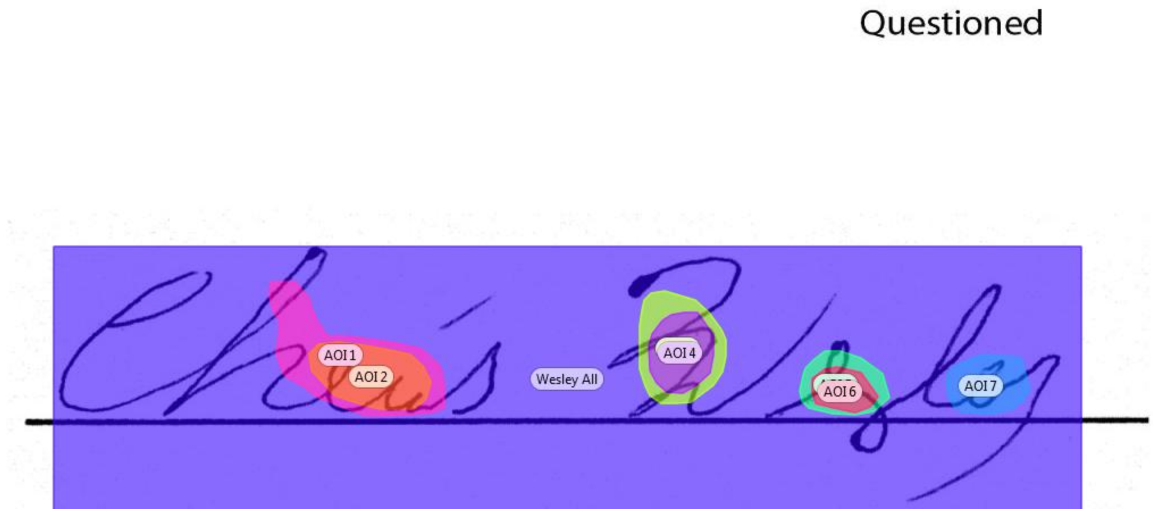


Figure Wesley 3. Areas of Interest (AOIs) for Signature Christopher Wesley



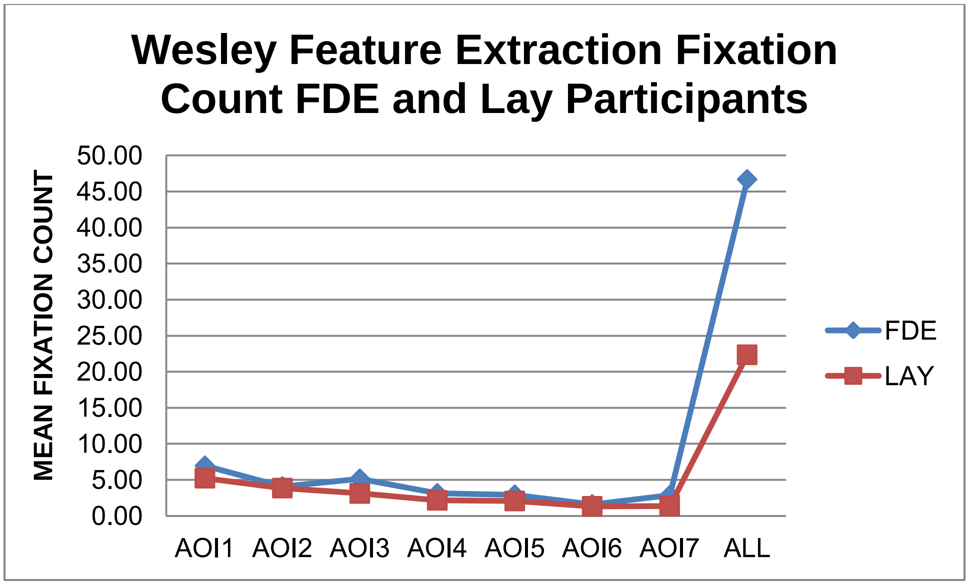
Eye-Tracking Metrics Analyses

These analyses investigate the participants' overall utilization of characteristics in the signature stimulus, and the participants' deployment of attentional resources to specific characteristics that the heat map indicated were particularly diagnostic during the examination. The examination process analyses are based on AOIs in the signature, and the overall signature analysis (the AOI overlaying the entire signature designated *Wesley All*). Figure Wesley 3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .692, F (8, 81) = 22.76, p < .001, multivariate η^2 = .692. Figure Wesley 4 presents the mean fixation counts by AOI.

Figure Wesley 4.



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for only two of the AOIs. Fixation count was greater among FDEs than among Lay participants in AOI 3, F (1, 88) = 4.71, p = .033, partial η^2 = .051; and AOI ALL, F (1, 88) = 12.10, p = .001, partial η^2 = .121.

No significant differences were found for AOI 1, p = .142, *ns*; AOI 2, p = .804, *ns*; AOI 4, p = .137, *ns;* AOI 5, p = .240, *ns;* AOI 6, p = .591, *ns;* and AOI 7, p = .117, *ns*. Table Wesley 1 presents the means and standard deviations for areas of interest by participant type.

Table Wesley 1

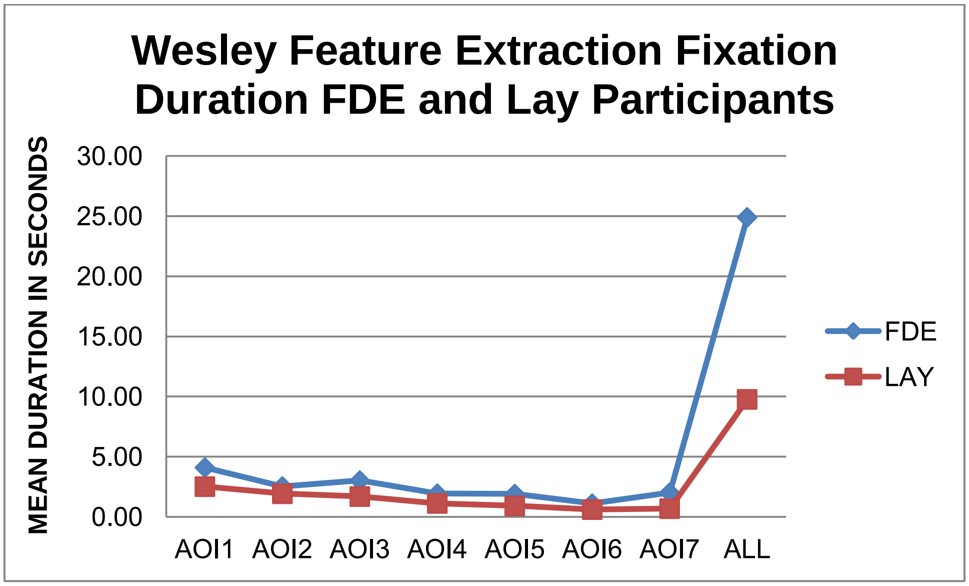
Fixation Counts for FDE and Lay Participants

	AOI1		**AOI2**		**AOI3**		**AOI4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	6.96	6.05	4.09	4.37	5.15	4.53	3.13	2.86
Lay	5.23	4.86	3.86	4.16	3.12	4.33	2.16	3.24
	AOI5		**AOI6**		**AOI7**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.94	3.87	1.60	2.63	2.85	5.41	46.68	40.58
Lay	2.07	2.98	1.33	2.06	1.37	3.00	22.35	22.32

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .618, F (8, 81) = 16.39, p < .001, multivariate η^2 = .618. Figure Wesley 5 presents the mean fixation duration by AOI.

Figure Wesley 5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for all but two of the AOIs. Fixations durations in all significant AOIs were greater for FDEs than for Lay participants (AOI 1, F (1, 88) = 6.06, p = .016 partial η^2 = .064; AOI 3, F (1, 88) = 7.38, p = .008, partial η^2 = .077; AOI 4, F (1, 88) = 5.27, p = .024, partial η^2 < .057; AOI 5, F (1, 88) = 7.04, p = .009, η^2 = .074; AOI7, F (1, 88) = 5.68, p = .019, η^2 = .061; AOI ALL, F (1, 85) = 16.34, p < .001, η^2 = .157).

There were no significant difference for AOI 2, p = .259, *ns*; or AOI 6, p = .098, *ns*. Table Wesley 2 presents the means and standard deviations for areas of interest by participant type.

Table Wesley 2

Process Analysis Fixation Durations for FDE and Lay Participants

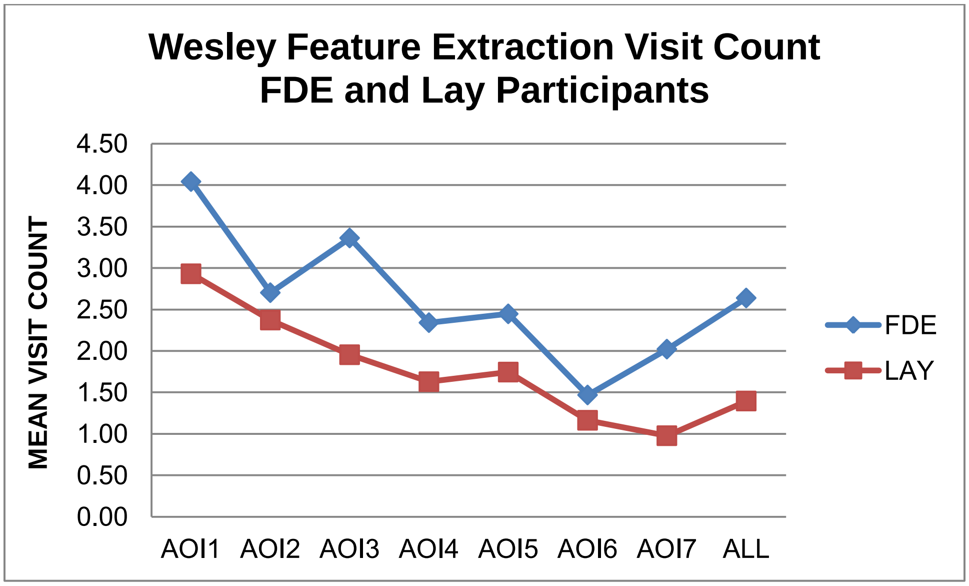
	AOI1		AOI2		AOI3		AOI4	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	4.10	3.52	2.53	2.77	3.02	2.56	1.93	1.82
Lay	2.52	2.44	1.93	2.22	1.69	2.01	1.12	1.47

	AOI5		AOI6		AOI7		ALL	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.90	2.12	1.10	1.63	2.02	3.45	24.91	23.00
Lay	0.92	1.24	0.61	1.08	0.68	1.32	9.77	8.96

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .786, F (8, 81) = 37.12, p < .001, multivariate η^2 = .786. Figure Wesley 6 presents the mean visit counts by AOI.

Figure Wesley 6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for three of the AOIs. Fixations duration counts in all significant AOIs were greater for FDEs than for lay participants (AOI 3, F (1, 88) = 7.76, p = .007 partial η^2 = .079; AOI 7, F (1, 88) = 4.31, p = .041, partial η^2 = .047*;* and AOI ALL, F (1, 88) = 10.94, p = .001, partial η^2 = .111).

There were no significant difference for AOI 1, p = .052, *ns*; AOI 2, p = .510, *ns*; AOI 4, p = .069, *ns;* AOI 5, p = .193, *ns*; AOI 6, p = .455, *ns.* Table Wesley 3 presents the means and standard deviations for areas of interest by participant type.

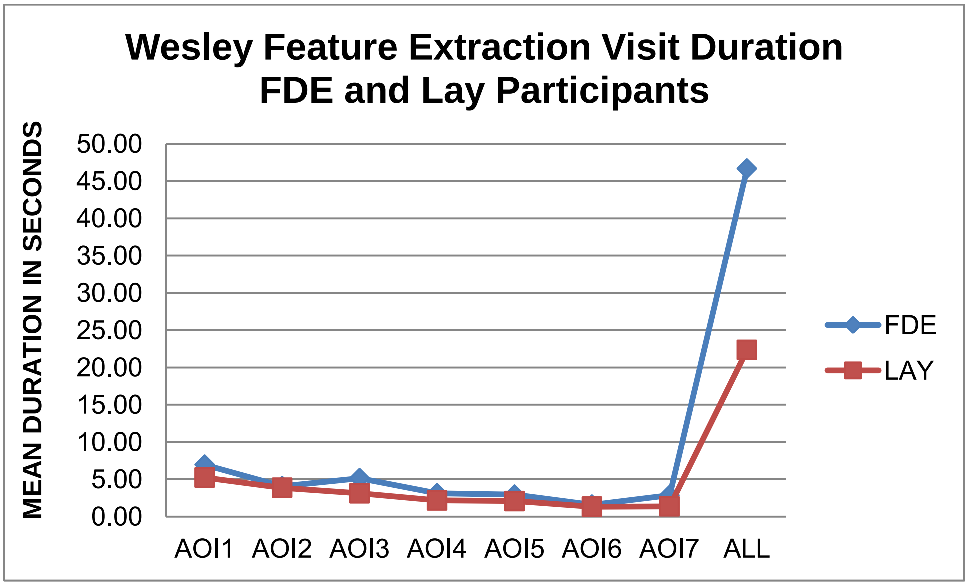
Table Wesley 3
Process Analysis Visit Counts for FDE and Lay Participants

	AOI1		**AOI2**		**AOI3**		**AOI4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	4.04	3.15	2.70	2.71	3.36	2.70	2.34	1.83
Lay	2.93	2.05	2.37	1.92	1.95	2.09	1.63	1.84
	AOI5		**AOI6**		**AOI7**		**ALL**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.45	2.91	1.47	2.22	2.02	3.00	2.64	2.35
Lay	1.74	2.05	1.16	1.54	0.98	1.44	1.40	0.76

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .692, F (8, 81) = 22.76, p < .001, multivariate η^2 = .692. Figure Wesley 7 presents the mean visit counts by AOI.

Figure Wesley 7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for two of the AOIs. Fixations duration counts in both significant AOIs were greater for FDEs than for lay participants (AOI 3, F (1, 88) = 4.71, p = .033, partial η^2 = .051; and AOI ALL, F (1, 88) = 12.10, p = .001, partial η^2 = .121).

There were no significant difference for AOI 1, p = .142, *ns*; AOI 2, p = .804, *ns*; AOL 4, p = .137, *ns*; AOI 5, p = .240, *ns*; AOI 6, p = .591, *ns*; or AOI 7, p = .117, *ns*. Table Wesley 4 presents the means and standard deviations for areas of interest by participant type.

Table Wesley 4

Process Analysis Visit Durations for FDE and Lay Participants

	AOI1		AOI2		AOI3		AOI4	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	6.96	6.05	4.09	4.37	5.15	4.53	3.13	2.86
Lay	5.23	4.86	3.86	4.16	3.12	4.33	2.16	3.24

	AOI5		AOI6		AOI7		ALL	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.94	3.87	1.60	2.63	2.85	5.41	46.68	40.58
Lay	2.07	2.98	1.33	2.06	1.37	3.00	22.35	22.32

Decision Confidence Analysis

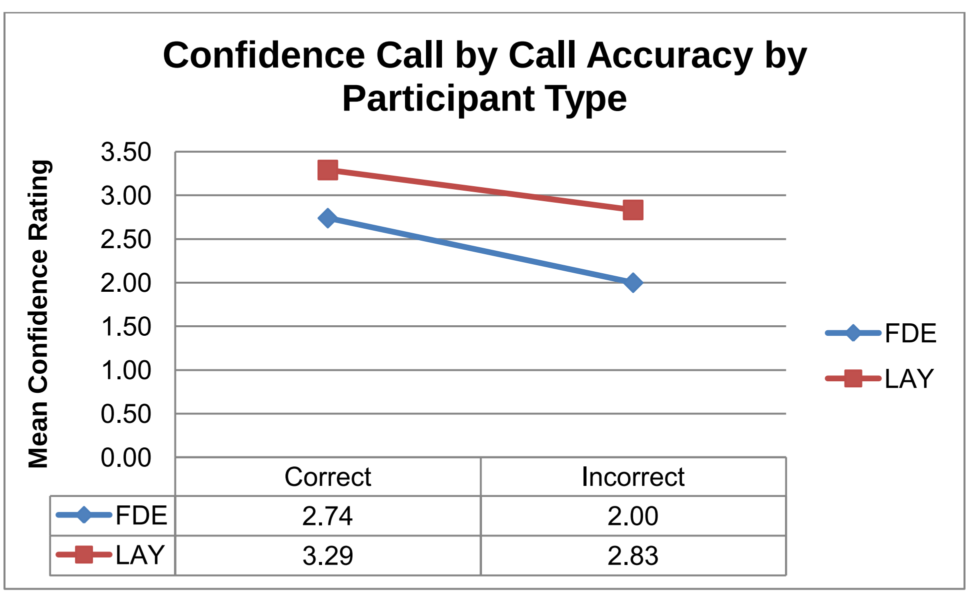
A 2 (FDE vs. Lay participant) x 2 (correct vs. incorrect call) univariate factorial ANOVA was conducted to investigate whether significant differences in level of *call confidence* existed between FDE and Lay participants, and whether significant differences existed according to the accuracy of the call. Table Wesley 5 presents the results of the omnibus analysis.

Table Wesley 5
Two-Way ANOVA Summary Table

Source	*SS*	*df*	*MS*	*F*	*p*	η^2
Between treatments						
Participant Type	3.01	1.00	3.01	3.69	.058	.041
Call Accuracy	2.24	1.00	2.24	2.75	.101	.031
Participant Type x Call Accuracy	0.12	1.00	0.12	0.15	.696	.002
Within treatments	70.92	87.00	0.82			
Total	856.00	91.00				

There was no significant main effects for participant type, p = .058, *ns*. There was no main effect for call accuracy, p = .101, *ns;* and no significant interaction of participant type by call accuracy, p = .696, *ns*. Figure Wesley 8 demonstrates the mean confidence ratings by call accuracy and participant type.

Figure Wesley 8



Conclusions

These findings indicate that FDEs were significantly more accurate than were Lay participants. No significant differences were found between FDEs and Lay participants in their levels of decision confidence, although FDEs were again less confident in the accuracy of their calls, on average rating their confidence level for correct calls at *somewhat confident* and their incorrect calls just at *somewhat confident*, compared to Lay participants, who on average rated their correct call confidence at the *moderately confident* level, and their incorrect call confidence at the *somewhat confident* level.

Eight areas of interest including AOI ALL were empirically identified by examining the full sample heat map for this signature. The four eye tracking metrics revealed that overall, FDEs examined the signature significantly more extensively than did Lay participants, fixating a greater number of times on all AOIs, and fixating on those AOIs for a greater period of time. The significant differences in fixation count, fixation duration, and visit duration observed in the AOI ALL indicated that FDEs also examined a greater variety of signature features, and spent more time evaluating them, than did Lay participants.

CHAPTER 3: RESULTS

SECTION 3.2: EYE-TRACKING ANALYSES

Questioned/Known Signature Comparison Protocol

The questioned/known comparison protocol was designed to explore how FDEs use the information contained within signature specimens to reach their conclusions. This investigation touches on two different but related areas of cognitive functioning—attention, and expertise.

The decision making process by which FDEs reach their conclusions about the authenticity of signatures has been described as a series of stages of comparison. These stages include evaluating the writing for internal consistency, range of variation, and the presence or absence of features suitable for comparison; determining the extent of similarities, dissimilarities, or absent characteristics during the comparison; evaluating the significance of these features individually and in combination; determining if the amount of evidence provided by the writing specimens is sufficient to form an opinion about the authenticity of the questioned writing; and, ultimately reporting an opinion based on the available evidence (or lack thereof).

FDEs seek those features and characteristics which may be characterized as a document's identifying attributes or characteristics. The quantity and quality of these features observed to be present or absent when comparing specimens from a known source (commonly referred to as a "standard") and disputed specimens form the basis of the FDE's opinion. McClary (2006) stated that FDEs are trained to evaluate such features as alignment, or the habit of placing all written words above or below the baseline; connections, or strokes connecting adjacent letters of adjoining words; pen lifts, or the presence or absence of other patterns of interruptions in a pen stroke; rhythm, or the regularity in the curvature of the writing; size of the writing; the slope or slant of the letters; and a variety of other characteristics which provide evidence of an individual's writing habits. The number and quality of these features allow FDEs to make assertions about the authorship of the specimen and the extent of their confidence in their decisions.

Attention is defined as the sustained focus of cognitive resources on information, while filtering or ignoring extraneous information (Anderson, 2010). Choosing where to focus vision determines where one focuses visual processing resources, and often precedes all other neural or cognitive functions. It is important to understand how and why attentional resources are deployed during signature comparison tasks, and how this deployment is related to the decision making process.

According to Anderson, what we attend to is determined by stimulus-driven (exogenous) factors, which are features of the stimulus that grab our attention, and goal-directed (endogenous) factors, which are features that we purposefully attend to or that guide our attention. Anderson stated that many current theories of attention propose that attention is based on "the interplay of a bottom-up, saliency-based attentional system and a top-down, feature specific selection mechanism" (p.248).

According to Becker, another kind of information which guides attention is relational information about the target, or information about how the irrelevant information of a non-target differs from the features of the target (2007). Relational models of visual search demonstrate that visual attention can be guided by attending to specific feature values such as color, size, or intensity, by inhibiting attention to irrelevant features, or by directing attention to how stimuli differ. Relational models place the target in relation to its context, offering more specific (e.g., directional) information about differences (Becker, 2007).

Research has demonstrated that in a variety of domains, expertise influences the deployment of attentional resources. In the domain of signature examination, experts might be distinguished from Lay people by the number and pattern of eye movements, the location and length of gaze fixations, and other evidence of the various dimensions of expertise development (e.g., proceduralization, tactical learning, strategic learning, problem perception, pattern learning and memory, long-term memory, and deliberate practice). The eye-tracking methodology used in this study provides evidence that expertise is clearly related to the deployment of visual resources in these signature examination tasks. .

Overall Analyses

A crosstab with Pearson's chi square statistic was performed to investigate whether there was a significant difference in call accuracy for FDE and Lay participants. This analysis demonstrated that FDEs were significantly more accurate overall in the single comparison than were Lay participants (χ^2 (1, N = 6,072) = 121.98, p < .001). Figure 3.2.QK.1 presents overall call accuracy by participant type.

Figure 3.2.QK.1

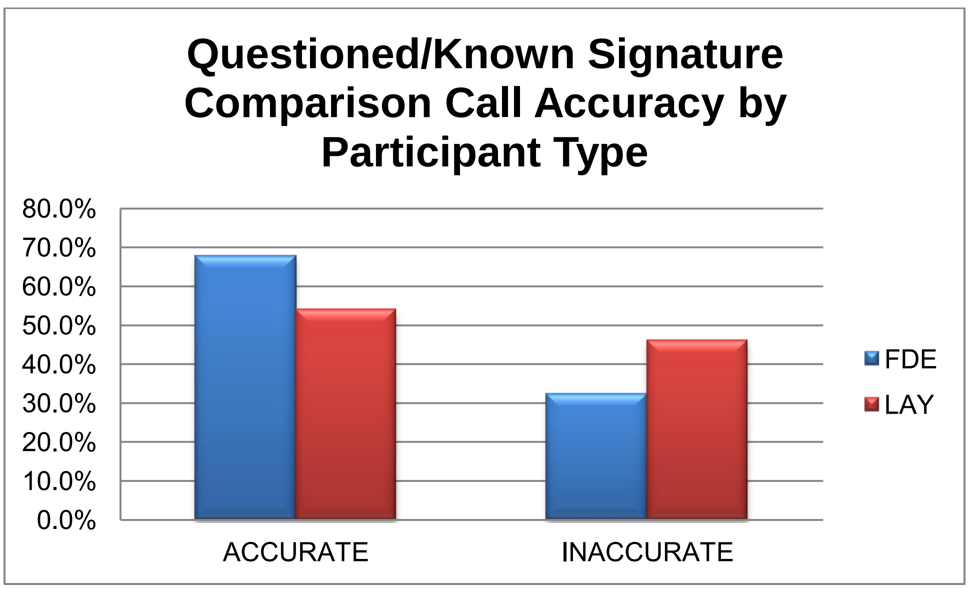


Table 3.2.QK.1 presents correct calls by individual signature and participant type. Pearson's chi square analyses revealed statistically significant differences by participant type for 29 of the 66 signature specimens. Lay participants were more accurate than FDEs in 9 of the 66 signatures. This difference was statistically significant in 4 of these 9 instances.

Table 3.2.QK.1
Correct Call by Signature and Participant Type

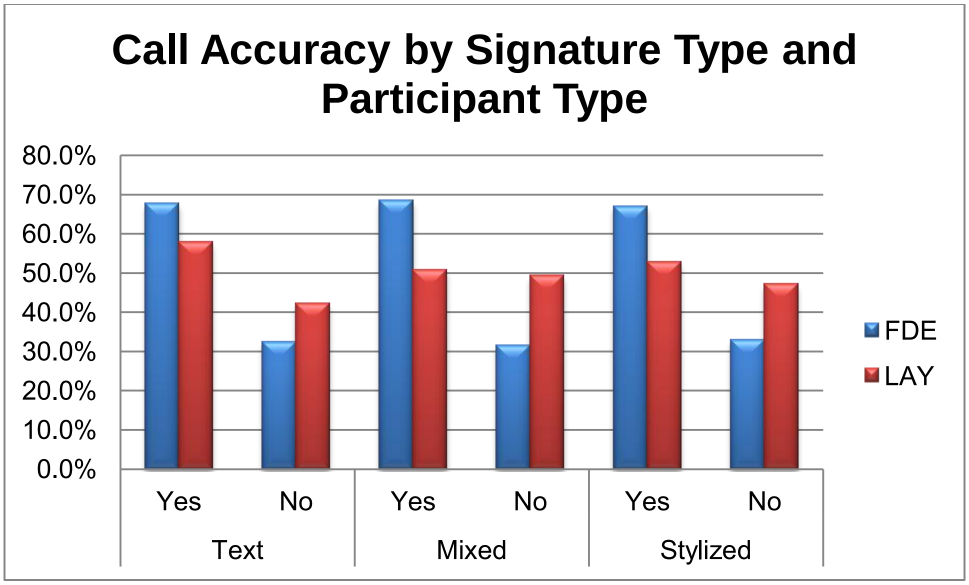
	FDE		Lay		
Signature	**N**	**Percent**	**N**	**Percent**	***p***
Mary Nagle 6	7	24.1%	22	75.9%	<.001*,**
Will Atkinson 1	44	64.7%	24	35.3%	<.001*
Jim LaBarbera 1	40	65.6%	21	34.4%	<.001*
Michelle Short 1	37	71.2%	15	28.8%	<.001*
Sean Richards 2	37	68.5%	17	31.5%	<.001*
Ricardo Vega 3	48	61.5%	30	38.5%	<.001*
John Wulf 3	46	63.9%	26	36.1%	<.001*
Jim LaBarbera 4	44	65.7%	23	34.3%	<.001*
Terry Lu 4	48	64.0%	27	36.0%	<.001*
Mary Nagle 4	44	67.7%	21	32.3%	<.001*
Sean Richards 4	45	73.8%	16	26.2%	<.001*
Ricardo Vega 4	38	70.4%	16	29.6%	<.001*
Brian Albury 5	44	80.0%	11	20.0%	<.001*
Bryan Bouysou 1	46	61.3%	29	38.7%	.001*
Sean Richards 5	39	65.0%	21	35.0%	.002*
Brian Albury 2	45	60.8%	29	39.2%	.003*
Mary Nagle 2	47	59.5%	32	40.5%	.003*
VilciseTima 1	40	63.5%	23	36.5%	.004*
Bryan Bouysou 2	34	66.7%	17	33.3%	.004*
Mary Nagle 1	28	70.0%	12	30.0%	.005*
Sean Richards 3	26	70.3%	11	29.7%	.007*
Bryan Bouysou 3	5	26.3%	14	73.7%	.008*, **
VilciseTima 6	6	28.6%	15	71.4%	.010*, **
Will Atkinson 3	39	61.9%	24	38.1%	.014*
Bryan Bouysou 6	36	63.2%	21	36.8%	.015*
Will Atkinson 6	30	65.2%	16	34.8%	.022*
Mary Nagle 3	41	60.3%	27	39.7%	.023*
John Wulf 2	4	26.7%	11	73.3%	.024*, **
Terry Lu 2	37	61.7%	23	38.3%	.027*
Ricardo Vega 6	42	59.2%	29	40.8%	.037*
John Wulf 4	44	57.9%	32	42.1%	.052
Jim LaBarbera 5	40	58.8%	28	41.2%	.072
VilciseTima 5	13	72.2%	5	27.8%	.072
Ricardo Vega 1	44	57.1%	33	42.9%	.091
Brian Albury 4	26	46.4%	30	53.6%	.101**
Terry Lu 6	31	60.8%	20	39.2%	.107
Will Atkinson 5	39	58.2%	28	41.8%	.119
Jim LaBarbera 6	35	59.3%	24	40.7%	.119
VilciseTima 3	38	58.5%	27	41.5%	.121
John Wulf 5	20	64.5%	11	35.5%	.123
Michelle Short 4	37	57.8%	27	42.2%	.186
Michelle Short 2	45	51.7%	42	48.3%	.218

Ricardo Vega 5	45	55.6%	36	44.4%	.231
Bryan Bouysou 4	32	58.2%	23	41.8%	.249
Brian Albury 3	19	61.3%	12	38.7%	.271
Will Atkinson 2	38	56.7%	29	43.3%	.277
Bryan Bouysou 5	38	56.7%	29	43.3%	.277
VilciseTima 4	39	56.5%	30	43.5%	.278
Will Atkinson 4	23	47.9%	25	52.1%	.283**
John Wulf 1	27	49.1%	28	34.0%	.328**
Terry Lu 1	31	57.4%	23	42.6%	.342
Mary Nagle 5	46	37.5%	38	45.2%	.350
Terry Lu 3	15	46.9%	17	53.1%	.370**
Sean Richards 6	45	54.9%	37	45.1%	.373
Sean Richards 1	35	56.5%	27	43.5%	.378
John Wulf 6	21	48.8%	22	51.2%	.426**
Michelle Short 6	42	54.5%	35	45.5%	.576
Ricardo Vega 2	18	50.0%	18	50.0%	.615
Michelle Short 3	31	55.4%	25	44.6%	.615
Jim LaBarbera 2	32	55.2%	26	44.8%	.631
Jim LaBarbera 3	17	56.7%	13	43.3%	.649
Terry Lu 5	31	51.7%	29	48.3%	.675
VilciseTima 2	12	50.0%	12	50.0%	.710
Michelle Short 5	35	52.2%	32	47.8%	.748
Brian Albury 6	18	54.5%	15	45.5%	.853
Brian Albury 1	22	53.7%	19	46.3%	.945

*Significant at p <.05; **Lay participants were more accurate than FDEs

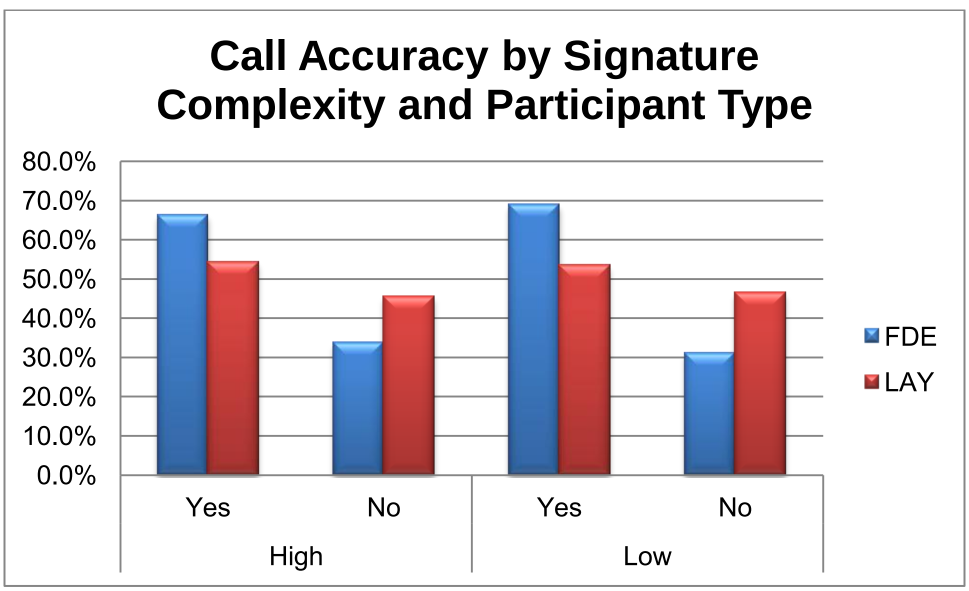
Accuracy by Signature Type. We investigated whether there were any significant differences in call accuracy according to signature type and participant type. Pearson's chi square analysis revealed significant differences for participant type, indicating that FDEs were more accurate than Lays for text-based, mixed, and stylized signatures, χ^2 (1, N = 2,208) = 22.44, $p < .001$, χ^2 (1, N = 2,208) = 71.68, $p < .001$, and χ^2 (1, N = 1,656) = 34.58, $p < .001$, respectively. These results are presented in Figure 3.2.QK.2.

Figure 3.2.QK.2



Accuracy by Signature Complexity. We also investigated whether there were significant differences in call accuracy according to signature complexity. Significant differences were again found, such that FDEs were more accurate than Lay participants for high-complexity and low-complexity signatures, χ^2 (1, N = 2,760) = 40.86, $p < .001$, and χ^2 (1, N = 3,312) = 83.25, $p < .001$, respectively. Figure 3.2.QK.3 presents these findings.

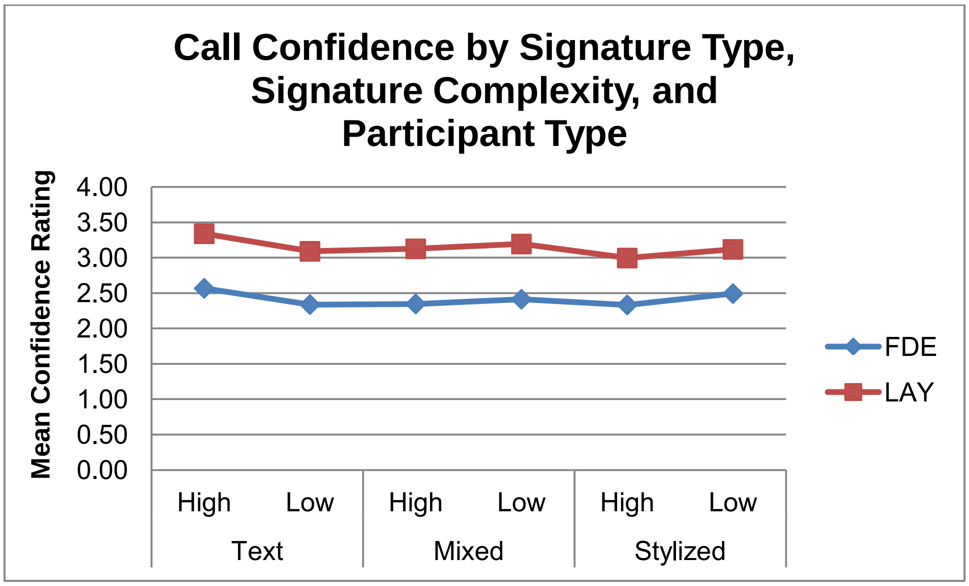
Figure 3.2.QK.3



<u>Questioned/Known Comparison Overall Confidence Analyses</u>

Call Confidence and Signature Type. Participant confidence in the process decision (genuine, disguised, or simulated) was measured on a scale from 1 (inconclusive) to 5 (identification/elimination). A 3 x 2 x 2 factorial ANOVA was conducted to investigate whether there was a significant difference between FDE and Lay participants in the level of confidence they expressed for their process decisions. The analysis revealed that the overall model was statistically significant, F (11, 6060) = 50.91, p < .001, partial η^2 = .085. Figure 3.2.QK.4 presents the call confidence level by signature type, signature complexity, and participant type.

Figure 3.2.QK.4



Significant main effects were found for Participant Type, F (1, 6060) = 483.58, p < .001, partial η^2 = .074, and Signature Type, F (2, 6060) = 3.04, p = .048, partial η^2 = .001; however, *post hoc* analysis using the *Bonferroni* correction revealed that the differences were not significant. No significant difference was found for Signature Complexity, p = .757, *ns*.

A significant two-way interaction was found for Signature Type x Signature Complexity, F (2, 6060) = 12.85, p < .001, partial η^2 = .004, indicating that confidence was higher for high complexity text-based signatures, and for low complexity mixed and stylized signatures. No significant difference was found for Participant Type x Signature Complexity, p = .783, *ns*, or for Participant Type x Signature Type, p = .233, *ns*.

The three-way interaction effect was not significant, p = .973, *ns*. Table 3.2.QK.2 presents the mean confidence call by signature type, signature complexity, and participant type.

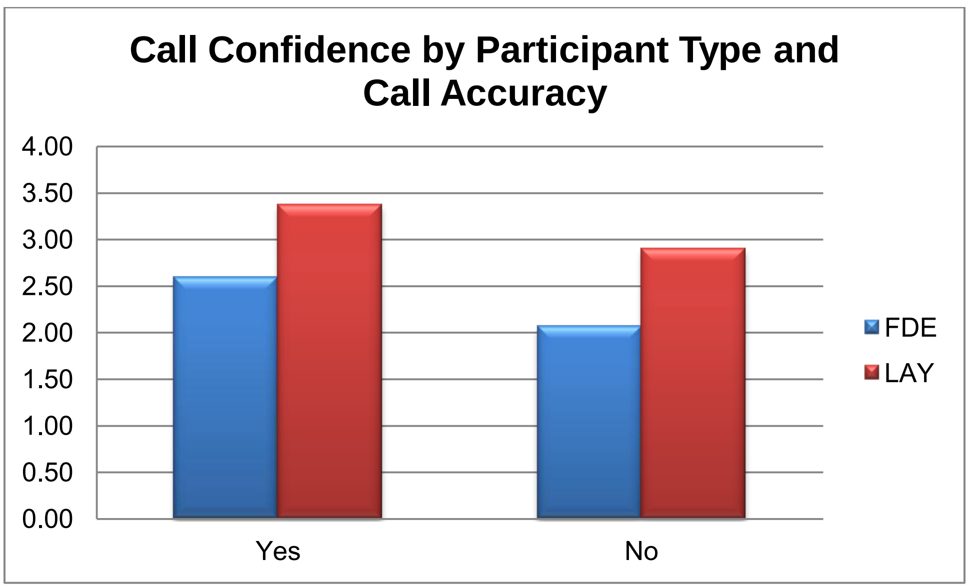
Table 3.2.QK.2
Mean Call Confidence by Signature Type, Signature Complexity, and Participant Type

	FDE			LAY		
	M	***SD***	**n**	***M***	***SD***	**n**

Text	**High**	2.57	1.364	588	3.34	1.292	516
	Low	2.34	1.174	588	3.09	1.234	516
Mixed	**High**	2.35	1.189	588	3.13	1.228	516
	Low	2.41	1.230	588	3.19	1.237	516
Stylized	**High**	2.33	1.205	294	3.00	1.243	258
	Low	2.49	1.267	588	3.12	1.251	516

Call Confidence and Call Accuracy. A 2 (Participant Type) x 2 (Call Accuracy) factorial ANOVA was conducted to investigate whether there was a significant difference in mean confidence level for accurate and inaccurate calls. The overall model was statistically significant, F (3, 6068) = 259.83, p < .001, partial η^2 = .114. Figure 3.2.QK.5 presents the call confidence level by call accuracy.

Figure 3.2.QK.5



Significant main effects were found for Participant Type, F (1, 6068) = 617.82, p < .001, partial η^2 = .092, and Call Accuracy, F (1, 6068) = 234.86, p < .001, partial η^2 = .037, indicating that on average, Lay participants were more confident in their decisions than were FDEs, whether their decisions were correct or incorrect.

No two-way interaction effect was found for Participant Type x Call Accuracy, p = .356, *ns*. Figure 3.2.QK.5 presents the call confidence level by participant type and call accuracy. Table 3.2.QK.3 presents the mean call confidence level by participant type and call accuracy.

Table 3.2.QK.3
Mean Call Confidence by Participant Type and Call Accuracy

	FDE	**LAY**

	M	*SD*	n	*M*	*SD*	n
Yes	2.59	1.273	2191	3.37	1.250	1530
No	2.06	1.103	1043	2.90	1.205	1308

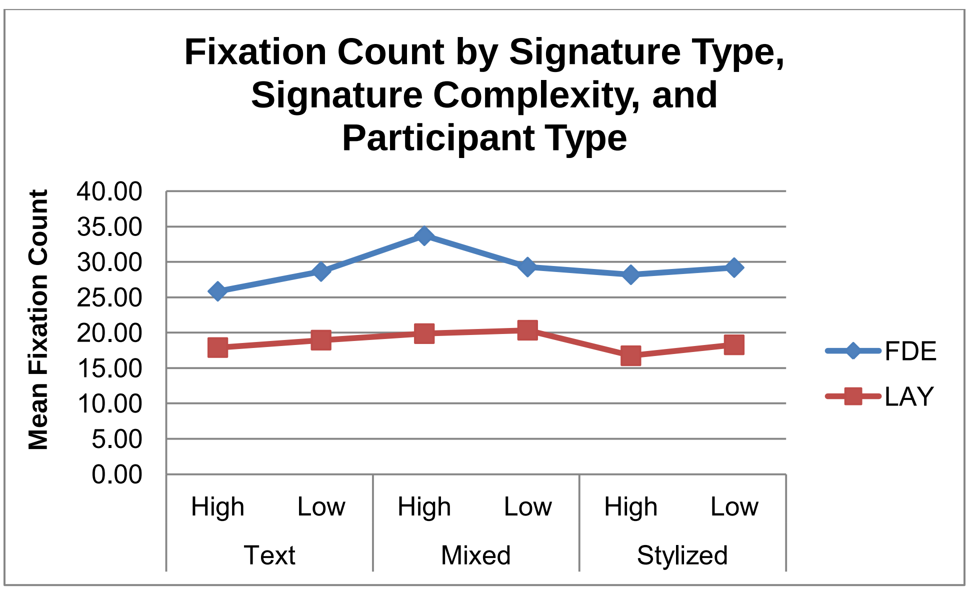
Questioned/Known Comparison Overall Eye-Tracking Analyses

We conducted a series of 3 (Signature Type) x 2 (Signature Complexity) x 2 (Participant Type) factorial ANOVAs to investigate the effect of these factors on each of the four eye-tracking metrics (fixation count, fixation duration, visit count, and visit duration) for the known signatures and for the questioned/known comparisons. The AOIs used for the dependent variable (DV) in the known signature analyses encompassed all four known signatures on each of the 66 known signature stimuli. The AOIs used for the DV in the questioned/known comparison analyses encompassed the entire questioned/known stimulus (the questioned signature and the four known signatures).

Known Signature Analyses

Known Signature Fixation Count. Fixation count is defined as the number of times the participant's gaze fixates within the AOI. A 3 x 2 x 2 factorial ANOVA revealed that the overall model was statistically significant, F (11, 5913) = 24.42, p < .001, partial η^2 = .043. Figure 3.2.QK.6 presents the mean fixation count by signature type, signature complexity, and participant type.

Figure 3.2.QK.6



Significant main effects were found for Participant Type, indicating that mean fixation count among FDEs was greater than that for Lay participants, F (1, 5913) = 224.90, p < .001, partial η^2 = .037, and Signature Type, F (2, 5913) = 8.20, p < .001, partial η^2 = .037. No significant effect was found for Signature Complexity, p = .558, *ns*.

A two-way interaction effect was found for Signature Type x Signature Complexity, F (2, 5913) = 3.36, p = .035, partial η^2 = .001. No interaction effects were found for Participant Type x Complexity, p = .378, *ns*, or for Participant Type x Signature Type, p = .214, *ns*. The three-way interaction effect was not significant, p = .104, *ns*. Table 3.2.QK.4 presents the means and standard deviations by signature type, signature complexity, and participant type.

Table 3.2.QK.4
Mean Fixation Count by Signature Type, Signature Complexity, and Participant Type

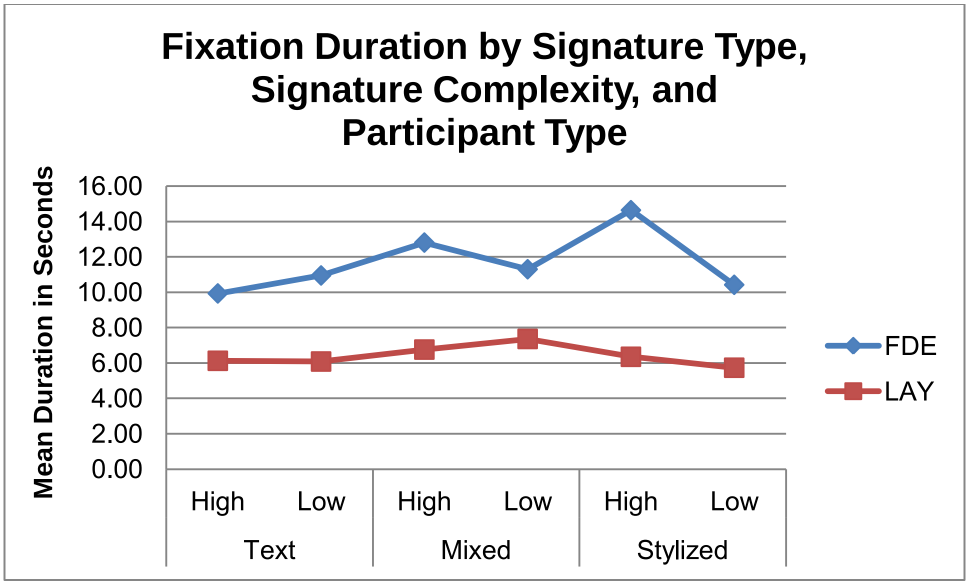
		FDE			**LAY**		
		M	***SD***	**n**	***M***	***SD***	**n**
Text	**High**	25.85	27.82	561	17.91	15.15	516
	Low	28.65	28.14	561	18.95	14.06	516
Mixed	**High**	33.71	39.13	563	19.87	16.22	516
	Low	29.28	33.83	558	20.35	18.39	516
Stylized	**High**	28.19	32.46	282	16.75	17.12	258
	Low	29.20	31.88	562	18.29	16.11	516

Post hoc analysis using the *Bonferroni* correction revealed that among both FDE and Lay participants mean fixation count for text-based signatures was significantly lower than that for mixed signatures (p = .001). The mean fixation count for stylized signatures was significantly lower than that for mixed signatures (p = .007). No significant differences were found between text-based and stylized signatures (p = 1.00). These findings indicate that the mean fixation count among FDEs was greater than that for Lay participants. Among both FDE and Lay participants the mean fixation count for text-based signatures was significantly lower than that for mixed signatures for both high complexity and low complexity signatures.

Known Signature Fixation Duration. Fixation duration is defined as the sum of the duration for all fixations within the AOI. A 3 x 2 x 2 factorial ANOVA revealed that the overall model was statistically significant, F (11, 5901) = 29.11, p < .001, partial η^2 = .051.

Figure 3.2.QK.7 presents the mean fixation duration by signature type, signature complexity, and participant type.

Figure 3.2.QK.7



Significant main effects were found for Participant Type, *F* (1, 5901) = 281.42, $p < .001$, partial $\eta^2 = .046$, Signature Complexity, *F* (1, 5901) = 6.39, $p = .012$, partial $\eta^2 = .001$, and Signature Type, *F* (2, 5901) = 7.03, $p = .001$, partial $\eta^2 = .002$. This indicates that that gaze fixation duration among FDEs was significantly greater than that among Lay participants.

Significant two-way interaction effects were found for Participant Type x Signature Type, *F* (2, 5901) = 3.69, $p = .025$, partial $\eta^2 = .002$, for Participant Type x Signature Complexity, *F* (1, 5901) = 6.09, $p = .014$, partial $\eta^2 = .001$, and for Signature Type x Signature Complexity, *F* (2, 5901) = 6.71, $p = .001$, partial $\eta^2 = .002$.

The three-way interaction was also significant, *F* (2, 5901) = 4.79, $p = .008$, partial $\eta^2 = .002$. Table 3.2.QK.5 presents the means and standard deviations by signature type, signature complexity, and participant type.

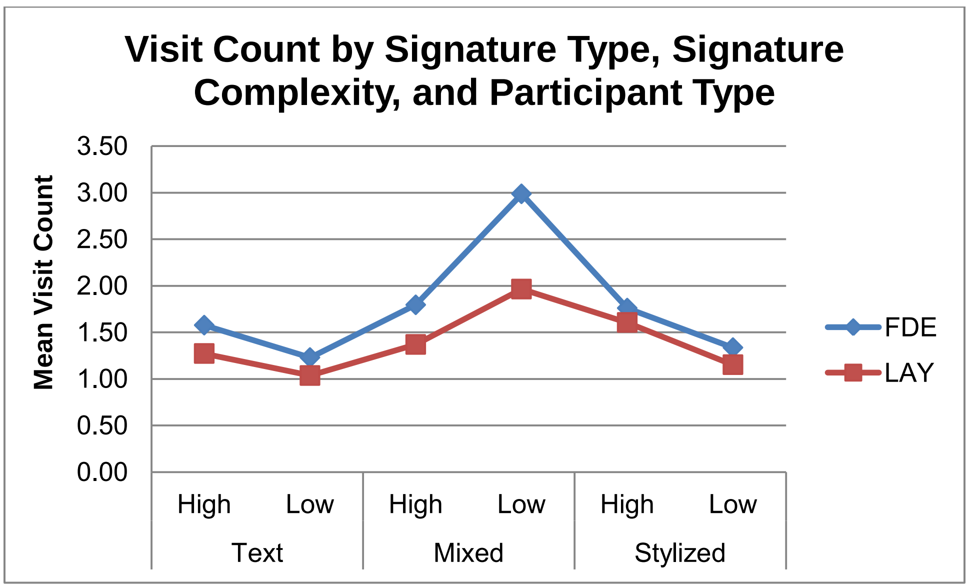
Table 3.2.QK.5
Mean Fixation Duration by Signature Type, Signature Complexity, and Participant Type

		FDE			LAY		
		M	*SD*	n	*M*	*SD*	n
Text	**High**	9.93	12.42	558	6.12	6.34	516
	Low	10.95	12.24	558	6.08	5.64	516
Mixed	**High**	12.81	15.98	560	6.76	6.41	516
	Low	11.30	15.31	561	7.36	8.84	516
Stylized	**High**	14.64	21.88	279	6.35	6.49	258
	Low	10.42	13.66	559	5.73	5.31	516

Post hoc analysis using the *Bonferroni* correction revealed that the mean fixation duration for text-based signatures was significantly lower than that for mixed signatures ($p = .001$), and for stylized signatures (p = .033). No significant difference was found between mixed and stylized signatures (p = 1.00). This indicates that that gaze fixation duration among FDEs was significantly greater than that among Lay participants. The mean fixation duration for text-based signatures was significantly lower than that for mixed signatures and for stylized signatures among both FDEs and Lay participants, and fixation duration was significantly greater among FDEs than among Lay participants for high-complexity mixed and high complexity stylized signatures.

Known Signature Visit Count. Visit count is defined as the time in seconds of the interval between the first fixation on an AOI and the last fixation within the AOI, where there have been no fixations outside the AOI boundary. A 3 x 2 x 2 factorial ANOVA revealed that the overall model was statistically significant, F (11, 5913) = 24.54, p < .001, partial η^2 = .044. Figure 3.2.QK.8 presents the mean fixation count by signature type, signature complexity, and participant type.

Figure 3.2.QK.8



Significant main effects were found for Participant Type, F (1, 5913) = 33.05, p < .001, partial η^2 = .006, and Signature Type, F (2, 5913) = 53.11, p < .001, partial η^2 = .004. No significant difference was found for Signature Complexity, p = .414, *ns*.

A significant two-way interaction effect was found for Participant Type x Signature Type, F (2, 5913) = 7.25, p = .001, partial η^2 = .002, and Signature Type x Complexity, F (2, 5913) = 43.27, p < .001, partial η^2 = .014. No significant two-way interactions were found for Participant Type x Complexity, p = .195, *ns*.

The three-way interaction effect was significant, F (2, 5913) = 3.03, p = .048, partial η^2 = .001. Table 3.2.QK.6 presents the means and standard deviations by signature type, signature complexity, and participant type.

Table 3.2.QK.6
Mean Visit Count by Signature Type, Signature Complexity, and Participant Type

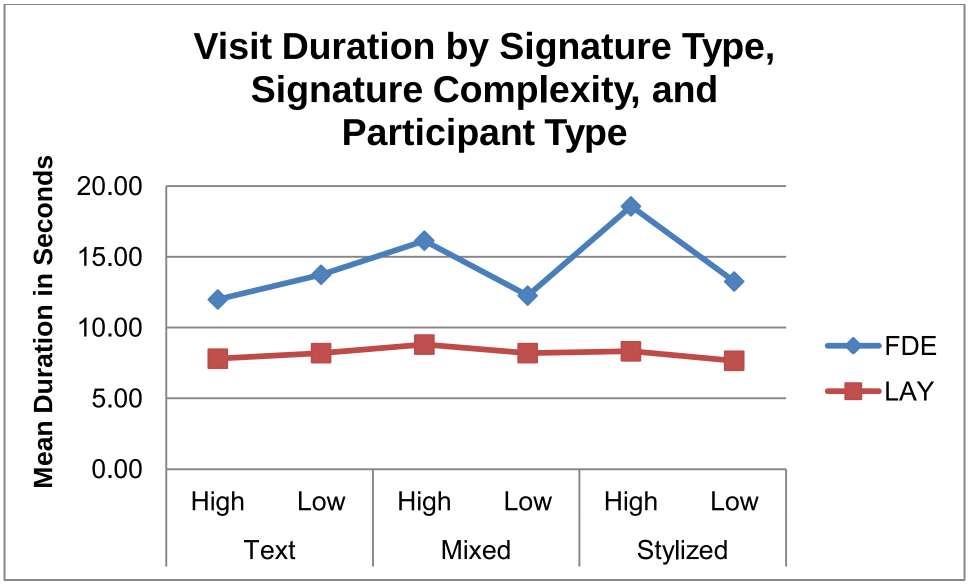
		FDE			LAY		
		M	*SD*	n	*M*	*SD*	n
Text	**High**	1.58	1.51	561	1.27	0.84	516
	Low	1.23	0.84	561	1.03	0.45	516
Mixed	**High**	1.79	2.17	563	1.37	1.12	516
	Low	2.99	5.76	558	1.96	4.40	516
Stylized	**High**	1.76	1.76	282	1.60	1.10	258
	Low	1.33	1.01	562	1.15	0.70	516

Post hoc analysis using the *Bonferroni* correction revealed that the mean visit count for text-based signatures was significantly lower than that for mixed signatures ($p < .001$). No significant differences were found between text-based and stylized signatures ($p = .083$). Visit count for stylized signatures was significantly lower than that for mixed signatures ($p < .001$).

These findings indicate that the mean visit count among FDEs was greater than that for Lay participants. Among both FDE and Lay participants, mean visit count for text-based signatures was significantly lower than that for mixed signatures, but no differences were found for signature complexity. Visit count among FDEs was greater than that among Lay participants for mixed signatures than for text-based or stylized signatures.

Known Signature Visit Duration. Visit duration is defined as the sum in seconds of all visits within an AOI. A 3 x 2 x 2 factorial ANOVA revealed that the overall model was statistically significant, F (11, 5913) = 31.54, $p < .001$, partial $\eta^2 = .055$. Figure 3.2.QK.9 presents the mean visit duration by signature type, signature complexity, and participant type.

Figure 3.2.QK.9



Significant main effects were found for Participant Type, F (1, 5913) = 289.85, p < .001, partial η^2 = .047, Signature Type, F (2, 5913) = 5.86, p = .003, partial η^2 = .002, and for Signature Complexity, F (1, 5913) = 14.69, p < .001, partial η^2 = .002.

Significant two-way interactions were found for Participant Type x Signature Type, F (2, 5913) = 5.71, p = .003, partial η^2 = .002, for Participant Type x Signature Complexity F (1, 5913) = 9.14, p = .003, partial η^2 = .002, and for Signature Type x Signature Complexity, F (2, 5913) = 12.43, p < .001, partial η^2 = .004.

A significant three-way interaction was found, F (2, 5913) = 6.50, p = .002, partial η^2 = .002. Table 3.2.QK.7 presents the means and standard deviations by signature type, signature complexity, and participant type.

Table 3.2.QK.7
Mean Visit Duration by Signature Type, Signature Complexity, and Participant Type

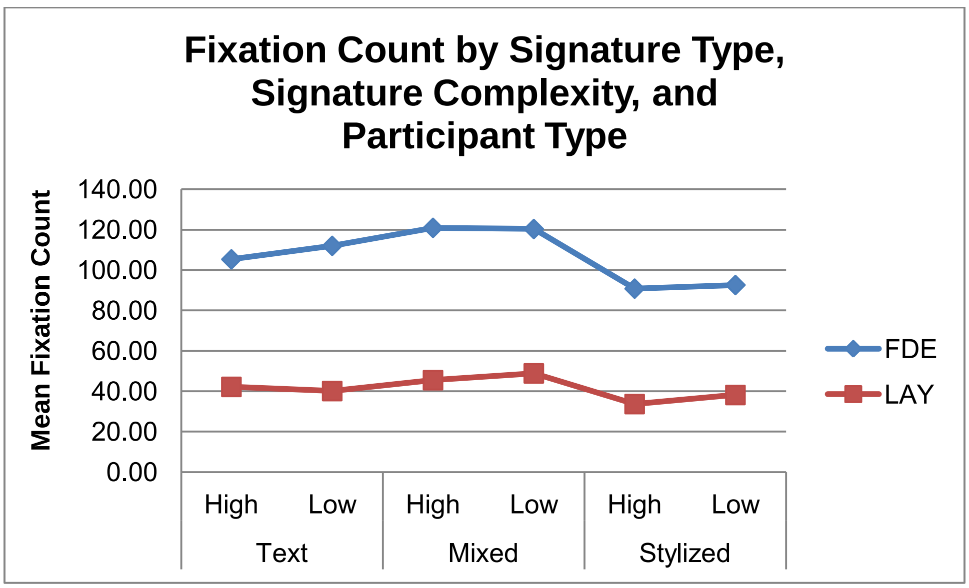
		FDE			LAY		
		M	*SD*	n	*M*	*SD*	n
Text	**High**	11.99	14.01	561	7.80	7.63	516
	Low	13.74	14.92	561	8.20	6.77	516
Mixed	**High**	16.15	19.22	563	8.80	7.78	516
	Low	12.26	14.75	558	8.20	7.71	516
Stylized	**High**	18.57	26.36	282	8.33	8.51	258
	Low	13.26	16.59	562	7.66	6.90	516

Post hoc analysis using the *Bonferroni* correction revealed that the mean visit duration for text-based signatures was significantly lower than that for stylized signatures (p < .003). No significant differences were found between text-based and mixed signatures (p = .075), or stylized and mixed signatures (p = .569). Visit duration was significantly greater among FDEs than among Lay participants. These findings indicate that among both FDE and Lay participants the mean visit duration for text-based signatures was significantly lower than that for stylized signatures. Visit duration was significantly greater among FDEs than among Lay participants for high complexity mixed and high complexity stylized signatures.

Questioned/Known Comparison Analyses

Questioned/Known Comparison Fixation Count. Fixation count is defined as the number of times the participant's gaze fixates within the AOI. A 3 x 2 x 2 factorial ANOVA revealed that the overall model was statistically significant, F (11, 5893) = 119.08, p < .001, partial η^2 = .182. Figure 3.2.QK.10 presents the mean fixation count by signature type, signature complexity, and participant type.

Figure 3.2.QK.10



Significant main effects were found for Participant Type, F (1, 5893) = 1116.98, p < .001, partial η^2 = .159, and Signature Type, F (2, 5893) = 32.74, p < .001, partial η^2 = .011. No significant main effect was found for Signature Complexity, p = .245, *ns.*

Two-way interaction effects were found for Participant Type x Signature Type, F (2, 5893) = 6.34, p = .002, partial η^2 = .002. No significant interaction effects were found for Signature Type x Complexity, p = .859, *ns*, or for Participant Type x Complexity, p = .939, *ns.*

The three-way interaction was not significant, p = .311, *ns.* Table 3.2.QK.8 presents the means and standard deviations by signature type, signature complexity, and participant type.

Table 3.2.QK.8
Mean Fixation Count by Signature Type, Signature Complexity, and Participant Type

		FDE			LAY		
		M	***SD***	**n**	***M***	***SD***	**n**
Text	**High**	105.33	92.31	557	42.17	46.75	513
	Low	111.99	89.93	559	40.13	39.01	516
Mixed	**High**	120.91	100.94	559	45.51	41.98	515
	Low	120.34	108.92	558	48.86	48.44	516
Stylized	**High**	90.81	68.40	279	33.68	36.30	258
	Low	92.61	78.03	559	38.17	36.17	516

These findings indicate that the mean fixation count among FDEs was greater than that for Lay participants. *Post hoc* analysis using the *Bonferroni* correction revealed that the mean fixation count for mixed signatures and text-based signatures was significantly higher than that for stylized signatures ($p < .001$). The mean fixation count for text-based signatures was significantly greater than that for stylized signatures ($p < .001$). Among both FDEs the mean fixation count for stylized signatures was significantly lower than that for mixed signatures for both high complexity and low complexity signatures

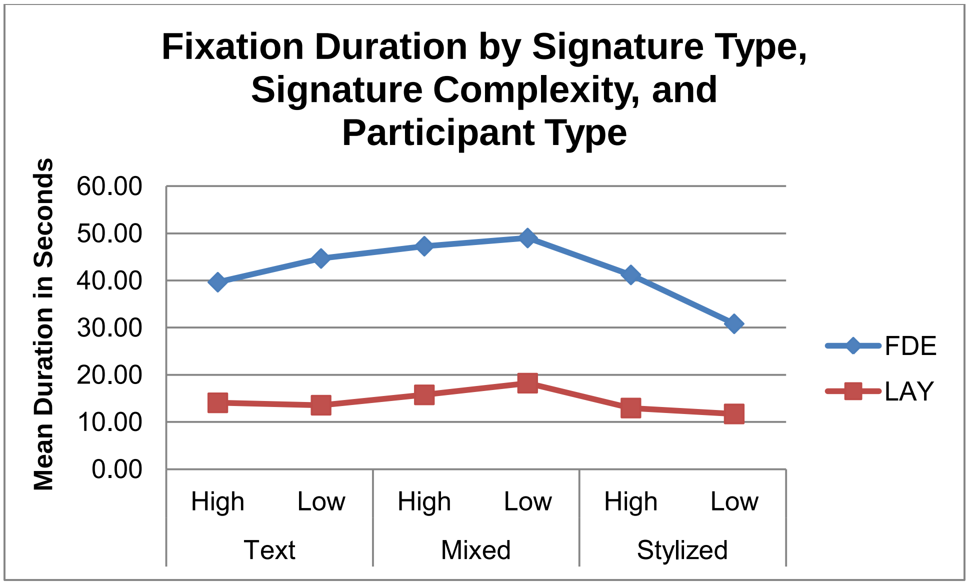
Questioned/Known Comparison Fixation Duration. Fixation duration is defined as the sum of the durations for all fixations within the AOI. A 3 x 2 x 2 factorial ANOVA revealed that the overall model was statistically significant, F (11, 5895) = 102.78, $p < .001$, partial $\eta^2 = .161$.

Significant main effects were found for Participant Type, F (1, 5895) = 948.90, $p < .001$, partial $\eta^2 = .139$, and Signature Type, F (2, 5895) = 28.00, $p < .001$, partial $\eta^2 = .009$. No main effect was found for Signature Complexity, $p = .594$, *ns*.

Significant two-way interaction effects were found for Participant Type x Signature Type, F (2, 5895) = 5.38, $p = .005$, partial $\eta^2 = .002$, and for Signature Type x Signature Complexity, F (2, 5895) = 7.68, $p < .001$, partial $\eta^2 = .003$. No interaction effect was found for Participant Type x Signature Complexity, $p = .423$, *ns.*

The three-way interaction was also significant, F (2, 5895) = 5.16, $p = .006$, partial $\eta^2 = .002$. Figure 3.2.QK.11 presents the mean fixation duration by signature type, signature complexity, and participant type.

Figure 3.2.QK.11



Post hoc analysis using the *Bonferroni* correction revealed that the mean fixation duration for stylized signatures was significantly greater than that for mixed and text-based signatures ($p < .001$). The mean fixation duration for stylized signatures was significantly greater than that for text-based signatures ($p < .001$). This indicates that that gaze fixation duration among FDEs was significantly greater than that among Lay participants, particularly for text-based and mixed signatures. The mean fixation duration for text-based signatures was significantly lower than that for mixed signatures and for stylized signatures among both FDEs and Lay participants. Table 3.2.QK.9 presents the means and standard deviations by signature type, signature complexity, and participant type.

Table 3.2.QK.9
Mean Fixation Duration by Signature Type, Signature Complexity, and Participant Type

		FDE			LAY		
		M	*SD*	n	*M*	*SD*	n
Text	**High**	39.63	37.49	558	14.06	15.40	513
	Low	44.66	39.45	558	13.55	12.92	516
Mixed	**High**	47.25	42.44	560	15.75	15.00	516
	Low	49.00	65.70	558	18.22	24.99	516
Stylized	**High**	41.18	33.73	279	12.95	13.36	258
	Low	30.81	28.16	559	11.70	11.66	516

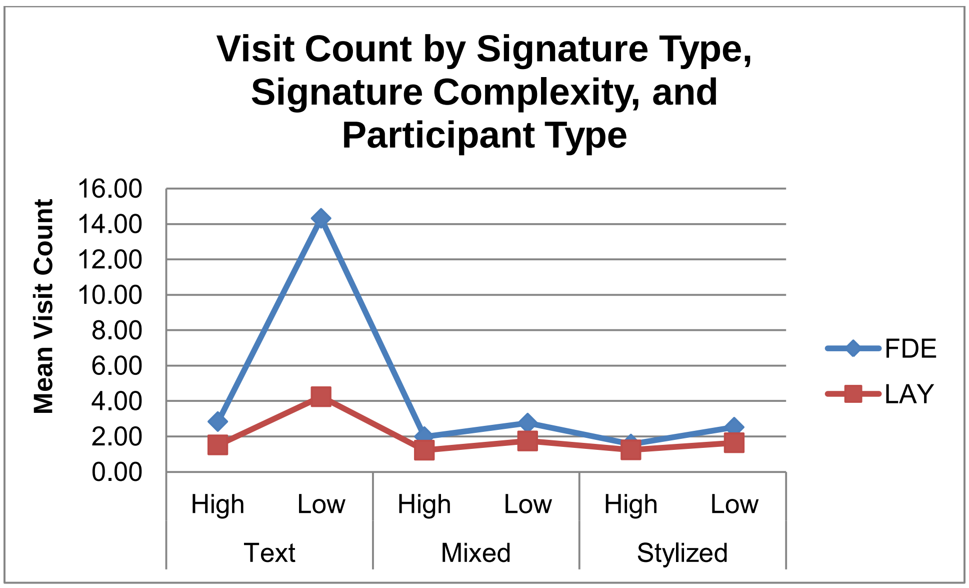
Questioned/Known Comparison Visit Count. Visit count is defined as the time in seconds of the interval between the first fixation on an AOI and the last fixation within the AOI, where there have been no fixations outside the AOI boundary. A 3 x 2 x 2 factorial ANOVA revealed that the overall model was statistically significant, F (11, 5892) = 24.44, $p < .001$, partial $\eta^2 = .044$.

Significant main effects were found for Participant Type, F (1, 5892) = 27.18, p < .001, partial η^2 = .005, Signature Type, F (2, 5892) = 34.64, p < .001, partial η^2 = .012, and Signature Complexity, F (1, 5892) = 37.28, p < .001, partial η^2 = .006.

Significant two-way interaction effects were found for Participant Type x Signature Type, F (2, 5892) = 13.98, p < .001, partial η^2 = .005, for Participant Type x Complexity, F (1, 5892) = 11.99, p = .001, partial η^2 = .002, and for Signature Type x Complexity, F (2, 5892) = 23.91, p < .001, partial η^2 = .008.

The three-way interaction effect was also significant, F (2, 5892) = 10.15, p < .001, partial η^2 = .003. Figure 3.2.QK.12 presents the mean fixation count by signature type, signature complexity, and participant type.

Figure 3.2.QK.12



Post hoc analysis using the *Bonferroni* correction revealed that the mean visit count for text-based signatures was significantly greater than that for mixed or stylized signatures (p < .001). No significant differences were found between mixed signatures and stylized signatures (p = 1.00). These findings indicate that the mean visit count among FDEs was greater than that for Lay participants. Among both FDE and Lay participants, mean visit count for text-based signatures was significantly greater than that for mixed and stylized signatures, particularly among FDEs viewing the low complexity text-based signatures. Table 3.2.QK.10 presents the means and standard deviations by signature type, signature complexity, and participant type.

Table 3.2.QK.10
Mean Visit Count by Signature Type, Signature Complexity, and Participant Type

	FDE	LAY

		M	*SD*	n	*M*	*SD*	n
Text	**High**	2.84	5.24	558	1.52	2.33	513
	Low	14.32	52.73	558	4.24	12.24	516
Mixed	**High**	1.99	6.06	558	1.22	1.10	515
	Low	2.75	6.66	558	1.74	3.26	516
Stylized	**High**	1.57	1.41	279	1.24	0.66	258
	Low	2.52	5.09	559	1.64	2.92	516

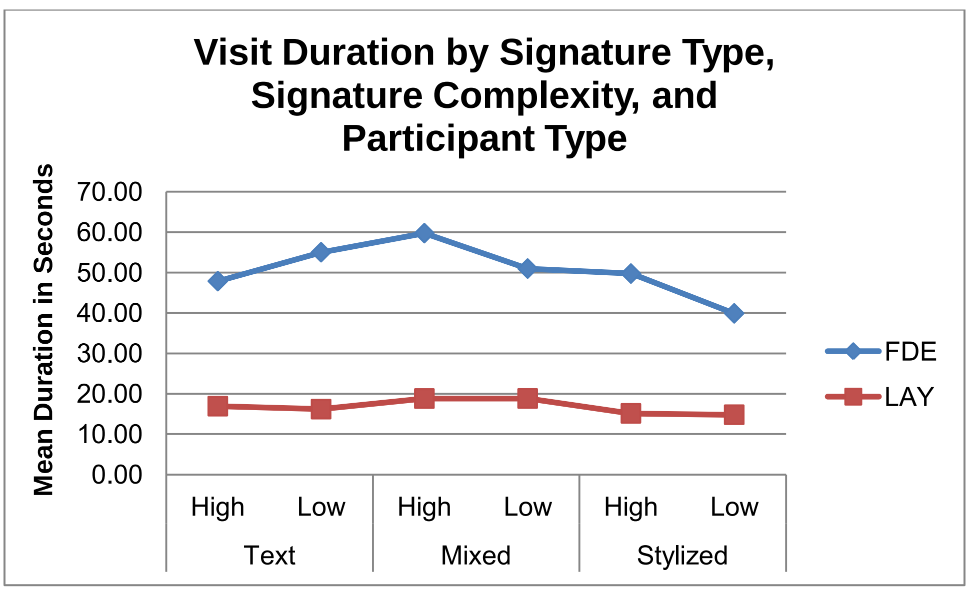
Questioned/Known Comparison Visit Duration. Visit duration is defined as the sum in seconds of all visits within an AOI. A 3 x 2 x 2 factorial ANOVA revealed that the overall model was statistically significant, F (11, 5893) = 144.21, p < .001, partial η^2 = .212.

Significant main effects were found for Participant Type, F (1, 5893) = 1380.05, p < .001, partial η^2 = .190, Signature Type, F (2, 5893) = 19.57, p < .001, partial η^2 = .007, and Signature Complexity, F (1, 5893) = 5.26, p = .022, partial η^2 = .001.

A significant two-way interaction was found for Participant Type x Signature Type, F (2, 5893) = 4.39, p = .012, partial η^2 = .001, and for Signature Type x Signature Complexity F (2, 5893) = 9.18, p < .001, partial η^2 = .003. No interaction effect was found for Participant Type x Signature Complexity, p = .056, *ns*.

A significant three-way interaction was found, F (2, 5893) = 10.60, p < .001, partial η^2 = .004. Figure 3.2.QK.13 presents the mean fixation duration by signature type, signature complexity, and participant type.

Figure 3.2.QK.13



Mean visit duration was greater among FDEs than among Lay participants across signature type and signature complexity. *Post hoc* analysis using the *Bonferroni* correction revealed that the mean visit duration for mixed signatures was significantly greater than that for text-based or stylized signatures (p = .003, and p < 001, respectively). The mean visit duration for text-based signatures was significantly greater than that for stylized signatures ($p < .001$). For FDEs, this effect was greater among mixed signatures and less among text-based and stylized signatures. Table 3.2.QK.11 presents the means and standard deviations by signature type, signature complexity, and participant type.

Table 3.2.QK.11
Mean Visit Duration by Signature Type, Signature Complexity, and Participant Type

		FDE			LAY		
		M	***SD***	**n**	***M***	***SD***	**n**
Text	**High**	47.85	43.37	558	16.90	18.76	513
	Low	55.01	46.98	558	16.17	15.03	516
Mixed	**High**	59.74	49.30	559	18.79	17.52	515
	Low	50.97	47.08	558	18.81	18.00	516
Stylized	**High**	49.72	38.20	279	15.12	15.62	258
	Low	39.87	34.22	559	14.78	13.91	516

Conclusions

FDEs were significantly more accurate overall in the questioned/known comparisons than were Lay participants, although Lay participants outperformed FDEs in nine of the 66 signature comparisons. Although Lay participants did outperform FDEs in these instances, in nearly all cases there was very low overall accuracy among both FDEs and Lay participants, and the difference between FDEs and Lay participants was quite small. In only four of the nine cases the difference was statistically significant. FDEs were more accurate overall than were Lay participants across all signature types and both levels of complexity.

Although FDEs were more accurate than were Lay participants, they were also more likely than were Lay participants to make qualified authorship opinion calls. Overall, Lay participants were significantly more confident than were FDEs in their process decisions. On average, Lay participant authorship confidence calls fell within the “probable” range for their accurate calls, and approached the “probable” level for their inaccurate calls. FDEs were less confident, placing their authorship confidence on average at the “indications” level for accurate calls, and just above the “inconclusive” level for the inaccurate calls. This indicates that FDEs and Lay participants tended to weight the available evidence differently.

As previously discussed, in the domain of signature examination, FDE experts might be distinguished from Lay people by the number and pattern of eye movements, the location and length of gaze fixations, and other evidence of the various dimensions of expertise development (e.g., proceduralization, tactical learning, strategic learning, problem perception, pattern learning and memory, long-term memory, and deliberate practice). The eye-tracking data for the overall analyses, as well as for the individual signature by signature analyses reported in the following sections, clearly demonstrate expertise-based differences between the FDE and Lay participant groups on the signature comparison tasks.

Recall that Droll and Hayhoe (2007) found differences in eye movement among participants who knew in advance that the information they were about to see was relevant to the next sorting task they would be performing. Droll and Hayhoe suggested that the changes in visual behavior were related to changes from participants' use working memory (in cognitive terms, information to which one is able to attend for a limited amount of time, and which is not permanently stored in long-term memory without some form of elaboration or rehearsal) to participants' reliance on gaze. They concluded that this trade-off is largely determined by the demands of the task, and that the participants' sensitivity to changes in the visual stimuli (sometimes referred to as "change blindness") is an important determinant of where the brain looks, what it attends to, and what it subsequently remembers (Droll & Hayhoe, 2007).

Known signature analyses demonstrated that the mean fixation count among FDEs was greater than that for Lay participants on the known signature stimuli. This indicates that FDEs attended to a greater amount of information contained within the known signature specimens than did Lay participants, and is consistent with Droll and Heyhoe's findings. Among both FDE and Lay participants the mean fixation count for text-based signatures was significantly lower than that for mixed signatures for both high complexity and low complexity signatures, although the greater number of fixations for FDEs suggests an expertise effect.

Fixation duration for the known signature stimuli was also significantly greater among FDEs than among Lay participants. The mean fixation duration for text-based signatures was significantly lower than that for mixed signatures and for stylized signatures among both FDEs and Lay participants, and fixation duration was significantly greater among FDEs than among Lay participants for high-complexity mixed and high complexity stylized signatures. This is also consistent with Droll and Hayhoe's findings.

Mean visit count for the known signature stimuli was also was greater on average among FDEs than that among Lay participants. Among both FDE and Lay participants, mean visit count for text-based signatures was significantly lower than that for mixed signatures, but no differences were found for signature complexity. Visit count among FDEs was greater than that among Lay participants for mixed signatures than for text-based or stylized signatures.

Visit duration for the known signature stimuli was also significantly greater among FDEs than among Lay participants. Among both FDE and Lay participants the mean visit duration for text-based signatures was significantly lower than that for stylized signatures. Visit duration was significantly greater among FDEs than among Lay participants for high complexity mixed and high complexity stylized signatures.

These findings indicate that FDEs spent a greater amount of time systematically investigating the range of variation among the known signatures and identifying features that might carry evidential weight prior to beginning the questioned/known comparison, and provide support for Droll and Hayhoe's argument that sensitivity to changes in the visual stimuli (sometimes referred to as "change blindness") is an important determinant of where the brain looks, what it attends to, and what it subsequently remembers (Droll & Hayhoe, 2007).

Eye-tracking analyses for the actual questioned/known signature comparisons revealed that FDEs approached the comparison aspect of the tasks differently from the Lay participants. The mean fixation count among FDEs was again greater than fixation count and fixation duration for Lay participants. The mean fixation count for mixed signatures and text-based signatures was significantly higher than that for stylized signatures, and among both FDEs and Lay participants the mean fixation count for stylized signatures was significantly lower than that for mixed signatures for both high complexity and low complexity signatures.

Fixation duration among FDEs was also significantly greater than that among Lay participants, particularly for text-based and mixed signatures. The mean fixation duration for text-based signatures was significantly lower than that for mixed signatures and for stylized signatures among both FDEs and Lay participants.

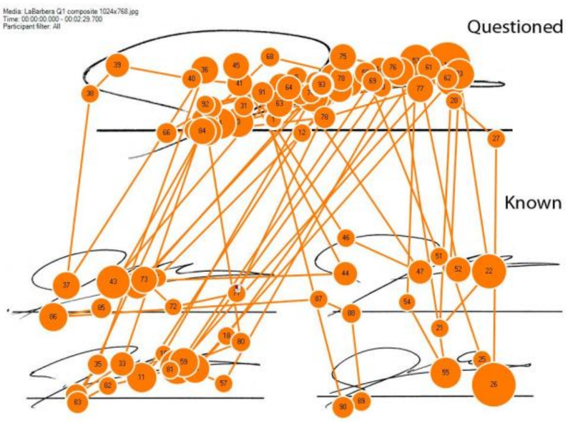
Visit count among FDEs was greater than that for Lay participants. Among both FDE and Lay participants, mean visit count for text-based signatures was significantly greater than that for mixed and stylized signatures, particularly among FDEs viewing the low complexity text-based signatures.

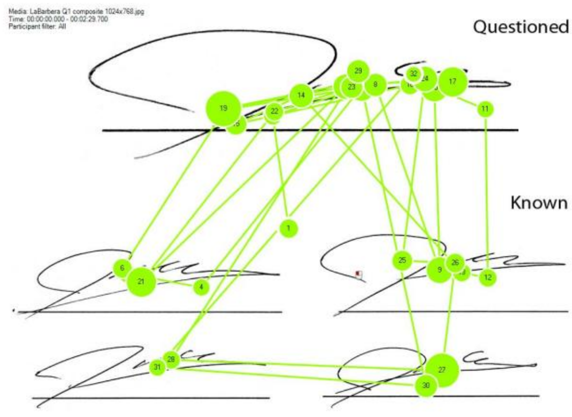
Mean visit duration was greater among FDEs than among Lay participants across signature type and signature complexity. For FDEs, this effect was greater among mixed signatures and less among text-based and stylized signatures.

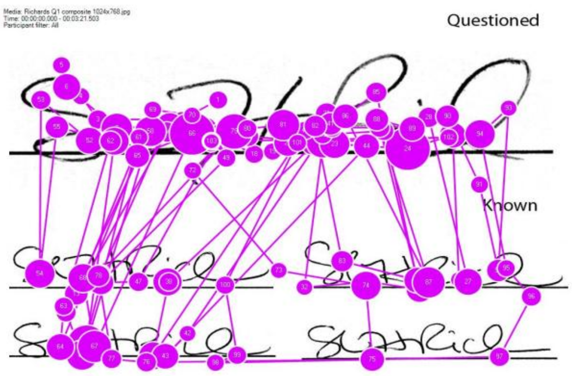
Similar to the results of the known signature analyses, the results of the questioned/known comparison eye-tracking analyses demonstrate expertise effects in the deployment of attentional and cognitive resources, and the differences in accuracy between FDEs and Lay participants indicate that the two groups weight the available information differently. Additional information about the systematic analyses employed by FDEs can be empirically observed by examining the heat maps and gaze plots of individual FDE and Lay participants.

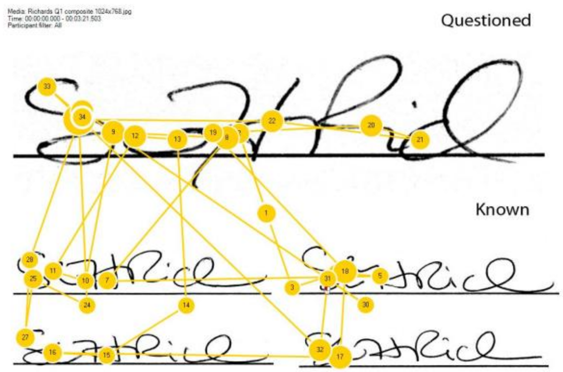
Recall that Busey and colleagues (2013) found that fingerprint experts and lay participants were both able to correctly identify true correspondences between points on two separate fingerprint images, similar to our own findings for FDE and Lay participants. The similarity in visual locations identified by both our study and that of Busey et al. is consistent with the findings of Dyer et al., but Busey and colleagues noted a difference between experts and lay participants in the temporal sequences and length of their saccades. According to Busey and colleagues, shorter and more numerous visual saccades observed among the experts suggested that experts may have been identifying multiple corresponding points in an area, while the lay participants may have been limited to making point-by-point visual correspondences. Figure 3.2.QK.14 presents gaze plots for two signatures, viewed by two different FDEs (on the left) and two different Lay participants (on the right). The gaze plots clearly demonstrate the differences in fixation count (each numbered dot represents a fixation) and fixation duration (the size of the numbered dots indicated that a greater amount of time was spent in that area), which is consistent with the findings of Busey and collegues.

Figure 3.2.QK.14. Expert and Lay participant gaze plots and heat maps demonstrating differences in temporal sequences and fixation clustering. Signatures on the left were examined by FDEs. Those on the right were examined by Lay participants.









The gaze plots for these comparisons clearly demonstrate the phenomenon described by Busey and colleagues, and provide support for the argument that differences in expertise are revealed by examining the pattern and sequence of the eye movements. According to Busey et al. (2013), the shorter saccades are consistent with the expertise literature on pattern learning and memory, and provide indirect evidence of "a 'chunking' strategy in which several features are placed into working memory" (p. 21). Busey and colleagues concluded that examining these clusters of short-saccade fixations, which they referred to as a "bag of fixations approach" (p. 21), may be more diagnostic of the individualizing characteristics of the stimuli than may focusing on fixation pairs separated by a single saccade.

The following sections present the results for separate eye-tracking analyses for each of the 66 singatures in the questioned/known comparison protocol.

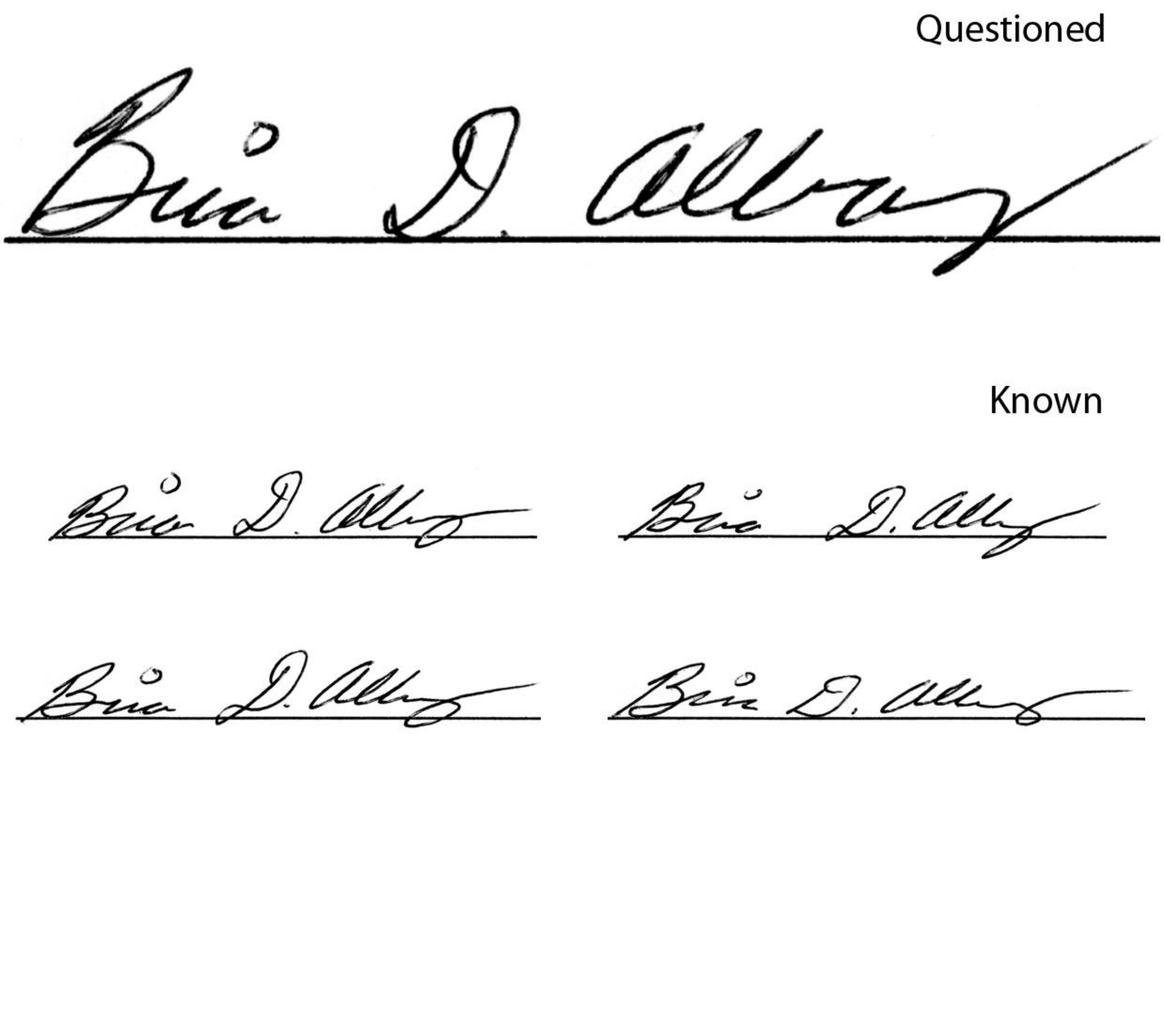
SIGNATURE 1: Brian Albury

The signature of Brian Albury is characterized as a high-complexity mixed-type signature. The set of Albury signature specimens included two genuine signatures. Of the non-genuine signatures, two were traced, one was disguised, and one was a freehand simulation.

Albury Signature 1: Genuine

Of the 49 FDE participants, 22 responded correctly that the signature was genuine and 27 responded that the signature was non-genuine. Conversely, 42 of the 43 Lay participants responded correctly that the signature was genuine, and one responded that it was non-genuine. This difference was statistically significant, $\chi^2(3, N = 92) = 30.13$, $p < .001$. Figure 1 presents the comparison view of this signature.

Figure Albury 1.1. Questioned-Known Comparison Stimulus for Albury Signature 1.

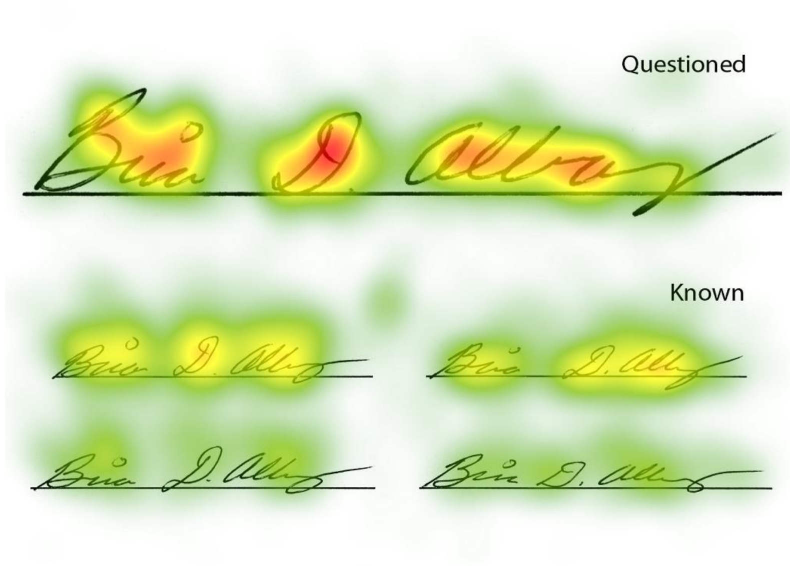


Selection of Areas of Interest (AOIs)

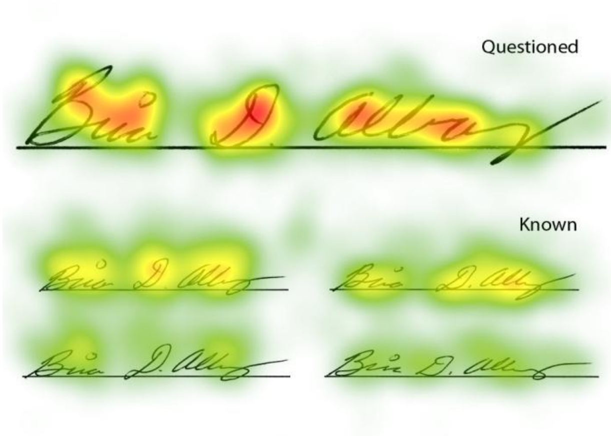
Figure Albury 1.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were five locations indicated by red “hot spots” within the signature that elicited significant attention from the participants. AOIs were created for these specific hot spots. Larger, secondary AOIs incorporating the smaller hot spots were created to include the orange “warm spots”, creating a total of seven AOIs (including the AOI for the questioned signature) for this stimulus. Figure Albury 1.3 demonstrates all AOIs identified for this signature.

Figure Albury 1.2. Heat map for Albury signature 1, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

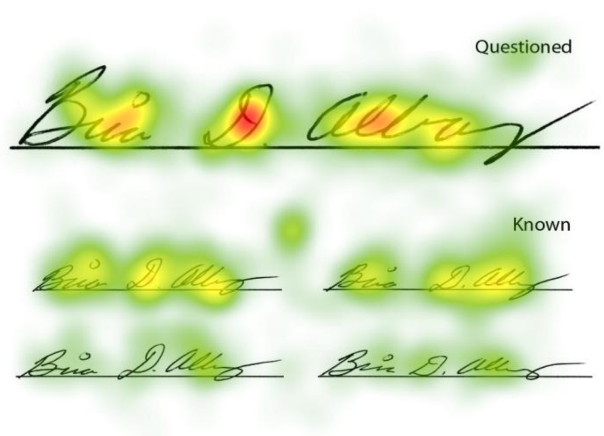
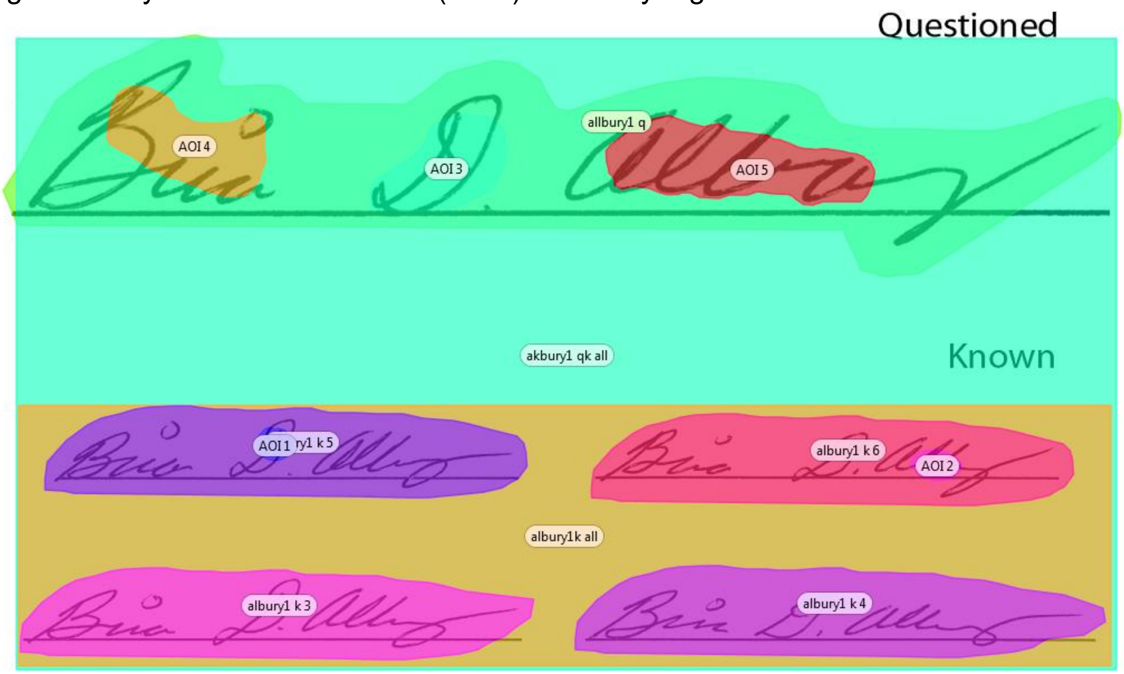


Figure Albury1.3. Areas of Interest (AOIs) for Albury Signature 1.



Eye-Tracking Metrics Analyses

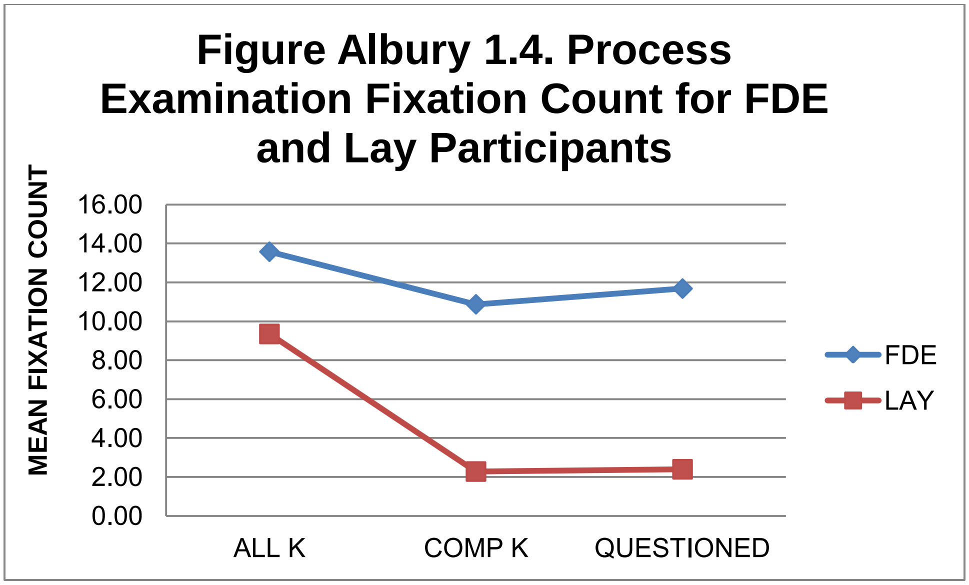
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known signature stimulus, and the known and questioned signatures on the comparison stimulus. The examination process analyses are based on AOIs in the Albury known signature stimulus (Knowns, not pictured here), Albury 1K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Albury 1Q (the Albury questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 5) are included in subsequent analyses.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .211, F (3, 86) = 7.67, p < .001, multivariate η^2 = .21. Figure Albury 1.4 presents the mean fixation counts by AOI.

Figure Albury 1.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation counts in the questioned signature (Questioned), and known signatures on the comparison stimulus (Comp K). Total fixation count for the questioned signature was significantly greater for FDEs than for lay participants, F (1, 88) = 14.27, $p < .001$, partial $\eta^2 = .14$. Fixation counts in the known signature comparison stimulus were significantly greater for FDEs than for lay participants (Comp K, F (1, 88) = 21.70, $p < .001$, partial $\eta^2 = .20$. Fixation counts in the known signature stimulus (All K) were not significantly different, $p = .054$, *ns*. Table Albury 1.1 presents the means and standard deviations for areas of interest by participant type.

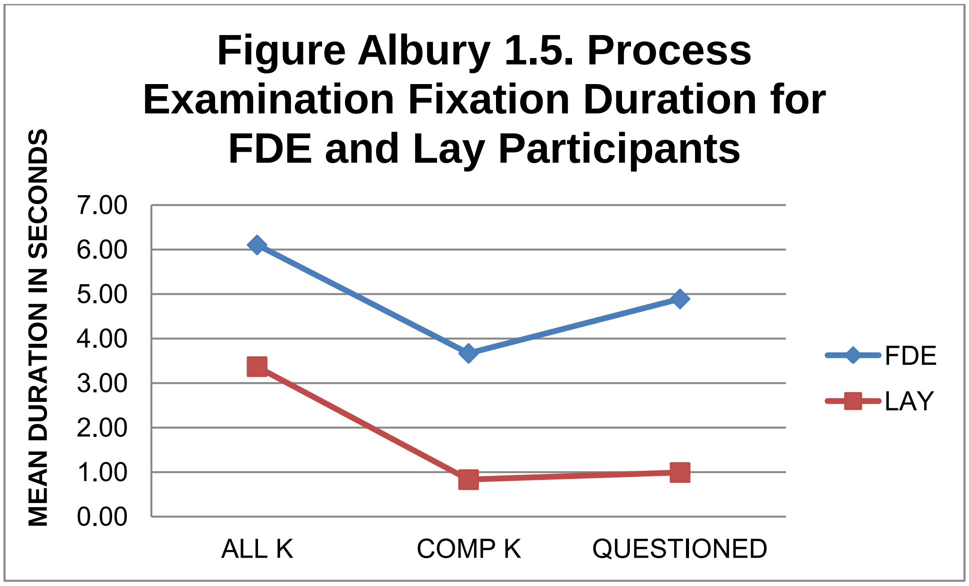
Table Albury 1.1
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	13.57	11.58	10.87	11.87	11.68	15.88
LAY	9.35	8.58	2.28	2.43	2.40	2.85

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .17, F (3, 86) = 5.74, $p = .001$, multivariate $\eta^2 = .17$. Figure Albury 1.5 presents the mean fixation duration by AOI. Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation durations in all areas of interest.

Figure Albury 1.5



Total fixation duration for the questioned signature was significantly greater for FDEs than for lay participants, F (1, 88) = 9.76, p = .002, partial η^2 = .10. Fixation durations in both the known signature stimulus and the known signature comparison stimulus were significantly greater for FDEs than for lay participants, known signature stimulus (All K), F (1, 88) = 6.23, p = .014, partial η^2 = .07; known signature comparison stimulus (Comp K), F(1, 88) = 13.99, p < .001, partial η^2 = .14). Table Albury 1.2 presents the means and standard deviations for areas of interest by participant type.

Table Albury 1.2

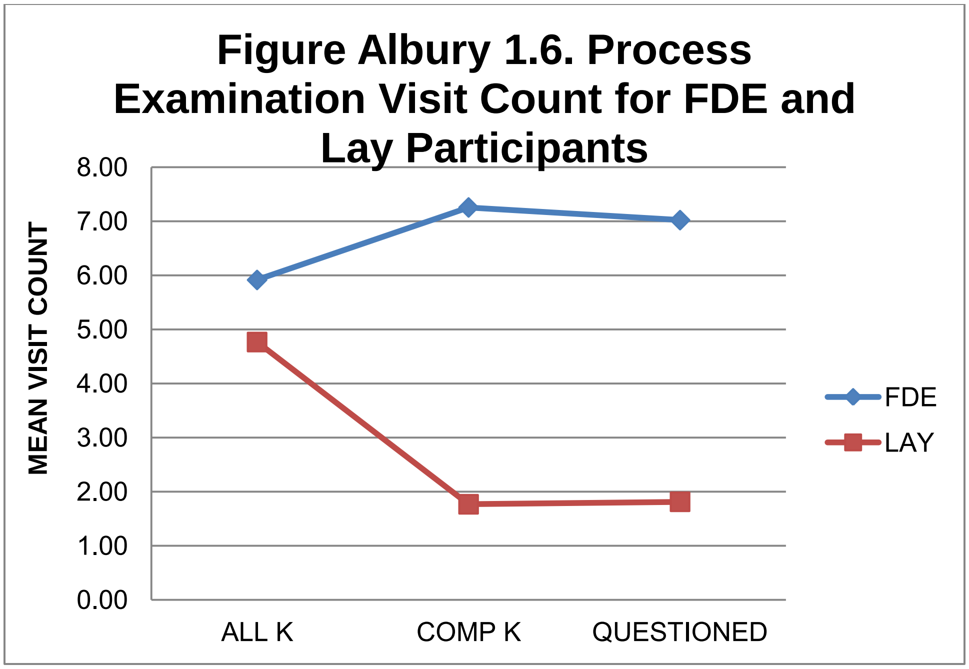
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	6.10	6.41	3.67	4.87	4.89	8.09
LAY	3.37	3.38	0.83	1.02	0.99	1.24

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .20, F (3, 86) = 7.18, p < .001, multivariate η^2 = .20. Figure Albury 1.6 presents the mean visit counts by AOI.

Figure Albury 1.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in the questioned signature (Questioned), and known signatures on the comparison stimulus (Comp K). Total fixation count for the questioned signature was significantly greater for FDEs than for lay participants, F (1, 88) = 14.28, p < .001, partial η^2 = .14. Visit counts in the known signature comparison stimulus were significantly greater for FDEs than for lay participants (Comp K, F (1, 88) = 21.89, p < .001, partial η^2 = .20. Visit counts in the known signature stimulus (All K) were not significantly different, p = .28, *ns*). Table Albury 1.3 presents the means and standard deviations for areas of interest by participant type.

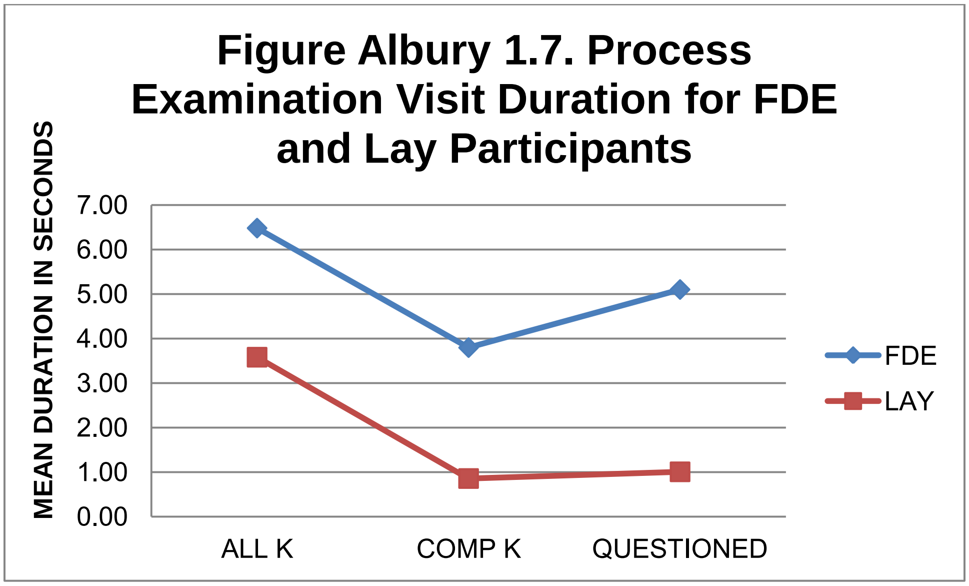
Table Albury 1.3
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	5.91	5.54	7.26	7.45	7.02	8.77
LAY	4.77	4.21	1.77	2.00	1.81	2.25

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .17, F (3, 86) = 6.01, p = .001, multivariate η^2 = .17. Figure Albury 1.7 presents the mean visit durations by AOI.

Figure Albury 1.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature was significantly greater for FDEs than for lay participants, F (1, 88) = 10.26, p = .002, partial η^2 = .10. Visit durations in both the known signature stimulus and the known signature comparison stimulus were significantly greater for FDEs than for lay participants (All K, F (1, 88) = 6.52, p = .012, partial η^2 = .07; Comp K, F(1, 88) = 14.50, p < .001, partial η^2 = .14). Table Albury 1.4 presents the means and standard deviations for areas of interest by participant type.

Table Albury 1.4

Process Analysis Visit Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	6.48	6.67	3.80	4.96	5.10	8.29
LAY	3.58	3.46	0.86	1.04	1.01	1.27

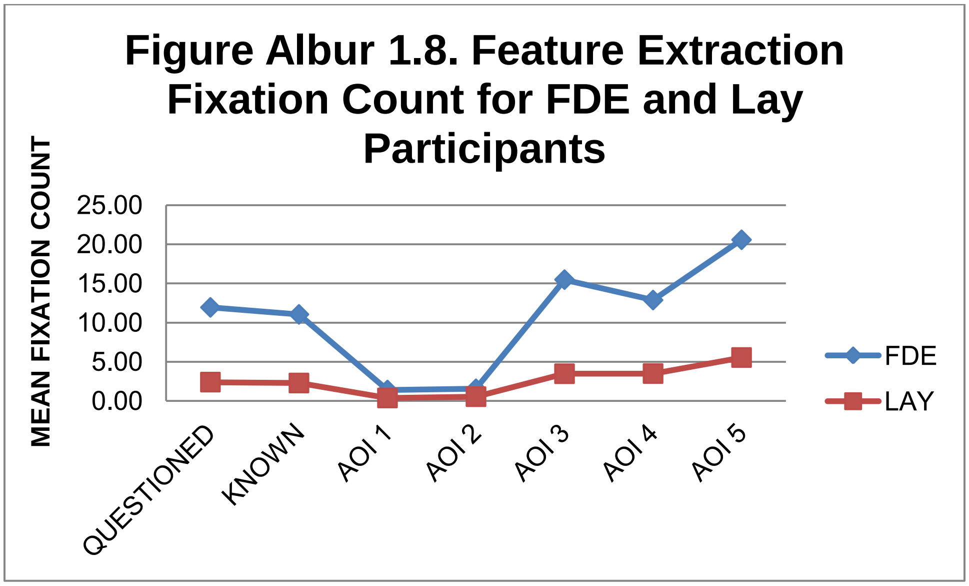
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .316, F (7, 81) = 5.34, $p < .001$, multivariate $\eta^2 = .316$. Figure Albury 1.8 presents the mean fixation counts by AOI.

Figure Albury 1.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature and the known comparison signature comparison stimulus were significantly greater for FDEs than for lay participants, F (1, 87) = 14.91, $p < .001$, partial $\eta^2 = .146$, and F (1, 87) = 22.29, $p < .001$, partial $\eta^2 = .204$. Fixations counts in all AOIs were significantly greater for FDEs than for lay participants (AOI 1, F(1, 87) = 6.14, $p = .015$, partial $\eta^2 = .066$; AOI 2, F(1, 87) = 8.55, $p = .004$, partial $\eta^2 = .089$; AOI 3, F(1, 87) = 26.96, $p < .001$, partial $\eta^2 = .237$; AOI 4, F(1, 87) = 34.13, $p < .001$, partial $\eta^2 = .282$; AOI 5, F(1, 87) = 26.48, $p < .001$, partial $\eta^2 = .233$). Table Albury 1.5 presents the means and standard deviations for areas of interest by participant type.

Table Albury 1.5

Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	11.93	15.96	11.04	11.94	1.39	2.64	1.54	2.03
LAY	2.40	2.85	2.28	2.43	0.37	0.58	0.53	1.03

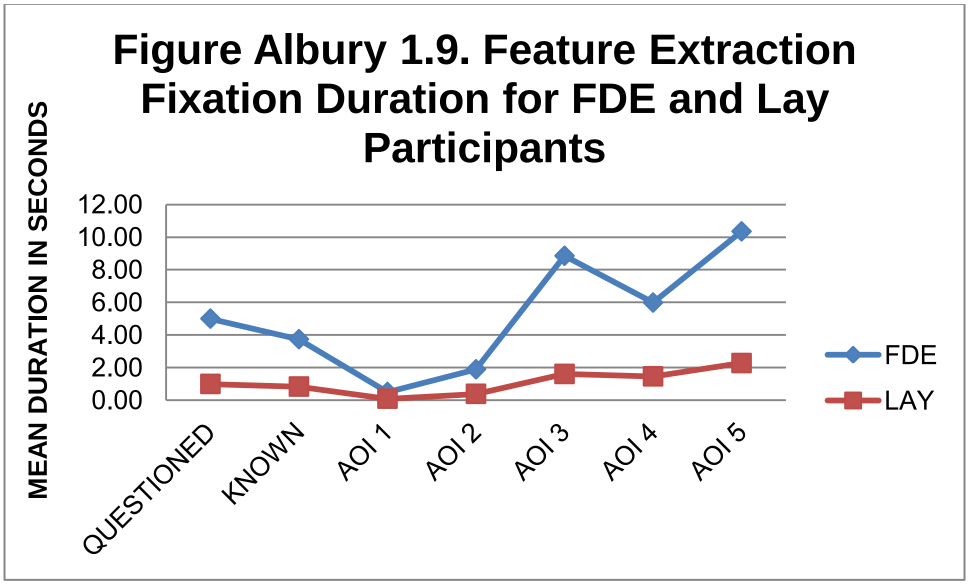
	AOI 3		AOI 4		AOI 5	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***

FDE	15.48	14.90	12.87	10.12	20.57	18.20
LAY	3.47	2.91	3.49	3.01	5.53	6.15

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .319, F (7, 81) = 5.42, p < .001, multivariate η^2 = .319. Figure Albury 1.9 presents the mean fixation durations by AOI.

Figure Albury 1.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all but one area of interest. Total fixation durations for the questioned signature and the known comparison signature comparison stimulus were significantly greater for FDEs than for lay participants, F (1, 87) = 10.16, p = .002, partial η^2 = .105, and F (1, 87) = 14.50, p < .001, partial η^2 = .143. Fixation durations in AOI 1, AOI 3, AOI 4, and AOI 5 were significantly greater for FDEs than for lay participants (AOI 1, F(1, 87) = 9.64, p = .003, partial η^2 = .100; AOI 3, F(1, 87) = 26.60, p < .001, partial η^2 = .234; AOI 4, F(1, 87) = 28.86, p < .001, partial η^2 = .249; AOI 5, F(1, 87) = 24.63, p < .001, partial η^2 = .221). No significant difference was found for AOI 2, p = .062, *ns*. Table Albury 1.6 presents the means and standard deviations for areas of interest by participant type.

Table Albury 1.6
Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

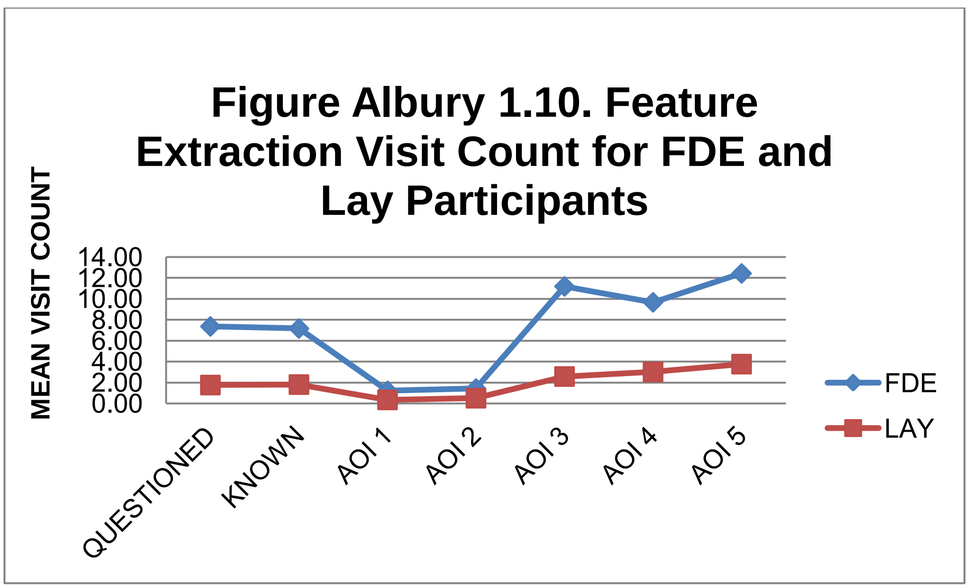
	QUESTIONED	KNOWN	AOI 1	AOI 2

Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	5.00	8.15	3.74	4.90	0.50	0.85	0.83	1.29
LAY	0.99	1.24	0.83	1.02	0.09	0.17	0.38	0.87
	AOI 3		AOI 4		AOI 5			
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*		
FDE	8.85	9.05	5.98	5.35	10.35	10.37		
LAY	1.60	1.78	1.46	1.42	2.27	2.59		

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .358, $F(7, 81) = 6.45$, $p < .001$, multivariate $\eta^2 = .358$. Figure Albury 1.10 presents the mean visit counts by AOI.

Figure Albury 1.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Mean visit counts for the questioned signature and the known comparison signature comparison stimulus were significantly greater for FDEs than for lay participants, F (1, 87) = 15.00, $p < .001$, partial $\eta^2 = .147$, and F (1, 87) = 22.56, $p < .001$, partial $\eta^2 = .206$. Visit count in all AOIs was significantly greater for FDEs than for lay participants (AOI 1, $F(1, 87) = 8.50$, $p = .005$, partial $\eta^2 = .089$; AOI 2, $F(1, 87) = 7.70$, $p = .007$, partial $\eta^2 = .081$; AOI 3, $F(1, 87) = 36.83$, $p < .001$, partial $\eta^2 = .297$; AOI 4, $F(1, 87) = 34.92$, $p < .001$, partial $\eta^2 = .286$) ; AOI 5, $F(1, 87) = 26.46$, $p < .001$, partial $\eta^2 = .233$). Table Albury 1.7 presents the means and standard deviations for areas of interest by participant type.

Table Albury 1.7

Feature Extraction Analysis Visit Count for FDE and Lay Participants

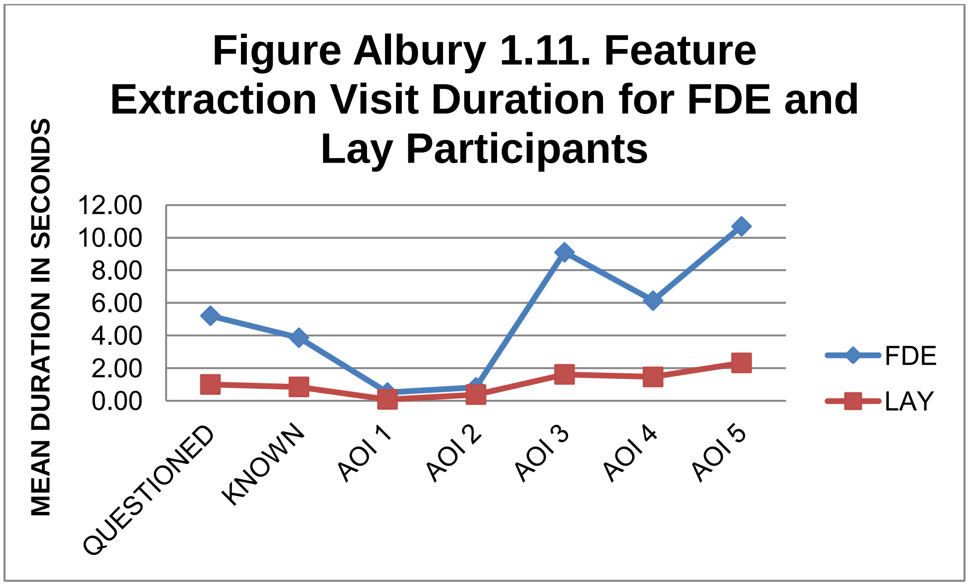
	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	7.37	7.49	7.17	8.81	1.22	1.88	1.43	1.95
Lay	1.77	2.00	1.81	2.25	0.35	0.53	0.51	1.01

	AOI 3		AOI 4		AOI 5	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	11.20	9.09	9.67	6.96	12.43	10.38
Lay	2.58	2.07	3.02	2.52	3.77	3.91

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .318, $F(7, 81) = 5.41$, $p < .001$, multivariate $\eta^2 = .318$. Figure Albury 1.11 presents the mean visit durations by AOI.

Figure Albury 1.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in four of the five areas of interest. Total visit duration for the questioned signature was significantly greater for FDEs than for lay participants, $F(1, 87) = 10.67$, $p = .002$, partial $\eta^2 = .109$. Visit durations in AOI 1, AOI 3, AOI 4, and AOI 5 were significantly greater for FDEs than for lay participants (AOI 1, $F(1, 87) = 9.33$, $p = .003$, partial $\eta^2 = .097$; AOI 3, $F(1, 87) = 26.77$, $p < .001$, partial $\eta^2 = .235$; AOI 4, $F(1, 87) = 29.64$, $p < .001$, partial $\eta^2 = .254$; AOI 5,

$F(1, 87) = 24.92$, $p < .001$, partial $\eta^2 = .223$). No significant difference was found for AOI 2, $p = .06$, *ns*. Table Albury 1.8 presents the means and standard deviations for areas of interest by participant type.

Table Albury 1.8
Feature Extraction Analysis Visit Duration for FDE and Lay Participants

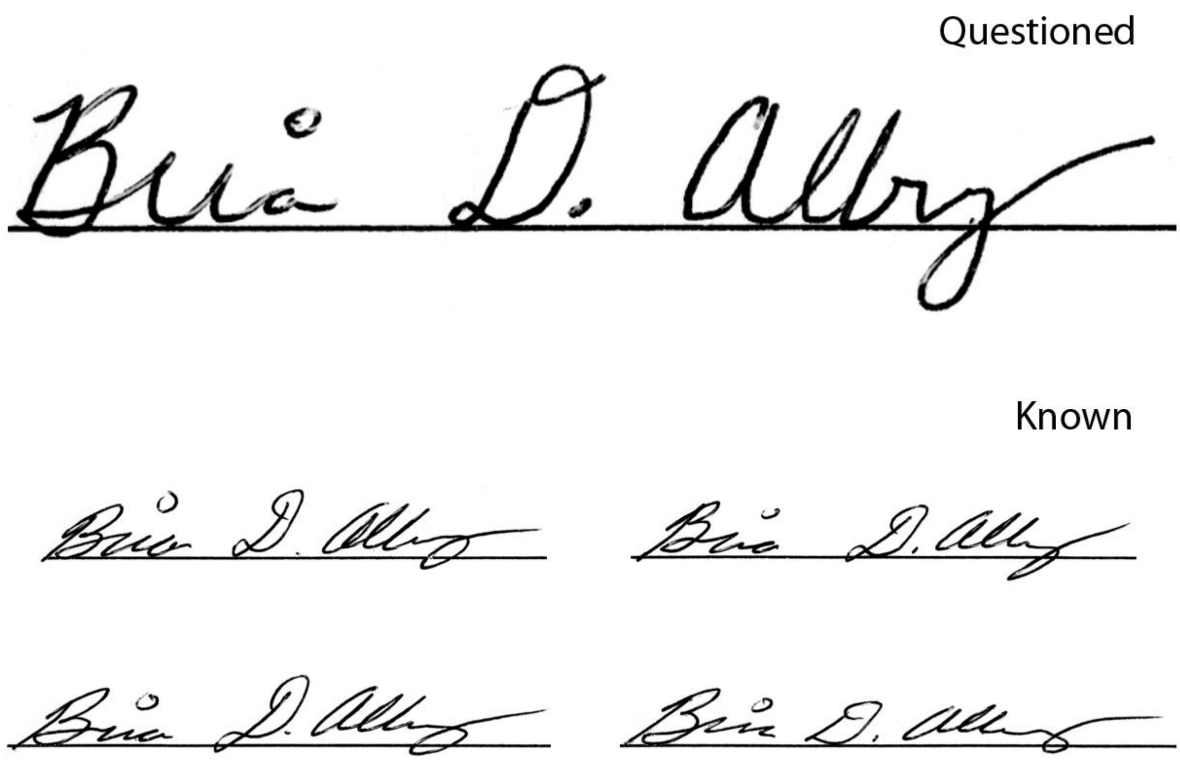
	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	5.21	8.35	3.87	4.99	0.51	0.88	0.83	1.29
LAY	1.01	1.27	0.86	1.04	0.09	0.17	0.39	0.87

	AOI 3		**AOI 4**		**AOI 5**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	9.10	9.31	6.14	5.45	10.69	10.68
LAY	1.62	1.81	1.47	1.43	2.33	2.66

Albury Signature 2: Freehand Simulation

All 49 FDE participants responded correctly that the signature was non-genuine. Of the 43 Lay participants, 41 responded correctly that the signature was non-genuine, while 2 responded that the signature was genuine. This difference was not statistically significant, $p = .127$, *ns*. Figure 1 presents the comparison view of this signature.

Figure Albury 2.1. Questioned-Known Comparison Stimulus for Albury Signature 2.

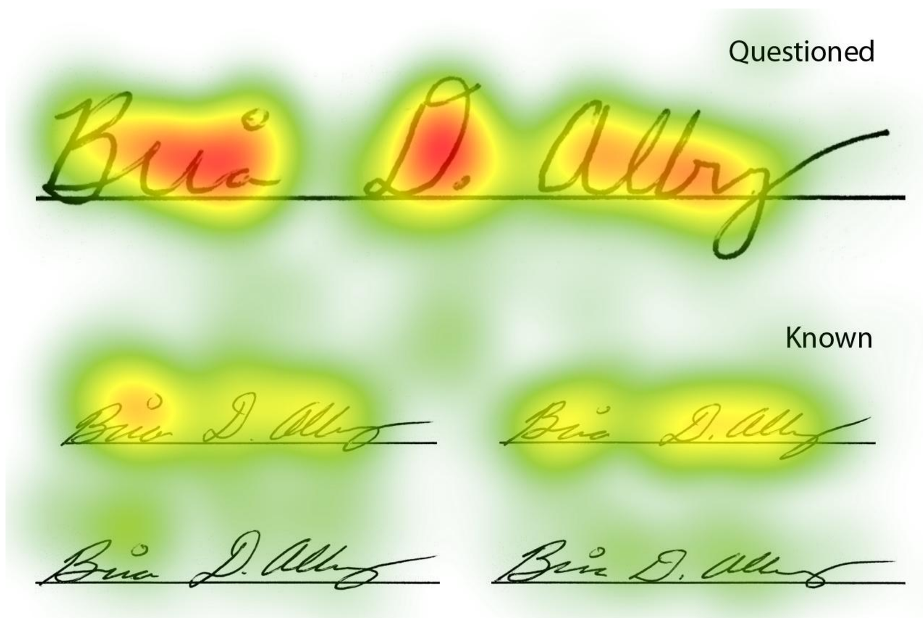


Selection of Areas of Interest (AOIs)

Figure Albury 2.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were six locations indicated by red “hot spots” within the signature that elicited significant attention from the participants. AOIs were created for these specific hot spots. Larger, secondary AOIs incorporating the smaller hot spots were created to incAlburyde the orange “warm spots”, creating a total of eight AOIs (incAlburyding the AOI for the questioned signature) for this stimulus. Figure Albury 2.3 demonstrates all AOIs identified for this signature.

Figure Albury 2.2. Heat map for Albury Signature 2, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE

Lay

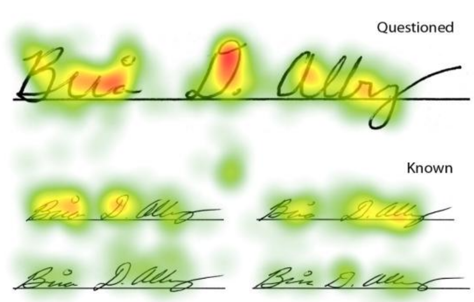
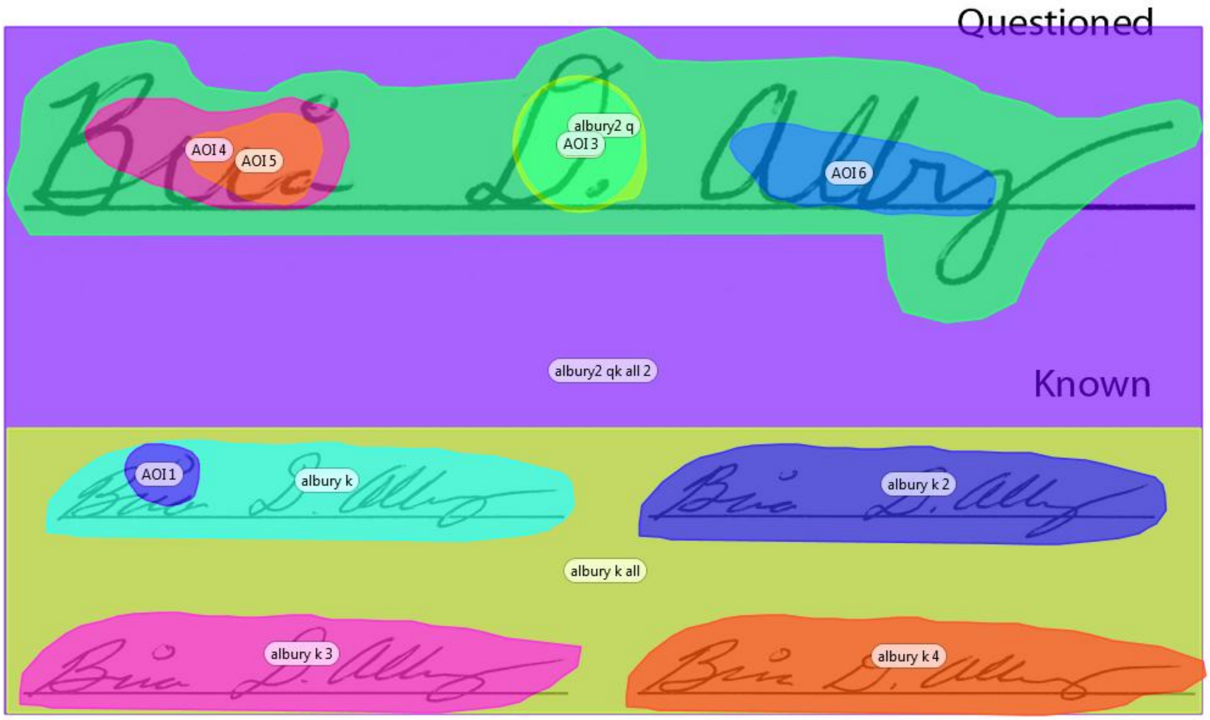


Figure Albury 2.3. Areas of Interest (AOIs) for Albury Signature 2.



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

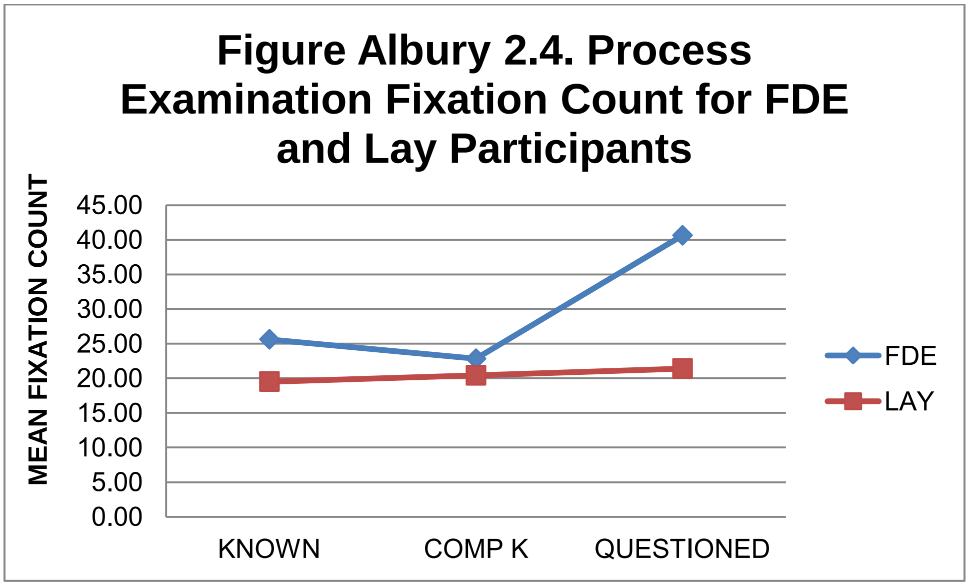
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Albury known signature stimulus (Knowns, not pictured here), Albury K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Albury 2Q (the Albury questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 6) are included in subsequent analyses. Figure Albury 2.3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .261, $F(3, 85) = 0.03$, $p < .001$, multivariate $\eta^2 = .261$. Figure Albury 2.4 presents the mean fixation counts by AOI.

Figure Albury 2.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in only one area of interest. Total fixation count for the questioned signature was significantly greater for FDEs than for lay participants, $F(1, 85) = 8.50$, $p = .005$, partial $\eta^2 = .091$.

No significant differences were found for the known signature comparison stimulus (COMP K), $p = .631$, *ns*, or for the known signature stimulus (ALL K), $p = .168$, *ns*. Table Albury 2.1 presents the means and standard deviations for areas of interest by participant type.

Table Albury 2.1

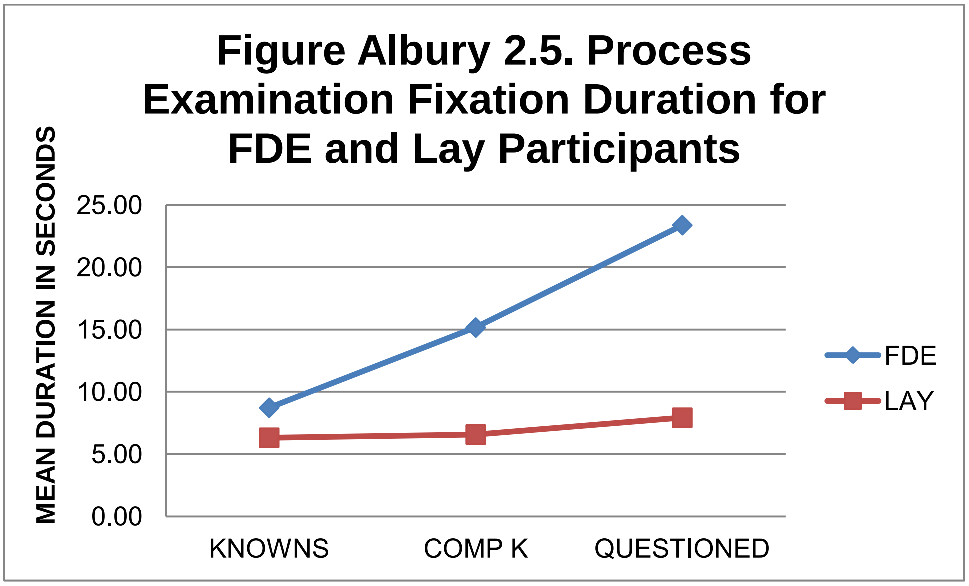
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	25.62	23.98	22.82	25.27	40.64	39.21
LAY	19.52	15.81	20.42	20.69	21.41	17.56

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .145, $F(3, 83) = 4.70$, $p = .004$, multivariate $\eta^2 = .145$. Figure Albury 2.5 presents the mean fixation durations by AOI.

Figure Albury 2.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in two areas of interest. Total fixation duration for the questioned signature was significantly greater for FDEs than for lay participants, $F(1, 87) = 26.48$, $p < .001$, partial $\eta^2 = .233$. A significant difference was also found for the known signature comparison stimulus (COMP K), $F(1, 87) = 6.79$, $p = .011$, partial $\eta^2 = .072$.

No significant difference was found for the known signature comparison stimulus (COMP K), $p = .129$, *ns*. Table Albury 2.2 presents the means and standard deviations for areas of interest by participant type.

Table Albury 2.2

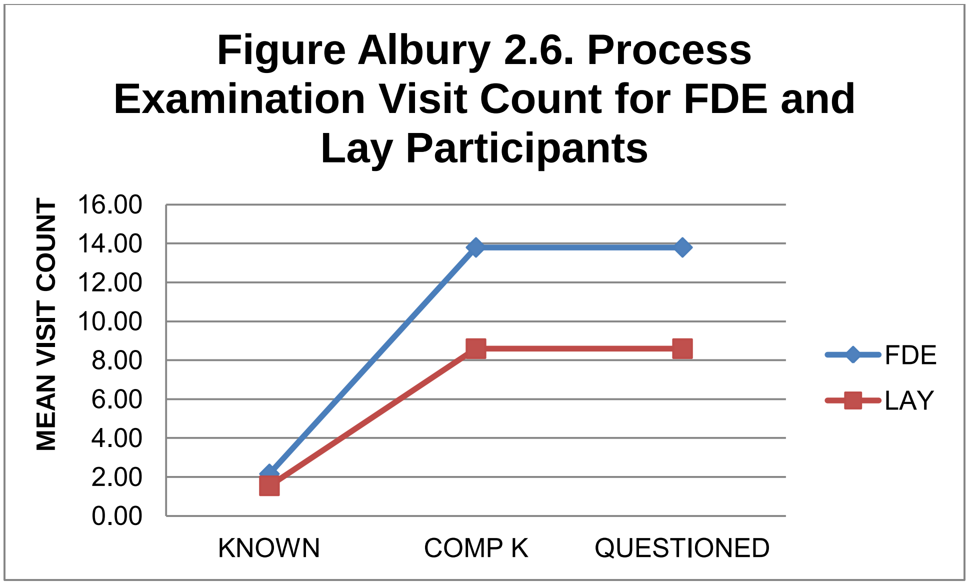
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	8.72	8.24	15.17	20.80	23.38	18.29
LAY	6.32	6.41	6.58	6.08	7.92	7.56

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .146, $F(3, 82) = 4.66$, $p = .005$, multivariate $\eta^2 = .146$. Figure Albury 2.6 presents the mean visit counts by AOI.

Figure Albury 2.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in two areas of interest. Total visit count for the questioned signature was significantly greater for FDEs than for lay participants, $F(1, 84) = 9.58$, $p = .003$, partial $\eta^2 = .102$. A significant difference was also found for the known signature comparison stimulus (COMP K), $F(1, 84) = 5.12$, $p = .026$, partial $\eta^2 = .057$.

No significant difference was found for the known signature comparison stimulus (COMP K), $p = .075$, *ns*. Table Albury 2.3 presents the means and standard deviations for areas of interest by participant type.

Table Albury 2.3

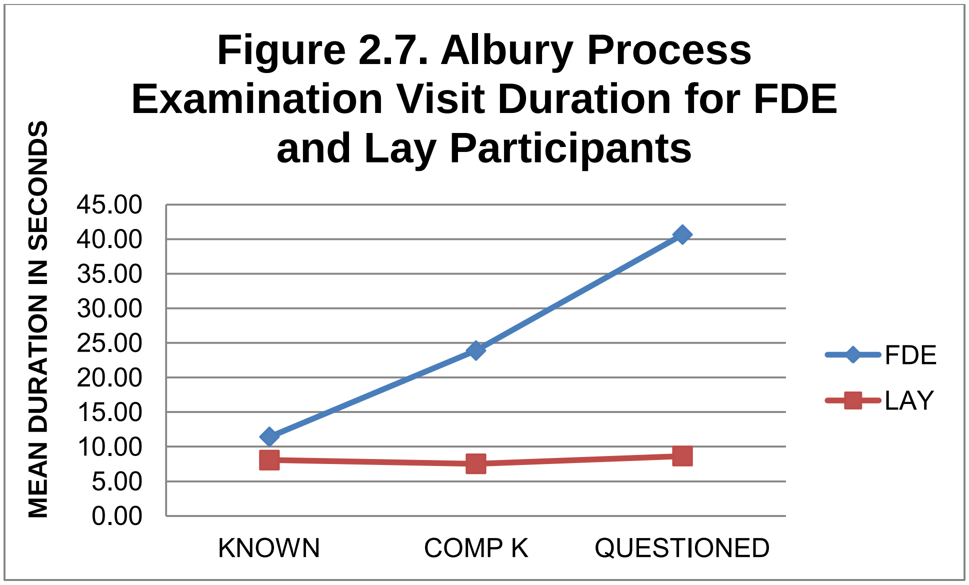
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.16	1.83	13.80	10.87	13.80	10.87
LAY	1.55	1.25	8.60	10.42	8.60	10.42

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .366, $F(3, 83) = 15.98$, $p < .001$, multivariate $\eta^2 = .366$. Figure Albury 2.7 presents the mean visit durations by AOI.

Figure Albury 2.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in two areas of interest. Total visit duration for the questioned signature was significantly greater for FDEs than for lay participants, $F(1, 84) = 9.58$, $p = .003$, partial $\eta^2 = .102$. A significant difference was also found for the known signature comparison stimulus (COMP K), $F(1, 84) = 5.12$, $p = .026$, partial $\eta^2 = .057$.

No significant difference was found for the known signature comparison stimulus (COMP K), $p = .075$, *ns*. Table Albury 2.4 presents the means and standard deviations for areas of interest by participant type.

Table Albury 2.4

Process Analysis Visit Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	11.42	9.95	23.89	23.86	40.65	29.46
LAY	8.06	7.02	7.53	6.82	8.65	7.60

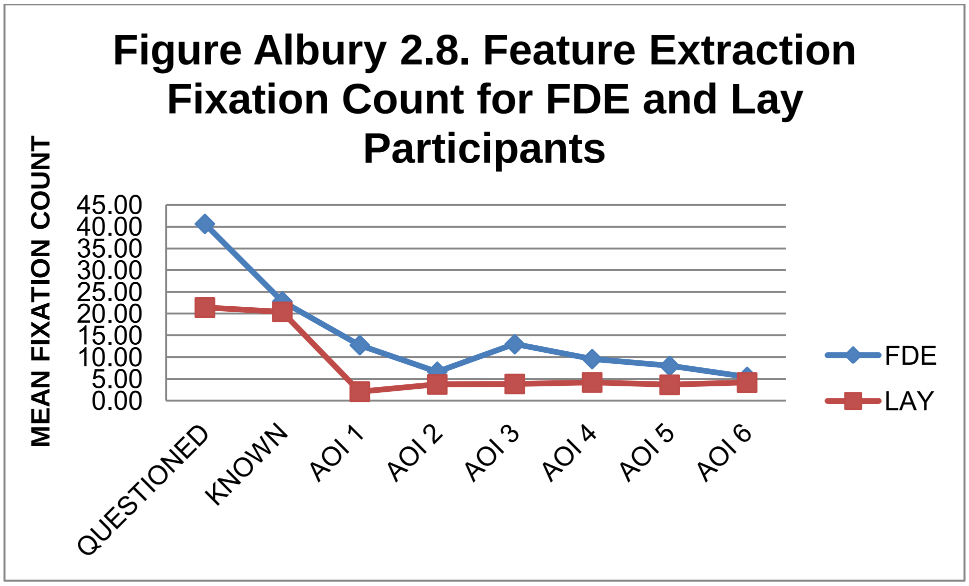
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .375, $F(8, 78) = 5.85$, $p < .001$, multivariate $\eta^2 = .375$. Figure Albury 2.8 presents the mean fixation counts by AOI.

Figure Albury 2.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all but three areas of interest. Total fixation count for the questioned signature was significantly greater for FDEs than for lay participants, $F(1, 85) = 8.50$, $p = .005$, partial $\eta^2 = .091$. No significant difference was found for the known signature comparison stimulus, $p = .631$, *ns*.

Fixations counts for four AOIs were significantly greater for FDEs than for lay participants (AOI 1, $F(1, 85) = 36.35$, $p < .001$, partial $\eta^2 = .300$; AOI 3, $F(1, 85) = 30.06$, $p < .001$, partial $\eta^2 = .261$; AOI 4, $F(1, 85) = 16.64$, $p < .001$, partial $\eta^2 = .164$; AOI 5, $F(1, 85) = 15.13$, $p < .001$, partial $\eta^2 = .151$).

There was no difference in the fixation counts for AOI 2, $p = .054$, *ns*, or for AOI 6, $p = .259$, *ns*. Table Albury 2.5 presents the means and standard deviations for areas of interest by participant type.

Table Albury 2.5

Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	40.64	39.21	22.82	25.27	12.78	11.20	6.67	8.45
LAY	21.41	17.56	20.42	20.69	2.10	2.61	3.76	4.78

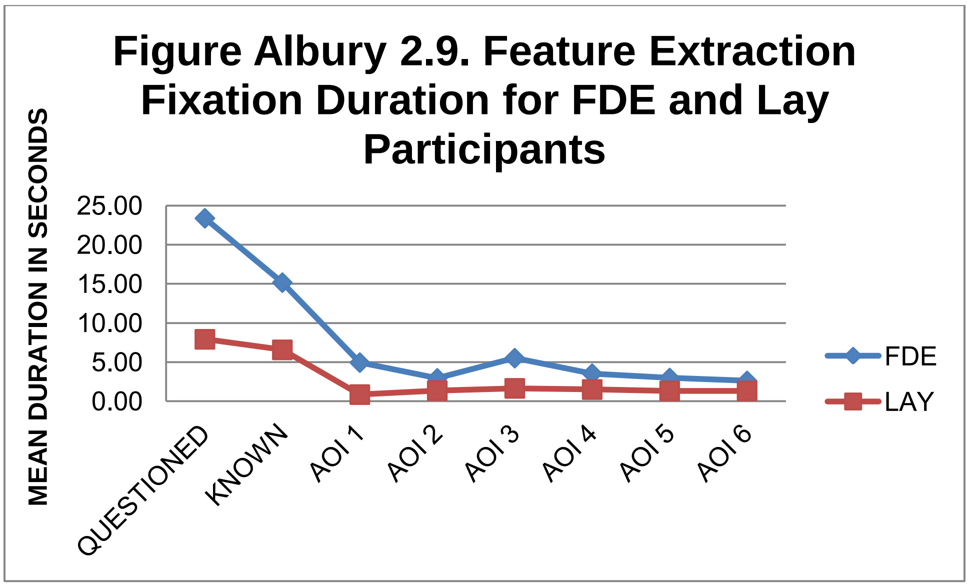
	AOI 3		AOI 4		AOI 5		AOI 6	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	13.00	10.26	9.58	7.66	8.00	6.37	5.49	6.17

LAY	3.86	3.52	4.21	3.85	3.67	3.51	4.19	4.24

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .406, $F(8, 80) = 6.84$, $p < .001$, multivariate $\eta^2 = .406$. Figure Albury 2.9 presents the mean fixation durations by AOI.

Figure Albury 2.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all but one area of interest. Total fixation duration for the questioned signature was significantly greater for FDEs than for lay participants, $F(1, 87) = 26.48$, $p < .001$, partial $\eta^2 = .233$. A significant difference was found for the known signature comparison stimulus, $F(1, 87) = 6.79$, $p = .011$, partial $\eta^2 = .072$.

Fixations durations for five AOIs were significantly greater for FDEs than for lay participants (AOI 1, $F(1, 87) = 32.86$, $p < .001$, partial $\eta^2 = .233$; AOI 2, $F(1, 87) = 4.83$, $p = .031$, partial $\eta^2 = .053$; AOI 3, $F(1, 87) = 32.71$, $p < .001$, partial $\eta^2 = .273$; AOI 4, $F(1, 87) = 15.12$, $p < .001$, partial $\eta^2 = .148$; AOI 5, $F(1, 87) = 13.70$, $p < .001$, partial $\eta^2 = .136$).

There was no difference in the fixation durations for AOI 6, $p = .225$, *ns*. Table Albury 2.6 presents the means and standard deviations for areas of interest by participant type.

Table Albury 2.6

Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

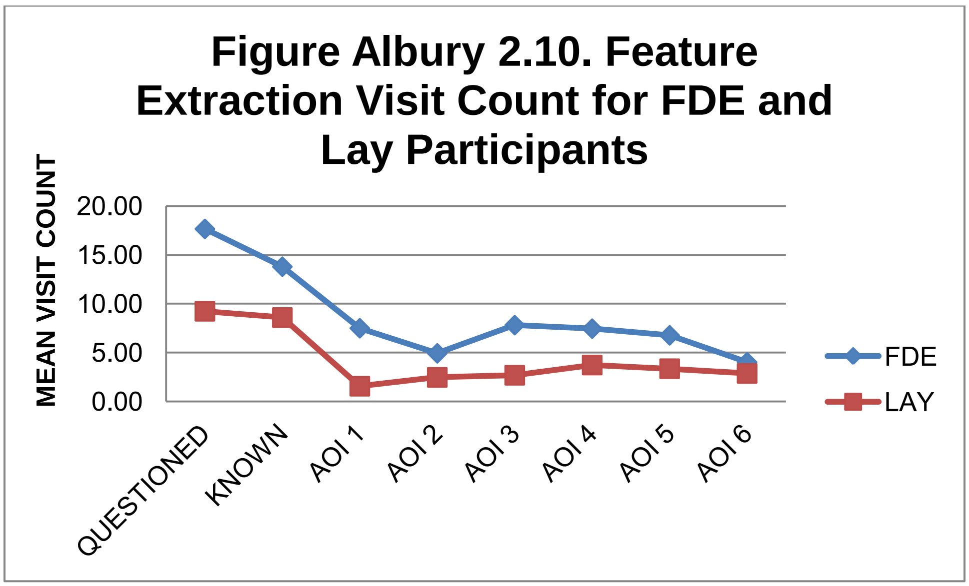
	QUESTIONED	KNOWN	AOI 1	AOI 2

Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	23.38	18.29	15.17	20.80	4.95	4.55	2.93	4.30
LAY	7.92	7.56	6.58	6.08	0.86	1.11	1.37	1.83
	AOI 3		AOI 4		AOI 5		AOI 6	
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	5.51	4.11	3.53	3.03	2.98	2.52	2.61	3.62
LAY	1.66	1.68	1.51	1.62	1.33	1.52	1.84	2.00

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .378, $F(8, 77) = 5.84$, $p < .001$, multivariate $\eta^2 = .378$. Figure Albury 2.10 presents the mean visit counts by AOI.

Figure Albury 2.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in all but one area of interest. Total visit count for the questioned signature was significantly greater for FDEs than for lay participants, $F(1, 84) = 9.58$, $p = .003$, partial $\eta^2 = .102$. A significant difference was found for the known signature comparison stimulus, $F(1, 84) = 5.12$, $p = .026$, partial $\eta^2 = .057$.

Visit counts for five AOIs were significantly greater for FDEs than for lay participants (AOI 1, $F(1, 84) = 34.68$, $p < .001$, partial $\eta^2 = .292$; AOI 2, $F(1, 84) = 5.96$, $p = .017$, partial $\eta^2 = .066$; AOI 3, $F(1, 84) = 25.91$, $p < .001$, partial $\eta^2 = .236$; AOI 4, $F(1, 84) = 12.45$, $p = .001$, partial $\eta^2 = .129$; AOI 5, $F(1, 84) = 11.97$, $p = .001$, partial $\eta^2 = .125$).

There was no difference in the visit counts for AOI 6, p = .107, *ns*. Table Albury 2.7 presents the means and standard deviations for areas of interest by participant type.

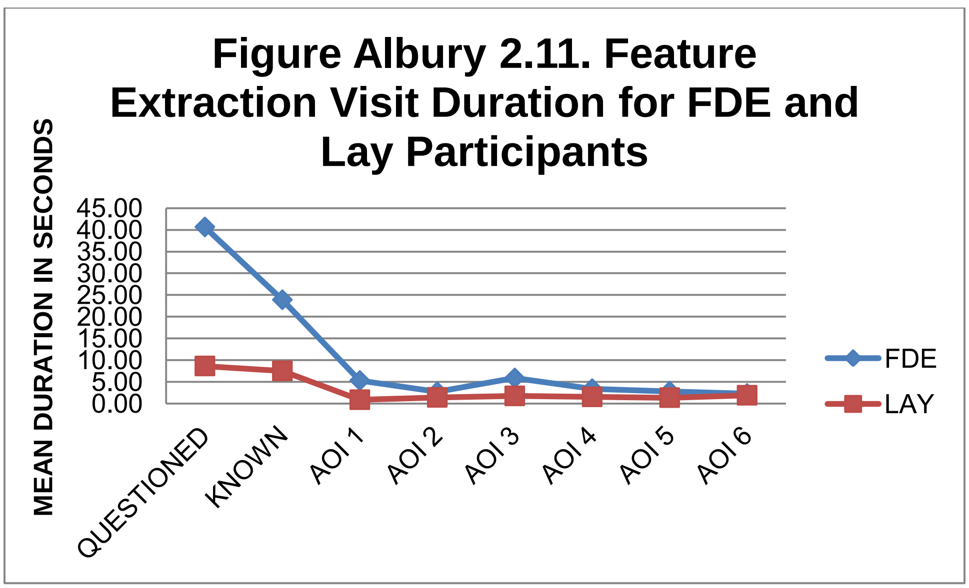
Table Albury 2.7
Feature Extraction Analysis Visit Counts for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	17.66	14.25	13.80	10.87	7.50	6.35	4.93	5.90
LAY	9.24	10.63	8.60	10.42	1.57	1.53	2.48	2.82
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	7.82	6.15	7.45	6.13	6.77	5.73	4.02	3.86
LAY	2.69	2.25	3.74	3.07	3.36	2.91	2.88	2.44

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .339, $F(7, 81) = 5.93$, $p < .001$, multivariate $\eta^2 = .339$. Figure Albury 2.11 presents the mean visit durations by AOI.

Figure Albury 2.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit duration in all but two areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for

FDEs than for lay participants, $F(1, 85) = 46.64$, $p < .001$, partial $\eta^2 = .354$, and $F(1, 85) = 18.35$, $p < .001$, partial $\eta^2 = .178$.

Visit durations for AOIs 1 through 4 were significantly greater for FDEs than for lay participants (AOI 1, $F(1, 85) = 35.07$, $p < .001$, partial $\eta^2 = .292$; AOI 3, $F(1, 85) = 32.82$, $p < .001$, partial $\eta^2 = .279$; AOI 4, $F(1, 85) = 15.39$, $p < .001$, partial $\eta^2 = .153$; AOI 5, $F(1, 85) = 13.26$, $p < .001$, partial $\eta^2 = .135$).

There was no difference in the visit durations for AOI 2, $p = .059$, *ns*, or for AOI 6, $p = .447$, *ns*. Table Albury 2.8 presents the means and standard deviations for areas of interest by participant type.

Table Albury 2.8

Feature Extraction Analysis Visit Duration for FDE and Lay Participants

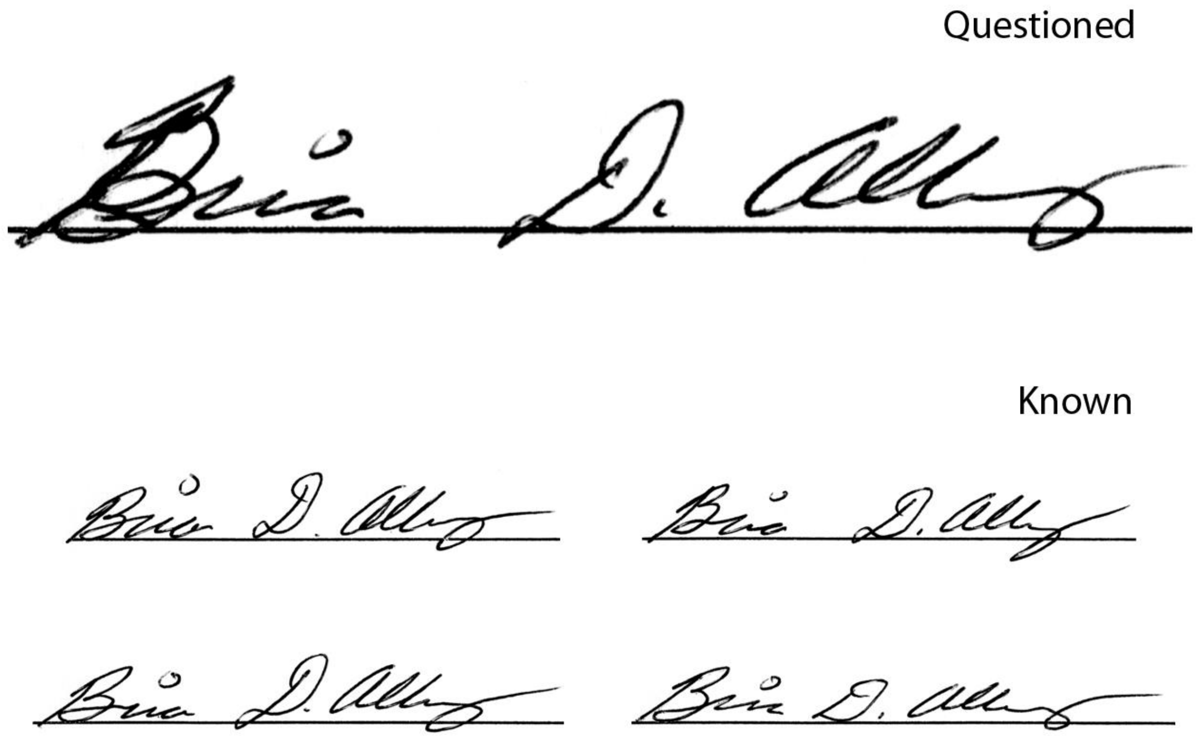
	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	40.65	29.46	23.89	23.86	5.31	4.71	2.71	3.98
LAY	8.65	7.60	7.53	6.82	0.89	1.14	1.42	1.83

	AOI 3		AOI 4		AOI 5		AOI 6	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	5.89	4.36	3.42	2.67	2.84	2.17	2.31	2.74
LAY	1.76	1.72	1.55	1.62	1.37	1.53	1.91	2.03

Albury Signature 3: Genuine

Of the 49 FDE participants, 19 responded correctly as genuine, with the remaining 30 identifying that the signature as non-genuine. Of the 43 Lay participants, 42 responded correctly that the signature was genuine, while 1 identified the signature as non-genuine. This difference was statistically significant, χ^2 (1, N = 92) = 35.56, p = < .001. Figure Albury 3.1 presents the comparison view of this signature.

Figure Albury 3.1. Questioned-Known Comparison Stimulus for Albury Signature 3.



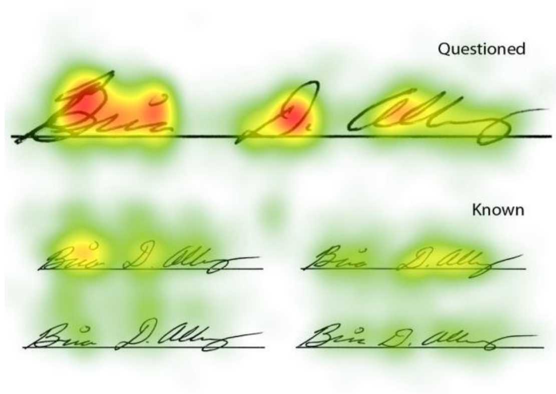
Selection of Areas of Interest (AOIs)

Figure Albury 3.2 presents the heat map demonstrating the “hot spots” and “warm spots” for this comparison slide.

Figure Albury 3.2. Heat map for Albury signature 3, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants

FDE



Lay

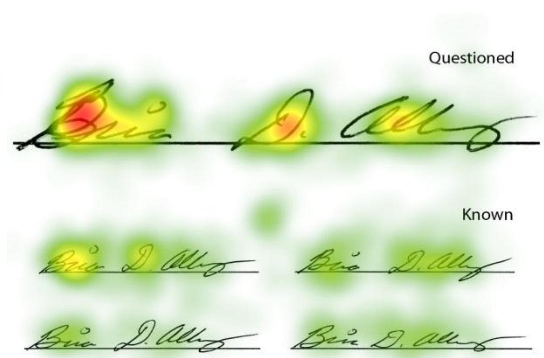
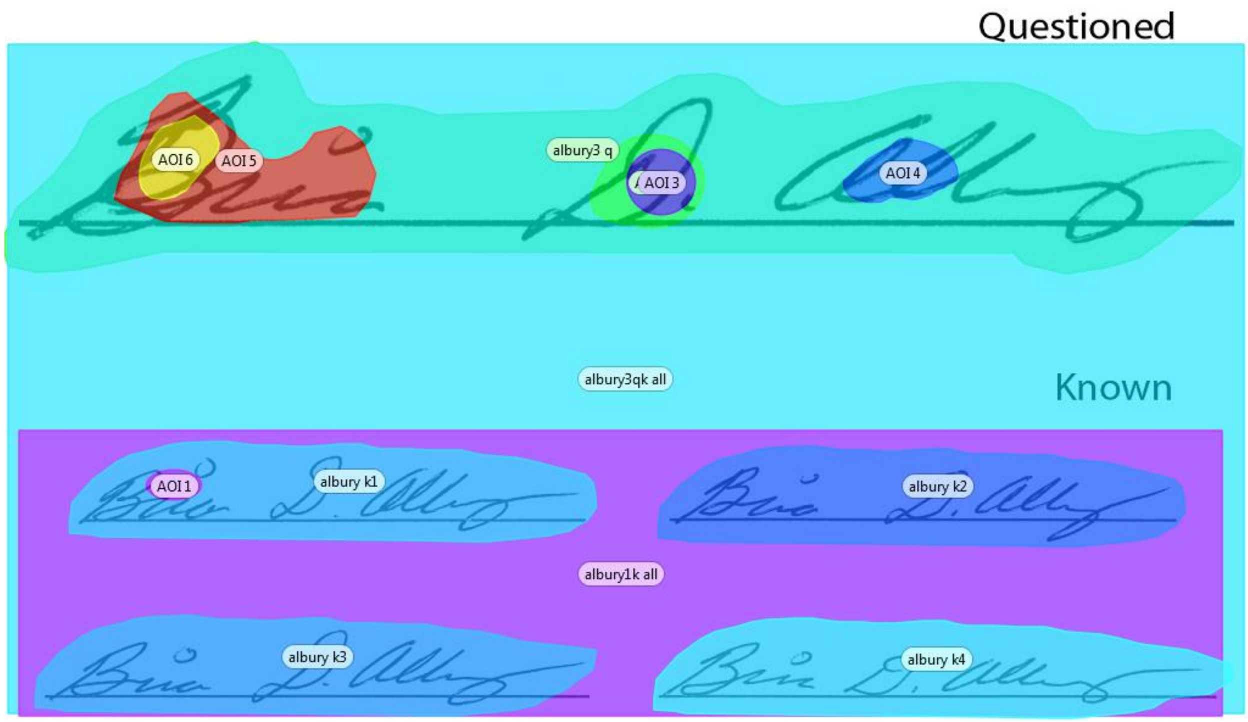


Figure Albury 3.3. Areas of Interest (AOIs) for Albury Signature 3.



Eye-Tracking Metrics Analyses

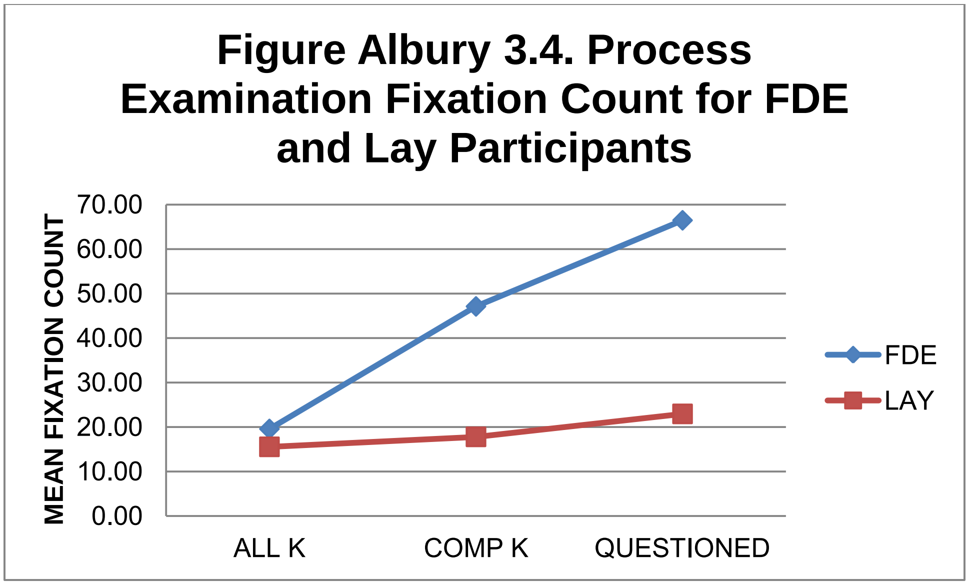
Examination Process Analyses

The examination process analyses are based on AOIs in the Albury known signature stimulus (Knowns, not pictured here), Albury 3K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Albury 3Q (the Albury questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 6) are included in subsequent analyses.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .286, F (3, 86) = 11.47, p < .001, multivariate η^2 = .286. Figure Albury 3.4 presents the mean fixation counts by AOI.

Figure Albury 3.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixations counts in all areas of interest. Total fixation count for the questioned signature was significantly greater for FDEs than for lay participants, F (1, 88) = 34.60, p < .001, partial η^2 = .282. The known signature comparison stimulus was also significantly greater for FDEs than for lay participants, F (1, 88) = 25.46, p < .001, partial η^2 = .22). Fixation count in the known signature stimulus was not significantly different between groups, p = .214, *ns*. Table Albury 3.1 presents the means and standard deviations for areas of interest by participant type.

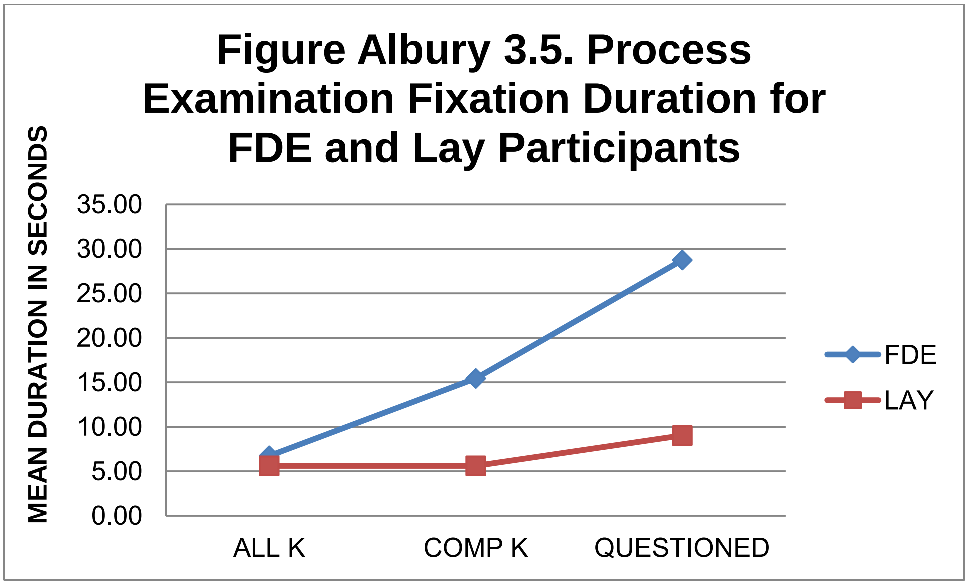
Table Albury 3.1
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	19.55	17.66	47.09	34.60	66.45	41.49
Lay	15.53	11.93	17.77	16.64	22.93	26.27

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .306, F (3, 86) = 12.64, p < .001, multivariate η^2 = .306. Figure Albury 3.5 presents the mean fixation counts by AOI.

Figure Albury 3.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation durations in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for lay participants, F (1, 88) = 38.74, p < .001, partial η^2 = .31, and F (1, 88) = 25.88, p < .001, partial η^2 = .227. Fixation durationin the known signature stimulus was not significantly different between the groups, p = .390, *ns*. Table Albury 3.2 presents the means and standard deviations for areas of interest by participant type.

Table Albury 3.2

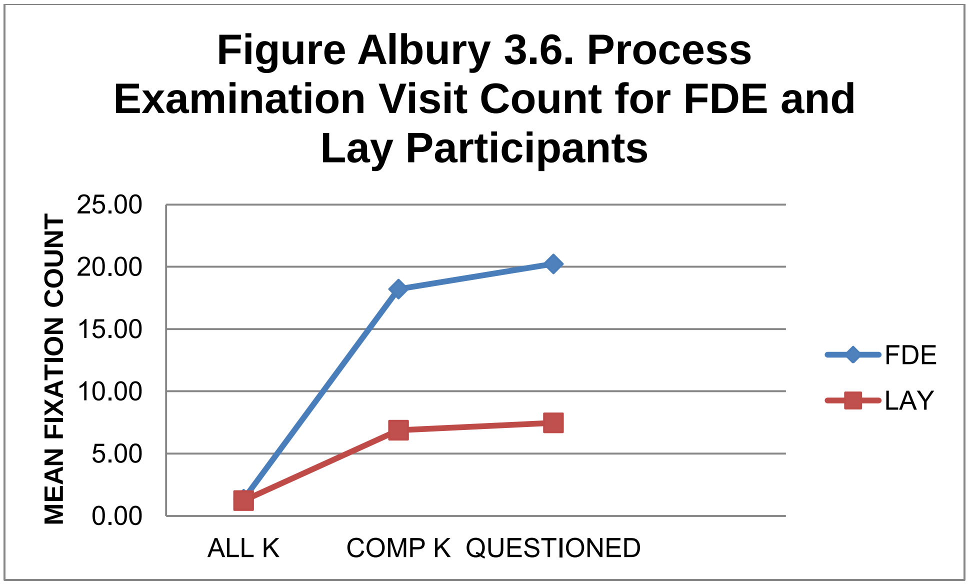
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	6.73	6.74	15.42	11.53	28.73	19.23
Lay	5.60	5.56	5.60	5.46	9.00	8.24

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .282, F (3, 86) = 11.27, p < .001, multivariate η^2 = .282. Figure Albury 3.6 presents the mean visit counts by AOI.

Figure Albury 3.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit count for the questioned signature was significantly greater for FDEs than for lay participants, F (1, 88) = 34.46, p < .001, partial η^2 = .281. The known signature comparison stimulus was significantly greater for FDEs than for lay participants, F(1, 88) = 31.57, p < .001, partial η^2 = .264). Visit count in the known signature stimulus was not significantly different between the groups, p = .697, *ns*. Table 3.3 presents the means and standard deviations for areas of interest by participant type.

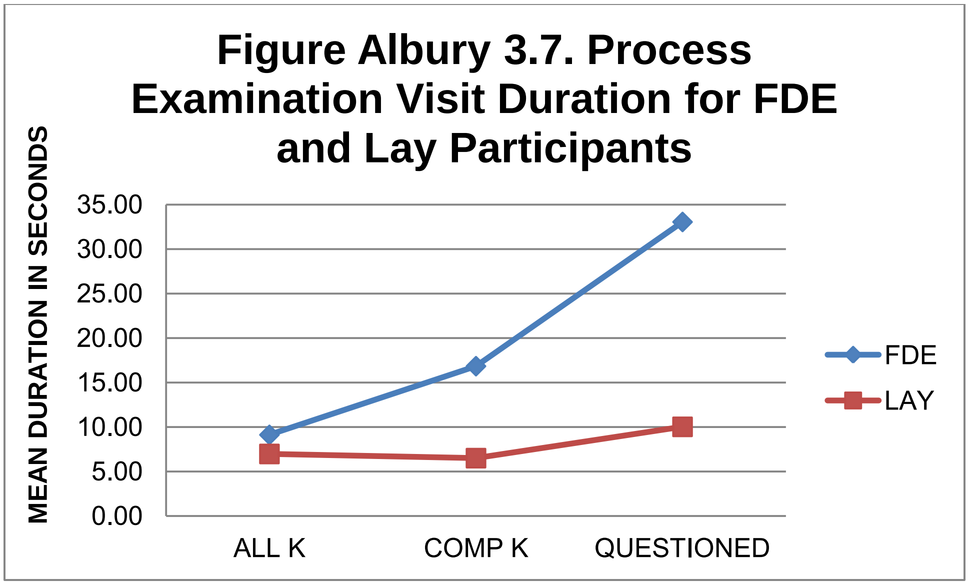
Table Albury 3.3
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.34	1.26	18.21	11.50	20.23	12.41
Lay	1.23	1.36	6.88	6.82	7.47	7.34

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .326, F (3, 86) = 13.86, p < .001, multivariate η^2 = .326. Figure Albury 3.7 presents the mean visit durations by AOI.

Figure Albury 3.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for lay participants, F (1, 88) = 42.52, p < .001, partial η^2 = .326, and F (1, 88) = 23.97, p < .001, partial η^2 = .281. The was significantly greater for FDEs than for lay participants, F(1, 88) = 31.57, p < partial η^2 = .214). Visit duration in the known signature stimulus was not significantly different between the groups, p = .184, *ns*. Table Albury 3.4 presents the means and standard deviations for areas of interest by participant type.

Table Albury 3.4

Process Analysis Visit Duration for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	9.11	8.60	16.83	12.58	33.04	21.35
Lay	6.96	6.39	6.49	6.05	10.01	9.35

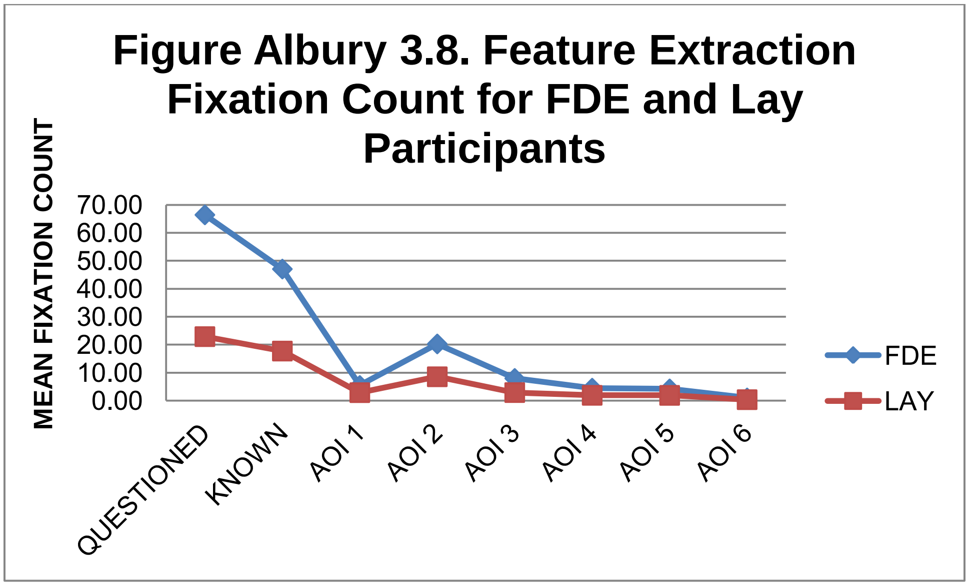
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .356, F (8, 81) = 5.59, p < .001, multivariate η^2 = .356. Figure Albury 3.8 presents the mean fixation counts by AOI.

Figure Albury 3.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature was significantly greater for FDEs than for lay participants, F (1, 88) = 34.59, p < .001, partial η^2 = .282, as well as for all knowns, F (1, 88) = 25.46, p < .001, partial η^2 = .224. Fixation counts in all AOIs were significantly greater for FDEs than for lay participants (AOI 1, F(1, 88) = 6.38, p = .013, partial η^2 = .068; AOI 2, F (1, 88) = 17.99, p < .001, partial η^2 = .170; AOI 3, F (1, 88) = 24.74, p < .001, partial η^2 = .219; AOI 4, F (1, 88) = 11.69, p = .001, partial η^2 = .117; AOI 5, F (1, 88) = 12.54, p = .001, partial η^2 = .125; AOI6, F (1, 88) = 5.56, p = .021, partial η^2 = .059). Table Albury 3.5 presents the means and standard deviations for areas of interest by participant type.

Table Albury 3.5

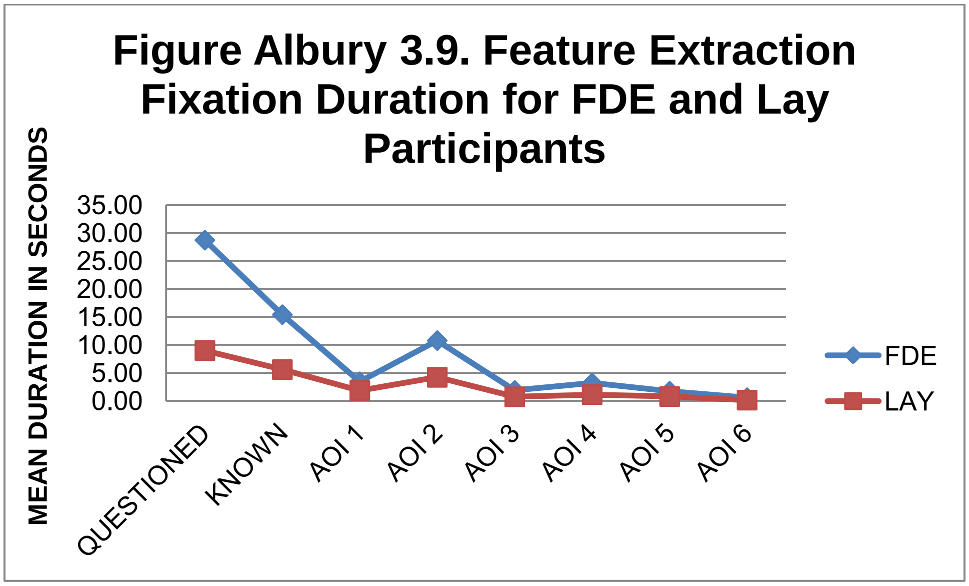
Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	66.45	41.49	47.09	34.60	5.47	5.37	1.89	1.51
Lay	22.93	26.27	17.77	16.64	2.91	4.09	0.61	0.86
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	8.00	5.99	4.51	4.42	4.26	3.71	1.02	1.61
Lay	2.93	3.10	1.95	2.21	1.93	2.28	0.40	0.69

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .388, F (8, 81) = 6.41, p < .001, multivariate η^2 = .388. Figure Albury 3.9 presents the mean fixation durations by AOI.

Figure Albury 3.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for lay participants, F (1, 88) = 38.74, p < .001, partial η^2 = .31, and F (1, 88) = 25.88, p < .001, partial η^2 = .23. Fixation durations in all AOIs was significantly greater for FDEs than for lay participants (AOI 1, F(1, 88) = 5.35, p = .023, partial η^2 = .057; AOI 2, F(1, 88) = 19.03, p < .001, partial η^2 = .178; AOI 3, F(1, 88) = 10.66, p = .002, partial η^2 = .108; AOI 4, F(1, 88) = 20.72, p < .001, partial η^2 = .191; AOI 5, F (1, 88) = 11.46, p = .001, partial η^2 = .115; *AOI 6*, F (1, 88) = 7.71, p = .007, partial η^2 = .081). Table Albury 3.6 presents the means and standard deviations for areas of interest by participant type.

Table Albury 3.6
Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

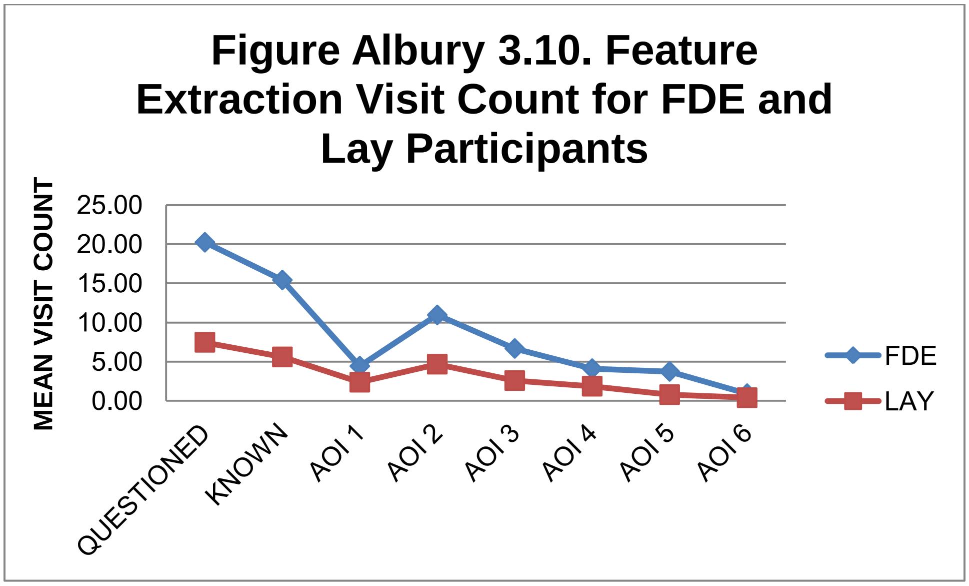
	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	28.76	19.23	15.42	11.53	3.43	3.95	10.78	9.07

Lay	9.00	8.24	5.60	5.46	1.87	2.06	4.22	4.04
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.87	2.12	3.19	2.79	1.74	1.54	0.58	1.00
Lay	0.74	0.86	1.12	1.11	0.79	1.06	0.14	0.28

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .356, $F(8, 81) = 5.61$, $p < .001$, multivariate $\eta^2 = .356$. Figure Albury 3.10 presents the mean total visit counts by AOI.

Figure Albury 3.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit counts for the questioned signature and known signature comparison stimulus were significantly greater for FDEs than for lay participants, $F(1, 88) = 34.45$, $p < .001$, partial $\eta^2 = .281$, and $F(1, 88) = 31.57$, $p < .001$, partial $\eta^2 = .264$. Visit count in all AOIs was significantly greater for FDEs than for lay participants (AOI 1, $F(1, 88) = 7.22$, $p = .009$, partial $\eta^2 = .076$; AOI 2, $F(1, 88) = 26.24$, $p < .001$, partial $\eta^2 = .230$; ; AOI 3, $F(1, 88) = 26.51$, $p < .001$, partial $\eta^2 = .232$; AOI 4, $F(1, 88) = 12.10$, $p = .001$, partial $\eta^2 = .121$; AOI 4, $F(1, 88) = 12.62$, $p = .001$, partial $\eta^2 = .125$; AOI 5, $F(1, 88) = 4.77$, $p = .032$, partial $\eta^2 = .051$). Table Albury 3.7 presents the means and standard deviations for areas of interest by participant type.

Table Albury 3.7

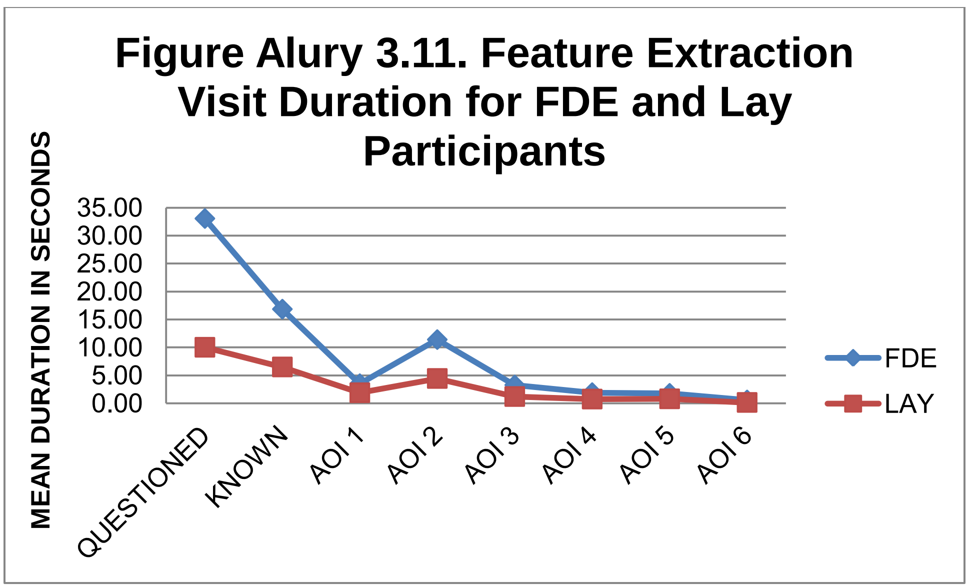
Feature Extraction Analysis Visit Count for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	20.23	12.41	18.21	11.50	4.43	4.30	10.96	6.62
Lay	7.47	7.34	6.88	6.82	2.37	2.69	4.67	4.77
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	6.68	4.67	4.11	3.73	3.74	3.06	0.91	1.41
Lay	2.58	2.43	1.86	2.10	1.79	1.99	0.40	0.69

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .391, $F(8, 81) = 6.49$, $p < .001$, multivariate $\eta^2 = .391$. Figure Albury 3.11 presents the mean total visit counts by AOI.

Figure Albury 3.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Visit duration for the known signature and known signature comparison stimulus were significantly greater for FDEs than for lay participants, $F(1, 88) = 42.52$, $p < .001$, partial $\eta^2 = .326$, and $F(1, 88) = 23.97$, $p < .001$, partial $\eta^2 = .214$. Visit duration in all AOIs was significantly greater for FDEs than for lay participants (AOI 1, $F(1, 88) = 5.59$, $p = .020$, partial $\eta^2 = .060$; AOI 2, $F(1, 88) = 19.84$, $p < .001$, partial $\eta^2 = .180$; ; AOI 3, $F(1, 88) = 19.37$, $p < .001$, partial $\eta^2 = .180$; AOI 4, $F(1, 88) = 10.79$, $p = .001$, partial $\eta^2 = .109$; AOI 4, $F(1, 88) =$

11.74, p = .001, partial η^2 = .118; AOI 5, $F(1, 88)$ = 7.78, p = .006, partial η^2 = .081). Table Albury 3.8 presents the means and standard deviations for areas of interest by participant type.

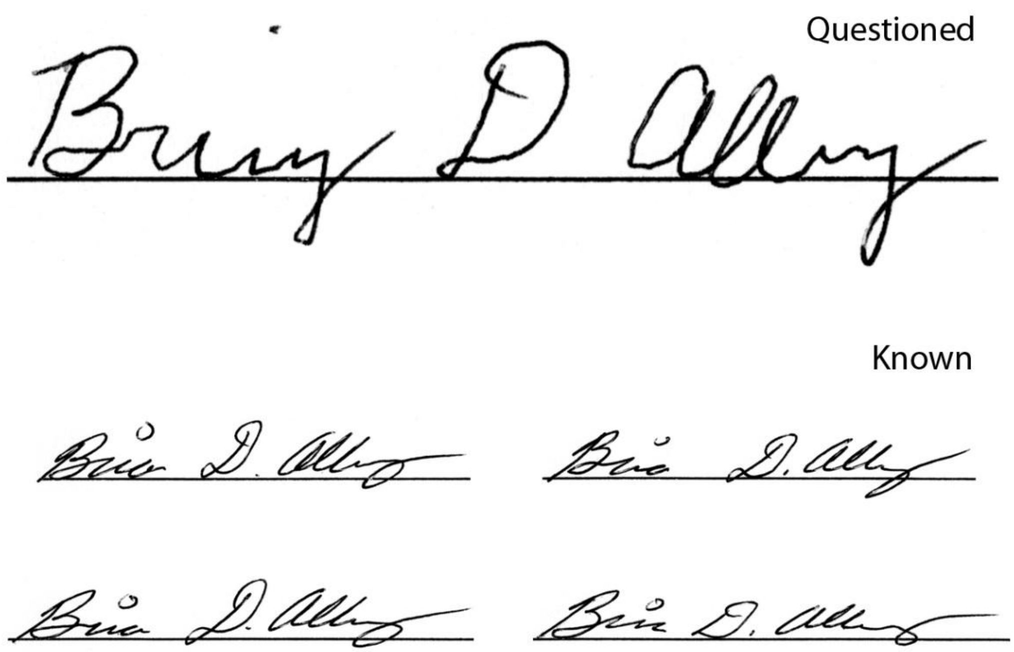
Table Albury 3.8
Feature Extraction Analysis Visit Duration for FDE and Lay Participants

	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	33.04	21.35	16.83	12.58	3.50	4.01	11.39	9.36
Lay	10.01	9.35	6.49	6.05	1.88	2.10	4.43	4.34
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	3.26	2.87	1.90	2.15	1.78	1.59	0.58	1.00
Lay	1.20	1.16	0.75	0.86	0.79	1.07	0.14	0.28

Albury Signature 4: Traced

Of the 49 FDE participants, 47 correctly identified the signature as non-genuine. Two FDEs declined to respond. Of the 43 Lay participants, 42 responded correctly that the signature was non-genuine, while 1 responded that the signature was genuine. This difference was not statistically significant, $p = .234$, *ns*. Figure Albury 4.1 presents the comparison view of this signature.

Figure Albury 4.1. Questioned-Known Comparison Stimulus for Albury Signature 4.

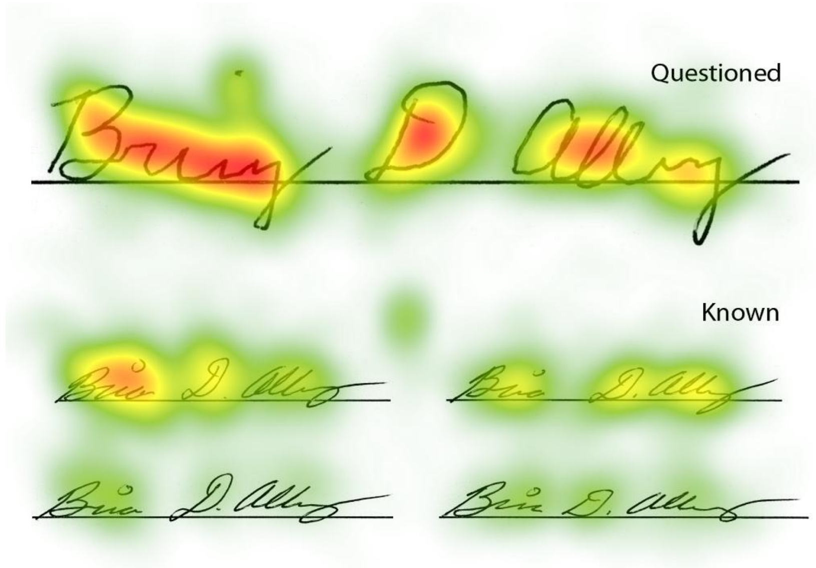


Selection of Areas of Interest (AOIs)

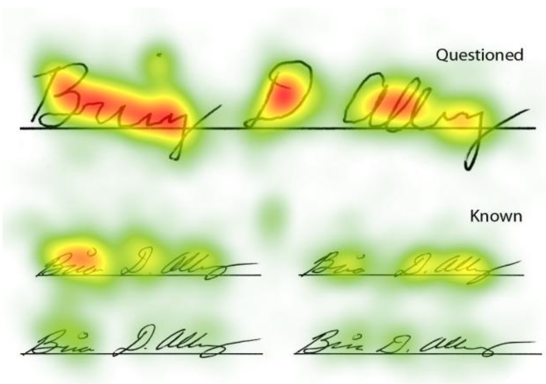
Figure Albury 4.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were two locations indicated by red "hot spots" within the signature that elicited significant attention from the participants. AOIs were created for these specific hot spots. Larger, secondary AOIs incorporating the smaller hot spots were created to include the orange "warm spots", creating a total of four AOIs for this stimulus. Figure Albury 4.3 presents the location of the AOIs identified in the heat map.

Figure Albury 4.2. Heat map for Albury signature 4, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

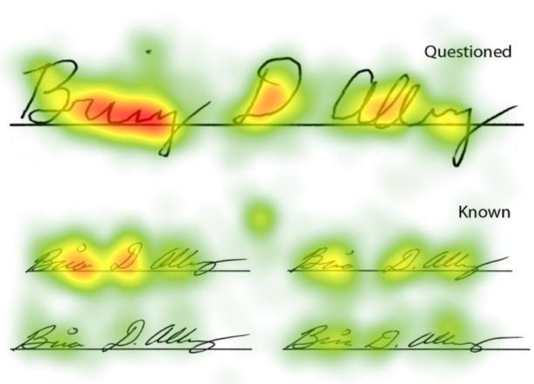
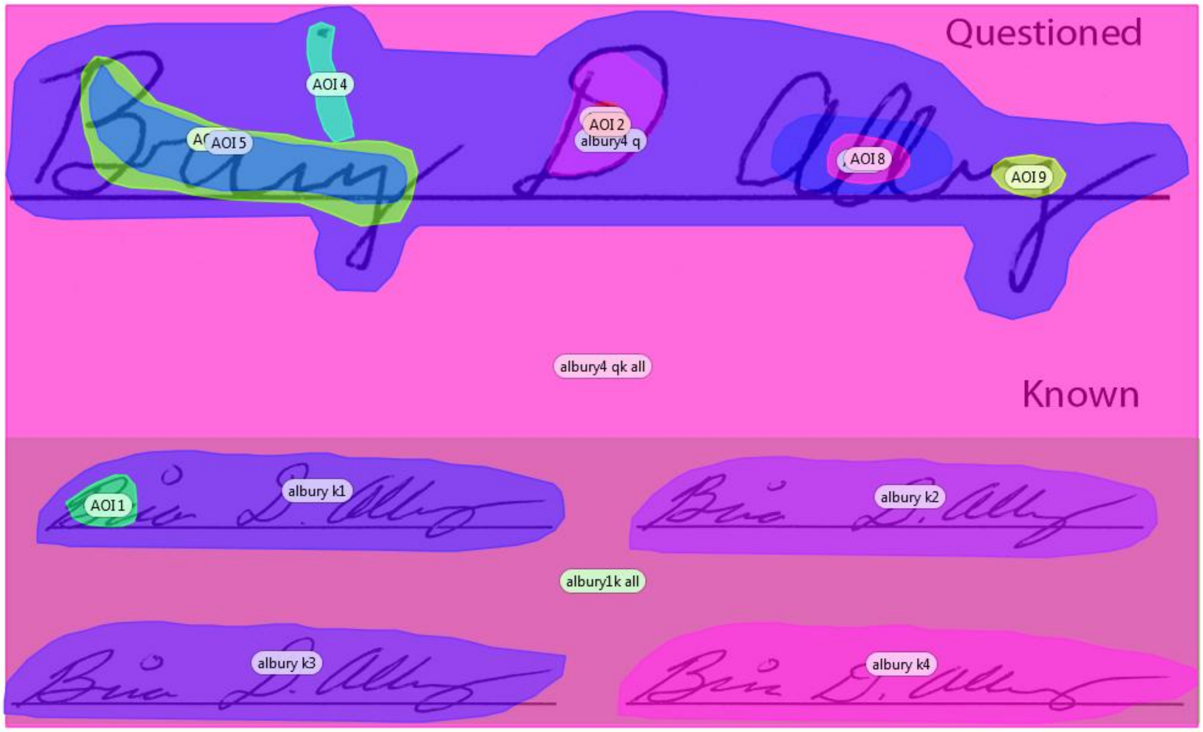


Figure Albury 4.3. Areas of Interest (AOIs) for Albury Signature 4.



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

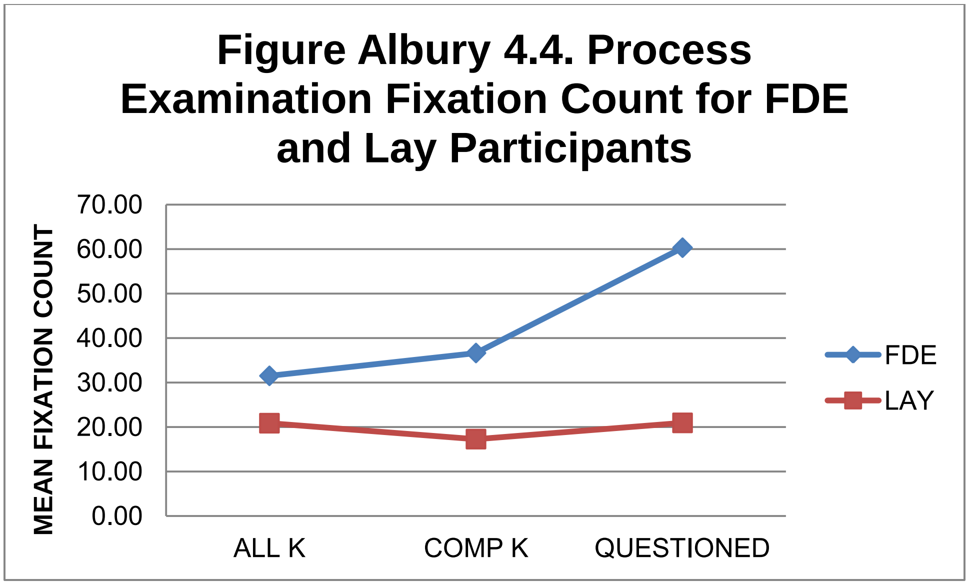
Examination Process Analyses

These analyses are based on AOIs Albury4Q, Albury K All, and Albury K All on the known signature stimulus (not pictured).

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .321, $F(3, 86) = 13.57$, $p < .001$, multivariate $\eta^2 = .321$. Figure Albury 4.4 presents the mean fixation counts by AOI.

Figure Albury 4.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixations counts in all areas of interest. Fixation counts in both the known signature stimulus and the known signature comparison stimulus were significantly greater for FDEs than for lay participants (questioned signature, $F(1, 88) = 29.22$, $p < .001$, partial $\eta^2 = .249$; known signature comparison stimulus, $F(1, 88) = 8.33$, $p = .005$, partial $\eta^2 = .086$). No significant difference was found in the known signature stimulus, $p = .059$, *ns*. Table Albury 4.1 presents the means and standard deviations for areas of interest by participant type.

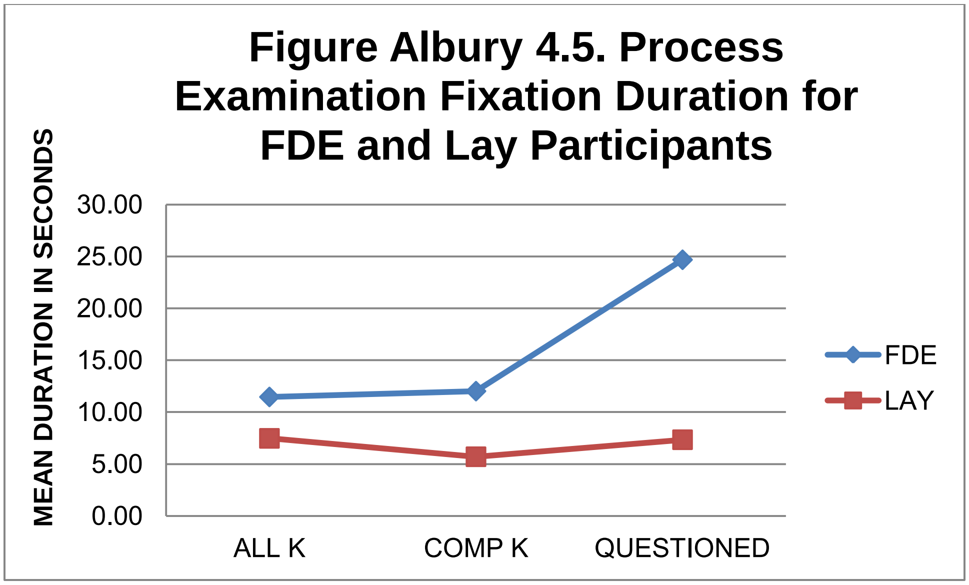
Table Albury 4.1
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	31.49	34.38	36.62	40.89	60.30	44.32
Lay	20.84	12.99	17.26	16.95	20.91	18.63

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .302, $F(3, 86) = 12.40$, $p < .001$, multivariate $\eta^2 = .302$. Figure Albury 4.5 presents the mean fixation counts by AOI.

Figure Albury 4.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation durations in all areas of interest. Fixation durations in both the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for lay participants (questioned signature, F (1, 88) = 25.91, p < .001, partial η^2 = .227; known signature comparison stimulus, F (1, 88) = 8.02, p = .006, partial η^2 = .084). Total fixation duration for the known signature stimulus was not significantly greater for FDEs than for lay participants, p = .081, *ns*. Table Albury 4.2 presents the means and standard deviations for areas of interest by participant type.

Table Albury 4.2

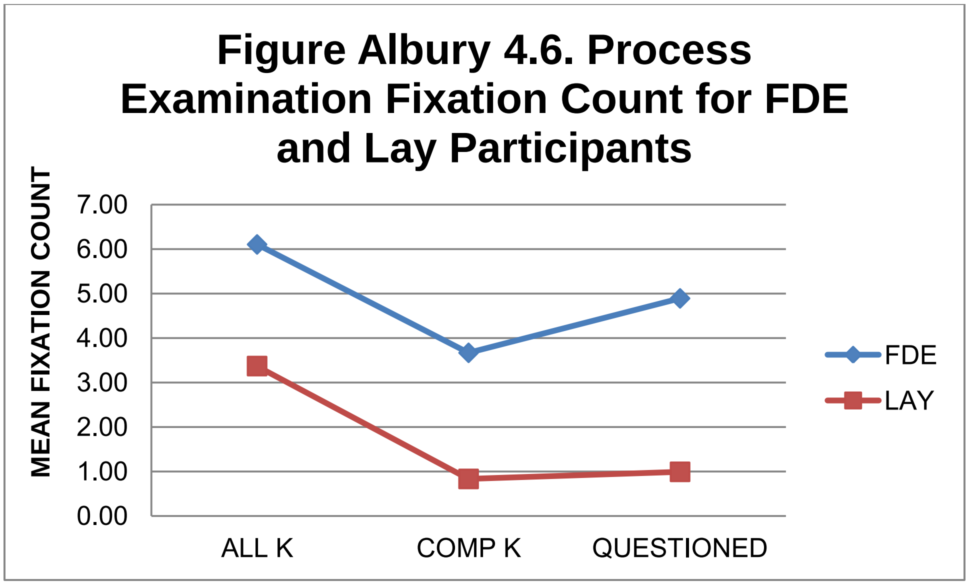
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	11.46	13.62	12.02	13.16	24.68	21.48
Lay	7.47	6.03	9.00	11.00	7.34	6.35

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .245, F (3, 86) = 9.30, p < .001, multivariate η^2 = .245. Figure Albury 4.6 presents the mean visit counts by AOI.

Figure Albury 4.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Visit counts in both the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for lay participants (questioned signature, F (1, 88) = 17.00, p < .001, partial η^2 = .162; known signature comparison stimulus, F (1, 88) = 11.52, p = .001, partial η^2 = .116). Visit count for the known signature stimulus was not significantly greater for FDEs than for lay participants, p = .197, *ns*. Table Albury 4.3 presents the means and standard deviations for areas of interest by participant type.

Table Albury 4.3

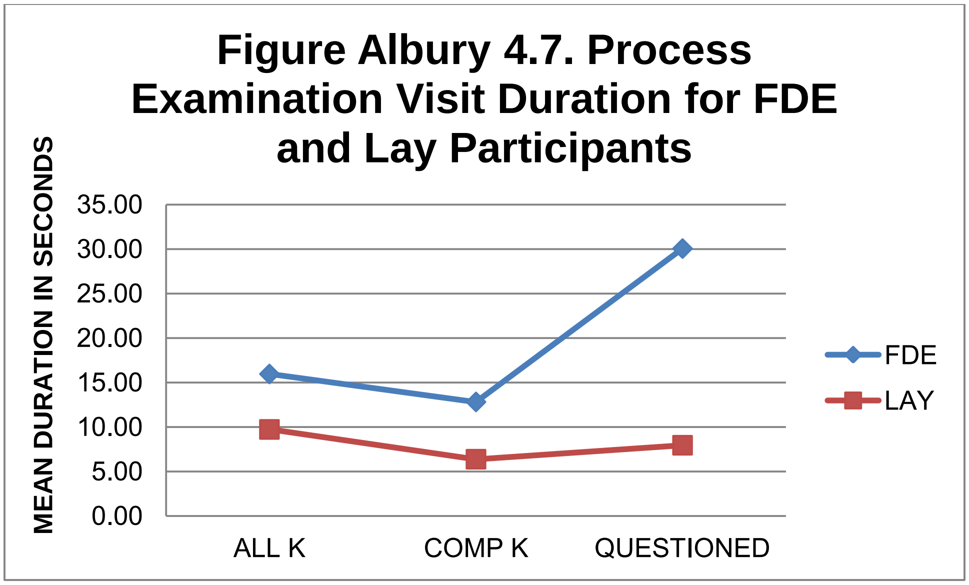
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.40	1.99	14.72	15.02	16.91	14.58
Lay	1.56	1.48	6.40	6.02	6.98	6.36

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .257, F (3, 86) = 9.93, p < .001, multivariate η^2 = .257. Figure Albury 4.7 presents the mean visit durations by AOI.

Figure Albury 4.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Visit durations in both the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for lay participants (questioned signature, F (1, 88) = 28.31, p < .001, partial η^2 = .243; known signature comparison stimulus, F (1, 88) = 7.16, p = .009, partial η^2 = .075). Visit duration for the known signature stimulus was not significantly greater for FDEs than for lay participants, p = .096, *ns*. Table Albury 4.4 presents the means and standard deviations for areas of interest by participant type.

Table Albury 4.4
Process Analysis Visit Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	15.95	23.10	12.81	14.22	30.05	26.43
Lay	9.72	7.91	6.37	7.14	7.94	6.83

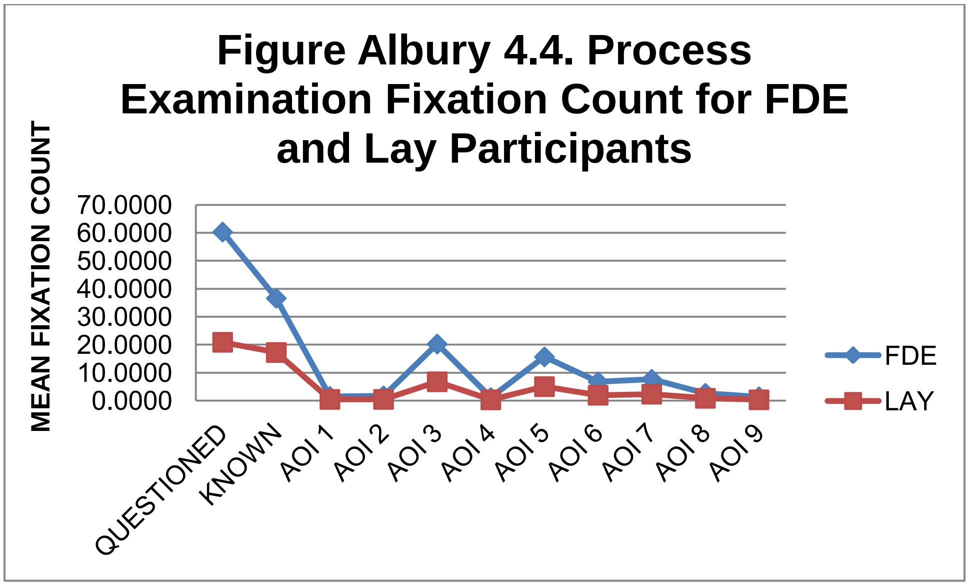
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .373, F (11, 78) = 4.22, p < .001, multivariate η^2 = .373. Figure Albury 4.8 presents the mean fixation counts by AOI.

Figure Albury 4.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature was significantly greater for FDEs than for lay participants, F (1, 88) = 29.22, p < .001, partial η^2 = .249, as well as for known signature comparison stimulus, F (1, 88) = 8.33, p = .005, partial η^2 = .086. Fixation counts in all AOIs were significantly greater for FDEs than for lay participants (AOI 1, F (1, 88) = 9.99, p = .002, partial η^2 = .102; AOI 2, F (1, 88) = 12.49, p = .001, partial η^2 = .124; AOI 3, F (1, 88) = 22.51, p < .001, partial η^2 = .204; AOI 4, F (1, 88) = 10.36, p = .002, partial η^2 = .105; AOI 5, F (1, 88) = 20.30, p < .001, partial η^2 = .187; AOI6, F (1, 88) = 23.83, p < .001, partial η^2 = .213; AOI7, F (1, 88) = 18.25, p < .001, partial η^2 = .172; AOI8, F (1, 88) = 10.15, p = .002, partial η^2 = .103; AOI9, F (1, 88) = 8.45, p = .005, partial η^2 = .088). Table Albury 4.5 presents the means and standard deviations for areas of interest by participant type.

Table Albury 4.5

Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	60.30	44.32	36.62	40.89	1.55	2.08	1.74	2.20
Lay	20.91	18.63	17.26	16.95	0.49	0.77	0.49	0.80
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***

FDE	20.28	17.57	1.13	1.50	15.68	14.63	6.81	6.15
Lay	6.79	6.49	0.33	0.68	5.05	5.26	1.98	2.17
	AOI 7		**AOI 8**		**AOI 9**			
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***		
FDE	7.68	7.74	2.68	3.53	1.43	2.31		
Lay	2.35	2.77	0.88	1.14	0.35	0.78		

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .250, $F(10, 79) = 2.64$, $p = .008$, multivariate $\eta^2 = .250$. Figure Albury 4.9 presents the mean fixation durations by AOI.

Figure Albury 4.9

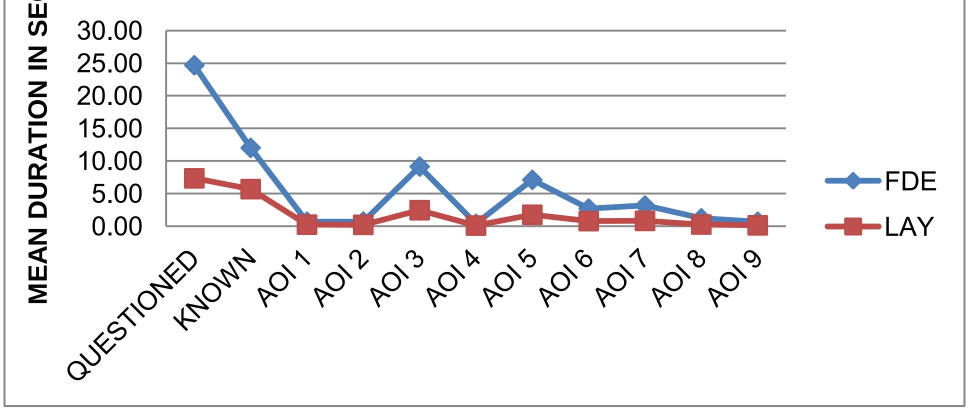


Figure Albury 4.9. Feature Extraction Fixation Duration for FDE and Lay Participants

Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature was significantly greater for FDEs than for lay participants, F (1, 88) = 25.91, $p < .001$, partial $\eta^2 = .227$, as well as for known signature comparison stimulus, F (1, 88) = 8.02, $p = .006$, partial $\eta^2 = .084$. Fixation counts in all AOIs were significantly greater for FDEs than for lay participants (AOI 1, F (1, 88) = 8.37, $p = .005$, partial $\eta^2 = .087$; AOI 2, F (1, 88) = 10.79, $p = .001$, partial $\eta^2 = .109$; AOI 3, F (1, 88) = 21.48, $p < .001$, partial $\eta^2 = .196$; AOI 4, F (1, 88) = 8.81, $p = .004$, partial $\eta^2 = .091$; AOI 5, F (1, 88) = 19.13, $p < .001$, partial $\eta^2 = .179$; AOI6, F (1, 88) = 18.02, $p < .001$, partial $\eta^2 = .170$; AOI7, F (1, 88) = 18.52, $p < .001$, partial $\eta^2 = .174$; AOI8, F (1, 88) = 12.64, $p = .001$, partial $\eta^2 = .126$; AOI9, F (1, 88) = 9.40, $p = .003$, partial $\eta^2 = .096$). Table Albury 4.6 presents the means and standard deviations for areas of interest by participant type.

Table Albury 4.6

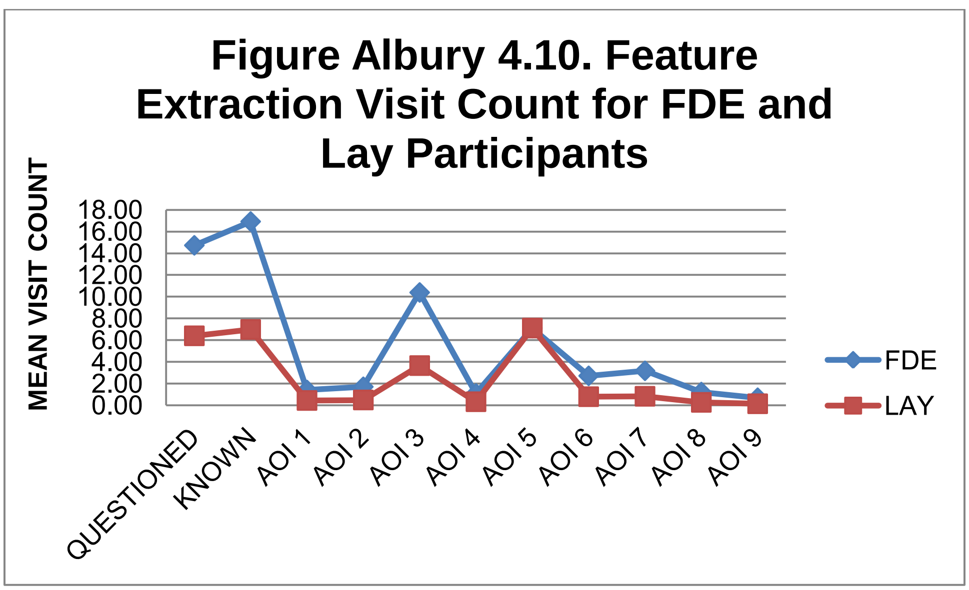
Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	24.68	21.48	12.02	13.16	0.70	0.93	0.72	0.94
Lay	7.34	6.35	5.70	6.72	0.24	0.44	0.22	0.35
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	9.15	9.24	0.38	0.55	7.11	7.85	2.71	2.81
Lay	2.46	2.12	0.10	0.25	1.76	1.69	0.79	1.00
	AOI 7		**AOI 8**		**AOI 9**			
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***		
FDE	3.17	3.45	1.22	1.72	0.69	1.14		
Lay	0.83	0.96	0.27	0.34	0.14	0.34		

<u>*Total Visit Count*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .389, F (11, 78) = 4.52, p < .001, multivariate η^2 = .389. Figure Albury 4.10 presents the mean total visit counts by AOI.

Figure Albury 4.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for lay participants, F (1, 88) = 17.00, p < .001, partial η^2 = .162; F (1, 88) = 11.52, p = .001, partial η^2 = .116. Visit count in all AOIs was significantly greater for FDEs than for lay participants (AOI 1, F (1, 88) = 10.65, p = .002, partial η^2 = .108; AOI 2, F (1, 88) = 12.31, p = .001, partial η^2 = .123; AOI 3, F (1, 88) = 21.54, p < .001, partial η^2 = .197; AOI 4, F (1, 88) = 10.85, p = .001, partial η^2 = .110; AOI 5, F (1, 88) = 21.11, p < .001, partial η^2 = .193; AOI 6, F (1, 88) = 26.50, p < .001, partial η^2 = .231; AOI 7, F (1, 88) = 17.58, p < .001, partial η^2 = .167; AOI 8, F (1, 88) = 10.28, p = .002, partial η^2 = .105, AOI 9, F (1, 88) = 8.22, p = .005, partial η^2 = .085). Table Albury 4.7 presents the means and standard deviations for areas of interest by participant type.

Table Albury 4.7

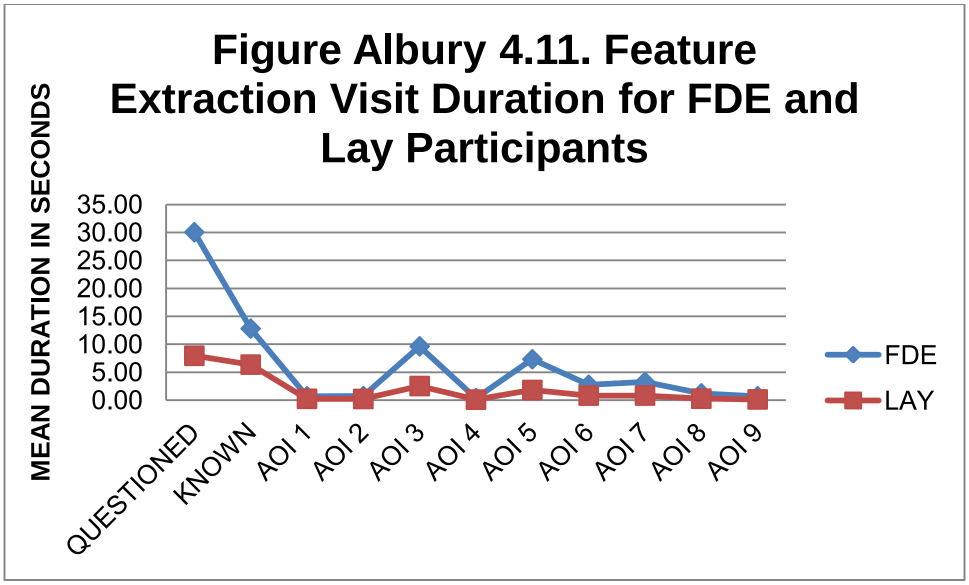
Feature Extraction Analysis Visit Count for FDE and Lay Participants

	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	16.91	14.58	14.72	15.02	1.40	1.81	1.70	2.14
Lay	6.98	6.36	6.40	6.02	0.44	0.70	0.49	0.80
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	10.38	8.96	1.09	1.36	9.32	8.83	6.02	5.25
Lay	3.65	3.32	0.33	0.68	2.86	2.76	1.70	1.73
	AOI 7		**AOI 8**		**AOI 9**			
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***		
FDE	5.55	5.49	2.47	3.30	1.34	2.14		
Lay	1.86	1.87	0.79	0.99	0.35	0.78		

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .389, F (11, 78) = 4.51, p < .001, multivariate η^2 = .389. Figure Albury 4.11 presents the mean total visit counts by AOI.

Figure Albury 4.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit durations for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for lay participants, F (1, 88) = 28.31, p < .001, partial η^2 = .243, and F (1, 88) = 7.16, p = .009, partial η^2 = .075. Visit duration in all AOIs was significantly greater for FDEs than for lay participants (AOI 1, F (1, 88) = 8.35, p = .005, partial η^2 = .087; AOI 2, F (1, 88) = 10.96, p = .001, partial η^2 = .111; AOI 3, F (1, 88) = 23.06, p < .001, partial η^2 = .208; AOI 4, F (1, 88) = 8.81, p = .004, partial η^2 = .091; AOI 5, F (1, 88) = 18.98, p < .001, partial η^2 = .177; AOI6, F (1, 88) = 17.53, p < .001, partial η^2 = .166, AOI 7, F (1, 88) = 18.75, p < .001, partial η^2 = .176, AOI 8, F (1, 88) = 12.47, p = .001, partial η^2 = .124, AOI 9, F (1, 88) = 9.47, p = .003, partial η^2 = .097). Table Albury 4.8 presents the means and standard deviations for areas of interest by participant type.

Table Albury 4.8

Feature Extraction Analysis Visit Duration for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	30.05	26.43	12.81	14.22	0.70	0.93	0.73	0.96
Lay	7.94	6.83	6.37	7.14	0.25	0.45	0.22	0.35

	AOI 3		AOI 4		AOI 5		AOI 6	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	9.64	9.46	0.38	0.55	7.33	8.09	2.76	2.84
Lay	2.53	2.27	0.10	0.25	1.83	1.83	0.83	1.11

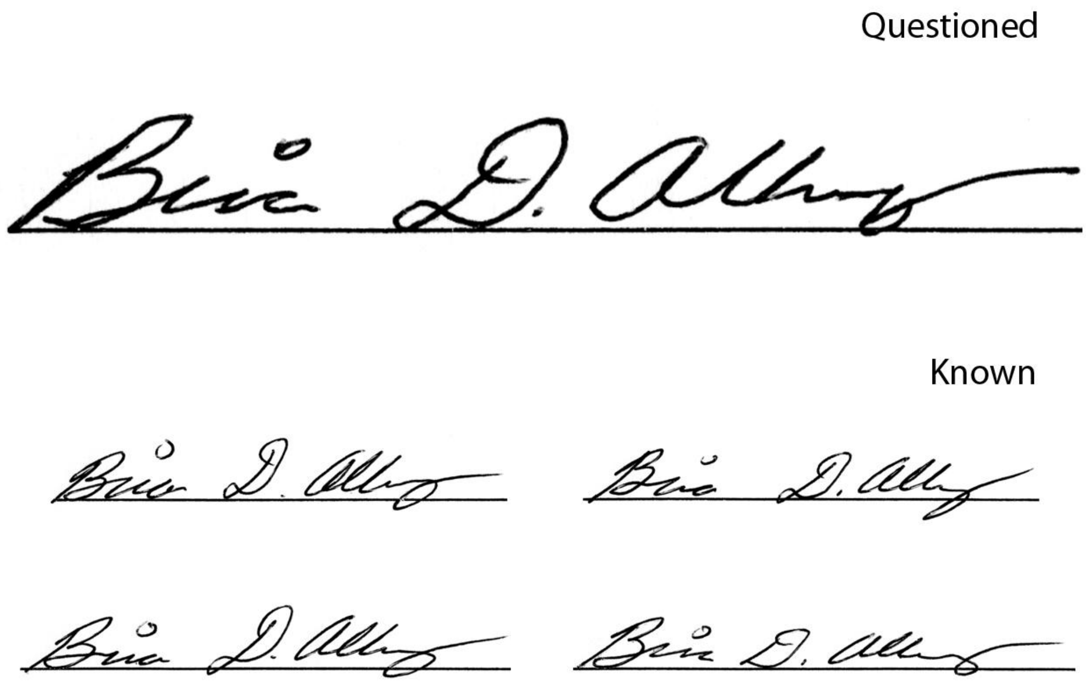
	AOI 7		AOI 8		AOI 9	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	3.26	3.54	1.23	1.73	0.70	1.15

Lay	0.84	0.98	0.28	0.37	0.14	0.34

Albury Signature 5: Traced

Of the 49 FDE participants, 10 correctly identified the signature as non-genuine, while the remaining 39 identified the signature as genuine. Of the 43 Lay participants, 1 responded correctly that the signature was non-genuine, while 42 responded that the signature was genuine. This difference was statistically significant, χ^2 (1, N = 92) = 7.11, *p* = .008. Figure Albury 5.1 presents the comparison view of this signature.

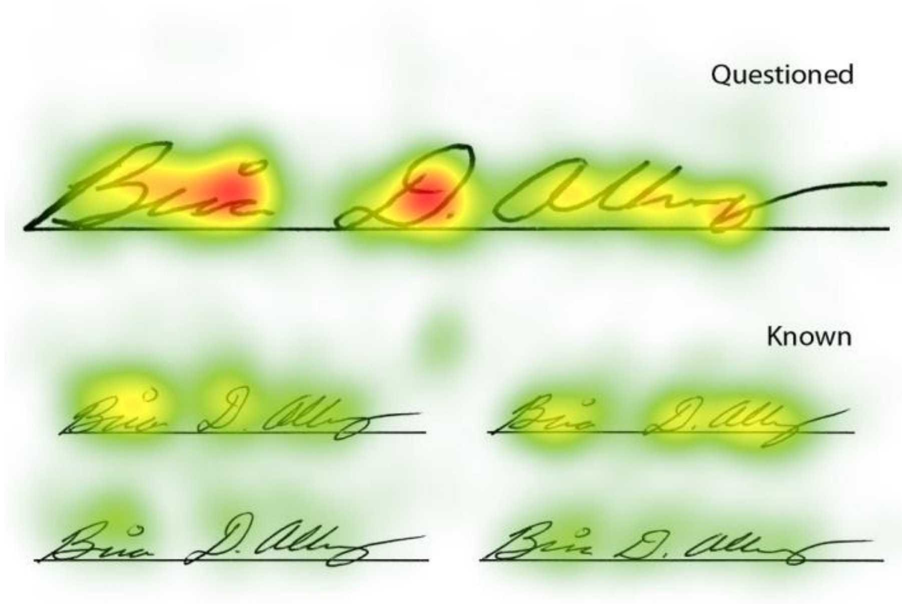
Figure Albury 5.1. Questioned-Known Comparison Stimulus for Albury Signature 5.



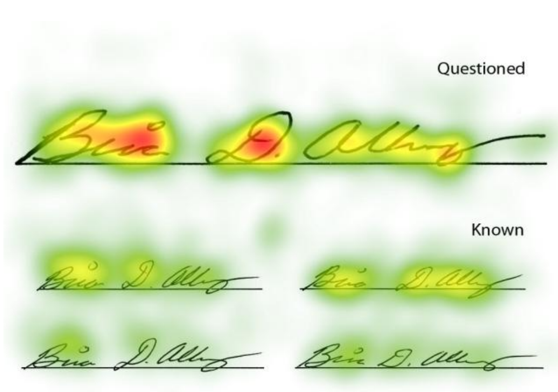
Selection of Areas of Interest (AOIs)

Figure Albury 5.2. Heat map for Albury signature 5, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

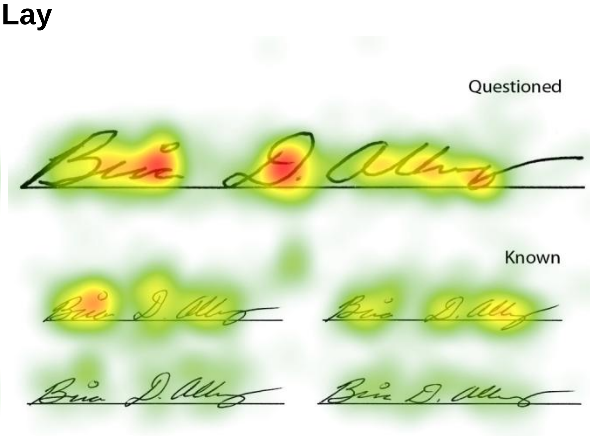
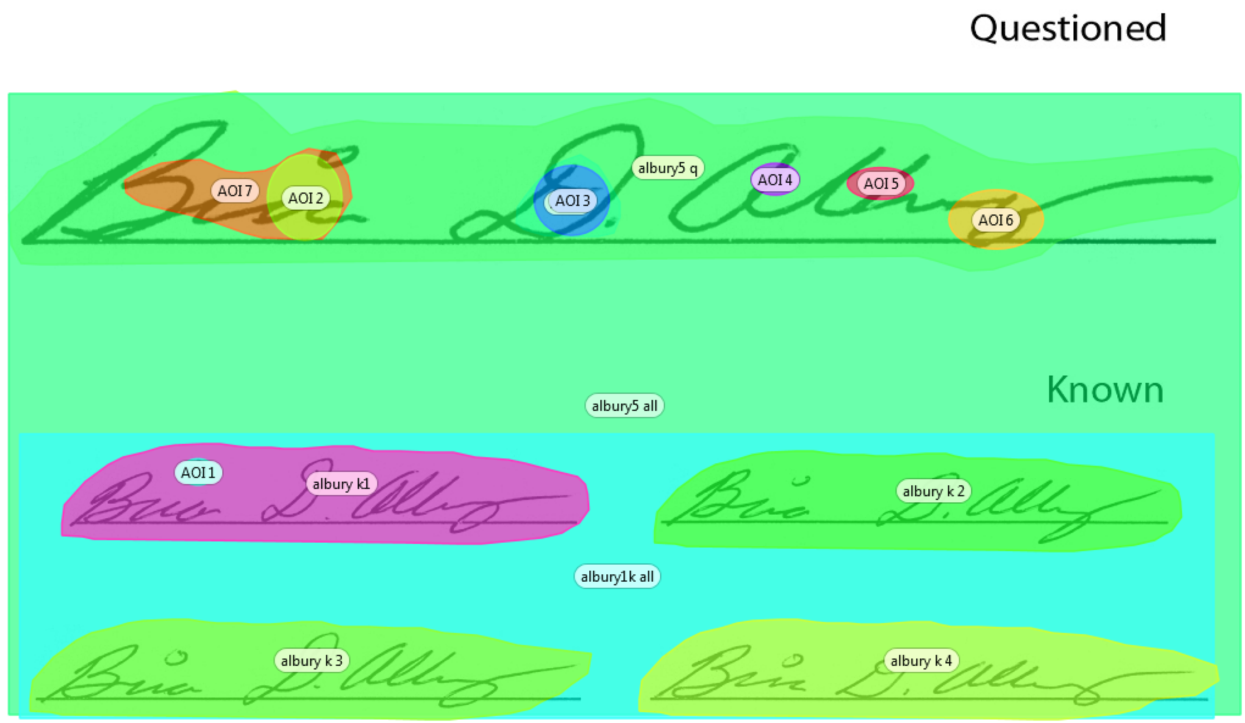


Figure Albury 5.3. Areas of Interest (AOIs) for Albury Signature 5



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

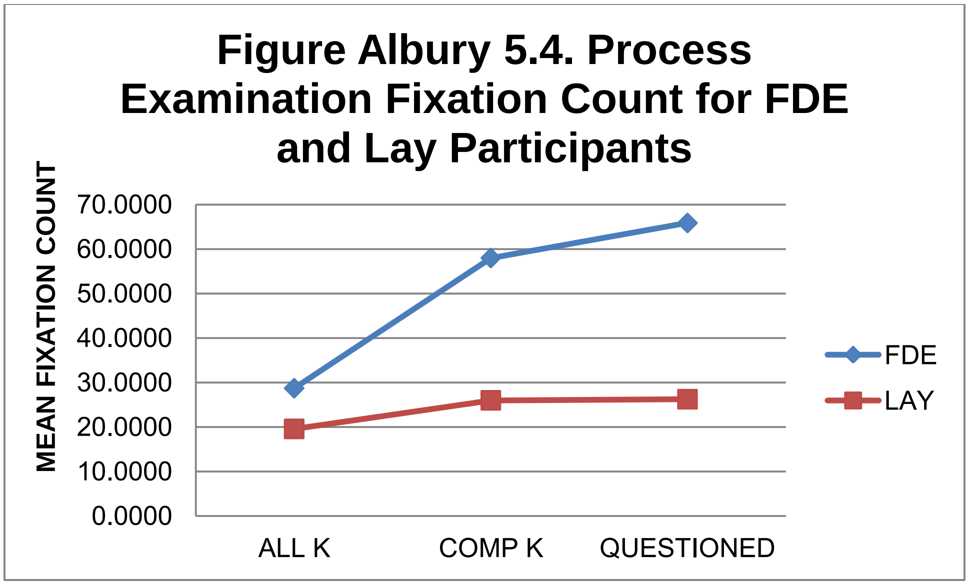
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. These analyses are based on AOIs Albury5 Q, Albury5 K All, and Albury K All on the known signature stimulus (not pictured).

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .298, F (3, 86) = 12.15, p < .001, multivariate η^2 = .298. Figure Albury 5.4 presents the mean fixation counts by AOI.

Figure Albury 5.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixations counts in all areas of interest. Total fixation count for the questioned signature was significantly greater for FDEs than for lay participants, F (1, 88) = 28.51, $p <$ .001, partial η^2 = .245. Fixation counts in the known signature comparison stimulus was also significantly difference between groups, F (1, 88) = 15.63, $p <$ .001, partial η^2 = .15. Finally, the known signature comparison stimulus was significantly greater for FDEs than for lay participants, F (1, 88) = 4.76, p = .03, partial η^2 = .05). Table Albury 5.1 presents the means and standard deviations for areas of interest by participant type.

Table Albury 5.1

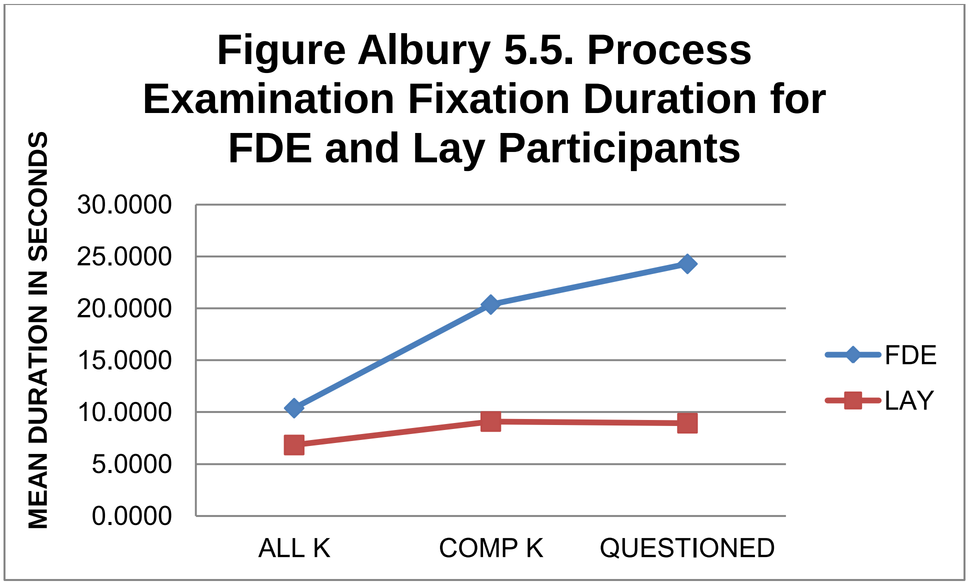
Process Analysis Fixation Counts FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	28.70	23.75	57.98	44.45	65.85	41.95
Lay	19.56	14.44	25.88	30.61	26.23	25.76

<u>*Total Fixation Duration*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .330, F (3, 86) = 14.13, $p <$ .001, multivariate η^2 = .330. Figure Albury 5.5 presents the mean fixation counts by AOI.

Figure Albury 5.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation durations in two of the three areas of interest. Total fixation duration for the questioned signature was significantly greater for FDEs than for lay participants, F (1, 88) = 33.49, p < .001, partial η^2 = .276. Fixation duration for the known signature comparison stimulus was also significantly greater for FDEs than for lay participants, F (1, 88) = 14.55, p < .001, partial η^2 = .142. Fixation durations in the known signature stimulus were not significantly different between the groups, p = .054, *ns*. Table Albury 5.2 presents the means and standard deviations for areas of interest by participant type.

Table Albury 5.2

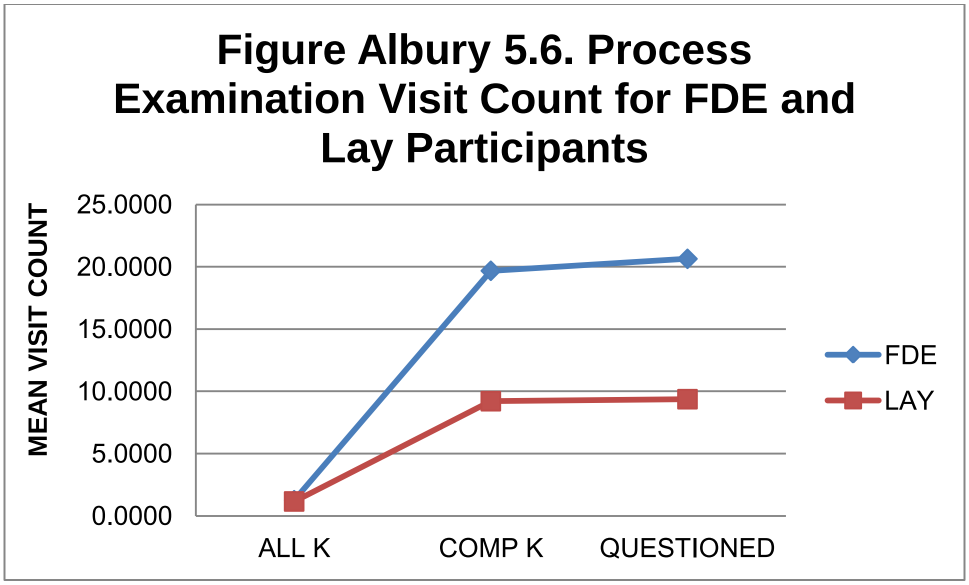
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	10.38	10.21	20.36	15.71	24.28	15.11
Lay	6.83	6.42	9.09	11.90	8.93	8.98

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .255, F (3, 86) = 9.83, p < .001, multivariate η^2 = .255. Figure Albury 5.6 presents the mean visit counts by AOI.

Figure Albury 5.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all but one area of interest. Total visit count for the questioned signature was significantly greater for FDEs than for lay participants, $F\ (1, 88) = 25.11$, $p < .001$, partial $\eta^2 = .222$. The known signature comparison stimulus was significantly greater for FDEs than for lay participants, $F\ (1, 88) = 21.28$, $p < .001$, partial $\eta^2 = .195$). Visit count in the known signature stimulus was not significantly different between the groups, $p = .549$, *ns*. Table 5.3 presents the means and standard deviations for areas of interest by participant type.

Table Albury 5.3

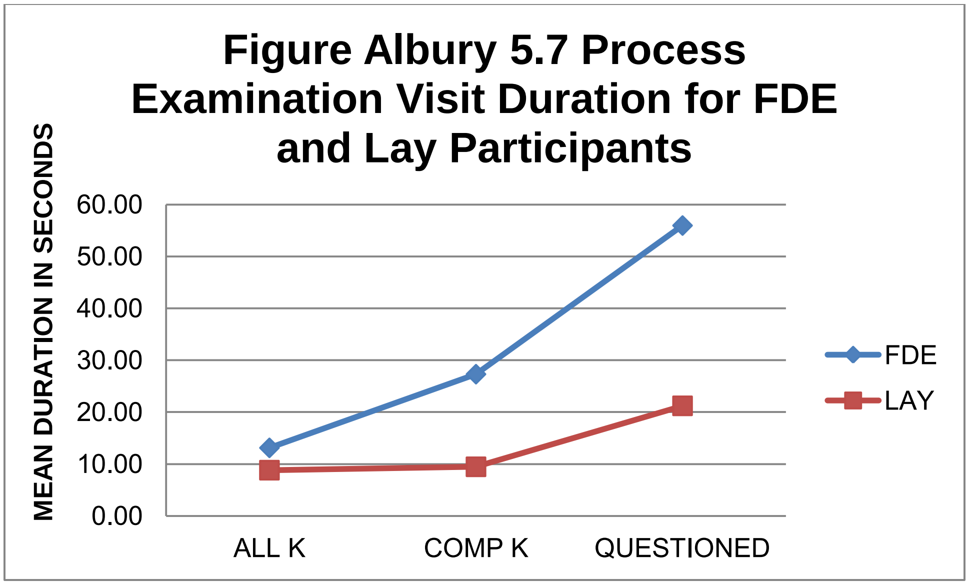
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.26	0.71	19.68	11.38	20.64	11.30
Lay	1.16	0.75	9.21	10.03	9.37	9.90

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .345, $F\ (3, 86) = 15.12$, $p < .001$, multivariate $\eta^2 = .345$. Figure Albury 5.7 presents the mean visit durations by AOI.

Figure Albury 5.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in two of the three areas of interest. Total visit duration for the questioned signature was significantly greater for FDEs than for lay participants, F (1, 88) = 31.74, p < .001, partial η^2 = .265. The known signature comparison stimulus was significantly greater for FDEs than for lay participants, F (1, 88) = 40.62, p < .001, partial η^2 = .316). Visit duration in the known signature stimulus was not significantly different between groups, p = .061, *ns*. Table Albury 5.4 presents the means and standard deviations for areas of interest by participant type.

Table Albury 5.4

Process Analysis Visit Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	13.11	12.78	27.31	15.97	55.95	33.69
Lay	8.81	7.90	9.46	9.48	21.21	23.37

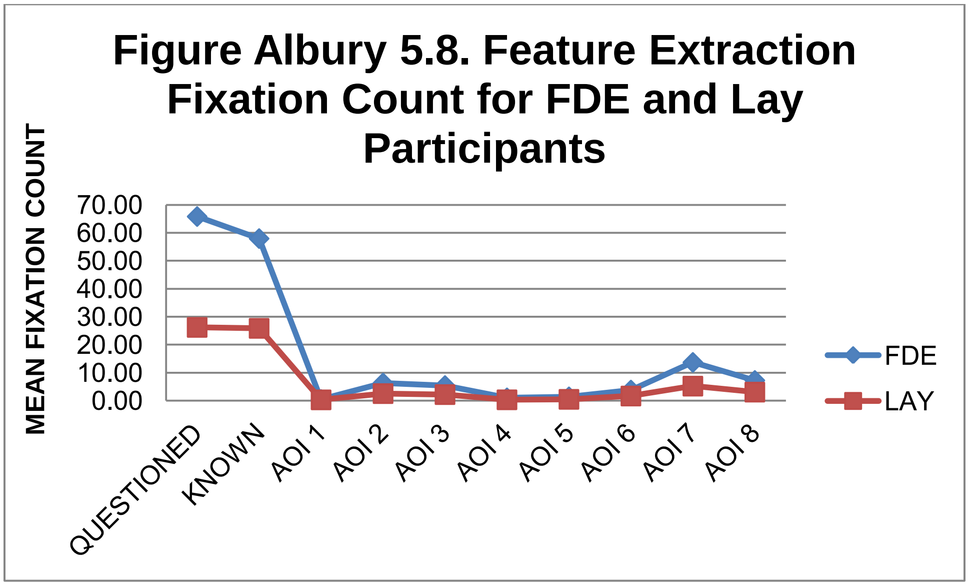
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination. AOIs for the following analyses include the AOI encompassing the questioned signature, the AOI encompassing the four known signatures, and the eight additional AOIs encompassing the hot and warm spots indicated on the heat map.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .372, F (10, 79) = 4.69, p < .001, multivariate η^2 = .372. Figure Albury 5.8 presents the mean fixation counts by AOI.

Figure Albury 5.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all but one area of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for lay participants, F (1, 88) = 28.51, p < .001, partial η^2 = .245, and F (1, 88) = 15.63, p < .001, partial η^2 = .151. Fixations counts in all but AOI 1 were significantly greater for FDEs than for lay participants (AOI 2, F (1, 88) = 17.14, p < .001, partial η^2 = .163; AOI 3, F (1, 88) = 15.52, p < .001, partial η^2 = .150; AOI 4, F (1, 88) = 6.03, p < .02, partial η^2 = .064; AOI 5, F (1, 88) = 5.21, p = .025, partial η^2 = .056; AOI 6, F (1, 88) = 9.40, p = .003, partial η^2 = .097; AOI 7, F (1, 88) = 20.26, p < .001, partial η^2 = .187; AOI 8, F (1, 88) = 16.93, p < .001, partial η^2 = .161. No significant difference was found in AOI 1, p = .60, *ns*. Table Albury 5.5 presents the means and standard deviations for areas of interest by participant type.

Table Albury 5.5

Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

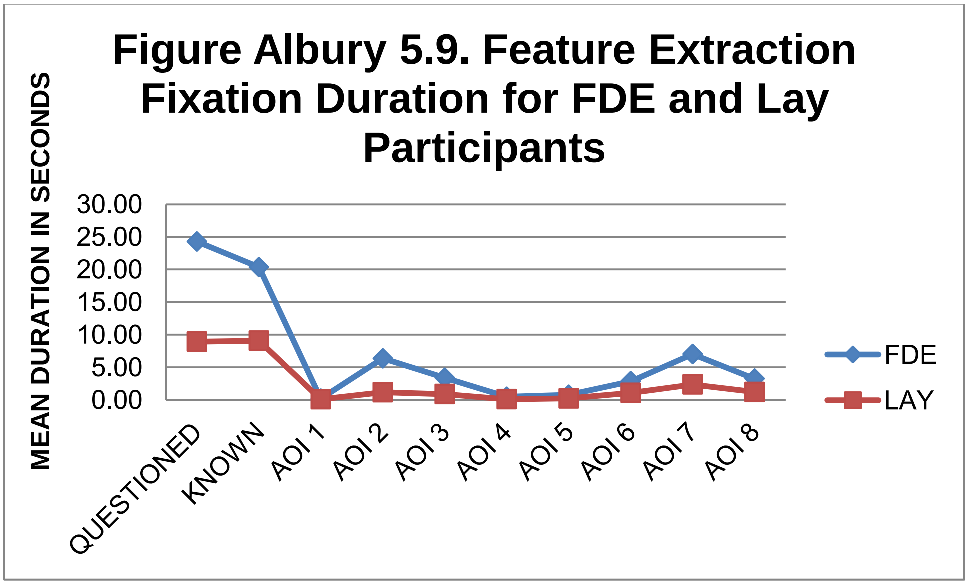
	QUESTIONED		KNOWN		AOI 1		AOI 2		AOI 3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	65.85	41.95	57.98	44.45	0.47	0.86	6.36	5.21	5.45	5.02
Lay	26.23	25.76	25.88	30.61	0.33	0.89	2.56	3.15	2.21	2.04
	AOI 4		**AOI 5**		**AOI 6**		**AOI 7**		**AOI 8**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***

FDE	1.04	1.71	1.40	2.36	3.83	3.80	13.72	11.18	7.28	5.98
Lay	0.35	0.75	0.51	1.05	1.70	2.64	5.23	5.53	3.09	3.07

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .416, F (10, 79) = 5.62, p < .001, multivariate η^2 = .416. Figure Albury 5.9 presents the mean fixation durations by AOI.

Figure Albury 5.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for lay participants, F (1, 88) = 33.49, p < .001, partial η^2 = .276, and F (1, 88) = 14.55, p < .001, partial η^2 = .142. Fixations counts in all but AOI 1 were significantly greater for FDEs than for lay participants (AOI 2, F (1, 88) = 18.29, p < .001, partial η^2 = .172; AOI 3, F (1, 88) = 17.97, p < .001, partial η^2 = .170; AOI 4, F (1, 88) = 7.48, p = .008, partial η^2 = .078; AOI 5, F (1, 88) = 6.21, p = .015, partial η^2 = .066; AOI 6, F (1, 88) = 8.61, p = .004, partial η^2 = .089; AOI 7, F (1, 88) = 21.61, p < .001, partial η^2 = .197; AOI 8, F (1, 88) = 19.64, p < .001, partial η^2 = .182. No significant difference was found in AOI 1, p = .302, *ns*. Table Albury 5.6 presents the means and standard deviations for areas of interest by participant type.

Table Albury 5.6

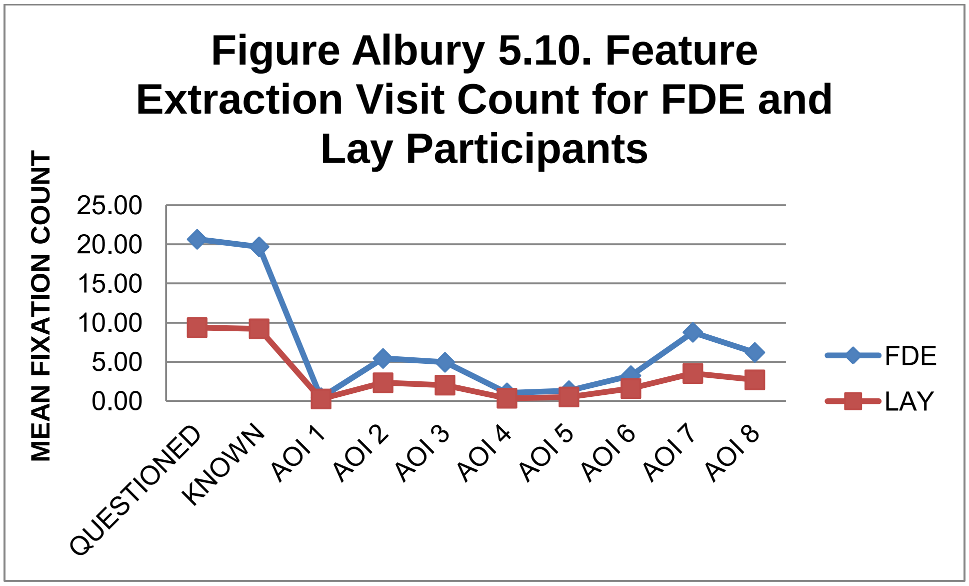
Feature Extraction Analysis Fixation Durations for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2		AOI 3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	24.28	15.11	20.36	15.71	0.19	0.36	3.39	2.92	2.46	2.20
Lay	8.93	8.98	9.08	11.90	0.11	0.36	1.18	1.79	0.90	1.03
	AOI 4		**AOI 5**		**AOI 6**		**AOI 7**		**AOI 8**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	0.47	0.79	0.79	1.36	2.87	3.52	7.03	5.89	3.26	2.72
Lay	0.12	0.32	0.23	0.58	1.08	1.97	2.38	3.02	1.21	1.40

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .351, F (10, 79) = 4.27, p < .001, multivariate η^2 = .351. Figure Albury 5.10 presents the mean total visit counts by AOI.

Figure Albury 5.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit count for the questioned signature and known signature comparison stimulus were significantly greater for FDEs than for lay participants, F (1, 88) = 25.10, p < .001, partial η^2 = .222, and F (1, 88) = 21.28, p < .001, partial η^2 = .195. Visit count in all but one AOI was significantly greater for FDEs than for lay participants (AOI 2, F (1, 88) = 15.55, p < .001, partial η^2 = .150; AOI 3, F (1, 88) = 17.65, p < .001, partial η^2 = .167; AOI 4, F (1, 88) = 6.03, p = .016, partial η^2 = .064; AOI 5, F (1, 88) = 5.05, p = .027, partial η^2 = .054; AOI 6, F (1, 88) = 7.74, p = .007, partial η^2 = .081; AOI 7, F (1, 90) = 21.12, p < .001, partial η^2 = .194; AOI 8, F (1, 88) = 19.11, p < .001, partial η^2 = .178). No significant difference was found in AOI 1, p = .257, *ns*,; Table Albury 5.7 presents the means and standard deviations for areas of interest by participant type.

Table Albury 5.7

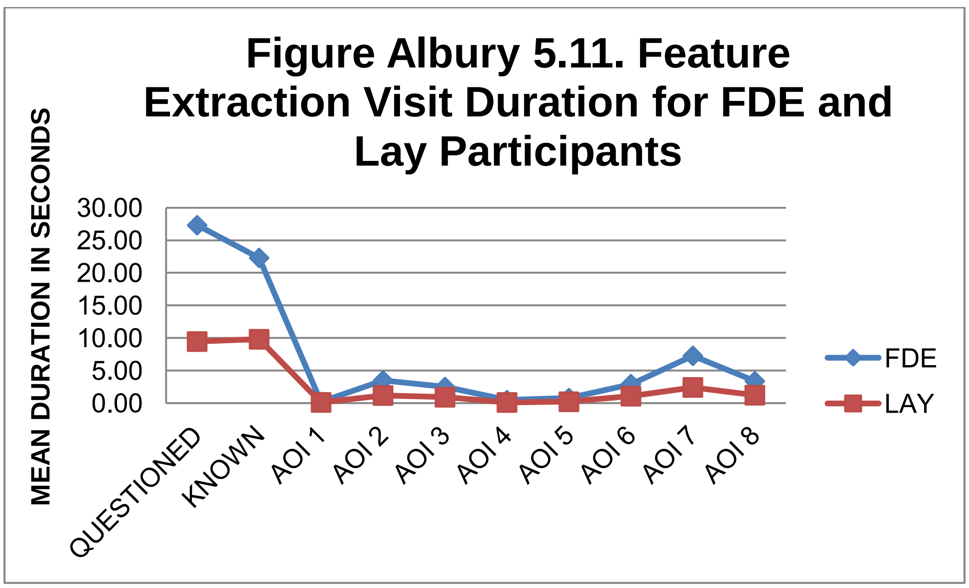
Feature Extraction Analysis Visit Counts for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2		AOI 3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	20.64	11.30	19.68	11.38	0.43	0.74	5.43	4.43	4.94	4.19
Lay	9.37	9.90	9.21	10.03	0.26	0.66	2.33	2.75	2.02	1.85
	AOI 4		**AOI 5**		**AOI 6**		**AOI 7**		**AOI 8**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.04	1.71	1.32	2.13	3.23	3.18	8.77	6.76	6.19	4.62
Lay	0.35	0.75	0.51	1.05	1.58	2.35	3.51	3.38	2.70	2.59

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .456, F (10, 79) = 6.62, p < .001, multivariate η^2 = .456. Figure Albury 5.11 presents the mean total visit counts by AOI.

Figure Albury 5.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all but one area of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for lay participants, F (1, 88) = 40.62, p < .001, partial η^2 = .316, and F (1, 88) = 15.54, p < .001, partial η^2 = .150. Visit duration was significantly greater for FDEs than for lay participants (AOI 2,

F (1, 88) = 19.62, p < .001, partial η^2 = .182; AOI 3, F (1, 88) = 17.37, p < .001, partial η^2 = .165; AOI 4, F (1, 88) = 7.48, p = .008, partial η^2 = .078; AOI 5, F (1, 88) = 6.25, p = .014, partial η^2 = .066; AOI 6, F (1, 88) = 8.67, p = .004, partial η^2 = .090; AOI 7, F (1, 88) = 22.57, p < .001, partial η^2 = .204; AOI 8, F (1, 88) = 19.77, p < .001, partial η^2 = .183). No significant difference was found in AOI 1, p = .425, *ns*. Table Albury 5.8 presents the means and standard deviations for areas of interest by participant type.

Table Albury 5.8

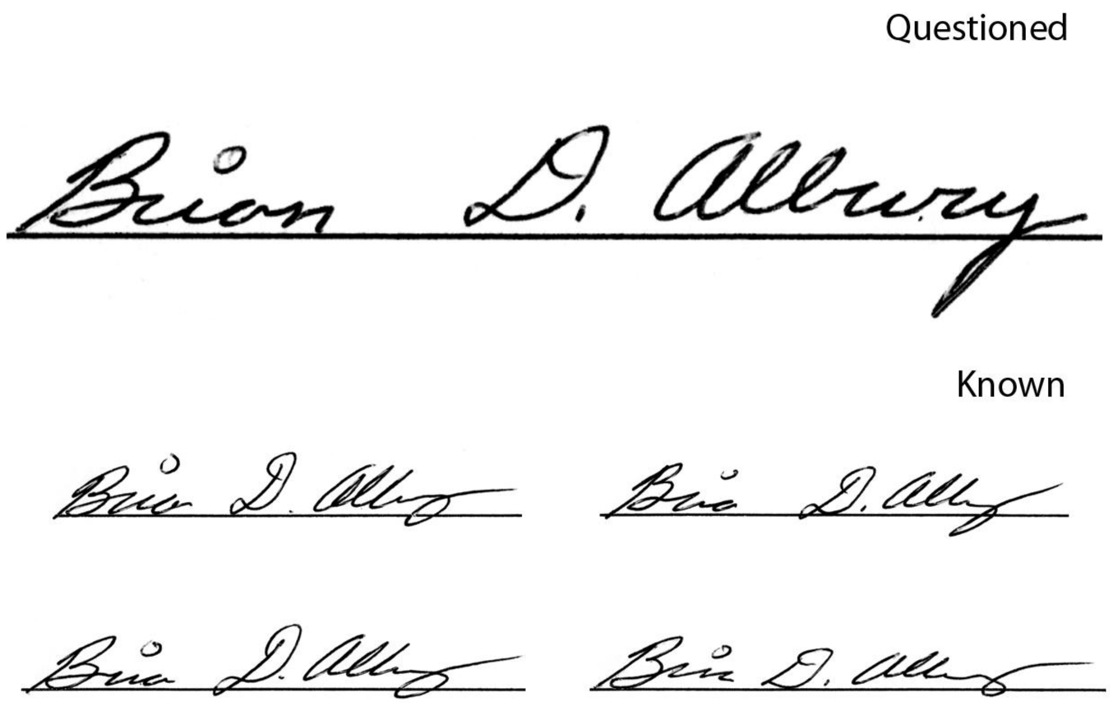
Feature Extraction Analysis Visit Counts for FDE and Lay Participants

	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**		**AOI 3**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	27.31	15.97	22.30	16.83	0.19	0.37	3.49	2.94	2.49	2.26
Lay	9.46	9.48	9.82	12.72	0.13	0.39	1.19	1.81	0.92	1.05
	AOI 4		**AOI 5**		**AOI 6**		**AOI 7**		**AOI 8**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	0.47	0.79	0.79	1.36	2.92	3.61	7.27	5.99	3.37	2.85
Lay	0.12	0.32	0.23	0.58	1.09	2.01	2.42	3.11	1.23	1.41

Albury Signature 6: Disguised (Non-Genuine)

Of the 49 FDE participants, 34 correctly identified the signature as non-genuine, while the remaining 14 identified the signature as genuine. One FDE declined to respond. Of the 43 Lay participants, 37 responded correctly that the signature was non-genuine, while 6 identified the signature as genuine. This difference was not statistically significant, χ^2 (2, N = 92) = 3.95, p = .139. Figure Albury 6.1 presents the comparison view of this signature.

Figure Albury 6.1. Questioned-Known Comparison Stimulus for Albury Signature 6.



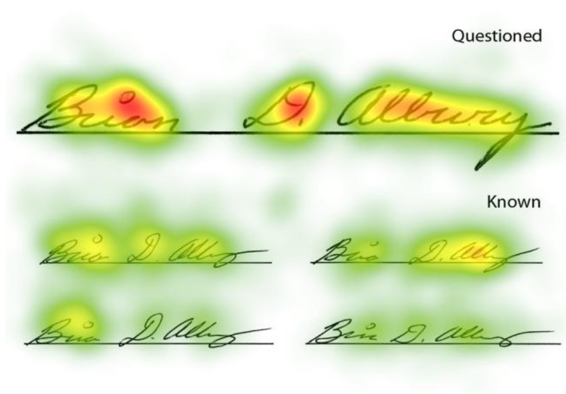
Selection of Areas of Interest (AOIs)

Figure Albury 6.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were six areas within this signature that appeared to the participants to be particularly diagnostic. Figure Albury 6.3 presents the location of the AOIs identified in the heat map.

Figure Albury 6.2. Heat map for Albury signature 6, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants

FDE



Lay

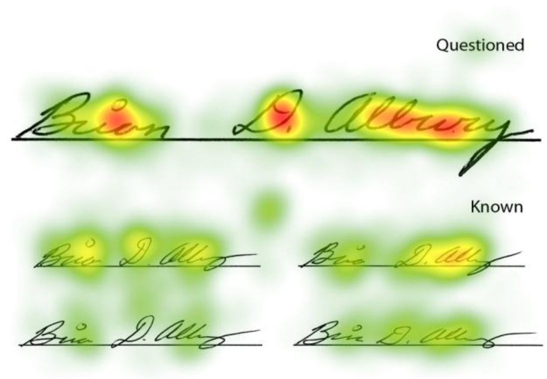
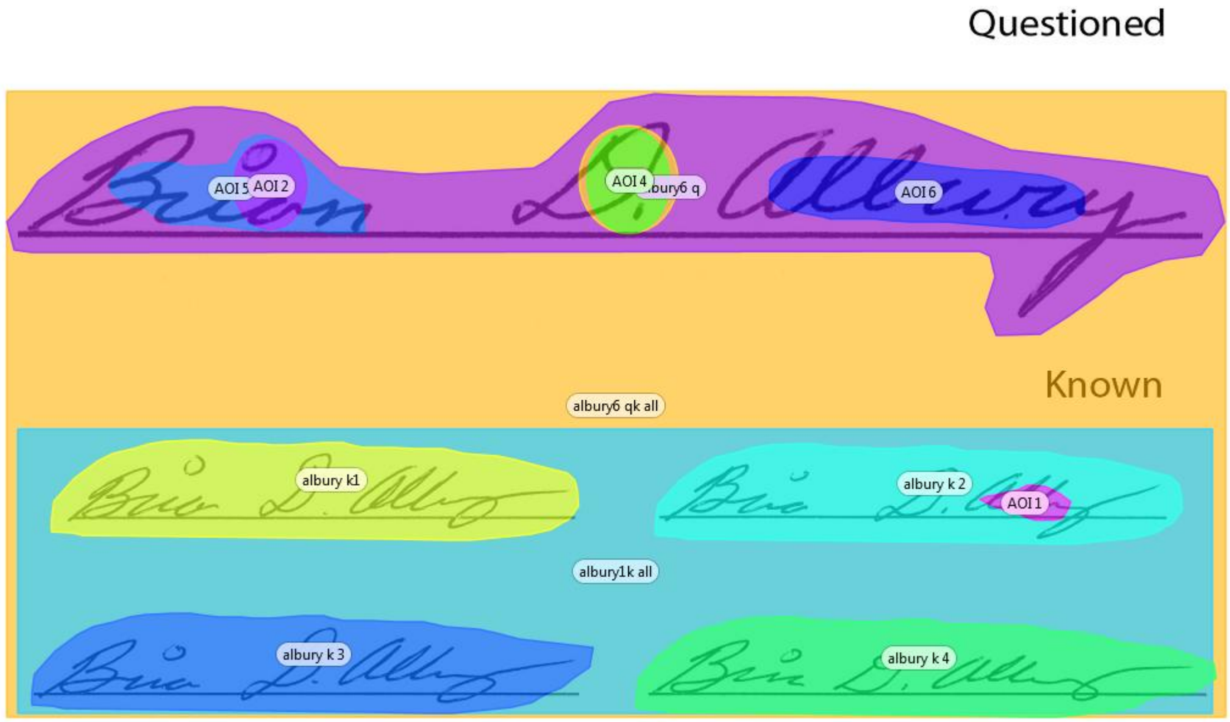


Figure Albury 6.3. Areas of Interest (AOIs) for Albury Signature 6.



Eye-Tracking Metrics Analyses

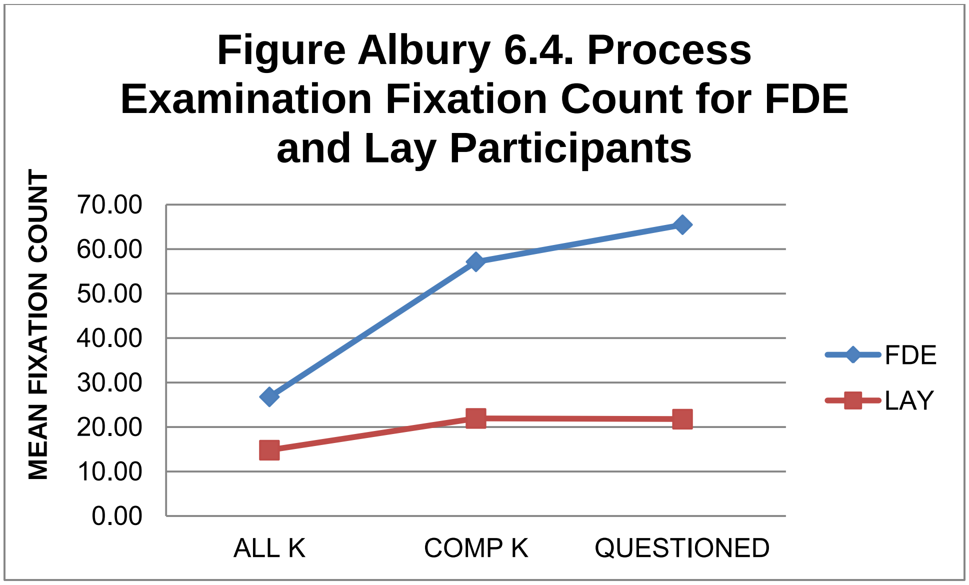
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The following analyses are based on AOIs Albury6Q, Albury1K All, and Albury1K All on the known signature stimulus (not pictured).

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .347, F (3, 85) = 15.08, p < .001, multivariate η^2 = .347. Figure Albury 6.4 presents the mean fixation counts by AOI.

Figure Albury 6.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixations counts in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for lay participants, F (1, 87) = 45.22, p < .001, partial η^2 = .342, and F (1, 87) = 26.00, p < .001, partial η^2 = .230. A statistically significant difference was also found for the known signature comparison stimulus, F (1, 87) = 5.84, p = .018, partial η^2 = .063). Table Albury 6.1 presents the means and standard deviations for areas of interest by participant type.

Table Albury 6.1

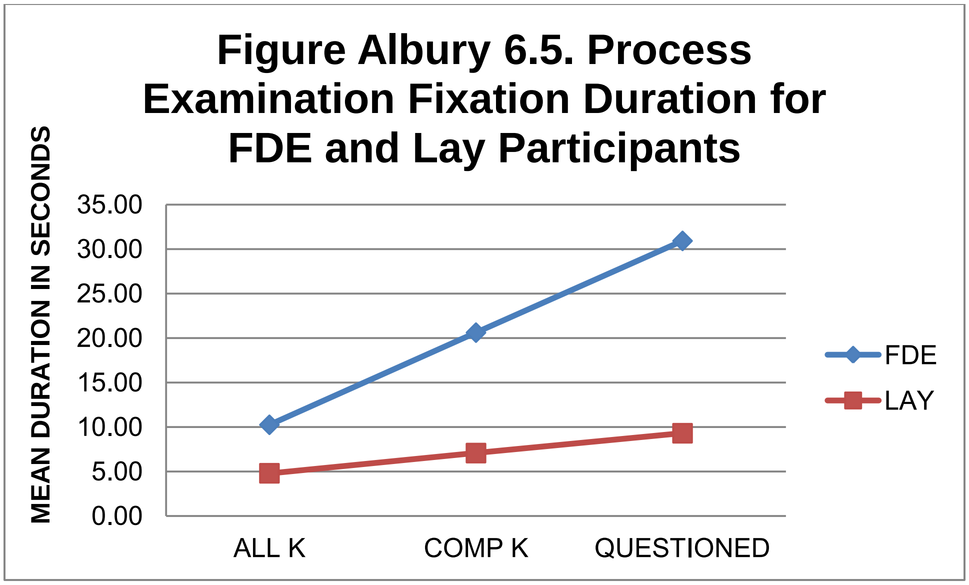
Process Analysis Fixation Counts FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	26.76	30.54	57.11	41.62	65.46	39.50
Lay	14.77	11.60	21.91	18.37	21.74	16.53

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .306, F (3, 85) = 12.50, p < .001, multivariate η^2 = .306. Figure Albury 6.5 presents the mean fixation counts by AOI.

Figure Albury 6.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation durations in all areas of interest. Total fixation duration for the questioned signature and known signature comparison stimulus were significantly greater for FDEs than for lay participants, F (1, 87) = 37.95, p < .001, partial η^2 = .304, and F (1, 89) = 28.25, p < .001, partial η^2 = .245. Fixation durations were also significantly different in the known signature stimulus, F (1, 87) = 7.12, p = .009, partial η^2 = .076. Table Albury 6.2 presents the means and standard deviations for areas of interest by participant type.

Table Albury 6.2

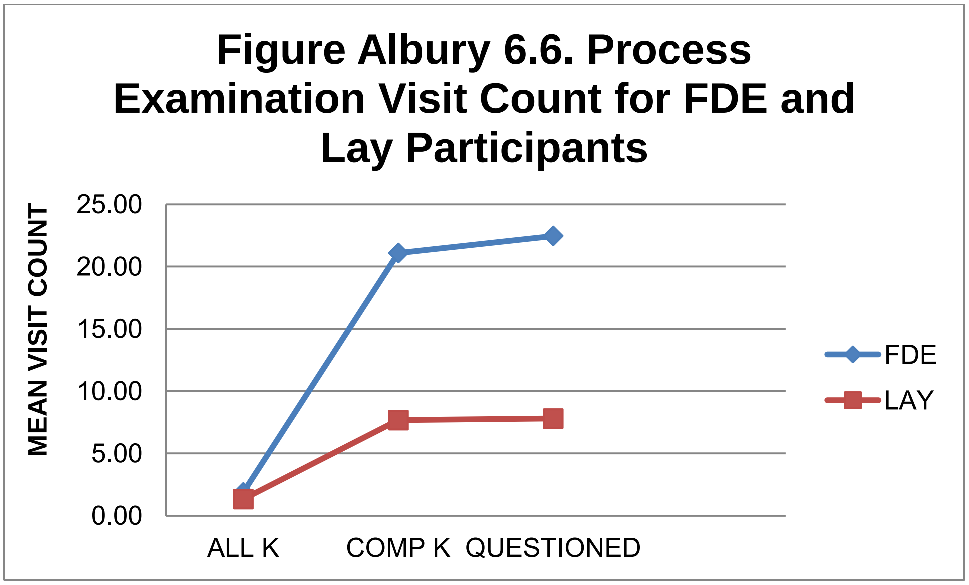
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	10.24	12.70	20.60	15.60	30.91	21.65
Lay	4.79	4.43	7.06	6.16	9.29	8.06

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .315, F (3, 85) = 13.05, p < .001, multivariate η^2 = .315. Figure Albury 6.6 presents the mean visit counts by AOI.

Figure Albury 6.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all but one area of interest. Total visit count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for lay participants, F (1, 87) = 38.76, p < .001, partial η^2 = .308, and (1, 87) = 32.91, p < .001, partial η^2 = .274. Visit counts in the known signature stimulus was not significantly different between the groups, p = .074, *ns*. Table 6.3 presents the means and standard deviations for areas of interest by participant type.

Table Albury 6.3

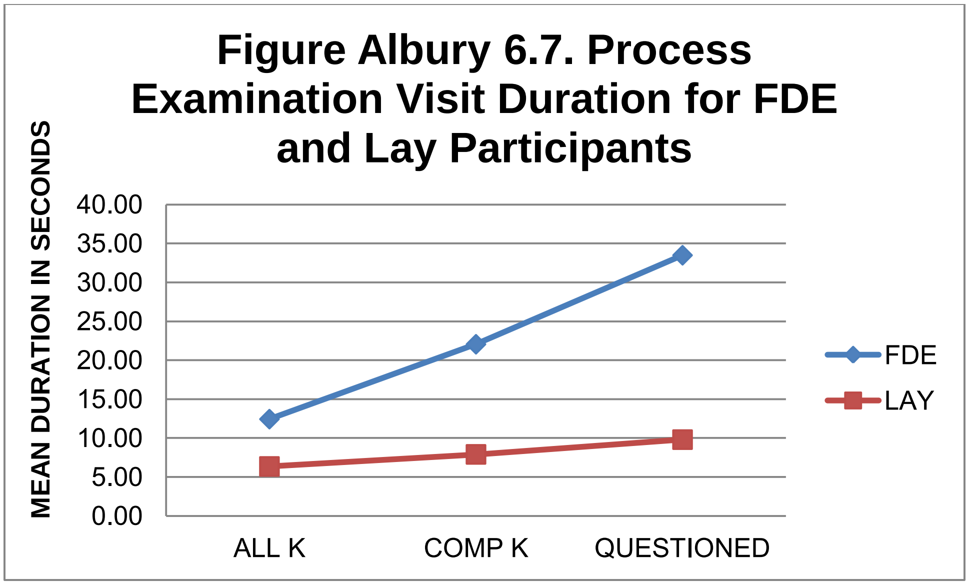
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.87	1.73	21.09	14.01	22.46	14.21
Lay	1.33	0.97	7.67	6.44	7.79	6.25

<u>*Total Visit Duration*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .332, F (3, 85) = 14.10, p < .001, multivariate η^2 = .332. Figure Albury 6.7 presents the mean visit durations by AOI.

Figure Albury 6.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature and known signature comparison stimulus was significantly greater for FDEs than for lay participants, F (1, 87) = 42.51, p < .001, partial η^2 = .328, and F (1, 87) = 27.84, p < .001, partial η^2 = .242. Visit duration in the known signature stimulus was also significantly different between groups, F (1, 87) = 6.82, p = .011, partial η^2 = .073. Table Albury 6.4 presents the means and standard deviations for areas of interest by participant type.

Table Albury 6.4

Process Analysis Visit Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	12.43	14.22	22.05	16.37	33.48	22.42
Lay	6.35	5.71	7.90	6.64	9.80	8.28

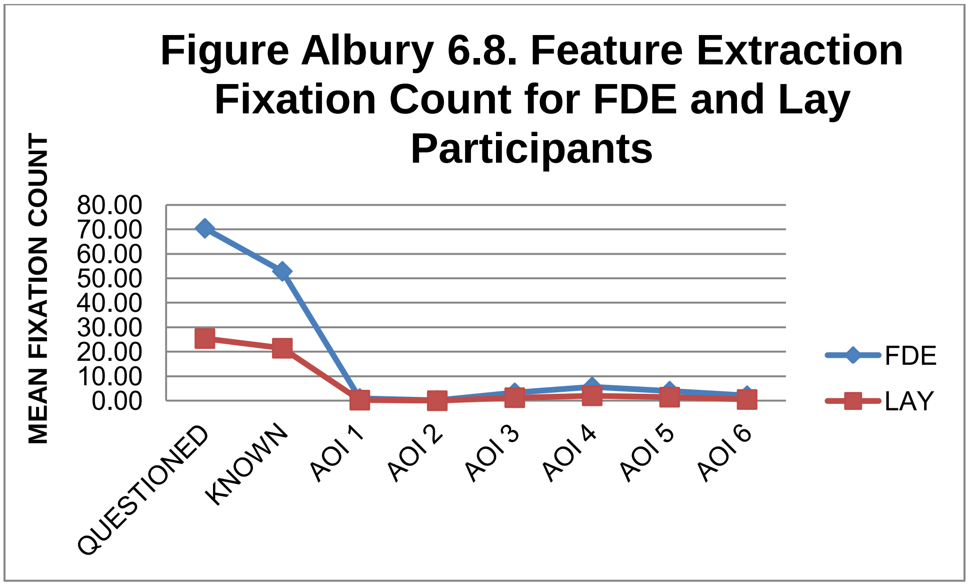
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination. AOIs for the following analyses include the AOI encompassing the questioned signature, the AOI encompassing the four known signatures, and the six additional AOIs encompassing the hot and warm spots indicated on the heat map.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .335, F (8, 80) = 5.03, p < .001, multivariate η^2 = .335. Figure Albury 6.8 presents the mean fixation counts by AOI.

Figure Albury 6.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all but one area of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for lay participants, F (1, 87) = 25.09, p < .001, partial η^2 = .224, and F (1, 87) = 15.24, p < .001, partial η^2 = .149. Fixation counts in most AOIs were significantly greater for FDEs than for lay participants (AOI 2, F (1, 87) = 11.89, p < .001, partial η^2 = .120; AOI 3, F (1, 87) = 15.33, p < .001, partial η^2 = .150; AOI 4, F (1, 87) = 15.59, p < .001, partial η^2 = .152; AOI 5, F (1, 87) = 11.57, p = .001, partial η^2 = .117; AOI 6, F (1, 87) = 24.22, p < .001, partial η^2 = .218. No significant difference was found for AOI 1, p = .157, *ns*. Table Albury 6.5 presents the means and standard deviations for areas of interest by participant type.

Table Albury 6.5

Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

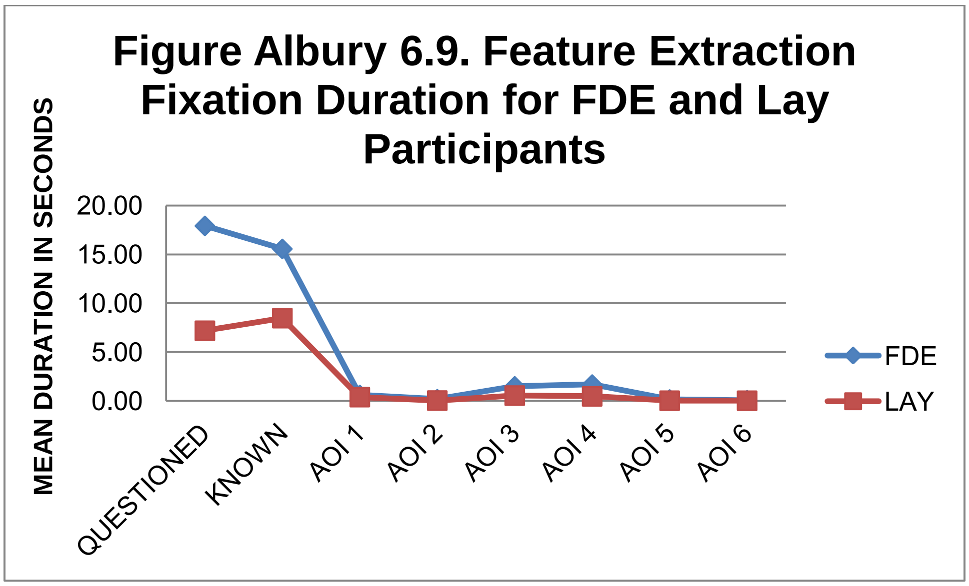
	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	70.46	54.53	52.89	49.16	0.93	1.18	0.17	0.68
Lay	25.42	23.16	21.47	19.83	0.26	0.54	0.02	0.15
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	3.26	2.65	5.65	5.29	3.93	4.18	2.09	1.76

Lay	1.26	2.13	2.05	2.90	1.47	2.36	0.53	1.12

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .35, F (8, 80) = 5.26, p < .001, multivariate η^2 = .35. Figure Albury 6.9 presents the mean fixation durations by AOI.

Figure Albury 6.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for lay participants, F (1, 87) = 30.79, p < .001, partial η^2 = .261, and F (1, 87) = 14.97, p < .001, partial η^2 = .147. Fixation durations in most AOIs were significantly greater for FDEs than for lay participants (AOI 1, F (1, 87) = 10.52, p = .002, partial η^2 = .108; AOI 3, F (1, 87) = 14.09, p < .001, partial η^2 = .139; AOI 4, F (1, 87) = 22.12, p < .001, partial η^2 = .203; AOI 5, F (1, 87) = 16.06, p < .001, partial η^2 = .156; AOI 6, F (1, 87) = 13.06, p = .001, partial η^2 = .131). No significant difference was found in AOI 2, p = .127, *ns*. Table Albury 6.6 presents the means and standard deviations for areas of interest by participant type.

Table Albury 6.6
Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

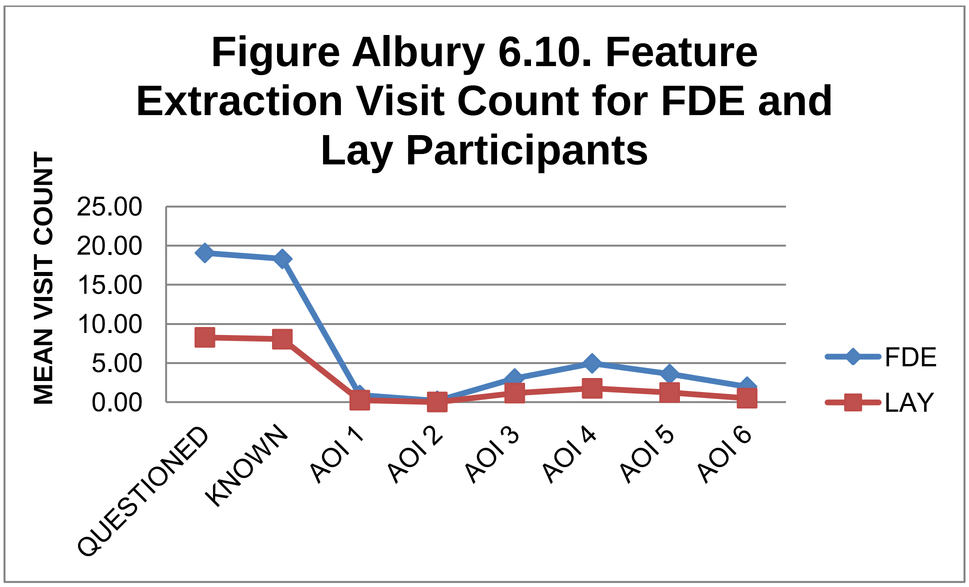
	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***

FDE	25.85	19.61	15.67	15.07	.28	.39	.06	.24
Lay	8.21	7.30	6.07	6.35	.07	.17	.00	.02
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.15	1.10	2.75	2.58	1.94	2.17	.80	1.02
Lay	.41	.72	.79	.91	.55	.70	.19	.43

<u>*Total Visit Count*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .307, *F* (8, 80) = 4.42, *p* < .001, multivariate η^2 = .307. Figure Albury 6.10 presents the mean total visit counts by AOI.

Figure Albury 6.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit count for the questioned signature and known signature comparison stimulus were significantly greater for FDEs than for lay participants, *F* (1, 87) = 18.89, *p* < .001, partial η^2 = .178, and *F* (1, 87) = 17.87, *p* < .001, partial η^2 = .170. Visit counts in most AOIs were significantly greater for FDEs than for lay participants (AOI 1, *F* (1, 87) = 11.96, *p* = .001, partial η^2 = .121; AOI 3, *F* (1, 87) = 16.67, *p* < .001, partial η^2 = .161; AOI 4, *F* (1, 87) = 17.98, *p* < .001, partial η^2 = .171; AOI 5, *F* (1, 87) = 14.31, *p* < .001, partial η^2 = .141; AOI 6, *F* (1, 87) = 24.22, *p* < .001, partial η^2 = .218). No significant difference was found in AOI 2, *p* = .157, *ns*. Table Albury 6.7 presents the means and standard deviations for areas of interest by participant type.

Table Albury 6.7

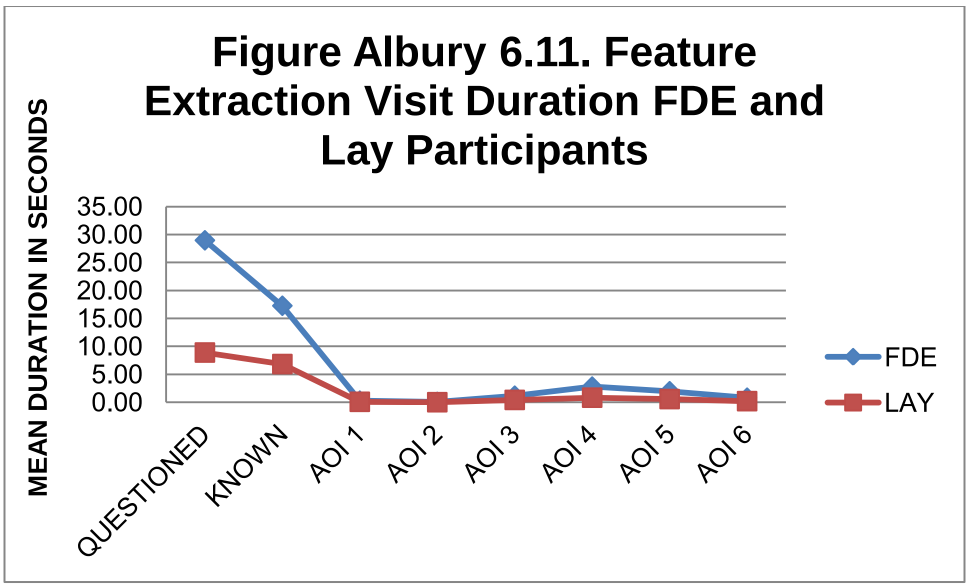
Feature Extraction Analysis Visit Count for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	19.07	14.70	18.30	14.46	0.91	1.13	0.17	0.68
Lay	8.28	7.22	8.05	6.87	0.26	0.54	0.02	0.15
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	3.02	2.50	4.96	4.43	3.59	3.73	1.98	1.69
Lay	1.16	1.69	1.77	2.24	1.23	1.72	0.51	1.01

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .339, F (8, 80) = 5.14, p < .001, multivariate η^2 = .339. Figure Albury 6.11 presents the mean total visit counts by AOI.

Figure Albury 6.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for lay participants, F (1, 87) = 31.12, p < .001, partial η^2 = .263., and F (1, 87) = 14.77, p < .001, partial η^2 = .145. Visit duration in most AOIs was significantly greater for FDEs than for lay participants (AOI 1, F (1, 87) = 10.53, p = .002, partial η^2 = .108; AOI 3, F (1, 87) = 14.39, p < .001, partial η^2 = .142; AOI 4, F (1, 87) = 21.77, p < .001, partial η^2 = .200; AOI 5, F (1, 87) = 15.70, p < .001, partial η^2

= .153; AOI 6, F (1, 87) = 13.30, p < .001, partial η^2 = .133). No significant difference was found in AOI 2, p = .127, *ns*. Table Albury 6.8 presents the means and standard deviations for areas of interest by participant type.

Table Albury 6.8

Feature Extraction Analysis Visit Duration for FDE and Lay Participants

	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	28.96	22.37	17.25	16.47	0.28	0.39	0.06	0.24
Lay	8.89	7.72	6.83	6.93	0.07	0.17	0.00	0.02
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.17	1.10	2.80	2.62	1.97	2.20	0.81	1.02
Lay	0.41	0.73	0.81	0.97	0.57	0.78	0.19	0.43

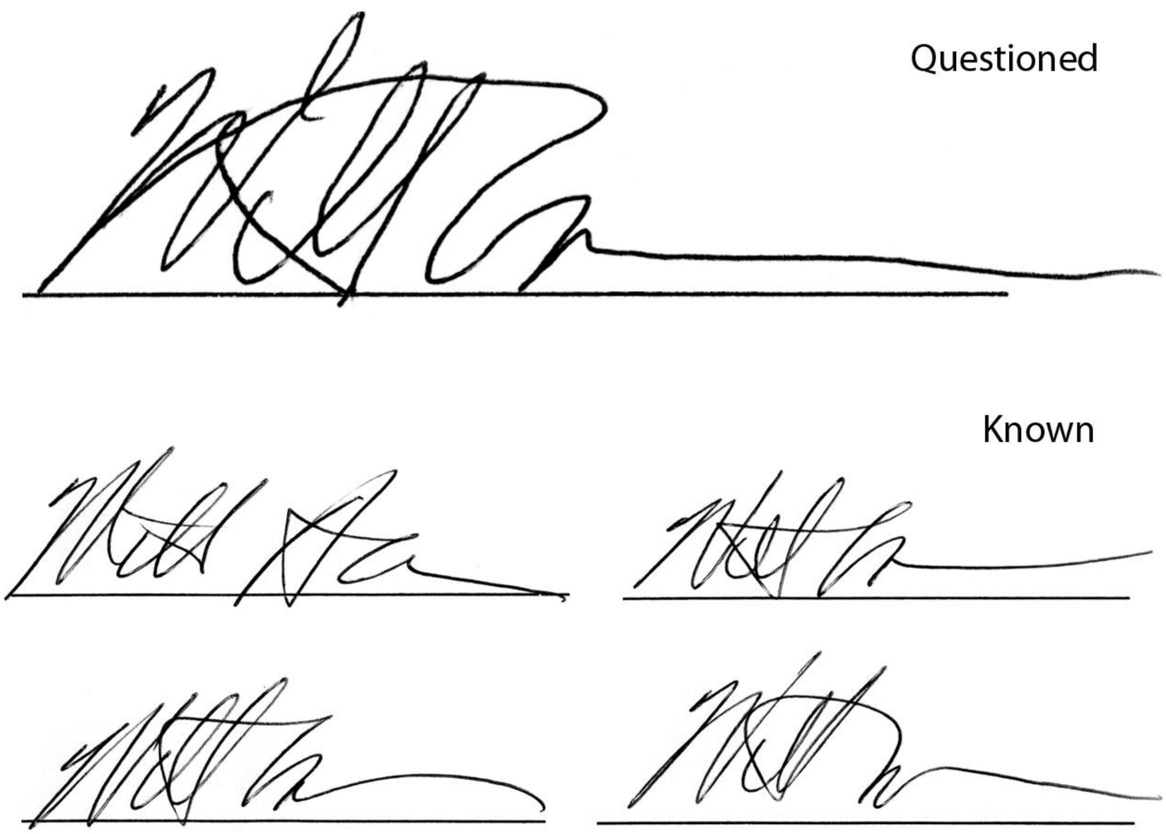
<u>SIGNATURE 2: Will Atkinson</u>

The signature of Will Atkinson is characterized as a high-complexity mixed-type signature. The set of Atkinson signature specimens included two genuine signatures. Of the non-genuine signatures, one was traced, and three were freehand simulations. No disguised signatures were included in the set.

Atkinson Signature 1: Traced (Non-Genuine)

Of the 49 FDE participants, 49 responded correctly that the signature was non-genuine, and none responded that it was genuine. Of the 43 Lay participants, 41 responded correctly that the signature was non-genuine, and 2 responded that the signature was genuine. This difference was not statistically significant, $p = .127$, *ns.* Figure Atkinson 1.1 presents the comparison view of this signature.

Figure Atkinson 1.1. Questioned-Known Comparison Stimulus for Atkinson Signature 1.

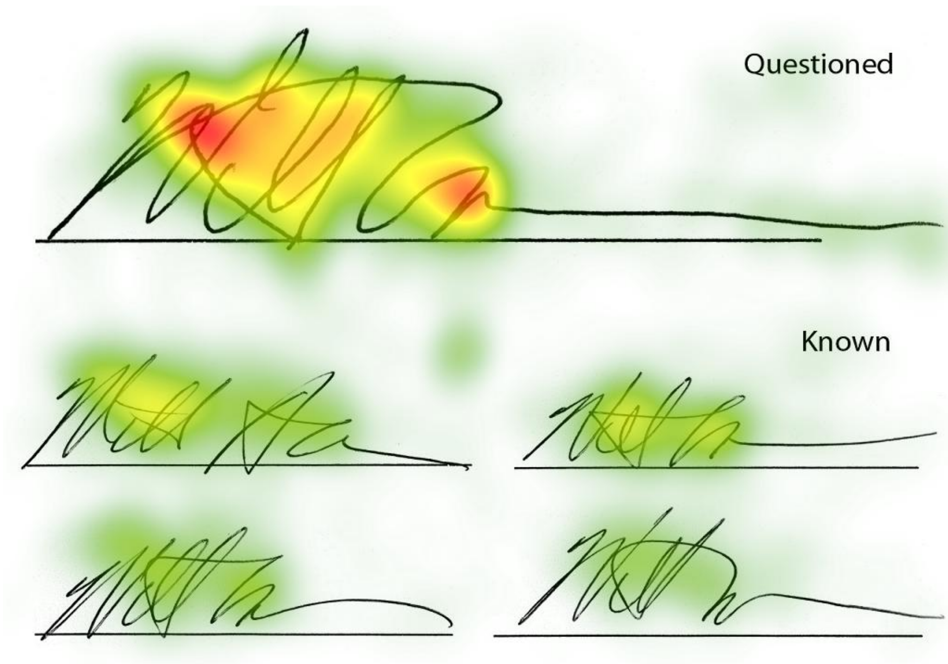


Selection of Areas of Interest (AOIs)

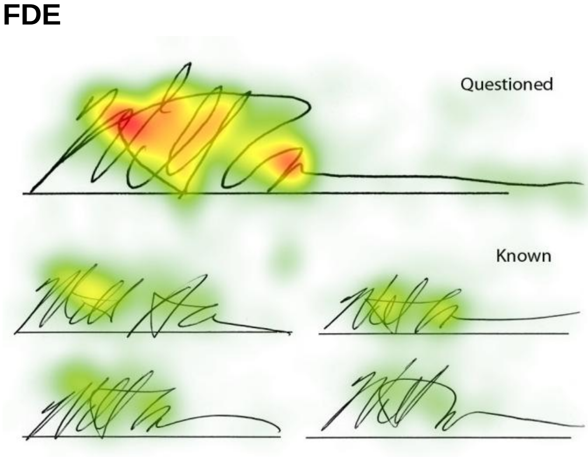
Figure Atkinson 1.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were four locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of four AOIs for this stimulus. Figure 3 presents the location of the AOIs identified in the heat map.

Figure Atkinson 1.2. Heat map for Atkinson Signature 1, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

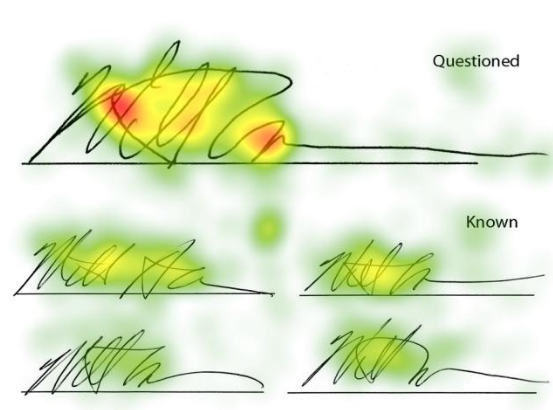
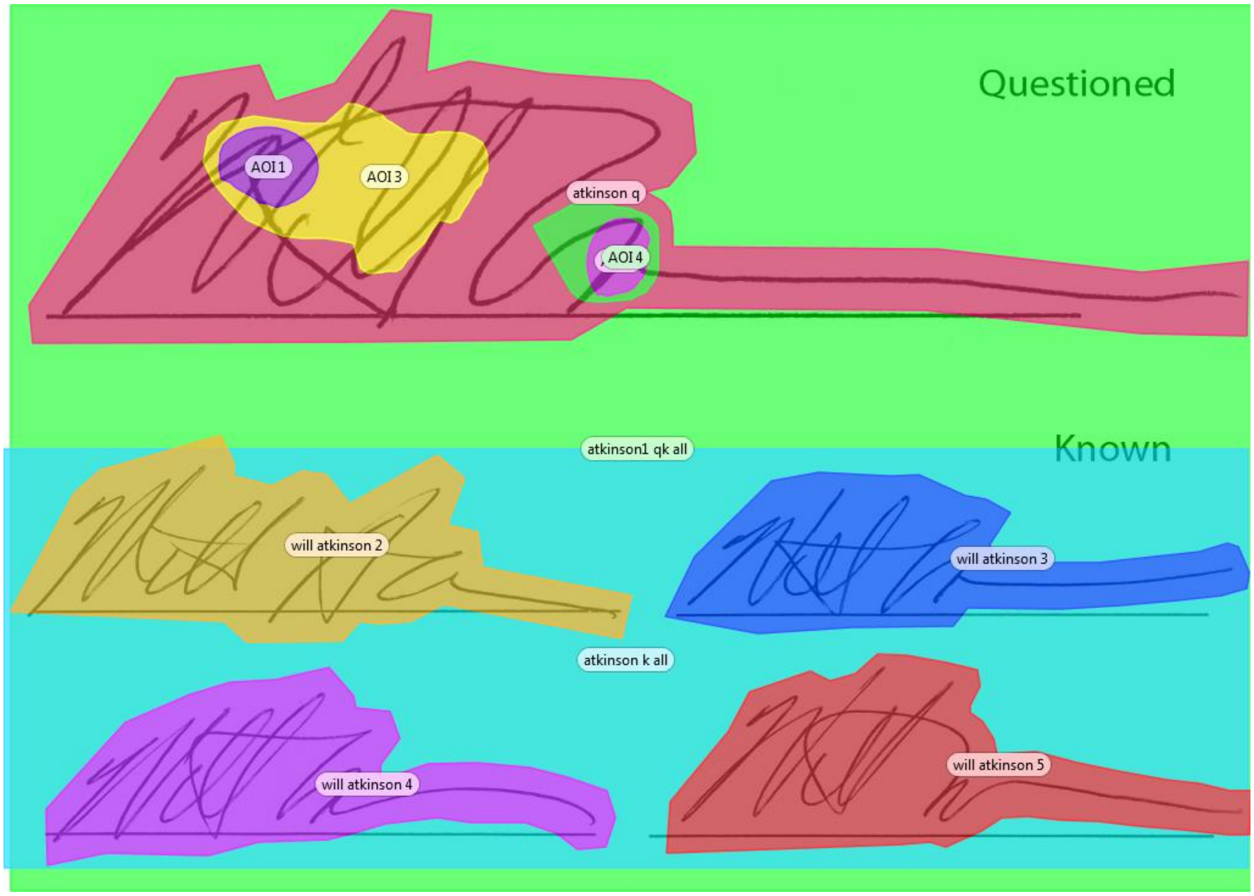


Figure 3. Areas of Interest (AOIs) for Atkinson Signature 1.



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

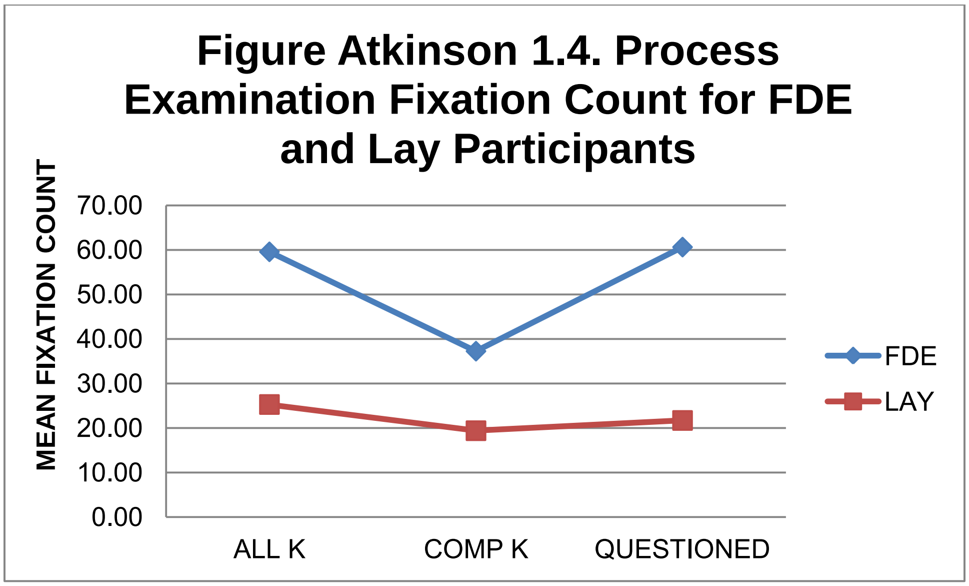
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Atkinson known signature stimulus (Knowns, not pictured here), Atkinson 1K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Atkinson 1Q (the Atkinson questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 4) are included in subsequent analyses. Figure Atkinson 1.3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .265, $F(3, 86) = 10.36$, $p < .001$, multivariate $\eta^2 = .265$. Figure Atkinson 1.4 presents the mean fixation counts by AOI.

Figure Atkinson 1.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixations counts in all areas of interest. Total fixation count for the questioned signature was significantly greater for FDEs than for lay participants, $F(1, 88) = 17.86$, $p < .001$, partial $\eta^2 = .169$. Fixation counts in both the known signature stimulus and the known signature comparison stimulus were significantly greater for FDEs than for lay participants (known signature stimulus, $F(1, 88) = 9.36$, $p = .003$, partial $\eta^2 = .096$; known signature comparison stimulus, $F(1, 88) = 6.83$, $p = .011$, partial $\eta^2 = .072$). Table Atkinson 1.1 presents the means and standard deviations for areas of interest by participant type.

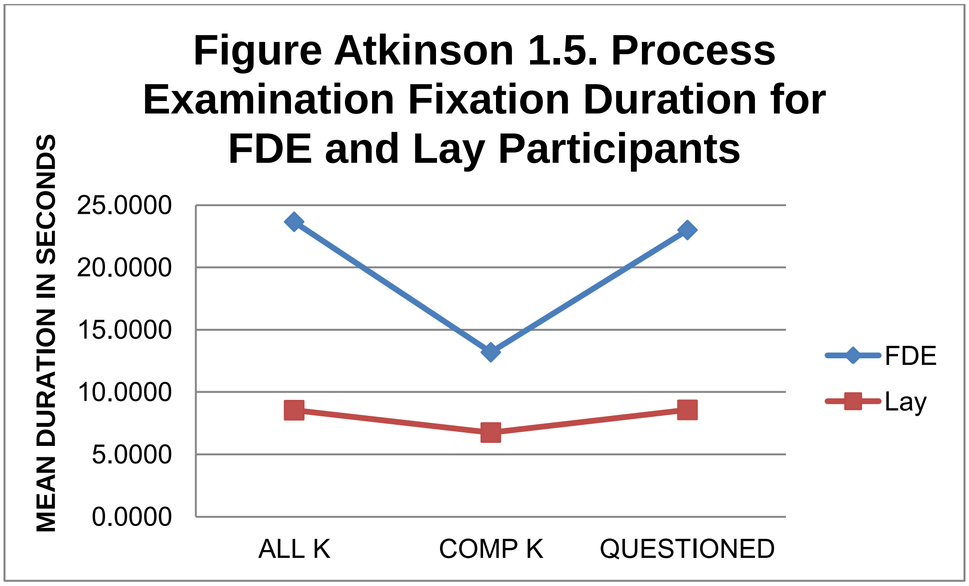
Table Atkinson 1.1
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	59.55	70.77	37.23	41.05	60.62	57.63
Lay	25.26	20.60	19.37	18.77	21.67	18.91

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .251, $F(3, 86) = 9.60$, $p < .001$, multivariate $\eta^2 = .251$. Figure Atkinson 1.5 presents the mean fixation counts by AOI.

Figure Atkinson 1.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation durations in all areas of interest. Total fixation duration for the questioned signature was significantly greater for FDEs than for lay participants, $F(1, 88) = 16.96$, $p < .001$, partial $\eta^2 = .162$. Fixation durations in both the known signature stimulus and the known signature comparison stimulus were significantly greater for FDEs than for lay participants (known signature stimulus, $F(1, 88) = 12.25$, $p < .001$, partial $\eta^2 = .122$; known signature comparison stimulus, $F(1, 88) = 5.16$, $p = .026$, partial $\eta^2 = .055$). Table Atkinson 1.2 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 1.2

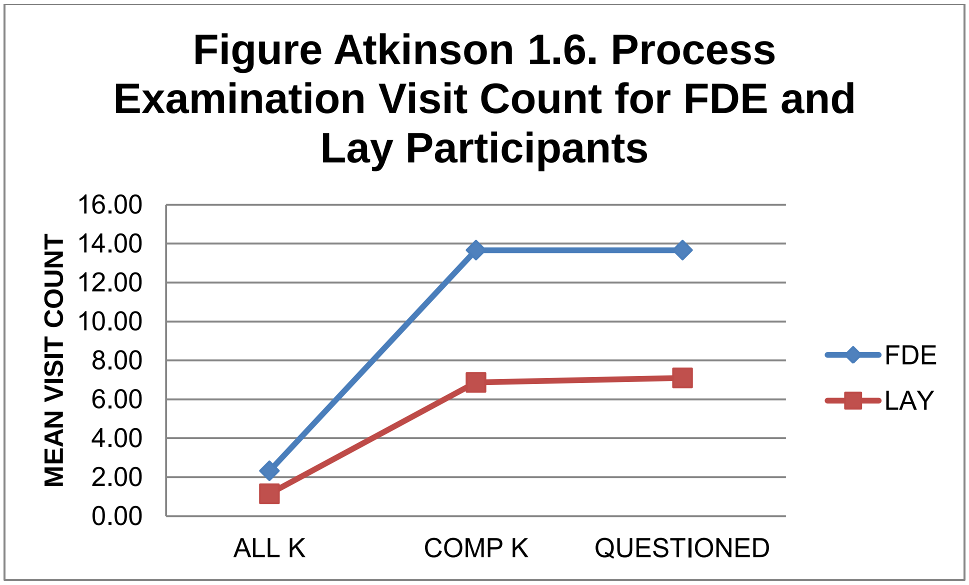
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	23.66	27.11	13.19	16.88	23.00	21.36
Lay	8.54	8.50	6.75	8.13	8.56	8.85

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .133, $F(3, 86) = 4.39$, $p = .006$, multivariate $\eta^2 = .133$. Figure Atkinson 1.6 presents the mean visit counts by AOI.

Figure Atkinson 1.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit count for the questioned signature was significantly greater for FDEs than for lay participants, $F(1, 88) = 12.90$, $p = .001$, partial $\eta^2 = .128$. Visit counts in both the known signature stimulus and the known signature comparison stimulus were significantly greater for FDEs than for lay participants (known signature stimulus, $F(1, 88) = 4.26$, $p = .042$, partial $\eta^2 = .046$; known signature comparison stimulus, $F(1, 88) = 10.19$, $p = .002$, partial $\eta^2 = .104$). Table Atkinson 1.3 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 1.3

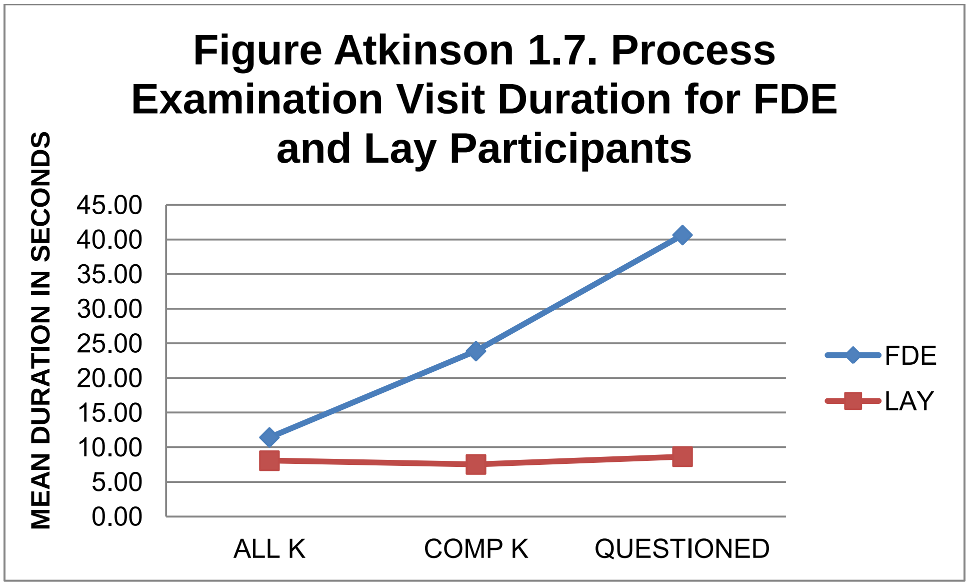
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.32	3.71	13.66	12.82	15.77	14.73
Lay	1.14	0.52	6.86	5.78	7.09	6.07

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .366, $F(3, 83) = 15.98$, $p < .001$, multivariate $\eta^2 = .366$. Figure Atkinson 1.7 presents the mean visit durations by AOI.

Figure Atkinson 1.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for lay participants, $F(1, 85) = 46.64$ $p < .001$, partial $\eta^2 = .354$, and $F(1, 85) = 18.35$, $p < .001$, partial $\eta^2 = .178$. Visit duration in the known signature stimulus was not statistically significant, $p = .074$, *ns*. Table Atkinson 1.4 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 1.4

Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	11.42	9.95	23.89	23.86	40.65	29.46
Lay	8.06	7.02	7.53	6.82	8.65	7.60

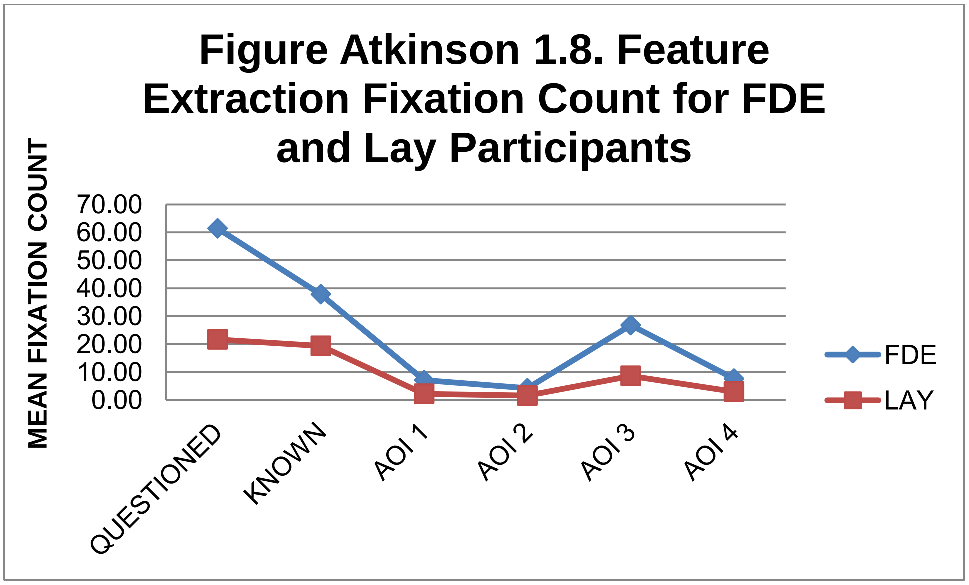
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .260, $F(6, 82) = 4.80$, $p < .001$, multivariate $\eta^2 = .260$. Figure Atkinson 1.8 presents the mean fixation counts by AOI.

Figure Atkinson 1.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for lay participants, $F(1, 87) = 18.32$ $p < .001$, partial $\eta^2 = .174$, and $F(1, 87) = 7.21$, $p = .009$, partial $\eta^2 = .077$. Fixations counts in all AOIs was significantly greater for FDEs than for lay participants (AOI 1, $F(1, 87) = 15.84$, $p < .001$, partial $\eta^2 = .154$; AOI 2, $F(1, 87) = 10.69$, $p = .002$, partial $\eta^2 = .109$; AOI 3, $F(1, 87) = 18.74$, $p < .001$, partial $\eta^2 = .177$; AOI 4, $F(1, 87) = 13.23$, $p < .001$, partial $\eta^2 = .132$). Table Atkinson 1.5 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 1.5

Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

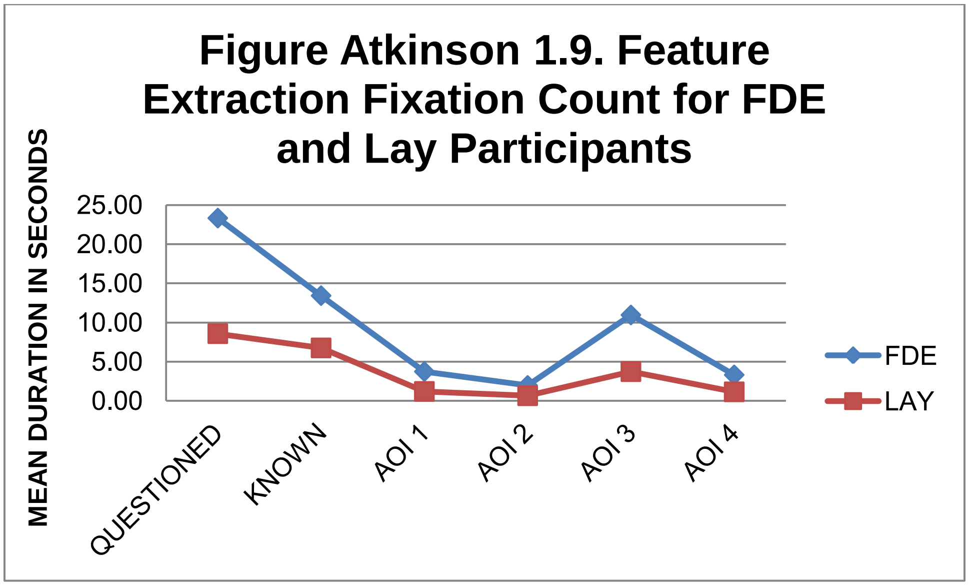
	QUESTIONED		KNOWN		AOI 1	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	61.39	58.01	37.85	41.29	7.11	7.53

Lay	21.67	18.91	19.37	18.77	2.23	2.89
	AOI 2		**AOI 3**		**AOI 4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	4.20	4.76	26.78	26.45	7.63	7.68
Lay	1.58	2.26	8.65	7.63	3.02	3.27

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .257, $F(6, 82) = 4.72$, $p < .001$, multivariate $\eta^2 = .257$. Figure Atkinson 1.9 presents the mean fixation durations by AOI.

Figure Atkinson 1.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for lay participants, $F(1, 87) = 17.51$, $p < .001$, partial $\eta^2 = .168$, and $F(1, 87) = 5.46$, $p = .022$, partial $\eta^2 = .059$. Fixation durations in all AOIs were significantly greater for FDEs than for lay participants (AOI 1, $F(1, 87) = 13.31$, $p < .001$, partial $\eta^2 = .133$; AOI 2, $F(1, 87) = 11.34$, $p = .001$, partial $\eta^2 = .115$; AOI 3, $F(1, 87) = 17.84$, $p < .001$, partial $\eta^2 = .170$; AOI 4, $F(1, 87) = 15.62$, $p < .001$, partial $\eta^2 = .152$). Table Atkinson 1.6 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 1.6

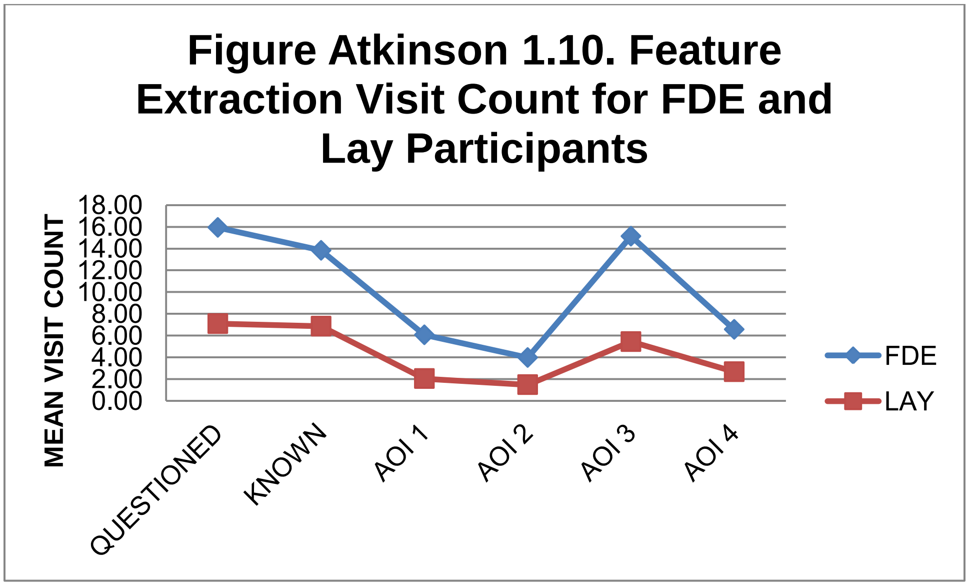
Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	23.32	21.48	13.42	16.99	3.73	4.20
Lay	8.56	8.85	6.75	8.13	1.19	1.84
	AOI 2		**AOI 3**		**AOI 4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.96	2.40	10.95	10.59	3.30	3.36
Lay	0.65	0.92	3.72	3.85	1.14	1.29

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .218, $F(6, 82) = 3.81$, $p = .002$, multivariate $\eta^2 = .218$. Figure Atkinson 1.10 presents the mean visit count by AOI.

Figure Atkinson 1.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for lay participants, $F(1, 87) = 13.19$, $p < .001$, partial $\eta^2 = .132$, and $F(1, 87) = 10.53$, $p = .002$, partial $\eta^2 = .108$. Visit count in all AOIs was significantly greater for FDEs than for lay participants (AOI 1, $F(1, 87) = 15.23$, $p < .001$, partial $\eta^2 = .149$; AOI 2, $F(1, 87) = 11.42$, $p = .001$, partial $\eta^2 = .116$; AOI 3, $F(1, 87) = 19.84$, $p < .001$, partial $\eta^2 = .186$; AOI 4, $F(1, 87) = 14.72$, $p < .001$, partial $\eta^2 = .145$). Table Atkinson 1.7 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 1.7

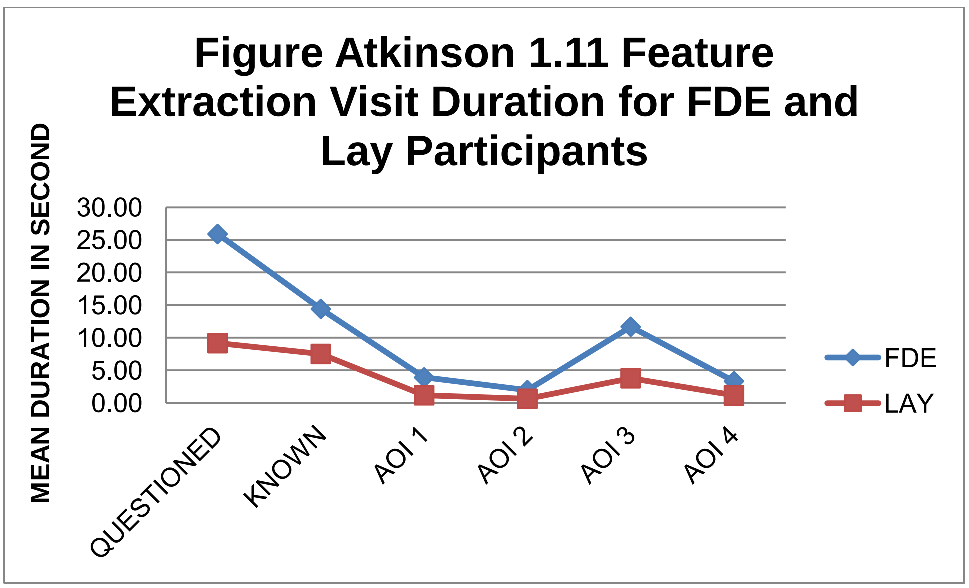
Feature Extraction Analysis Visit Count for FDE and Lay Participants

	QUESTIONED		**KNOWN**		**AOI 1**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	15.93	14.84	13.83	12.91	6.07	6.33
Lay	7.09	6.07	6.86	5.78	2.05	2.42
	AOI 2		**AOI 3**		**AOI 4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	3.98	4.45	15.13	13.56	6.57	6.12
Lay	1.49	1.94	5.44	4.56	2.67	2.70

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .207, $F(5, 83) = 4.39$, $p = .001$, multivariate $\eta^2 = .207$. Figure Atkinson 1.11 presents the mean visit duration by AOI.

Table Atkinson 1.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for lay participants, $F(1, 87) = 19.55$, $p < .001$, partial $\eta^2 = .183$, and $F(1, 87) = 5.23$, $p = .025$, partial $\eta^2 = .057$. Visit duration in all AOIs was significantly greater for FDEs than for lay participants

(AOI 1, $F(1, 87) = 14.35$, $p < .001$, partial $\eta^2 = .142$; AOI 2, $F(1, 87) = 11.19$, $p = .001$, partial $\eta^2 = .114$; AOI 3, $F(1, 87) = 19.80$, $p < .001$, partial $\eta^2 = .185$; AOI 4, $F(1, 87) = 15.20$, $p < .001$, partial $\eta^2 = .149$). Table Atkinson 1.8 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 1.8

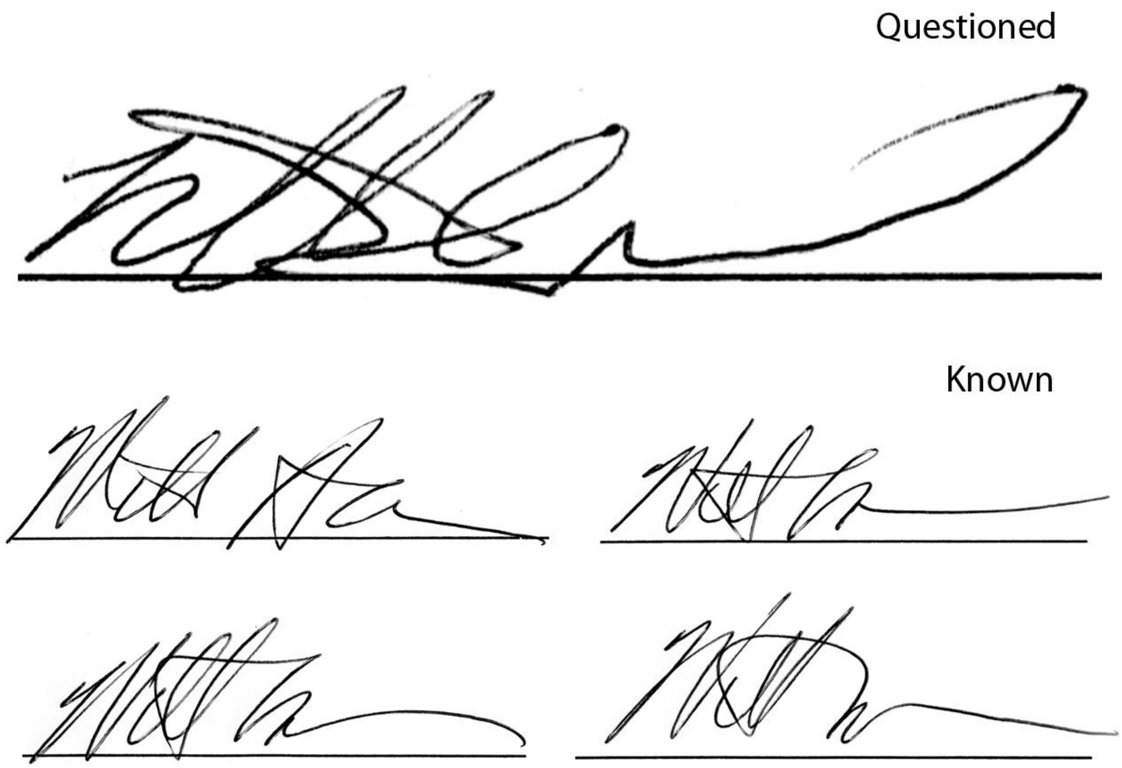
Feature Extraction Analysis Visit Count for FDE and Lay Participants

	QUESTIONED		**KNOWN**		**AOI 1**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	25.91	23.14	14.43	17.95	3.93	4.36
Lay	9.19	9.22	7.52	8.61	1.20	1.86
	AOI 2		**AOI 3**		**AOI 4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.98	2.44	11.69	10.99	3.35	3.46
Lay	0.65	0.92	3.80	3.92	1.16	1.29

Atkinson Signature 2: Freehand Simulation (Non-Genuine)

Of the 49 FDE participants, 45 responded correctly that the signature was non-genuine, while 3 identified the signature as genuine. One FDE declined to respond. Of the 43 Lay participants, 42 responded correctly that the signature was non-genuine, while 1 responded that the signature was genuine. This difference was not statistically significant, p = .423, *ns*. Figure Atkinson 2.1 presents the comparison view of this signature.

Figure Atkinson 2.1. Questioned-Known Comparison Stimulus for Atkinson Signature 2.

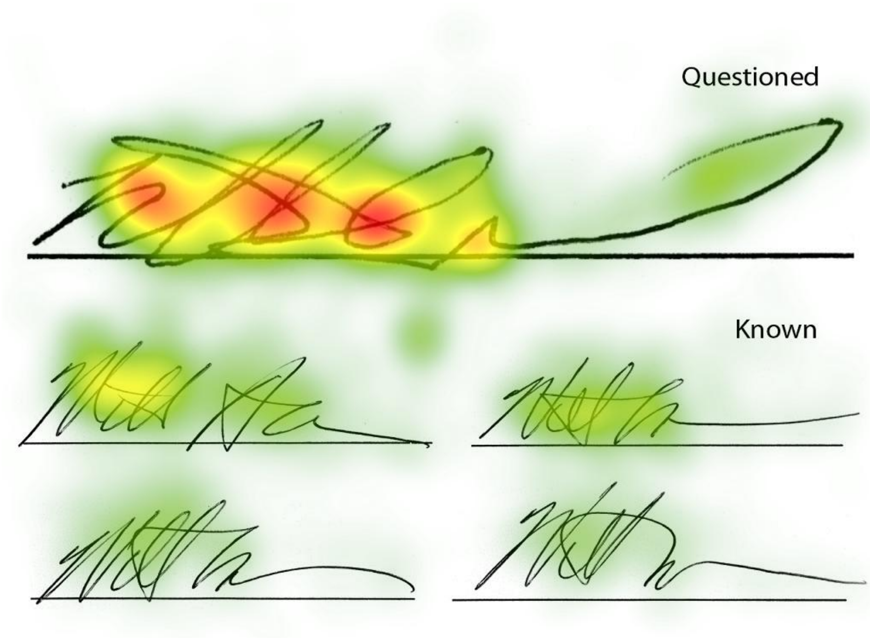


Selection of Areas of Interest (AOIs)

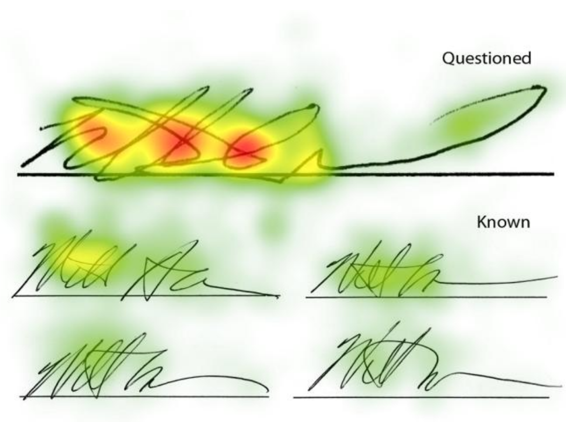
Figure Atkinson 2.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were four locations indicated by hot spots and warm spots within the signature that elicited significant attention from the participants. AOIs were created for these specific areas, creating a total of four AOIs for this stimulus. Figure Atkinson 2.3 presents the location of the AOIs identified in the heat map.

Figure Atkinson 2.3. Areas of Interest (AOIs) for Atkinson Signature 2.

All Participants



FDE



Lay

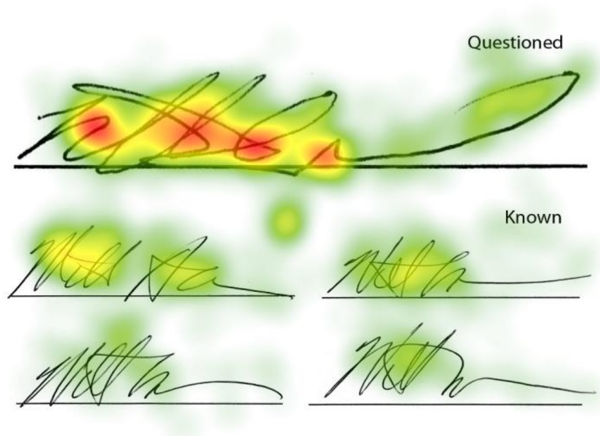
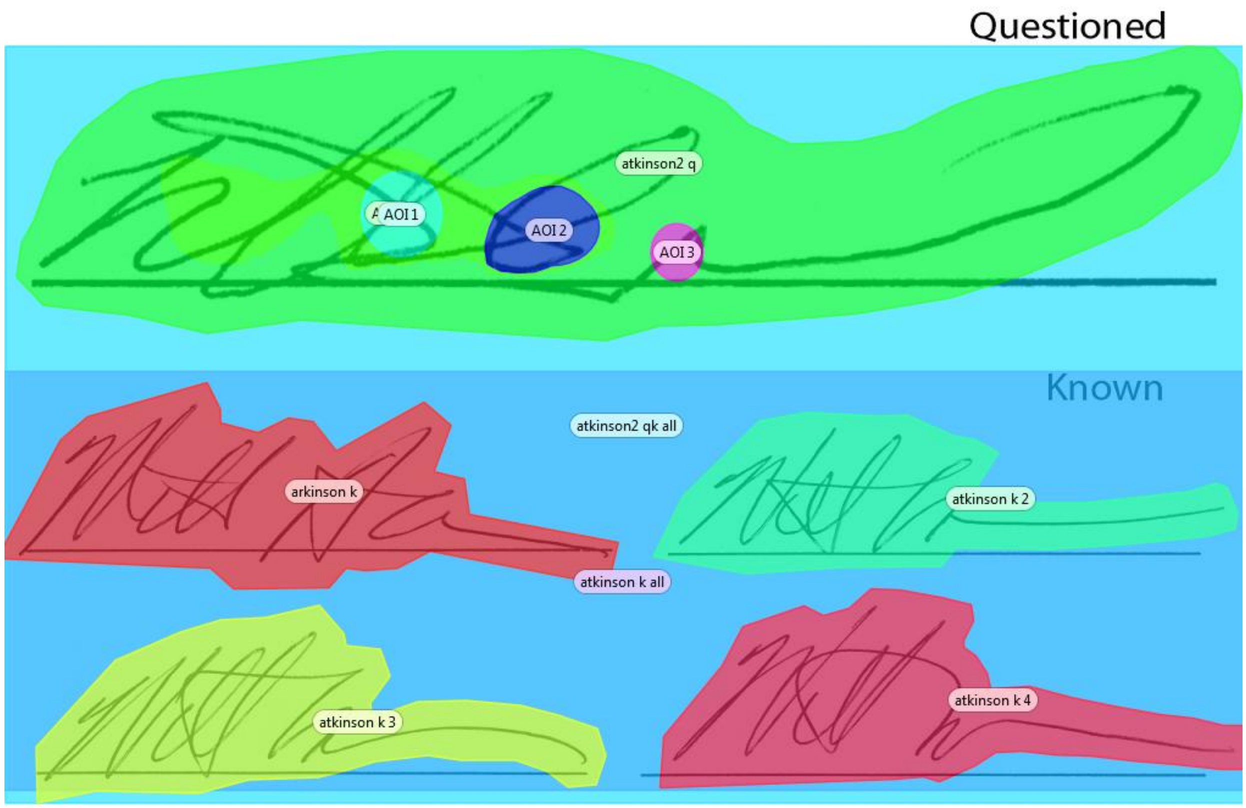


Figure 3. Areas of Interest (AOIs) for Atkinson Signature 2.



Eye-Tracking Metrics Analyses

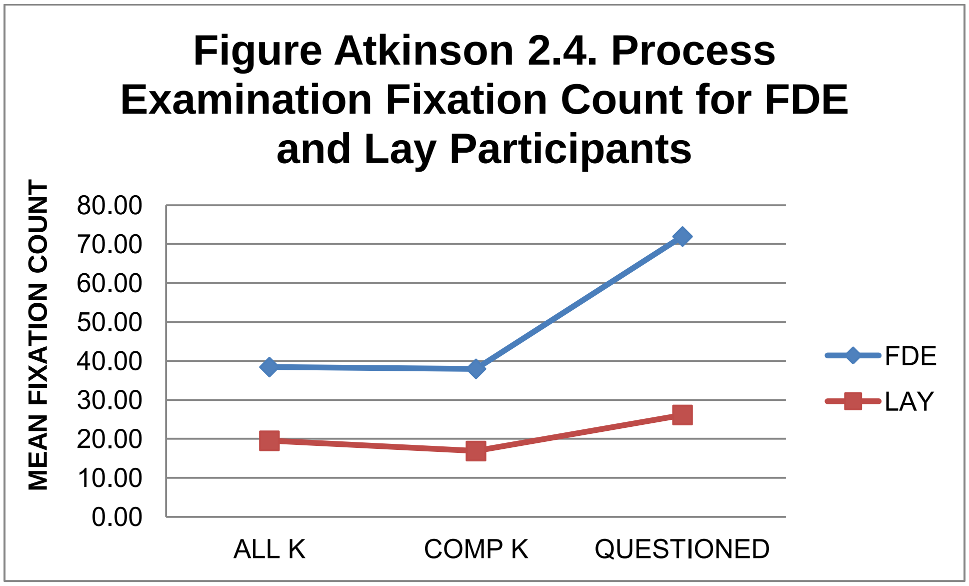
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Atkinson known signature stimulus (Knowns, not pictured here), Atkinson1K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Atkinson 2Q (the Atkinson questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 4) are included in subsequent analyses.

<u>*Total Fixation Count*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .208, $F(3, 85) = 7.45$, $p < .001$, multivariate $\eta^2 = .208$. Figure Atkinson 2.4 presents the mean fixation counts by AOI.

Figure Atkinson 2.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation counts in all areas of interest. Total fixation count for the questioned signature was significantly greater for FDEs than for lay participants, F (1, 87) = 20.77, $p <$ .001, partial η^2 = .193. Fixation counts in the known signature stimulus was also significantly difference between groups, F (1, 87) = 6.62, p = .012, partial η^2 = .071. Finally, the known signature comparison stimulus was significantly greater for FDEs than for lay participants, F (1, 87) = 10.72, p = .002, partial η^2 = .110). Table Atkinson 2.1 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 2.1

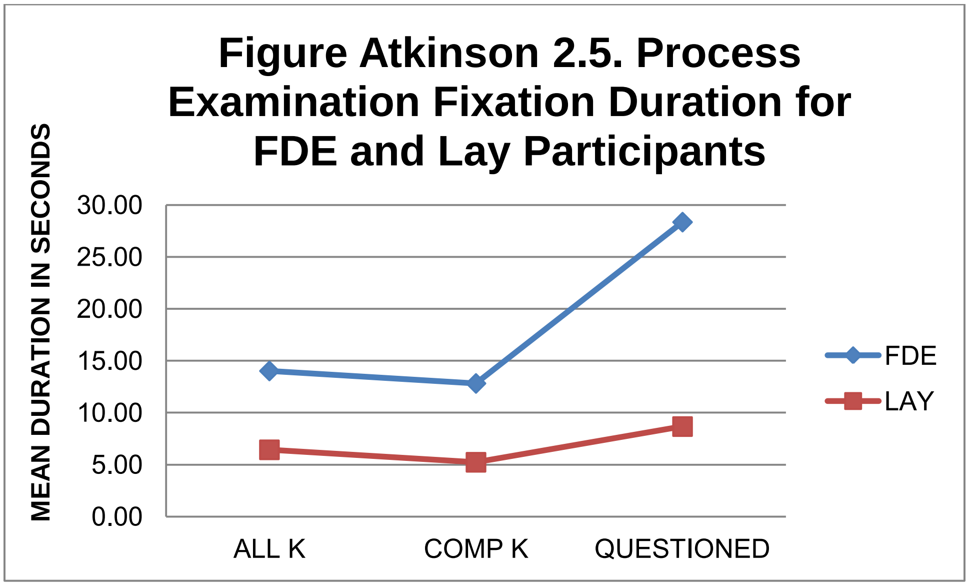
Process Examination Fixation Counts FDE and Lay

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	38.46	46.09	38.00	38.03	71.98	59.28
Lay	19.53	14.62	16.91	18.98	26.16	29.79

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .219, F (3,85) = 7.95, p < .001, multivariate η^2 = .219. Figure Atkinson 2.5 presents the mean fixation counts by AOI.

Figure Atkinson 2.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation durations in all areas of interest. Total fixation duration for the questioned signature was significantly greater for FDEs than for lay participants, F (1, 87) = 20.61, $p < .001$, partial $\eta^2 = .192$. Fixation durations in the known signature stimulus was significantly different between the groups, F (1, 87) = 10.02, $p = .002$, partial $\eta^2 = .103$. The fixation duration in the known signature comparison stimulus was also significantly greater for FDEs than for lay participants, F (1, 87) = 9.75, $p = .002$, partial $\eta^2 = .101$. Table Atkinson 2.2 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 2.2

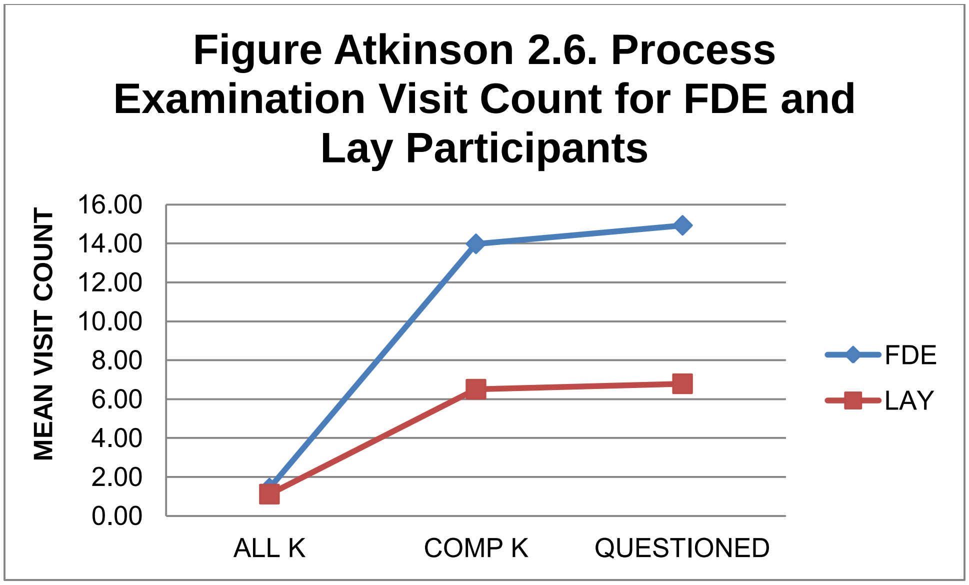
Atkinson 2 Process Examination Fixation Duration FDE and Lay

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	14.02	15.11	12.82	14.77	28.35	26.66
Lay	6.43	4.45	5.23	6.23	8.67	10.14

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .168, F (3, 85) = 5.70, $p = .001$, multivariate $\eta^2 = .168$. Figure Atkinson 2.6 presents the mean visit counts by AOI.

Figure Atkinson 2.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all but one area of interest. Total visit count for the questioned signature and known signature comparison stimulus were significantly greater for FDEs than for lay participants, F (1, 87) = 10.08, p = .002, partial η^2 = .104, and F (1, 87) = 8.70, p = .004, partial η^2 = .091). Visit counts in the known signature stimulus was not significantly different between the groups, p = .088, *ns*. Table Atkinson 2.3 presents the means and standard deviations for areas of interest by participant type.

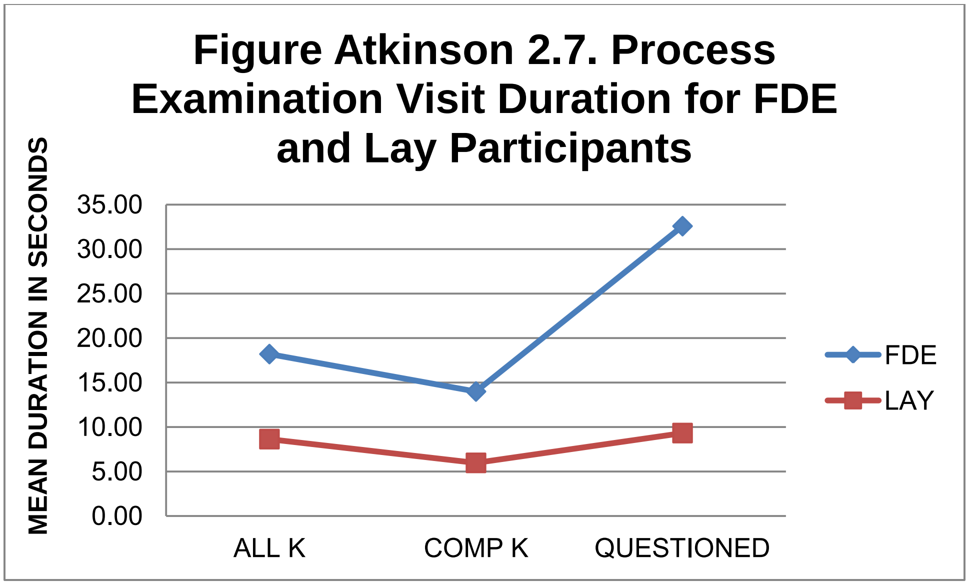
Table Atkinson 2.3
Process Examination Visit Count FDE and Lay

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.43	1.11	13.98	15.49	14.93	15.71
Lay	1.12	0.50	6.51	6.15	6.79	6.20

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .241, F (3, 85) = 9.01, p < .001, multivariate η^2 = .241. Figure Atkinson 2.7 presents the mean visit durations by AOI.

Figure Atkinson 2.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature was significantly greater for FDEs than for lay participants, F (1, 87) = 24.05, p < .001, partial η^2 = .217. Visit durations in the known signature stimulus was also significantly different between groups, F (1, 87) = 10.71, p = .002, partial η^2 = .110. The known signature comparison stimulus was also significantly greater for FDEs than for lay participants, F (1, 87) = 9.41, p = .003, partial η^2 = .098). Table Atkinson 2.4 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 2.4

Process Examination Visit Duration FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	18.19	18.23	13.57	14.51	32.57	29.27
Lay	8.63	6.04	5.96	7.50	9.31	10.85

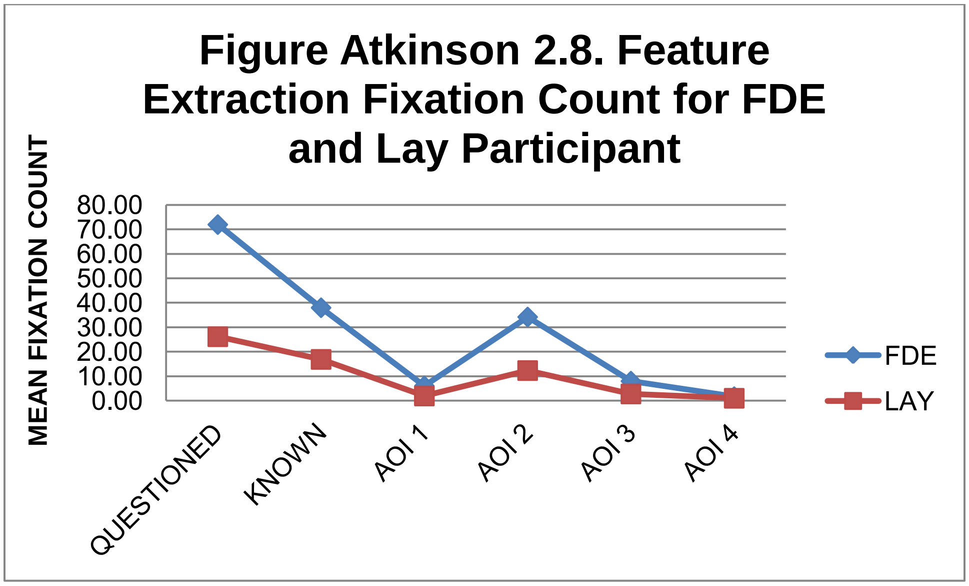
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .229, F (6, 82) = 4.06, p = .001, multivariate η^2 = .229. Figure Atkinson 2.8 presents the mean fixation counts by AOI.

Figure Atkinson 2.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all but one area of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for lay participants, F (1, 87) = 20.77, p < .001, partial η^2 = .193, and F (1, 87) = 10.72, p = .002, partial η^2 = .110. Fixation counts in all but one AOI were significantly greater for FDEs than for lay participants (AOI 1, F (1, 87) = 14.84, p < .001, partial η^2 = .146; AOI 2, F(1, 87) = 15.69, p < .001, partial η^2 = .153; AOI 3, F (1, 87) = 12.93, p = .001, partial η^2 = .129). No significant difference was found for AOI 4, p = .096, *ns*. Table Atkinson 2.5 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 2.5

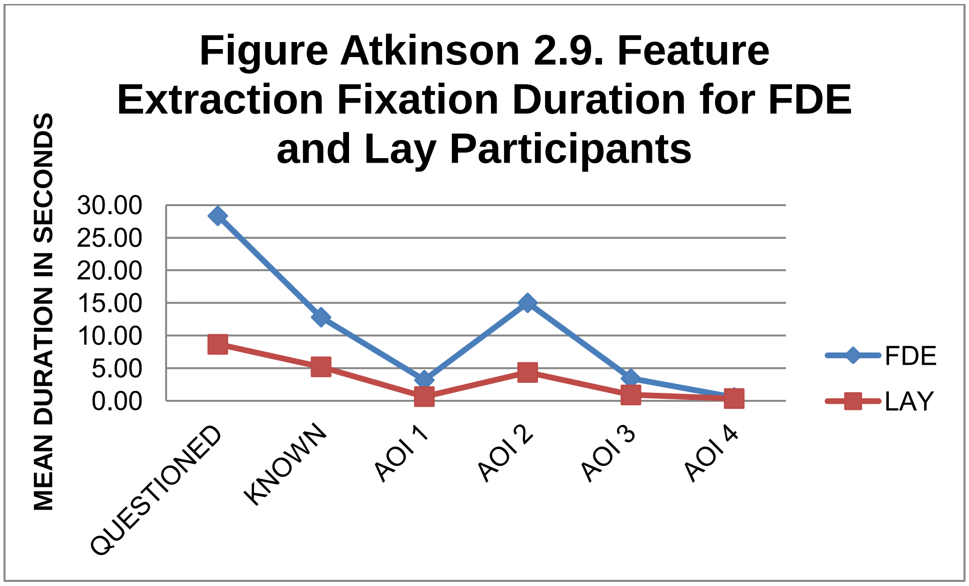
Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	71.98	59.28	38.00	38.03	6.04	6.50
Lay	26.16	29.79	16.91	18.98	1.95	2.58
	AOI 2		**AOI 3**		**AOI 4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	34.22	33.68	8.02	8.56	1.67	2.15
Lay	12.35	13.71	2.79	4.35	1.02	1.39

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .241, F (6, 82) = 4.34, p = .001, multivariate η^2 = .241. Figure Atkinson 2.9 presents the mean fixation durations by AOI.

Figure Atkinson 2.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all but one area of interest. Total fixation duration for the questioned signature was significantly greater for FDEs than for lay participants, F (1, 87) = 20.61, p = .001, partial η^2 = .192, and for the known signature comparison stimulus, F (1, 87) = 9.75, p = .002, partial η^2 = .101. Fixation durations in all AOIs but one was significantly greater for FDEs than for lay participants (AOI 1, F (1, 87) = 19.43, p < .001, partial η^2 = .183; AOI 2, F (1, 87) = 19.10, p < .001, partial η^2 = .180; AOI 3, F (1, 87) = 15.14, p < .001, partial η^2 = .148). No significant difference was found in AOI 4, p = .258, *ns*. Table Atkinson 2.6 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 2.6
Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

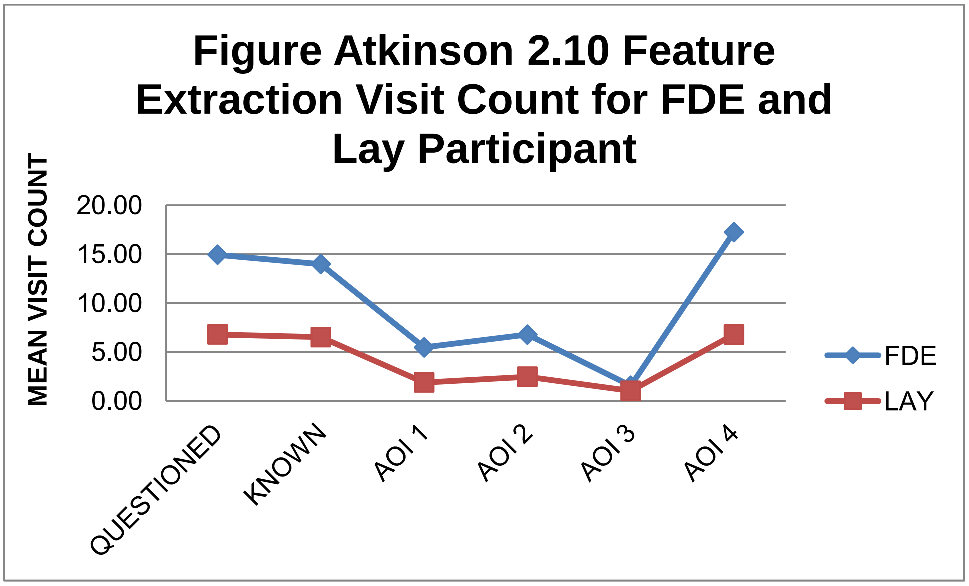
	QUESTIONED		KNOWN		AOI 1	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	28.35	26.66	12.82	14.77	3.18	3.63
Lay	8.67	10.14	5.23	6.23	0.66	0.99

	AOI 2		AOI 3		AOI 4	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	15.02	15.27	3.43	4.03	0.53	0.72
Lay	4.36	4.91	0.92	1.37	0.37	0.63

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .258, F (6, 82) = 4.74, p < .001, multivariate η^2 = .258. Figure Atkinson 2.10 presents the mean total visit counts by AOI.

Figure Atkinson 2.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all but one area of interest. Total visit count for the questioned signature and known signature comparison stimulus were significantly greater for FDEs than for lay participants, F (1, 87) = 10.08, p = .002, partial η^2 = .104, and F (1, 87) = 8.70, p = .004, partial η^2 = .091. Visit count in most AOIs was significantly greater for FDEs than for lay participants (AOI 1, F (1, 87) = 14.44, p < .001, partial η^2 = .142; AOI 2, F (1, 87) = 13.69, p < .001, partial η^2 = .136; AOI 4, F (1, 87) = 16.46, p < .001, partial η^2 = .159). No significant difference was found in AOI 3, p = .147, *ns*. Table Atkinson 2.7 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 2.7

Feature Extraction Analysis Visit Count for FDE and Lay Participants

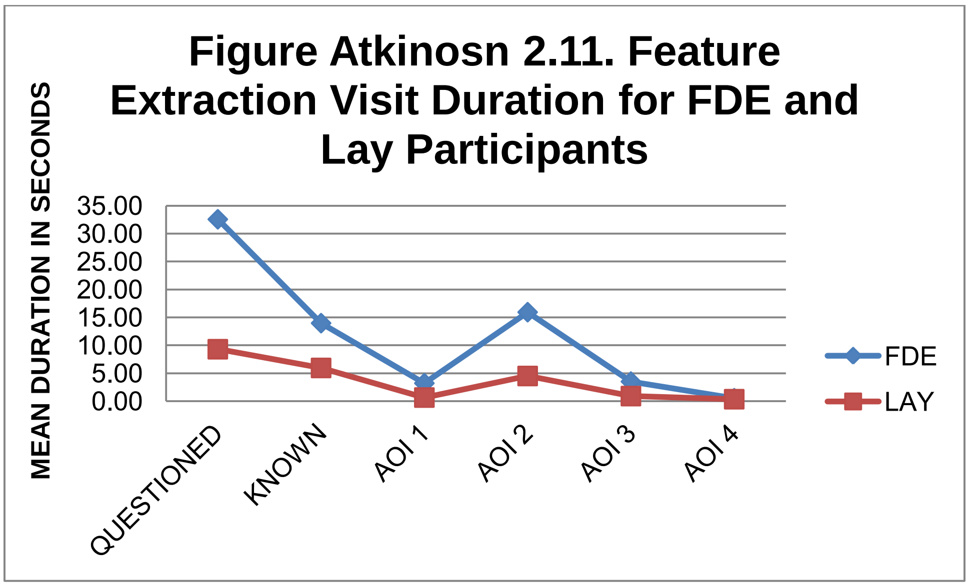
	QUESTIONED	KNOWN	AOI 1

Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	14.93	15.71	13.98	15.49	5.46	5.71
Lay	6.79	6.20	6.51	6.15	1.88	2.41
	AOI 2		AOI 3		AOI 4	
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	6.76	6.79	1.54	1.91	17.24	15.44
Lay	2.47	3.57	1.02	1.39	6.77	7.14

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .254, *F* (6, 82) = 4.65, $p < .001$, multivariate $\eta^2 = .254$. Figure Atkinson 2.11 presents the mean total visit counts by AOI.

Figure Atkinson 2.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature and known signature comparison stimulus were significantly greater for FDEs than for lay participants, *F* (1, 87) = 78.00, $p < .001$, partial $\eta^2 = .473$, and *F* (1, 87) = 58.23, $p < .001$, partial $\eta^2 = .401$. Visit duration in all AOIs was significantly greater for FDEs than for lay participants (AOI 1, *F* (1, 87) = 44.98, $p < .001$, partial $\eta^2 = .341$; AOI 2, *F* (1, 87) = 63.86, $p < .001$, partial $\eta^2 = .423$; AOI 3, *F* (1, 87) = 44.75, $p < .001$, partial $\eta^2 = .340$; AOI 4, *F* (1, 87) = 39.03, $p < .001$, partial $\eta^2 = .310$. Table Atkinson 2.8 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 2.11

Feature Extraction Analysis Visit Count for FDE and Lay Participants

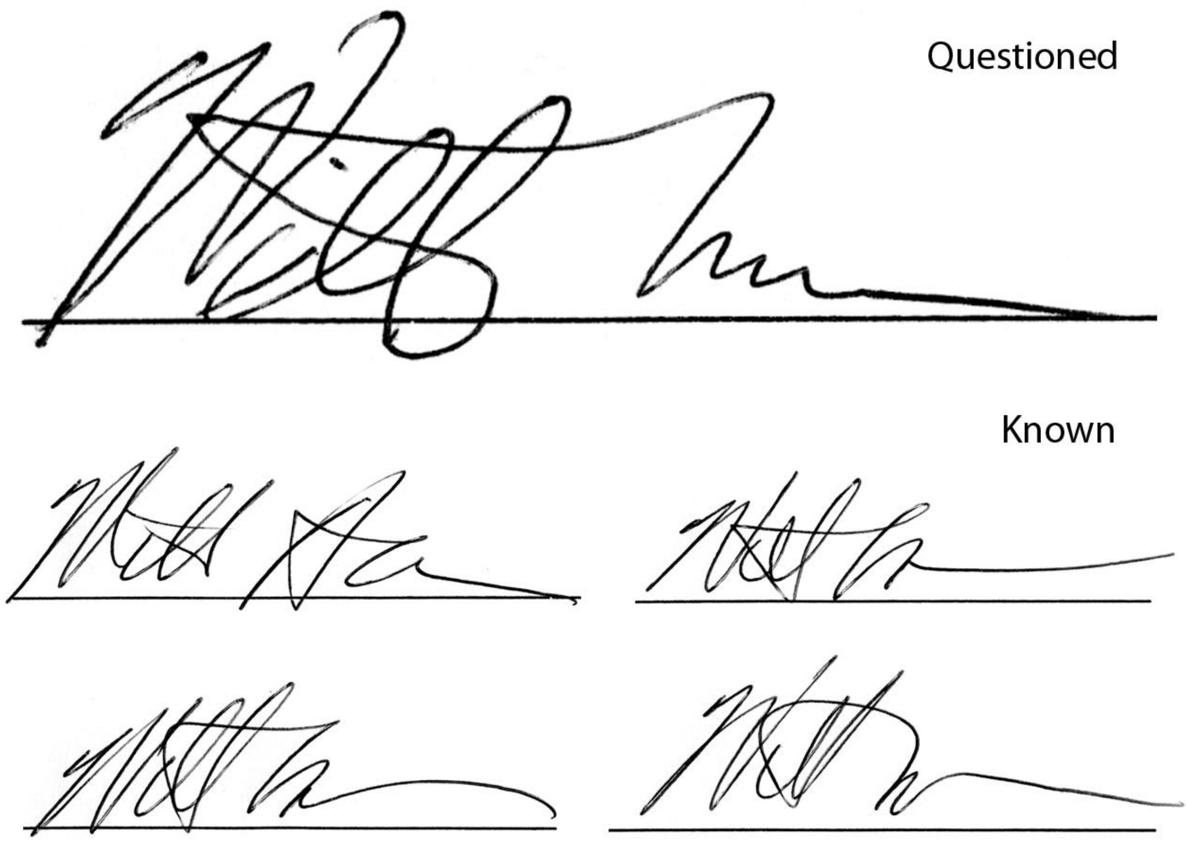
	QUESTIONED		KNOWN		AOI 1	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	32.57	29.27	13.98	15.52	3.23	3.68
Lay	9.31	10.85	5.96	7.50	0.66	0.99

	AOI 2		AOI 3		AOI 4	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	15.95	16.05	3.52	4.15	0.54	0.73
Lay	4.52	5.11	0.93	1.40	0.37	0.63

Atkinson Signature 3: Freehand Simulation (Non-Genuine)

Of the 49 FDE participants, 48 correctly identified the signature as non-genuine. One FDE declined to respond. Of the 43 Lay participants, 39 responded correctly that the signature was non-genuine, while 4 identified the signature as genuine. This difference was not statistically significant, p = .062, *ns*. Figure Atkinson 3.1 presents the comparison view of this signature.

Figure Atkinson 3.1. Questioned-Known Comparison Stimulus for Atkinson Signature 3.

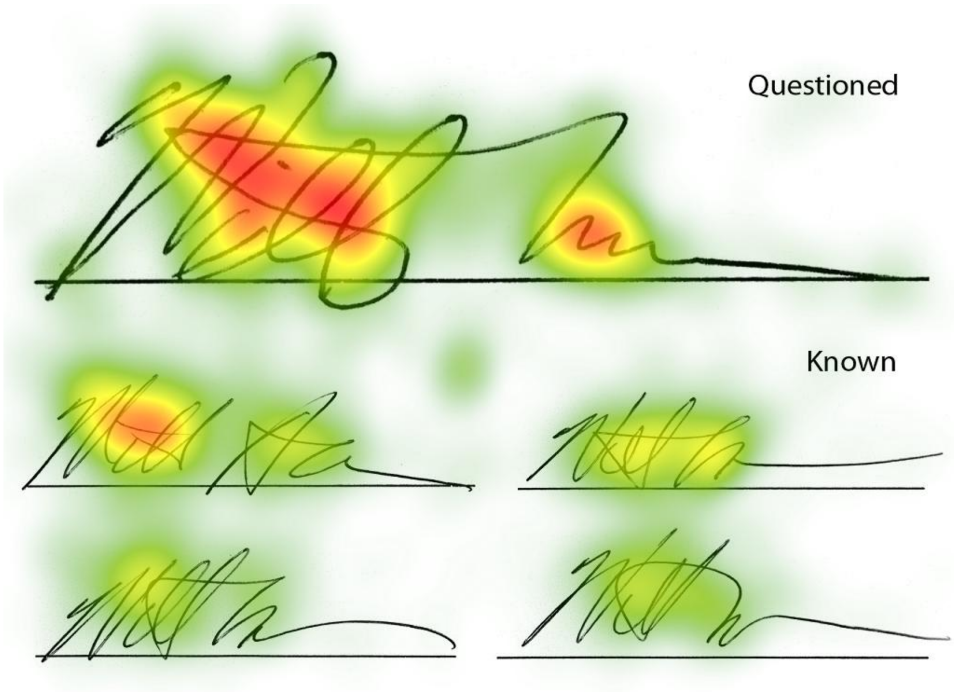


Selection of Areas of Interest (AOIs)

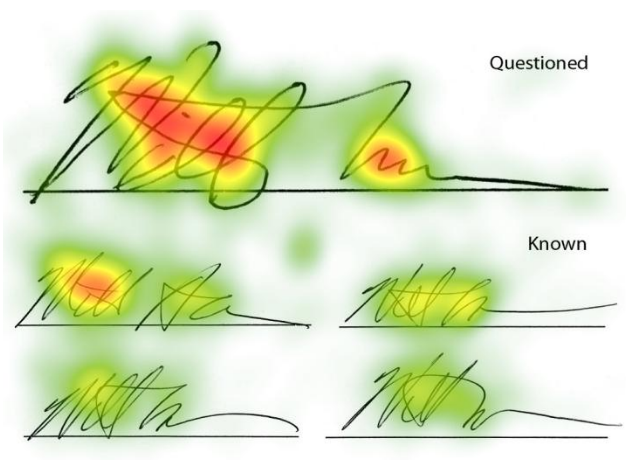
Figure Atkinson 3.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were four locations indicated by hot spots and warm spots within the signature that elicited significant attention from the participants. AOIs were created for these specific areas, creating a total of four AOIs for this stimulus. Figure Atkinson 3.3 presents the location of the AOIs identified in the heat map.

Figure Atkinson 3.2. Heat map for Atkinson signature 3, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

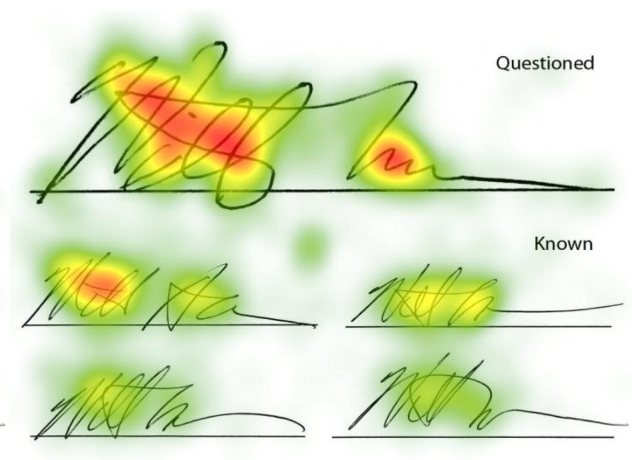


Figure Atkinson 3.3. Areas of Interest (AOIs) for Atkinson Signature 3.

Eye-Tracking Metrics Analyses

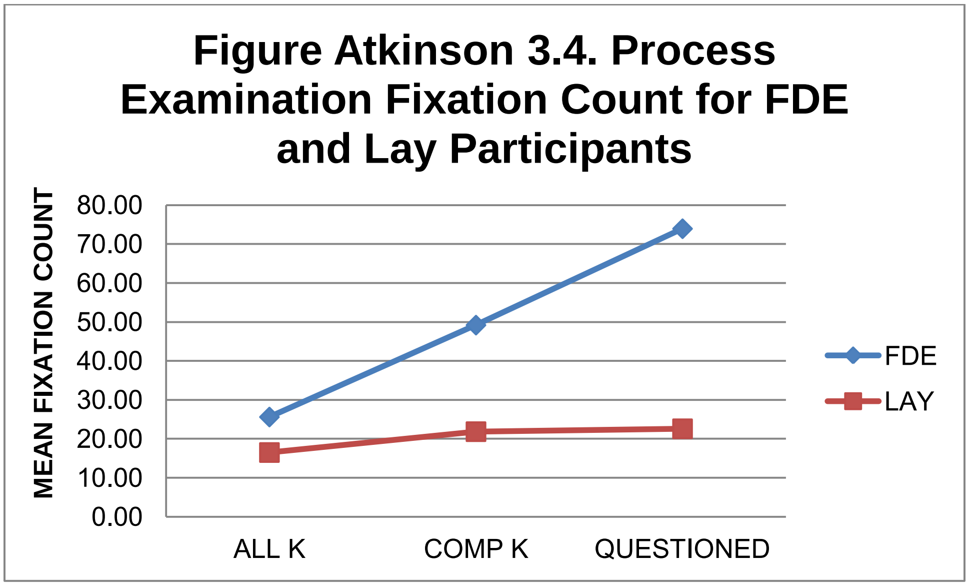
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Atkinson known signature stimulus (Knowns, not pictured here), Atkinson1K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Atkinson 3Q (the Atkinson questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 4) are included in subsequent feature extraction analyses.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .314, F (3, 86) = 13.11, p < .001, multivariate η^2 = .314. Figure Atkinson 3.4 presents the mean fixation counts by AOI.

Figure Atkinson 3.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixations counts in all areas of interest. Total fixation count for the questioned signature was significantly greater for FDEs than for lay participants, F (1, 88) = 30.33, $p <$ .001, partial η^2 = .256. Fixation count in the known signature comparison stimulus was also significantly different between groups, F (1, 88) = 4.93, p = .029, partial η^2 = .053. Finally, the known signature stimulus (ALL K) was significantly greater for FDEs than for lay participants, F (1, 88) = 11.83, p = .001, partial η^2 = .119). Table Atkinson 3.1 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 3.1

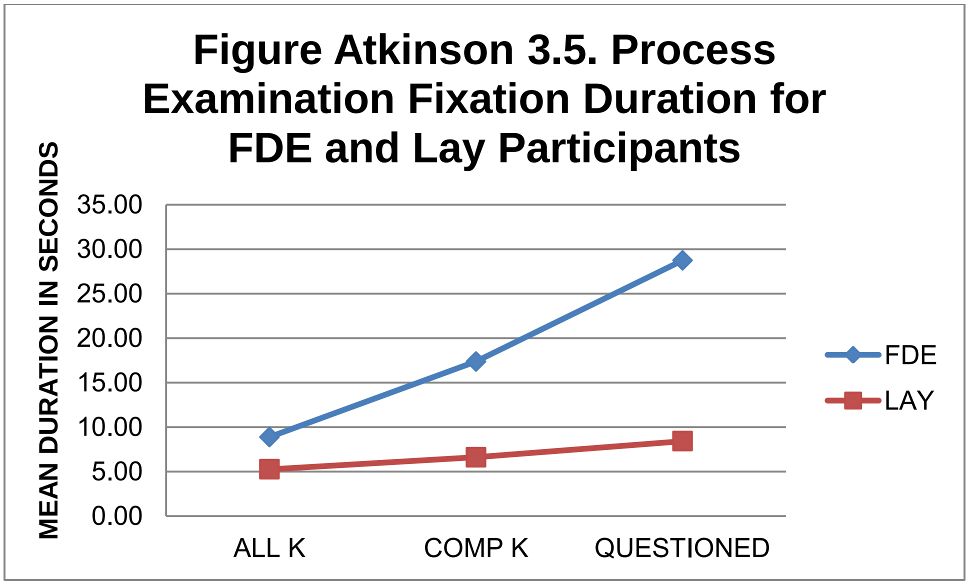
Process Examination Fixation Counts FDE and Lay

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	25.60	23.90	49.19	46.47	73.94	57.00
Lay	16.49	12.92	21.84	24.70	22.58	23.10

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .287, F (3, 86) = 11.56, p < .001, multivariate η^2 = .287. Figure Atkinson 3.5 presents the mean fixation counts by AOI.

Figure Atkinson 3.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation durations in all areas of interest. Total fixation duration for the questioned signature was significantly greater for FDEs than for lay participants, F (1, 88) = 28.10, p < .001, partial η^2 = .242. Fixation durations in the known signature stimulus (ALL K) were significantly different between the groups, F (1, 88) = 5.62, p = .020, partial η^2 = .060. Likewise, fixation duration in the known signature comparison stimulus (COMP K) was significantly greater for FDEs than for lay participants, F (1, 88) = 13.21, p < .001, partial η^2 = .131. Table Atkinson 3.2 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 3.2

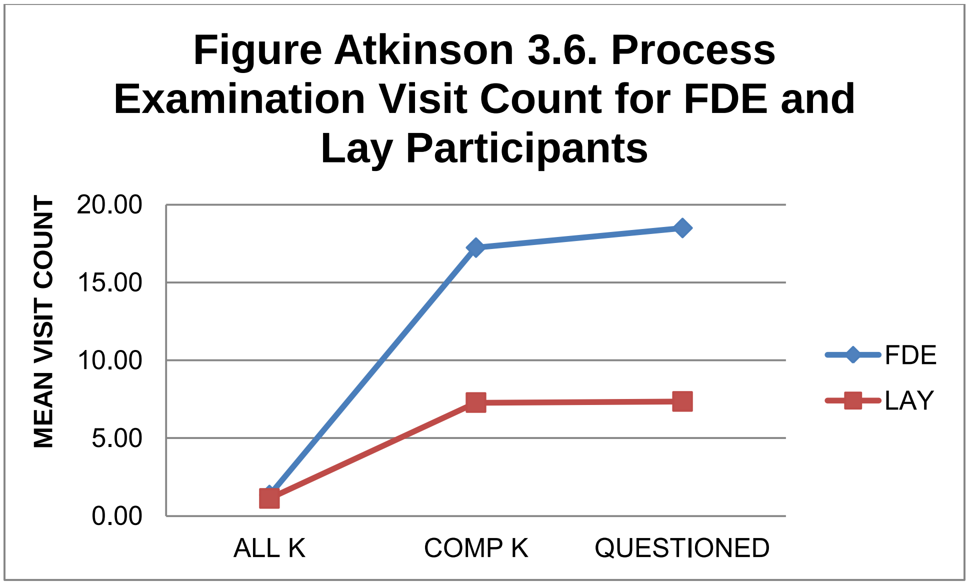
Atkinson 3 Process Examination Fixation Duration FDE and Lay

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	8.86	9.11	17.35	18.12	28.72	23.65
Lay	5.25	4.26	6.59	7.29	8.41	8.87

<u>Total Visit Count</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .193, F (3, 86) = 6.87, p < .001, multivariate η^2 = .193. Figure Atkinson 3.6 presents the mean visit counts by AOI.

Figure Atkinson 3.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in two of the three areas of interest. Total visit count for the questioned signature was significantly greater for FDEs than for lay participants, F (1, 88 = 18.09, $p <$ .001, partial η^2 = .171. Visit count in the known signature comparison stimulus (COMP K) was significantly greater for FDEs than for lay participants, F (1, 88) = 16.20, p < .001, partial η^2 = .155). Visit counts in the known signature stimulus (ALL K) were not significantly different between the groups, p = .220, *ns*. Table Atkinson 3.3 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 3.3

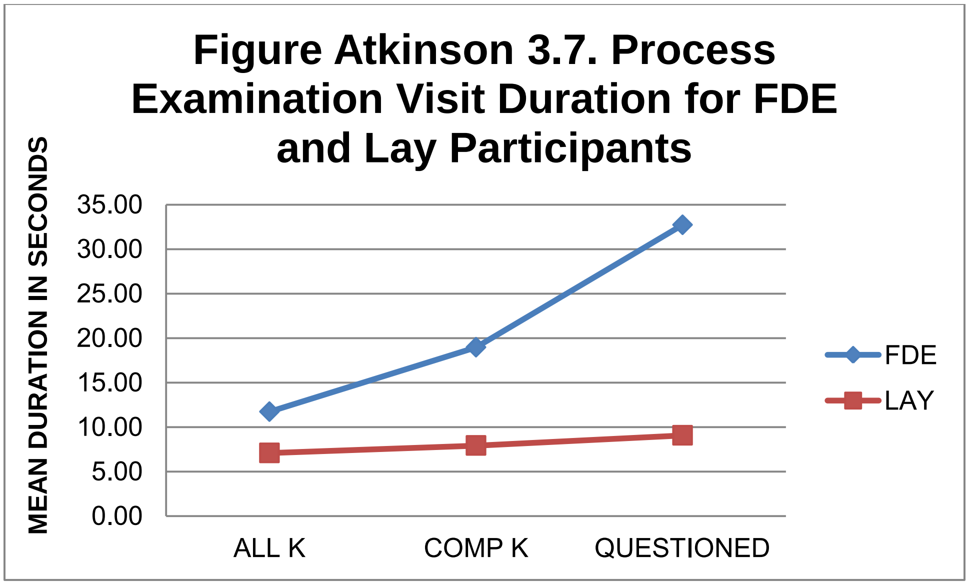
Process Examination Visit Count FDE and Lay

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.34	1.09	17.23	14.46	18.49	15.46
Lay	1.12	0.5	7.28	7.68	7.35	7.81

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .337, F (3, 86) = 14.59, p < .001, multivariate η^2 = .337. Figure Atkinson 3.7 presents the mean visit durations by AOI.

Figure Atkinson 3.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature was significantly greater for FDEs than for lay participants, $F\,(1, 88) = 34.24$, $p < .001$, partial $\eta^2 = .280$. Visit durations in the known signature stimulus (ALL K) was also significantly different between groups, $F\,(1, 88) = 5.93$, $p = .017$, partial $\eta^2 = .063$. Likewise, the known signature comparison stimulus (COMP K) was significantly greater for FDEs than for lay participants, $F\,(1, 88) = 11.80$, $p = .001$, partial $\eta^2 = .118$). Table Atkinson 3.4 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 3.4

Process Examination Visit Duration FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	11.72	11.28	18.96	19.48	32.72	24.99
Lay	7.08	5.61	7.92	8.39	9.06	9.22

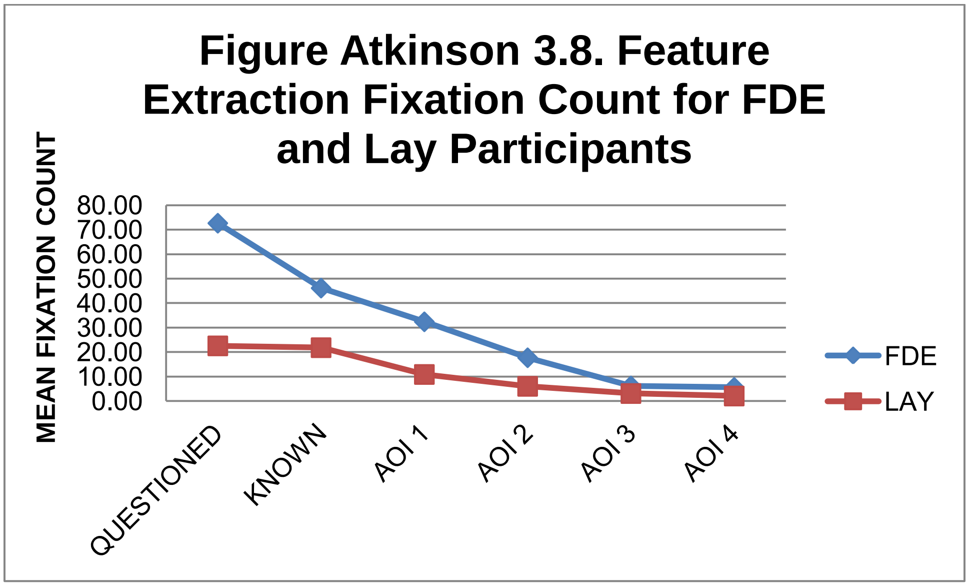
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .429, F (6, 80) = 10.02, p < .001, multivariate η^2 = .429. Figure Atkinson 3.8 presents the mean fixation counts by AOI.

Figure Atkinson 3.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation counts for the questioned signature and known signatures were significantly greater for FDEs than for lay participants, F (1, 85) = 32.55, p < .001, partial η^2 = .277, and F (1, 85) = 12.90, p = .001, partial η^2 = .132. Fixation counts in all AOIs were significantly greater for FDEs than for lay participants (AOI 1, F (1, 85) = 29.73, p < .001, partial η^2 = .259; AOI 2, F (1, 85) = 27.63, p < .001, partial η^2 = .245; AOI 3, F (1, 85) = 9.31, p = .003, partial η^2 = .099; AOI 4, F (1, 85) = 12.37, p = .001, partial η^2 = .127. Table Atkinson 3.5 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 3.5

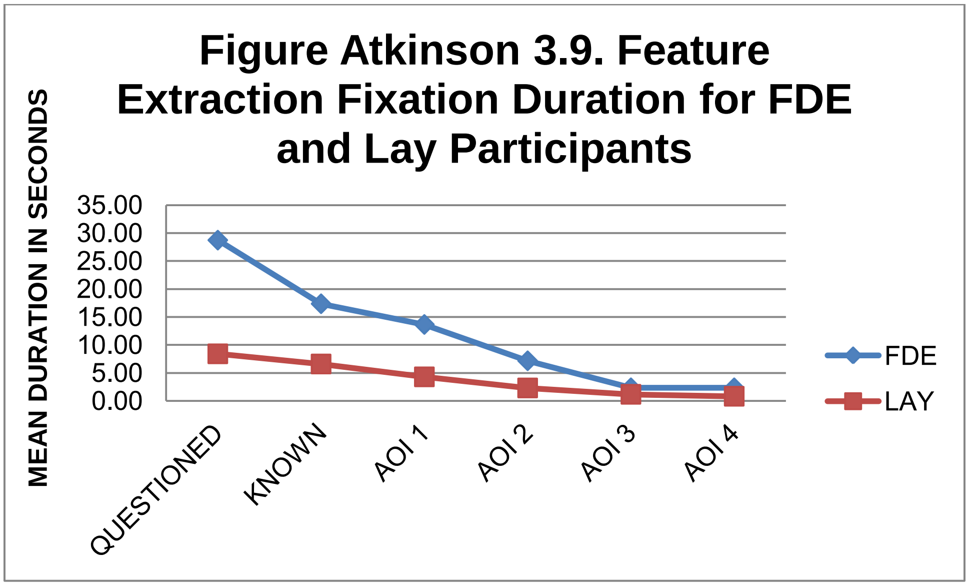
Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

	QUESTIONED		**KNOWN**		**AOI 1**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	72.68	52.86	46.18	37.14	32.41	23.79
Lay	22.58	23.10	21.84	24.70	10.91	10.24
	AOI 2		**AOI 3**		**AOI 4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	17.73	13.58	6.23	5.81	5.64	6.22
Lay	6.05	5.34	3.12	3.35	2.09	2.23

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .34, F (6, 83) = 7.26, p < .001, multivariate η^2 = .34. Figure Atkinson 3.9 presents the mean fixation durations by AOI.

Figure Atkinson 3.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation durations for the questioned signature and the known signatures were significantly greater for FDEs than for lay participants, F (1, 88) = 28.10, p < .001, partial η^2 = .242, and F (1, 88) = 13.21, p < .001, partial η^2 = .131. Fixation durations in all AOIs were significantly greater for FDEs than for lay participants (AOI 1, F (1, 88) = 30.34, p < .001, partial η^2 = .256; AOI 2, F (1, 88) = 25.43, p < .001, partial η^2 = .224; AOI 3, F (1, 88) = 10.09, p = .002, partial η^2 = .103; AOI 4, F (1, 88) = 12.48, p = .001, partial η^2 = .124. Table Atkinson 3.6 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 3.6

Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

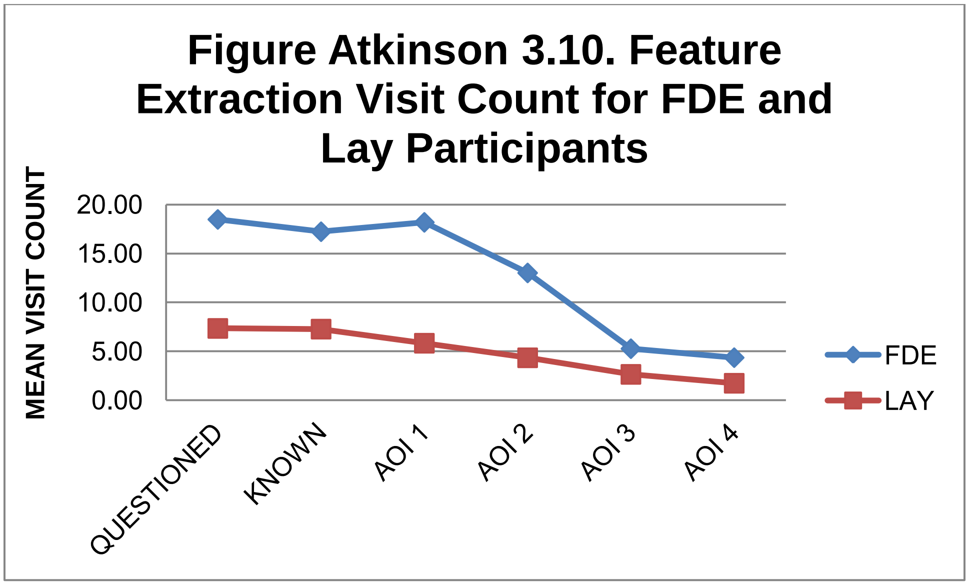
	QUESTIONED		**KNOWN**		**AOI 1**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	28.72	23.65	17.35	18.12	13.66	10.14
Lay	8.41	8.87	6.59	7.29	4.29	4.84
	AOI 2		**AOI 3**		**AOI 4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	7.17	5.87	2.34	2.03	2.34	2.63

Lay	2.31	2.43	1.17	1.34	0.83	1.01

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .339, F (6, 83) = 7.08, p < .001, multivariate η^2 = .339. Figure Atkinson 3.10 presents the mean total visit counts by AOI.

Figure Atkinson 3.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit counts for the questioned signature and known signatures were significantly greater for FDEs than for lay participants, F (1, 88) = 18.09, p < .001, partial η^2 = .171, and F (1, 88) = 16.20, p < .001, partial η^2 = .155. Visit count in all AOIs was significantly greater for FDEs than for lay participants (AOI 1, F (1, 88) = 32.78, p < .001, partial η^2 = .271; AOI 2, F (1, 88) = 32.69, p < .001, partial η^2 = .271; AOI 3, F (1, 88) = 10.55, p = .002, partial η^2 = .107; AOI 4, F (1, 88) = 13.61, p < .001, partial η^2 = .134). Table Atkinson 3.7 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 3.7
Feature Extraction Analysis Visit Count for FDE and Lay Participants

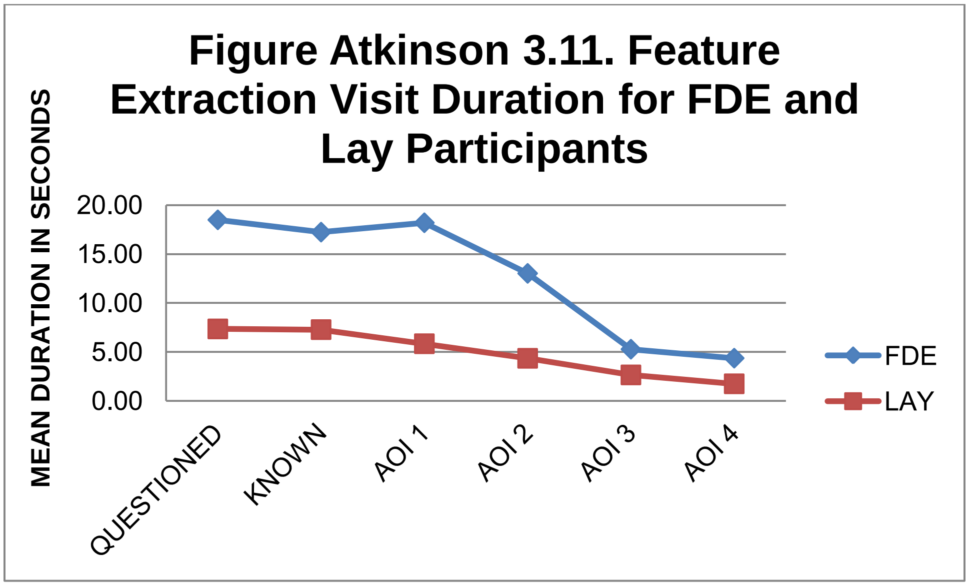
	QUESTIONED		KNOWN		AOI 1	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	18.49	15.46	17.23	14.46	18.19	13.10
Lay	7.35	7.81	7.28	7.68	5.84	5.58

	AOI 2		AOI 3		AOI 4	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	13.02	9.18	5.28	4.51	4.36	4.32
Lay	4.35	3.99	2.65	2.91	1.74	1.81

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .444, F (6, 80) = 10.63, p < .001, multivariate η^2 = .444. Figure Atkinson 3.11 presents the mean total visit counts by AOI.

Figure Atkinson 3.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature was significantly greater for FDEs than for lay participants, F (1, 85) = 35.97, p < .001, partial η^2 = .297. Total visit duration for the known signatures was significantly greater for FDEs and for Lay participants, F (1, 85) = 12.64, p = .001, partial η^2 = .129. Visit duration in all AOIs was significantly greater for FDEs than for lay participants (AOI 1, F (1, 85) = 27.74, p < .001, partial η^2 = .246; AOI 2, F (1, 85) = 22.94, p < .001, partial η^2 = .213; AOI 3, F (1, 85) = 8.09, p = .006, partial η^2 = .087; AOI 4, F (1, 85) = 11.43, p = .001, partial η^2 = .119. Table Atkinson 3.8 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 3.8

Feature Extraction Analysis Visit Count for FDE and Lay Participants

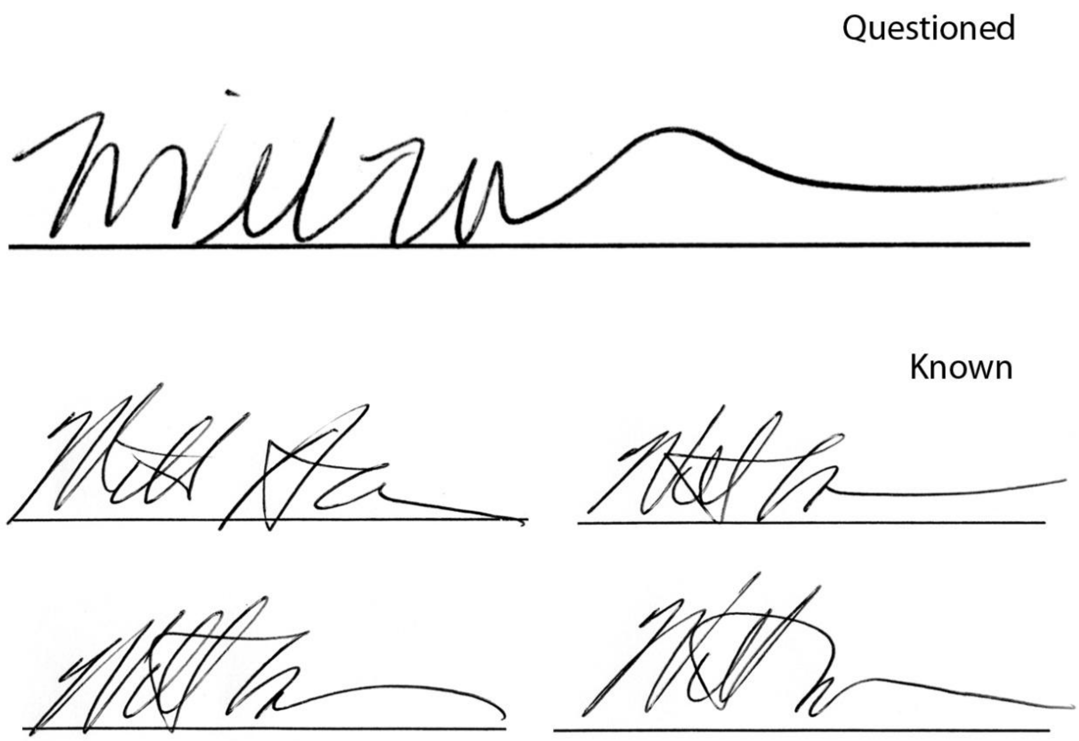
	QUESTIONED	KNOWN	AOI 1

Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	32.39	23.82	17.76	16.15	14.35	10.99
Lay	9.06	9.22	7.92	8.39	4.69	4.95
	AOI 2		**AOI 3**		**AOI 4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	7.43	6.35	2.39	2.21	2.39	2.81
Lay	2.46	2.47	1.26	1.38	0.86	1.00

Atkinson Signature 4: Freehand Simulation (Non-Genuine)

Of the 49 FDE participants, 47 correctly identified the signature as non-genuine, while 1 indentified the signature as genuine. One FDE declined to respond. Of the 43 Lay participants, 40 responded correctly that the signature was non-genuine, while 3 identified the specimen as genuine. This difference was not statistically significant, $p = .336$, *ns*. Figure Atkinson 4.1 presents the comparison view of this signature.

Figure Atkinson 4.1. Questioned-Known Comparison Stimulus for Atkinson Signature 4.

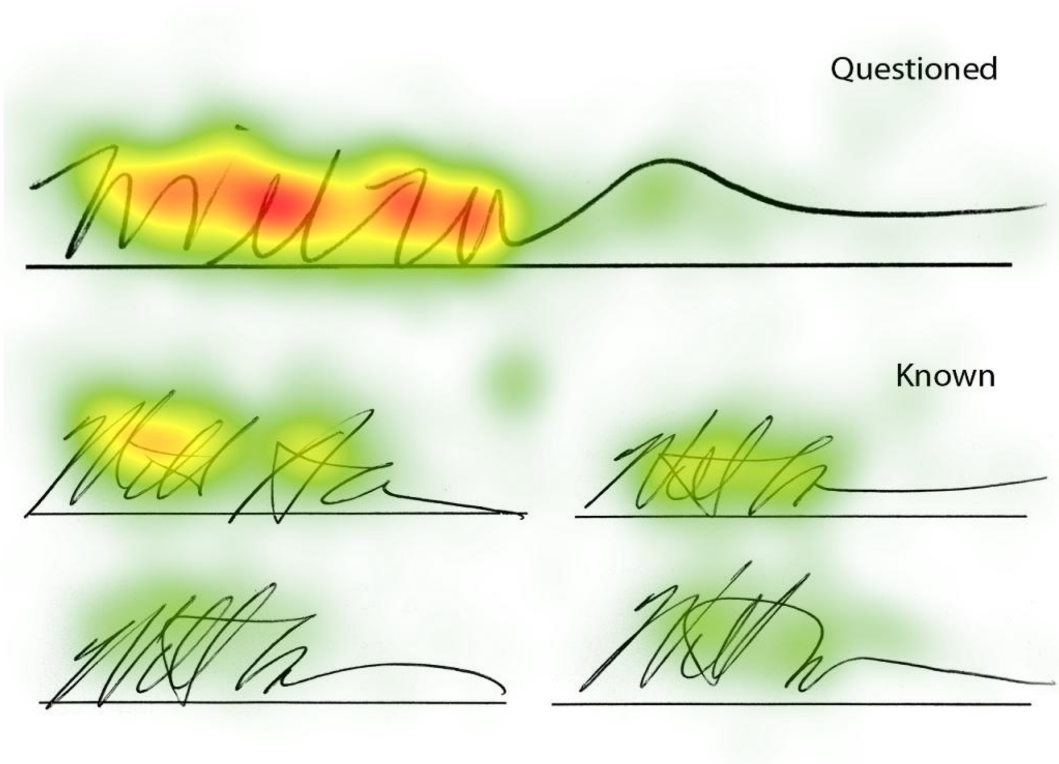


Selection of Areas of Interest (AOIs)

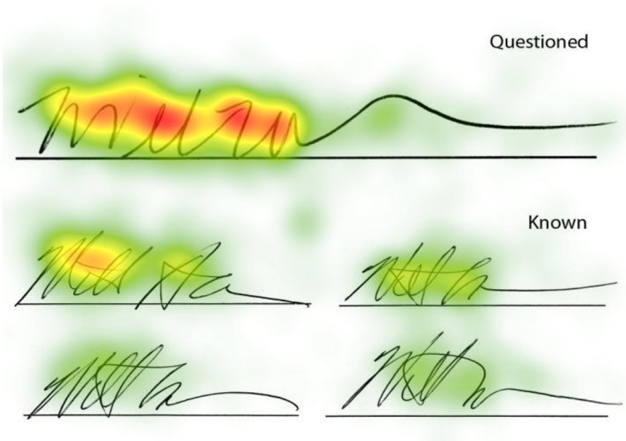
Figure Atkinson 4.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were six locations indicated by hot spots and warm spots within the signature that elicited significant attention from the participants. AOIs were created for these specific areas, creating a total of six AOIs for this stimulus. Figure Atkinson 4.3 presents the location of the AOIs identified in the heat map.

Figure Atkinson 4.2. Heat map for Atkinson signature 4, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

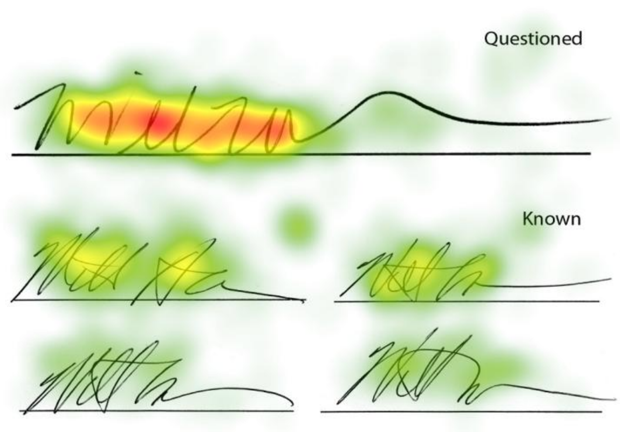
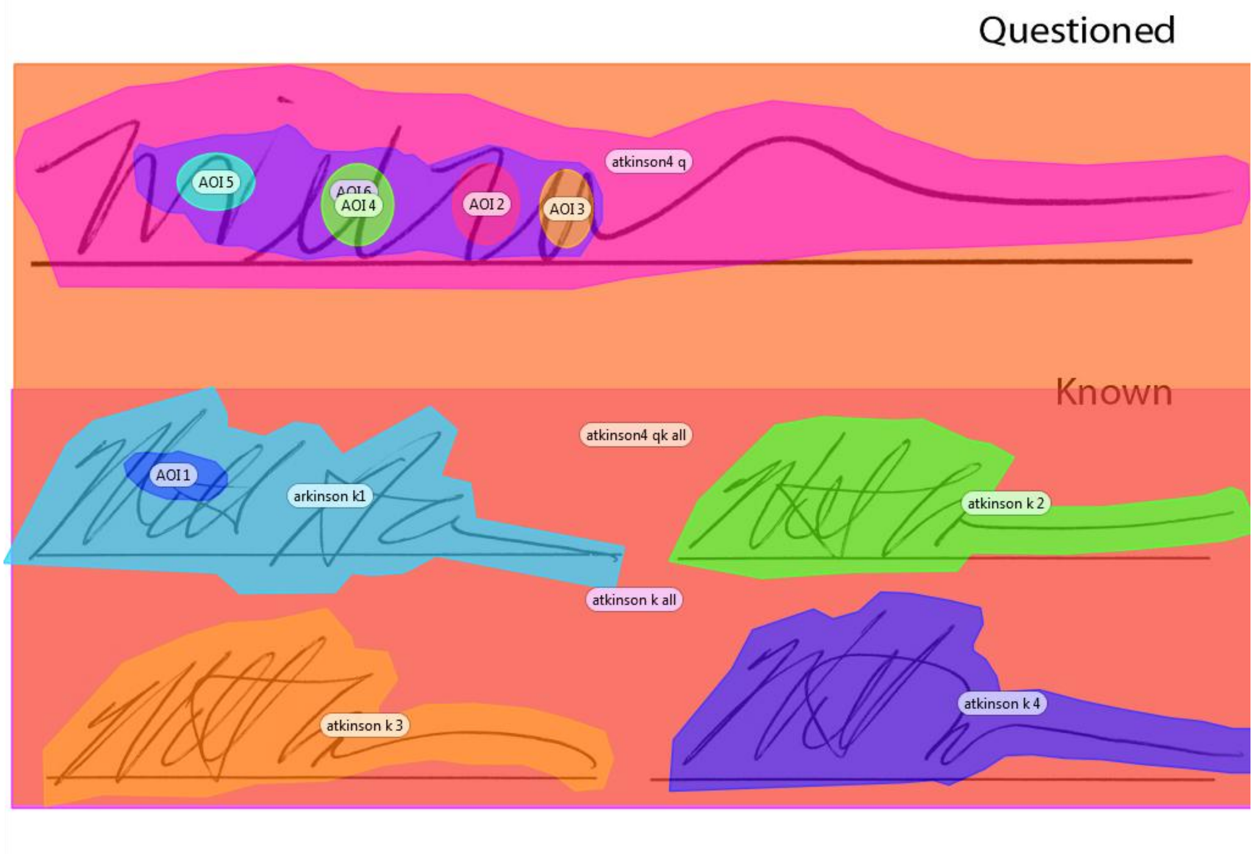


Figure Atkinson 4.3. Areas of Interest (AOIs) for Atkinson Signature 4.



Eye-Tracking Metrics Analyses

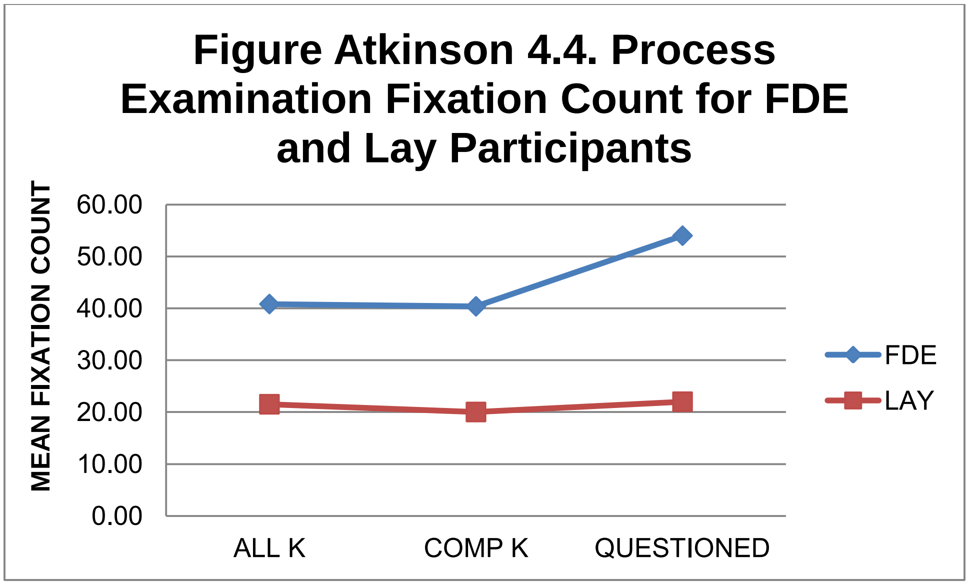
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Atkinson known signature stimulus (Knowns, not pictured here), Atkinson K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Atkinson 4Q (the Atkinson questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 6) are included in subsequent feature extraction analyses.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .262, F (3, 86) = 10.20, p < .001, multivariate η^2 = .262. Figure Atkinson 4.4 presents the mean fixation counts by AOI.

Figure Atkinson 4.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixations counts in all areas of interest. Total fixation count for the questioned signature was significantly greater for FDEs than for lay participants, F (1, 88) = 22.87, p < .001, partial η^2 = .206. Fixation counts in the known signature stimulus (ALL K) were also significantly difference between groups, F (1, 88) = 6.28, p = .002, partial η^2 = .067. Finally, the fixation counts in the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for lay participants, F (1, 88) = 10.60, p = .002, partial η^2 = .108). Table Atkinson 4.1 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 4.1

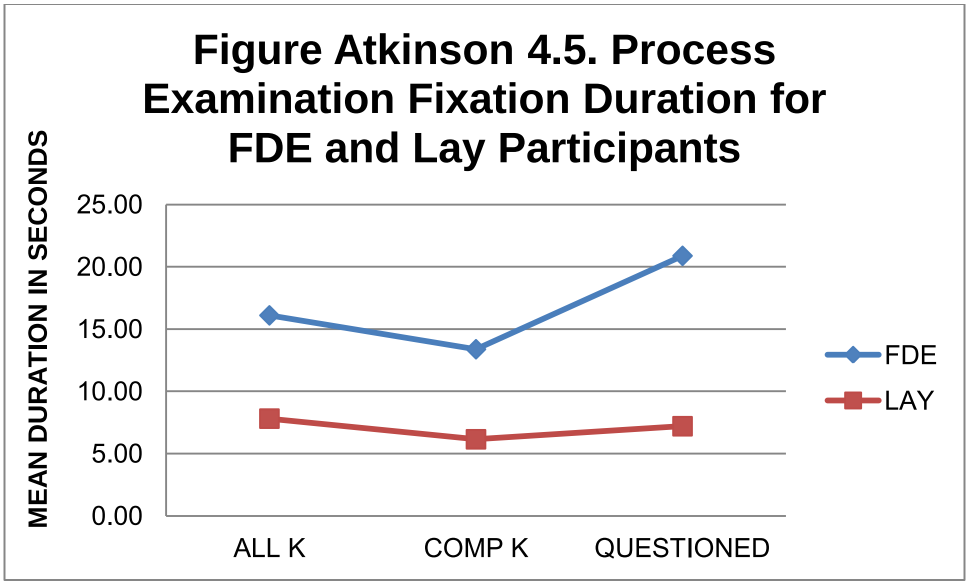
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	40.83	48.09	40.38	36.18	54.00	39.40
Lay	21.51	16.20	20.02	20.14	22.00	20.16

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .232, F (3, 86) = 8.65, p < .001, multivariate η^2 = .232. Figure Atkinson 4.5 presents the mean fixation duration by AOI.

Figure Atkinson 4.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation durations in all areas of interest. Total fixation duration for the questioned signature was significantly greater for FDEs than for lay participants, F (1, 88) = 21.53, p < .001, partial η^2 = .197. Fixation durations in the known signature stimulus (ALL K) were significantly different between the groups, F (1, 88) = 5.65, p = .020, partial η^2 = .060. Likewise, mean duration in the known signature comparison stimulus was significantly greater for FDEs than for lay participants, F (1, 88) = 11.24, p = .001, partial η^2 = .113. Table Atkinson 4.2 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 4.2

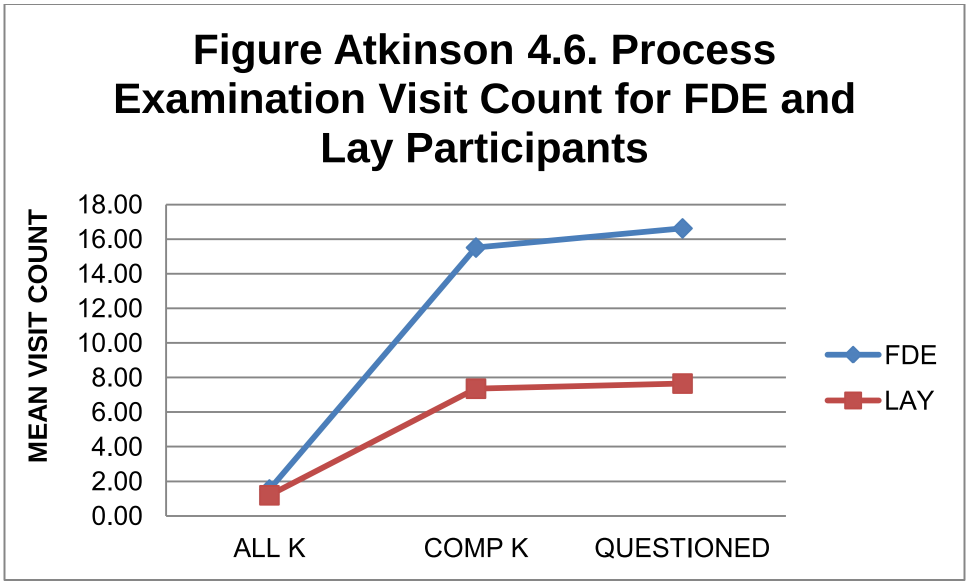
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	16.10	21.84	13.38	12.70	20.88	18.33
Lay	7.81	7.06	6.15	6.50	7.20	6.37

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .224, F (3, 86) = 8.29, p < .001, multivariate η^2 = .224. Figure Atkinson 4.6 presents the mean visit counts by AOI.

Figure Atkinson 4.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in two of the three areas of interest. Total visit counts for the questioned signature and known signature comparison (COMP K) were significantly greater for FDEs than for lay participants, F (1, 88) = 18.27, p < .001, partial η^2 = .172, and F (1, 88) = 14.61, p < .001, partial η^2 = .142. Visit counts in the known signature stimulus (ALL K) were not significantly different between the groups, p = .198, *ns*. Table Atkinson 4.3 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 4.3

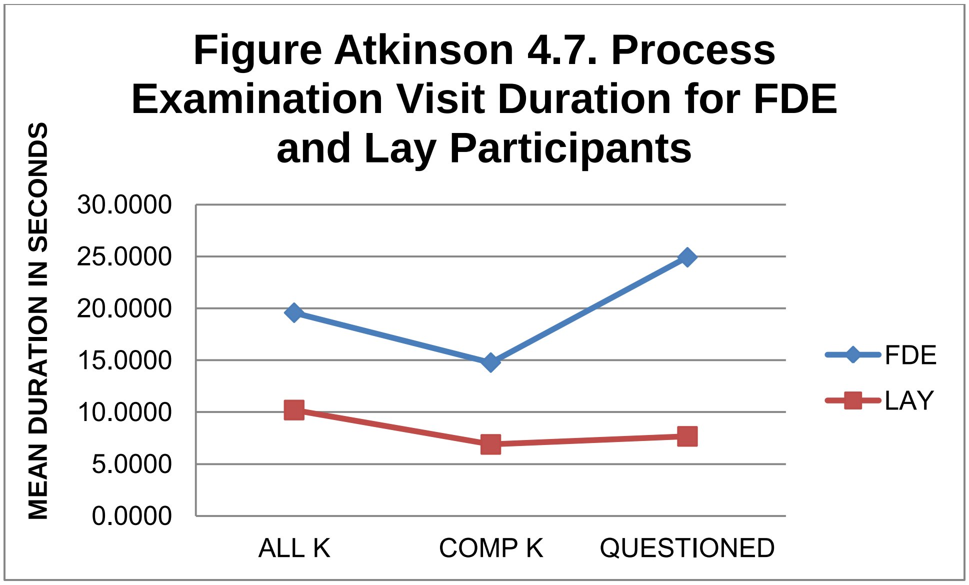
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.53	1.64	15.51	12.27	16.62	11.9
Lay	1.19	0.63	7.35	7.04	7.65	7.2

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .269, F (3, 86) = 10.54, p < .001, multivariate η^2 = .269. Figure Atkinson 4.7 presents the mean visit durations by AOI.

Figure Atkinson 4.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature was significantly greater for FDEs than for lay participants, F (1, 88) = 28.83, p < .001, partial η^2 = .247. Visit durations in the known signature stimulus (ALL K) was also significantly different between groups, F (1, 88) = 5.34, p = .023, partial η^2 = .057. Likewise, the known signature comparison stimulus (COMP K) was significantly greater for FDEs than for lay participants, F (1, 88) = 11.12, p = .001, partial η^2 = .112). Table Atkinson 3.4 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 4.4

Process Analysis Visit Durations for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	19.58	25.18	14.77	13.84	24.92	20.11
Lay	10.2	9	6.89	7.31	7.66	6.56

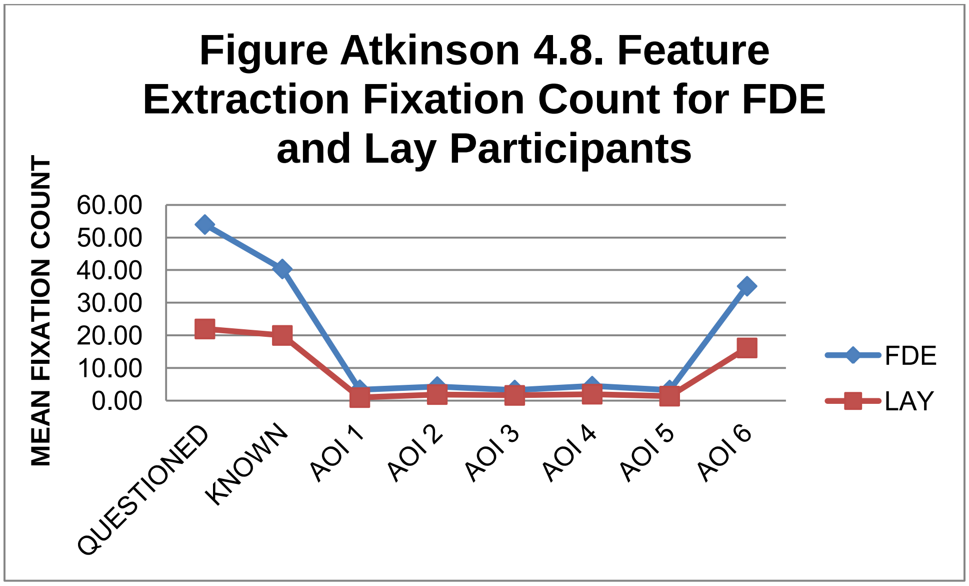
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .336, F (8, 81) = 5.13, p < .001, multivariate η^2 = .336. Figure Atkinson 4.8 presents the mean fixation counts by AOI.

Figure Atkinson 4.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation counts for the questioned signature and the known signatures were significantly greater for FDEs than for lay participants, F (1, 88) = 22.87, p < .001, partial η^2 = .206, and F (1, 88) = 10.60, p = .002, partial η^2 = .108. Fixations counts in all AOIs were significantly greater for FDEs than for lay participants (AOI 1, F (1, 88) = 5.99, p = .016, partial η^2 = .064; AOI 2, F (1, 88) = 11.25, p = .001, partial η^2 = .113; AOI 3, F (1, 88) = 8.30, p = .005, partial η^2 = .086; AOI 4, F (1, 88) = 11.14, p = .001, partial η^2 = .112; AOI 5, F (1, 88) = 6.92, p = .010, partial η^2 = .073; AOI 6, F (1, 88) = 14.86, p < .001, partial η^2 = .144. Table Atkinson 4.5 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 4.5

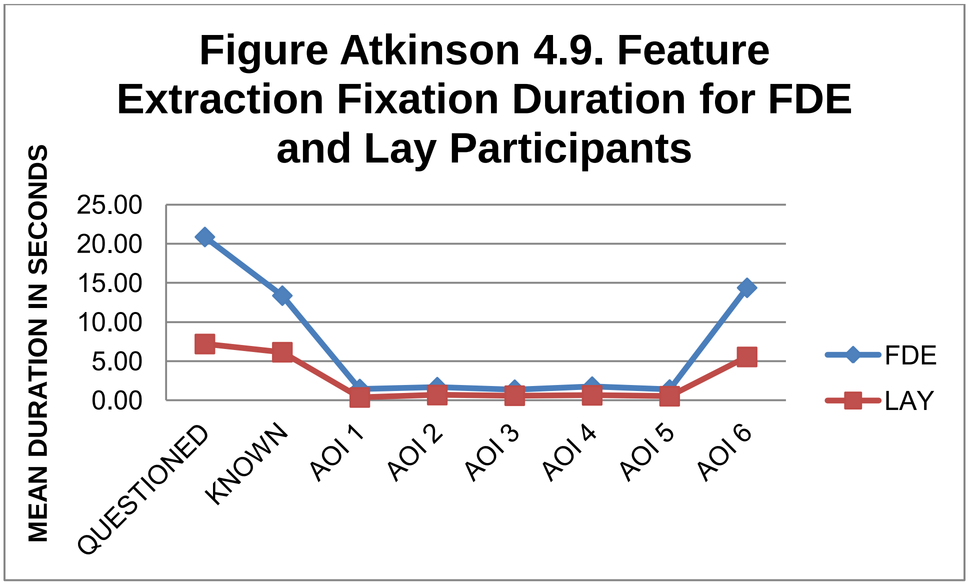
Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	54.00	39.40	40.38	36.18	3.38	6.30	4.36	4.10
Lay	22.00	20.16	20.02	20.14	0.98	1.42	1.91	2.61
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	3.30	3.11	4.49	4.55	3.30	4.37	35.11	29.56
Lay	1.65	2.19	2.02	1.74	1.42	1.76	16.19	13.27

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .284, F (8, 81) = 4.01, p < .001, multivariate η^2 = .281. Figure Atkinson 4.9 presents the mean fixation durations by AOI. Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest.

Figure Atkinson 4.9



Total fixation durations for the questioned signature and known signatures were significantly greater for FDEs than for lay participants, F (1, 88) = 21.53, p < .001, partial η^2 = .197, and F (1, 88) = 11.24, p = .001, partial η^2 = .113. Fixation durations in all AOIs were significantly greater for FDEs than for lay participants (AOI 1, F (1, 88) = 6.03, p = .016, partial η^2 = .064; AOI 2, F (1, 88) = 10.05, p = .002, partial η^2 = .103; AOI 3, F (1, 88) = 7.90, p = .006, partial η^2 = .082; AOI 4, F (1, 88) = 12.22, p = .001, partial η^2 = .122; AOI 5, F (1, 88) = 9.01, p = .003, partial η^2 = .093; AOI 6, F (1, 88) = 15.60, p < .001, partial η^2 = .151). Table Atkinson 4.6 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 4.6

Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

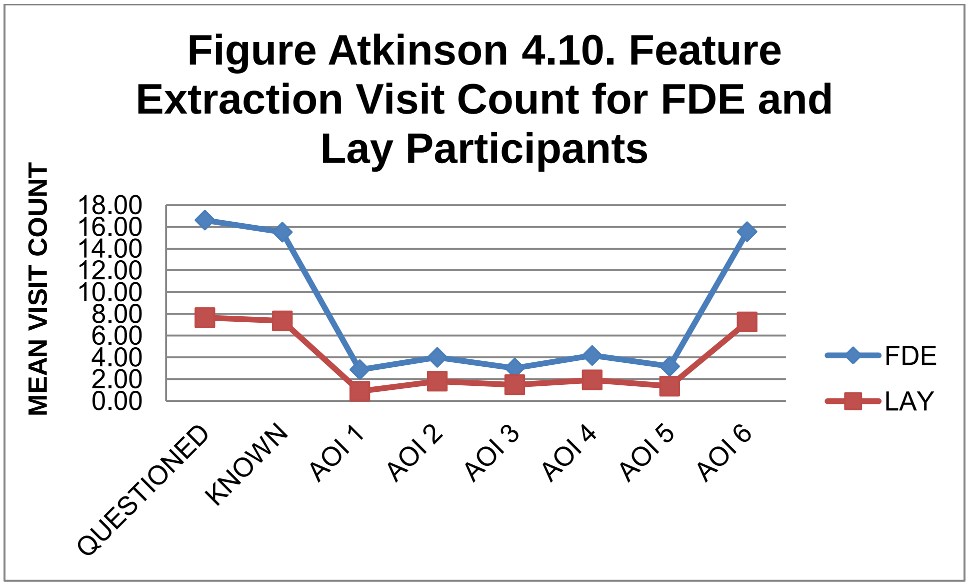
	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	20.88	18.33	13.38	12.70	1.46	2.83	1.69	1.85
Lay	7.20	6.37	6.15	6.50	0.37	0.60	0.68	1.01

	AOI 3		AOI 4		AOI 5		AOI 6	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.37	1.59	1.76	1.99	1.39	1.74	14.38	14.04
Lay	0.60	0.87	0.65	0.66	0.53	0.72	5.55	4.44

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .262, F (8, 81) = 3.60, p = .001, multivariate η^2 = .261. Figure Atkinson 4.10 presents the mean total visit counts by AOI.

Figure Atkinson 4.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit counts for the questioned signature and known signatures were significantly greater for FDEs than for lay participants, F (1, 88) = 18.27, p < .001, partial η^2 = .172, and F (1, 88) = 14.61, p < .001, partial η^2 = .142. Visit count in all AOIs was significantly greater for FDEs than for lay participants (AOI 1, F (1, 88) = 7.99, p = .006, partial η^2 = .083; AOI 2, F (1, 88) = 11.68, p = .001, partial η^2 = .117; AOI 3, F (1, 88) = 8.93, p = .004, partial η^2 = .092; AOI 4, F (1, 88) = 10.88, p = .001, partial η^2 = .110; AOI 5, F (1, 88) = 7.36, p = .008, partial η^2 = .077; AOI 6, F (1, 8) = 16.40, p < .001, partial η^2 = .157). Table Atkinson 4.7 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 4.7

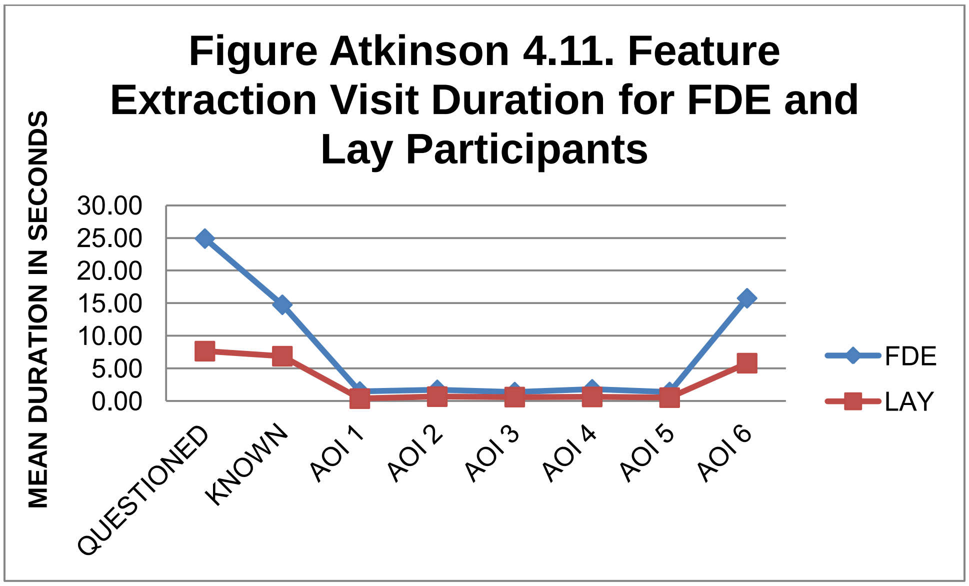
Feature Extraction Analysis Visit Counts for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	16.62	11.90	15.51	12.27	2.87	4.45	4.00	3.61
Lay	7.65	7.20	7.35	7.04	0.88	1.26	1.81	2.24
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	3.02	2.80	4.17	4.16	3.17	4.14	15.55	11.88
Lay	1.49	1.94	1.93	1.65	1.35	1.57	7.26	6.55

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .315, *F* (8, 81) = 4.65, *p* < .001, multivariate η^2 = .315. Figure Atkinson 4.11 presents the mean total visit counts by AOI.

Figure Atkinson 4.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit durations for the questioned signature and known signatures were significantly greater for FDEs than for lay participants, *F* (1, 88) = 28.82, *p* < .001, partial η^2 = .247, and *F* (1, 88) = 11.12, *p* = .001, partial η^2 = .112. Visit duration in all AOIs was significantly greater for FDEs than for lay participants (AOI 1, *F* (1, 88) = 5.79, *p* = .018, partial η^2 = .062; AOI 2, *F* (1, 88) = 10.21, *p* = .002, partial η^2 = .104; AOI 3, *F* (1, 88) = 7.42, *p* = .008, partial η^2 = .078; AOI 4, *F* (1, 88) = 12.65, *p* = .001, partial η^2 = .126; AOI 5, *F* (1, 88) = 8.75, *p* = .004, partial η^2 = .090; AOI 6, *F* (1, 88) = 17.77, *p* < .001, partial η^2 = .168). Table Atkinson 4.8 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 4.8

Feature Extraction Analysis Visit Durations for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	24.92	20.11	14.77	13.84	1.47	2.92	1.73	1.91
Lay	7.66	6.56	6.89	7.31	0.38	0.61	0.69	1.02
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.39	1.63	1.81	2.05	1.40	1.79	15.77	14.85
Lay	0.62	0.90	0.65	0.66	0.54	0.74	5.82	4.57

Atkinson Signature 5: Genuine

Of the 49 FDE participants, 39 correctly identified the signature as genuine, while 10 identified the signature as non-genuine. Of the 43 Lay participants, 42 responded correctly that the signature was genuine, while 1 identified the signature as non-genuine. This difference was statistically significant, χ^2 (2, N = 92) = 7.11, p = .008. Figure Atkinson 5.1 presents the comparison view of this signature.

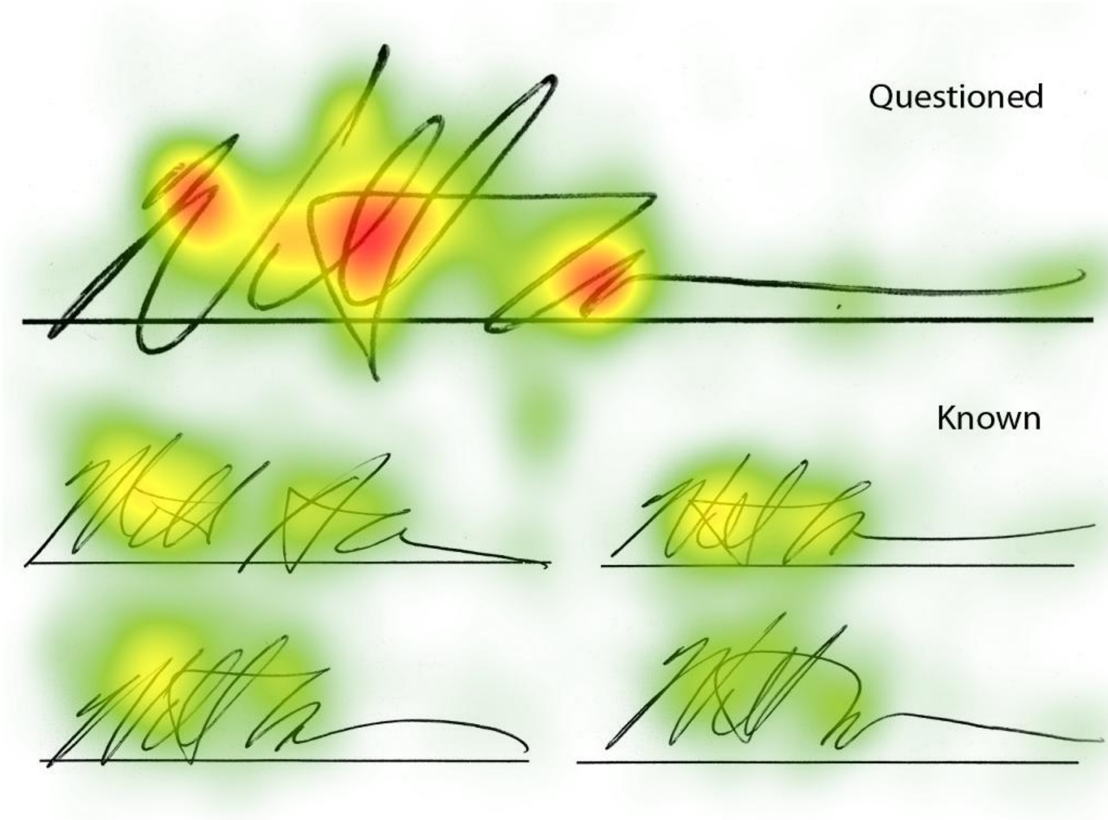
Figure Atkinson 5.1. Questioned-Known Comparison Stimulus for Atkinson Signature 5.

Selection of Areas of Interest (AOIs)

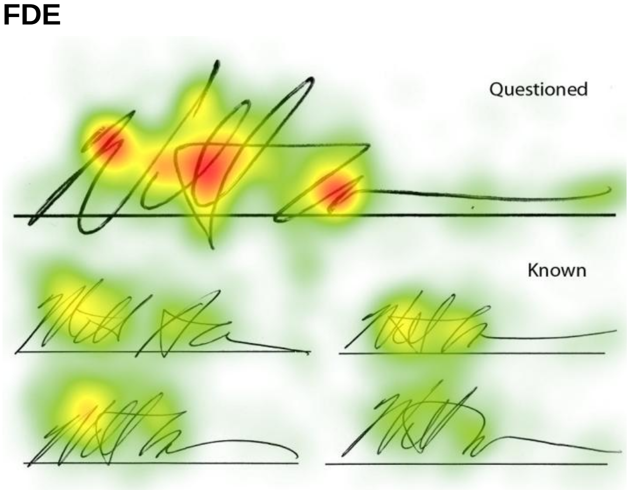
Figure Atkinson 5.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were seven locations indicated by hot spots and warm spots within the signature that elicited significant attention from the participants. AOIs were created for these specific areas, creating a total of seven AOIs for this stimulus. Figure Atkinson 5.3 presents the location of the AOIs identified in the heat map.

Figure Atkinson 5.2. Questioned-Known Comparison Stimulus for Atkinson Signature 5.

All Participants



FDE



Lay

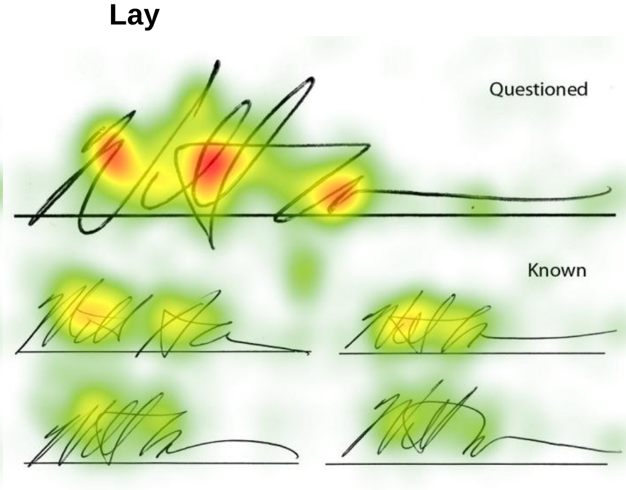
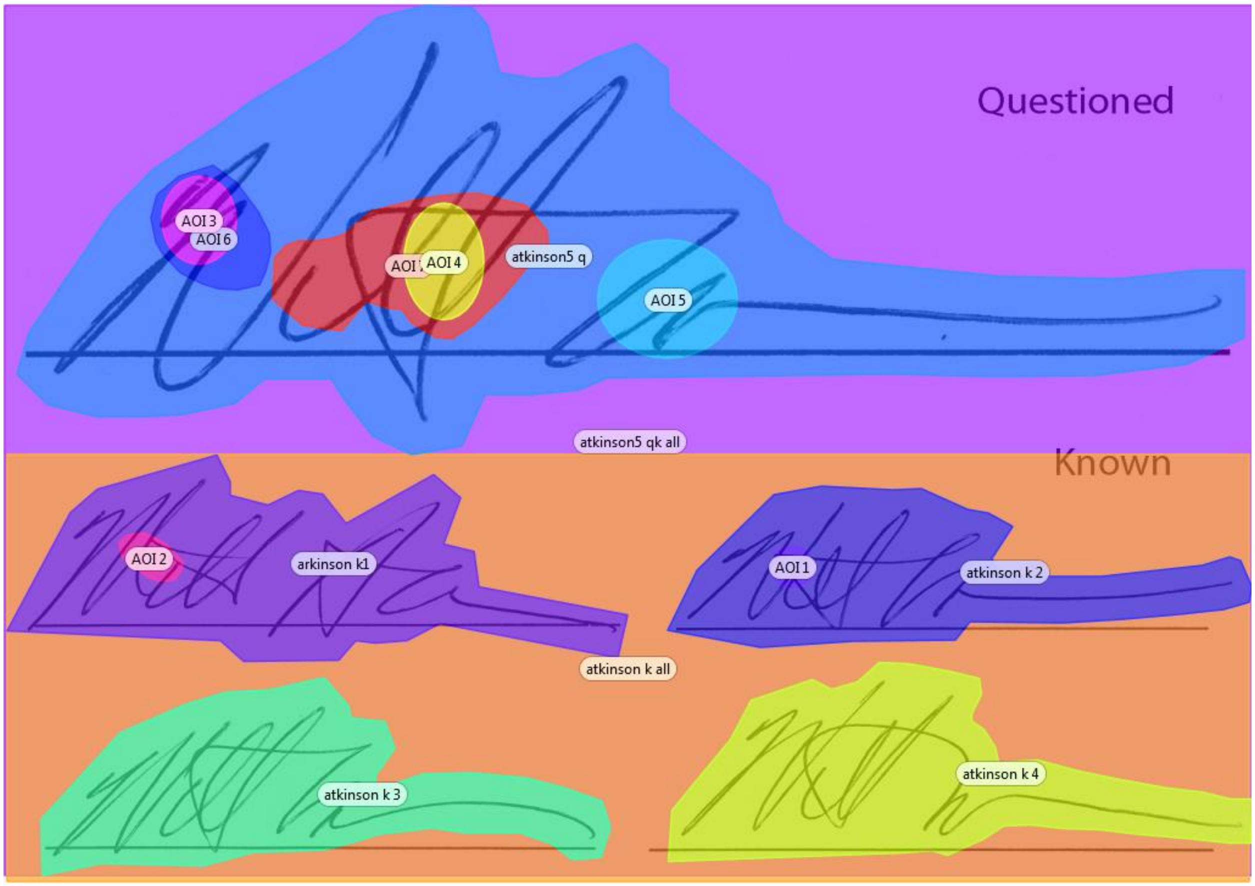


Figure Atkinson 5.3. Areas of Interest (AOIs) for Atkinson Signature 5.



Eye-Tracking Metrics Analyses

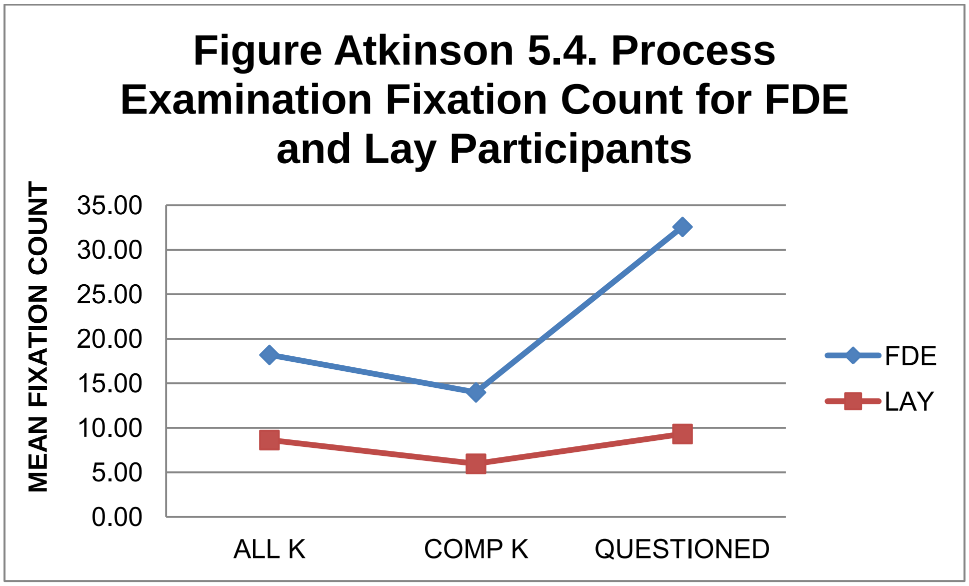
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Atkinson known signature stimulus (Knowns, not pictured here), Atkinson K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Atkinson 5Q (the Atkinson questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 7) are included in subsequent feature extraction analyses.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .298, F (3, 86) = 12.15, p < .001, multivariate η^2 = .298. Figure Atkinson 5.4 presents the mean fixation counts by AOI.

Figure Atkinson 5.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixations counts in all areas of interest. Total fixation count for the questioned signature was significantly greater for FDEs than for lay participants, F (1, 88) = 28.51, p < .001, partial η^2 = .245. Fixation counts in the known signature stimulus (ALL K) were also significantly different between groups, F (1, 88) = 4.76, p = .032, partial η^2 = .051. Finally, fixation counts in the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for lay participants, F (1, 88) = 15.63, p < .001, partial η^2 = .151). Table Atkinson 5.1 presents the means and standard deviations for areas of interest by participant type.

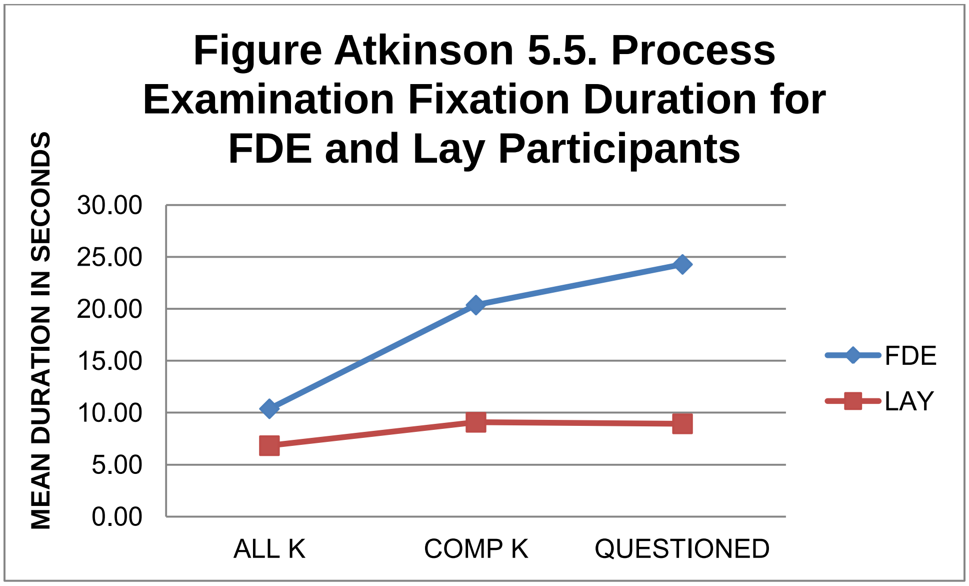
Table Atkinson 5.1
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	28.7	23.75	57.98	44.45	57.98	44.45
Lay	19.56	14.44	25.88	30.61	25.88	30.61

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .330, F (3, 86) = 14.13, p < .001, multivariate η^2 = .330. Figure Atkinson 5.5 presents the mean fixation counts by AOI.

Figure Atkinson 5.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation durations in two of the three areas of interest. Total fixation durations for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for lay participants, F (1, 88) = 33.49, p < .001, partial η^2 = .276, and F (1, 88) = 14.55, p < .001, partial η^2 = .142.

Fixation duration in the known signature stimulus (ALL K) was not significantly different between the groups, p = .054, *ns*. Table Atkinson 5.2 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 5.2

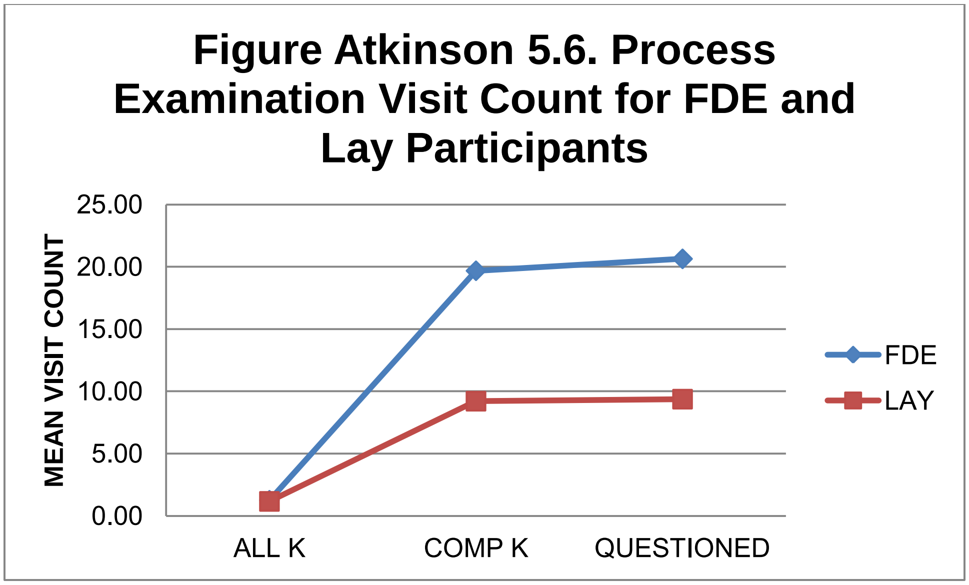
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	10.38	10.21	20.36	15.71	24.28	15.11
Lay	6.83	6.42	9.08	11.9	8.93	8.98

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .255, F (3, 86) = 9.83, p < .001, multivariate η^2 = .255. Figure Atkinson 5.6 presents the mean visit counts by AOI.

Figure Atkinson 5.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in two of the three areas of interest. Total visit counts for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for lay participants, F (1, 88) = 25.10, p < .001, partial η^2 = .222, and F (1, 88) = 21.28, p < .001, partial η^2 = .195.

Visit counts in the known signature stimulus (ALL K) were not significantly different between the groups, p = .549, *ns*. Table Atkinson 5.3 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 5.3

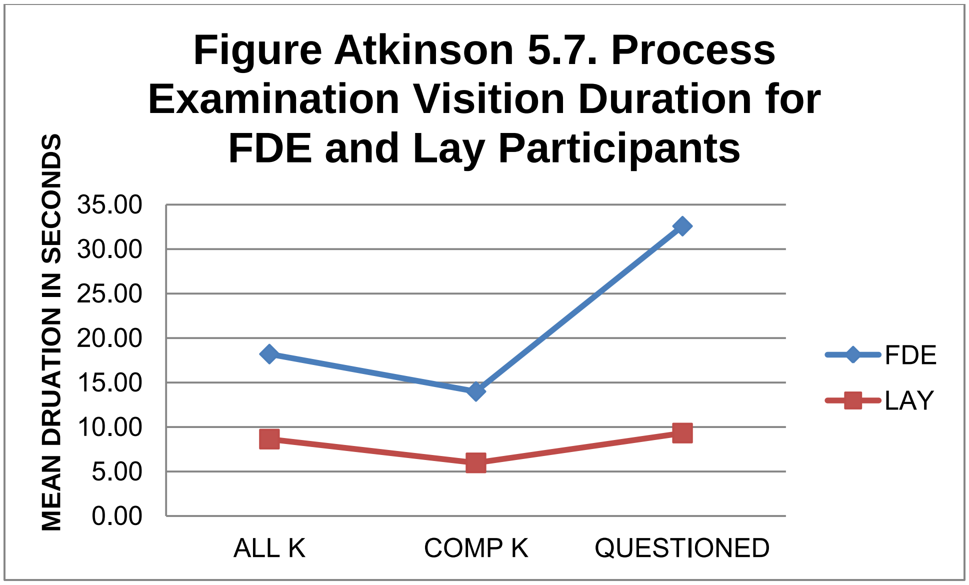
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.26	0.71	19.68	11.38	20.64	11.3
Lay	1.16	0.75	9.21	10.03	9.37	9.9

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .360, F (3, 86) = 16.15, p < .001, multivariate η^2 = .360. Figure Atkinson 5.7 presents the mean visit durations by AOI.

Figure Atkinson 5.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in two of the three areas of interest. Total visit duration for the questioned signature and known signature comparison stimulus (COMP K) were significantly greater for FDEs than for lay participants, F (1, 88) = 40.62, p < .001, partial η^2 = .316, and F (1, 88) = 15.54, p < .001, partial η^2 = .150.

Visit durations in the known signature stimulus (ALL K) were not significantly different between groups, p = .061, *ns*. Table Atkinson 5.4 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 5.4

Process Analysis Visit Durations FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	13.11	12.78	22.3	16.83	27.31	15.97
Lay	8.81	7.9	9.82	12.72	9.46	9.48

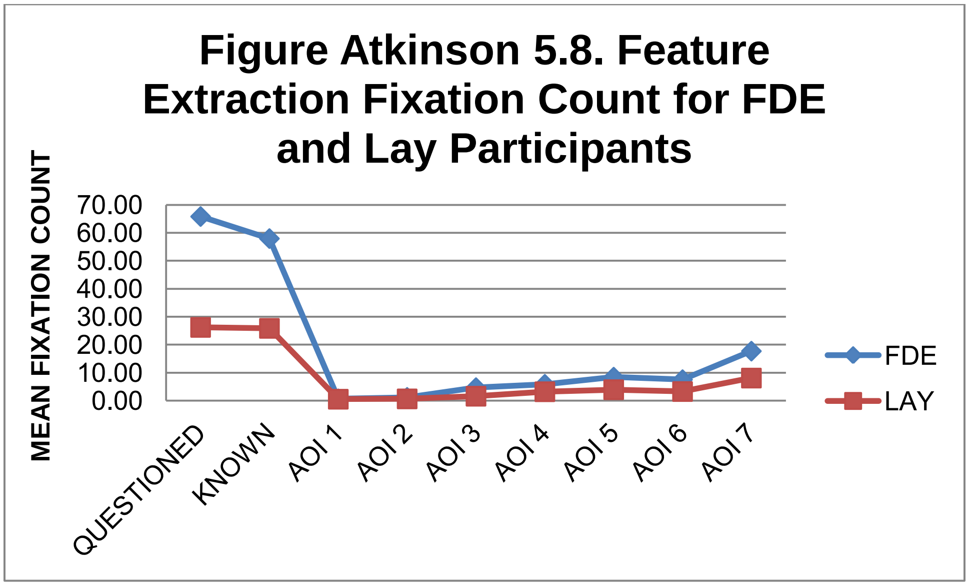
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .326, F (9, 80) = 4.86, p < .001, multivariate η^2 = .326. Figure Atkinson 5.8 presents the mean fixation counts by AOI.

Figure Atkinson 5.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all but two areas of interest. Total fixation count for the questioned signature and known signatures were significantly greater for FDEs than for lay participants, F (1, 88) = 28.51, p < .001, partial η^2 = .245, and F (1, 88) = 15.63, p < .001, partial η^2 = .151.

Fixation counts in most AOIs were significantly greater for FDEs than for lay participants (AOI 3, F (1, 88) = 12.22, p < .001, partial η^2 = .122; AOI 4, F (1, 88) = 9.39, p = .003, partial η^2 = .096; AOI 5, F (1, 88) = 12.15, p = .001, partial η^2 = .121; AOI 6, F (1, 88) = 11.85, p = .001, partial η^2 = .119; AOI 7, F (1, 88) = 18.48, p < .001, partial η^2 = .174.

No significant difference in fixation counts were found for AOI 1, p = .460, *ns*; AOI 2, p = .076, *ns*. Table Atkinson 5.5 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 5.5

Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

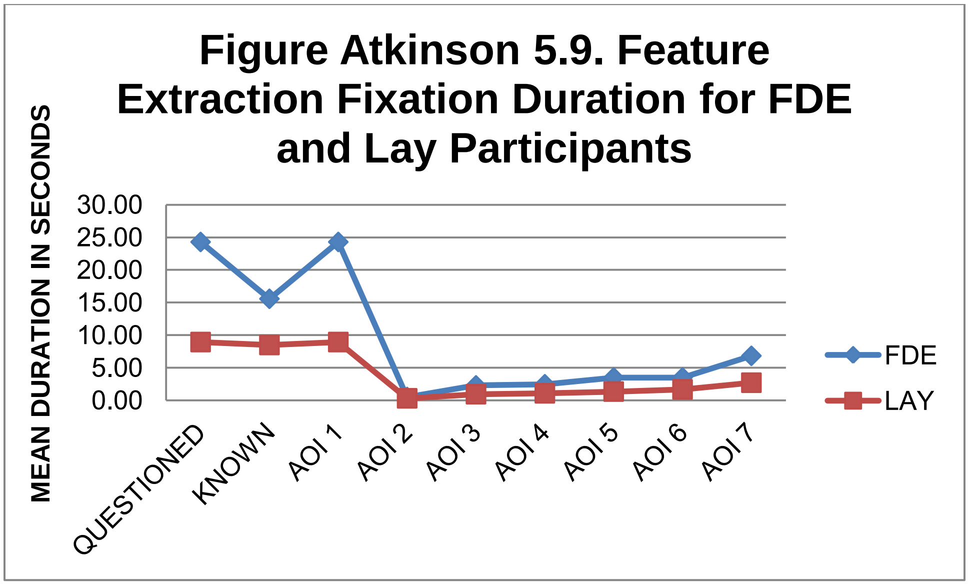
	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**		**AOI 3**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	65.85	41.95	57.98	44.45	0.7	1.06	1.21	1.72	4.7	5.32
Lay	26.23	25.76	25.88	30.61	0.56	0.93	0.67	0.99	1.63	2.33
	AOI 4		**AOI 5**		**AOI 6**		**AOI 7**			

Participant	M	SD	M	SD	M	SD	M	SD
FDE	5.89	4.51	8.45	7.46	7.55	7.21	17.74	12.42
Lay	3.23	3.63	3.95	4.16	3.3	3.84	8.12	8.19

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .354, F (9, 80) = 3.99, $p < .001$, multivariate $\eta^2 = .354$. Figure Atkinson 5.9 presents the mean fixation durations by AOI.

Figure Atkinson 5.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation durations for the questioned signature and the known signatures were significantly greater for FDEs than for lay participants, F (1, 88) = 33.49, $p < .001$, partial $\eta^2 = .276$, and F (1, 88) = 14.55, $p < .001$, partial $\eta^2 = .142$.

Fixation durations in most AOIs were significantly greater for FDEs than for lay participants (AOI 3, F (1, 88) = 8.02, $p = .006$, partial $\eta^2 = .083$; AOI 4, F (1, 88) = 16.09, $p < .001$, partial $\eta^2 = .155$; AOI 5, F (1, 88) = 17.89, $p < .001$, partial $\eta^2 = .169$; AOI 6, F (1, 88) = 8.64, $p = .004$, partial $\eta^2 = .089$; AOI 7, F (1, 88) = 25.52, $p < .001$, partial $\eta^2 = .225$).

No significant differences were found in fixation duration for AOI 1, $p = .451$, *ns*; AOI 2, $p = .172$, *ns*. Table Atkinson 5.6 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 5.6

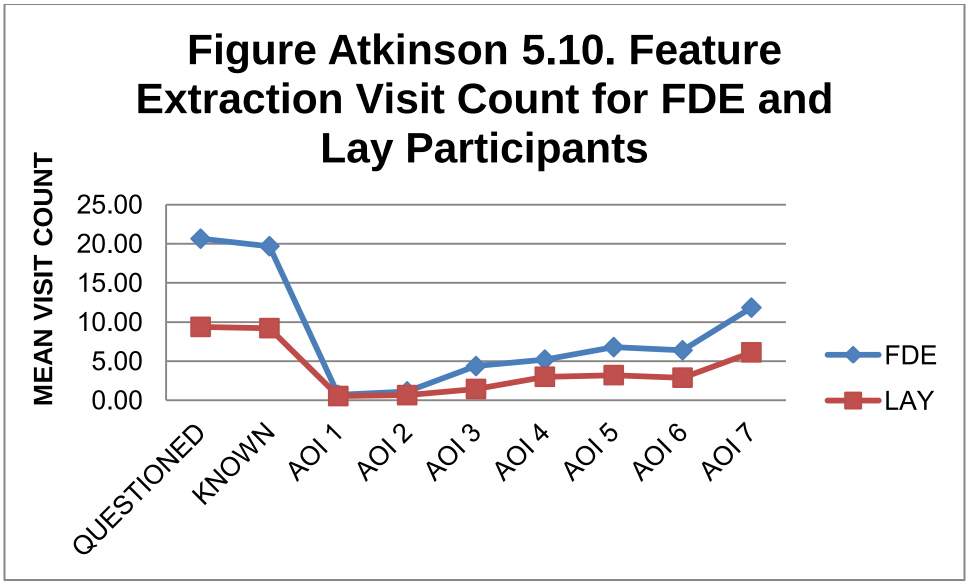
Feature Extraction Analysis Fixation Durations for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2		AOI 3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	24.28	15.11	15.56	22.75	24.28	15.11	0.51	0.76	2.29	2.76
Lay	8.93	8.98	8.48	9.45	8.93	8.98	0.31	0.6	0.94	1.53
	AOI 4		**AOI 5**		**AOI 6**		**AOI 7**			
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***		
FDE	2.46	1.92	3.5	2.99	3.5	3.46	6.82	4.64		
Lay	1.08	1.25	1.34	1.56	1.67	2.26	2.7	2.79		

<u>Total Visit Count</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .310, F (8, 80) = 3.99, p = .001, multivariate η^2 = .310. Figure Atkinson 5.10 presents the mean total visit counts by AOI.

Figure Atkinson 5.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all but two areas of interest. Total visit count for the questioned signature and the known signatures were significantly greater for FDEs than for lay participants, F (1, 88) = 25.10, p < .001, partial η^2 = .222, and F (1, 88) = 21.28, p < .001, partial η^2 = .195.

Visit counts in most AOIs were significantly greater for FDEs than for lay participants (AOI 3, F (1, 88) = 13.44, p < .001, partial η^2 = .132; AOI 4, F (1, 88) = 8.43, p = .005, partial η^2 = .087; AOI 5, F

(1, 88) = 15.80, p < .001, partial η^2 = .152; AOI 6, F (1, 88) = 12.10, p = .001, partial η^2 = .121; AOI 7, F (1, 88) = 15.38, p < .001, partial η^2 = .149).

No significant difference in visit count was found for AOI 1, p = .473, *ns*, or AOI 2, p = .088, *ns*. Table Atkinson 5.7 presents the means and standard deviations for areas of interest by participant type.

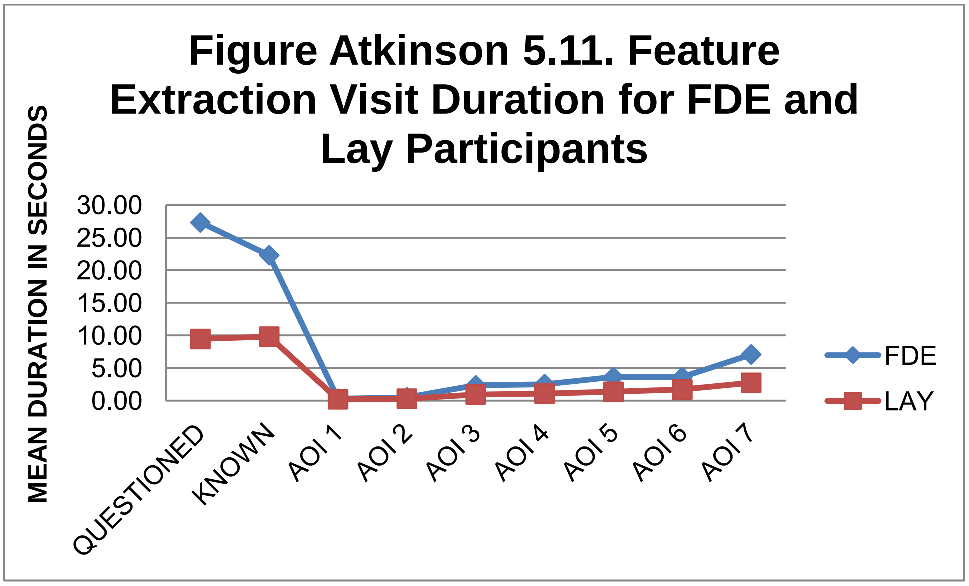
Table Atkinson 5.7
Feature Extraction Analysis Visit Counts for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2		AOI 3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	20.64	11.3	19.68	11.38	0.68	1.02	1.13	1.56	4.36	4.9
Lay	9.37	9.9	9.21	10.03	0.53	0.88	0.65	0.97	1.44	1.89
	AOI 4		**AOI 5**		**AOI 6**		**AOI 7**			
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***		
FDE	5.19	3.93	6.79	5.09	6.38	5.9	11.83	7.65		
Lay	3	3.15	3.21	3.12	2.88	3.08	6.12	5.98		

<u>*Total Visit Duration*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .389, F (9, 80) = 5.66, p < .001, multivariate η^2 = .389. Figure Atkinson 5.11 presents the mean total visit counts by AOI.

Figure Atkinson 5.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all but two areas of interest. Total visit count for the questioned signature and the known signatures were significantly greater for FDEs than for lay participants, F (1, 88) = 40.62, p < .001, partial η^2 = .316, and F (1, 88) = 15.54, p < .001, partial η^2 = .150.

Visit counts in most AOIs were significantly greater for FDEs than for lay participants (AOI 3, F (1, 88) = 8.23, p = .005, partial η^2 = .085; AOI 4, F (1, 88) = 16.66, p < .001, partial η^2 = .159; AOI 5, F (1, 88) = 17.60, p < .001, partial η^2 = .167; AOI 6, F (1, 88) = 8.92, p = .004, partial η^2 = .092; AOI 7, F (1, 88) = 27.23, p < .001, partial η^2 = .236).

No significant difference in visit count was found for AOI 1, p = .449, *ns*, or AOI 2, p = .168, *ns*. Table Atkinson 5.8 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 5.8

Feature Extraction Analysis Visit Counts for FDE and Lay Participants

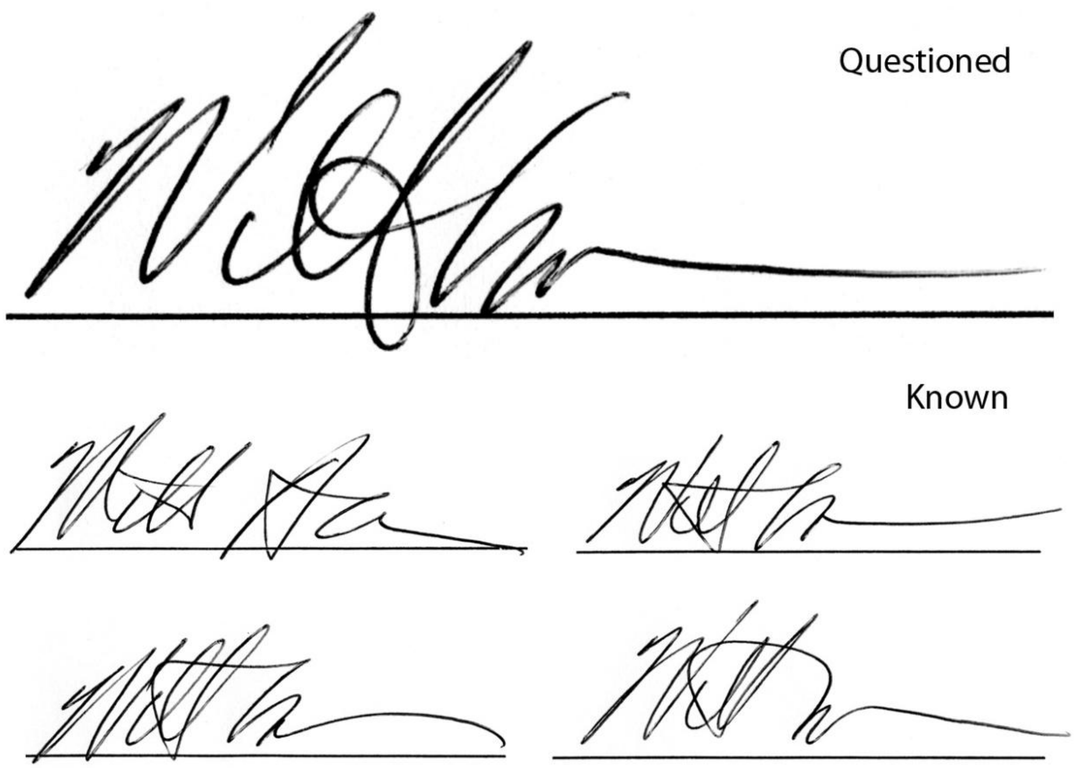
	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**		**AOI 3**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	27.31	15.97	22.3	16.83	0.31	0.58	0.51	0.77	2.35	2.8
Lay	9.46	9.48	9.82	12.72	0.22	0.43	0.31	0.6	0.96	1.58

	AOI 4		**AOI 5**		**AOI 6**		**AOI 7**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.53	1.97	3.62	3.18	3.62	3.56	7.09	4.74
Lay	1.09	1.28	1.36	1.59	1.71	2.33	2.74	2.83

Atkinson Signature 6: Genuine

Of the 49 FDE participants, 18 correctly identified the signature as genuine, while 30 identified the signature as non-genuine. One FDE declined to respond. Of the 43 Lay participants, 1 responded correctly that the signature was genuine, while 42 identified the signature as non-genuine. This difference was statistically significant, χ^2 (2, N = 92) = 17.90, $p < .001$. Figure Atkinson 6.1 presents the comparison view of this signature.

Figure Atkinson 6.1. Questioned-Known Comparison Stimulus for Signature Atkinson 6.

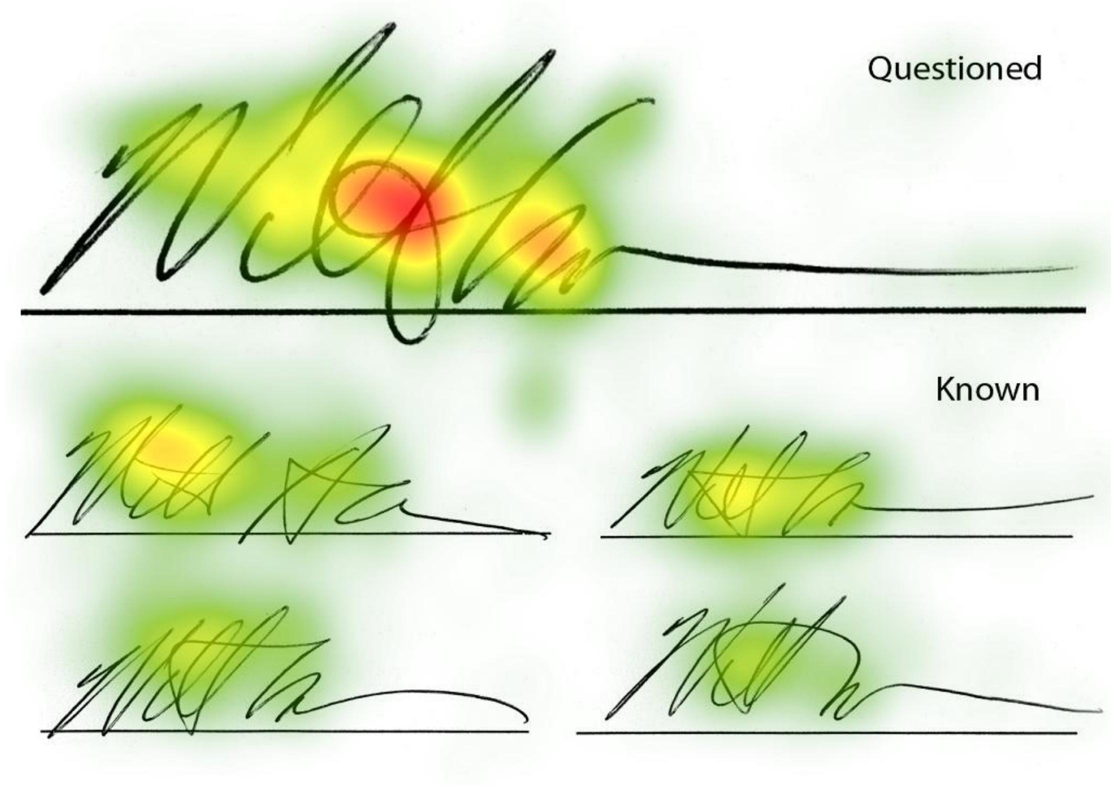


Selection of Areas of Interest (AOIs)

Figure Atkinson 6.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were four locations indicated by hot spots and warm spots within the signature that elicited significant attention from the participants. AOIs were created for these specific areas, creating a total of four AOIs for this stimulus. Figure Atkinson 6.3 presents the location of the AOIs identified in the heat map.

Figure Atkinson 6.2. Heat map for Atkinson signature 6, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE

Lay

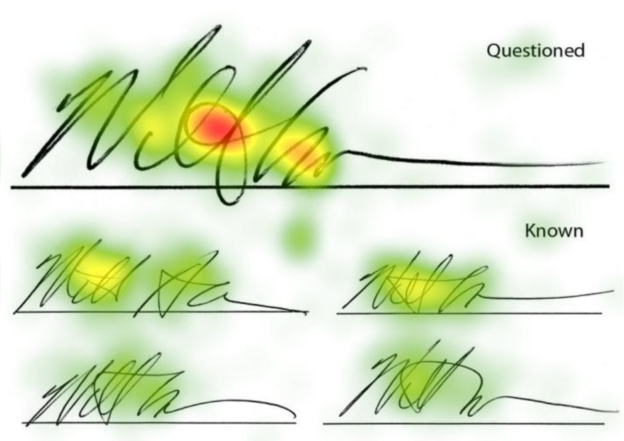
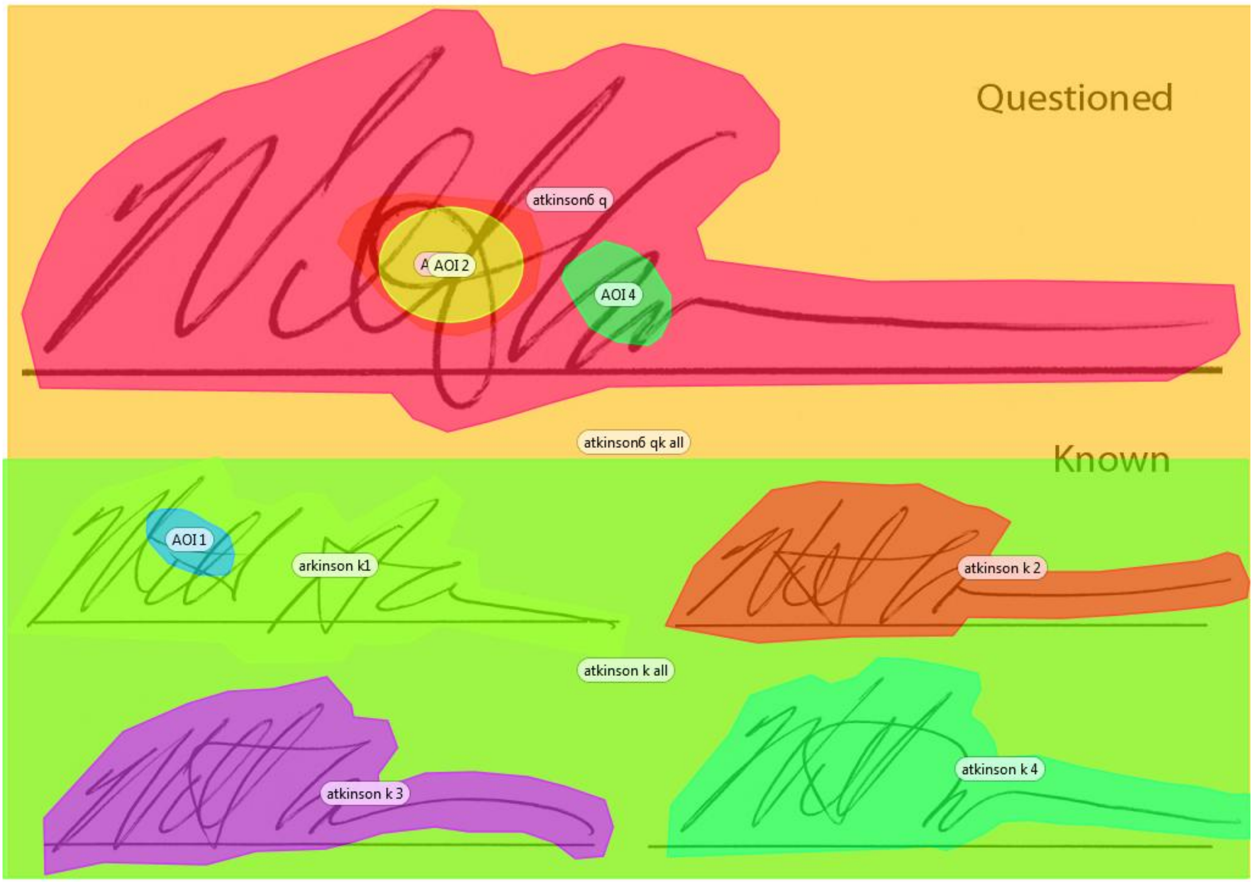


Figure Atkinson 6.3. Areas of Interest (AOIs) for Atkinson Signature 6.



Eye-Tracking Metrics Analyses

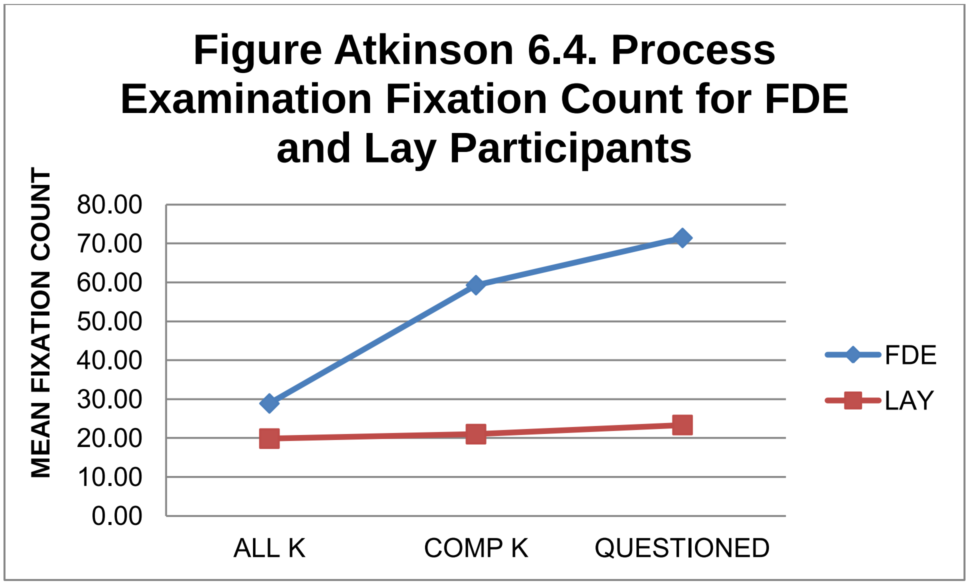
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .335, F (3, 85) = 14.26, p < .001, multivariate η^2 = .335. Figure Atkinson 6.4 presents the mean fixation counts by AOI.

Figure Atkinson 6.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixations counts in two of the three areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for lay participants, F (1, 87) = 39.23, p < .001, partial η^2 = .311, and F (1, 87) = 25.56, p < .001, partial η^2 = .227.

Fixation counts in the known signature stimulus (ALL K) were not significantly different between groups, p = .088, *ns*. Table Atkinson 6.1 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 6.1

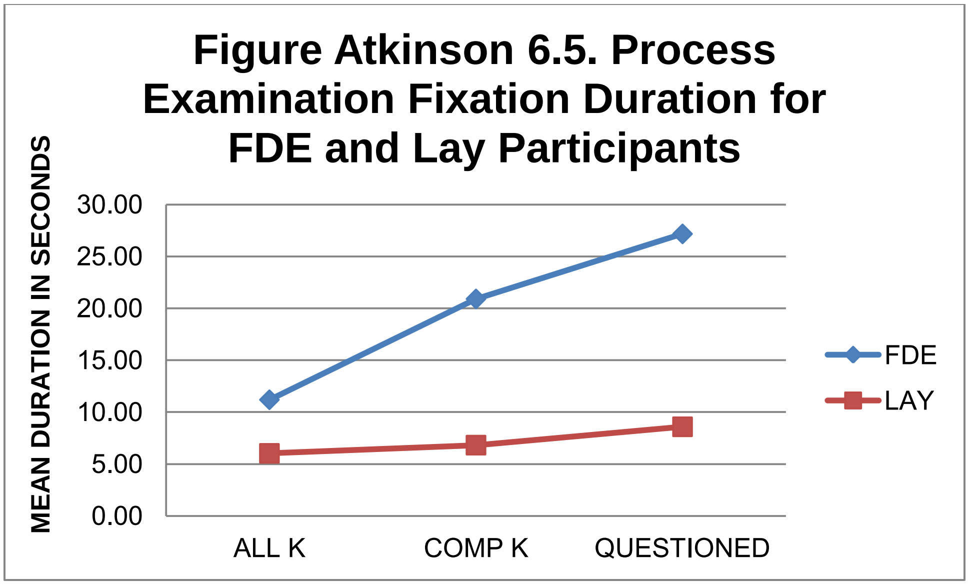
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	28.89	29.89	59.28	44.92	71.41	45.8
Lay	19.86	17.52	21	21.86	23.35	21.53

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .352, F (3, 85) = 15.37, p < .001, multivariate η^2 = .352. Figure Atkinson 6.5 presents the mean fixation counts by AOI.

Figure Atkinson 6.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixations durations in all three areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for lay participants, F (1, 87) = 45.83, p < .001, partial η^2 = .345, and F (1, 87) = 30.08, p < .001, partial η^2 = .257.

Fixation durations in the known signature stimulus (ALL K) were also significantly different between groups, F (1, 87) = 5.58, p = .020, partial η^2 = .060. Table Atkinson 6.2 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 6.2

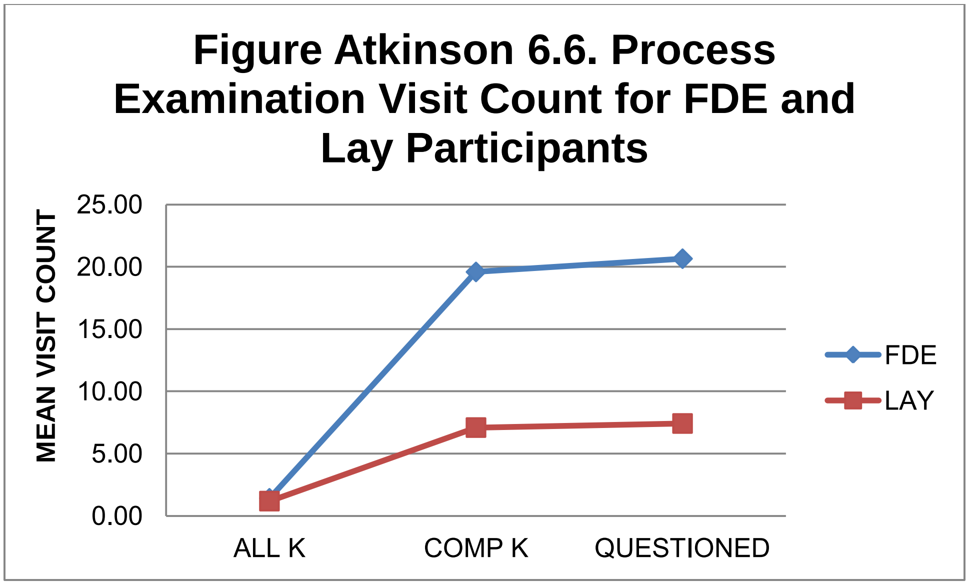
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	11.19	13.21	20.9	15.75	27.17	15.98
Lay	6.02	5.76	6.82	6.16	8.59	8.57

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .333, F (3, 85) = 14.13, p < .001, multivariate η^2 = .333. Figure Atkinson 6.6 presents the mean visit counts by AOI.

Figure Atkinson 6.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixations counts in two of the three areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for lay participants, F (1, 87) = 42.93, p < .001, partial η^2 = .330, and F (1, 87) = 40.51, p < .001, partial η^2 = .318.

Visit counts in the known signature stimulus (ALL K) were not significantly different between groups, p = .325, *ns*. Table Atkinson 6.3 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 6.3

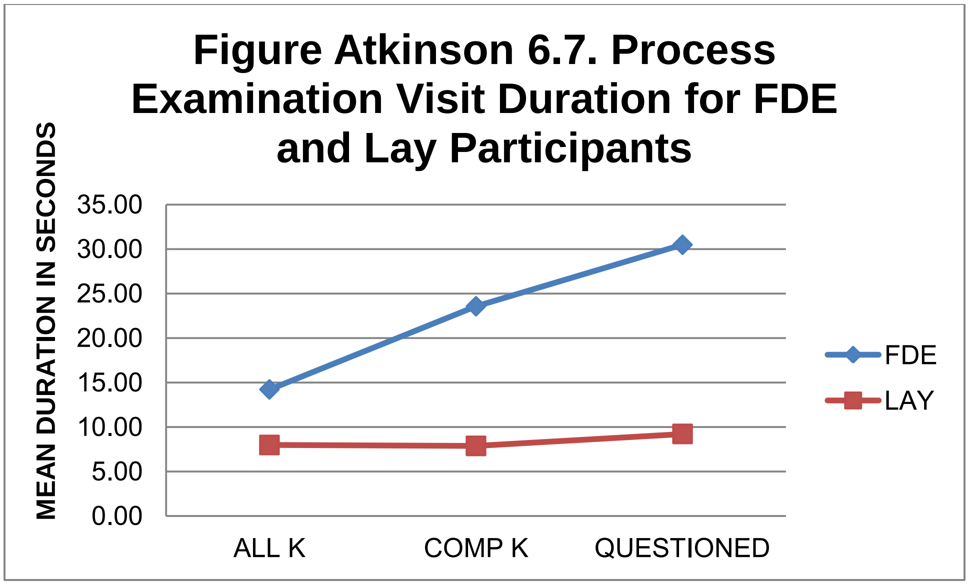
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.41	1.34	19.59	11.5	20.65	11.91
Lay	1.19	0.7	7.09	5.97	7.42	5.99

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .367, F (3, 85) = 16.43, p < .001, multivariate η^2 = .367. Figure Atkinson 6.7 presents the mean visit durations by AOI.

Figure Atkinson 6.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixations durations in all three areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for lay participants, F (1, 87) = 47.71, p < .001, partial η^2 = .354, and F (1, 87) = 28.42, p < .001, partial η^2 = .246.

Fixation durations in the known signature stimulus (ALL K) were also significantly different between groups, F (1, 87) = 5.59, p = .020, partial η^2 = .060. Table Atkinson 6.4 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 6.4

Process Analysis Visit Durations for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	14.21	15.85	23.57	17.98	30.48	18.22
Lay	7.97	7.2	7.87	7.26	9.21	8.98

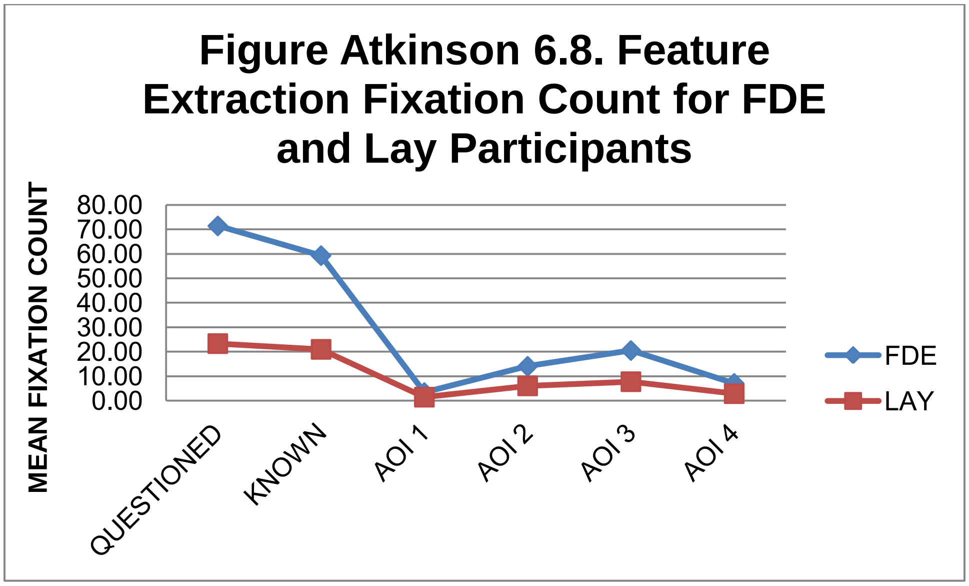
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .373, F (6, 82) = 8.14, p < .001, multivariate η^2 = .373. Figure Atkinson 6.8 presents the mean fixation counts by AOI.

Figure Atkinson 6.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature and known signatures were significantly greater for FDEs than for lay participants, F (1, 87) = 39.23, p < .001, partial η^2 = .311, and F (1, 87) = 25.56, p < .001, partial η^2 = .227.

Fixation counts in all AOIs were significantly greater for FDEs than for lay participants (AOI 1, F (1, 87) = 11.58, p = .001, partial η^2 = .117; AOI 2, F (1, 87) = 16.57, p < .00, partial η^2 = .160; AOI 3, F (1, 87) = 22.33, p < .001, partial η^2 = .204; AOI 4, F (1, 87) = 20.79, p < .001, partial η^2 = .193. Table Atkinson 6.5 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 6.5

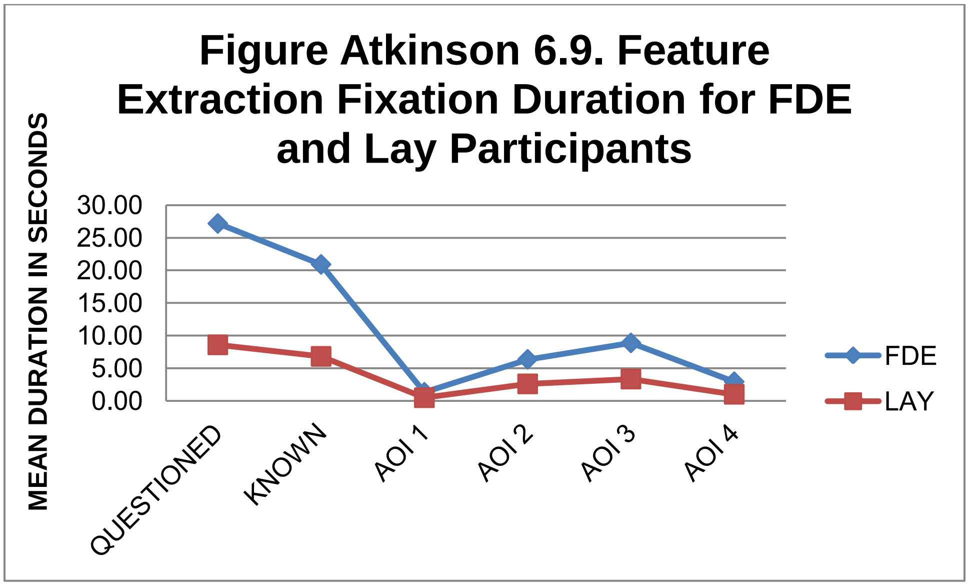
Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	71.41	45.80	59.28	44.92	3.37	3.07
Lay	23.35	21.53	21.00	21.86	1.47	2.07
	AOI 2		**AOI 3**		**AOI 4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	14.09	12.04	20.52	16.58	7.09	5.04
Lay	6.09	4.71	7.79	6.31	2.91	3.39

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .403, $F(5, 83) = 9.21$, $p < .001$, multivariate $\eta^2 = .403$. Figure Atkinson 6.9 presents the mean fixation durations by AOI.

Figure Atkinson 6.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation durations for the questioned signature and known signatures were significantly greater for FDEs than for lay participants, F (1, 87) = 169.62, $p < .001$, partial $\eta^2 = .661$, and F (1, 87) = 116.47, $p < .001$, partial η^2 = .572.

Fixation durationss in all AOIs were significantly greater for FDEs than for lay participants (AOI 1, F (1, 87) = 76.38, $p = .001$, partial $\eta^2 = .467$; AOI 2, F (1, 87) = 116.72, $p < .001$, partial $\eta^2 = .573$; AOI 3, F (1, 87) = 115.54, $p < .001$, partial $\eta^2 = .570$; AOI 4, F (1, 87) = 120.33, $p < .001$, partial η^2 = .580. Table Atkinson 6.6 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 6.6

Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

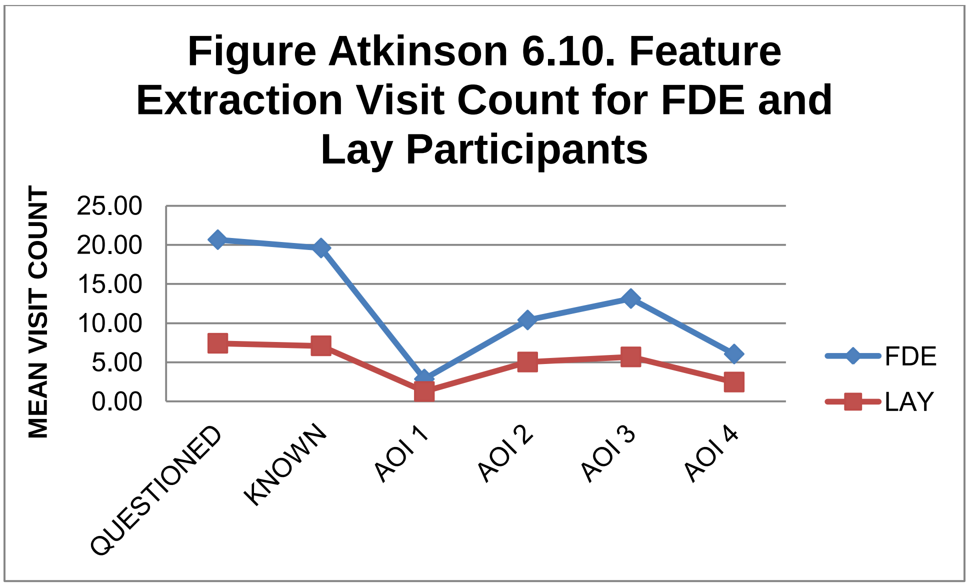
	QUESTIONED		**KNOWN**		**AOI 1**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	27.17	15.98	20.90	15.75	1.31	1.15
Lay	8.59	8.57	6.82	6.16	0.48	0.72
	AOI 2		**AOI 3**		**AOI 4**	

Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	6.36	5.00	8.88	6.76	2.93	2.06
Lay	2.60	2.22	3.34	3.24	1.01	1.19

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .359, *F*(6, 82) = 7.64, *p* <.001, multivariate η^2 = .359. Figure Atkinson 6.10 presents the mean visit counts by AOI.

Figure Atkinson 6.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit counts for the questioned signature and known signatures were significantly greater for FDEs than for lay participants, *F* (1, 87) = 42.93, *p* < .001, partial η^2 = .318, and *F* (1, 87) = 40.51, *p* < .001, partial η^2 = .318.

Visit counts in all AOIs were significantly greater for FDEs than for lay participants (AOI 1, *F* (1, 87) = 15.03, *p* < .001, partial η^2 = .147; AOI 2, *F* (1, 87) = 17.10, *p* < .001, partial η^2 = .164; AOI 3, *F* (1, 87) = 23.52, *p* < .001, partial η^2 = .213; AOI 4, *F* (1, 87) = 24.07, *p* < .001, partial η^2 = .217. Table Atkinson 6.7 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 6.7

Feature Extraction Analysis Visit Count for FDE and Lay Participants

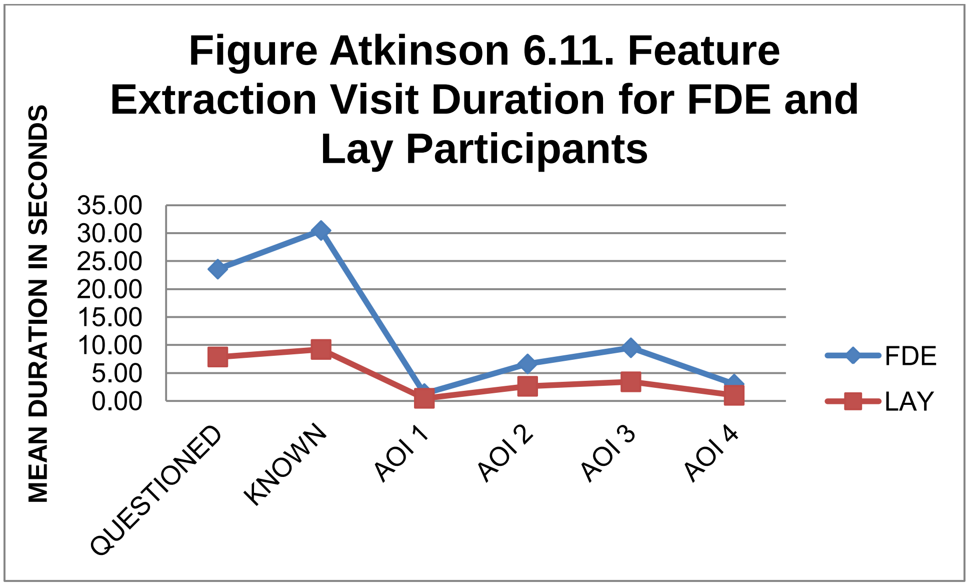
	QUESTIONED		KNOWN		AOI 1	
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*

FDE	20.65	11.91	19.59	11.50	2.85	2.11
Lay	7.42	5.99	7.09	5.97	1.26	1.73
	AOI 2		**AOI 3**		**AOI 4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	10.39	7.65	13.13	9.03	6.04	3.92
Lay	5.02	3.85	5.67	4.63	2.47	2.84

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .422, $F(6, 82) = 9.99$, $p < .001$, multivariate $\eta^2 = .422$. Figure Atkinson 6.11 presents the mean visit durations by AOI.

Figure Atkinson 6.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit counts for the questioned signature and known signatures were significantly greater for FDEs than for lay participants, $F(1, 87) = 47.71$, $p < .001$, partial $\eta^2 = .354$, and $F(1, 87) = 28.42$, $p < .001$, partial $\eta^2 = .246$.

Visit counts in all AOIs were significantly greater for FDEs than for lay participants (AOI 1, $F(1, 87) = 16.57$, $p < .001$, partial $\eta^2 = .160$; AOI 2, $F(1, 87) = 20.57$, $p < .001$, partial $\eta^2 = .191$; AOI 3, $F(1, 87) = 24.31$, $p < .001$, partial $\eta^2 = .2183$; AOI 4, $F(1, 87) = 29.93$, $p < .001$, partial $\eta^2 = .256$. Table Atkinson 6.8 presents the means and standard deviations for areas of interest by participant type.

Table Atkinson 6.8

Feature Extraction Analysis Visit Duration for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	23.57	17.98	30.48	18.22	1.34	1.18
Lay	7.87	7.26	9.21	8.98	0.48	0.72
	AOI 2		**AOI 3**		**AOI 4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	6.63	5.36	9.51	7.43	3.02	2.11
Lay	2.63	2.25	3.43	3.31	1.02	1.20

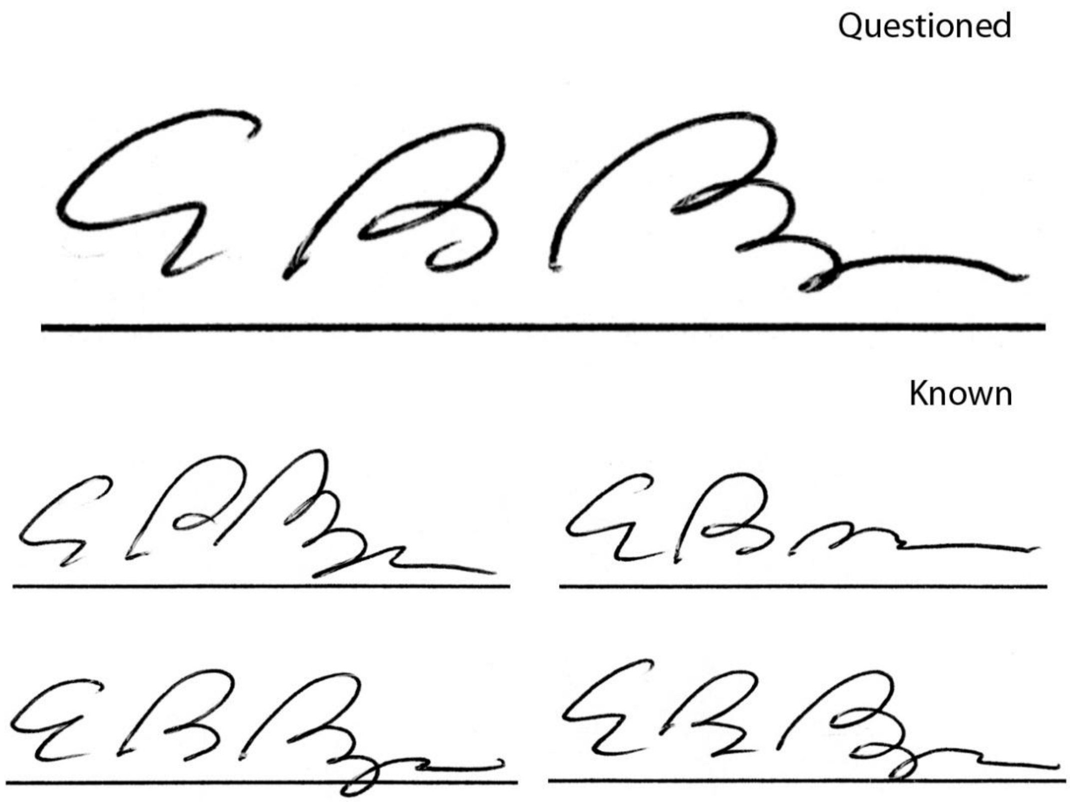
SIGNATURE 3: Bryan Bouysou

The signature of Bryan Bouysou is characterized as a low-complexity mixed-type signature. Two of the six Bouysou signatures were genuine. Of the four non-genuine specimens, three were freehand simulations, one was traced, and one signature was disguised.

Bouysou Signature 1: Genuine

Of the 49 FDE participants, 46 responded correctly that the signature was genuine, and 3 responded that it was non-genuine. Of the 43 Lay participants, 42 responded correctly that the signature was genuine, and one responded incorrectly that the signature was non-genuine. This difference was not statistically significant, p = .37, *ns*. Figure Bouysou 1.1 presents the comparison view of this signature.

Figure Bouysou 1.1. Questioned-Known Comparison Stimulus for Bouysou Signature 1.

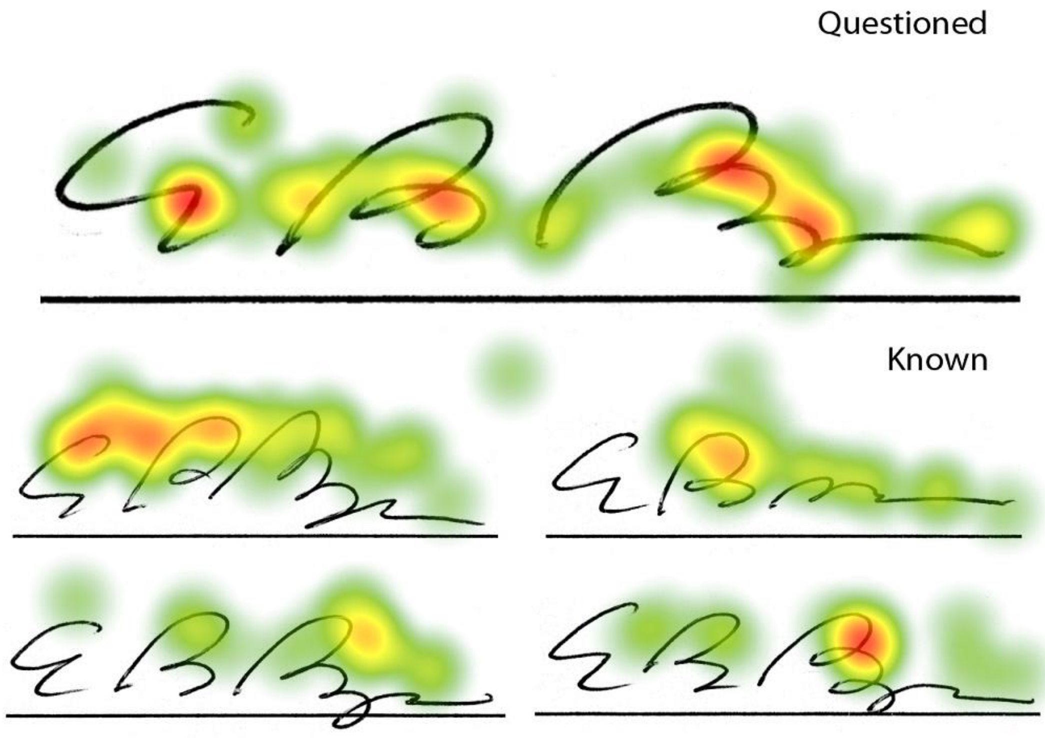


Selection of Areas of Interest (AOIs)

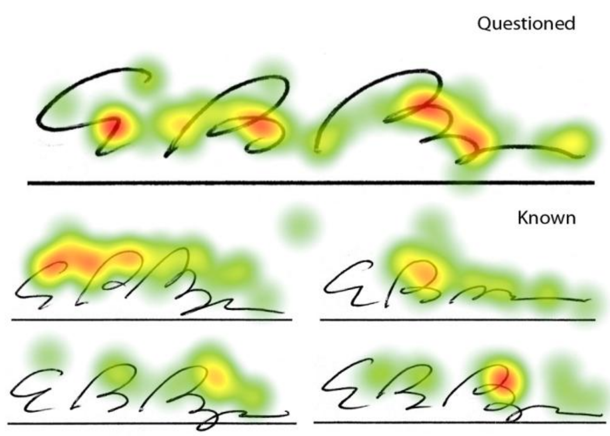
Figure Bouysou 1.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were six locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of six AOIs for this stimulus. Figure Bouysou 1.3 presents the location of the AOIs identified in the heat map.

Figure Bouysou 1.2. Heat map for Bouysou signature 1, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

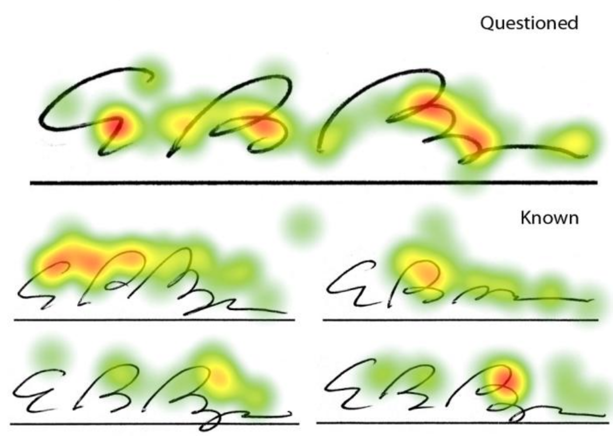
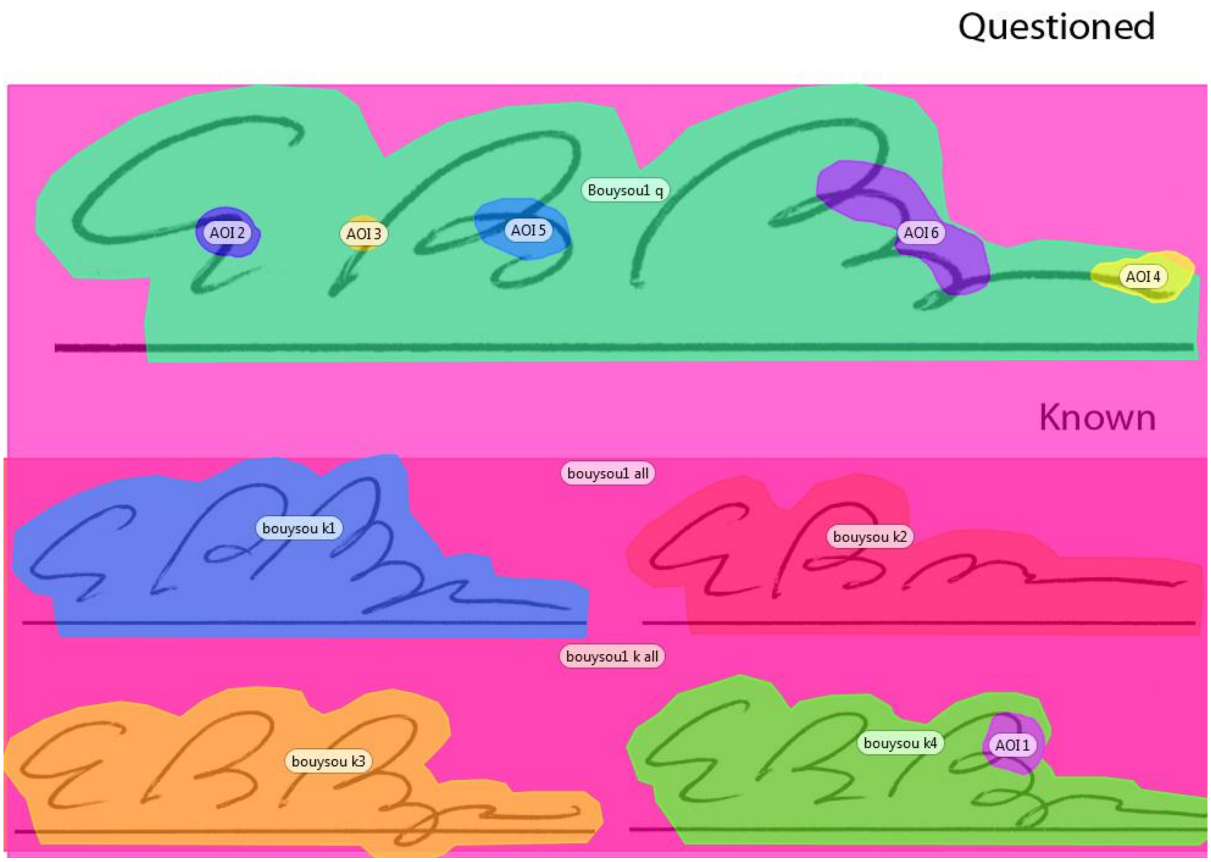


Figure Bouysou 1.3. Areas of Interest (AOIs) for Bouysou Signature 1.



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

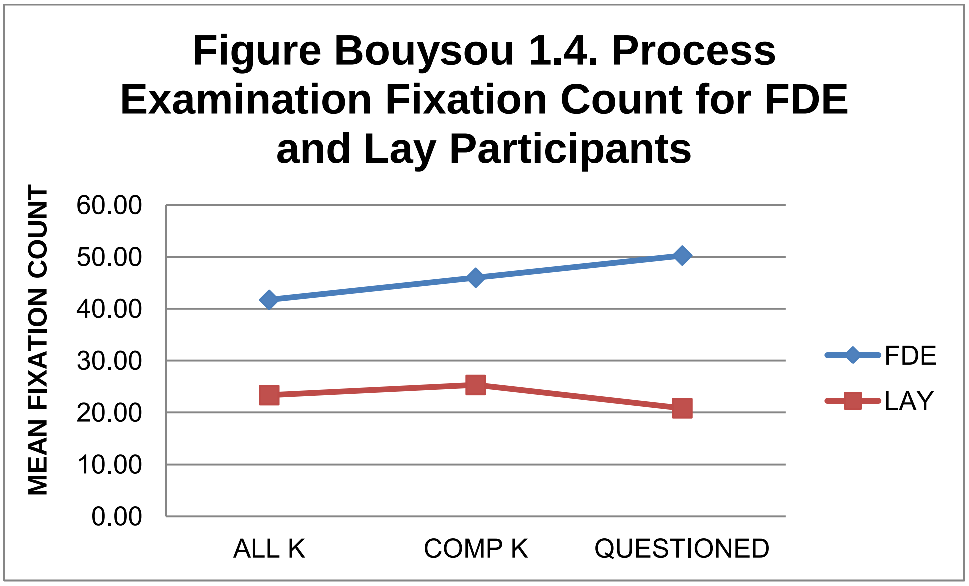
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Bouysou known signature stimulus (Knowns, not pictured here), Bouysou 1 K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Bouysou 1Q (the Bouysou questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 6) are included in subsequent analyses.

<u>Total Fixation Count</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .228, F (3, 86) = 8.49, p < .001, multivariate η^2 = .228. Figure Bouysou 1.4 presents the mean fixation counts by AOI.

Figure Bouysou 1.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation counts in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus (COMP K) was significantly greater for FDEs than for Lay participants, F (1, 88) = 9.45, p = .003, partial η^2 = .097, and F (1, 88) = 4.17, p = .044, partial η^2 = .045.

Fixation counts in the known signature stimulus (ALL K) were significantly greater for FDEs than for Lay participants, F (1, 88) = 6.96, p = .010, partial η^2 = .073. Table Bouysou 1.1 presents the means and standard deviations for areas of interest by participant type.

Table Bouysou 1.1

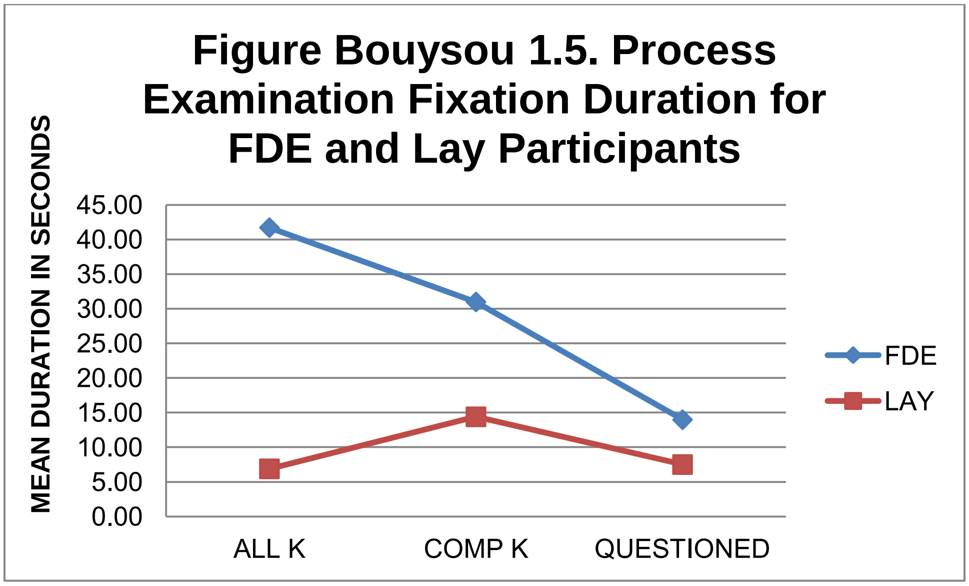
Process Analysis Fixation Counts for FDE and Lay participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	41.72	42.10	45.98	60.70	50.26	59.17
Lay	23.37	18.35	25.33	27.84	20.84	21.80

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .276, F (3, 86) = 10.95, p < .001, multivariate η^2 = .276. Figure Bouysou 1.5 presents the mean fixation durations by AOI.

Figure Bouysou 1.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation durations in two of three areas of interest. Fixation durations in both the known signature stimulus (ALL K) and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, F (1, 88) = 7.57, p = .007, partial η^2 = .079; and F (1, 88) = 7.28, p = .008, partial η^2 = .076).

Total fixation duration for the questioned signature was not significantly greater for FDEs than for Lay participants, p = .054, *ns*. Table Bouysou 1.2 presents the means and standard deviations for areas of interest by participant type.

Table Bouysou 1.2
Process Analysis Fixation Durations for FDE and Lay participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	13.79	15.32	30.99	37.53	13.98	20.11
Lay	6.89	6.19	14.40	15.31	7.51	8.60

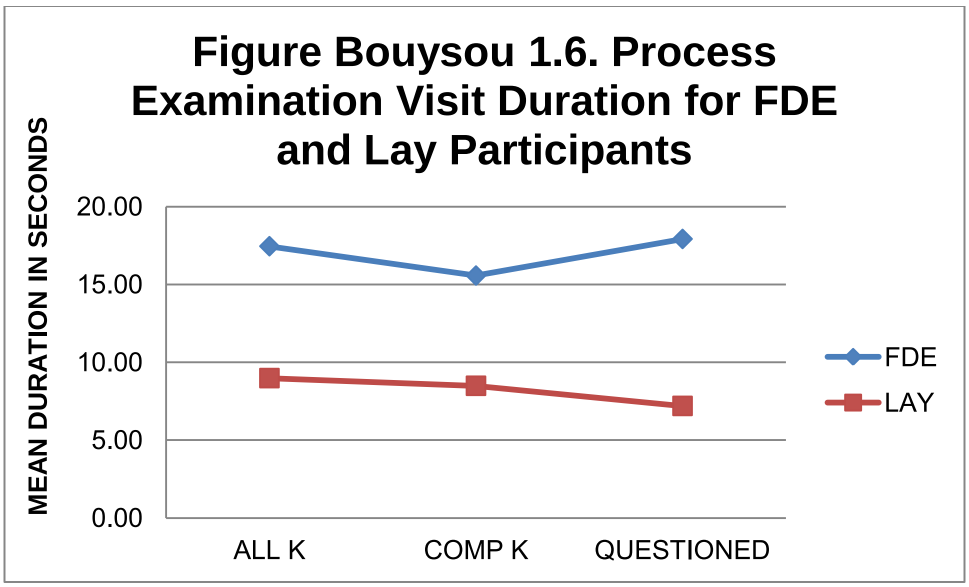
Total Visit Count

MANOVA results did not reveal significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .059, p = .151, *ns*. No further analyses were conducted because the full model was not statistically significant.

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .26, F (3, 86) = 10.15, p < .001, multivariate η^2 = .26. Figure Bouysou 1.6 presents the mean visit durations by AOI.

Figure Bouysou 1.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in two of the three areas of interest. Total visit duration for the questioned signature was significantly greater for FDEs than for Lay participants, F(1, 88) = 11.41, p = .001, partial η^2 = .115. Visit duration in the known signature stimulus (ALL K) was significantly greater for FDEs than for Lay participants, F (1, 88) = 8.18, p = .005, partial η^2 = .085.

However, no statistical difference was found in the known signature comparison stimulus (COMP K), p = .061, *ns*.). Table Bouysou 1.3 presents the means and standard deviations for areas of interest by participant type.

Table Bouysou 1.3
Process Analysis Visit Durations for FDE and Lay participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	17.45	18.18	15.56	22.75	17.92	19.62

Lay	8.98	7.14	8.48	9.45	7.19	7.25

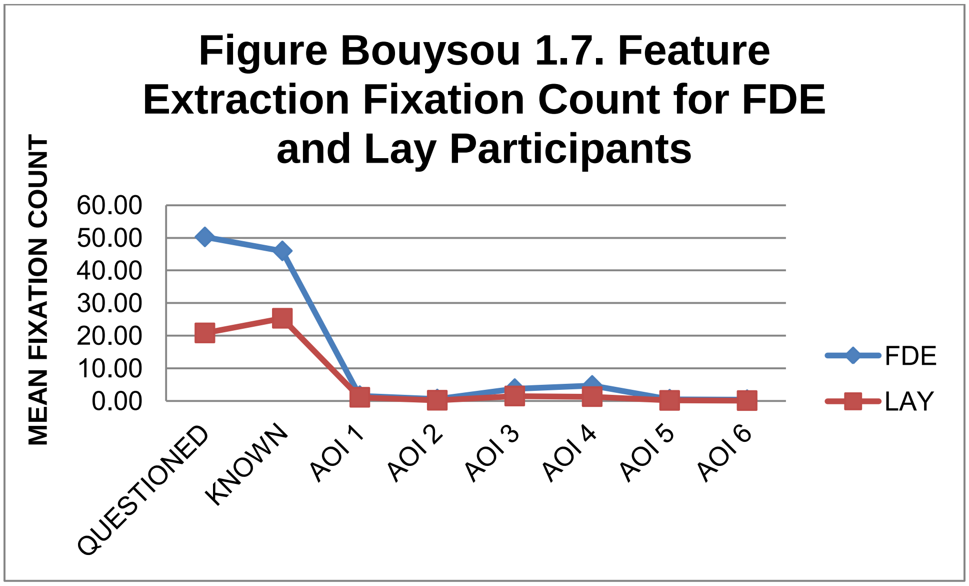
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .258, F (8, 81) = 3.52, p = .002, multivariate η^2 = .258. Figure Bouysou 1.7 presents the mean fixation counts by AOI.

Figure Bouysou 1.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all but two areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, F(1, 88) = 9.45, p = .003, partial η^2 = .097, and F(1, 88) = 4.17, p = .044, partial η^2 = .045.

Fixation count in both AOIs was significantly greater for FDEs than for Lay participants (AOI 2, F(1, 88) = 4.88, p = .030, partial η^2 = .053; AOI 4, F (1, 88) = 11.36, p = .001, partial η^2 = .114; AOI 4, F (1, 88) = 6.37, p = .013, partial η^2 =114; AOI 5, F (1, 88) = 6.81, p = .011, partial η^2 = . 072).

No significant difference was found in AOI 1, p = 166, *ns*; or AOI 6, p = .089, *ns*. Table Bouysou 1.4 presents the means and standard deviations for areas of interest by participant type.

Table Bouysou 1.4

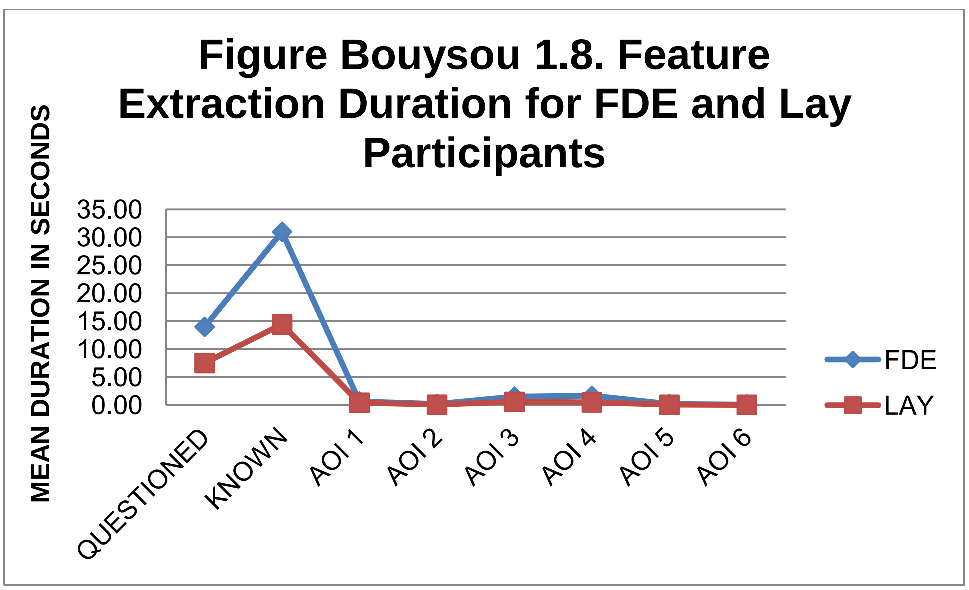
Feature Extraction Analysis Fixation Counts for FDE and Lay participants

	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	17.92	19.62	15.56	22.75	0.63	0.74	0.19	0.32
Lay	7.19	7.25	8.48	9.45	0.41	0.64	0.05	0.16
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.51	1.70	1.69	2.72	0.16	0.26	0.08	0.19
Lay	0.56	0.76	0.49	0.83	0.04	0.13	0.04	0.13

<u>*Total Fixation Duration*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .319, F (8, 81) = 4.74, p < .001, multivariate η^2 = .319. Figure Bouysou 1.8 presents the mean fixation durations by AOI.

Figure Bouysou 1.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all but two areas of interest. Total fixation duration for the questioned signature was not statistically significant, F(1, 88) = 3.81, p = .054, partial η^2 = .041, *ns*. The known signature comparison stimulus was significantly greater for FDEs than for Lay participants, F(1, 88) = 7.28, p = .008, partial η^2 = .076.

Fixation count in all but two AOIs was significantly greater for FDEs than for Lay participants (AOI 2, $F(1, 88) = 7.79$, $p = .006$, partial $\eta^2 = .081$; AOI 4, F (1, 88) = 11.41, $p = .001$, partial $\eta^2 = .115$; AOI 4, F (1, 88) = 7.86, $p = .006$, partial $\eta^2 = .081$; AOI 5, F (1, 88) = 7.94, $p = .006$, partial $\eta^2 = .083$).

No significant difference was found in AOI 1, $p = .125$, *ns*; or AOI 6, $p = .208$, *ns*. Table Bouysou 1.5 presents the means and standard deviations for areas of interest by participant type.

Table Bouysou 1.5

Feature Extraction Analysis Fixation Duration for FDE and Lay participants

	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	17.92	19.62	15.56	22.75	0.63	0.74	0.19	0.32
Lay	7.19	7.25	8.48	9.45	0.41	0.64	0.05	0.16
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.51	1.70	1.69	2.72	0.16	0.26	0.08	0.19
Lay	0.56	0.76	0.49	0.83	0.04	0.13	0.04	0.13

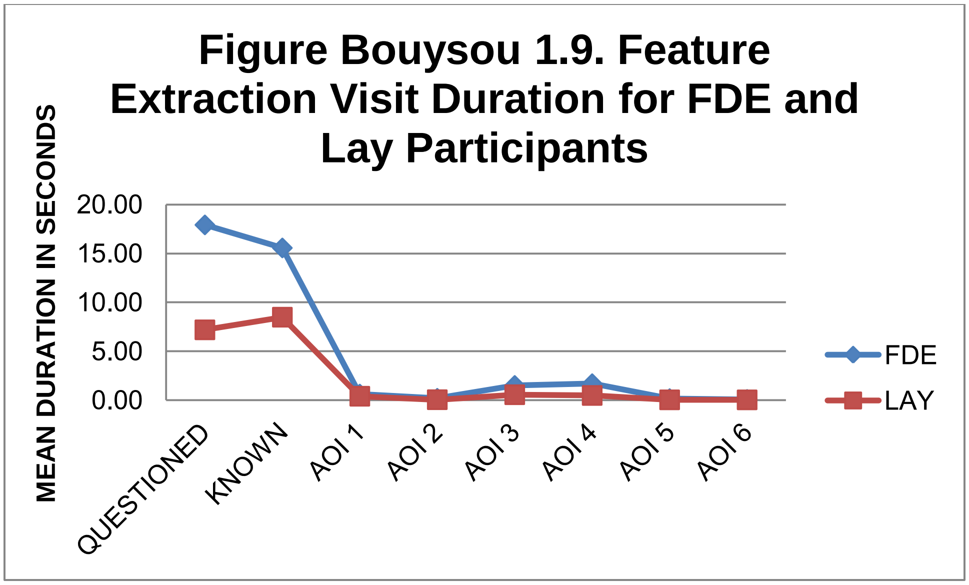
Total Visit Count

MANOVA results did not reveal significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .155, $p = .079$, *ns*. No further analyses were conducted because no significant differences were found in the full model.

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .306, F (8, 81) = 4.47, $p < .001$, multivariate $\eta^2 = .306$. Figure Bouysou 1.9 presents the mean total visit durations by AOI.

Figure Bouysou 1.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit duration in all but two areas of interest. Total visit duration for the questioned signature was statistically significant, $F(1, 88) = 11.41$, $p = .001$, partial $\eta^2 = .115$. The known signature comparison stimulus was not significantly greater for FDEs than for Lay participants, $p = .061$, *ns*.

Visit duration in all but two AOIs was significantly greater for FDEs than for Lay participants (AOI 2, $F(1, 88) = 7.02$, $p = .010$, partial $\eta^2 = .074$; AOI 4, $F\ (1, 88) = 11.31$, $p = .001$, partial $\eta^2 = .114$; AOI 4, $F\ (1, 88) = 7.74$, $p = .007$, partial $\eta^2 = .081$; AOI 5, $F\ (1, 88) = 7.94$, $p = .006$, partial $\eta^2 = .083$).

No significant difference was found in AOI 1, $p = .134$, *ns*; or AOI 6, $p = .191$, *ns*. Table Bouysou 1.6 presents the means and standard deviations for areas of interest by participant type.

Table Bouysou 1.6

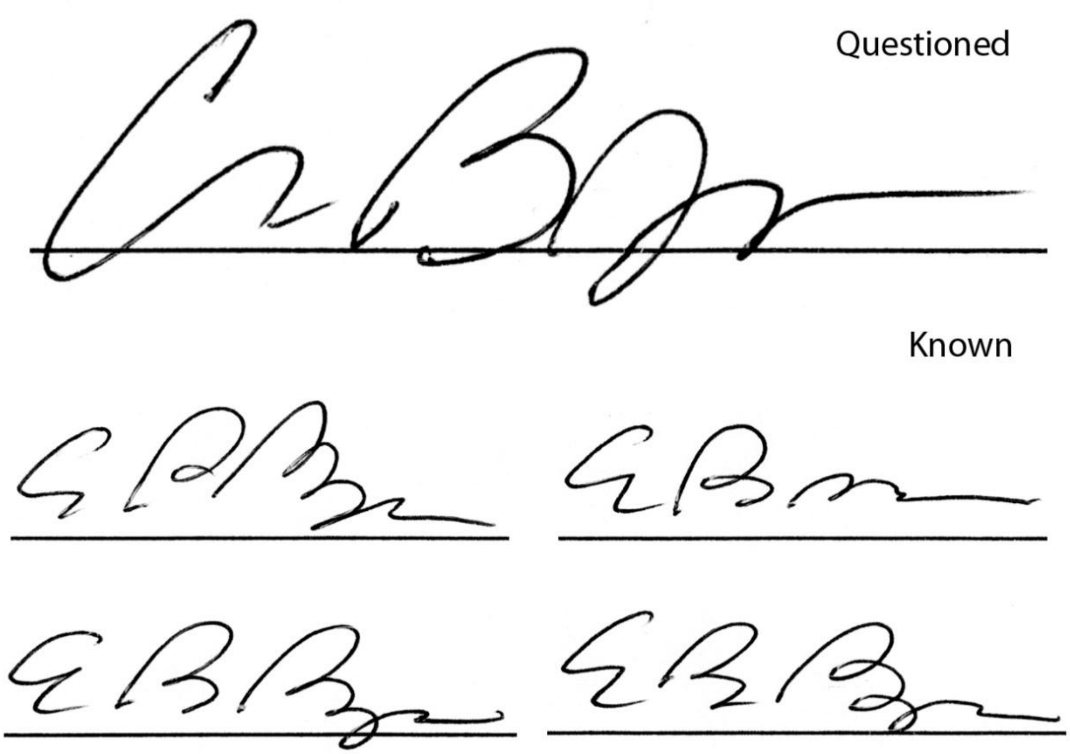
Feature Extraction Analysis Visit Durations for FDE and Lay participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	17.92	19.62	15.56	22.75	0.63	0.74	0.19	0.32
Lay	7.19	7.25	8.48	9.45	0.41	0.64	0.05	0.16
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.51	1.70	1.69	2.72	0.16	0.26	0.08	0.19
Lay	0.56	0.76	0.49	0.83	0.04	0.13	0.04	0.13

Bouysou Signature 2: Freehand Simulation (Non-Genuine)

Of the 49 FDE participants, 46 responded correctly that the signature was non-genuine, and 2 responded that the signature was genuine. One FDE declined to respond. Of the 43 Lay participants, 34 responded correctly that the signature was non-genuine, and 9 responded that the signature was genuine. This difference was statistically significant, χ^2 (2, N = 92) = 6.89, p = .032. Figure Bouysou 2.1 presents the comparison view of this signature.

Figure Bouysou 2.1. Questioned-Known Comparison Stimulus for Bouysou Signature 2.

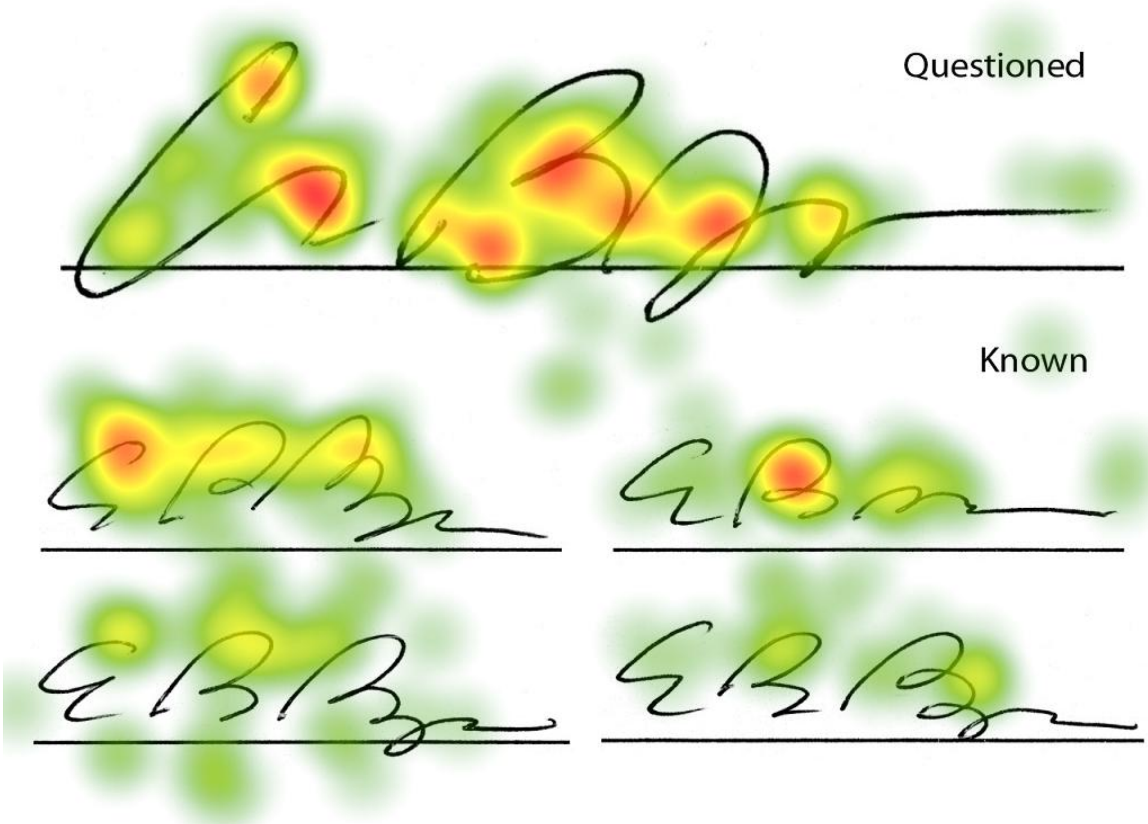


Selection of Areas of Interest (AOIs)

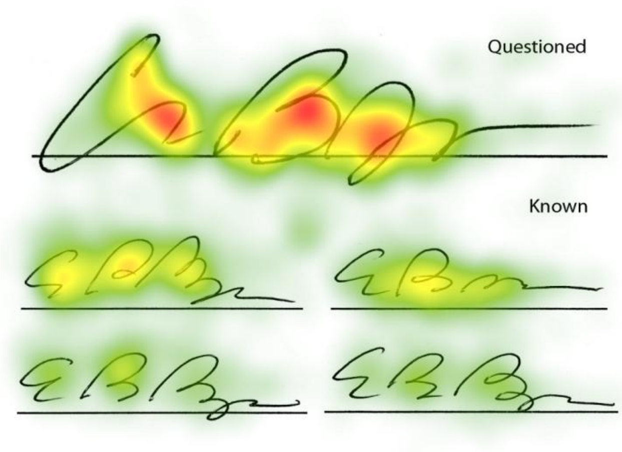
Figure Bouysou 2.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were nine locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of nine AOIs for this stimulus. Figure Bouysou 2.3 presents the location of the AOIs identified in the heat map.

Figure Bouysou 2.2. Heat map for Bouysou Signature 2, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

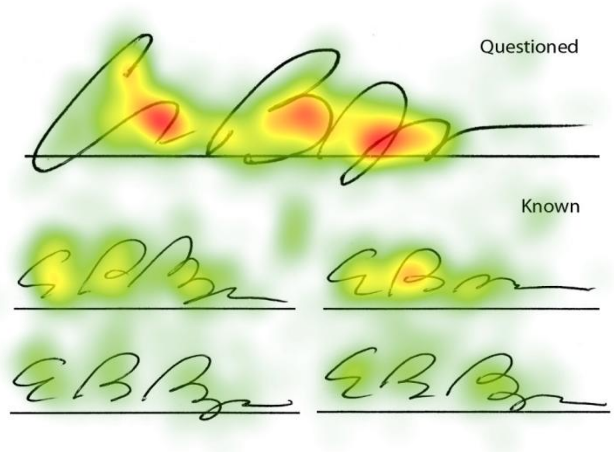


Figure Bouysou 2.3. Areas of Interest (AOIs) for Bouysou Signature 2.

Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

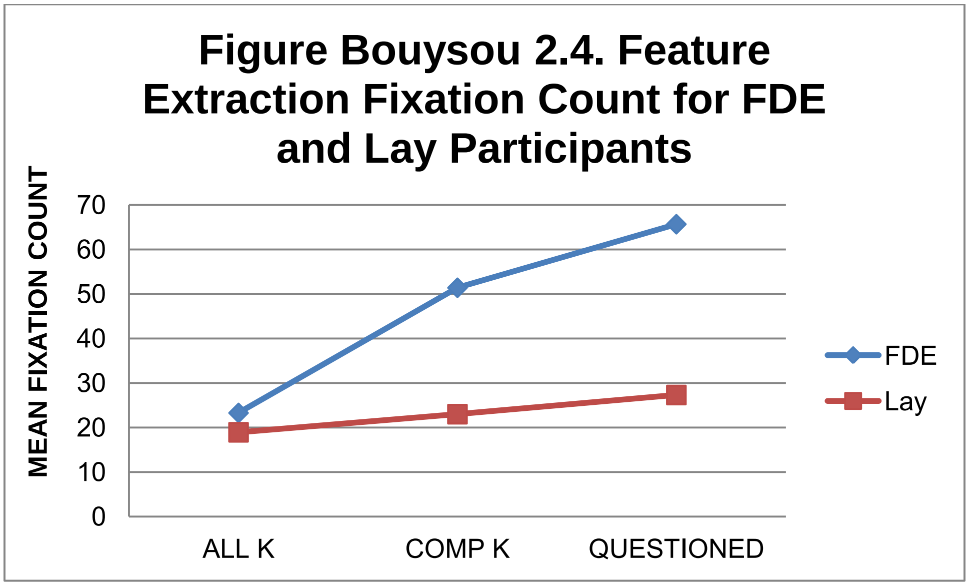
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Bouysou known signature stimulus (Knowns, not pictured here), Bouysou 1 K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Bouysou 2Q (the Bouysou questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 9) are included in subsequent analyses.

<u>*Total Fixation Count*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .178, F (3, 85) = 6.15, p = .001, multivariate η^2 = .178. Figure Bouysou 2.4 presents the mean fixation counts by AOI.

Figure Bouysou 2.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixations counts in all but one area of interest. Total fixation count for the questioned signature (COMP K) was significantly greater for FDEs than for Lay participants, F (1, 87) = 18.01, p < .001, partial η^2 = .172. Fixation counts in the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, F (1, 87) = 16.01, p < .001, partial η^2 = .16.

Fixation count in the known signature stimulus (ALL K) was not significantly different between groups, p = .244, *ns*. Table Bouysou 2.1 presents the means and standard deviations for areas of interest by participant type.

Table Bouysou 2.1

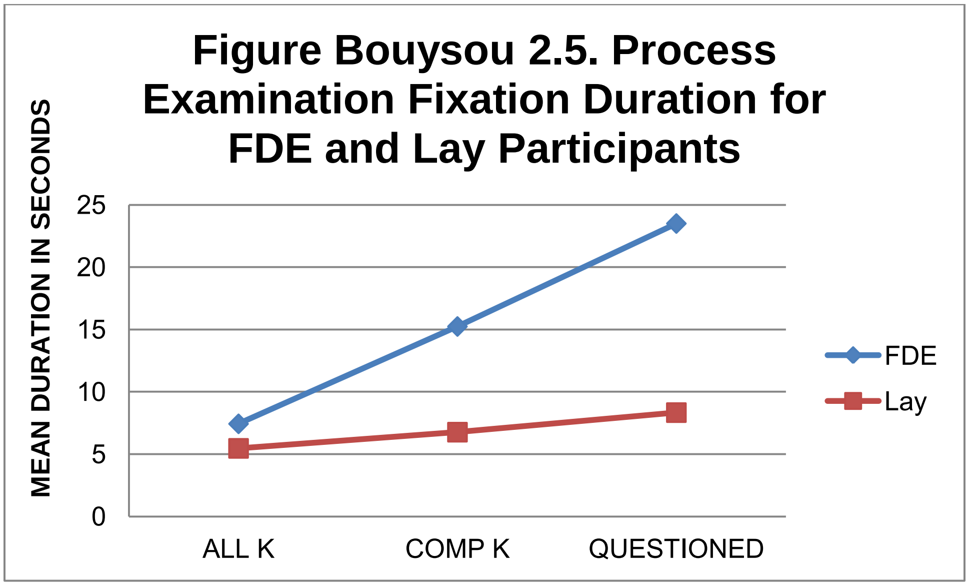
Process Analysis Fixation Counts for FDE and Lay participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	23.28	19.07	51.39	42.44	65.67	53.44
Lay	18.93	15.66	23	19.69	27.3	26.53

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .23, F (3, 85) = 8.58, p < .001, multivariate η^2 = .23. Figure Bouysou 2.5 presents the mean fixation counts by AOI.

Figure Bouysou 2.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation durations in all but one area of interest. Total fixation duration for the questioned signature was significantly greater for FDEs than for Lay participants, F (1, 87) = 25.13, p < .001, partial η^2 = .224. The known signature comparison stimulus was significantly greater for FDEs than for Lay participants, F (1, 87) = 14.96, p < .001, partial η^2 = .147.

Fixation durations in the known signature stimulus was not significantly different between groups, p = .166, *ns*. Table Bouysou 2.2 presents the means and standard deviations for areas of interest by participant type.

Table Bouysou 2.2

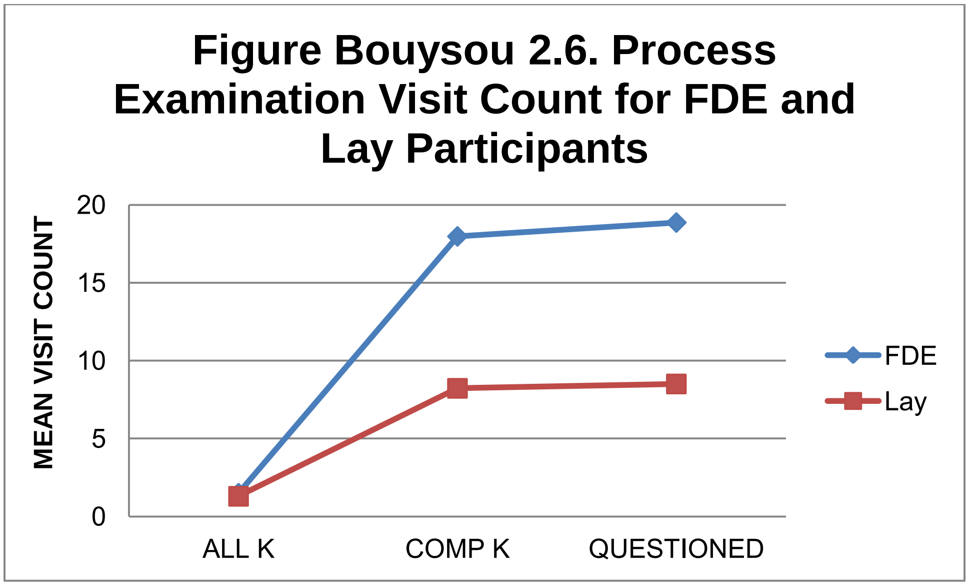
Process Analysis Fixation Durations for FDE and Lay participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	7.44	7.67	15.25	13.06	23.51	18.4
Lay	5.47	5.35	6.77	6.22	8.34	7.68

Total Visit Count

MANOVA results reveal significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .156, F (3, 85) = 5.22, p = .002, multivariate η^2 = .156. Figure Bouysou 2.6 presents the mean visit counts by AOI.

Figure Bouysou 2.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all but one area of interest. Total visit count for the questioned signature was significantly greater for FDEs than for Lay participants, F (1, 87) = 14.96, p < .001, partial η^2 = .147. The known signature comparison stimulus (COMP K) also showed significant differences, F (1, 87) = 14.34, p < .001, partial η^2 = .141).

Visit counts in the known signature stimulus (ALL K) was not significantly greater for FDEs than for Lay participants, p = .336, *ns*. Table Bouysou 2.3 presents the means and standard deviations for areas of interest by participant type.

Table Bouysou 2.3

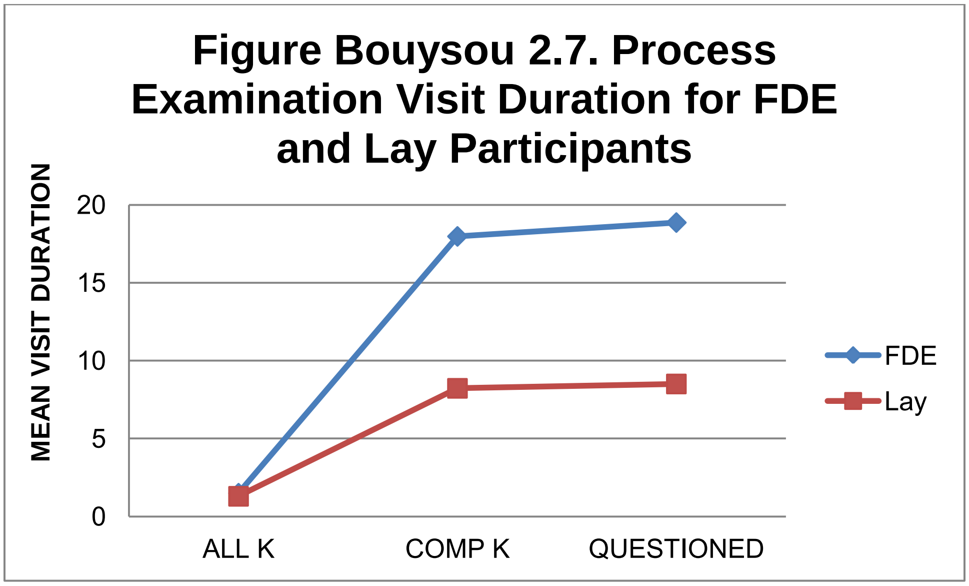
Process Analysis Visit Counts for FDE and Lay participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.5	1.09	17.98	15.44	18.87	16.07
Lay	1.3	0.8	8.23	7.04	8.51	7.32

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .229, F (3, 85) = 8.42, p < .001, multivariate η^2 = .229. Figure Bouysou 2.7 presents the mean visit durations by AOI.

Figure Bouysou 2.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all but one area of interest. Total visit duration for the questioned signature was significantly greater for FDEs than for Lay participants, F(1, 87) = 25.68, p < .001, partial η^2 = .228. A statistical difference was also found in the known signature comparison stimulus (COMP K), F (1, 87) = 15.03, p < .001, partial η^2 = .147).

Visit durations in the known signature stimulus (ALL K) was not significantly greater for FDEs than for Lay participants, p = .298, *ns*. Table Bouysou 2.4 presents the means and standard deviations for areas of interest by participant type.

Table Bouysou 2.4

Process Analysis Visit Durations for FDE and Lay participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	9.22	8.56	16.96	14.11	26.6	20.6
Lay	7.51	6.64	7.79	6.63	9.43	8.58

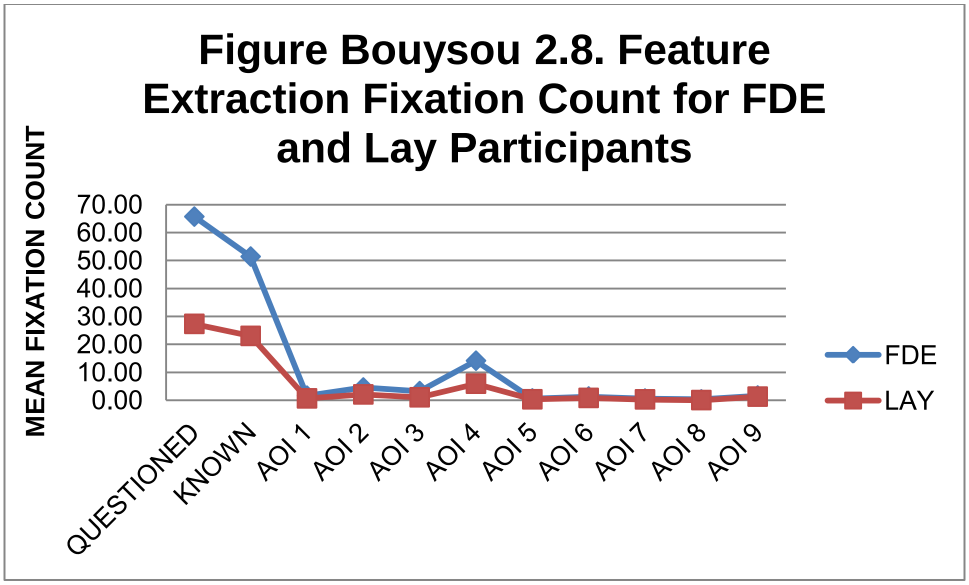
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .279, F (11, 77) = 2.71, p = .005, multivariate η^2 = .279. Figure Bouysou 2.8 presents the mean fixation counts by AOI.

Figure Bouysou 2.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in most areas of interest. Total fixation count for the questioned signature and the known signatures was significantly greater for FDEs than for Lay participants, F (1, 87) = 18.01, p < .001, partial η^2 =.172, and F (1, 87) = 16.01, p < .001, partial η^2 = .155.

Fixations counts in five AOIs were significantly greater for FDEs than for Lay participants (AOI 1, F (1, 87) = 6.25, p = .014, partial η^2 = .067; AOI 2, F (1, 87) = 12.61, p = .001, partial η^2 = .127; AOI 3, F (1, 87) = 10.36, p = .002, partial η^2 = .06; AOI 4, F (1, 87) = 11.34, p = .001, partial η^2 = .115; AOI 8, F (1, 87) = 8.22, p = .005, partial η^2 = .086).

No significant differences were found in four AOIs (AOI 5, p = .082, ns; AOI 6, p = .160, *ns*; AOI 7, p = .161, *ns*; AOI 9, p = .267, *ns*). Table Bouysou 2.5 presents the means and standard deviations for areas of interest by participant type.

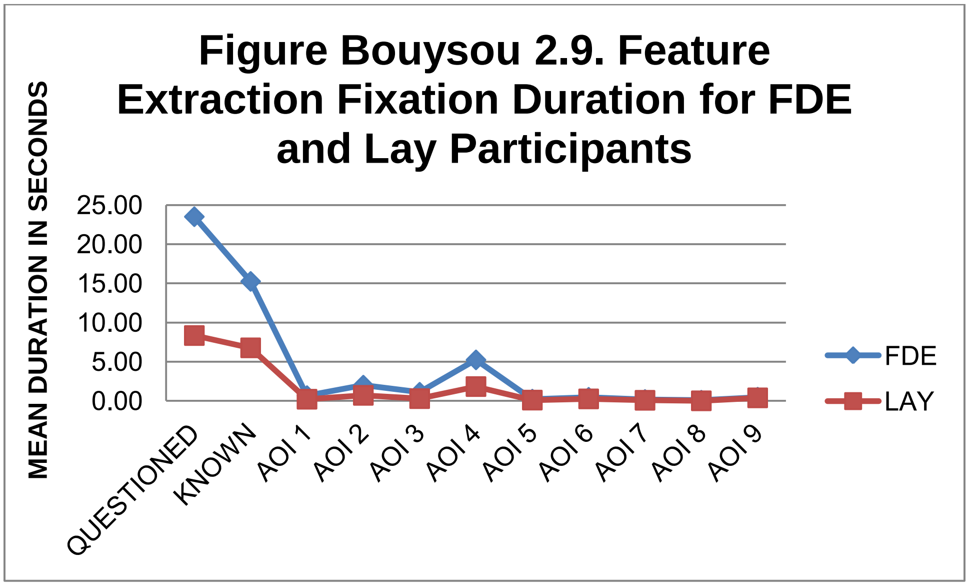
Table Bouysou 2.5
Feature Extraction Analysis Fixation Counts for FDE and Lay participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	65.67	53.44	51.39	42.44	1.63	2.21	4.54	3.99
Lay	27.3	26.53	23	19.69	0.65	1.34	2.07	2.29
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	3.26	4.28	14.13	14.7	0.63	0.93	1.33	1.66
Lay	1.05	1.48	5.91	6.57	0.33	0.68	0.81	1.75
	AOI 7		**AOI 8**		**AOI 9**			
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*		
FDE	0.59	1.05	0.3	0.55	1.67	2.5		
Lay	0.3	0.83	0.05	0.21	1.28	1.42		

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .316, F (11, 77) = 3.24, p = .001, multivariate η^2 = .316. Figure Bouysou 2.9 presents the mean fixation durations by AOI.

Figure Bouysou 2.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in most areas of interest. Total fixation duration for the questioned signature and known signatures was significantly greater for FDEs than for Lay participants, F (1, 87) = 25.13, p < .001, partial η^2 = .224, and F (1, 87) = 14.96, p < .001, partial η^2 = .147.

Fixation durations in six AOIs were significantly greater for FDEs than for Lay participants (AOI 1, F (1, 87) = 6.99, p = .010, partial η^2 = .074; AOI 2, F (1, 87) = 16.13, p < .001, partial η^2 = .156; AOI 3, F (1, 87) = 11.97, p = .001, partial η^2 = .121; AOI 4, F (1, 87) = 13.94, p < .001, partial η^2 = .138; AOI 5, F (1, 87) = 4.09, p = .046, partial η^2 = .045; AOI 8, F (1, 87) = 9.25, p = .003, partial η^2 = .096).

No significant differences were found in three AOIs (AOI 6, p < .13, *ns*,; AOI 7, p < .10, *ns*,; AOI 9, p = .48, *ns*,). Table Bouysou 2.6 presents the means and standard deviations for areas of interest by participant type.

Table Bouysou 2.6

Feature Extraction Analysis Fixation Duration for FDE and Lay participants

	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	23.51	18.4	15.25	13.06	0.67	1.04	2	1.93
Lay	8.34	7.68	6.77	6.22	0.21	0.49	0.7	0.91

	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.1	1.48	5.23	5.66	0.22	0.33	0.46	0.67
Lay	0.28	0.46	1.82	1.99	0.1	0.22	0.25	0.58

	AOI 7		**AOI 8**		**AOI 9**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	0.18	0.37	0.09	0.17	0.47	0.66
Lay	0.07	0.21	0.01	0.03	0.38	0.46

<u>Total Visit Count</u>

MANOVA results did reveal significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .281, F (11, 77) = 2.73, p = .005, multivariate η^2 = .281. Figure Bouysou 2.10 presents the mean visit counts by AOI.

Figure Bouysou 1.10

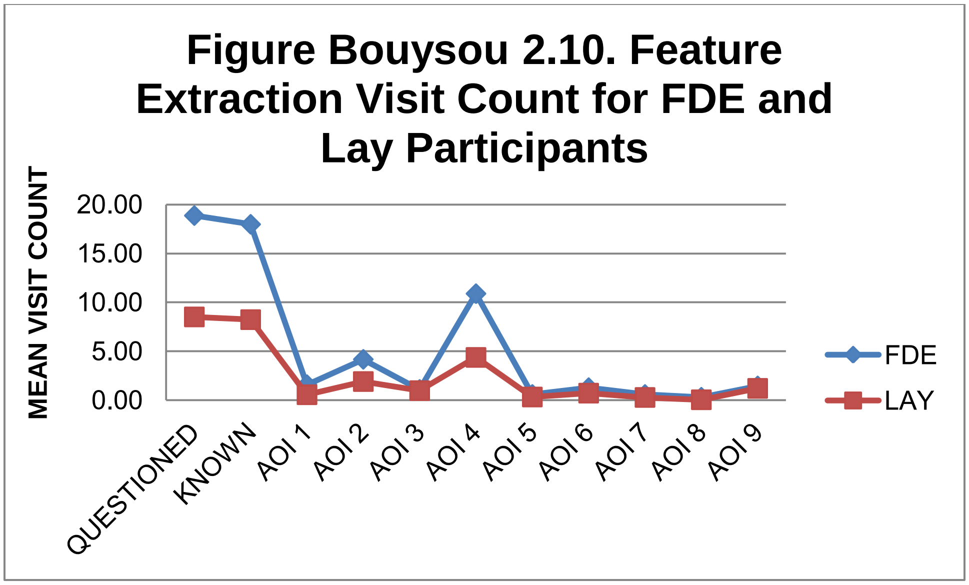


Figure Bouysou 2.10 presents the mean total visit counts by AOI. Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in most areas of interest. Total visit count for the questioned signature and the know signatures were significantly greater for FDEs than for Lay participants, F (1, 87) = 14.96, p < .001, partial η^2 = .147, and F (1, 87) = 14.34, p < .001, partial η^2 = .141.

Visit counts in five AOIs were significantly greater for FDEs than for Lay participants (AOI 1, F (1, 87) = 7.88, p = .006, partial η^2 = .083; AOI 2, F (1, 87) = 13.72, p < .001, partial η^2 = .136; AOI 3, F (1, 87) = 11.60, p = .001, partial η^2 = .118; AOI 4, F (1, 87) = 13.82, p < .001, partial η^2 = .137; AOI 8, F (1, 87) = 8.22, p = .005, partial η^2 = .086).

No significant differences were found for four AOIs (AOI 5, p = .123, *ns*; AOI 6, p = .093, *ns*; AOI 7, p = .119, *ns*; AOI 9, p = .515, *ns*). Table Bouysou 2.7 presents the means and standard deviations for areas of interest by participant type.

Table Bouysou .7

Feature Extraction Analysis Visit Count for FDE and Lay participants

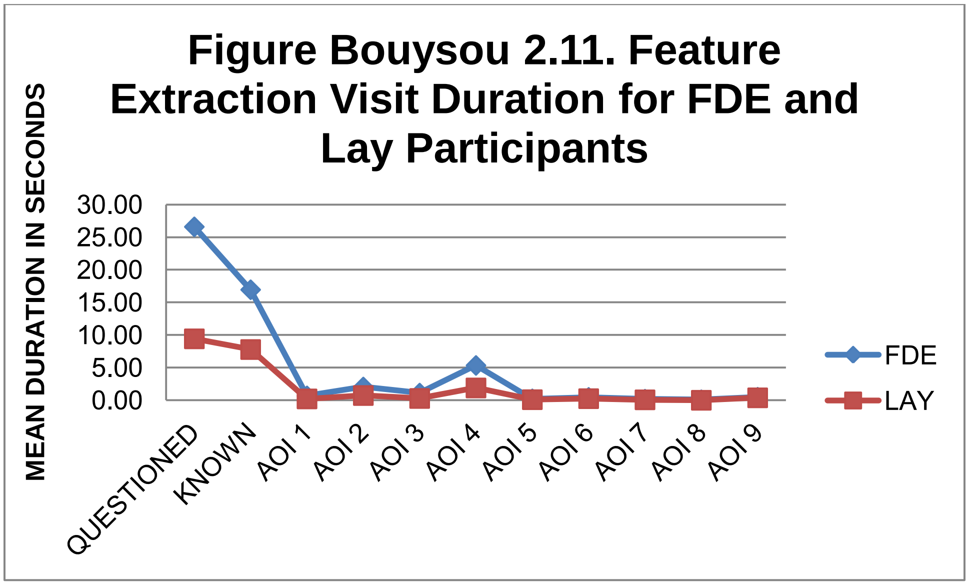
	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	18.87	16.07	17.98	15.44	1.59	2.15	4.17	3.55
Lay	8.51	7.32	8.23	7.04	0.56	1.12	1.91	1.94
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.1	3.62	10.89	10.56	0.59	0.88	1.28	1.6
Lay	0.98	1.37	4.37	4.7	0.33	0.68	0.72	1.52
	AOI 7		**AOI 8**		**AOI 9**			
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***		
FDE	0.59	1.05	0.3	0.55	1.46	2.15		

Lay	0.28	0.77	0.05	0.21	1.21	1.28

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .313, F (11, 77) = 3.19, p = .001, multivariate η^2 = .313. Figure Bouysou 2.11 presents the mean total visit counts by AOI.

Figure Bouysou 2.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in many areas of interest. Total visit duration for the questioned signature and the known signatures was significantly greater for FDEs than for Lay participants, F (1, 87) = 25.68, p < .001, partial η^2 = .228, and F (1, 87) = 15.03, p < .001, partial η^2 = .147.

Visit duration in most AOIs was significantly greater for FDEs than for Lay participants (AOI 1, F (1, 87) = 6.75, p = .011, partial η^2 = .072; AOI 2, F (1, 87) = 15.39, p < .001, partial η^2 = .150; AOI 3, F (1, 87) = 11.89, p = .001, partial η^2 = .120; AOI 4, F (1, 87) = 13.42, p < .001, partial η^2 = .134; AOI 5, F (1, 87) = 4.20, p = .043, partial η^2 = .046; AOI 8, F (1, 87) = 9.25, p = .003, partial η^2 = .096).

No significant difference was found in three AOIs (AOI 6, p = .14, *ns*; AOI 7, p = .13, *ns*; AOI 9, p = .45, *ns*). Table Bouysou 2.8 presents the means and standard deviations for areas of interest by participant type.

Table Bouysou 2.8

Feature Extraction Analysis Visit Duration for FDE and Lay participants

Participant	QUESTIONED M	QUESTIONED SD	KNOWN M	KNOWN SD	AOI 1 M	AOI 1 SD	AOI 2 M	AOI 2 SD
FDE	26.6	20.6	16.96	14.11	0.68	1.07	2.04	1.96
Lay	9.43	8.58	7.79	6.63	0.22	0.49	0.74	1

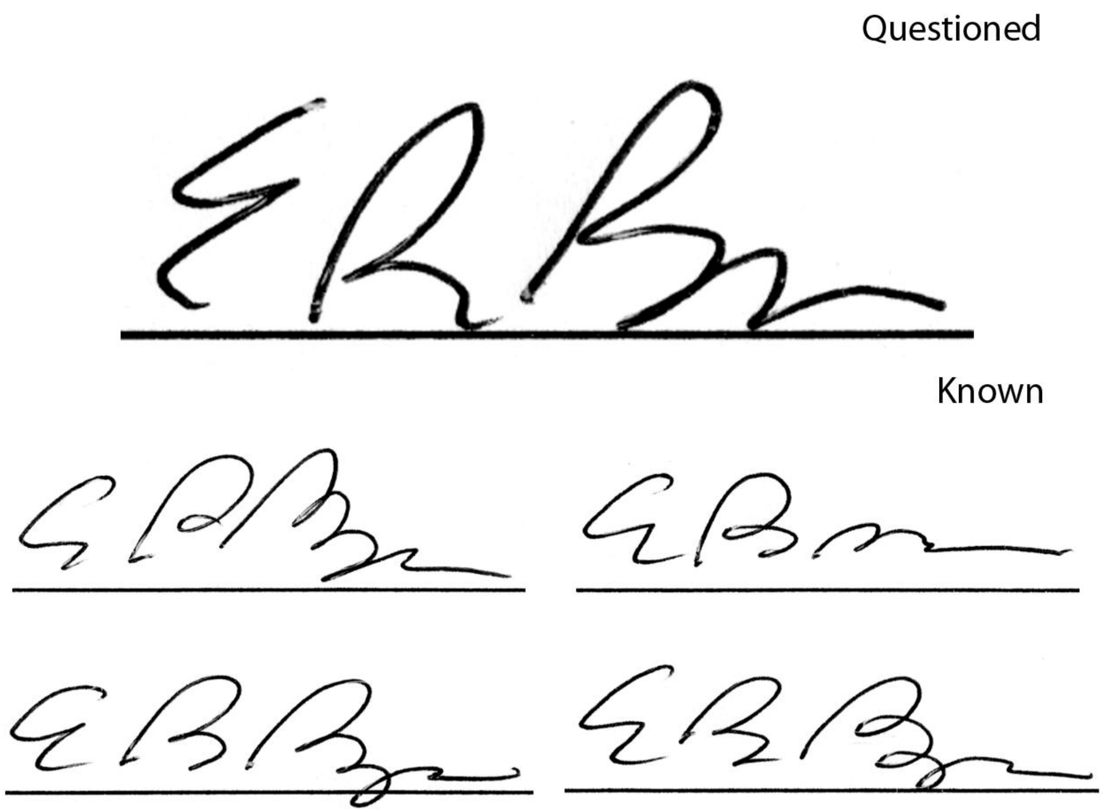
Participant	AOI 3 M	AOI 3 SD	AOI 4 M	AOI 4 SD	AOI 5 M	AOI 5 SD	AOI 6 M	AOI 6 SD
FDE	1.12	1.52	5.35	5.83	0.22	0.34	0.46	0.67
Lay	0.29	0.46	1.9	2.1	0.1	0.22	0.25	0.59

Participant	AOI 7 M	AOI 7 SD	AOI 8 M	AOI 8 SD	AOI 9 M	AOI 9 SD
FDE	0.18	0.37	0.09	0.17	0.48	0.68
Lay	0.08	0.22	0.01	0.03	0.38	0.46

Bouysou Signature 3: Disguised (Non-Genuine)

Of the 49 FDE participants, 47 responded correctly that the signature was non-genuine, disguised with one who responded incorrectly and one refusal. Of the 43 Lay participants, 39 responded correctly that the signature was non-genuine, and 4 responded incorrectly that the signature was genuine. This difference was not statistically significant, χ^2 (2, N = 92) = 3.17, p = .21. Figure Bouysou 3.1 presents the comparison view of this signature.

Figure Bouysou 3.1. Questioned-Known Comparison Stimulus for Bouysou Signature 3.

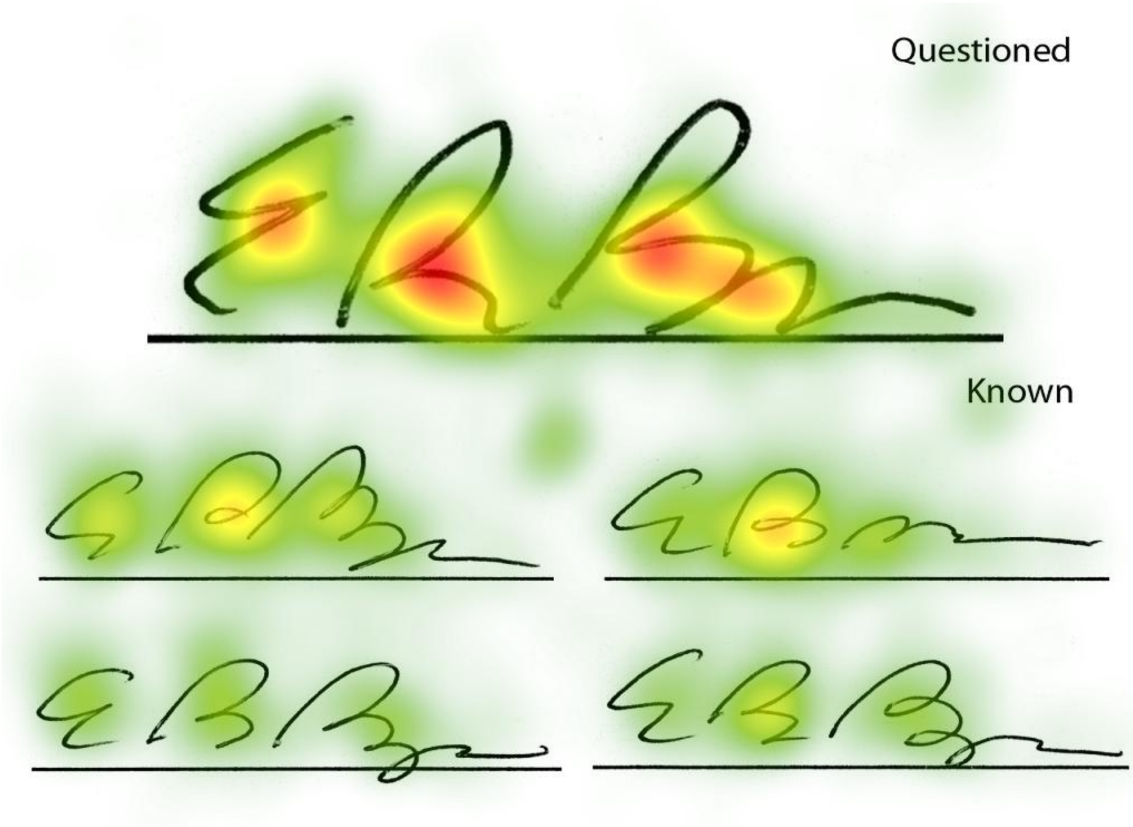


Selection of Areas of Interest (AOIs)

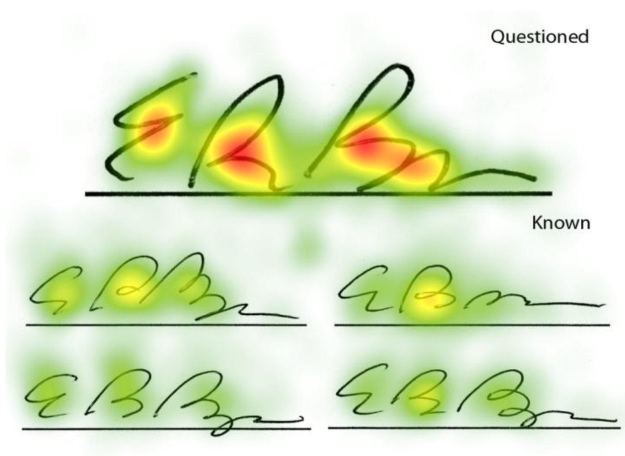
Figure Bouysou 3.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were eight locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of eight AOIs for this stimulus. Figure Bouysou 3.3 presents the location of the AOIs identified in the heat map.

Figure Bouysou 3.2. Heat map for Bouysou signature 3, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

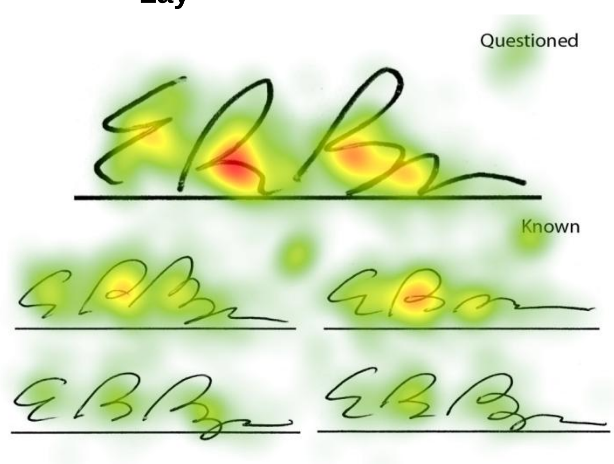
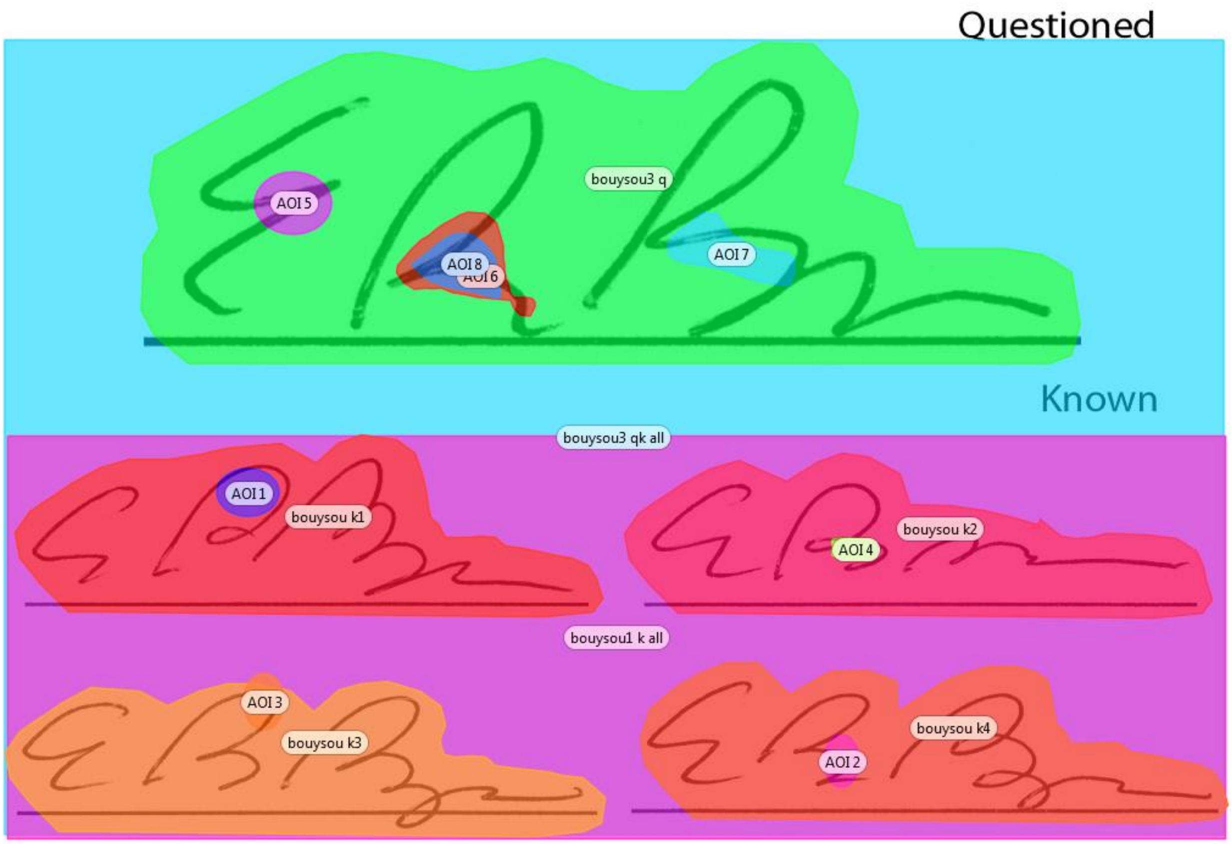


Figure Bouysou 3.3. Areas of Interest (AOIs) for Bouysou Signature 3.



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

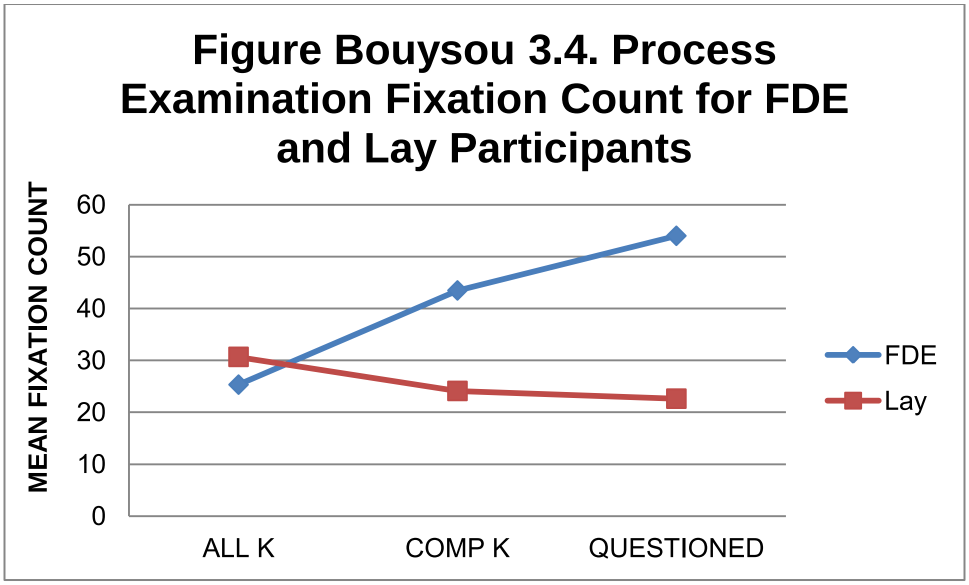
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Bouysou known signature stimulus (Knowns, not pictured here), Bouysou 1 K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Bouysou 3Q (the Bouysou questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 6) are included in subsequent analyses.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .309, F (3, 86) = 12.82, p < .001, multivariate η^2 = .309. Figure Bouysou 3.4 presents the mean fixation counts by AOI.

Figure Bouysou 3.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixations counts in one area of interest. Total fixation count for the questioned signature was significantly greater for FDEs than for Lay participants, F (1, 88) = 5.49, p = .021, partial η^2 = .059. Fixation count in the known signature stimulus (ALL K) was not significantly different between groups, p = .444, *ns*.

Although fixation count in the known signature comparison stimulus (COMP K) was greater for Lay than for FDE participants, this difference was not significantly different, F (1, 88) = 2.17, p = .144, partial η^2 = .024. Table Bouysou 3.1 presents the means and standard deviations for areas of interest by participant type.

Table Bouysou 3.1

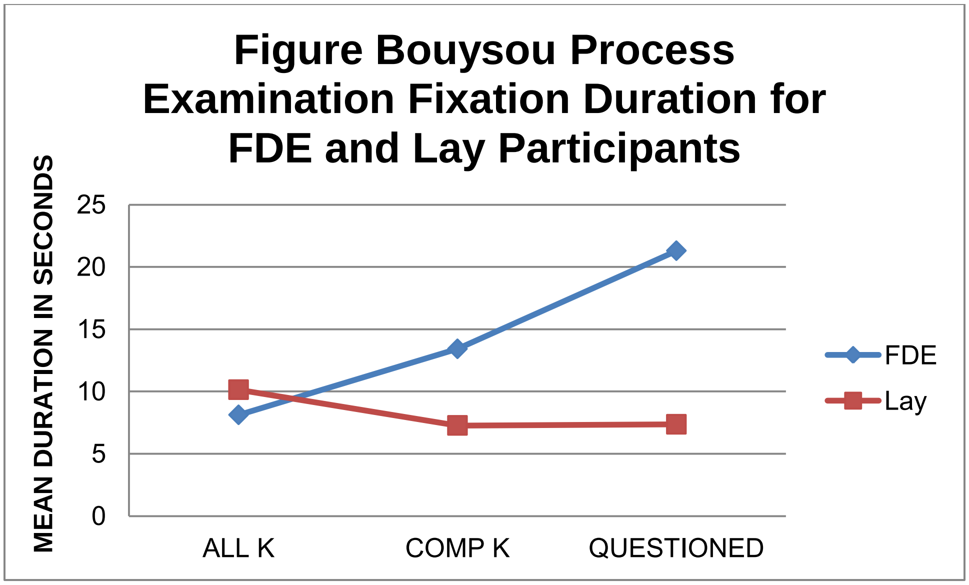
Process Analysis Fixation Counts for FDE and Lay participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	25.3	37.01	43.45	83.1	53.98	85.31
Lay	30.65	28.02	24.09	23.44	22.6	21.62

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .176, F (3, 86) = 6.10, p = .001, multivariate η^2 = .176. Figure Bouysou 3.5 presents the mean fixation counts by AOI.

Figure Bouysou 3.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation durations in one area of interest. Total fixation duration for the questioned signature was significantly greater for FDEs than for Lay participants, F (1, 88) = 4.53, p = .036, partial η^2 = .049.

Although fixation count in the known signature comparison stimulus (COMP K) was greater for Lay than for FDE participants, this difference was not significantly different, p = .425, *ns*. The known signature comparison stimulus (COMP K) was not significantly greater for FDEs than for Lay participants, p = .133, *ns*. Table Bouysou 3.2 presents the means and standard deviations for areas of interest by participant type.

Table Bouysou 3.2

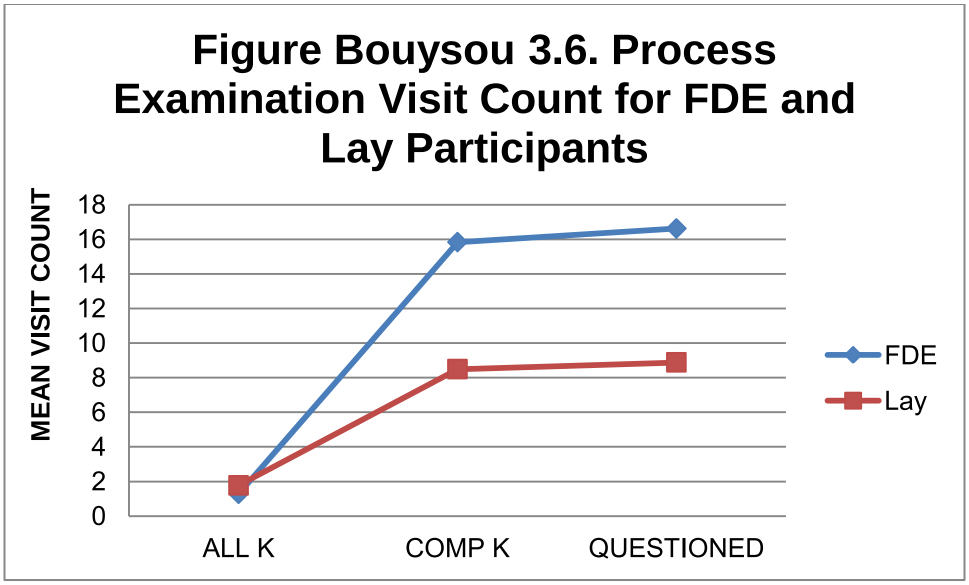
Process Analysis Fixation Durations for FDE and Lay participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	8.12	13.34	13.42	25.44	21.3	42.38
Lay	10.14	10.2	7.27	7.96	7.36	6.99

Total Visit Count

MANOVA results reveal significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .121, F (3, 86) = 3.95, p = .011, multivariate η^2 = .121. Figure Bouysou 3.6 presents the mean visit counts by AOI.

Figure Bouysou 3.6



However, follow-up ANOVAS conducted on each dependent variable revealed no significant differences among visit counts in the questioned signature, known signature stimulus, or know signature comparison stimulus (p = .069, *ns*; p = .089, *ns*; p = .079, *ns*). Table Bouysou 3.3 presents the means and standard deviations for areas of interest by participant type

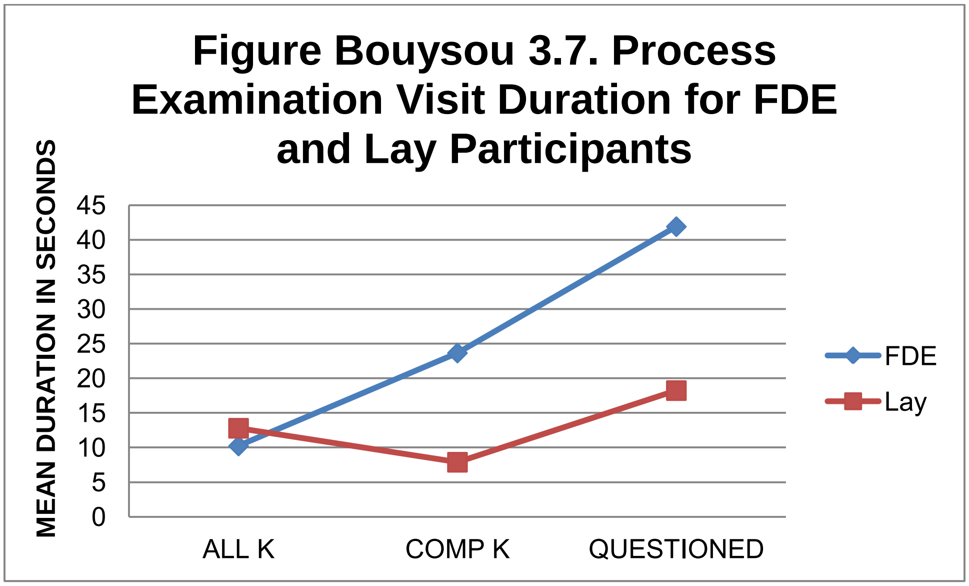
Table Bouysou 3.3
Process Analysis Visit Counts for FDE and Lay participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.28	0.71	15.83	26.29	16.62	26.59
Lay	1.77	1.81	8.49	6.96	8.88	7.45

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .213, F (3, 86) = 7.77, p < .001, multivariate η^2 = .213. Figure Bouysou 3.7 presents the mean visit durations by AOI.

Figure Bouysou 3.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. There was a statistically significant difference found in the known signature comparison stimulus (COMP K), F (1, 88) = 5.19, p =.025, partial η^2 = .056).

Total visit duration for the questioned signature was not significantly greater for FDEs than for Lay participants, p = .054, *ns*. Although visit duration in the known signature stimulus (ALL K) was greater for Lay than for FDE participants, this difference was not significantly different, p = .381, *ns*. Table Bouysou 3.4 presents the means and standard deviations for areas of interest by participant type.

Table Bouysou 3.4

Process Analysis Visit Durations for FDE and Lay participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	10.24	15.51	23.66	44.85	41.91	78
Lay	12.8	11.65	7.89	7.25	18.24	16.43

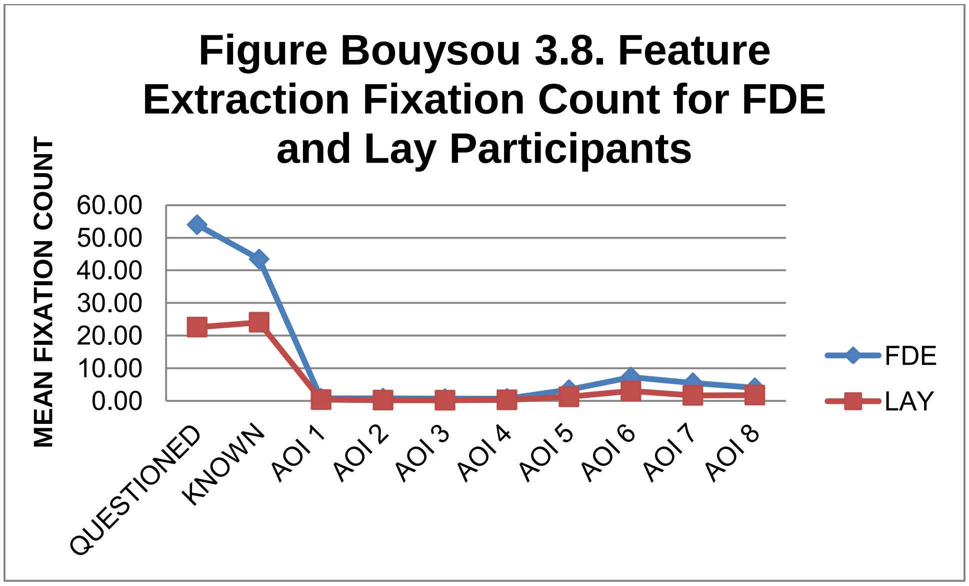
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .365, F (10, 79) = 4.34 p < .001, multivariate η^2 = .365. Figure Bouysou 3.8 presents the mean fixation counts by AOI.

Figure Bouysou 3.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in most areas of interest. Total fixation count for the questioned signature was significantly greater for FDEs than for Lay participants, F (1, 88) = 5.49, p = .021, partial η^2 =.059. No significant difference was found for the known signatures, , *p = .144, ns*.

Fixations counts in five AOIs were significantly greater for FDEs than for Lay participants (AOI 3, F (1, 88) = 6.80, p = .011, partial η^2 = .072; AOI 5, F (1, 88) = 4.89, p = .030, partial η^2 = .053; AOI 6, F (1, 88) = 8.63, p = .004, partial η^2 = .089; AOI 7, F (1, 88) = 5.34, p = .023, partial η^2 = .057; AOI 8, F (1, 88) = 6.43, p = .013, partial η^2 = .068).

No significant differences were found in three AOIs (AOI 1, p = .119, *ns*; AOI 2, p = .144, *ns*; AOI 4, p = .082, *ns*). Table Bouysou 2.5 presents the means and standard deviations for areas of interest by participant type.

Table Bouysou 3.5

Feature Extraction Analysis Fixation Counts for FDE and Lay participants

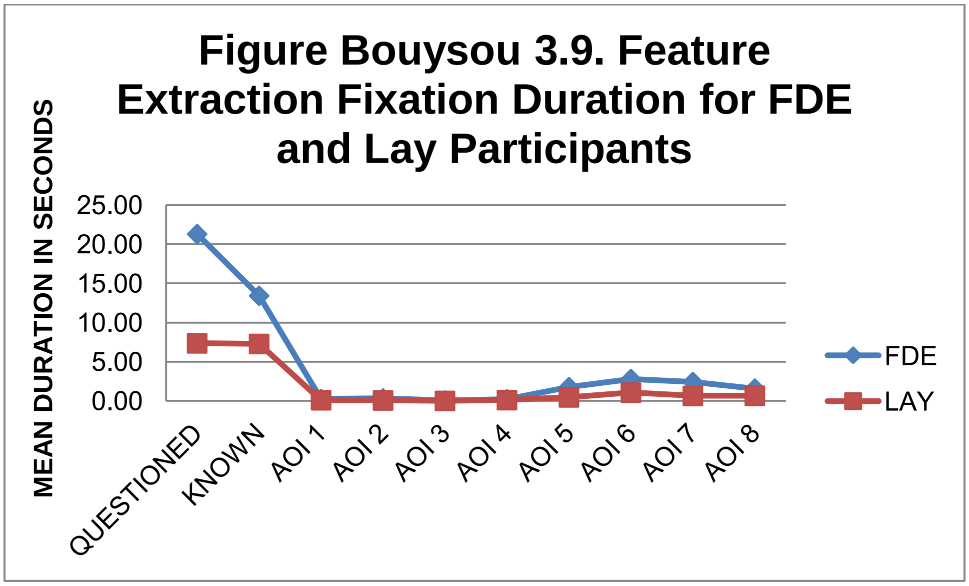
	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	53.98	85.31	43.45	83.10	0.79	1.41	0.83	2.48
Lay	22.60	21.62	24.09	23.44	0.40	0.85	0.26	0.62

	AOI 3		AOI 4		AOI 5		AOI 6	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	0.68	1.15	0.74	1.33	3.45	6.29	7.30	9.17
Lay	0.21	0.51	0.33	0.87	1.26	1.71	3.02	2.73
	AOI 7		**AOI 8**					
Participant	***M***	***SD***	***M***	***SD***				
FDE	5.55	10.68	4.00	5.45				
Lay	1.70	2.44	1.79	1.79				

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .291, *F* (10, 79) = 3.24, *p* = .002, multivariate η^2 = .291. Figure Bouysou 3.9 presents the mean fixation durations by AOI.

Figure Bouysou 3.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in most areas of interest. Total fixation duration for the questioned signature was significantly greater for FDEs than for Lay participants, *F* (1, 88) = 4.53, *p* = .036, partial η^2 =.049. No significant difference was found for the known signatures, *p* = .133, *ns*.

Fixation durations in five AOIs were significantly greater for FDEs than for Lay participants (AOI 3, *F* (1, 88) = 6.90, *p* = .010, partial η^2 = .073; AOI 5, *F* (1, 88) = 4.33, *p* = .040, partial η^2 = .047; AOI 6, *F* (1, 88) = 8.17, *p* = .005, partial η^2 = .085; AOI 7, *F* (1, 88) = 4.19, *p* = .044, partial η^2 = .045; AOI 8, *F* (1, 88) = 4.74, *p* = .032, partial η^2 = .051).

No significant differences were found in three AOIs (AOI 1, p = .077 *ns*; AOI 2, p = .121, *ns*; AOI 4, p = .197, *ns*). Table Bouysou 2.6 presents the means and standard deviations for areas of interest by participant type.

Table Bouysou 3.6

Feature Extraction Analysis Fixation Duration for FDE and Lay participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	21.30	42.38	13.42	25.44	0.25	0.51	0.31	1.01
Lay	7.36	6.99	7.27	7.96	0.10	0.22	0.07	0.17

	AOI 3		AOI 4		AOI 5		AOI 6	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	0.06	0.15	0.22	0.42	1.77	4.07	2.80	3.89
Lay	0.00	0.00	0.11	0.36	0.46	0.61	1.05	1.01

	AOI 7		AOI 8	
Participant	***M***	***SD***	***M***	***SD***
FDE	2.42	5.62	1.58	2.66
Lay	0.64	0.93	0.66	0.72

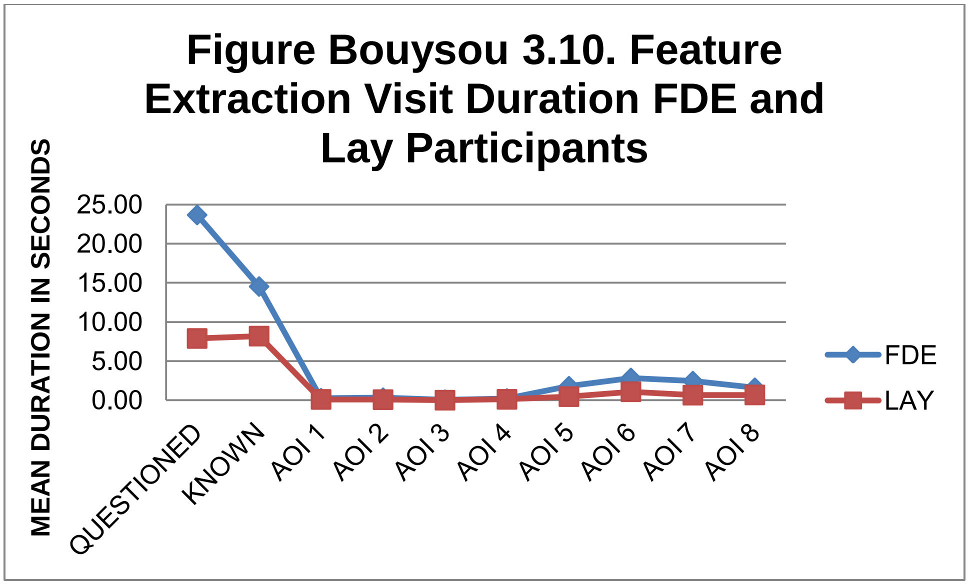
Total Visit Count

MANOVA results did reveal significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .148, p = .209, *ns.* No subsequent analyses were performed because the overall model was not statistically significant.

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .346, F (0, 79) = 4.18, p < .001, multivariate η^2 = .346. Figure Bouysou 3.10 presents the mean total visit counts by AOI.

Figure Bouysou 3.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in most areas of interest. Total fixation duration for the questioned signature was significantly greater for FDEs than for Lay participants, F (1, 88) = 5.19, p = .025, partial η^2 =.056. No significant difference was found for the known signatures, p = .161, *ns*.

Fixation durations in five AOIs were significantly greater for FDEs than for Lay participants (AOI 3, F (1, 88) = 6.90, p = .010, partial η^2 = .073; AOI 5, F (1, 88) = 4.46, p = .038, partial η^2 = .048; AOI 6, F (1, 88) = 8.16, p = .005, partial η^2 = .085; AOI 7, F (1, 88) = 4.24, p = .042, partial η^2 = .046; AOI 8, F (1, 88) = 4.79, p = .031, partial η^2 = .052).

No significant differences were found in three AOIs (AOI 1, p = .161, *ns*; AOI 2, p = .080, *ns*; AOI 4, p = .194, *ns*). Table Bouysou 2.7 presents the means and standard deviations for areas of interest by participant type.

Table Bouysou 3.7

Feature Extraction Analysis Visit Duration for FDE and Lay participants

	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	23.66	44.85	14.52	28.26	0.25	0.51	0.31	1.02
Lay	7.89	7.25	8.19	8.46	0.10	0.22	0.07	0.17

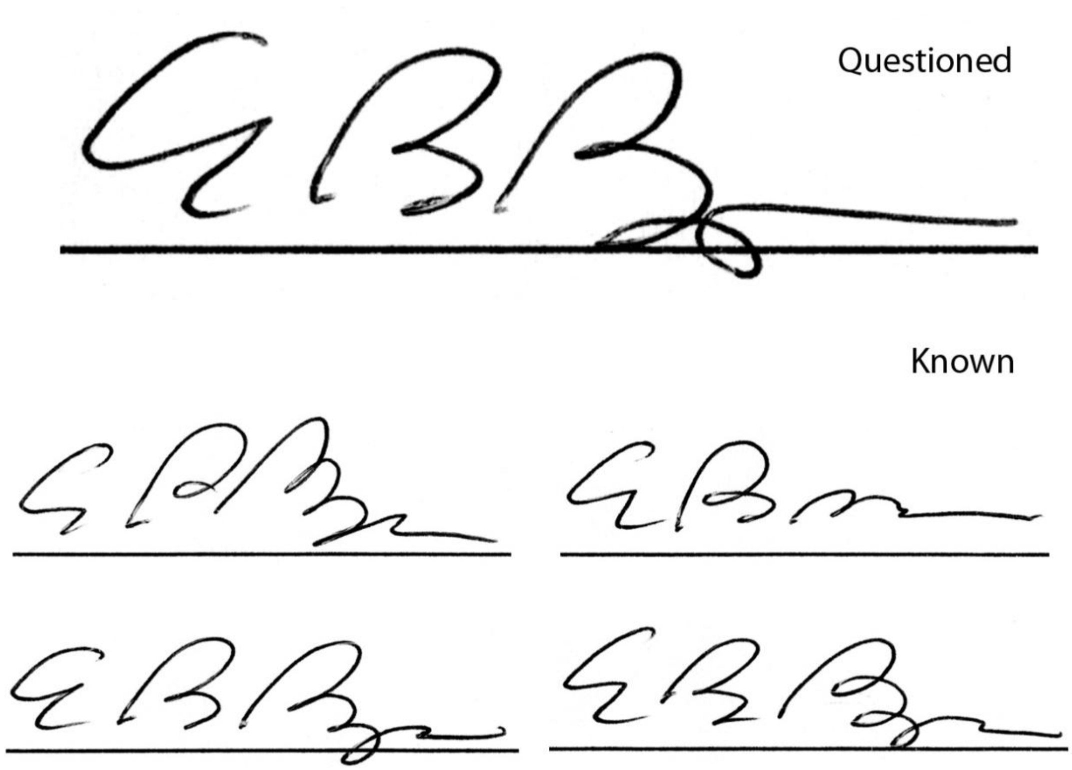
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	0.06	0.15	0.22	0.42	1.79	4.08	2.84	3.92
Lay	0.00	0.00	0.11	0.36	0.46	0.61	1.08	1.04

	AOI 7		**AOI 8**	
Participant	***M***	***SD***	***M***	***SD***
FDE	2.44	5.65	1.59	2.66
Lay	0.64	0.94	0.67	0.73

Bouysou Signature 4: Genuine

Of the 49 FDE participants, 32 responded correctly that the signature was genuine, while 16 responded that the signature was non-genuine. One FDE participant declined to respond. Of the 43 Lay participants, 42 responded correctly that the signature was genuine, and 1 responded that the signature was genuine. This difference was statistically significant, χ^2 (2, N = 92) = 15.26, p < .001. Figure Bouysou 4.1 presents the comparison view of this signature.

Figure Bouysou 4.1. Questioned-Known Comparison Stimulus for Bouysou Signature 4.

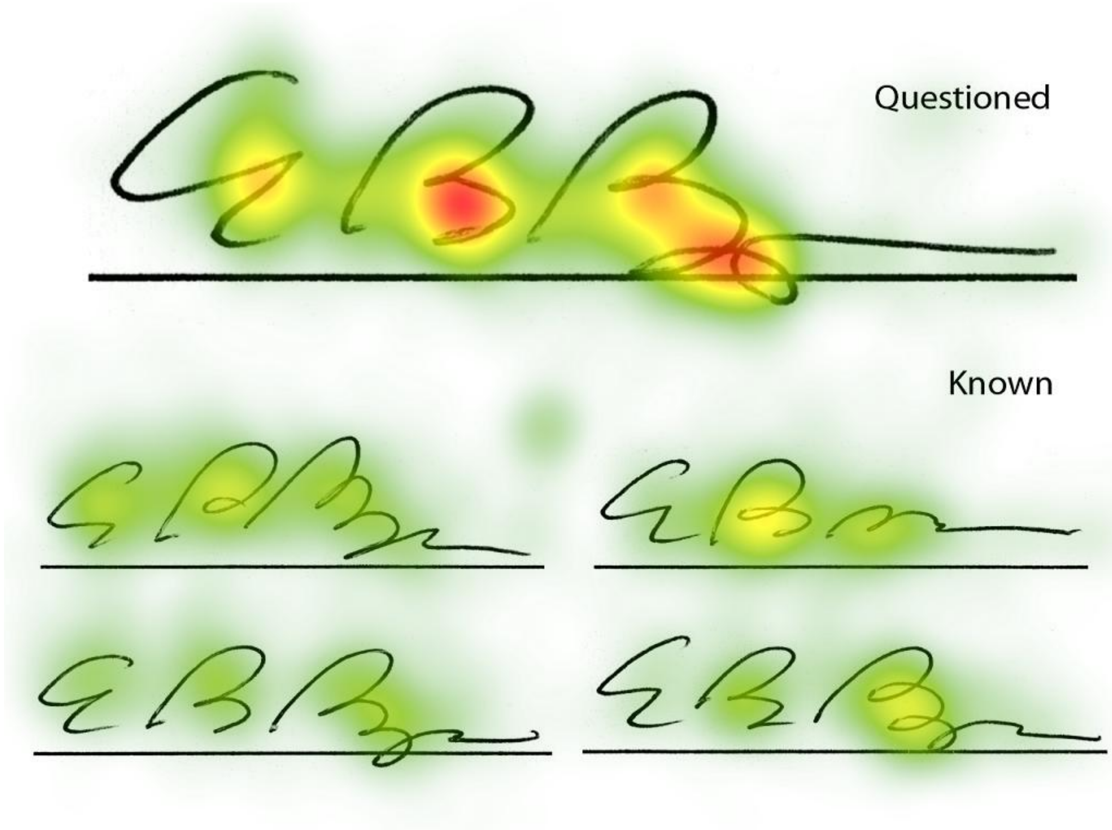


Selection of Areas of Interest (AOIs)

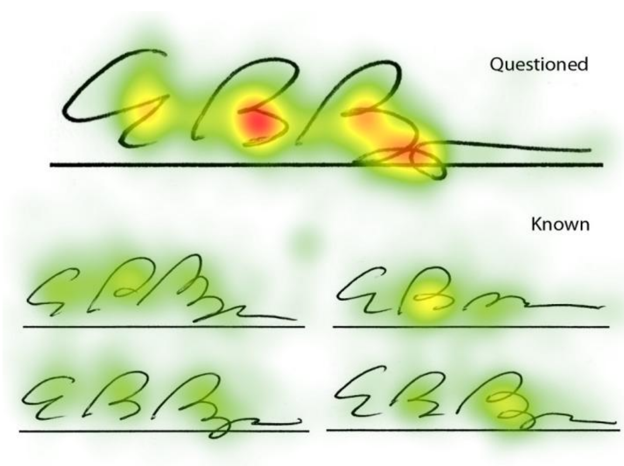
Figure Bouysou 4.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were 16 locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of 16 AOIs for this stimulus. Figure Bouysou 4.3 presents the location of the AOIs identified in the heat map.

Figure Bouysou 4.2. Heat map for Bouysou signature 4, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

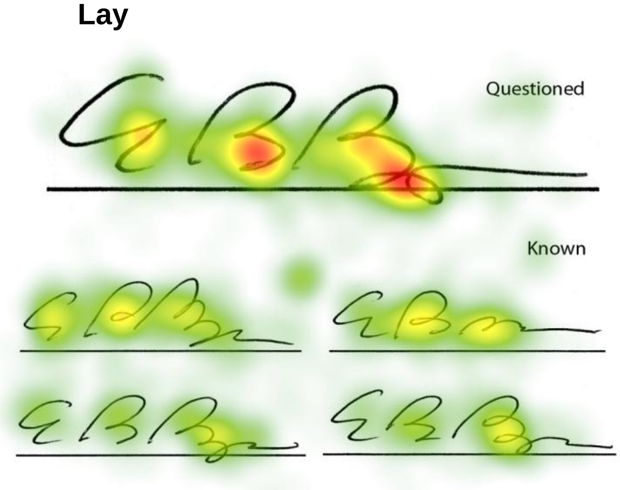
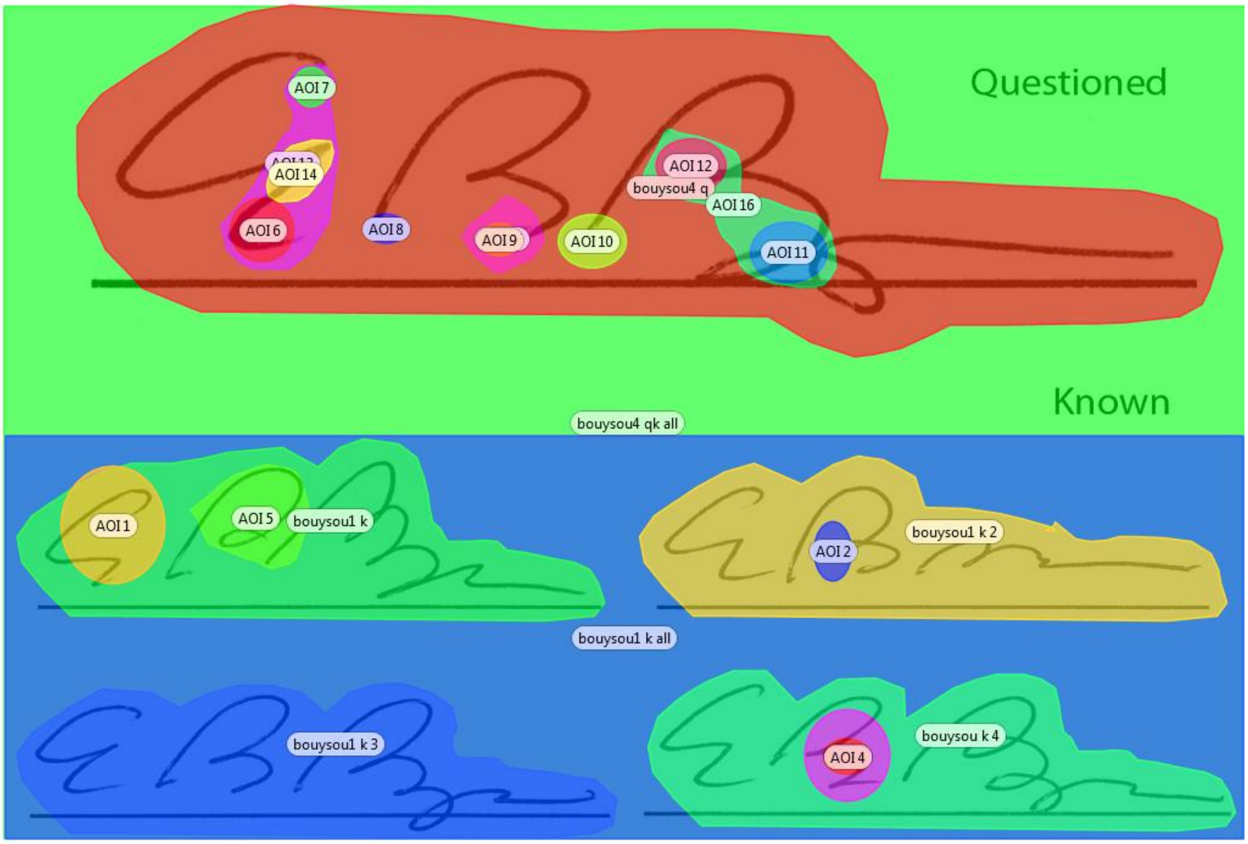


Figure Bouysou 4.3. Areas of Interest (AOIs) for Bouysou Signature 4.



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

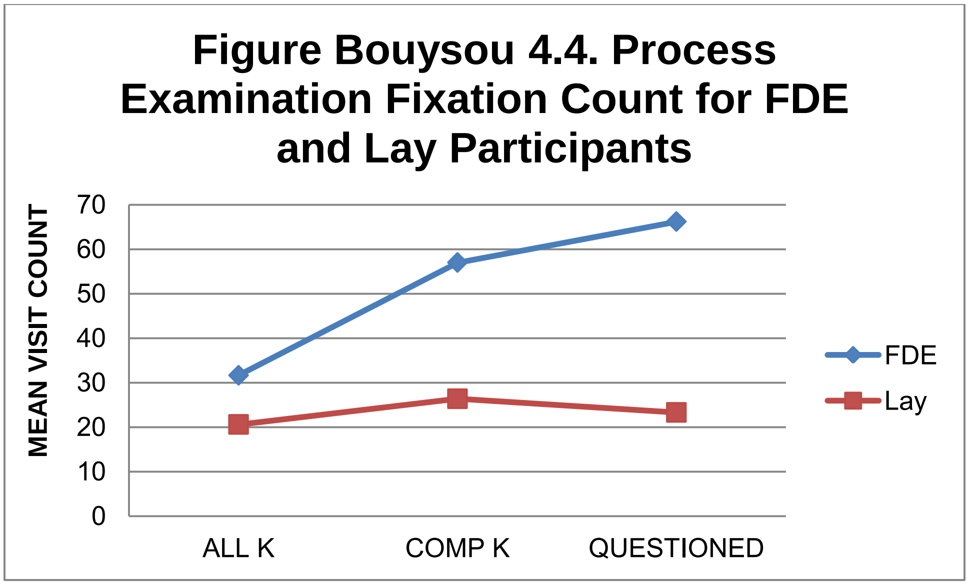
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Bouysou known signature stimulus (Knowns, not pictured here), Bouysou 1 K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Bouysou 4Q (the Bouysou questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 16) are included in subsequent analyses.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .282, F (3, 86) = 11.26, p < .001, multivariate η^2 = .282. Figure Bouysou 4.4 presents the mean fixation counts by AOI.

Figure Bouysou 4.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixations counts in all areas of interest. Total fixation count for the questioned signature was significantly greater for FDEs than for Lay participants, F (1, 88) = 27.88, p < .001, partial η^2 = .241. Fixation count in the known signature comparison stimulus (COMP K) was significantly greater for FDEs than for Lay participants, F (1, 88) = 12.93, p = .001, partial η^2 = .128.

Fixation count in the known signature stimulus (ALL K) was not significantly different between groups, p = .069, *ns*. Table Bouysou 4.1 presents the means and standard deviations for areas of interest by participant type.

Table Bouysou 4.1

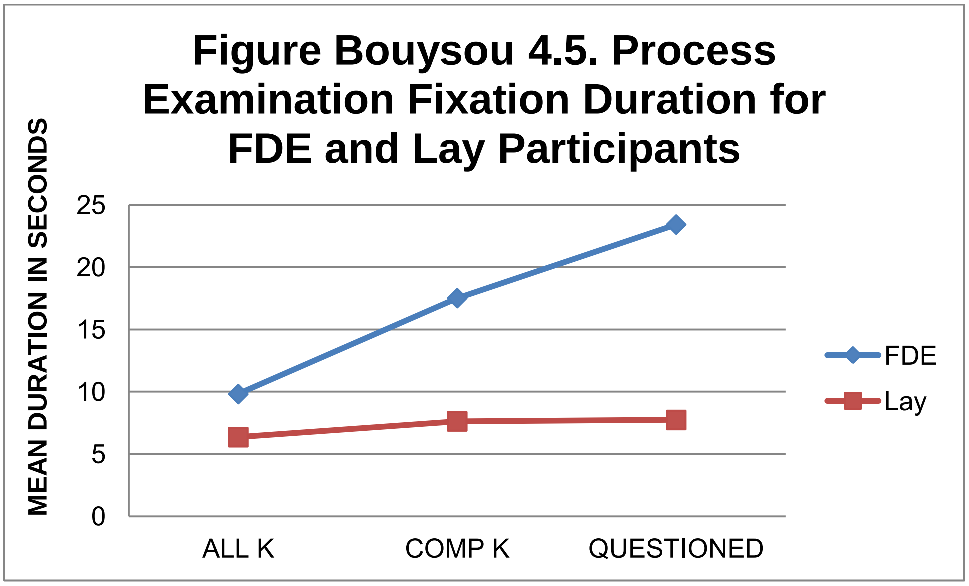
Process Analysis Fixation Counts for FDE and Lay participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	31.62	36.05	56.98	46.24	66.19	48.57
Lay	20.58	16.25	26.35	32.73	23.28	22.9

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .278, F (3, 86) = 11.05, p < .001, multivariate η^2 = .278. Figure Bouysou 4.5 presents the mean fixation counts by AOI.

Figure Bouysou 4.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation durations in all areas of interest. Total fixation duration for the questioned signature was significantly greater for FDEs than for Lay participants, F (1, 88) = 29.68, p < .001, partial η^2 = .252. The known signature comparison stimulus (COMP K) was significantly greater for FDEs than for Lay participants, F (1, 88) = 13.32, p < .001, partial η^2 = .131.

Fixation durations in the known signature stimulus (ALL K) was not significantly different between groups, p = .111, *ns*. Table Bouysou 4.2 presents the means and standard deviations for areas of interest by participant type.

Table Bouysou 4.2

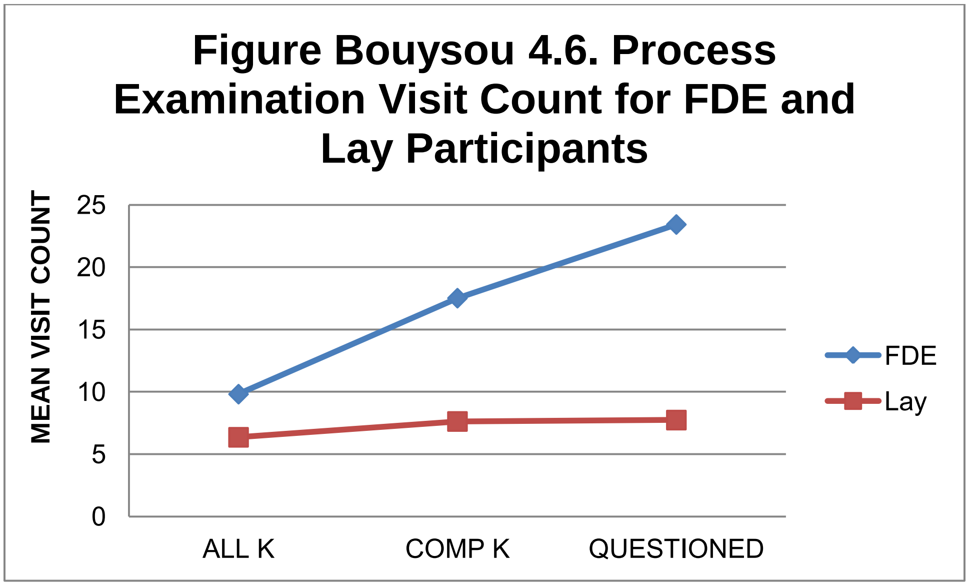
Process Analysis Fixation Durations for FDE and Lay participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	9.82	12.91	17.52	15.24	23.43	17.53
Lay	6.36	5.92	7.63	9.55	7.74	7.33

Total Visit Count

MANOVA results reveal significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .207, F (3, 86) = 7.47, p < .001, multivariate η^2 = .207. Figure Bouysou 4.6 presents the mean visit counts by AOI

Figure Bouysou 4.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant. Total visit count for the questioned signature was significantly greater for FDEs than for Lay participants, F (1, 88) = 16.33, p < .001, partial η^2 = .157. Visit count in the known signature comparison stimulus (COMP K) was significantly greater for FDEs than for Lay participants, F (1, 88) = 14.97, p < .001, partial η^2 = .145.

Visit count in the known signature stimulus (ALL K) was also significantly different between groups, F (1, 88) = 4.41, p = .039, partial η^2 = .048. Table Bouysou 4.3 presents the means and standard deviations for areas of interest by participant type.

Table Bouysou 4.3

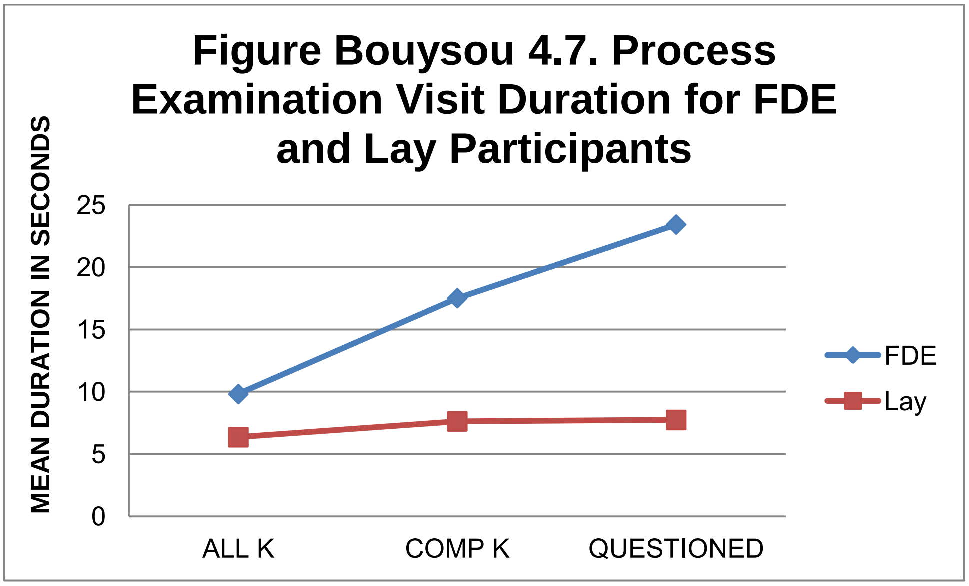
Process Analysis Visit Counts for FDE and Lay participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.43	0.74	19.79	14.13	20.51	14.03
Lay	1.14	0.52	9.28	11.33	9.49	11.6

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .324, F (3, 86) = 13.76, p < .001, multivariate η^2 = .324. Figure Bouysou 4.7 presents the mean visit durations by AOI.

Figure Bouysou 4.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in two of the three areas of interest. Total visit duration for the questioned signature was significantly greater for FDEs than for Lay participants, F(1, 88) = 26.43, p < .001, partial η^2 = .231. There was a statistical difference found in the known signature comparison stimulus (COMP K), F (1, 88) = 37.49, p < .001, partial η^2 = .299).

Visit durations in the known signature stimulus (ALL K) was not significantly greater for FDEs than for Lay participants, p = .100, *ns*. Table Bouysou 4.4 presents the means and standard deviations for areas of interest by participant type.

Table Bouysou 4.4

Process Analysis Visit Durations for FDE and Lay participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	12.53	14.99	27.01	18.86	52.02	38.2
Lay	8.27	7.86	8.19	7.4	18.74	19.33

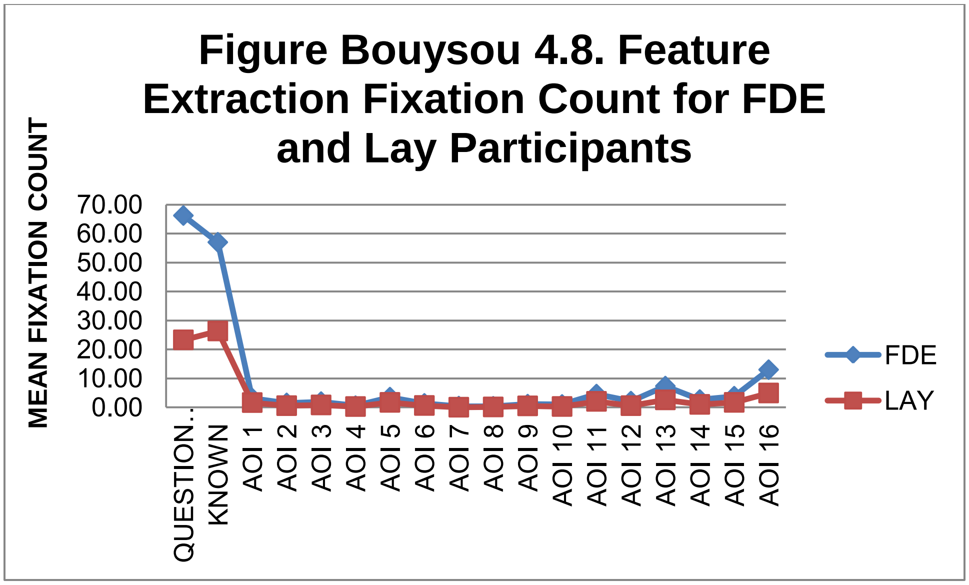
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .205, $F(5, 83) = 4.27$, $p = .002$, multivariate $\eta^2 = .205$. Figure Bouysou 4.8 presents the mean fixation counts by AOI.

Figure Bouysou 4.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in most areas of interest. Total fixation count for the questioned signature was significantly greater for FDEs than for Lay participants, $F(1, 87) = 27.88$, $p < .001$, partial $\eta^2 = .241$. A significant difference was also found in the known signature comparison stimulus, $F(1, 87) = 12.93$, $p = .001$, partial $\eta^2 = .128$).

Fixations count in most AOIs was significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 4.80$, $p = .031$, partial $\eta^2 = .052$; AOI 2, $F(1, 87) = 7.92$, $p = .006$, partial $\eta^2 = .083$; AOI 3, $F(1, 87) = 4.56$, $p = .035$, partial $\eta^2 = .049$; AOI 5, $F(1, 87) = 7.16$, $p = .009$, partial $\eta^2 = .075$; AOI 6, $F(1, 87) = 4.04$, $p = .048$, partial $\eta^2 = .044$; AOI 7, $F(1, 87) = 6.78$, $p = .011$, partial $\eta^2 = .072$; AOI 9, $F(1, 87) = 5.16$, $p = .026$, partial $\eta^2 = .055$; AOI 10, $F(1, 87) = 9.71$, $p = .002$, partial $\eta^2 = .099$; AOI 11, $F(1, 87) = 10.92$, $p = .001$, partial $\eta^2 = .110$; AOI 12, $F(1, 87) = 17.78$, $p < .001$, partial $\eta^2 = .168$; AOI 13, $F(1, 87) = 21.44$, $p < .001$, partial $\eta^2 = .196$; AOI 14, $F(1, 87) = 13.22$, $p < .001$, partial $\eta^2 = .131$; AOI 15, $F(1, 87) = 11.73$, $p = .001$, partial $\eta^2 = .118$; AOI 16, $F(1, 87) = 21.17$, $p < .001$, partial $\eta^2 = .194$).

No significant difference was found in two of the AOIs (AOI 4, p = .142, *ns*; AOI 8, p = .096, *ns*. Table Bouysou 4.5 presents the means and standard deviations for areas of interest by participant type.

Table Bouysou 4.5

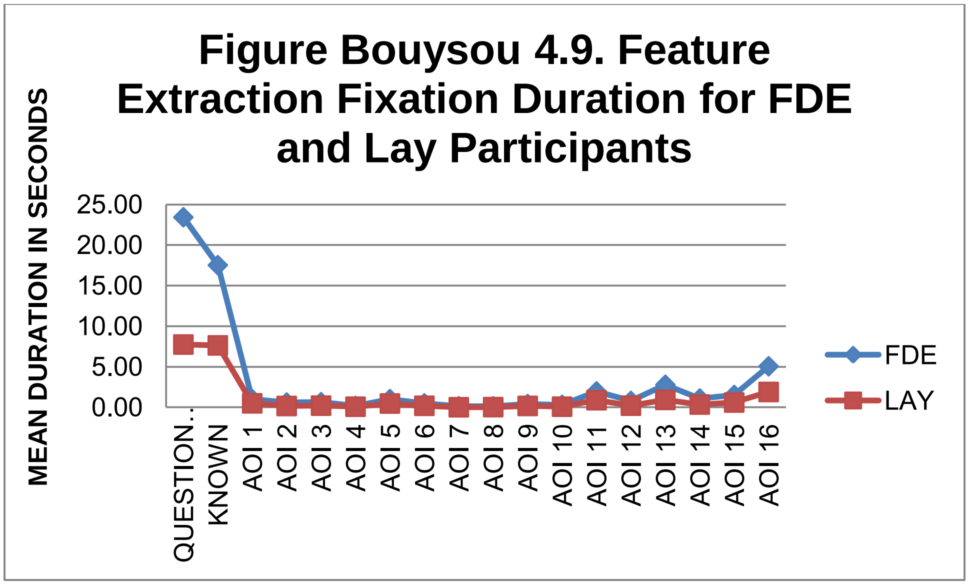
Feature Extraction Analysis Fixation Counts for FDE and Lay participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	66.19	48.57	56.98	46.24	3.13	3.24	1.51	1.98
Lay	23.28	22.90	26.35	32.73	1.63	3.24	0.56	1.05
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.96	2.92	0.55	1.14	3.51	3.61	1.34	1.94
Lay	0.81	2.04	0.26	0.69	1.70	2.70	0.63	1.35
	AOI 7		**AOI 8**		**AOI 9**		**AOI 10**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	0.40	0.95	0.34	0.76	1.09	1.44	0.98	1.38
Lay	0.02	0.15	0.12	0.45	0.49	0.98	0.28	0.55
	AOI 11		**AOI 12**		**AOI 13**		**AOI 14**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	4.55	4.46	2.13	2.16	7.32	6.27	2.68	2.79
Lay	2.05	2.30	0.56	1.18	2.56	2.59	1.00	1.23
	AOI 15		**AOI 16**					
Participant	***M***	***SD***	***M***	***SD***				
FDE	3.83	3.64	12.98	10.46				
Lay	1.70	1.93	4.93	4.91				

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .423, $F(18, 71) = 2.89$, p = .001, multivariate η^2 = .423. Figure Bouysou 4.9 presents the mean fixation durations by AOI.

Figure Bouysou 4.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation durationin most areas of interest. Total fixation duration for the questioned signature was significantly greater for FDEs than for Lay participants, $F(1, 87) = 29.68$, $p < .001$, partial $\eta^2 = .252$. A significant difference was also found in the known signature comparison stimulus, $F(1, 87) = 13.32$, $p < .001$, partial $\eta^2 = .131$).

Fixations duration in most AOIs was significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 5.08$, $p = .027$, partial $\eta^2 = .055$; AOI 2, $F(1, 87) = 12.14$, $p = .001$, partial $\eta^2 = .121$; AOI 3, $F(1, 87) = 6.58$, $p = .012$, partial $\eta^2 = .070$; AOI 5, $F(1, 87) = 8.18$, $p = .005$, partial $\eta^2 = .085$; AOI 6, $F(1, 87) = 3.51$, $p = .064$, partial $\eta^2 = .038$; AOI 7, $F(1, 87) = 5.67$, $p = .019$, partial $\eta^2 = .061$; AOI 8, $F(1, 87) = 3.92$, $p = .051$, partial $\eta^2 = .043$; AOI 9, $F(1, 87) = 6.63$, $p = .012$, partial $\eta^2 = .070$; AOI 10, $F(1, 87) = 7.39$, $p = .008$, partial $\eta^2 = .077$; AOI 11, $F(1, 87) = 10.17$, $p = .002$, partial $\eta^2 = .104$; AOI 12, $F(1, 87) = 14.52$, $p < .001$, partial $\eta^2 = .142$; AOI 13, $F(1, 87) = 16.14$, $p < .001$, partial $\eta^2 = .155$; AOI 14, $F(1, 87) = 13.64$, $p < .001$, partial $\eta^2 = .134$; AOI 15, $F(1, 87) = 3.47$, $p < .001$, partial $\eta^2 = .133$; AOI 16, $F(1, 87) = 20.94$, $p < .001$, partial $\eta^2 = .192$).

No significant difference was found in three of the AOIs (AOI 4, $p = .116$, *ns*; AOI 6, $p = .064$, *ns*; AOI 8, $p = .051$, *ns*). Table Bouysou 4.6 presents the means and standard deviations for areas of interest by participant type.

Table Bouysou 4.6

Feature Extraction Analysis Fixation Duration for FDE and Lay participants

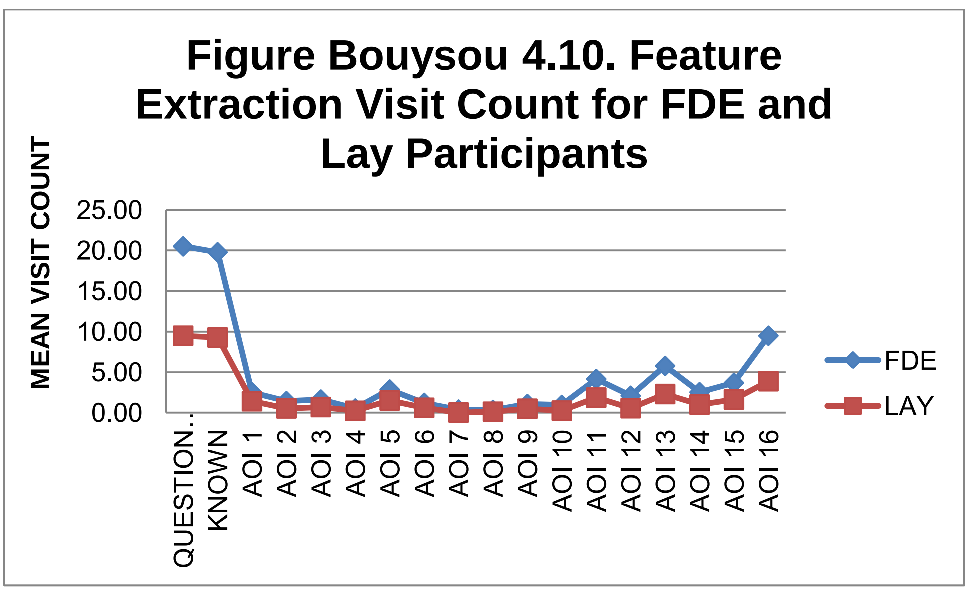
	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	23.43	17.53	17.52	15.24	1.00	1.02	0.59	0.76
Lay	7.74	7.33	7.63	9.55	0.49	1.13	0.16	0.26
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***

FDE	0.63	0.97	0.17	0.35	1.01	1.06	0.48	0.96
Lay	0.20	0.50	0.07	0.21	0.46	0.70	0.19	0.39
	AOI 7		**AOI 8**		**AOI 9**		**AOI 10**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	0.13	0.35	0.11	0.28	0.40	0.52	0.30	0.51
Lay	0.01	0.04	0.02	0.09	0.17	0.32	0.07	0.17
	AOI 11		**AOI 12**		**AOI 13**		**AOI 14**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.96	1.95	0.78	0.92	2.78	2.91	1.08	1.24
Lay	0.87	1.14	0.20	0.43	0.91	0.97	0.34	0.46
	AOI 15		**AOI 16**					
Participant	***M***	***SD***	***M***	***SD***				
FDE	1.51	1.52	5.06	4.07				
Lay	0.59	0.69	1.89	2.10				

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .435, $F(18, 71) = 3.04$ $p < .001$, multivariate $\eta^2 = .435$. Figure Bouysou 4.10 presents the mean visit counts by AOI.

Figure Bouysou 4.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in most areas of interest. Total visit count for the questioned signature was significantly greater for FDEs than for Lay participants, $F(1, 87) = 16.33$, $p <$

.001, partial η^2 = .157. A significant difference was also found in the known signature comparison stimulus, $F(1, 87) = 14.97$, $p < .001$, partial η^2 = .145).

Visit counts in most AOIs was significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 4.09$, $p = .046$, partial η^2 = .044; AOI 2, $F(1, 87) = 8.33$, $p = .005$, partial η^2 = .086; AOI 3, $F(1, 87) = 5.45$, $p = .022$, partial η^2 = .058; AOI 5, $F(1, 87) = 5.98$, $p = .016$, partial η^2 = .064; AOI 7, $F(1, 87) = 6.71$, $p = .011$, partial η^2 = .071; AOI 9, $F(1, 87) = 5.05$, $p = .027$, partial η^2 = .054; AOI 10, $F(1, 87) = 10.34$, $p = .002$, partial η^2 = .105; AOI 11, $F(1, 87) = 11.07$, $p = .001$, partial η^2 = .112; AOI 12, $F(1, 87) = 17.30$, $p < .001$, partial η^2 = .164; AOI 13, $F(1, 87) = 23.58$, $p < .001$, partial η^2 = .211; AOI 14, $F(1, 87) = 12.28$, $p = .001$, partial η^2 = .122; AOI 15, $F(1, 87) = 12.00$, $p = .001$, partial η^2 = .120; AOI 16, $F(1, 87) = 20.88$, $p < .001$, partial η^2 = .192).

No significant difference was found in three of the AOIs (AOI 4, $p = .112$, *ns*; AOI 6, $p = .056$, *ns*; AOI 8, $p = .096$, *ns*). Table Bouysou 4.7 presents the means and standard deviations for areas of interest by participant type.

Table Bouysou 4.7

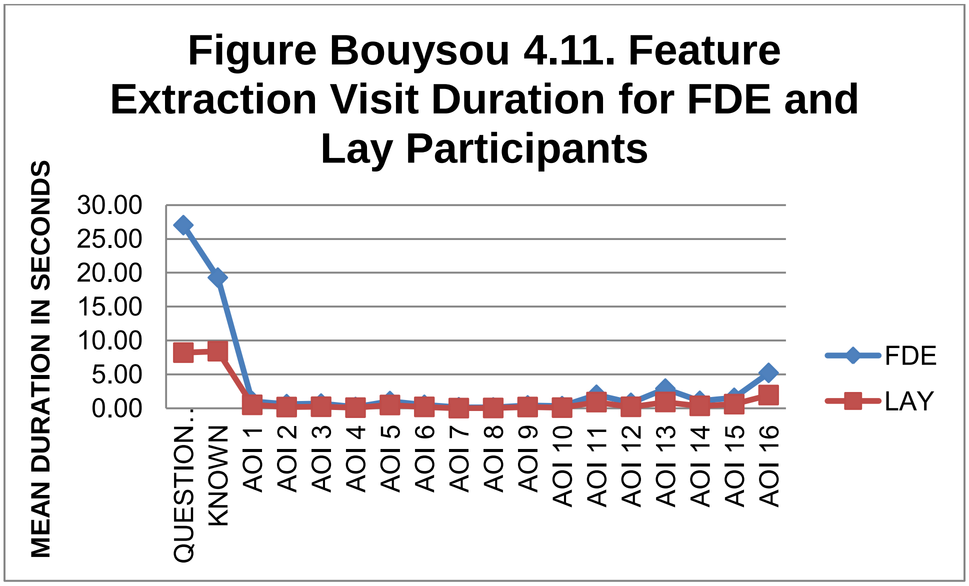
Feature Extraction Analysis Visit Count for FDE and Lay participants

	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	20.51	14.03	19.79	14.13	2.51	2.43	1.43	1.81
Lay	9.49	11.60	9.28	11.33	1.42	2.69	0.53	0.93
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.62	2.08	0.51	1.00	2.85	2.81	1.21	1.65
Lay	0.70	1.60	0.23	0.57	1.51	2.33	0.60	1.28
	AOI 7		**AOI 8**		**AOI 9**		**AOI 10**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	0.38	0.90	0.34	0.76	1.06	1.39	0.96	1.35
Lay	0.02	0.15	0.12	0.45	0.49	0.98	0.26	0.49
	AOI 11		**AOI 12**		**AOI 13**		**AOI 14**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	4.15	4.07	2.09	2.12	5.77	4.16	2.53	2.61
Lay	1.86	2.03	0.56	1.18	2.30	2.23	1.00	1.23
	AOI 15		**AOI 16**					
Participant	***M***	***SD***	***M***	***SD***				
FDE	3.68	3.48	9.49	7.04				
Lay	1.63	1.80	3.88	4.07				

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .440, $F(18,71) = 3.10$, $p < .001$, multivariate η^2 = .440. Figure Bouysou 4.11 presents the mean visit durations by AOI.

Figure Bouysou 4.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit duration in most areas of interest. Total visit duration for the questioned signature was significantly greater for FDEs than for Lay participants, $F(1, 87) = 37.49$, $p < .001$, partial $\eta^2 = .299$. A significant difference was also found in the known signature comparison stimulus, $F(1, 87) = 13.04$, $p = .001$, partial $\eta^2 = .129$).

Visit duration in most AOIs was significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 5.32$, $p = .023$, partial $\eta^2 = .057$; AOI 2, $F(1, 87) = 12.40$, $p = .001$, partial $\eta^2 = .123$; AOI 3, $F(1, 87) = 6.13$, $p = .015$, partial $\eta^2 = .065$; AOI 5, $F(1, 87) = 8.65$, $p = .004$, partial $\eta^2 = .090$; AOI 7, $F(1, 87) = 5.67$, $p = .019$, partial $\eta^2 = .061$; AOI 9, $F(1, 87) = 6.63$, $p = .012$, partial $\eta^2 = .070$; AOI 10, $F(1, 87) = 7.39$, $p = .008$, partial $\eta^2 = .077$; AOI 11, $F(1, 87) = 9.70$, $p = .002$, partial $\eta^2 = .099$; AOI 12, $F(1, 87) = 14.53$, $p < .001$, partial $\eta^2 = .142$; AOI 13, $F(1, 87) = 17.36$, $p < .001$, partial $\eta^2 = .165$; AOI 14, $F(1, 87) = 13.92$, $p < .001$, partial $\eta^2 = .137$; AOI 15 $F(1, 87) = 13.28$, $p < .001$, partial $\eta^2 = .131$; AOI 16, $F(1, 87) = 20.56$, $p < .001$, partial $\eta^2 = .189$).

No significant difference was found in three of the AOIs (AOI 4, $p = .114$, *ns*; AOI 6, $p = .057$, *ns*; AOI 8, $p = .051$, *ns*). Table Bouysou 4.8 presents the means and standard deviations for areas of interest by participant type.

Table Bouysou 4.8

Feature Extraction Analysis Visit Durations for FDE and Lay participants

	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	27.01	18.86	19.27	17.08	1.02	1.05	0.60	0.77
Lay	8.19	7.40	8.41	10.33	0.49	1.13	0.16	0.26

	AOI 3		AOI 4		AOI 5		AOI 6	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	0.68	1.15	0.17	0.36	1.04	1.10	0.49	0.97
Lay	0.21	0.51	0.07	0.22	0.47	0.71	0.19	0.39

	AOI 7		AOI 8		AOI 9		AOI 10	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	0.13	0.35	0.11	0.28	0.40	0.52	0.30	0.51
Lay	0.01	0.04	0.02	0.09	0.17	0.32	0.07	0.17

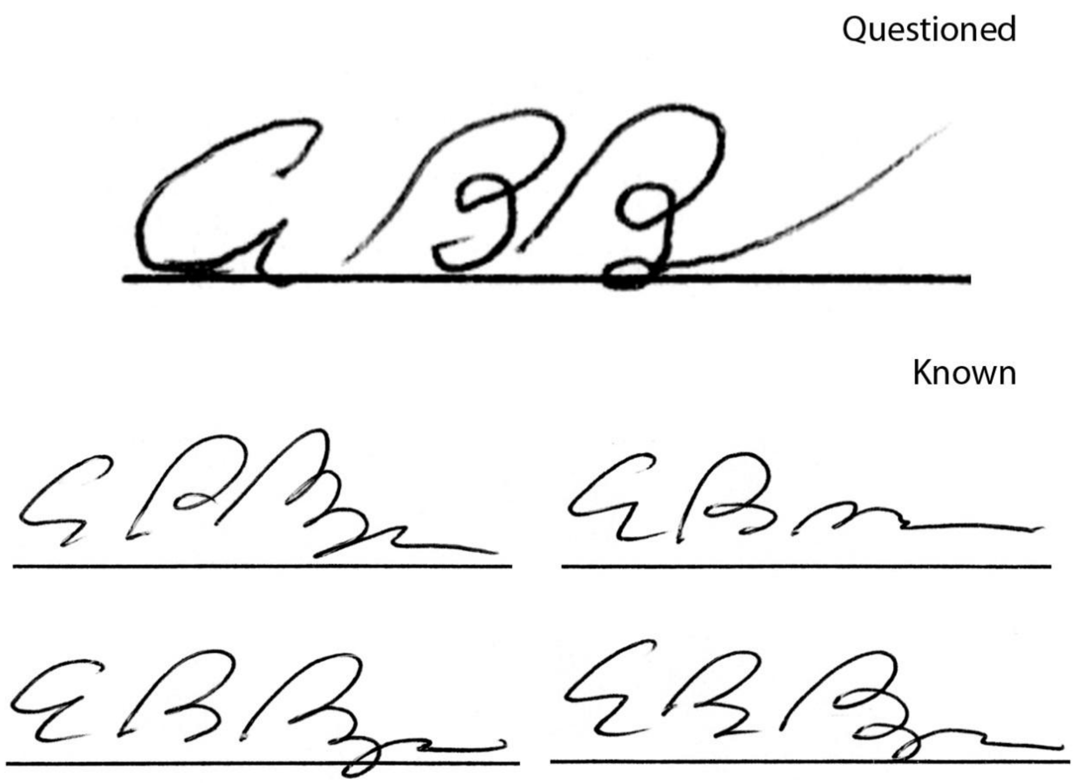
	AOI 11		AOI 12		AOI 13		AOI 14	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.97	1.97	0.78	0.92	2.89	2.97	1.09	1.24
Lay	0.89	1.18	0.20	0.43	0.91	0.97	0.34	0.46

	AOI 15		AOI 16	
Participant	***M***	***SD***	***M***	***SD***
FDE	1.53	1.55	5.21	4.28
Lay	0.59	0.69	1.93	2.12

Bouysou Signature 5: Freehand Simulation (Non-Genuine)

Of the 49 FDE participants, 48 responded correctly that the signature was non-genuine. One FDE declined to respond. Of the 43 Lay participants, 41 responded correctly that the signature was non-genuine, and 2 responded that the signature was genuine. This difference was not statistically significant, χ^2 (2, N = 92) = 3.17, *p* = .205. Figure Bouysou 5.1 presents the comparison view of this signature.

Figure Bouysou 5.1. Questioned-Known Comparison Stimulus for Bouysou Signature 5.

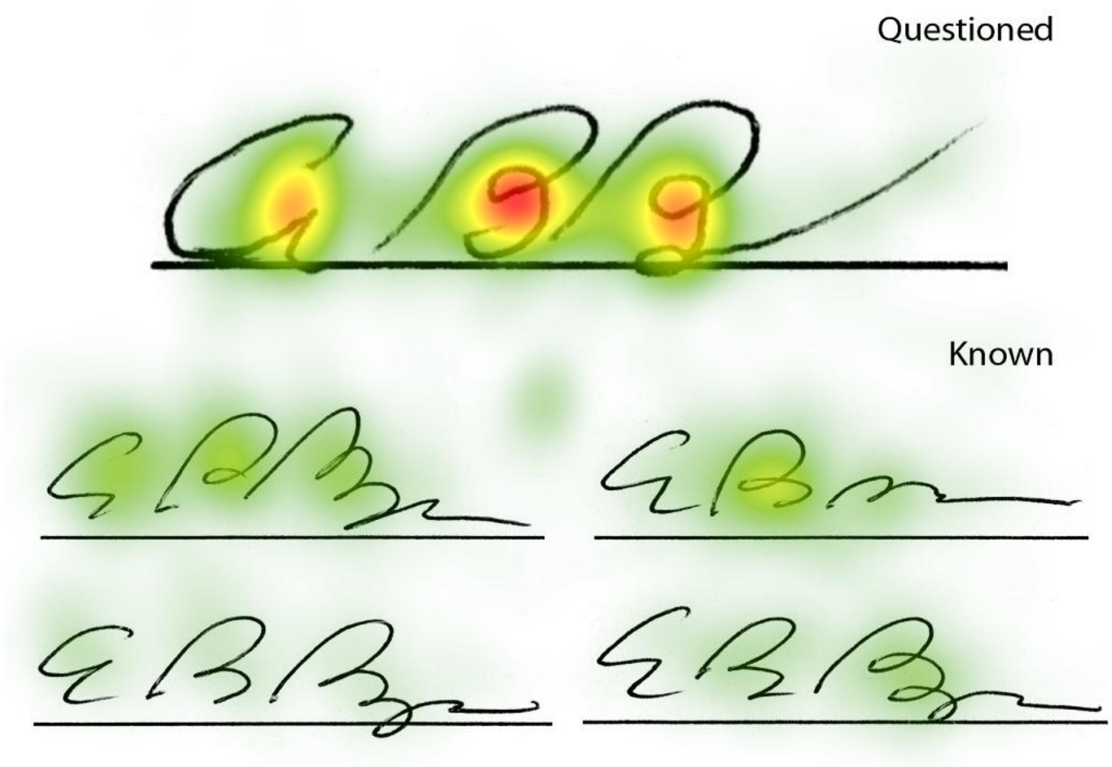


Selection of Areas of Interest (AOIs)

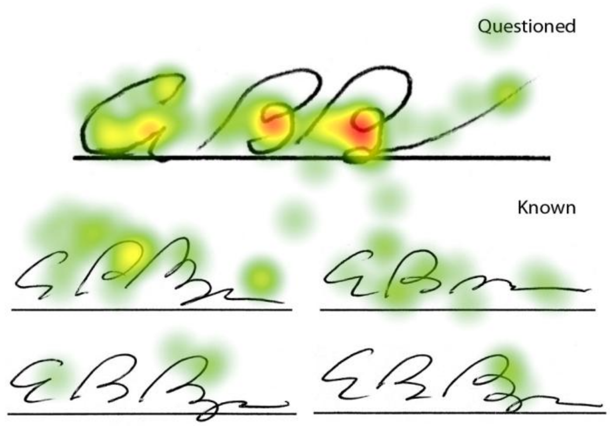
Figure Bouysou 5.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were five locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of five AOIs for this stimulus. Figure Bouysou 5.3 presents the location of the AOIs identified in the heat map.

Figure Bouysou 5.2. Heat map for Bouysou signature 5, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

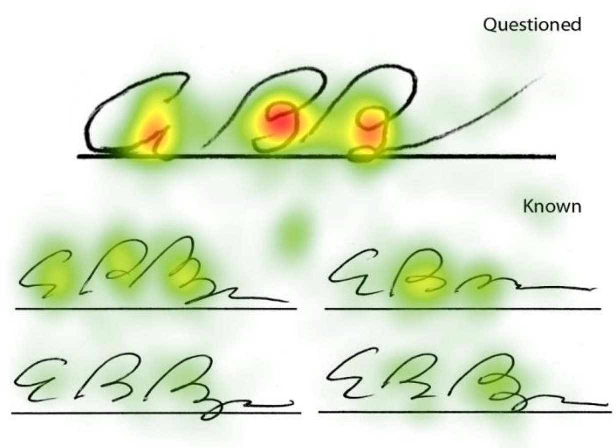
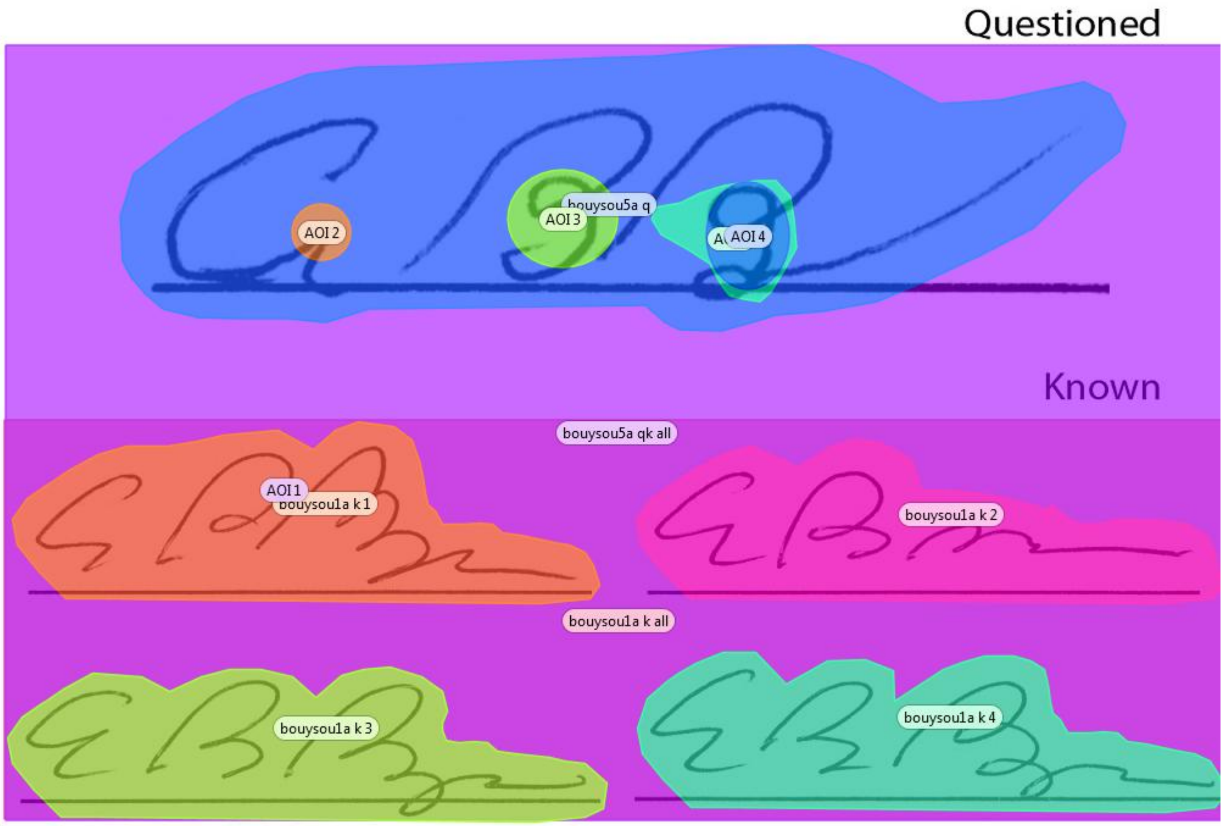


Figure Bouysou 5.3. Areas of Interest (AOIs) for Bouysou Signature 5.



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

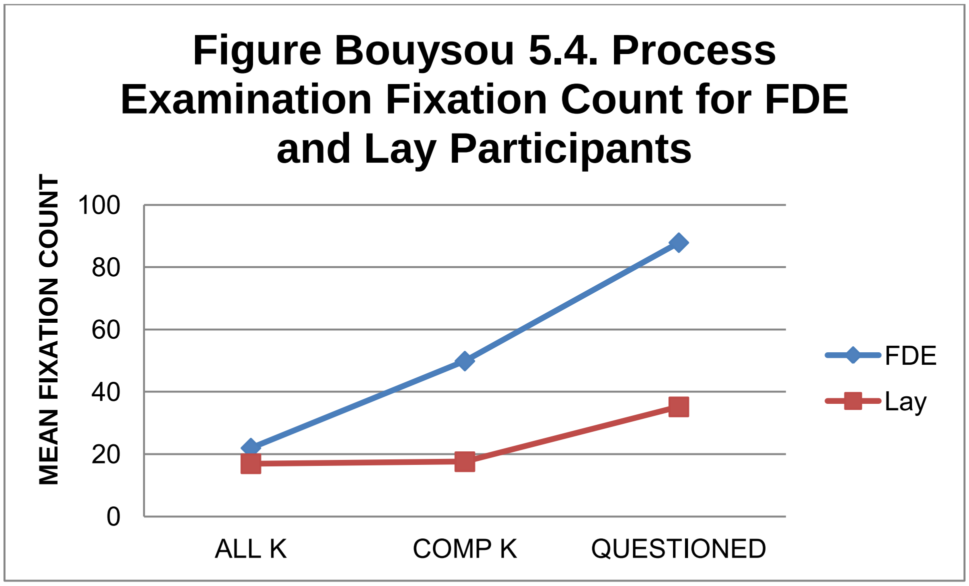
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Bouysou known signature stimulus (Knowns, not pictured here), Bouysou 1 K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Bouysou 5Q (the Bouysou questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 5) are included in subsequent analyses.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .307, F (3, 86) = 12.69, p < .001, multivariate η^2 = .307. Figure Bouysou 5.4 presents the mean fixation counts by AOI.

Figure Bouysou 5.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation counts in all but one area of interest. Total fixation count for the questioned signature was significantly greater for FDEs than for Lay participants, F (1, 88) = 19.99, p < .001, partial η^2 = .185. Fixation count in the known signature comparison stimulus (COMP K) was significantly greater for FDEs than for Lay participants, F (1, 88) = 28.02, p < .001, partial η^2 = .242.

No significant difference was found in the known signature stimulus (ALL K), p = .120, *ns*. Table Bouysou 5.1 presents the means and standard deviations for areas of interest by participant type.

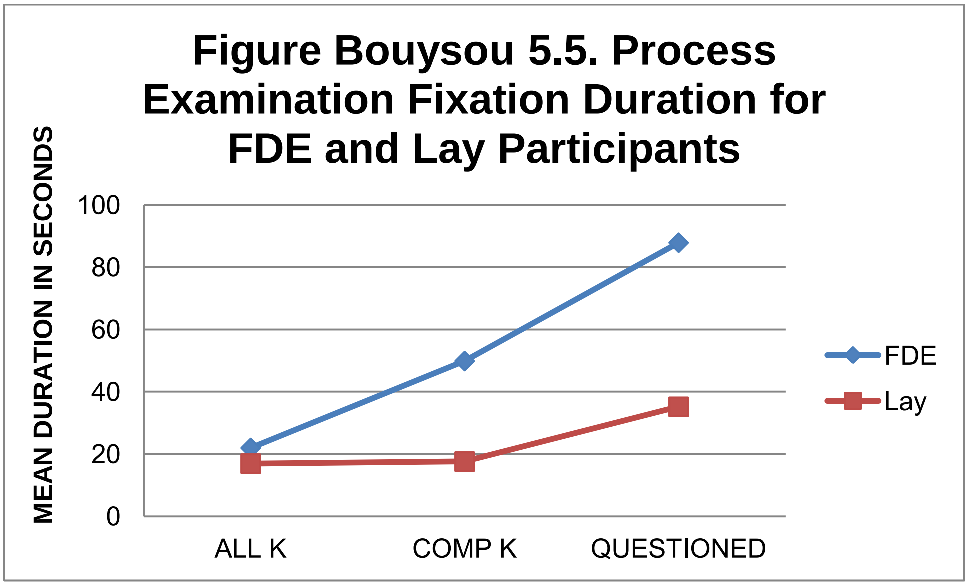
Table Bouysou 5.1
Process Analysis Fixation Counts for FDE and Lay participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	21.98	17.31	49.89	35.94	87.89	69.2
Lay	16.95	12.38	17.6	18.34	35.19	35.99

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .271, F (3, 86) = 10.67, p < .001, multivariate η^2 = .271. Figure Bouysou 5.5 presents the mean fixation counts by AOI.

Figure Bouysou 5.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in two areas of interest. Total fixation duration for the questioned signature was significantly greater for FDEs than for Lay participants, F (1, 88) = 26.82, p < .001, partial η^2 = .234. Fixation duration in the known signature comparison stimulus (COMP K) was significantly greater for FDEs than for Lay participants, F (1, 88) = 9.56, p = .003, partial η^2 = .098.

No significant difference was found in the known signature stimulus (ALL K), p = .106, *ns*. Table Bouysou 5.2 presents the means and standard deviations for areas of interest by participant type.

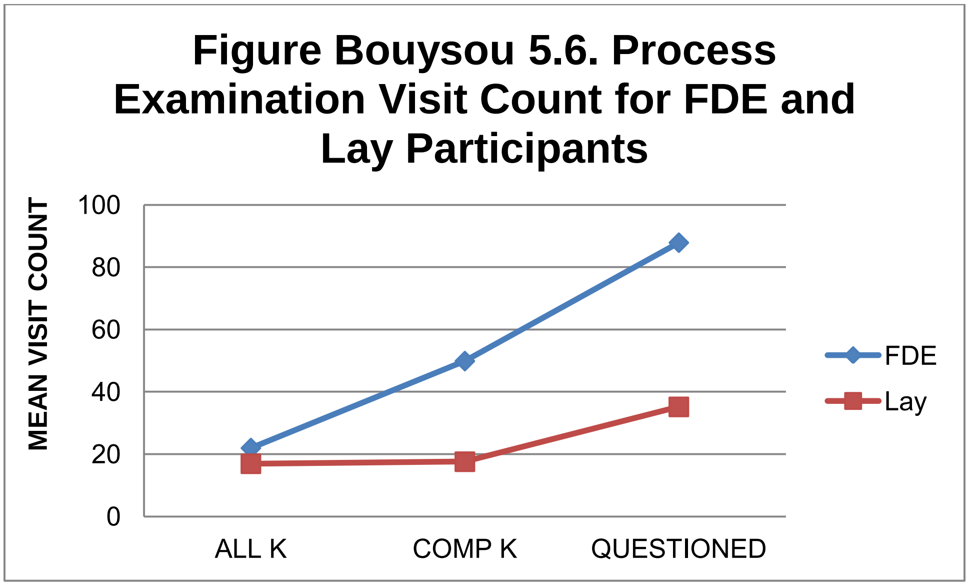
Table Bouysou 5.2
Process Analysis Fixation Durations for FDE and Lay participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	7.04	6.73	10.71	12.5	20.31	17.2
Lay	5.05	4.47	4.37	5.17	5.94	6.17

Total Visit Count

MANOVA results reveal significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .194, *F* (3, 86) = 6.88, *p* < .001, multivariate η^2 = .194. Figure Bouysou 5.6 presents the mean visit counts by AOI.

Figure Bouysou 5.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for visit counts in two areas of interest. Total visit count for the questioned signature was significantly greater for FDEs than for Lay participants, *F* (1, 88) = 14.93, *p* < .001, partial η^2 = .145. Visit count in the known signature comparison stimulus (COMP K) was significantly greater for FDEs than for Lay participants, *F* (1, 88) 12.50, *p* = .001, partial η^2 = .124.

No significant difference was found in the known signature stimulus (ALL K), *p* = .510, *ns*. Table Bouysou 5.3 presents the means and standard deviations for areas of interest by participant type.

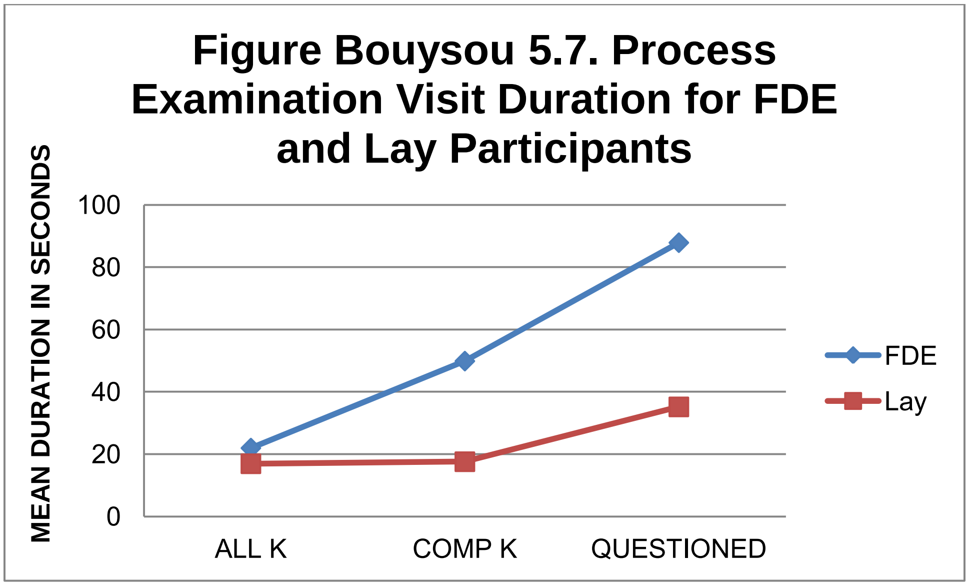
Table Bouysou 5.3
Process Analysis Visit Counts for FDE and Lay participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.32	0.56	13.57	12.62	14.23	12.38
Lay	1.23	0.68	6	6.45	6.05	6.59

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .272, F (3, 86) = 10.70, p < .001, multivariate η^2 = .272. Figure Bouysou 5.7 presents the mean visit durations by AOI.

Figure Bouysou 5.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in two areas of interest. Total visit duration for the questioned signature was significantly greater for FDEs than for Lay participants, F (1, 88) = 28.39, p < .001, partial η^2 = .244. Visit duration in the known signature comparison stimulus (COMP K) was significantly greater for FDEs than for Lay participants, F (1, 88) = 10.56, p = .002, partial η^2 = .107.

No significant difference was found in the known signature stimulus (ALL K), p = .073, *ns*. Table Bouysou 5.4 presents the means and standard deviations for areas of interest by participant type.

Table Bouysou 5.4

Process Analysis Visit Durations for FDE and Lay participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	9.04	7.84	11.85	13.1	22.84	18.49
Lay	6.46	5.23	4.8	5.79	6.93	6.7

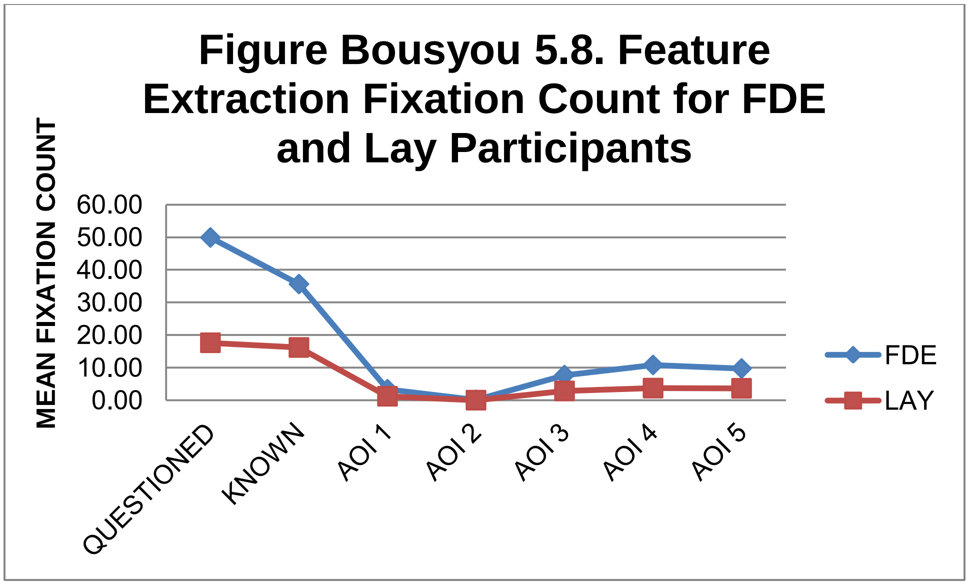
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .345, $F(7, 82) = 6.16$, $p < .001$, multivariate $\eta^2 = .345$. Figure Bouysou 5.8 presents the mean fixation counts by AOI.

Figure Bouysou 5.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in most areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 88) = 28.02$, $p < .001$, partial $\eta^2 = .242$, and $F(1, 88) = 11.27$, $p < .001$, partial $\eta^2 = .114$.

Fixations counts in all but one AOI were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 8.59$, $p = .004$, partial $\eta^2 = .089$; AOI 3, $F(1, 88) = 19.60$, $p < .001$, partial $\eta^2 = .182$; AOI 4, $F(1, 88) = 23.32$, $p < .001$, partial $\eta^2 = .209$; AOI 5, $F(1, 88) = 20.30$, $p < .001$, partial $\eta^2 = .187$).

No significant difference was found in one AOI (AOI 2, $p = .122$, *ns*). Table Bouysou 5.5 presents the means and standard deviations for areas of interest by participant type.

Table Bouysou 5.5

Feature Extraction Analysis Fixation Counts for FDE and Lay participants

	QUESTIONED	KNOWN	AOI 1	AOI 2

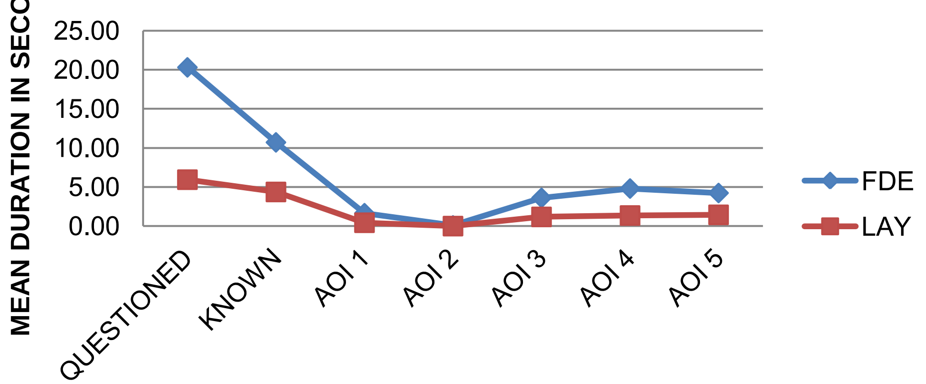
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	49.89	35.94	35.62	33.85	3.36	4.62	0.13	0.54
Lay	17.60	18.34	16.16	18.03	1.21	1.42	0.00	0.00
	AOI 3		**AOI 4**		**AOI 5**			
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***		
FDE	7.70	6.75	10.81	8.85	9.72	8.18		
Lay	2.84	2.64	3.70	4.03	3.65	3.48		

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .318, $F(7, 82) = 5.46$, $p < .001$, multivariate $\eta^2 = .318$. Figure Bouysou 5.9 presents the mean fixation durations by AOI.

Figure Bouysou 5.9

Figure Bouysou 5.9. Feature Extraction Fixation Duration for FDE and Lay Participants



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in most areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 88) = 26.82$, $p < .001$, partial $\eta^2 = .231$, and $F(1, 88) = 9.56$, $p = .003$, partial $\eta^2 = .098$.

Fixation durations in all but one AOI were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 8.27$, $p = .005$, partial $\eta^2 = .086$; AOI 3, $F(1, 88) = 17.12$, $p < .001$, partial $\eta^2 = .163$; AOI 4, $F(1, 88) = 21.51$, $p < .001$, partial $\eta^2 = .196$; AOI 5, $F(1, 88) = 17.81$, $p < .001$, partial $\eta^2 = .168$).

No significant difference was found in one AOI (AOI 2, *p* = .183, *ns*). Table Bouysou 5.6 presents the means and standard deviations for areas of interest by participant type.

Table Bouysou 5.6
Feature Extraction Analysis Fixation Duration for FDE and Lay participants

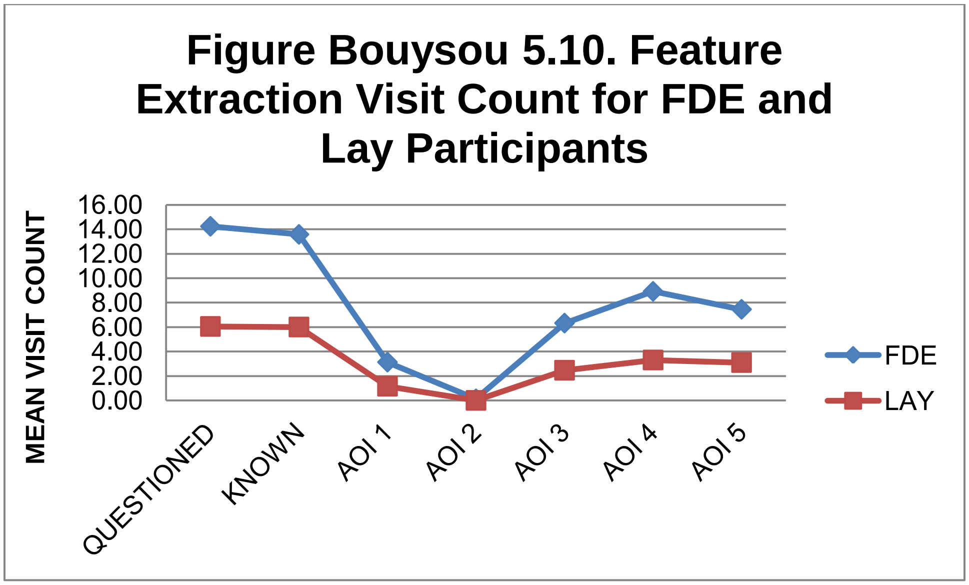
	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	20.31	17.20	10.71	12.50	1.65	2.74	0.09	0.43
Lay	5.94	6.17	4.37	5.17	0.43	0.51	0.00	0.00

	AOI 3		AOI 4		AOI 5	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	3.61	3.68	4.81	4.66	4.24	4.10
Lay	1.18	1.22	1.35	1.53	1.44	1.51

<u>*Total Visit Count*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .291, $F(7, 82) = 4.81$, $p < .001$, multivariate $\eta^2 = .291$. Figure Bouysou 5.10 presents the mean visit counts by AOI.

Figure Bouysou 5.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in most areas of interest. Total visit count for the questioned signature and known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 88) = 14.93$, $p < .001$, partial $\eta^2 = .145$, and $F(1, 88) = 12.50$, $p = .001$, partial $\eta^2 = .124$.

Visit counts in all but one AOI were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 7.79$, $p = .006$, partial $\eta^2 = .081$; AOI 3, $F(1, 88) = 21.79$, $p < .001$, partial $\eta^2 = .198$; AOI 4, $F(1, 88) = 20.69$, $p < .001$, partial $\eta^2 = .190$; AOI 5, $F(1, 88) = 19.64$, $p < .001$, partial $\eta^2 = .182$).

No significant difference was found in one AOI (AOI 2, $p = .122$, *ns*). Table Bouysou 5.7 presents the means and standard deviations for areas of interest by participant type.

Table Bouysou 5.7

Feature Extraction Analysis Visit Count for FDE and Lay participants

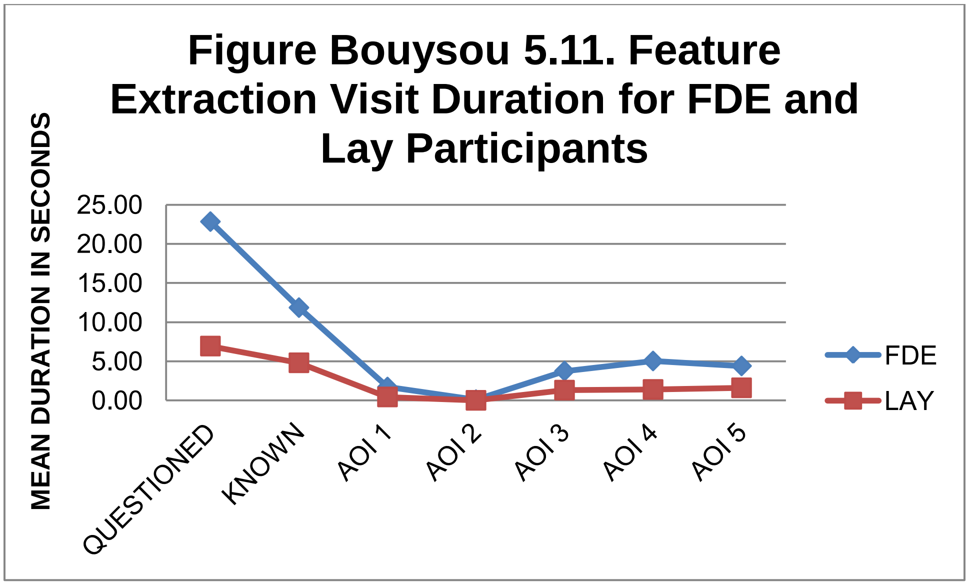
	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	14.23	12.38	13.57	12.62	3.13	4.44	0.13	0.54
Lay	6.05	6.59	6.00	6.45	1.16	1.31	0.00	0.00

	AOI 3		AOI 4		AOI 5	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	6.32	4.95	8.91	7.37	7.45	5.80
Lay	2.47	2.28	3.30	3.47	3.09	2.93

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .317, $F(7, 82) = 5.44$, $p < .001$, multivariate $\eta^2 = .317$. Figure Bouysou 5.11 presents the mean visit durations by AOI.

Figure Bouysou 5.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in most areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 88) = 23.89$, $p < .001$, partial $\eta^2 = .244$, and $F(1, 88) = 10.56$, $p = .002$, partial $\eta^2 = .107$.

Visit durations in all but one AOI were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 8.72$, $p = .004$, partial $\eta^2 = .090$; AOI 3, $F(1, 88) = 15.71$, $p < .001$, partial $\eta^2 = .151$; AOI 4, $F(1, 88) = 22.06$, $p < .001$, partial $\eta^2 = .200$; AOI 5, $F(1, 88) = 16.13$, $p < .001$, partial $\eta^2 = .155$).

No significant difference was found in one AOI (AOI 2, $p = .183$, *ns*). Table Bouysou 5.8 presents the means and standard deviations for areas of interest by participant type.

Table Bouysou 5.8

Feature Extraction Analysis Visit Durations for FDE and Lay participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	22.84	18.49	11.85	13.10	1.70	2.78	0.09	0.43
Lay	6.93	6.70	4.80	5.79	0.43	0.52	0.00	0.00

	AOI 3		AOI 4		AOI 5	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	3.74	3.81	5.03	4.85	4.40	4.26
Lay	1.30	1.39	1.39	1.58	1.60	1.71

Bouysou Signature 6: Freehand Simulation (Non-Genuine)

Of the 49 FDE participants, 42 responded correctly that the signature was non-genuine, while six identified the signature as genuine. One FDE declined to respond. Of the 43 Lay participants, 34 responded correctly that the signature was non-genuine, while 9 responded that the signature was genuine. This difference was not statistically significant, χ^2 (2, N = 92) = 2.06, p = .357. Figure Bouysou 6.1 presents the comparison view of this signature.

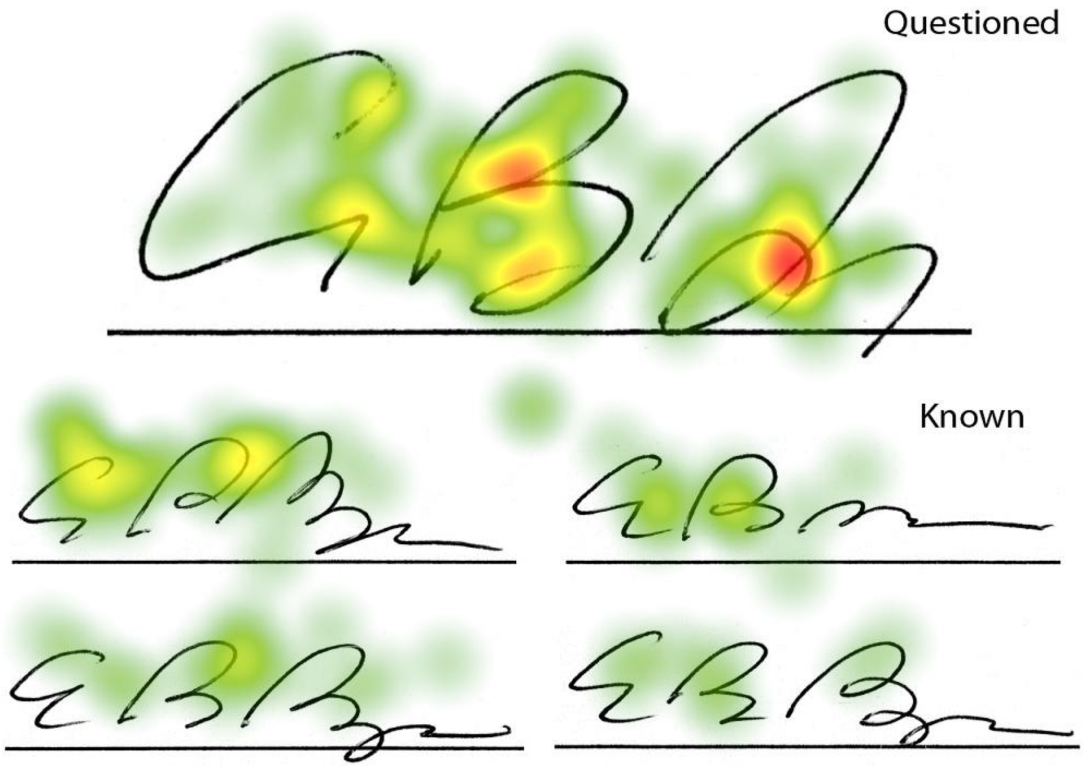
Figure Bouysou 6.1. Questioned-Known Comparison Stimulus for Signature Bouysou 6.

Selection of Areas of Interest (AOIs)

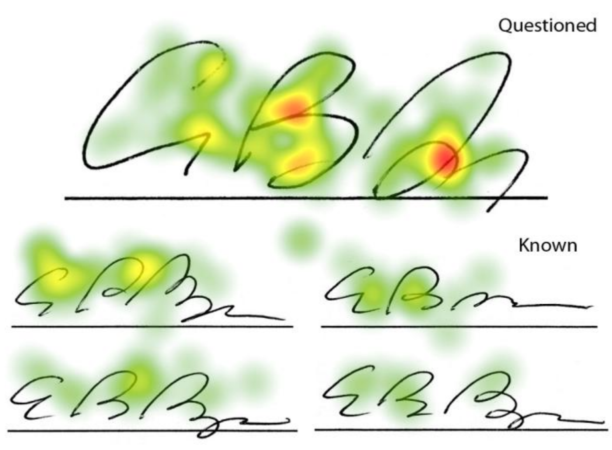
Figure Bouysou 6.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were six locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of six AOIs for this stimulus. Figure Bouysou 6.3 presents the location of the AOIs identified in the heat map.

Figure Bouysou 6.2. Heat map for Bouysou signature 6, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

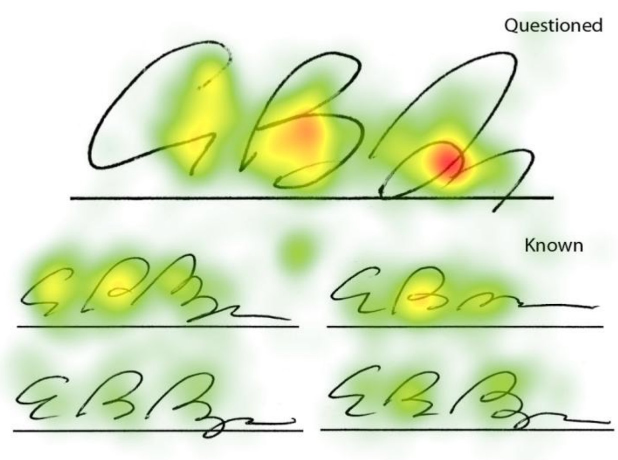


Figure Bouysou 6.3. Heat map for Bouysou signature 6, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

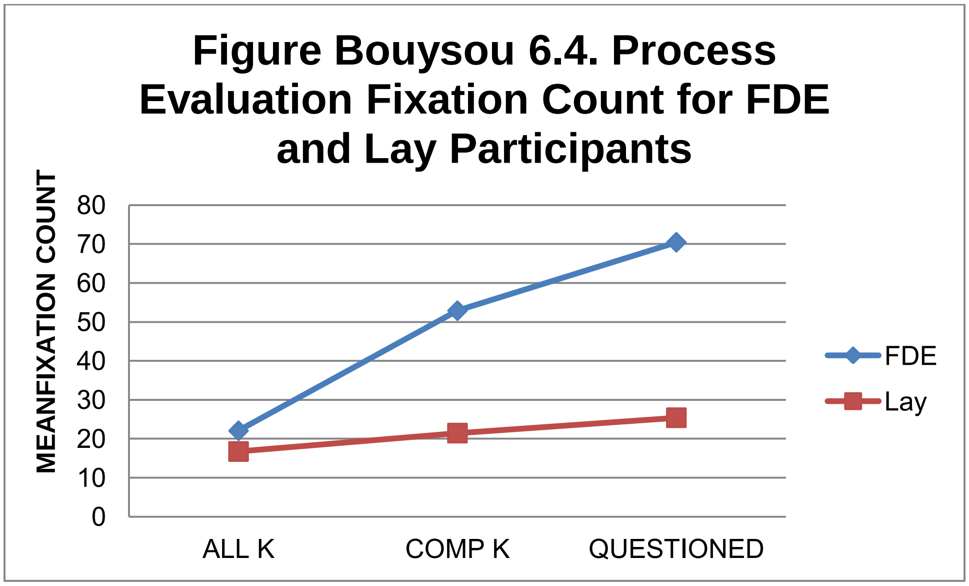
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Bouysou known signature stimulus (Knowns, not pictured here), Bouysou 1 K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Bouysou 6Q (the Bouysou questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 6) are included in subsequent analyses.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .249, F (3, 85) = 9.40, p < .001, multivariate η^2 = .249. Figure Bouysou 6.4 presents the mean fixation counts by AOI.

Figure Bouysou 6.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation counts in all areas of interest. Total fixation count for the questioned signature was significantly greater for FDEs than for Lay participants, F (1, 87) = 25.09, p < .001, partial η^2 = .224. Fixation count in the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, F (1, 87) = 15.24, p < .001, partial η^2 = .149.

Fixation count in the known signature stimulus was not significantly different between groups, p = .160, *ns*. Table Bouysou 6.1 presents the means and standard deviations for areas of interest by participant type.

Table Bouysou 6.1

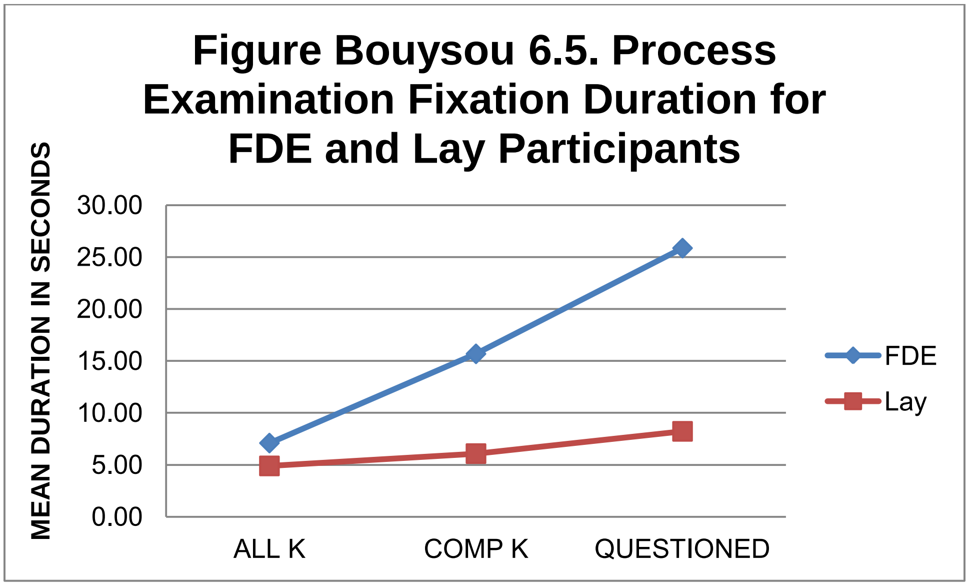
Process Analysis Fixation Counts for FDE and Lay participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	22.07	19.94	52.89	49.16	70.46	54.53
Lay	16.74	14.91	21.47	19.83	25.42	23.16

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .300, F (3, 85) = 12.15, p < .001, multivariate η^2 = .300. Figure Bouysou 6.5 presents the mean fixation counts by AOI.

Figure Bouysou 6.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in two areas of interest. Total fixation duration for the questioned signature was significantly greater for FDEs than for Lay participants, F (1, 87) = 30.79, p < .001, partial η^2 = .261. Fixation duration in the known signature comparison stimulus (COMP K) was significantly greater for FDEs than for Lay participants, F (1, 87) = 14.97, p < .001, partial η^2 = .147.

No significant difference was found in the known signature stimulus (ALL K), p = .090, *ns*. Table Bouysou 6.2 presents the means and standard deviations for areas of interest by participant type.

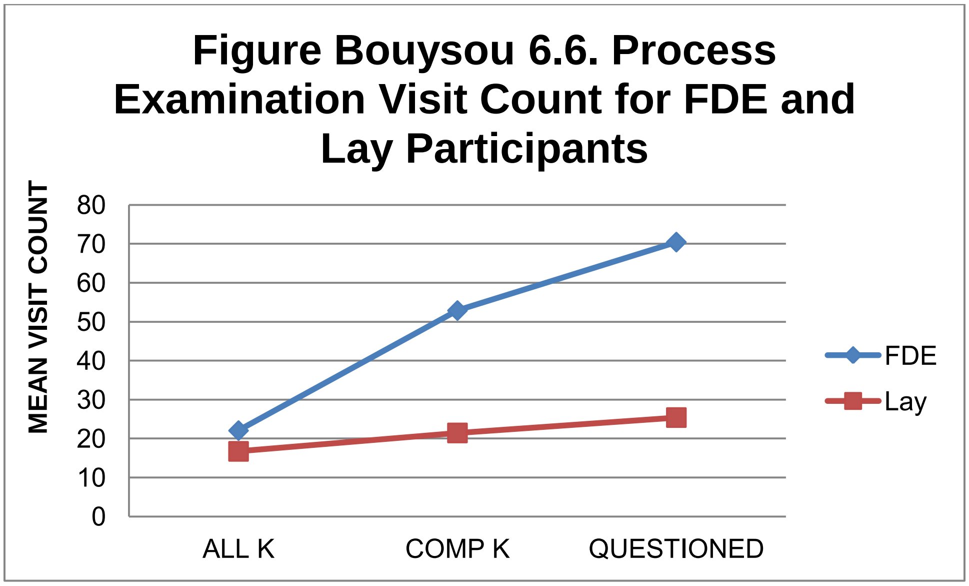
Table Bouysou 6.2
Process Analysis Fixation Durations for FDE and Lay participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	7.08	6.90	15.67	15.07	25.85	19.61
Lay	4.88	4.95	6.07	6.35	8.21	7.30

Total Visit Count

MANOVA results reveal significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .215, F (3, 85) = 7.75, p < .001, multivariate η^2 = .215. Figure Bouysou 6.6 presents the mean visit counts by AOI.

Figure Bouysou 6.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant. Total visit count for the questioned signature was significantly greater for FDEs than for Lay participants, F (1, 87) = 18.89, p < .001, partial η^2 = .178. Visit count in the known signature comparison stimulus (COMP K) was significantly greater for FDEs than for Lay participants, F (1, 87) 17.87, p < .001, partial η^2 = .170.

A significant difference was also found in the known signature stimulus (ALL K), F (1, 87) = 5.42, p = .022, partial η^2 = .059. Table Bouysou 6.3 presents the means and standard deviations for areas of interest by participant type.

Table Bouysou 6.3

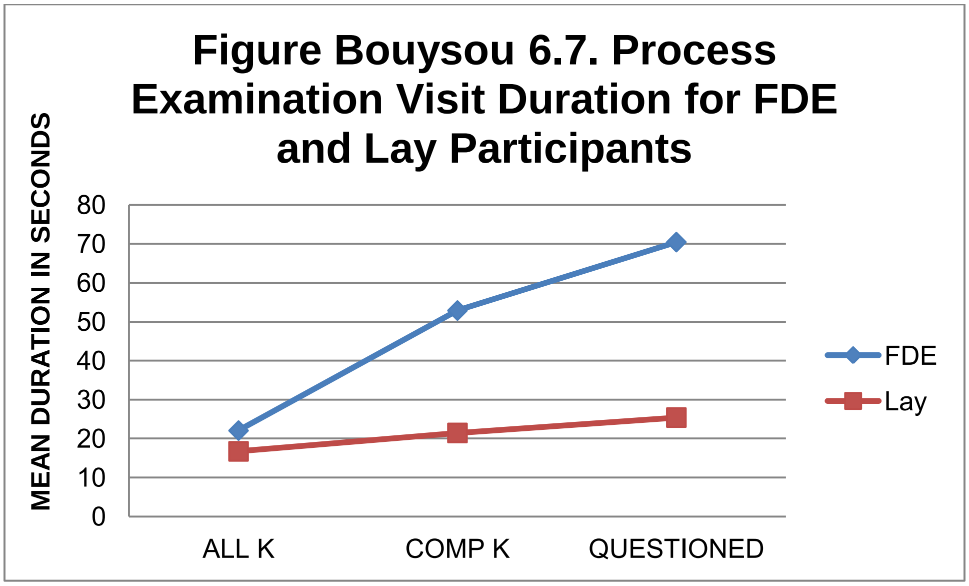
Process Analysis Visit Counts for FDE and Lay participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.5	1.19	18.3	14.46	19.07	14.7
Lay	1.05	0.49	8.05	6.87	8.28	7.22

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .290, F (3, 85) = 11.58, p < .001, multivariate η^2 = .290. Figure Bouysou 6.7 presents the mean visit durations by AOI.

Figure Bouysou 6.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature was significantly greater for FDEs than for Lay participants, F (1, 87) = 31.12, p < .001, partial η^2 = .263. Visit duration in the known signature comparison stimulus (COMP K) was significantly greater for FDEs than for Lay participants, F (1, 87) = 14.77, p < .001, partial η^2 = .145.

No significant difference was found in the known signature stimulus (ALL K), p = .177, *ns*. Table Bouysou 6.4 presents the means and standard deviations for areas of interest by participant type.

Table Bouysou 6.4

Process Analysis Visit Durations for FDE and Lay participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	8.85	8.19	17.25	16.47	28.96	22.37
Lay	6.72	6.39	6.83	6.93	8.89	7.72

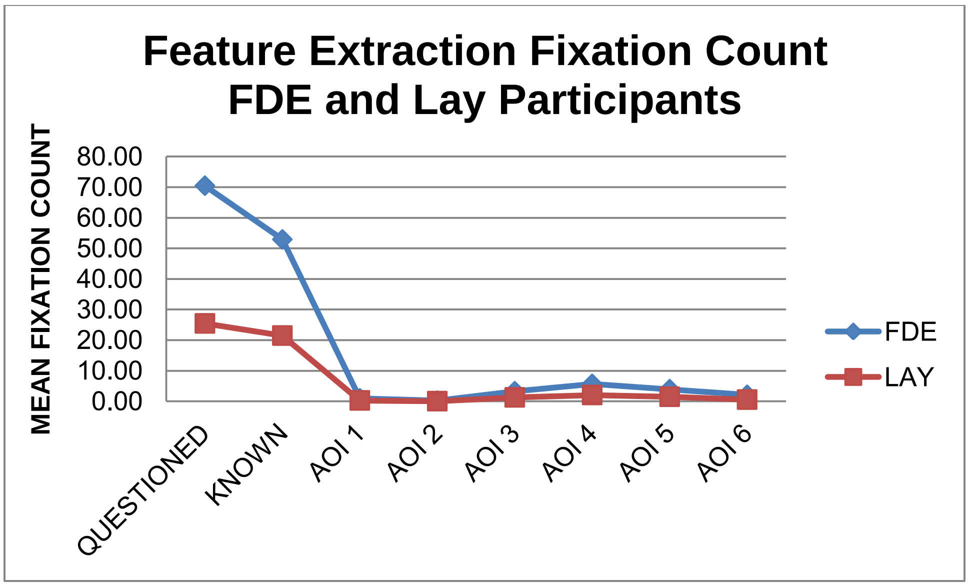
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .335, $F(8, 80) = 5.03$, $p < .001$, multivariate $\eta^2 = .335$. Figure Bouysou 6.8 presents the mean fixation counts by AOI.

Figure Bouysou 6.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in most areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 87) = 25.09$, $p < .001$, partial $\eta^2 = .224$, and $F(1, 87) = 15.24$, $p < .001$, partial $\eta^2 = .149$.

Fixations counts in all but one AOI were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 11.89$, $p = .001$, partial $\eta^2 = .120$; AOI 3, $F(1, 87) = 15.33$, $p < .001$, partial $\eta^2 = .150$; AOI 4, $F(1, 87) = 15.59$, $p < .001$, partial $\eta^2 = .152$; AOI 5, $F(1, 87) = 11.57$, $p < .001$, partial $\eta^2 = .117$; AOI 6, $F(1, 87) = 24.22$, $p < .001$, partial $\eta^2 = .218$).

No significant difference was found in one AOI (AOI 2, $p = .157$, *ns*). Table Bouysou 6.5 presents the means and standard deviations for areas of interest by participant type.

Table Bouysou 6.5

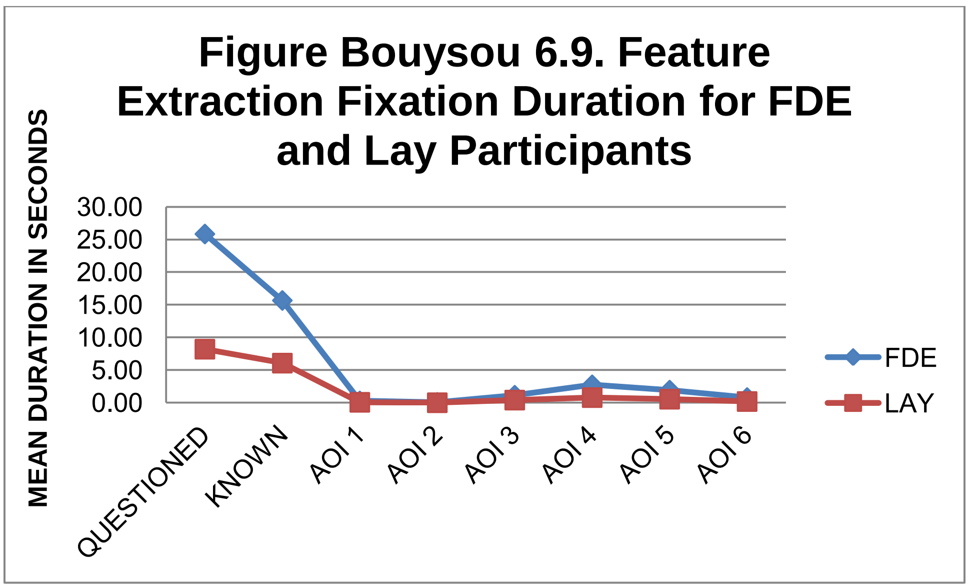
Feature Extraction Analysis Fixation Counts for FDE and Lay participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	70.46	54.53	52.89	49.16	0.93	1.18	0.17	0.68
Lay	25.42	23.16	21.47	19.83	0.26	0.54	0.02	0.15
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	3.26	2.65	5.65	5.29	3.93	4.18	2.09	1.76
Lay	1.26	2.13	2.05	2.90	1.47	2.36	0.53	1.12

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .345, $F(8, 80) = 5.26$, $p < .001$, multivariate $\eta^2 = .345$. Figure Bouysou 6.9 presents the mean fixation durations by AOI.

Figure Bouysou 6.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in most areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 87) = 30.79$, $p < .001$, partial $\eta^2 = .261$, and $F(1, 87) = 14.97$, $p < .001$, partial $\eta^2 = .147$.

Fixation durations in all but one AOI were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 10.52$, $p = .002$, partial $\eta^2 = .108$; AOI 3, $F(1, 87) = 14.09$, $p < .001$, partial $\eta^2 = .139$; AOI 4, $F(1, 87) = 22.12$, $p < .001$, partial $\eta^2 = .203$; AOI 5, $F(1, 87) = 16.06$, $p < .001$, partial $\eta^2 = .156$; AOI 6, $F(1, 87) = 13.06$, $p < .001$, partial $\eta^2 = .131$).

No significant difference was found in one AOI (AOI 2, *p* = .127, *ns*). Table Bouysou 6.6 presents the means and standard deviations for areas of interest by participant type.

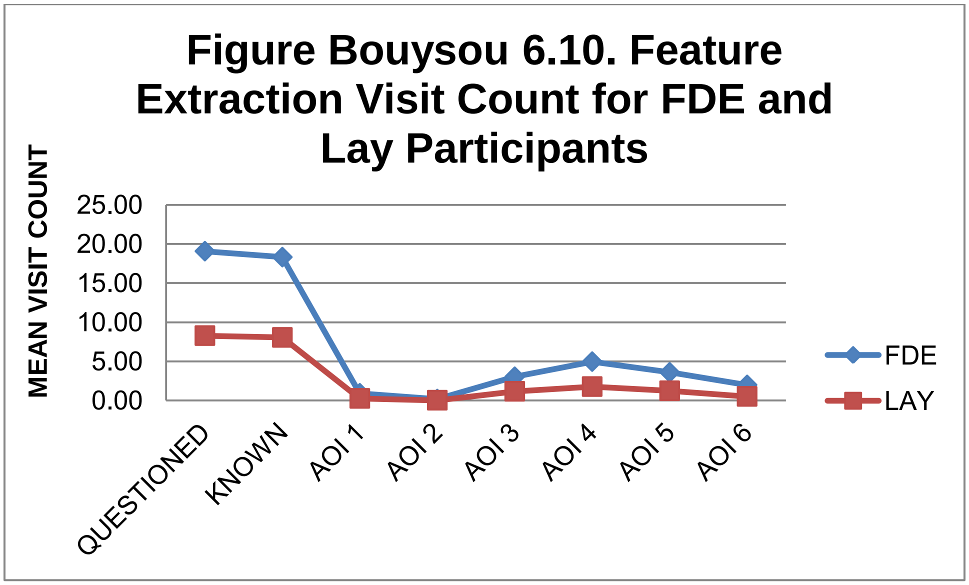
Table Bouysou 6.6
Feature Extraction Analysis Fixation Duration for FDE and Lay participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	25.85	19.61	15.67	15.07	0.28	0.39	0.06	0.24
Lay	8.21	7.30	6.07	6.35	0.07	0.17	0.00	0.02
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.15	1.10	2.75	2.58	1.94	2.17	0.80	1.02
Lay	0.41	0.72	0.79	0.91	0.55	0.70	0.19	0.43

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .307, *F*(8, 80) = 4.42, *p* =< .001, multivariate η^2 = .307. Figure Bouysou 6.10 presents the mean visit counts by AOI.

Figure Bouysou 6.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in most areas of interest. Total visit count for the questioned signature and known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 87) = 18.89$, $p < .001$, partial $\eta^2 = .178$, and $F(1, 87) = 17.87$, $p < .001$, partial $\eta^2 = .170$.

Visit counts in all but one AOI were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 11.96$, $p = .001$, partial $\eta^2 = .121$; AOI 3, $F(1, 87) = 16.67$, $p < .001$, partial $\eta^2 = .161$; AOI 4, $F(1, 87) = 17.98$, $p < .001$, partial $\eta^2 = .171$; AOI 5, $F(1, 87) = 14.31$, $p < .001$, partial $\eta^2 = .141$; AOI 6, $F(1, 87) = 14.3124.22$, $p < .001$, partial $\eta^2 = .218$).

No significant difference was found in one AOI (AOI 2, $p = .157$, *ns*). Table Bouysou 6.7 presents the means and standard deviations for areas of interest by participant type.

Table Bouysou 6.7

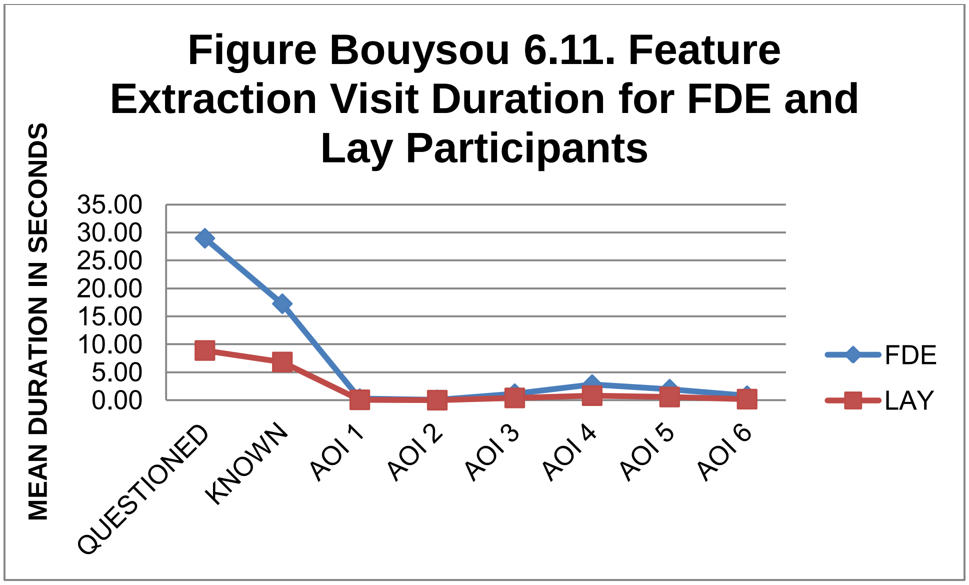
Feature Extraction Analysis Visit Count for FDE and Lay participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	19.07	14.70	18.30	14.46	0.91	1.13	0.17	0.68
Lay	8.28	7.22	8.05	6.87	0.26	0.54	0.02	0.15
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	3.02	2.50	4.96	4.43	3.59	3.73	1.98	1.69
Lay	1.16	1.69	1.77	2.24	1.23	1.72	0.51	1.01

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .339, $F(8, 80) = 5.14$, $p < .001$, multivariate $\eta^2 = .339$. Figure Bouysou 6.11 presents the mean visit counts by AOI.

Figure Bouysou 6.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in most areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 87) = 31.12$, $p < .001$, partial $\eta^2 = .263$, and $F(1, 87) = 14.77$, $p < .001$, partial $\eta^2 = .145$.

Visit durations in all but one AOI were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 10.53$, $p = .002$, partial $\eta^2 = .108$; AOI 3, $F(1, 87) = 14.39$, $p < .001$, partial $\eta^2 = .142$; AOI 4, $F(1, 87) = 21.76$, $p < .001$, partial $\eta^2 = .200$; AOI 5, $F(1, 87) = 15.70$, $p < .001$, partial $\eta^2 = .153$; AOI 6, $F(1, 87) = 13.30$, $p < .001$, partial $\eta^2 = .133$).

No significant difference was found in one AOI (AOI 2, $p = .127$, *ns*). Table Bouysou 6.8 presents the means and standard deviations for areas of interest by participant type.

Table Bouysou 6.8

Feature Extraction Analysis Visit Duration for FDE and Lay participants

	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	28.96	22.37	17.25	16.47	0.28	0.39	0.06	0.24
Lay	8.89	7.72	6.83	6.93	0.07	0.17	0.00	0.02
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.17	1.10	2.80	2.62	1.97	2.20	0.81	1.02
Lay	0.41	0.73	0.81	0.97	0.57	0.78	0.19	0.43

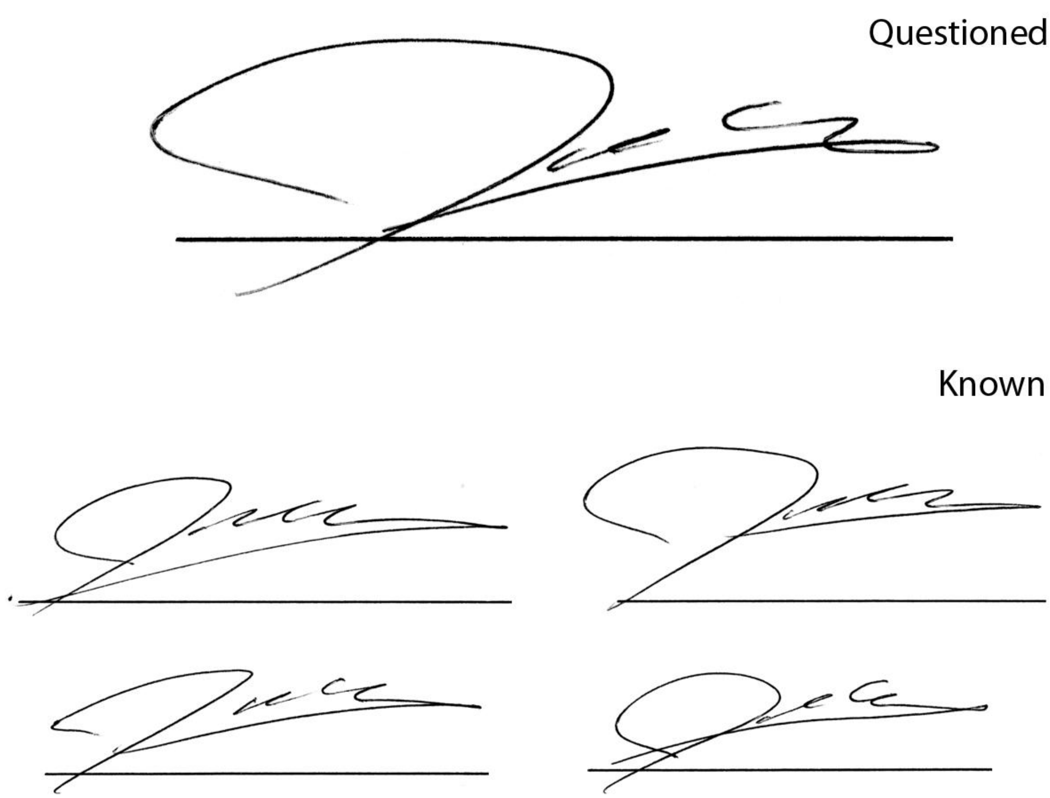
SIGNATURE 4: Jim LaBarbera

The signature of Jim LaBarbera is characterized as a low-complexity stylized-type signature. The set of LaBarbera signature specimens included two genuine signatures. Of the non-genuine signatures, one was disguised, and three were freehand simulations. No traced signatures were included in the set.

LaBarbera Signature 1: Genuine

Of the 49 FDE participants, 40 responded correctly that the signature was genuine, with one refusal and 8 incorrect calls. Of the 43 Lay participants, 42 responded correctly that the signature was genuine, and one responded incorrectly that the signature was non-genuine. This difference was statistically significant, χ^2 (2, N = 92) = 6.13, p = .047. Figure LaBarbera 1.1 presents the comparison view of this signature.

Figure LaBarbera 1.1. Questioned-Known Comparison Stimulus for LaBarbera Signature 1.

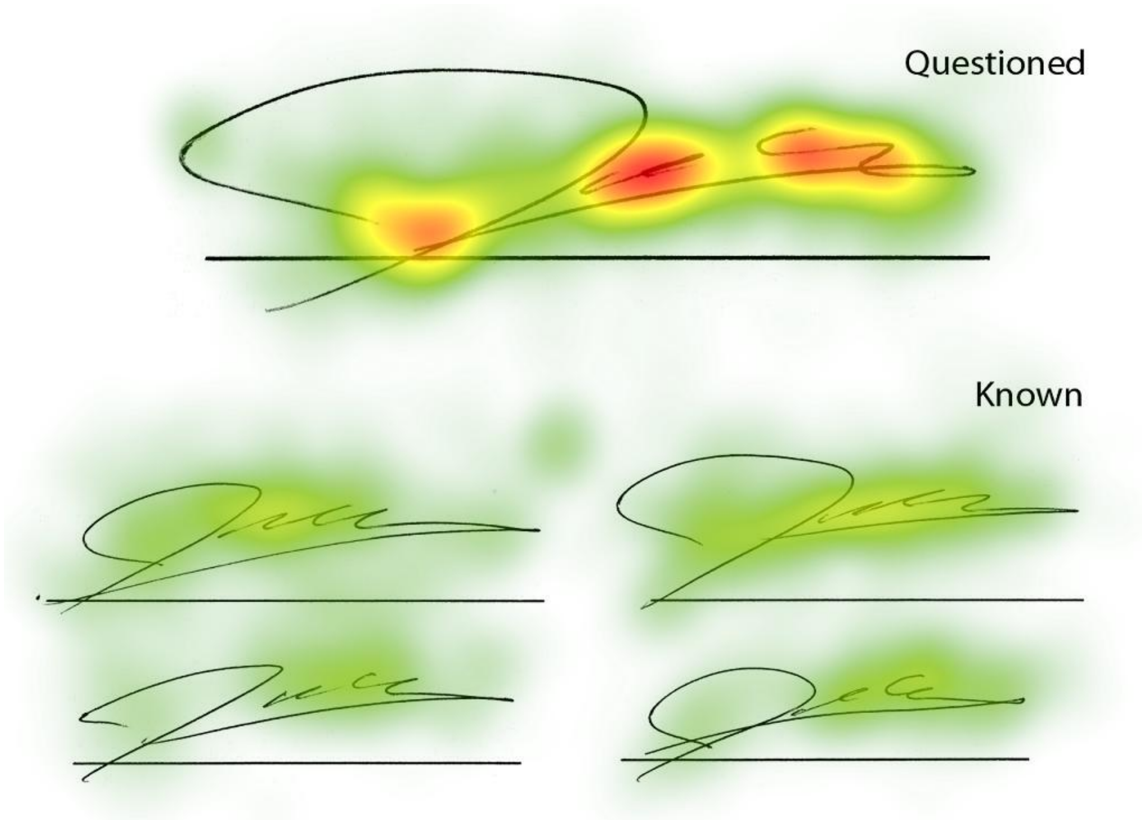


Selection of Areas of Interest (AOIs)

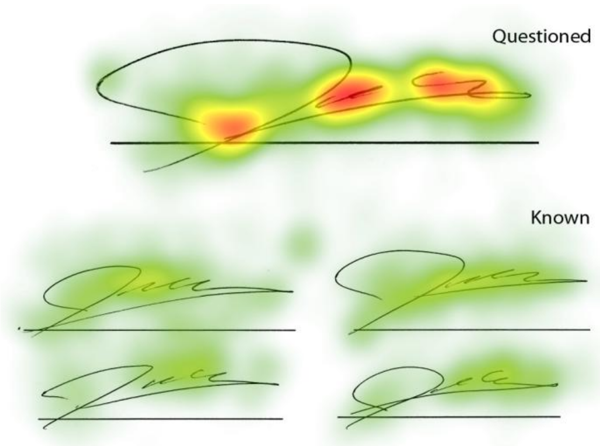
Figure LaBarbera 1.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were three locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of three AOIs for this stimulus. Figure LaBarbera 1.3 presents the location of the AOIs identified in the heat map.

Figure Labarbera 1.2. Heat map for LaBarbera signature 1, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

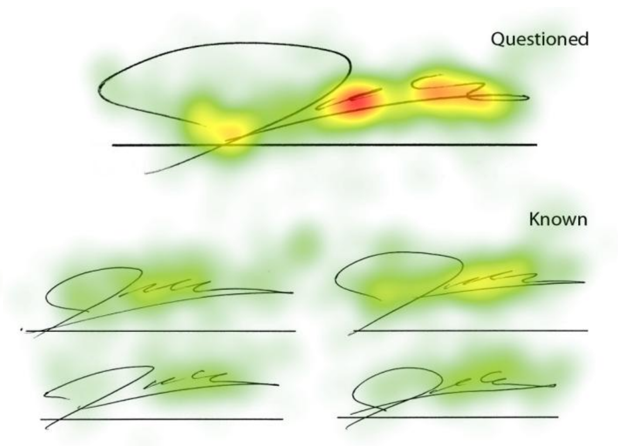
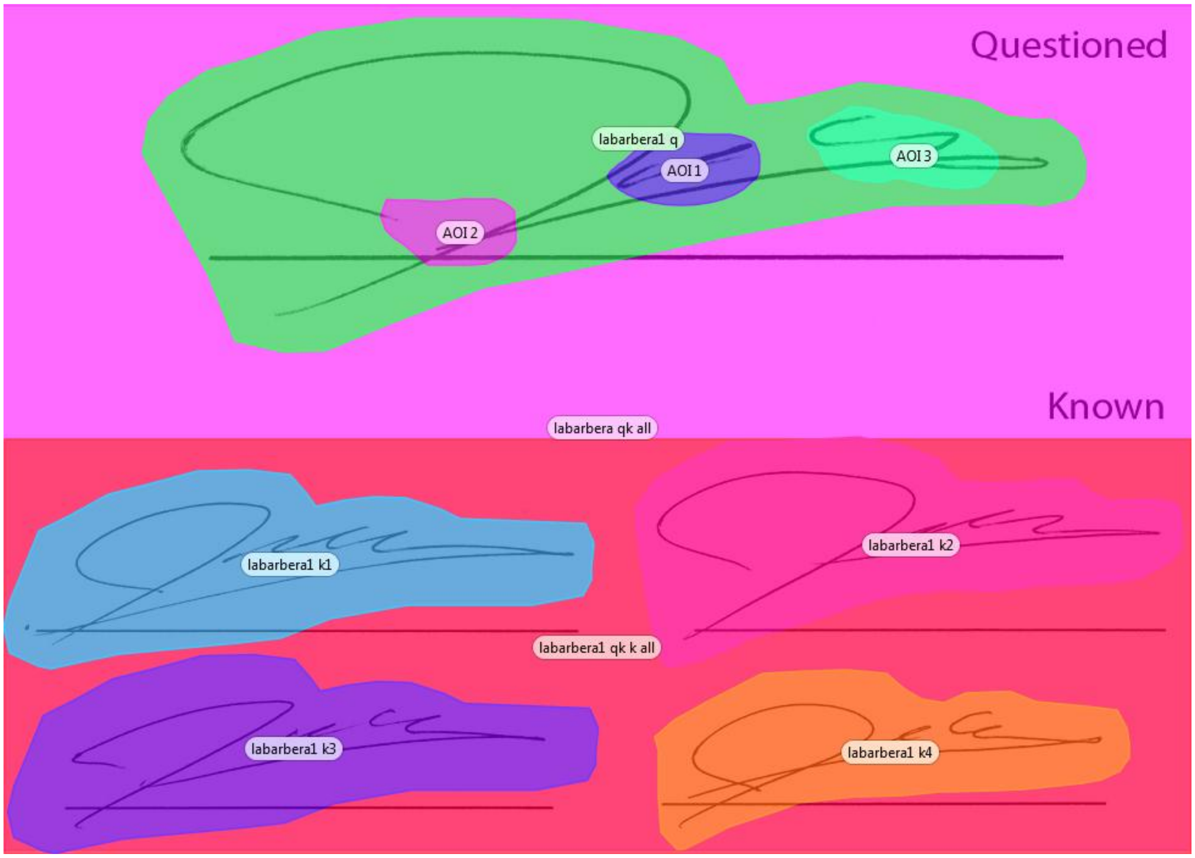


Figure LaBarbera 1.3. Areas of Interest (AOIs) for LaBarbera Signature 1.



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

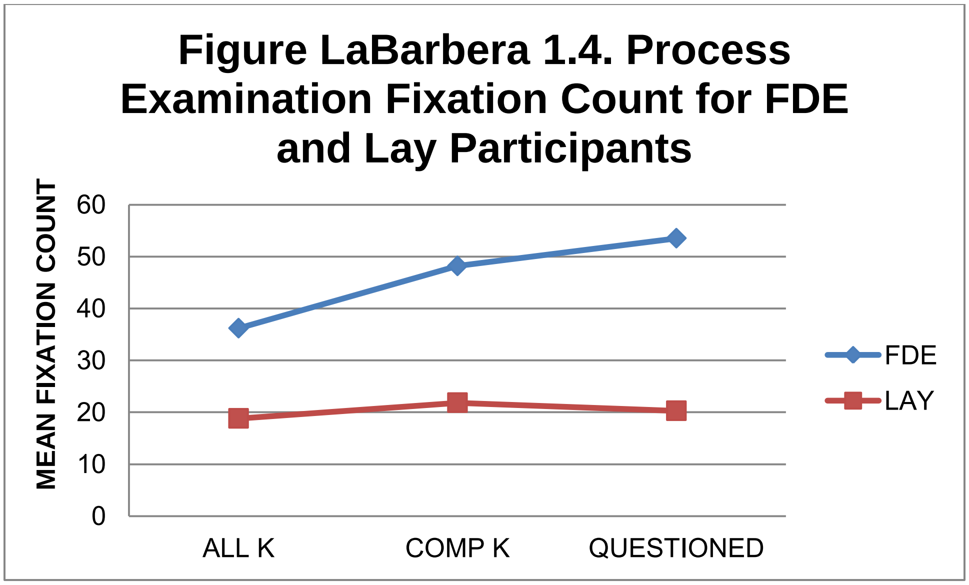
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the LaBarbera known signature stimulus (Knowns, not pictured here), LaBarbera 1QK K all (encompassing all the known signatures on the questioned/known comparison stimulus), and LaBarbera 1Q (the LaBarbera questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 3) are included in subsequent analyses. Figure LaBarbera 1.3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .202, F (3, 86) = 7.25, p < .001, multivariate η^2 = .202. Figure LaBarbera 1.4 presents the mean fixation counts by AOI.

Figure LaBarbera 1.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixations counts in all areas of interest. Total fixation count for the questioned signature was significantly greater for FDEs than for Lay participants, F (1, 88) = 21.28, p < .001, partial η^2 = .195. Fixation counts in the known signature stimulus (ALL K) were significantly different between groups, F (1, 88) = 11.06, p = .001, partial η^2 = .112. Fixation counts in the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, F (1, 88) = 13.48, p < .001, partial η^2 = .133. Table LaBarbera 1.1 presents the means and standard deviations for areas of interest by participant type.

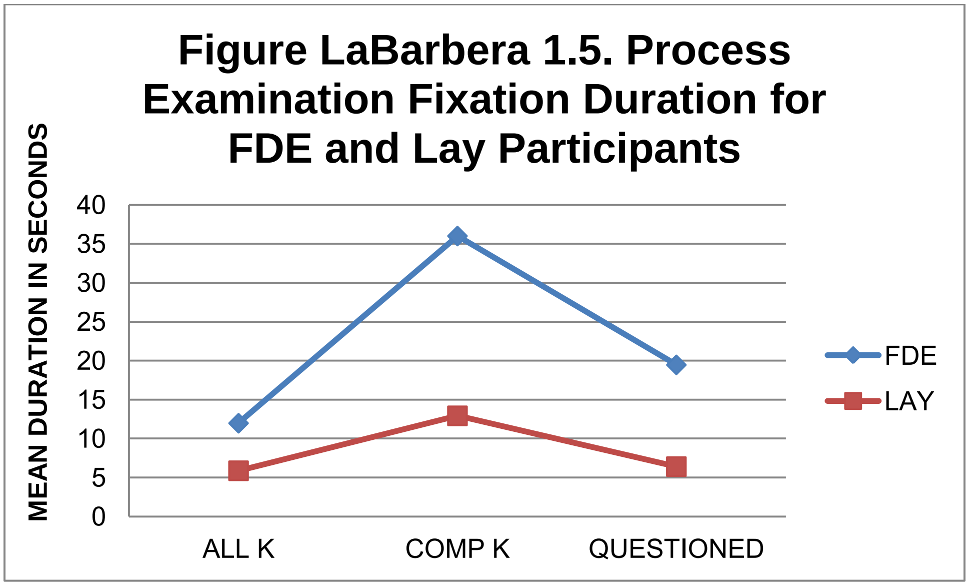
Table LaBarbera 1.1
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	36.19	31.47	48.19	40.86	53.53	44.24
Lay	18.81	14.14	21.84	24.42	20.28	17.34

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .210, F (3, 86) = 7.63, p < .001, multivariate η^2 = .210. Figure LaBarbera 1.5 presents the mean fixation counts by AOI.

Figure LaBarbera 1.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation durations in all areas of interest. Total fixation duration for the questioned signature was significantly greater for FDEs than for Lay participants, F (1, 88) = 22.24, p < .001, partial η^2 = .113. Fixation durations in the known signature stimulus (ALL K) was significantly different between groups, F (1, 88) = 11.26, p < .001, partial η^2 = .113. The known signature comparison stimulus (COMP K) was significantly greater for FDEs than for Lay participants, F (1, 88) = 19.84, p < .001, partial η^2 = .184. Table LaBarbera 1.2 presents the means and standard deviations for areas of interest by participant type.

Table LaBarbera 1.2

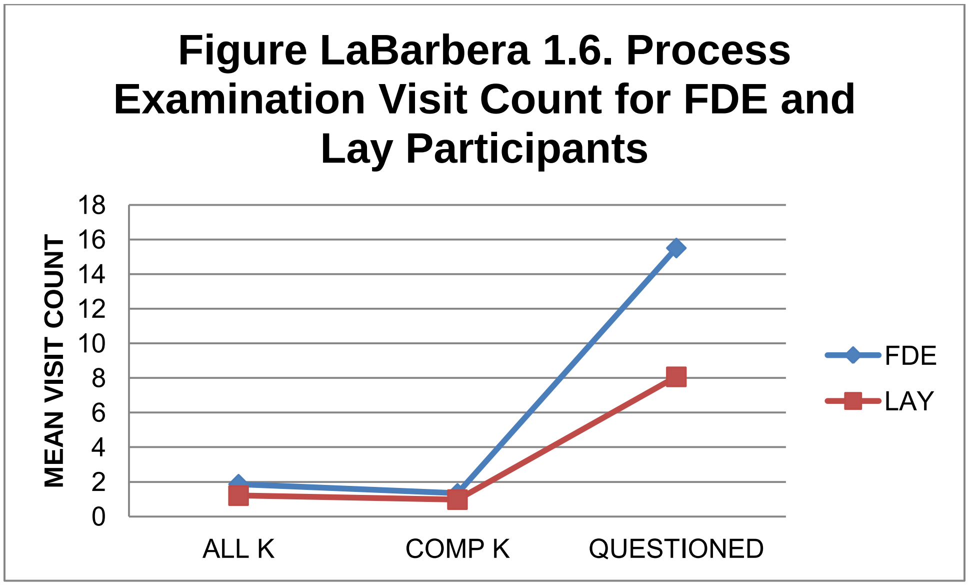
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	11.98	11.05	36.01	32.27	19.47	17.41
Lay	5.88	4.71	12.93	11.09	6.41	5.39

Total Visit Count

MANOVA results reveal significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .158, *F* (3, 86) = 5.38, *p* = .002, multivariate η^2 = .158. Figure LaBarbera 1.6 presents the mean visit counts by AOI.

Figure LaBarbera 1.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for visit count in only one area of interest. Total fixation duration for the questioned signature was significantly greater for FDEs than for Lay participants, *F* (1, 88) = 13.22, $p <$ .001, partial η^2 = .131.

Fixation durations in the known signature stimulus (ALL K) and known signature comparison stimulus (COMP K) were not significantly greater for FDEs than for Lay participants was significantly different between groups, *p* = .056, *ns*, and *p* = .073, *ns*. Table LaBarbera 1.3 presents the means and standard deviations for areas of interest by participant type.

Table LaBarbera 1.3

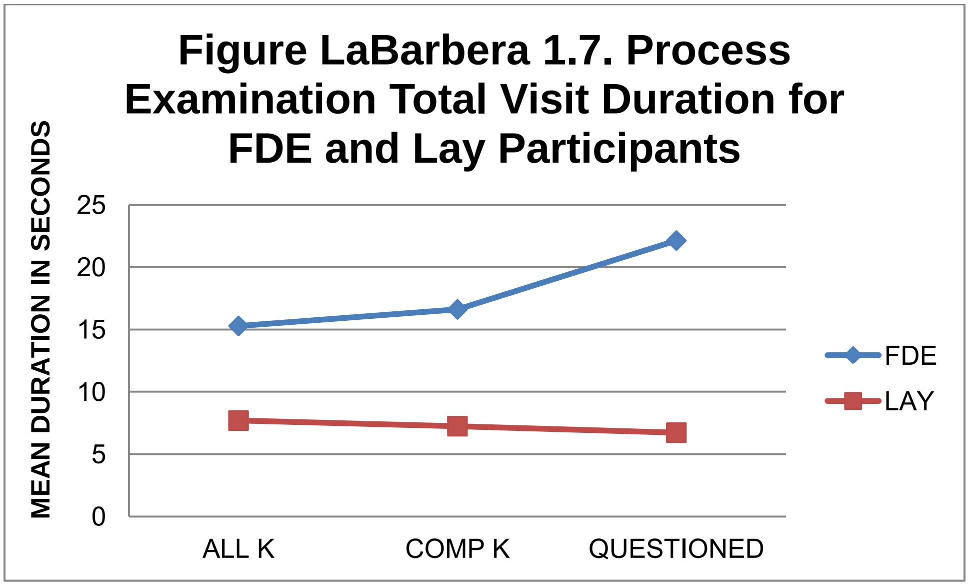
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.87	2.27	1.34	1.18	15.51	11.28
Lay	1.21	0.8	0.98	0.34	8.07	7.59

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .250, F (3, 86) = 9.57, p < .001, multivariate η^2 = .250. Figure LaBarbera 1.7 presents the mean visit durations by AOI.

Figure LaBarbera 1.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation durations in all areas of interest. Total fixation duration for the questioned signature was significantly greater for FDEs than for Lay participants, F (1, 88) = 27.72, p < .001, partial η^2 = .240. Fixation durations in the known signature stimulus (ALL K) was significantly different between groups, F (1, 88) = 12.81, p < .001, partial η^2 = .127. The known signature comparison stimulus (COMP K) was significantly greater for FDEs than for Lay participants, F (1, 88) = 12.92, p < .001, partial η^2 = .128. Table LaBarbera 1.4 presents the means and standard deviations for areas of interest by participant type.

Table LaBarbera 1.4

Process Analysis Visit Durations for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	15.29	12.87	16.62	15.59	22.14	18.43
Lay	7.7	5.47	7.25	7.28	6.73	5.57

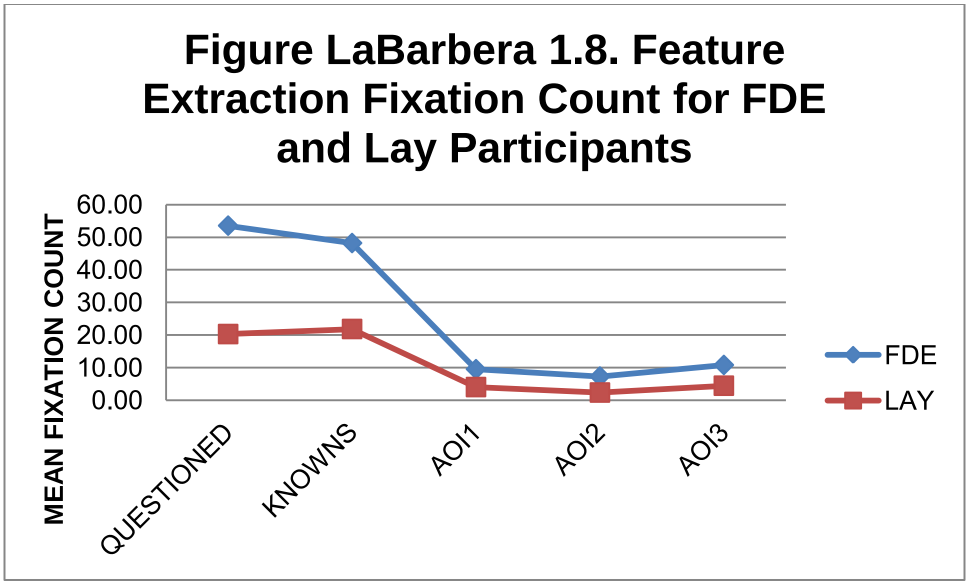
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .217, F (5, 84) = 4.65, p = .001, multivariate η^2 = .217. Figure LaBarbera 1.8 presents the mean fixation counts by AOI.

Figure LaBarbera 1.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature and known signatures were significantly greater for FDEs than for Lay participants, F (1, 88) = 21.28, p < .001, partial η^2 = .195; F (1, 88) = 13.48, p < .001, partial η^2 = .133. Fixations counts in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, F (1, 88) = 14.99, p < .001, partial η^2 = .146; AOI 2, F (1, 88) = 20.83, p < .001, partial η^2 = .191; AOI 3, F (1, 88) = 11.84, p = .001, partial η^2 = .119). Table LaBarbera 1.5 presents the means and standard deviations for areas of interest by participant type.

Table LaBarbera 1.5
Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

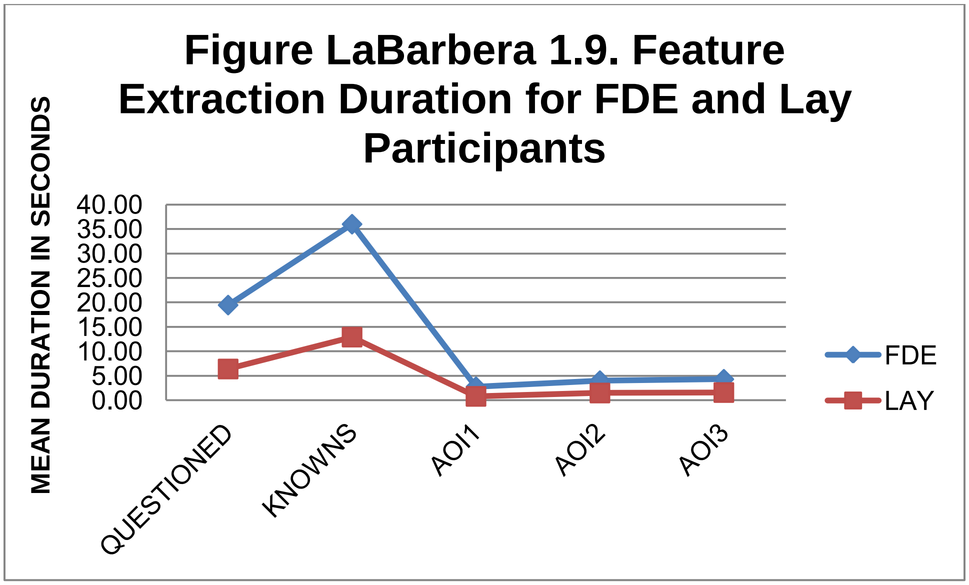
	QUESTIONED		KNOWNS		AOI1		AOI2		AOI3	
Participants	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	53.53	44.24	48.19	40.86	9.51	8.55	7.28	6.78	10.81	11.29

LAY	20.28	17.34	21.84	24.42	4.02	3.81	2.35	2.11	4.44	4.64

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .226, F (5, 84) = 4.91, p = .001, multivariate η^2 = .226. Figure LaBarbera 1.9 presents the mean fixation durations by AOI.

Figure LaBarbera 1.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature was significantly greater for FDEs than for Lay participants, F (1, 88) = 22.24, p < .001, partial η^2 = .202, as well as in the known signatures, F (1, 88) = 19.84, p < .001, partial η^2 = .184. Fixation durations in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, F(1, 88) = 18.84, p < .001, partial η^2 = .176; AOI 2, F (1, 88) = 17.64, p < .001, partial η^2 = .167; AOI 3, F (1, 88) = 15.40, p < .001, partial η^2 = .149). Table LaBarbera 1.6 presents the means and standard deviations for areas of interest by participant type.

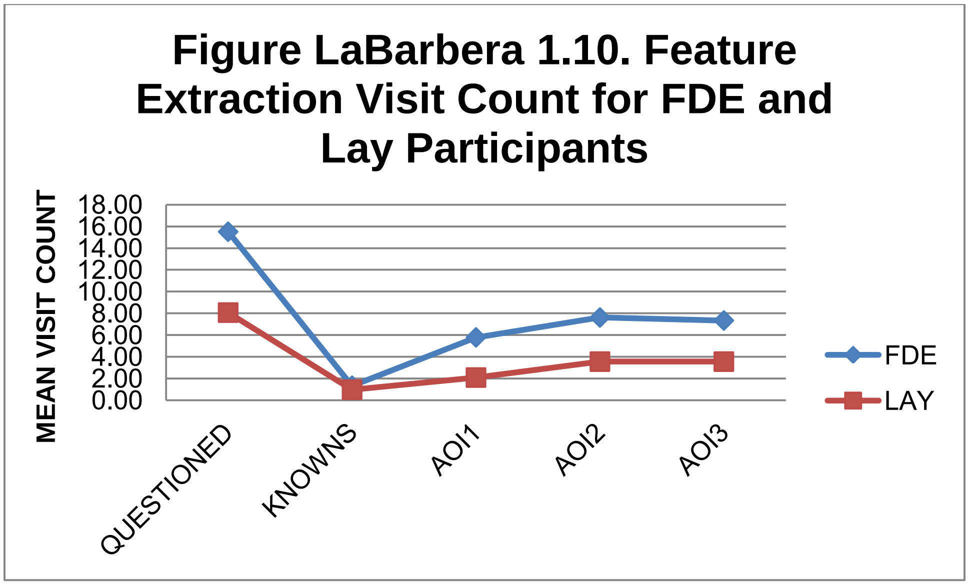
Table LaBarbera 1.6
Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

	QUESTIONED		KNOWNS		AOI1		AOI2		AOI3	
Participants	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	19.47	17.41	36.01	32.27	2.77	2.87	4.03	3.65	4.31	4.27
LAY	6.41	5.39	12.93	11.09	0.81	0.77	1.49	1.61	1.59	1.63

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .269, F (5, 84) = 6.20, p < .001, multivariate η^2 = .269. Figure LaBarbera 1.10 presents the mean visit count by AOI.

Figure LaBarbera 1.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all but one area of interest. Total visit count for the questioned signature was significantly greater for FDE than Lay participants, F (1, 88) = 13.22, p < .001, partial η^2 = .131. Visit count in all AOIs was significantly greater for FDEs than for Lay participants (AOI 1, F (1, 88) = 25.12, p < .001, partial η^2 = .222; AOI 2, F (1, 88) = 14.07, p < .001, partial η^2 = .138; AOI 3, F (1, 88) = 12.56, p = .001, partial η^2 = .125).

No significant difference was found in visit counts in the known signatures, p = .056, *ns*. Table LaBarbera 1.7 presents the means and standard deviations for areas of interest by participant type.

Table LaBarbera 1.7

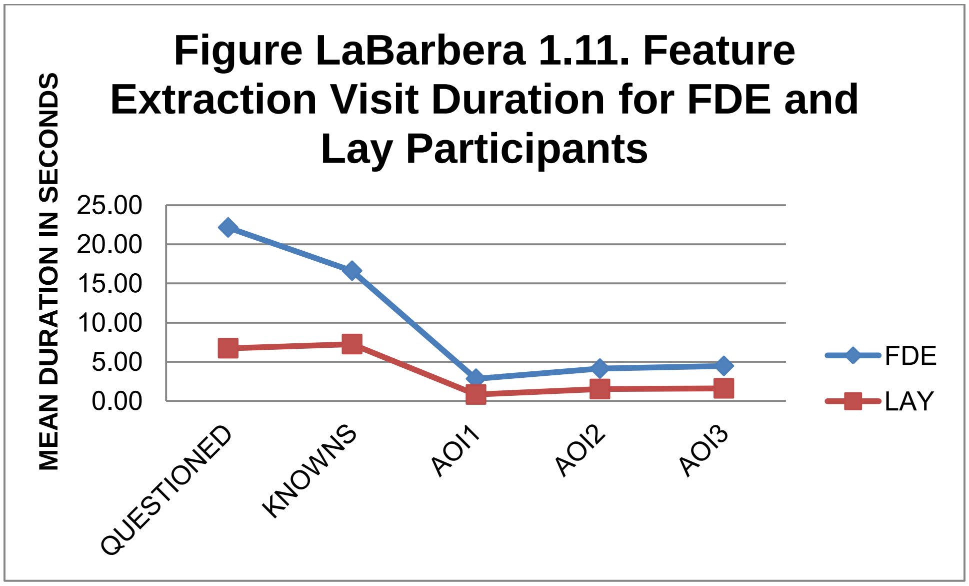
Feature Extraction Analysis Visit Count for FDE and Lay Participants

	QUESTIONED		KNOWNS		AOI1		AOI2		AOI3	
Participants	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	15.51	11.28	1.34	1.18	5.79	4.52	7.62	6.41	7.34	6.08
LAY	8.07	7.59	0.98	0.34	2.09	1.80	3.56	3.17	3.56	3.63

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .260, F (5, 84) = 5.91, p < .001, multivariate η^2 = .260. Figure LaBarbera 1.11 presents the mean visit duration by AOI.

Figure LaBarbera1.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit durations for the questioned signature and the known signatures were significantly greater for FDEs than for Lay participants, F (1, 88) = 27.72, p < .001, partial η^2 = .24, as well as for all knows, and F (1, 88) = 12.93, p = .001, partial η^2 = .13.

Visit duration in all AOIs was significantly greater for FDEs than for Lay participants (AOI 1, F (1, 88) = 18.56, p < .001, partial η^2 = .174; AOI 2, F (1, 88) = 17.94, p < .001, partial η^2 = .169; AOI 3, F (1, 88) = 14.68, p < .001, partial η^2 = .143). Table LaBarbera 1.8 presents the means and standard deviations for areas of interest by participant type.

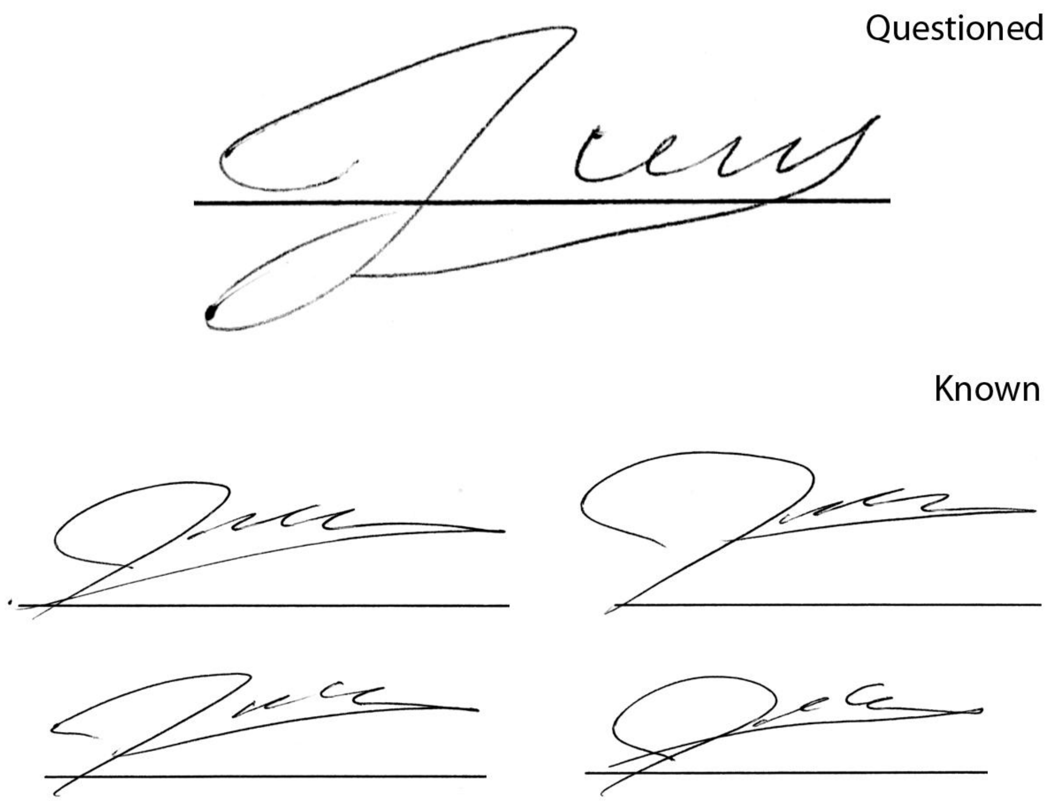
Table LaBarbera 1.8
Feature Extraction Analysis Visit Duration for FDE and Lay Participants

	QUESTIONED		KNOWNS		AOI1		AOI2		AOI3	
Participants	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	22.14	18.43	16.62	15.59	2.83	2.97	4.12	3.72	4.46	4.62
LAY	6.73	5.57	7.25	7.28	0.82	0.78	1.51	1.64	1.61	1.65

LaBarbera Signature 2: Simulation (Non-Genuine)

Of the 49 FDE participants, all responded correctly that the signature specimen was non-genuine. Of the 43 Lay participants, 40 responded correctly that the signature was non-genuine, and 3 responded that the signature was genuine. This difference was not statistically significant, χ^2 (2, N = 92) = 3.53, p = .060. Figure LaBarbera 2.2 presents the comparison view of this signature.

Figure LaBarbera 2.1. Questioned-Known Comparison Stimulus for LaBarbera Signature 2.

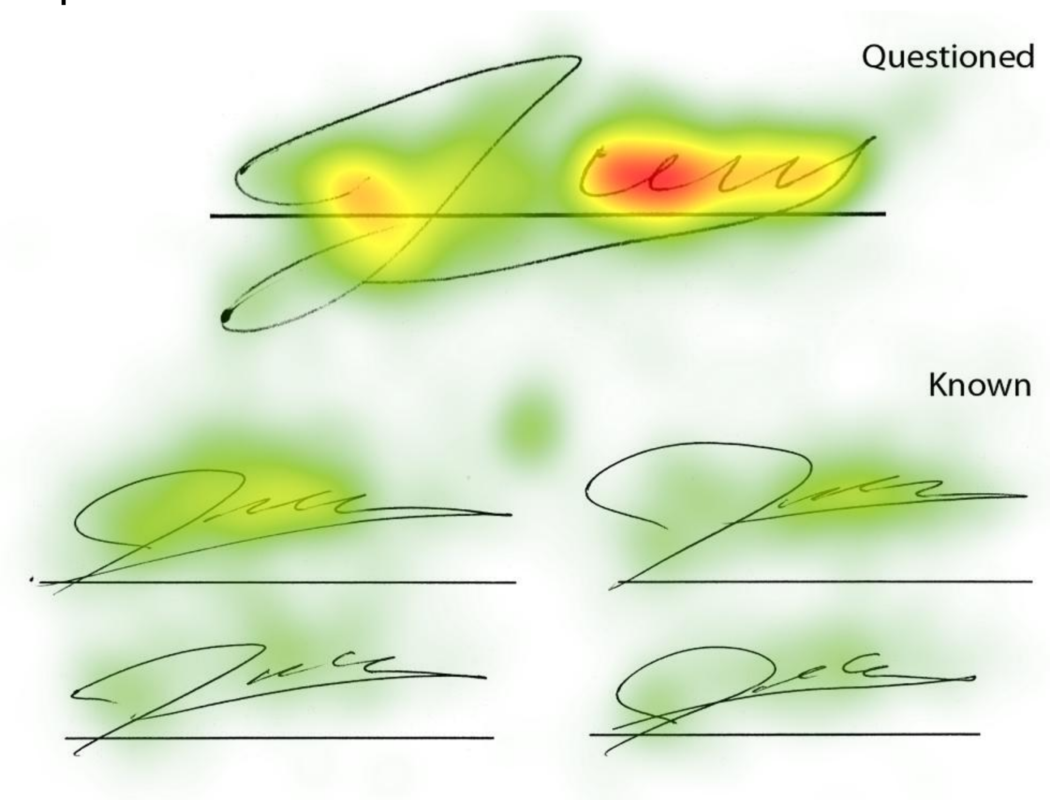


Selection of Areas of Interest (AOIs)

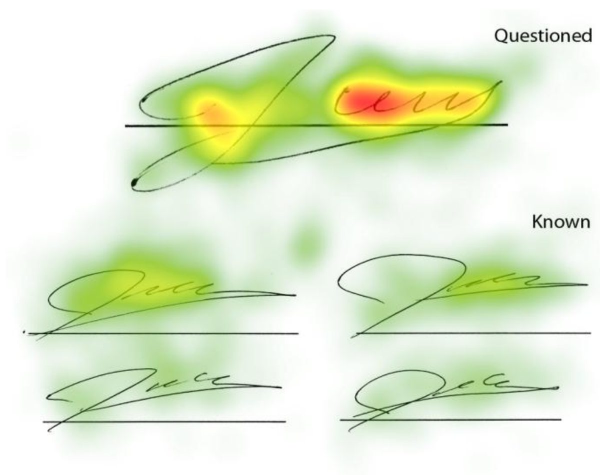
Figure LaBarbera 2.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were three locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of three AOIs for this stimulus. Figure LaBarbera 2.3 presents the location of the AOIs identified in the heat map.

Figure LaBarbera 2.2. Heat map for LaBarbera Signature 2, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

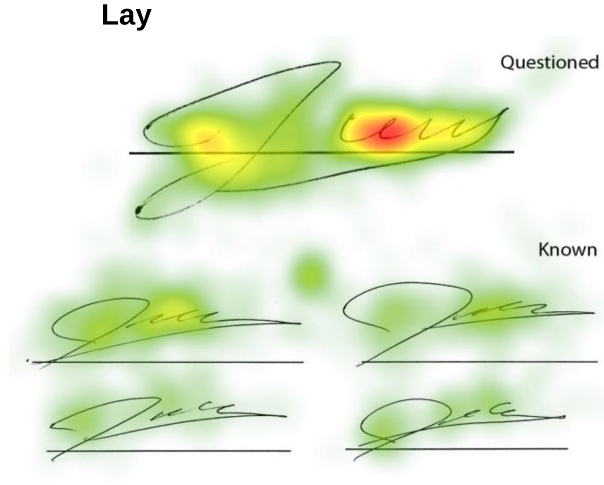
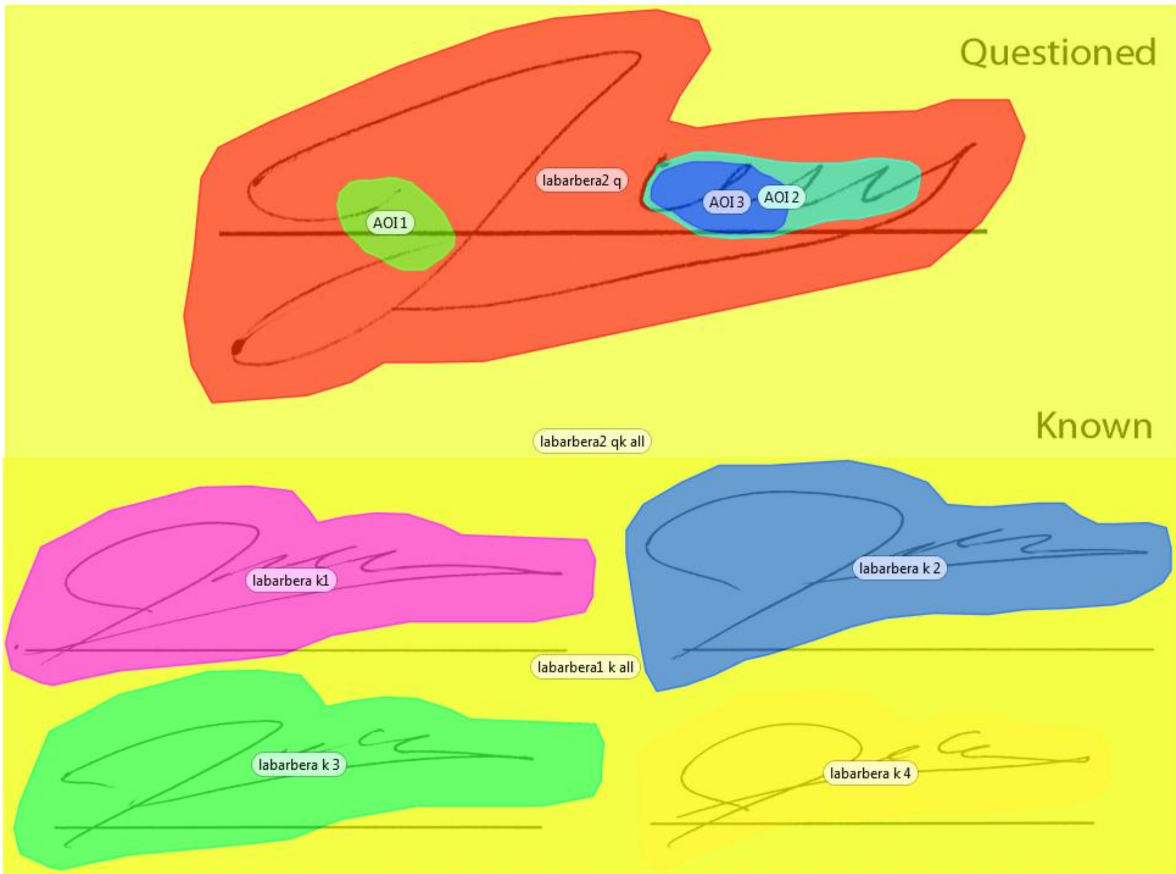


Figure LaBarbera 2.3. Areas of Interest (AOIs) for LaBarbera Signature 2.



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

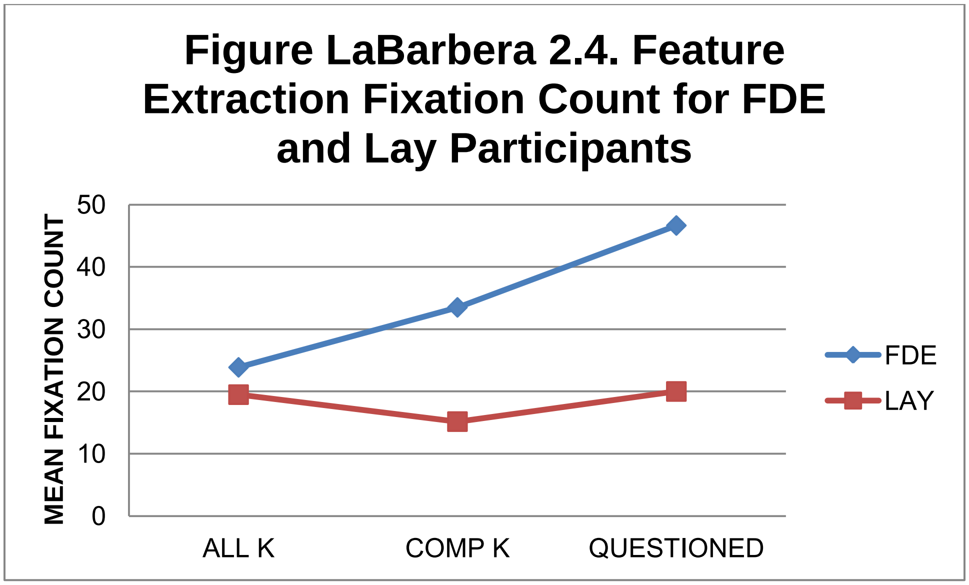
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the LaBarbera known signature stimulus (Knowns, not pictured here), LaBarbera 1K all (encompassing all the known signatures on the questioned/known comparison stimulus), and LaBarbera 2Q (the LaBarbera questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 3) are included in subsequent analyses. Figure LaBarbera 2.3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .187, F (3, 85) = 6.53, p = .001, multivariate η^2 = .187. Figure LaBarbera 2.4 presents the mean fixation counts by AOI.

Figure LaBarbera 2.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixations counts in two of the three areas of interest. Total fixation counts for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, F (1, 87) = 18.57, p < .001, partial η^2 = .176, and F (1, 87) = 15.25, p < .001, partial η^2 = .149.

Fixation counts in the known signature stimulus (ALL K) were not significantly different between groups, p = .289, *ns*. Table LaBarbera 2.1 presents the means and standard deviations for areas of interest by participant type.

Table LaBarbera 2.1

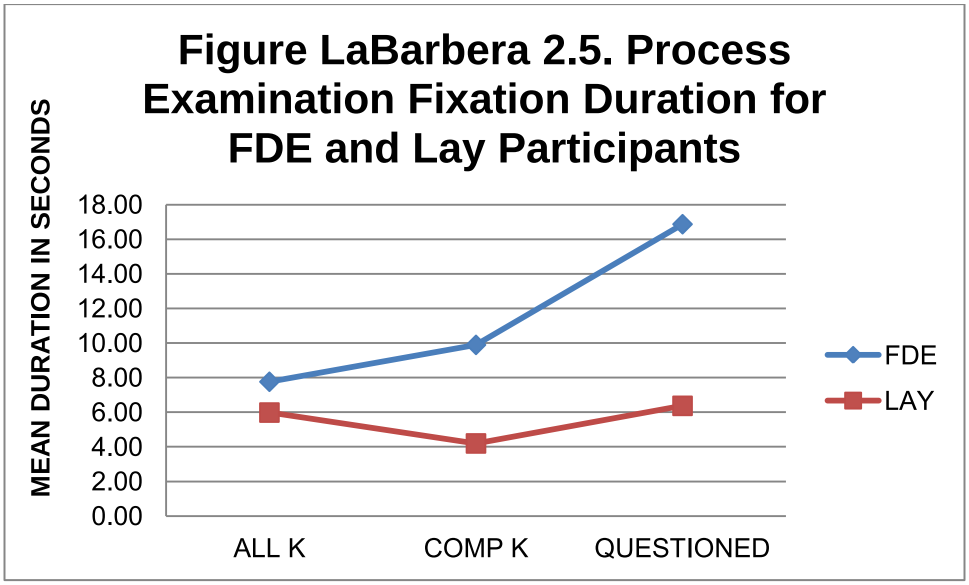
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		**Comp Knowns**		**QUESTIONED**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	23.87	19.88	33.5	27.71	46.65	33.85
LAY	19.49	18.78	15.16	13.86	20	23.1

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .200, F (3, 85) = 7.10, p < .001, multivariate η^2 = .200. Figure LaBarbera 2.5 presents the mean fixation duration by AOI.

Figure LaBarbera 2.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixations durations in two of the three areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, F (1, 87) = 20.33, p < .001, partial η^2 = .189, and F (1, 87) = 12.89, p = .001, partial η^2 = .129.

Fixation durations in the known signature stimulus (ALL K) were not significantly different between groups, p = .197, *ns*. Table LaBarbera 2.2 presents the means and standard deviations for areas of interest by participant type.

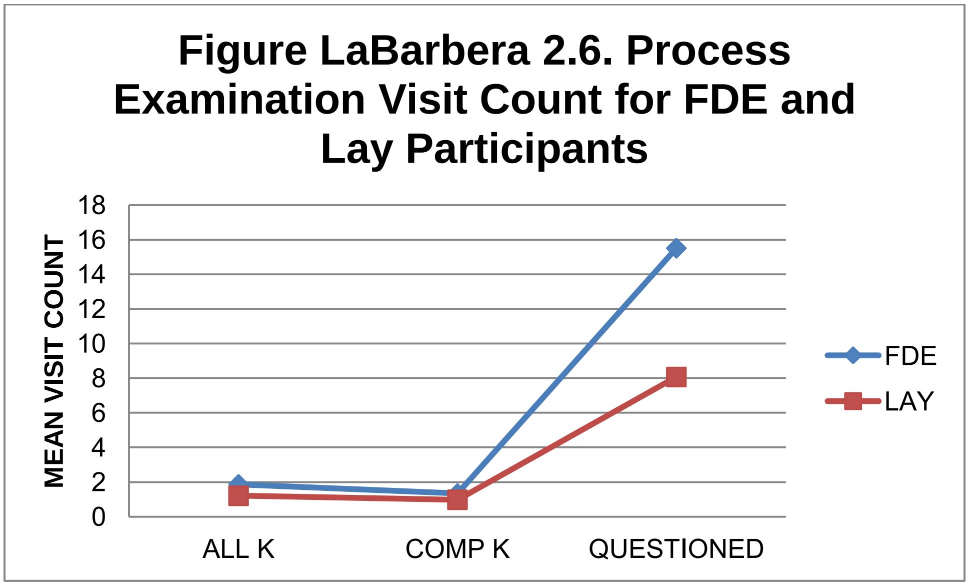
Table LaBarbera 2.2
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	7.76	7.37	9.89	9.70	16.87	13.78
LAY	5.98	5.31	4.19	3.90	6.37	6.79

Total Visit Count

MANOVA results reveal significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .20, F (3, 85) = 7.15, p < .001, multivariate η^2 = .20. Figure LaBarbera 2.6 presents the mean visit counts by AOI.

Figure LaBarbera 2.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant. Total visit counts for the questioned signature were significantly greater for FDEs than for Lay participants, F (1, 87) = 13.22, p < .001, partial η^2 = .14.

Fixation counts in the known signature stimulus were not significantly different between groups, p = .07, *ns*. Fixation counts in the known signature comparison stimulus were not significantly greater for FDEs than for Lay participants, p = .06, *ns*. Table LaBarbera 2.3 presents the means and standard deviations for areas of interest by participant type.

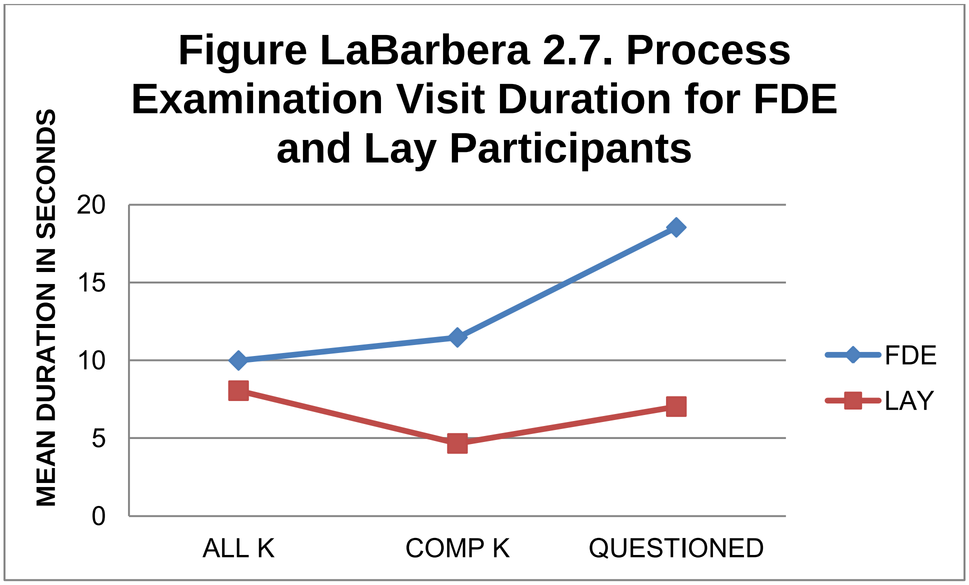
Table LaBarbera 2.3
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.87	2.27	1.34	1.18	15.51	11.28
Lay	1.21	0.8	0.98	0.34	8.07	7.59

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .201, F (3, 85) = 7.15, $p < .001$, multivariate $\eta^2 = .201$. Figure LaBarbera 2.7 presents the mean visit durations by AOI.

Figure LaBarbera 2.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in two of the three areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, F (1, 87) = 20.64, $p < .001$, partial $\eta^2 = .192$, and F (1, 87) = 15.59, $p < .001$, partial $\eta^2 = .152$.

Visit durations in the known signature stimulus (ALL K) were not significantly different between groups, $p = .282$, *ns*. Table LaBarbera 2.4 presents the means and standard deviations for areas of interest by participant type.

Table LaBarbera 2.4

Process Analysis Visit Duration for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	9.99	9.45	11.47	10.52	18.54	14.98
Lay	8.05	7.26	4.66	4.33	7.03	7.42

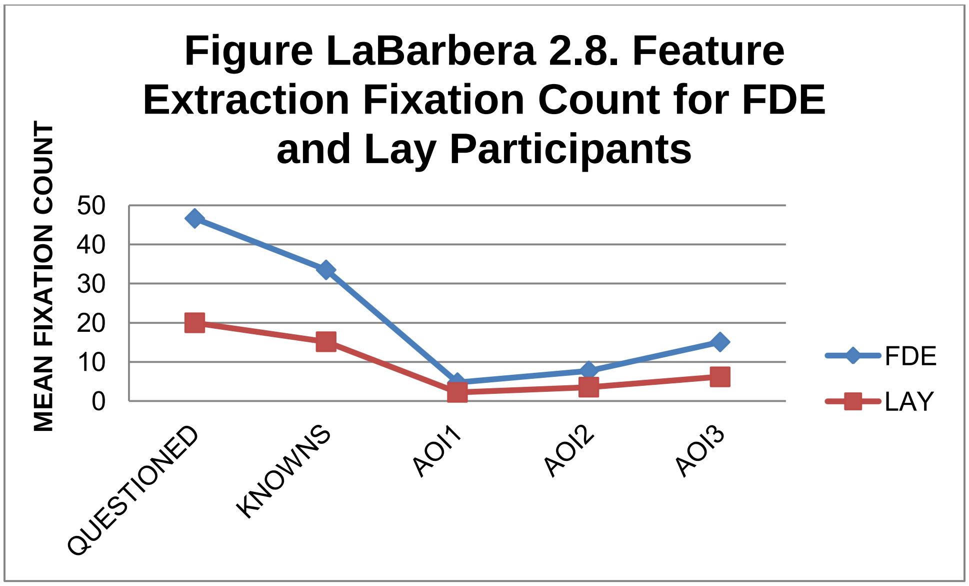
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .229, F (5, 83) = 4.92, p = .001, multivariate η^2 = .229. Figure LaBarbera 2.8 presents the mean fixation counts by AOI.

Figure LaBarbera 2.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation counts for the questioned signature and known signatures were significantly greater for FDEs than for Lay participants, F (1, 87) = 18.57, p < .001, partial η^2 =.76, and F (1, 87) = 15.25, p < .001, partial η^2 = .149.

Fixations counts in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, F (1, 87) = 12.24, p = .001, partial η^2 = .123; AOI 2, F (1, 87) = 18.20, p < .001, partial η^2 = .173; AOI 3, F (1, 87) = 23.55, p < .001, partial η^2 = .213. Table LaBarbera 2.5 presents the means and standard deviations for areas of interest by participant type.

Table LaBarbera 2.5

Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

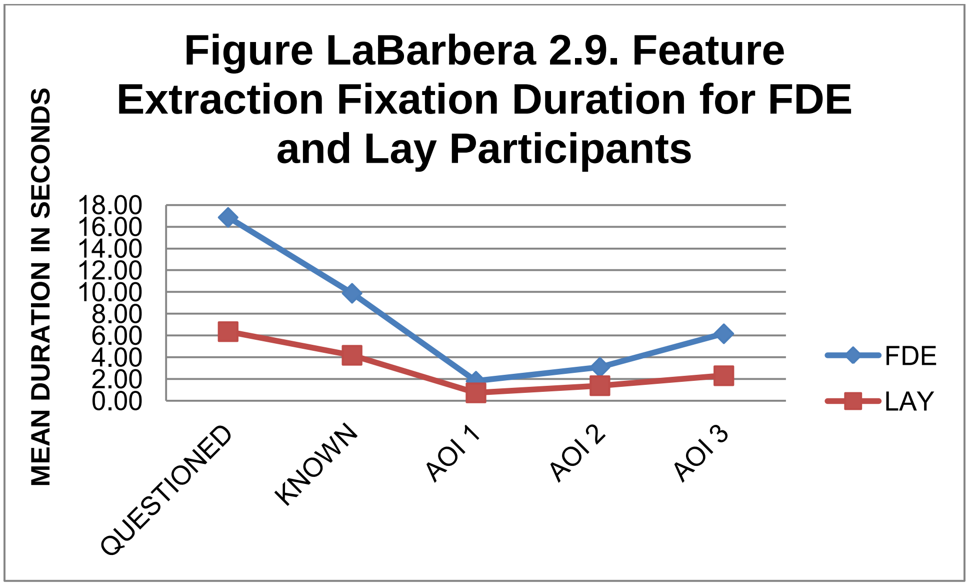
	QUESTIONED	KNOWN	AOI 1	AOI 2	AOI 3

Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	46.65	33.85	33.5	27.71	4.72	3.88	7.72	5.47	15.09	10.52
Lay	20	23.1	15.16	13.86	2.23	2.66	3.56	3.42	6.19	6.02

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .228, *F* (5, 83) = 4.91, *p* = .001, multivariate η^2 = .228. Figure LaBarbera 2.9 presents the mean fixation durations by AOI.

Figure LaBarbera 2.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation durations for the questioned signature and the known signatures were significantly greater for FDEs than for Lay participants, *F* (1, 87) = 20.33, *p* < .001, partial η^2 = .189, and *F* (1, 87) = 12.89, *p* = .001, partial η^2 = .129.

Fixation durations in most AOIs were significantly greater for FDEs than for Lay participants (AOI 1, *F* (1, 87) = 10.63, *p* = .002, partial η^2 = .109; AOI 2, *F* (1, 87) = 12.28, *p* = .001, partial η^2 = .124; AOI 3, *F* (1, 87) = 17.92, *p* < .001, partial η^2 = .171). Table LaBarbera 2.6 presents the means and standard deviations for areas of interest by participant type.

Table LaBarbera 2.6

Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

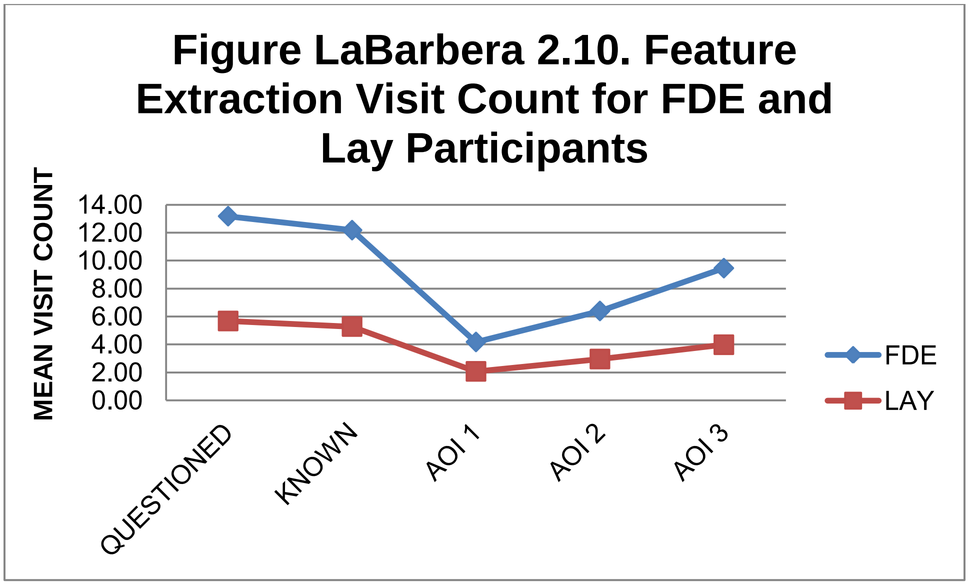
	QUESTIONED	KNOWN	AOI 1	AOI 2	AOI 3

Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	16.87	13.78	9.89	9.7	1.82	1.97	3.09	2.84	6.18	5.55
Lay	6.37	6.79	4.19	3.9	0.74	0.91	1.4	1.44	2.32	2.28

Total Visit Count

MANOVA results did reveal significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .224, F (5, 83) = 4.78, p = .001, multivariate η^2 = .224. Figure LaBarbera 2.10 presents the mean total visit counts by AOI.

Figure LaBarbera 2.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit counts for the questioned signature and known signatures were significantly greater for FDEs than for Lay participants, F (1, 87) = 16.23, p < .001, partial η^2 = .157, and F (1, 87) = 17.65, p < .001, partial η^2 = .169.

Visit counts in all three AOIs were significantly greater for FDEs than for Lay participants (AOI 1, F (1, 87) = 11.30, p = .001, partial η^2 = .115; AOI 2, F (1, 87) = 18.18, p < .001, partial η^2 = .173; AOI 3, F (1, 87) = 23.18, p < .001, partial η^2 = .210). Table LaBarbera 2.7 presents the means and standard deviations for areas of interest by participant type.

Table LaBarbera 2.7

Feature Extraction Analysis Visit Count for FDE and Lay Participants

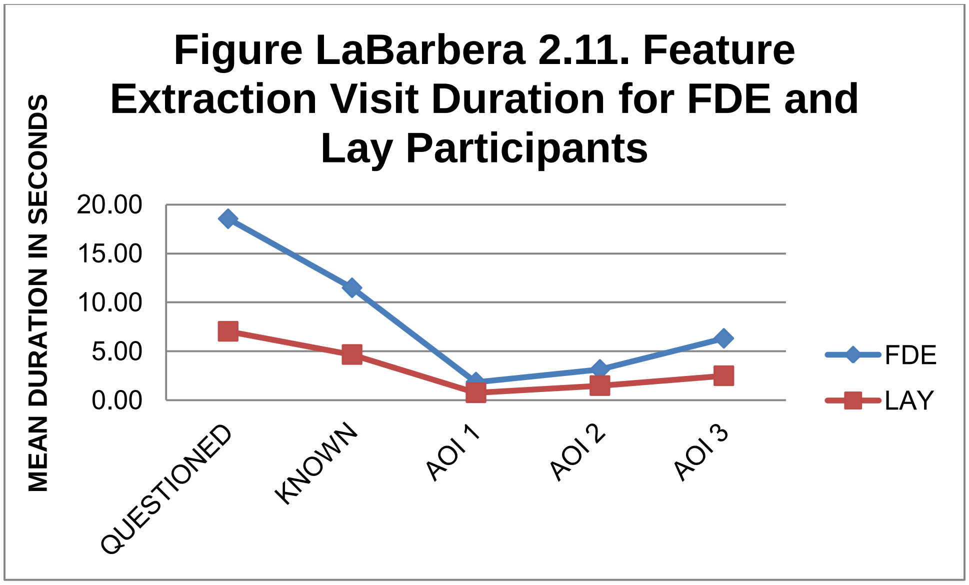
	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**		**AOI 3**	
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*

FDE	13.17	10.77	12.17	9.33	4.17	3.39	6.39	4.56	9.46	6.48
Lay	5.67	5.94	5.28	5.54	2.07	2.38	2.95	2.77	3.98	3.82

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .223, F (5, 83) = 4.75, p = .001, multivariate η^2 = .223. Figure LaBarbera 2.11 presents the mean total visit counts by AOI.

Figure LaBarbera 2.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit durations for the questioned signature and known signatures were significantly greater for FDEs than for Lay participants, F (1, 87) = 20.64, p < .001, partial η^2 = .192, and F (1, 87) = 15.59, p < .001, partial η^2 = .152.

Visit durations in all AOIs was significantly greater for FDEs than for Lay participants (AOI 1, F (1, 87) = 10.89, p = .001, partial η^2 = .111; AOI 2, F (1, 87) = 11.18, p = .001, partial η^2 = .114; AOI 3, F (1, 87) = 16.68, p < .001, partial η^2 = .161). Table LaBarbera 2.8 presents the means and standard deviations for areas of interest by participant type.

Table LaBarbera 2.8

Feature Extraction Analysis Visit Duration for FDE and Lay Participants

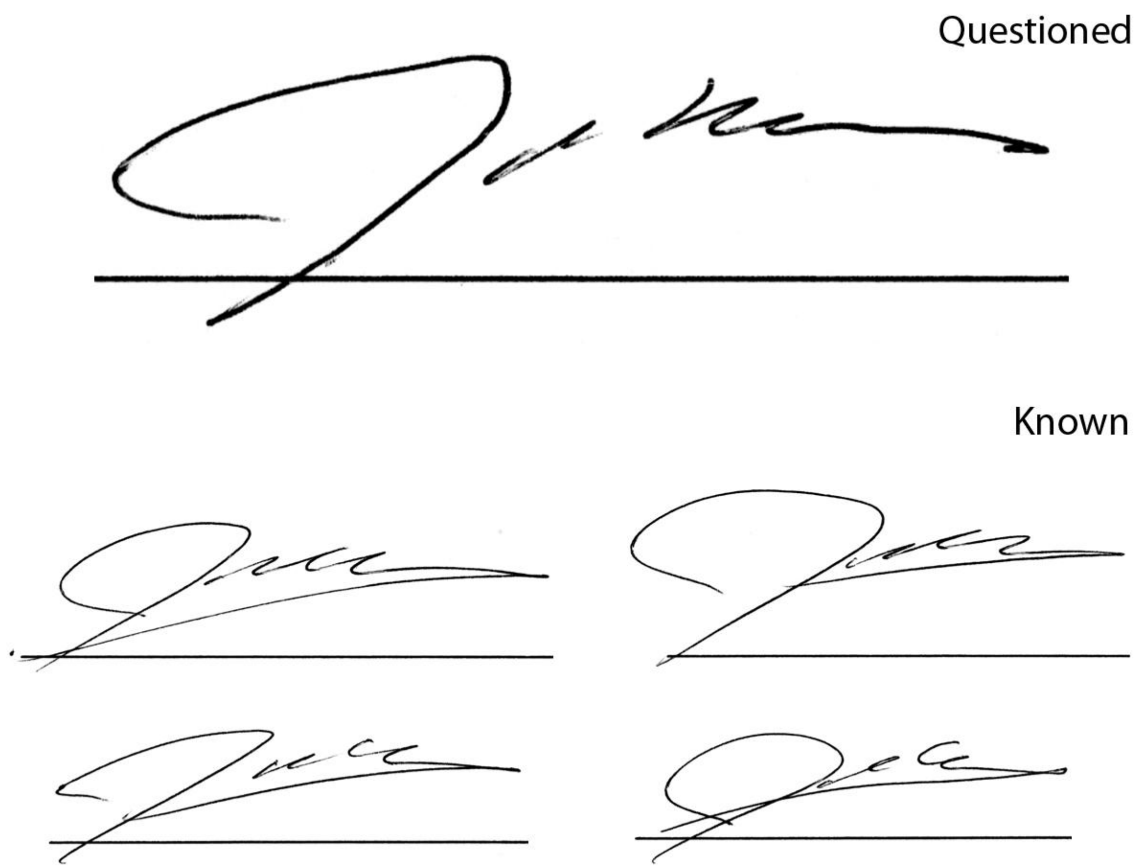
	QUESTIONED		KNOWN		AOI 1		AOI 2		AOI 3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	18.54	14.98	11.47	10.52	1.85	1.99	3.13	2.89	6.31	5.67

Lay	7.03	7.42	4.66	4.33	0.75	0.92	1.48	1.54	2.49	2.42

LaBarbera Signature 3: Disguised (Non-Genuine)

Of the 49 FDE participants, 42 responded correctly that the signature was non-genuine specimen, while 6 FDEs identified the signature as genuine. One FDE declined to respond. Of the 43 Lay participants, 36 responded correctly that the signature was non-genuine, while 7 responded that the signature was genuine. This difference was not statistically significant, p = .562, *ns*. Figure LaBarbera 3.1 presents the comparison view of this signature.

Figure LaBarbera 3.1. Questioned-Known Comparison Stimulus for LaBarbera Signature 3.

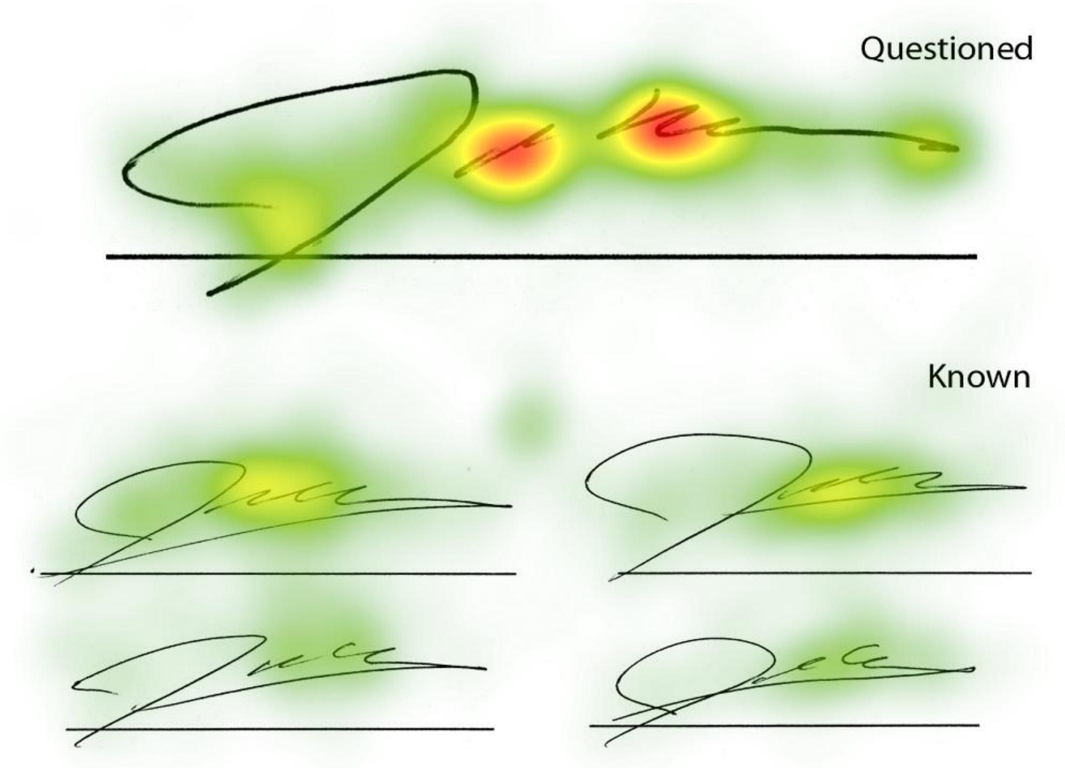


Selection of Areas of Interest (AOIs)

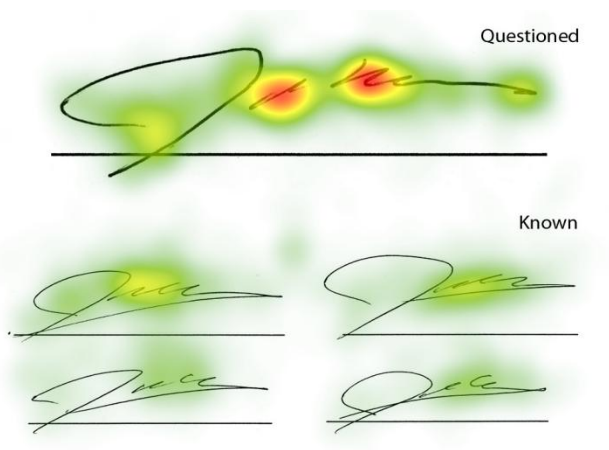
Figure LaBarbera 3.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were two locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of two AOIs for this stimulus. Figure LaBarbera 3.3 presents the location of the AOIs identified in the heat map.

Figure LaBarbera 3.2. Heat map for LaBarbera signature 3, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

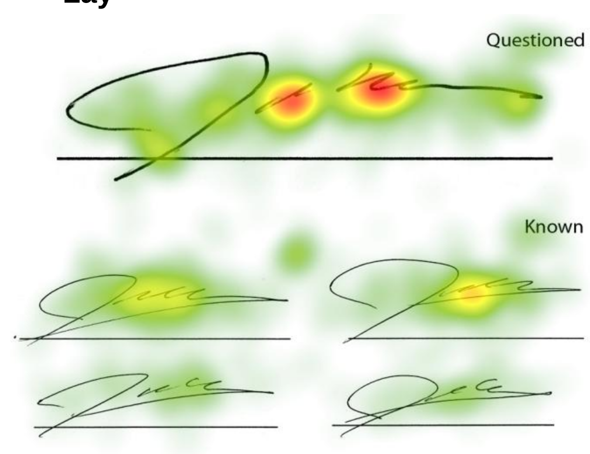
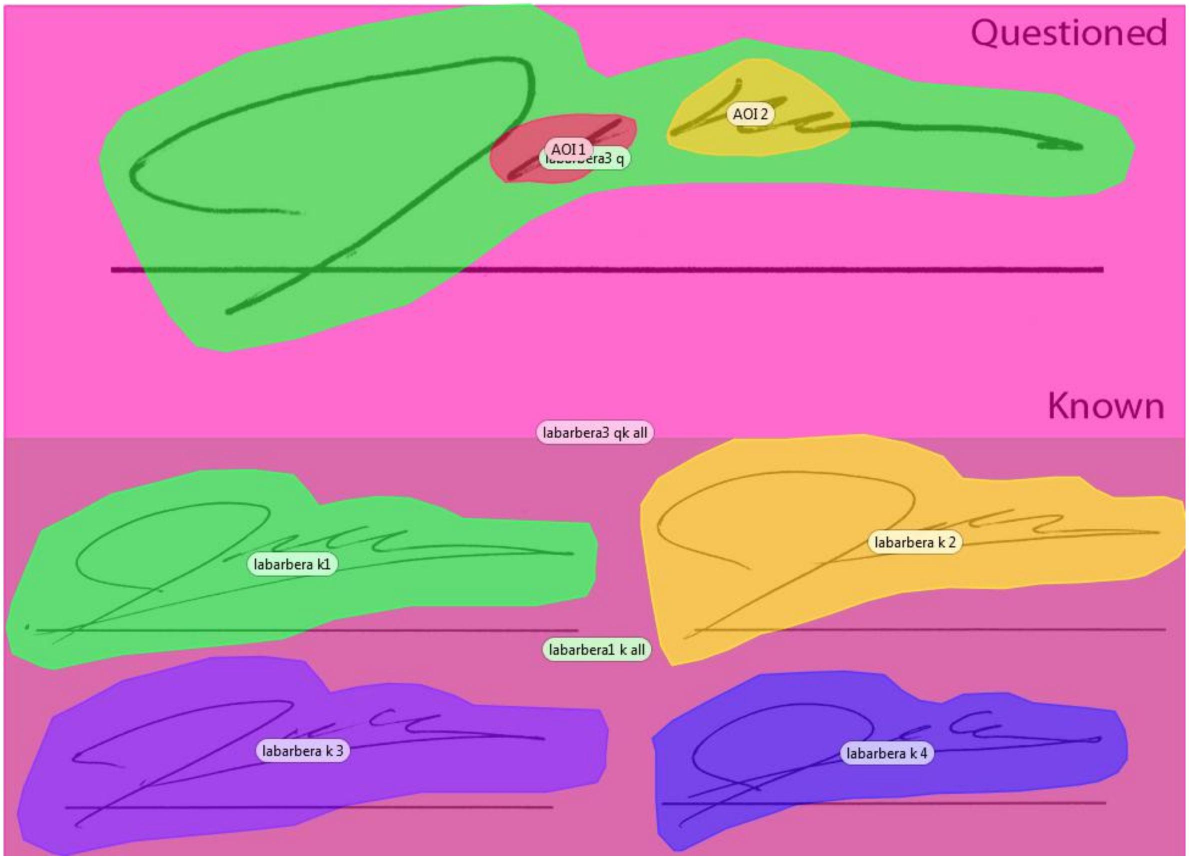


Figure LaBarbera 3.3. Areas of Interest (AOIs) for LaBarbera Signature 3.



Eye-Tracking Metrics Analyses

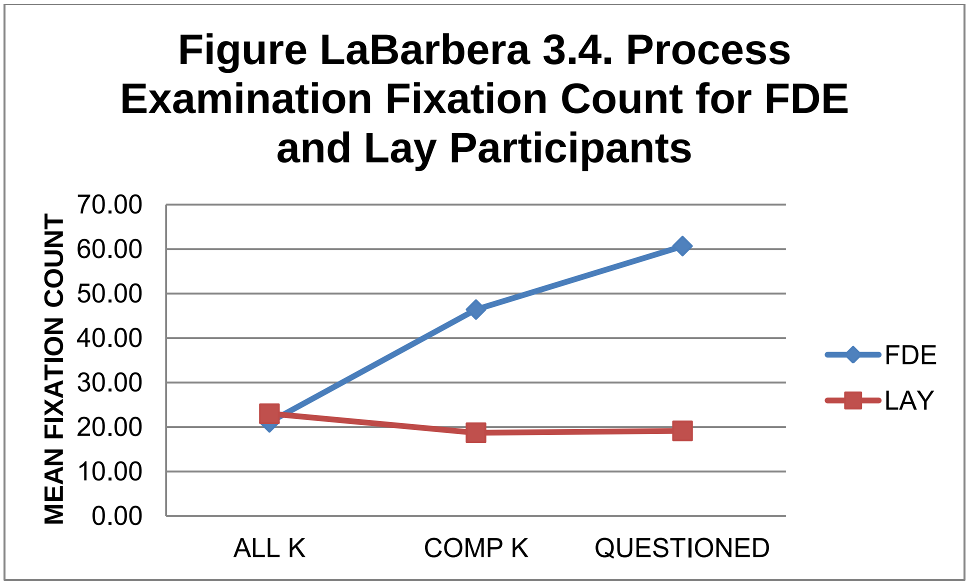
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .336, F (3, 86) = 14.48, p = .001, multivariate η^2 = .336. Figure LaBarbera 3.4 presents the mean fixation counts by AOI.

Figure LaBarbera 3.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixations counts in two of the three areas of interest. Total fixation counts for the questioned signature and the known comparison signatures (COMP K) were significantly greater for FDEs than for Lay participants, F (1, 88) = 27.50, p < .001, partial η^2 = .24, and F(1, 88) = 13.63, p < .001, partial η^2 = .14.

Fixation counts in the known signature comparison stimulus were greater for Lay participants than for FDEs, but this difference was not statistically significant (p = .649, *ns*). Table LaBarbera 3.1 presents the means and standard deviations for areas of interest by participant type.

Table LaBarbera 3.1

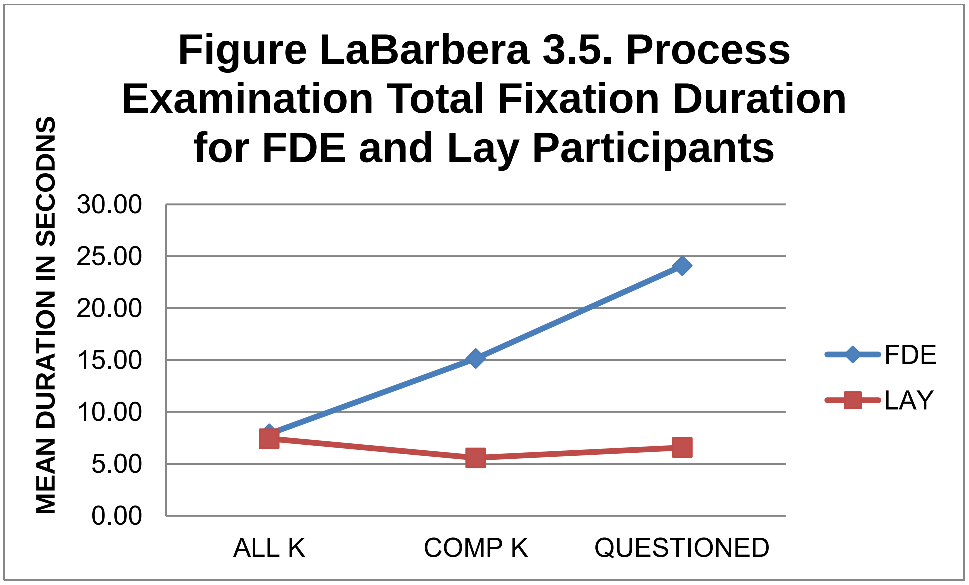
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	21.02	22.82	46.38	47.37	60.66	50.03
Lay	22.98	17.08	18.70	13.73	19.12	14.56

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .262, F (3, 86) = 10.19, p < .001, multivariate η^2 = .262. Figure LaBarbera 3.5 presents the mean fixation counts by AOI.

Figure LaBarbera 3.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixations counts in two of the three areas of interest. Total fixation durations for the questioned signature and the known comparison signatures (COMP K) were significantly greater for FDEs than for Lay participants, $F(1, 88) = 24.19$, $p < .001$, partial $\eta^2 = .216$, and $F(1, 88) = 15.43$, $p < .001$, partial $\eta^2 = .149$.

Fixation durations in the known signature comparison stimulus were greater for FDEs and for Lay participants, but this difference was not statistically significant ($p = .801$, *ns*). Table LaBarbera 3.2 presents the means and standard deviations for areas of interest by participant type.

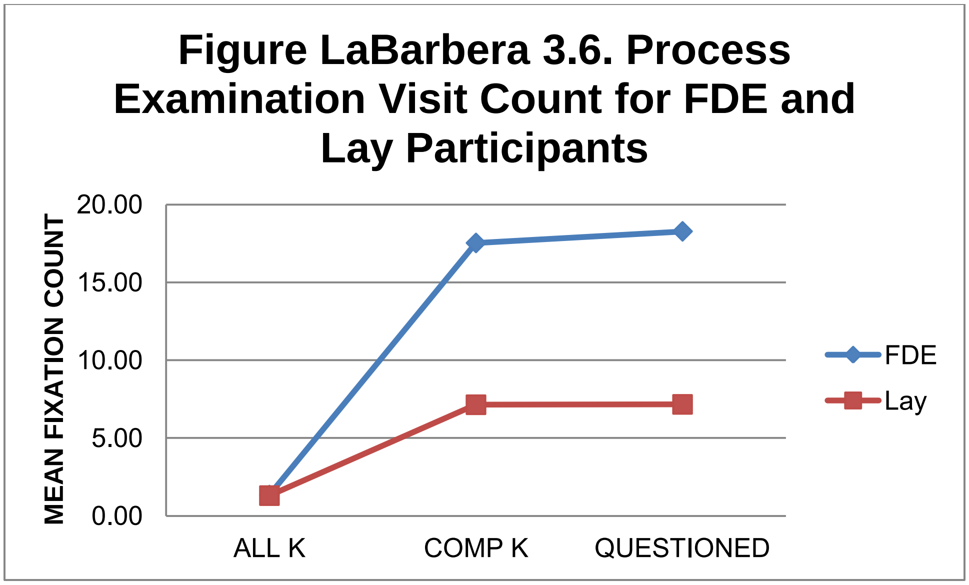
Table LaBarbera 3.2
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	7.89	11.00	15.14	15.47	24.08	22.82
Lay	7.41	6.12	5.56	4.24	6.57	5.03

Total Visit Count

MANOVA results reveal significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .166, $F(3, 86) = 5.70$, $p = .001$, multivariate $\eta^2 = .166$. Figure LaBarbera 3.6 presents the mean visit counts by AOI.

Figure LaBarbera 3.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in two of the three areas of interest. Total visit counts for the questioned signature and the known comparison signatures (COMP K) were significantly greater for FDEs than for Lay participants, F (1, 88) = 16.70, p < .001, partial η^2 = .160, and F(1, 88) = 15.31, p < .001, partial η^2 = .148.

Visit counts in the known signature comparison stimulus were greater for Lay participants than for FDEs, but this difference was not statistically significant (p = .852, *ns*). Table LaBarbera 3.3 presents the means and standard deviations for areas of interest by participant type.

Table LaBarbera 3.3

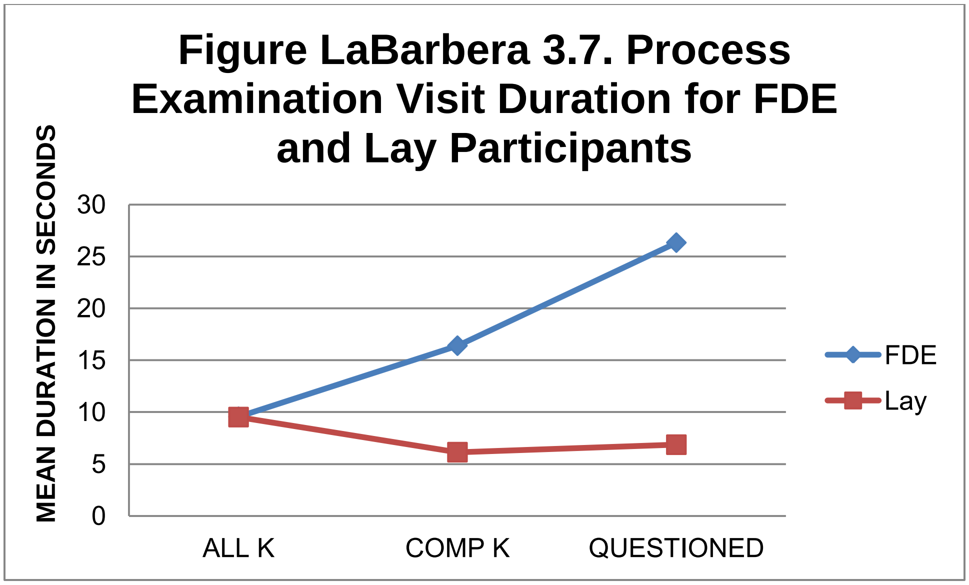
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.34	0.87	17.53	16.66	18.28	16.99
Lay	1.30	1.06	7.14	5.28	7.16	5.64

<u>Total Visit Duration</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .315, F (3, 86) = 13.18, p < .001, multivariate η^2 = .316. Figure LaBarbera 3.7 presents the mean visit durations by AOI.

Figure LaBarbera 3.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in two of the three areas of interest. Total visit counts for the questioned signature and the known comparison signatures (COMP K) were significantly greater for FDEs than for Lay participants, F (1, 88) = 27.65, p < .001, partial η^2 = .239, and F(1, 88) = 14.9831, p < .001, partial η^2 = .145.

Visit counts in the known signature comparison stimulus were greater for Lay participants than for FDEs, but this difference was not statistically significant (p = .989, *ns*). Table LaBarbera 3.4 presents the means and standard deviations for areas of interest by participant type.

Table LaBarbera 3.4

Process Analysis Visit Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	9.55	12.16	16.4	16.84	26.33	23.76
Lay	9.52	7.24	6.14	4.5	6.86	5.17

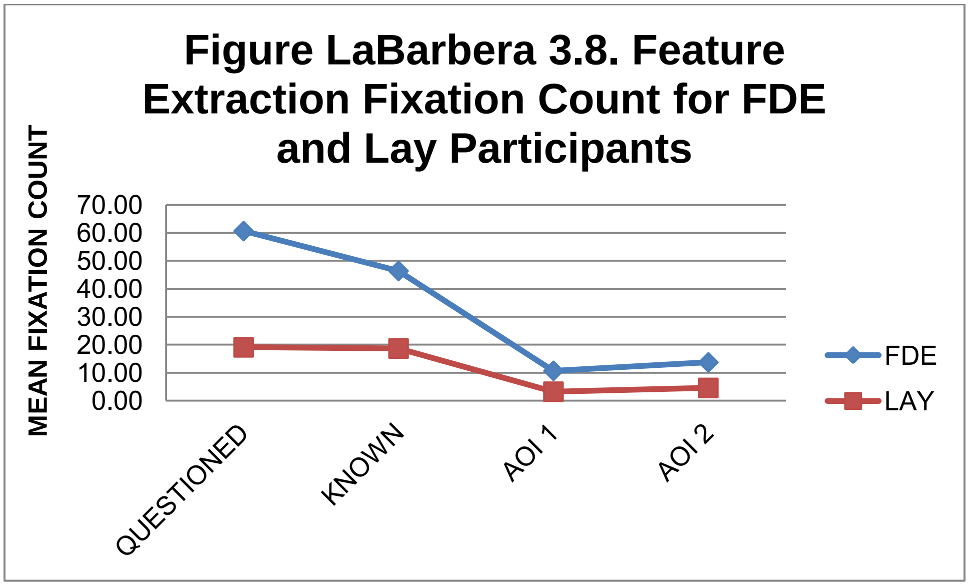
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

<u>*Total Fixation Count*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .299, F (4, 85) = 9.06, p < .001, multivariate η^2 = .299. Figure LaBarbera 3.8 presents the mean fixation counts by AOI.

Figure LaBarbera 3.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation counts in all areas of interest. Total fixation counts for the questioned signature and the known comparison signatures were significantly greater for FDEs than for Lay participants, F (1, 88) = 27.50, p < .001, partial η^2 = .238, and F(1, 88) = 13.63, p < .001, partial η^2 = .134.

Fixation counts in the AOIs were also greater for FDEs than for Lay participants (AOI 1, F (1, 88) = 21.40, p < .001, partial η^2 = .193; AOI 2, F (1, 88) = 18.82, p < .001, partial η^2 = .176). Table LaBarbera 3.5 presents the means and standard deviations for areas of interest by participant type.

Table LaBarbera 3.5

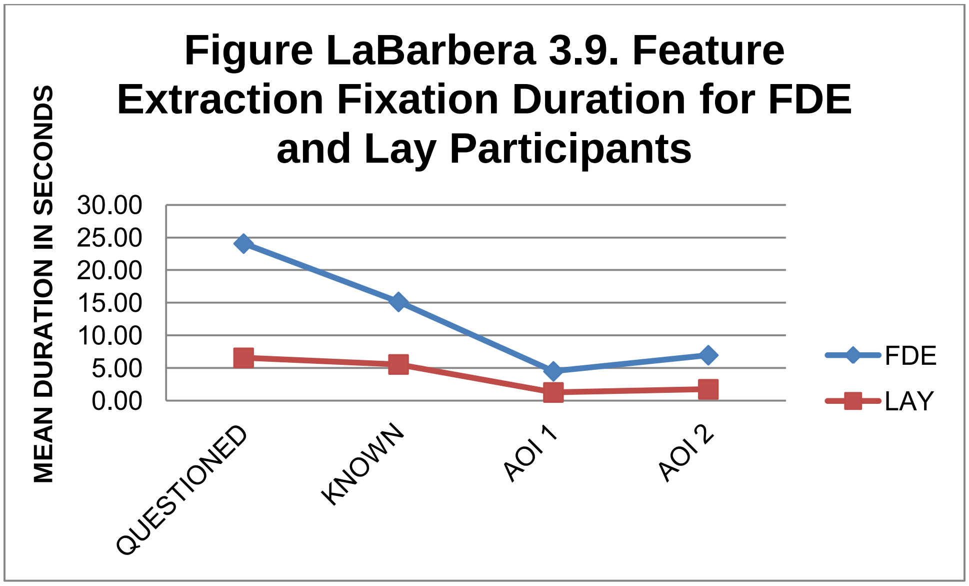
Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	60.66	50.03	46.38	47.37	10.7	10.23	13.72	13.11
Lay	19.12	14.56	18.7	13.73	3.23	2.84	4.58	4.55

<u>*Total Fixation Duration*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .276, F (4, 85) = 8.11, p < .001, multivariate η^2 = .276. Figure LaBarbera 3.9 presents the mean fixation durations by AOI.

Figure LaBarbera 3.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation durations in all areas of interest. Total fixation durations for the questioned signature and the known comparison signatures were significantly greater for FDEs than for Lay participants, F (1, 88) = 24.19, p < .001, partial η^2 = .216, and F(1, 88) = 15.43, p < .001, partial η^2 = .149.

Fixation durations in the AOIs were also greater for FDEs than for Lay participants (AOI 1, F (1, 88) = 16.23, p < .001, partial η^2 = .156; AOI 2, F (1, 88) = 19.25, p < .001, partial η^2 = .180). Table LaBarbera 3.6 presents the means and standard deviations for areas of interest by participant type.

Table LaBarbera 3.6

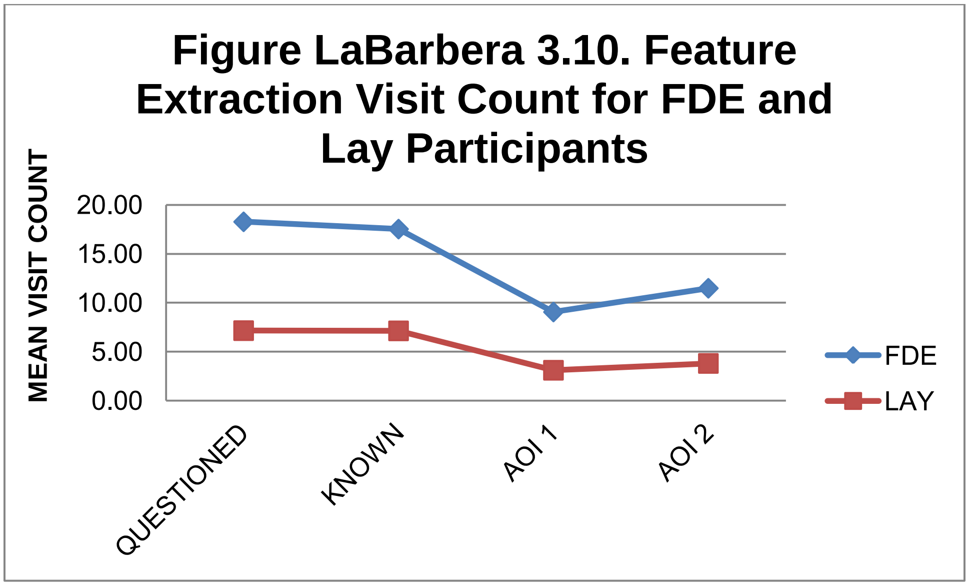
Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	24.08	22.82	15.14	15.47	4.5	5.12	6.98	7.58
Lay	6.57	5.03	5.56	4.24	1.28	1.22	1.75	1.94

Total Visit Count

MANOVA results did reveal significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .177, F (4, 85) = 4.58, p = .002, multivariate η^2 = .177. Figure LaBarbera 3.10 presents the mean total visit counts by AOI.

Figure LaBarbera 3.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit counts for the questioned signature and the known comparison signatures were significantly greater for FDEs than for Lay participants, F (1, 88) = 16.70, p < .001, partial η^2 = .160, and F(1, 88) = 15.31, p < .001, partial η^2 = .148.

Visit counts in the AOIs were also greater for FDEs than for Lay participants (AOI 1, F (1, 88) = 16.85, p < .001, partial η^2 = .161; AOI 2, F (1, 88) = 17.99, p < .001, partial η^2 = .170). Table LaBarbera 3.7 presents the means and standard deviations for areas of interest by participant type.

Table LaBarbera 3.7

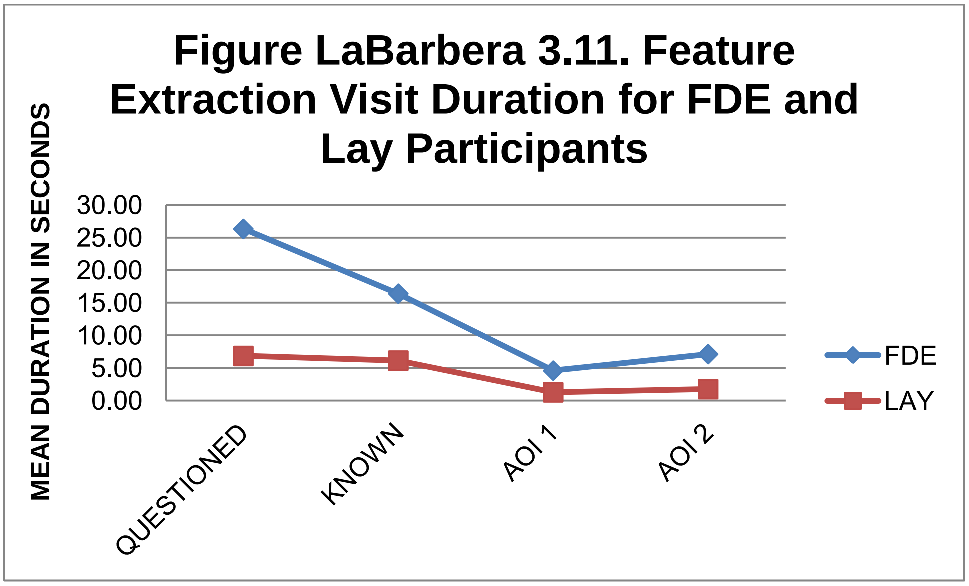
Feature Extraction Analysis Visit Count for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	18.28	16.99	17.53	16.66	9.06	9.12	11.49	11.33
Lay	7.16	5.64	7.14	5.28	3.12	2.78	3.81	3.67

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .324, F (4, 85) = 10.19, $p < .001$, multivariate $\eta^2 = .324$. Figure LaBarbera 3.11 presents the mean total visit counts by AOI.

Figure LaBarbera 3.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit durations for the questioned signature and the known comparison signatures were significantly greater for FDEs than for Lay participants, F (1, 88) = 16.70, $p < .001$, partial $\eta^2 = .160$, and F(1, 88) = 15.31, $p < .001$, partial $\eta^2 = .148$.

Visit durations in the AOIs were also greater for FDEs than for Lay participants (AOI 1, F (1, 88) = 16.85, $p < .001$, partial $\eta^2 = .161$; AOI 2, F (1, 88) = 17.99, $p < .001$, partial $\eta^2 = .170$). Table LaBarbera 3.8 presents the means and standard deviations for areas of interest by participant type.

Table LaBarbera 3.8

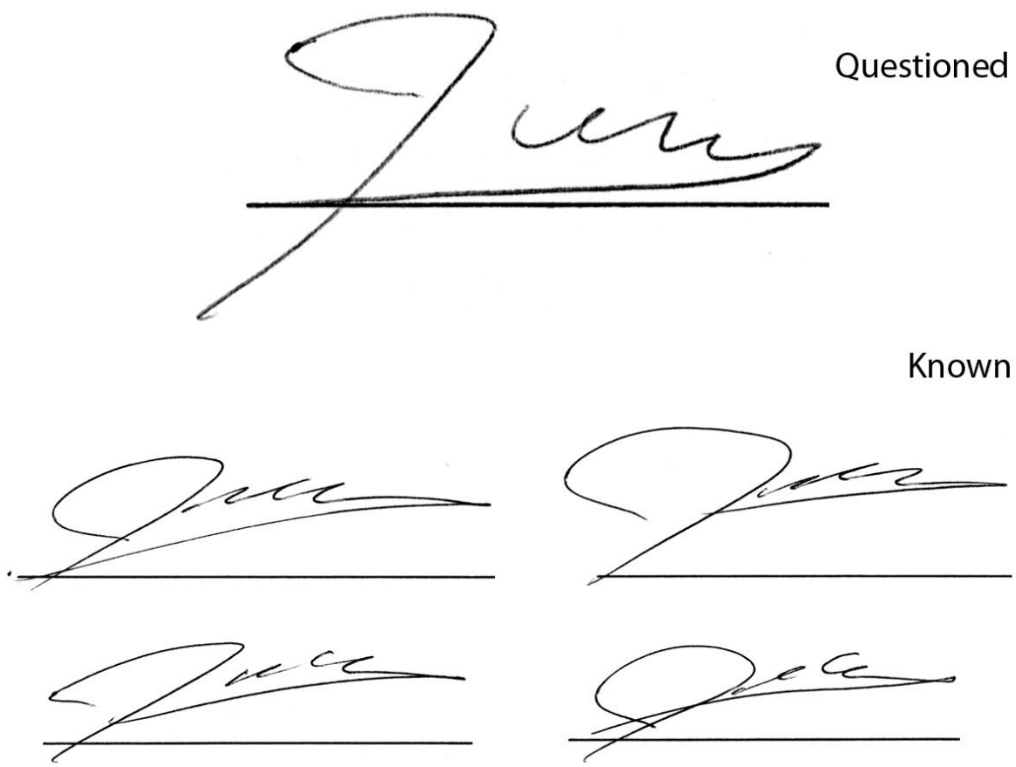
Feature Extraction Analysis Visit Durations for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	26.33	23.76	16.4	16.84	4.6	5.2	7.14	7.7
Lay	6.86	5.17	6.14	4.5	1.28	1.22	1.77	1.95

LaBarbera Signature 4: Freehand Simulation (Non-Genuine)

All 49 FDEs responded correctly that the signature was a non-genuine specimen. Of the 43 Lay participants, 38 responded correctly that the signature was non-genuine, while 5 responding that the signature was genuine. This difference was statistically significant, χ^2 (2, N = 92) = 6.03, p = .014. Figure LaBarbera 4.1 presents the comparison view of this signature.

Figure LaBarbera 4.1. Questioned-Known Comparison Stimulus for LaBarbera Signature 4.

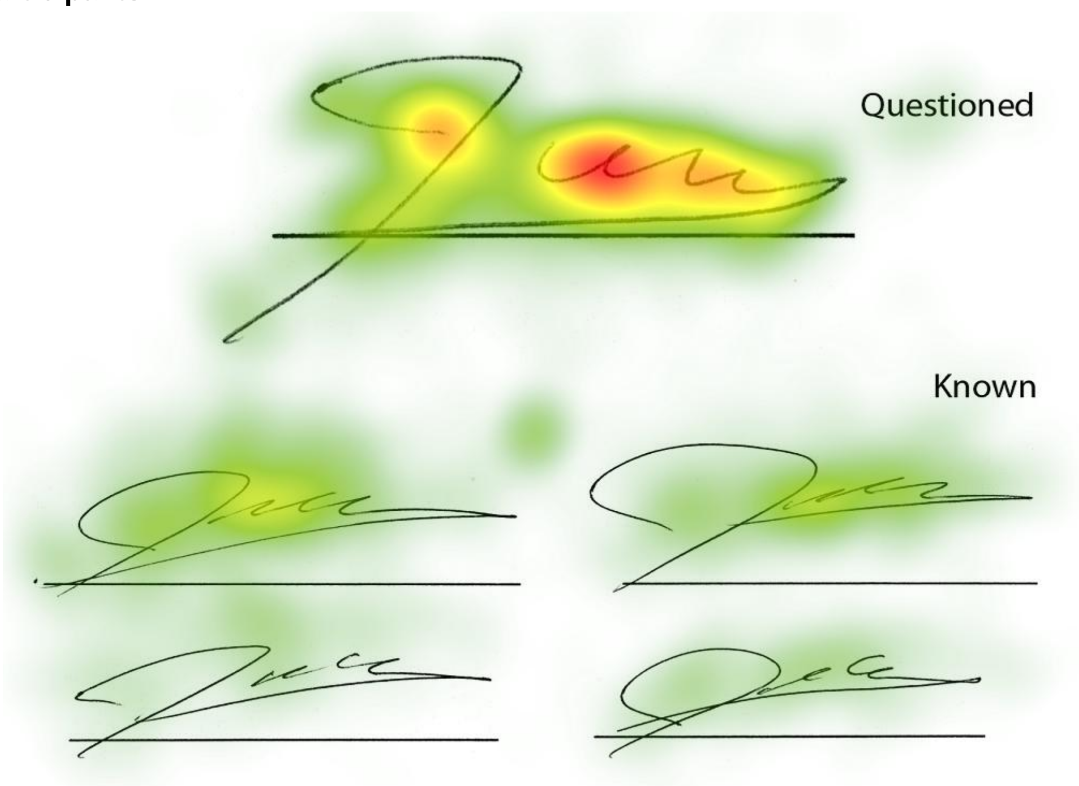


Selection of Areas of Interest (AOIs)

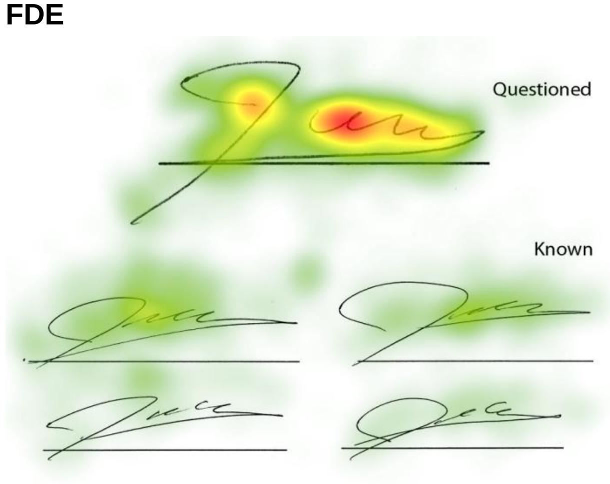
Figure LaBarbera 4.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were three locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of three AOIs for this stimulus. Figure LaBarbera 4.3 presents the location of the AOIs identified in the heat map.

Figure LaBarbera 4.2. Heat map for LaBarbera signature 4, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

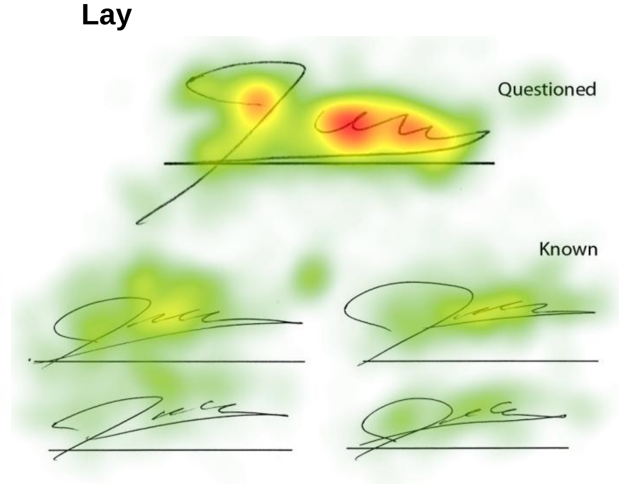
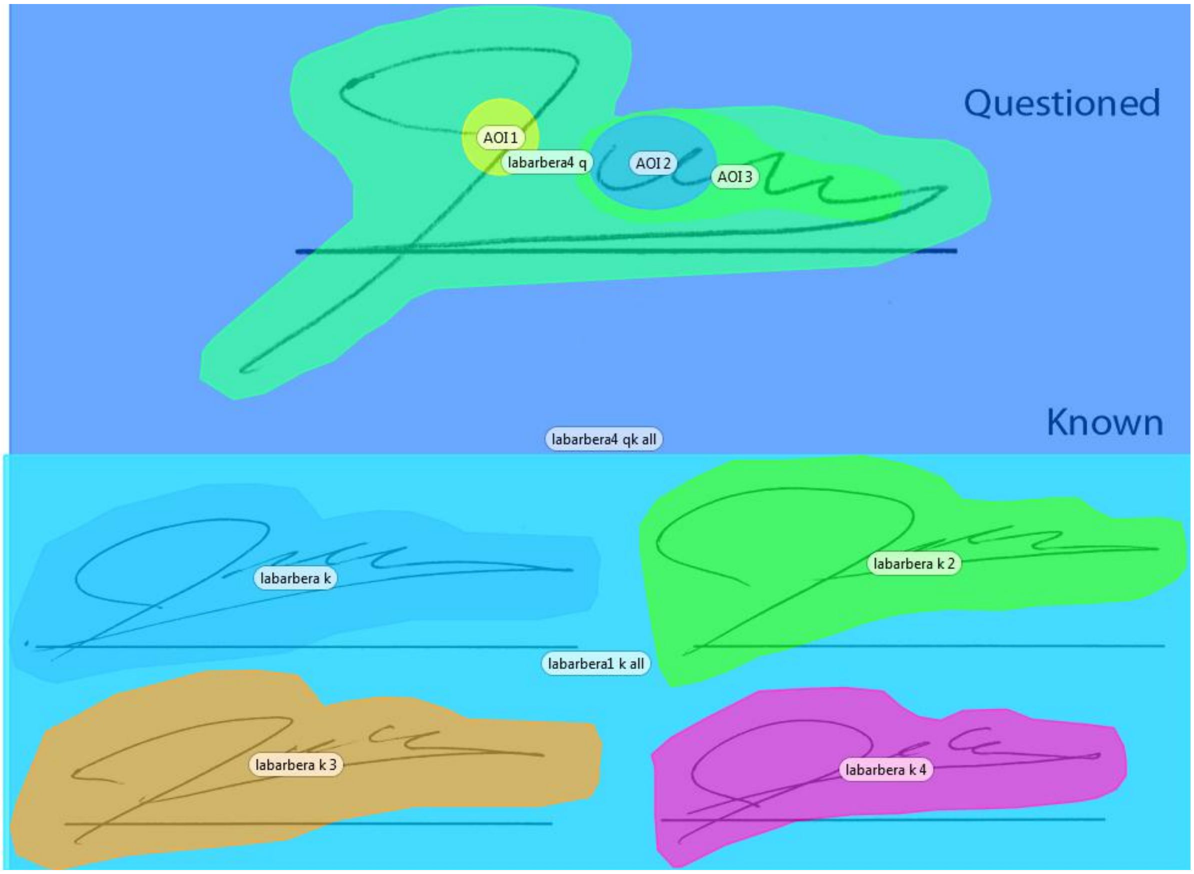


Figure LaBarbera 4.3. Areas of Interest (AOIs) for LaBarbera Signature 4.



A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

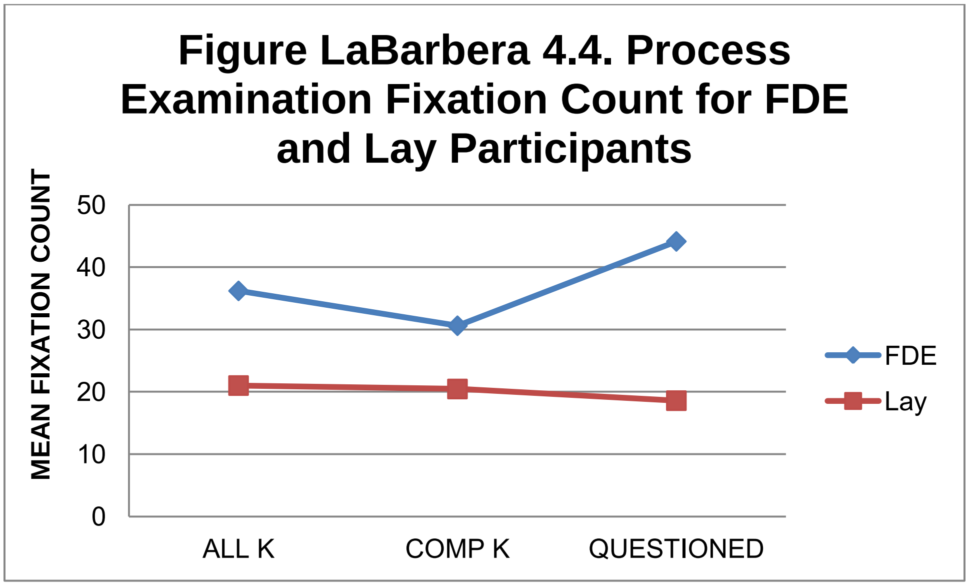
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the LaBarbera known signature stimulus (Knowns, not pictured here), LaBarbera1 K all (encompassing all the known signatures on the questioned/known comparison stimulus), and LaBarbera4 Q (the LaBarbera questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 3) are included in subsequent analyses. Figure LaBarbera 4.3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .263, F (3, 86) = 10.25, p < .001, multivariate η^2 = .263. Figure LaBarbera 4.4 presents the mean fixation counts by AOI.

Figure LaBarbera 4.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixations counts in two of the three areas of interest. Total fixation counts for the questioned signature and the known signature stimulus (ALL K) were significantly greater for FDEs than for Lay participants, F (1, 88) = 18.44, p < .001, partial η^2 = .173, and F (1, 88) = 5.90, p = .017, partial η^2 = .063.

Fixation counts in the known signature comparison stimulus (COMP K) were not significantly different, p = .134, *ns*. Table LaBarbera 4.1 presents the means and standard deviations for areas of interest by participant type.

Table LaBarbera 4.1

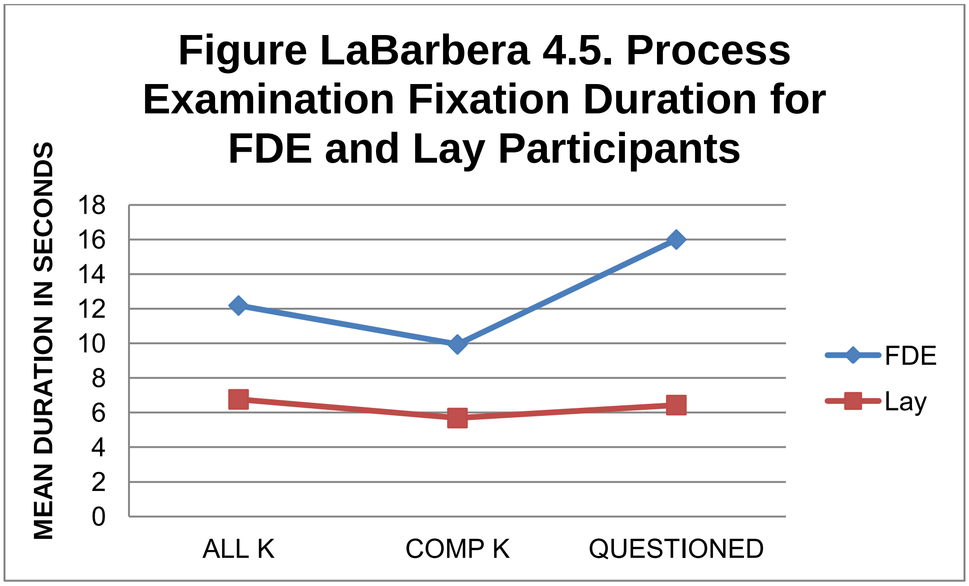
Examination Process Fixation Counts for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	36.21	37.8	30.62	36.51	44.15	35.58
Lay	21.02	16.61	20.47	25.77	18.6	16.7

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .249, F (3, 86) = 9.51, p < .001, multivariate η^2 = .249. Figure LaBarbera 4.5 presents the mean fixation counts by AOI.

Figure LaBarbera 4.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixations durations in two of the three areas of interest. Total fixation durations for the questioned signature and the known signature stimulus (ALL K) were significantly greater for FDEs than for Lay participants, F (1, 88) = 19.84, p < .001, partial η^2 = .184, and F (1, 88) = 6.18, p = .015, partial η^2 = .066.

Fixation durations in the known signature comparison stimulus (COMP K) were not significantly different, p = .088, *ns*. Table LaBarbera 4.2 presents the means and standard deviations for areas of interest by participant type.

Table LaBarbera 4.2

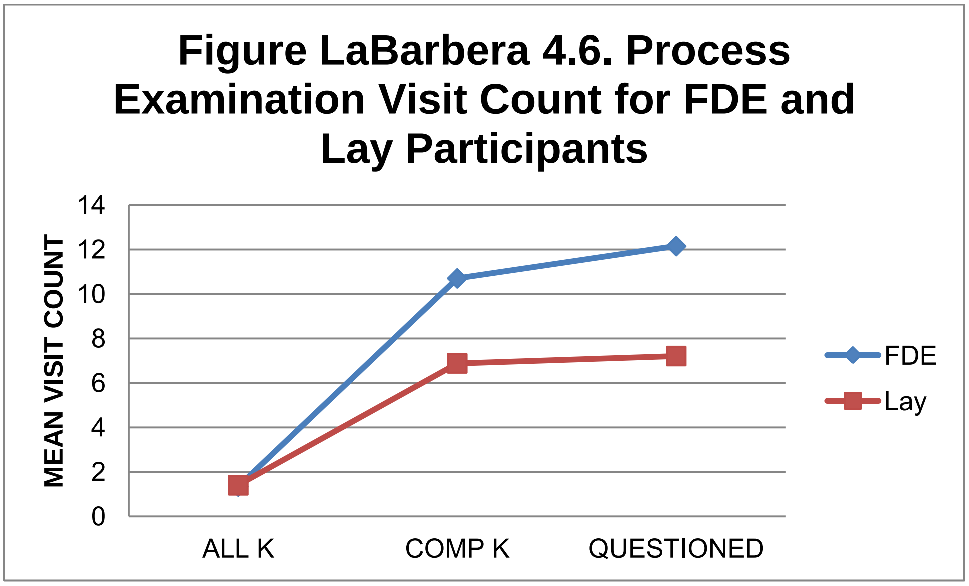
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	12.19	13.14	9.94	14.59	16	12.88
Lay	6.77	5.88	5.69	7.24	6.44	5.94

Total Visit Count

MANOVA results reveal significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .127, F (3, 86) = 4.16, p = .008, multivariate η^2 = .127. Figure LaBarbera 4.6 presents the mean visit counts by AOI.

Figure LaBarbera 4.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in two of the three areas of interest. Total visit counts for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, F (1, 88) = 7.82, p = .006, partial η^2 = .082, and F (1, 88) = 5.33, p = .023, partial η^2 = .057.

Visit counts in the known signature stimulus (ALL K) were not significantly different, p = .784, *ns*. Table LaBarbera 4.3 presents the means and standard deviations for areas of interest by participant type.

Table LaBarbera 4.3

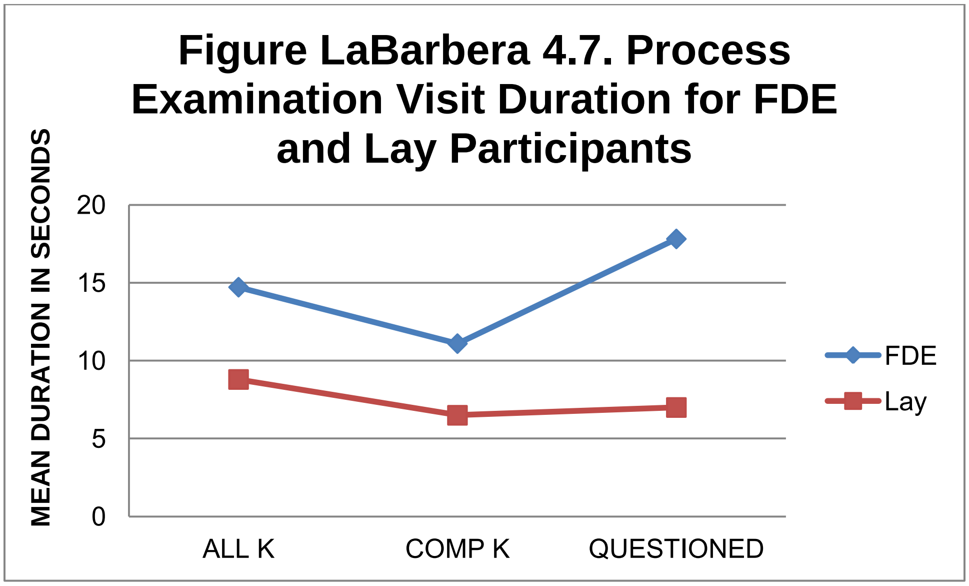
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.34	0.89	10.7	8.47	12.15	9.5
Lay	1.4	1	6.88	7.08	7.21	6.93

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .239, F (3, 86) = 9.00, p < .001, multivariate η^2 = .239. Figure LaBarbera 4.7 presents the mean visit durations by AOI.

Figure LaBarbera 4.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in two of the three areas of interest. Total visit durations for the questioned signature and the known signature stimulus (ALL K) were significantly greater for FDEs than for Lay participants, F (1, 88) = 20.01, p < .001, partial η^2 = .185, and F (1, 88) = 4.97, p = .028, partial η^2 = .054.

Visit durations in the known signature comparison stimulus (COMP K) were not significantly different, p = .100, *ns*. Table LaBarbera 4.4 presents the means and standard deviations for areas of interest by participant type.

Table LaBarbera 4.4
Process Analysis Visit Durations for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	14.72	16.04	11.1	16.28	17.82	14.74
Lay	8.8	7.11	6.5	8.35	7	6.13

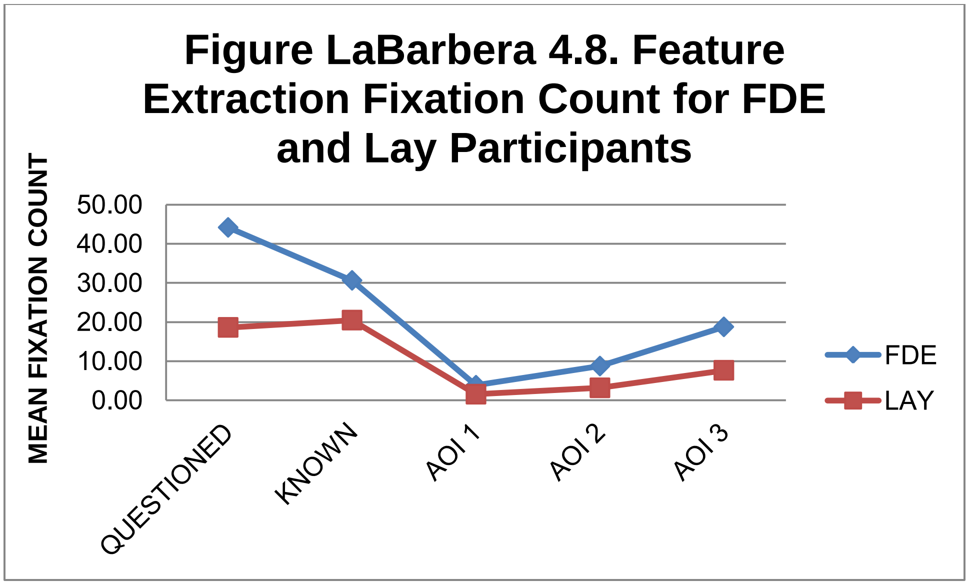
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .24, F (5, 84) = 5.43, p < .001, multivariate η^2 = .24. Figure LaBarbera 4.8 presents the mean fixation counts by AOI.

Figure LaBarbera 4.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation counts in all but one area of interest. Total fixation counts for the questioned signature was significantly greater for FDEs than for Lay participants, F (1, 88) = 18.44, p < .001, partial η^2 =.173.

Fixations counts in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, F (1, 88) = 14.55, p < .001, partial η^2 = .142; AOI 2, F (1, 88) = 13.79, p < .001, partial η^2 = .142; AOI 3, F (1, 88) = 12.12, p = .001, partial η^2 = .121).

No significant difference was found in the known signatures, p = .134, *ns*. Table LaBarbera 4.5 presents the means and standard deviations for areas of interest by participant type.

Table LaBarbera 4.5

Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

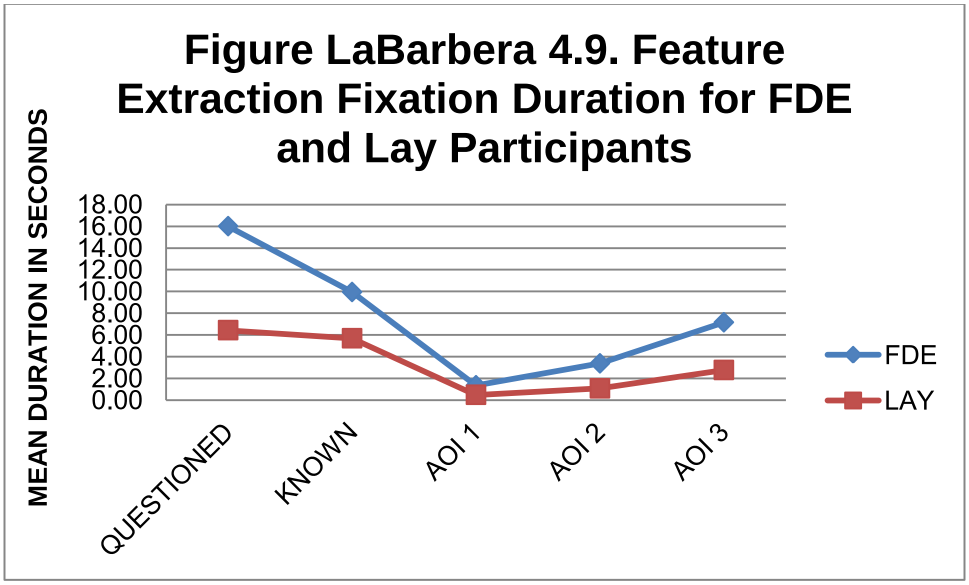
	QUESTIONED		KNOWN		AOI 1		AOI 2		AOI 3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***

FDE	44.15	35.58	30.62	36.51	3.83	3.62	8.72	9.41	18.74	19.78
Lay	18.6	16.7	20.47	25.77	1.53	1.64	3.16	2.89	7.65	7.01

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .252, *F* (5, 84) = 5.65, p < .001, multivariate η^2 = .252. Figure LaBarbera 4.9 presents the mean fixation durations by AOI.

Figure LaBarbera 4.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation durations in all but one area of interest. Total fixation duration for the questioned signature was significantly greater for FDEs than for Lay participants, *F* (1, 88) = 19.84, p < .001, partial η^2 =.184.

Fixations durations in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, *F* (1, 88) = 15.69, p < .001, partial η^2 = .151; AOI 2, *F* (1, 88) = 16.87, p < .001, partial η^2 = .161; AOI 3, *F* (1, 88) = 13.07, p = .001, partial η^2 = .129).

No significant difference was found in the known signatures, p = .088, *ns*. Table LaBarbera 4.6 presents the means and standard deviations for areas of interest by participant type.

Table LaBarbera 4.6
Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

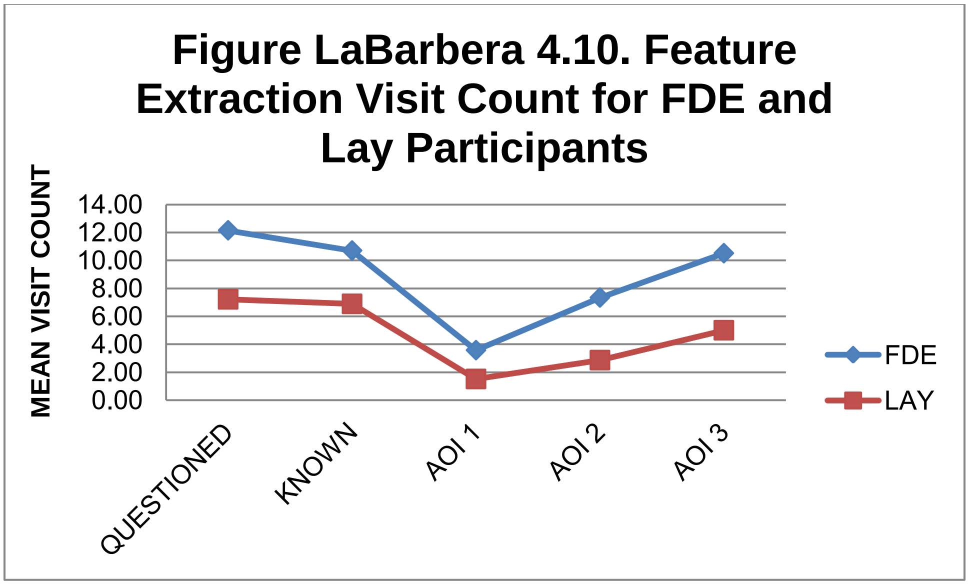
	QUESTIONED		KNOWN		AOI 1		AOI 2		AOI 3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***

FDE	16	12.88	9.94	14.59	1.37	1.34	3.38	3.53	7.16	7.55
Lay	6.44	5.94	5.69	7.24	0.49	0.58	1.08	1.02	2.77	2.62

Total Visit Count

MANOVA results did reveal significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .195, F (5, 84) = 4.07, p = .002, multivariate η^2 = .195. Figure LaBarbera 4.10 presents the mean total visit counts by AOI.

Figure LaBarbera 4.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit counts for the questioned signature and known signatures were significantly greater for FDEs than for Lay participants, F (1, 88) = 7.82, p = .006, partial η^2 =.082, and F (1, 88) = 5.33, p = .023, partial η^2 = .057.

Visit counts in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, F (1, 88) = 14.39, p < .001, partial η^2 = .141; AOI 2, F (1, 88) = 16.01, p < .001, partial η^2 = .154; AOI 3, F (1, 88) = 12.89, p = .001, partial η^2 = .128). Table LaBarbera 4.7 presents the means and standard deviations for areas of interest by participant type.

Table LaBarbera 4.7

Feature Extraction Analysis Visit Count for FDE and Lay Participants

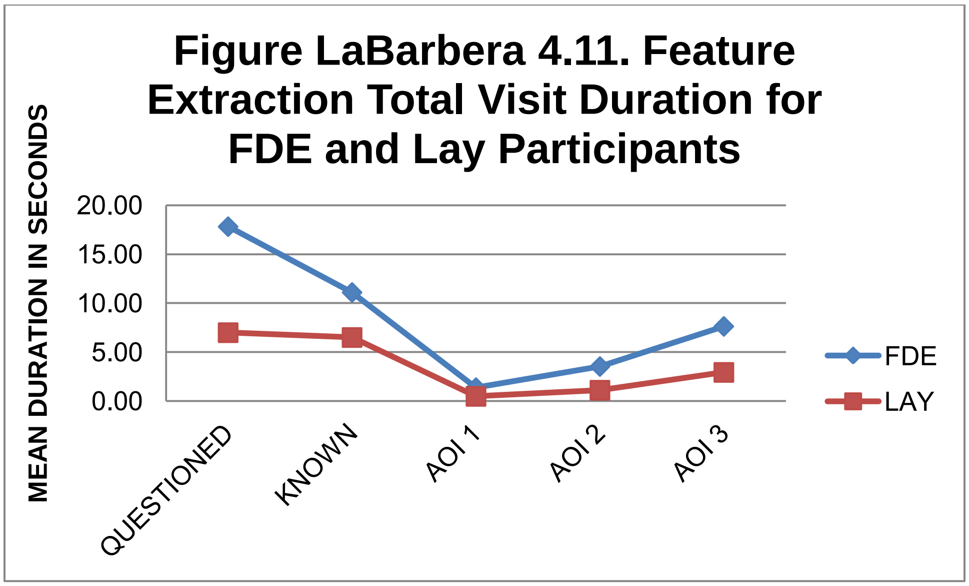
	QUESTIONED		KNOWN		AOI 1		AOI 2		AOI 3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	12.15	9.5	10.7	8.47	3.57	3.21	7.34	6.94	10.51	9.18

Lay	7.21	6.93	6.88	7.08	1.51	1.62	2.86	2.49	5	4.3

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .249, F (5, 84) = 5.56, p < .001, multivariate η^2 = .249. Figure LaBarbera 4.11 presents the mean total visit durations by AOI.

Figure LaBarbera 4.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation durations in all but one area of interest. Total fixation durations for the questioned signature was significantly greater for FDEs than for Lay participants, F (1, 88) = 20.01, p < .001, partial η^2 =.185.

Fixations durations in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, F (1, 88) = 15.82, p < .001, partial η^2 = .152; AOI 2, F (1, 88) = 17.42, p < .001, partial η^2 = .165; AOI 3, F (1, 88) = 13.18, p = .001, partial η^2 = .130).

No significant difference was found in the known signatures, p = .100, *ns*. Table LaBarbera 4.8 presents the means and standard deviations for areas of interest by participant type.

Table LaBarbera 4.8

Feature Extraction Analysis Visit Duration for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2		AOI 3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	17.82	14.74	11.1	16.28	1.38	1.37	3.54	3.66	7.63	8.07

Lay	7	6.13	6.5	8.35	0.49	0.58	1.12	1.06	2.94	2.73

LaBarbera Signature 5: Genuine

Of the 49 FDE participants, 40 responded correctly that the signature was a genuine specimen, while 9 identified the signature as non-genuine. Of the 43 Lay participants, 41 responded correctly that the signature was genuine, while 2 identified the signature as non-genuine. This difference was statistically significant, χ^2 (2, N = 92) = 4.09, p = .043. Figure LaBarbera 5.1 presents the comparison view of this signature.

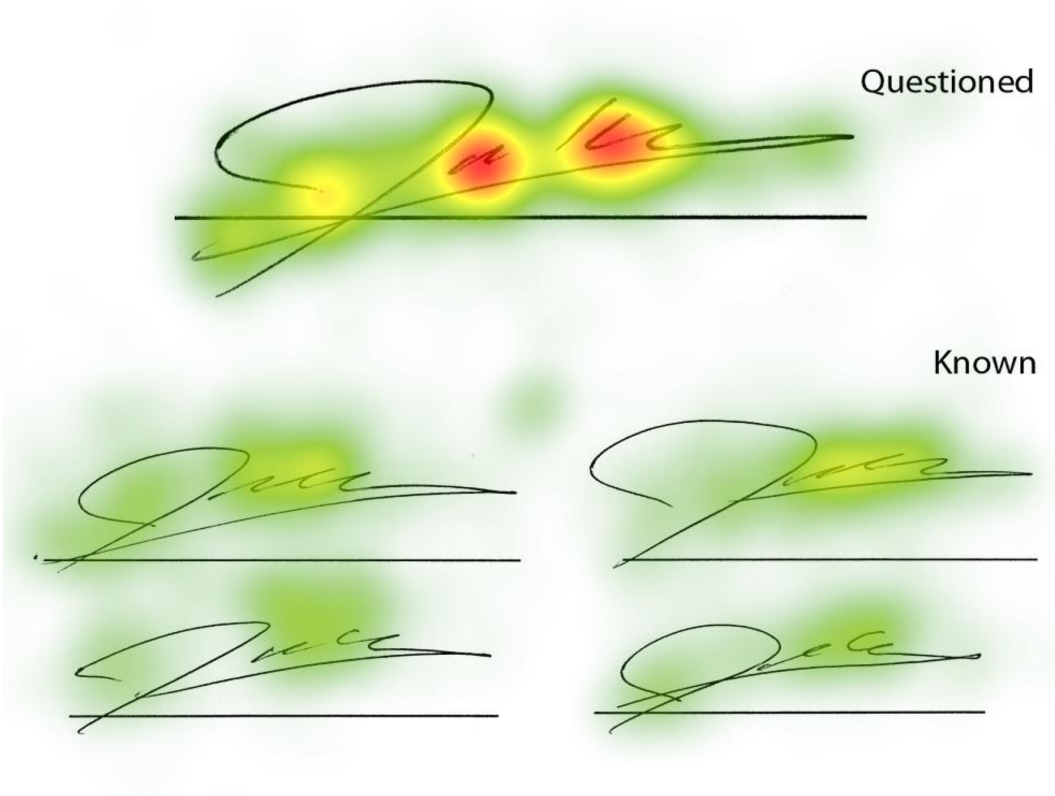
Figure LaBarbera 5.1. Questioned-Known Comparison Stimulus for LaBarbera Signature 5.

Selection of Areas of Interest (AOIs)

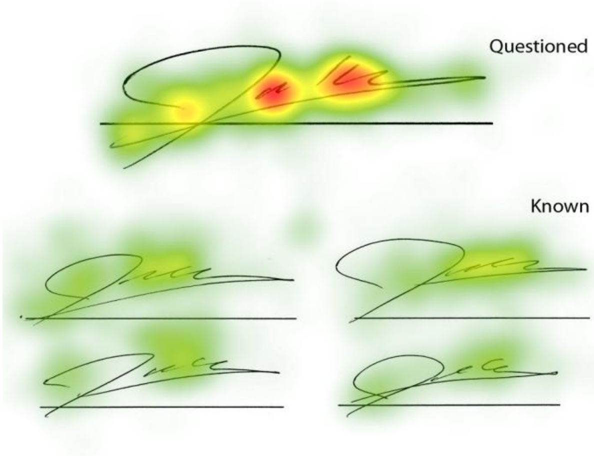
Figure Labarera 5.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were five locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of five AOIs for this stimulus. Figure LaBarbera 5.3 presents the location of the AOIs identified in the heat map.

Figure LaBarbera 5.2. Heat map for LaBarbera signature 5, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

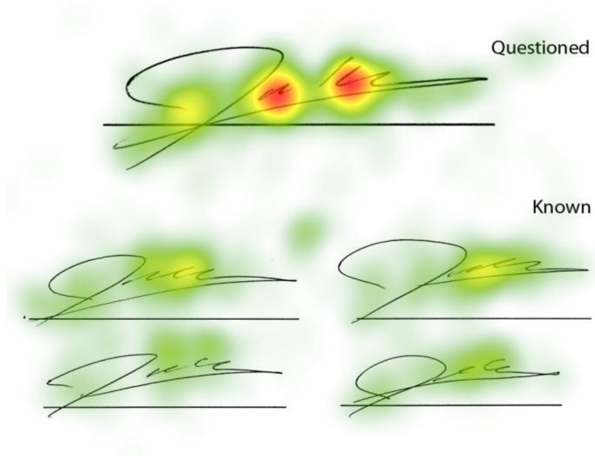
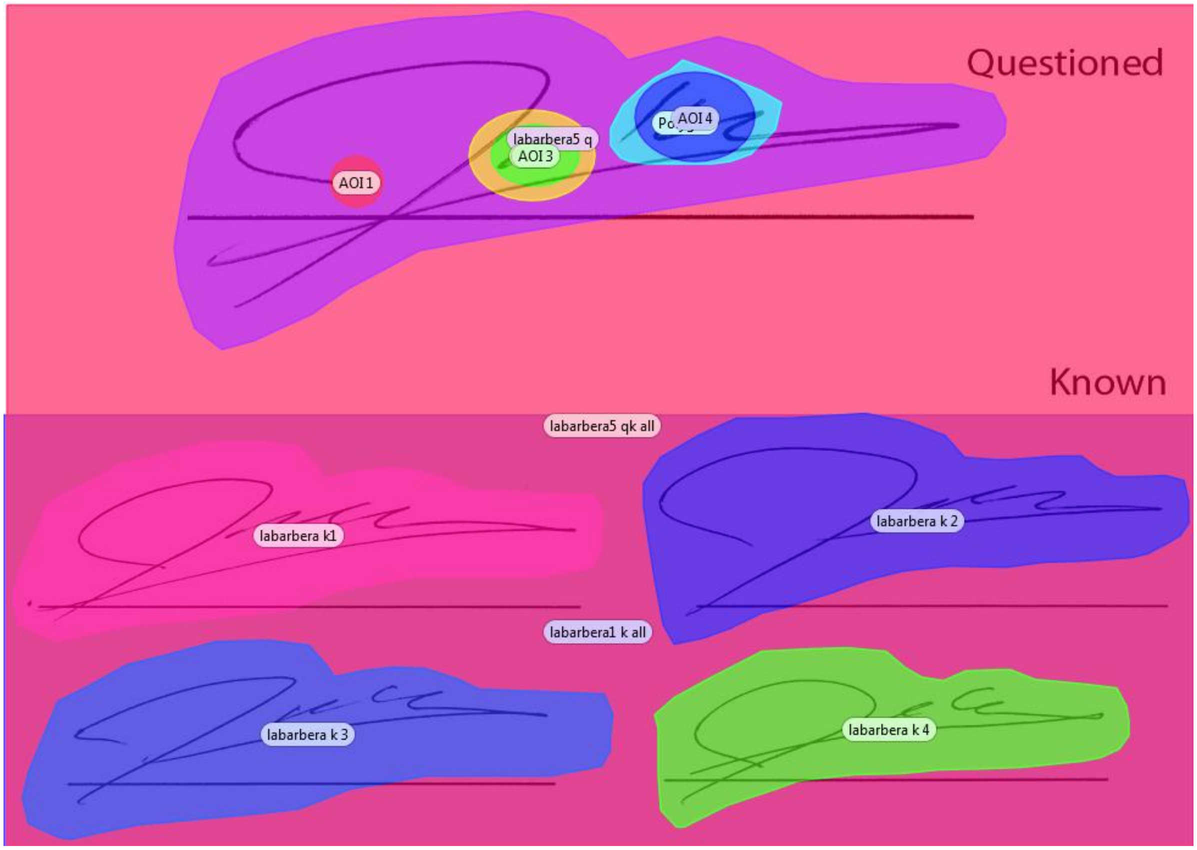


Figure LaBarbera 5.3. Areas of Interest (AOIs) for LaBarbera Signature 5.



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

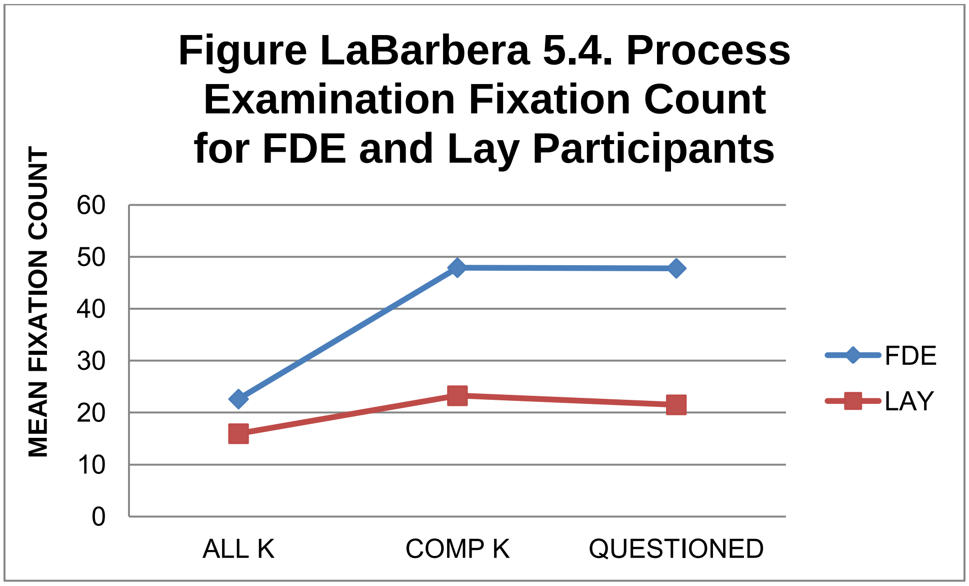
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the LaBarbera known signature stimulus (Knowns, not pictured here), LaBarbera1 K all (encompassing all the known signatures on the questioned/known comparison stimulus), and LaBarbera5 Q (the LaBarbera questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 5) are included in subsequent analyses.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .171, F (3, 86) = 5.90, p = .001, multivariate η^2 = .171. Figure LaBarbera 5.4 presents the mean fixation counts by AOI.

Figure LaBarbera 5.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation counts in two of the three areas of interest. Total fixation counts for the questioned signature and the known signature stimulus (ALL K) were significantly greater for FDEs than for Lay participants, F (1, 88) = 16.55, p < .001, partial η^2 = .158, and F (1, 88) = 11.64, p = .001, partial η^2 = .117.

Fixation counts in the known signature comparison stimulus (COMP K) were not significantly different, p = .060, *ns*. Table LaBarbera 5.1 presents the means and standard deviations for areas of interest by participant type.

Table LaBarbera 5.1

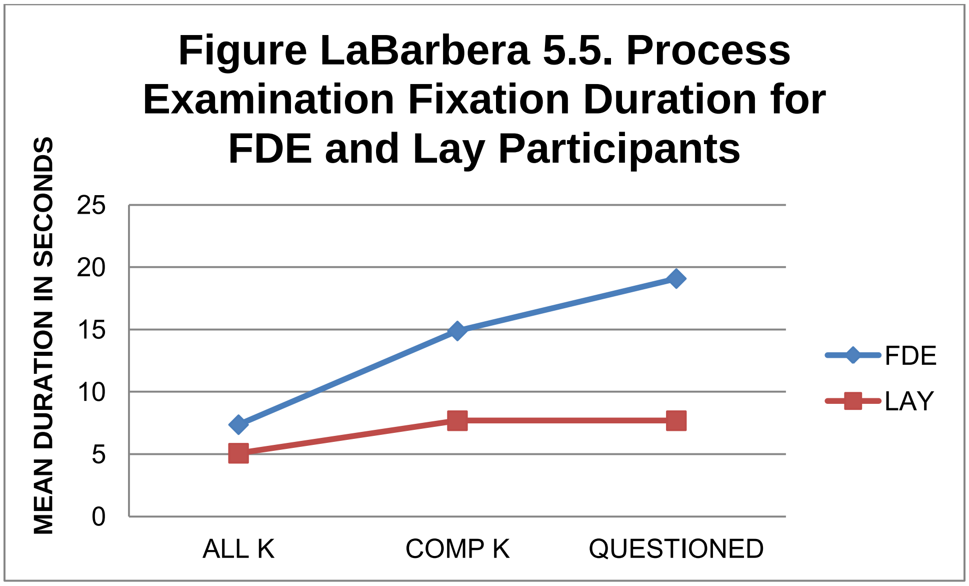
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	22.62	21.01	47.91	40.91	47.79	36.41
Lay	15.95	9.58	23.26	24.98	21.51	22.61

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .275, F (3, 86) = 10.86, p < .001, multivariate η^2 = .275. Figure LaBarbera 5.5 presents the mean fixation counts by AOI.

Figure LaBarbera 5.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation durations in two of the three areas of interest. Total fixation durations for the questioned signature and the known signature stimulus (ALL K) were significantly greater for FDEs than for Lay participants, F (1, 88) = 20.74, p < .001, partial η^2 = .191, and F (1, 88) = 8.74, p = .004, partial η^2 = .090.

Fixation durations in the known signature comparison stimulus (COMP K) were not significantly different, p = .075, *ns*. Table LaBarbera 5.2 presents the means and standard deviations for areas of interest by participant type.

Table LaBarbera 5.2

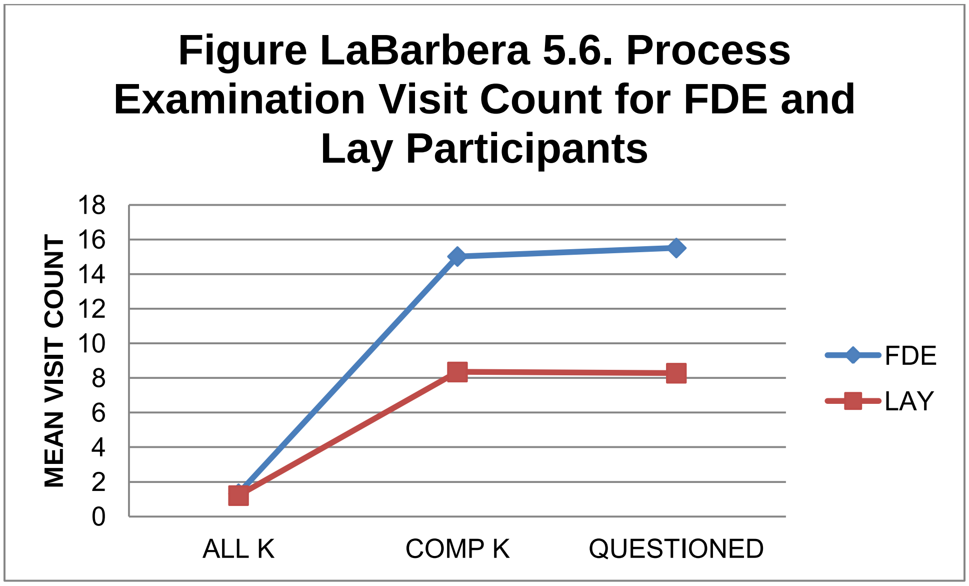
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	7.37	7.27	14.89	12.56	19.09	14.36
Lay	5.08	4.18	7.69	10.29	7.69	8.3

Total Visit Count

MANOVA results reveal significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .184, F (3, 86) = 6.47, p = .001, multivariate η^2 = .184. Figure LaBarbera 5.6 presents the mean visit counts by AOI.

Figure LaBarbera 5.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in two of the three areas of interest. Total visit counts for the questioned signature and the known signature stimulus (ALL K) were significantly greater for FDEs than for Lay participants, F (1, 88) = 14.61, p < .001, partial η^2 = .142, and F (1, 88) = 11.75, p = .001, partial η^2 = .118.

Visit counts in the known signature comparison stimulus (COMP K) were not significantly different, p = .497, *ns*. Table LaBarbera 5.3 presents the means and standard deviations for areas of interest by participant type.

Table LaBarbera 5.3

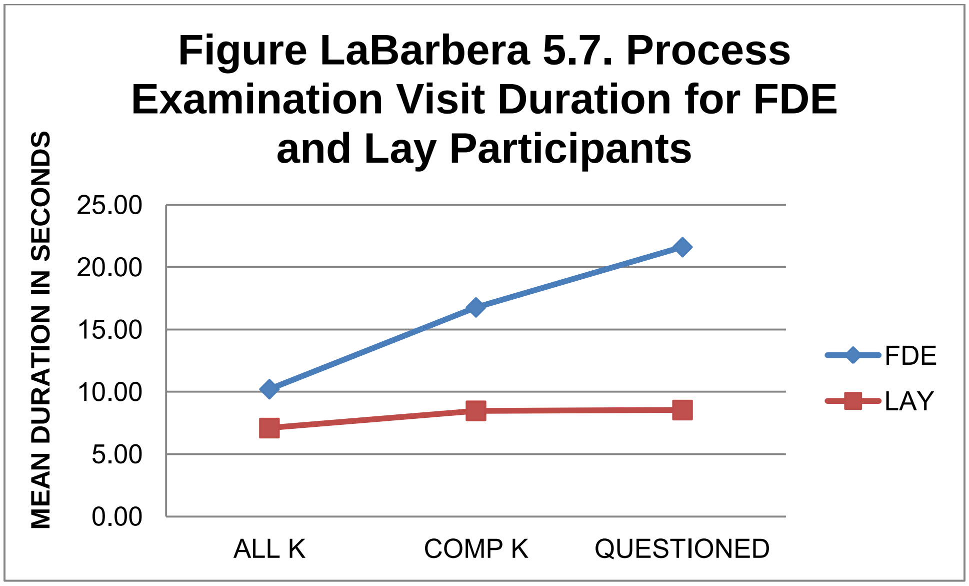
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		COMP K		QUESTIONED	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.32	0.75	15.02	9.93	15.51	9.69
Lay	1.21	0.77	8.35	8.38	8.28	8.1

<u>Total Visit Duration</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .201, F (3, 86) = 7.21, p < .001, multivariate η^2 = .201. Figure LaBarbera 5.7 presents the mean visit durations by AOI.

Figure LaBarbera 5.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in two of the three areas of interest. Total visit durations for the questioned signature and the known signature stimulus (ALL K) were significantly greater for FDEs than for Lay participants, F (1, 88) = 20.46, p < .001, partial η^2 = .189, and F (1, 88) = 9.44, p = .003, partial η^2 = .097.

Visit durations in the known signature comparison stimulus (COMP K) were not significantly different, p = .107, *ns*. Table LaBarbera 5.4 presents the means and standard deviations for areas of interest by participant type.

Table LaBarbera 5.4

Process Analysis Visit Durations for FDE and Lay Participants

	ALL K		COMP K		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	10.22	11.35	16.78	14.32	21.61	16.66
Lay	7.10	5.56	8.48	10.89	8.54	9.43

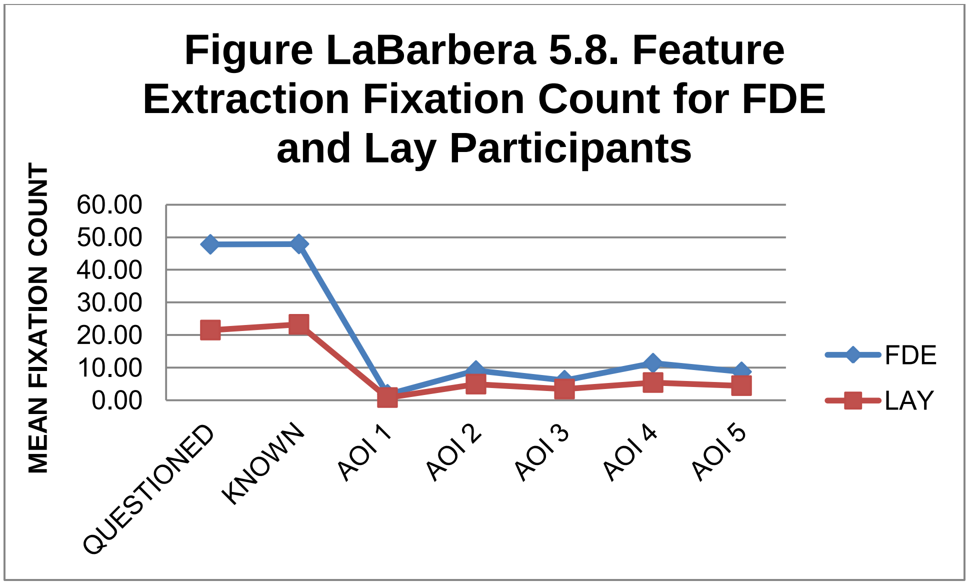
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .175, $F(7, 82) = 2.48$, $p = .023$, multivariate $\eta^2 = .175$. Figure LaBarbera 5.8 presents the mean fixation counts by AOI.

Figure LaBarbera 5.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation counts in all areas of interest. Total fixation count for the questioned signature and known signatures were significantly greater for FDEs than for Lay participants, $F(1, 88) = 16.55$, $p < .001$, partial $\eta^2 = .158$, and $F(1, 88) = 11.64$, $p = .001$, partial $\eta^2 = .117$.

Fixation counts in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 5.96$, $p = .017$, partial $\eta^2 = .063$; AOI 2, $F(1, 88) = 10.88$, $p = .001$, partial $\eta^2 = .110$; AOI 3, $F(1, 88) = 8.99$, $p = .004$, partial $\eta^2 = .093$; AOI 4, $F(1, 88) = 10.24$, $p = .001$, partial $\eta^2 = .104$; AOI 5, $F(1, 88) = 7.62$, $p = .007$, partial $\eta^2 = .080$). Table LaBarbera 5.5 presents the means and standard deviations for areas of interest by participant type.

Table LaBarbera 5.5
Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***

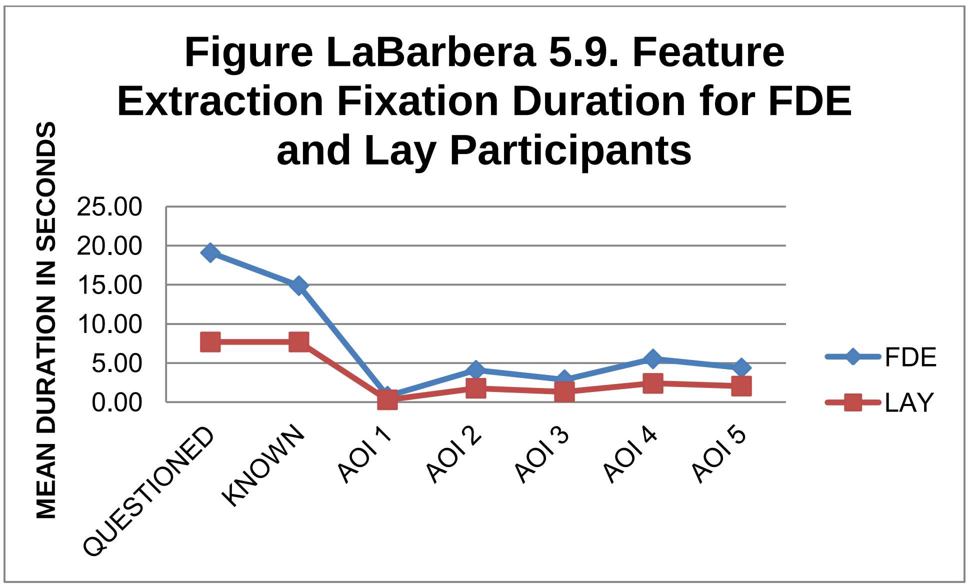
FDE	47.79	36.41	47.91	40.91	1.81	2.24	9.11	6.94
Lay	21.51	22.61	23.26	24.98	0.81	1.52	4.93	4.77

	AOI 3		**AOI 4**		**AOI 5**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	6.13	4.89	11.36	10.22	8.70	8.49
Lay	3.42	3.50	5.42	6.92	4.47	5.66

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .261, $F(7, 82) = 4.13$, $p = .001$, multivariate $\eta^2 = .261$. Figure LaBarbera 5.9 presents the mean fixation durations by AOI.

Figure LaBarbera 5.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation durations in all areas of interest. Total fixation durations for the questioned signature and known signatures were significantly greater for FDEs than for Lay participants, $F(1, 88) = 20.74$, $p < .001$, partial $\eta^2 = .191$, and $F(1, 88) = 8.74$, $p = .004$, partial $\eta^2 = .090$.

Fixation durations in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 6.19$, $p = .015$, partial $\eta^2 = .066$; AOI 2, $F(1, 88) = 16.45$, $p < .001$, partial $\eta^2 = .158$; AOI 3, $F(1, 88) = 12.59$, $p = .001$, partial $\eta^2 = .125$; AOI 4, $F(1, 88) = 13.62$, $p < .001$, partial $\eta^2 = .134$; AOI 5, $F(1, 88) = 10.19$, $p = .002$, partial $\eta^2 = .104$). Table LaBarbera 5.6 presents the means and standard deviations for areas of interest by participant type.

Table LaBarbera 5.6

Feature Extraction Analysis Fixation Durations for FDE and Lay Participants

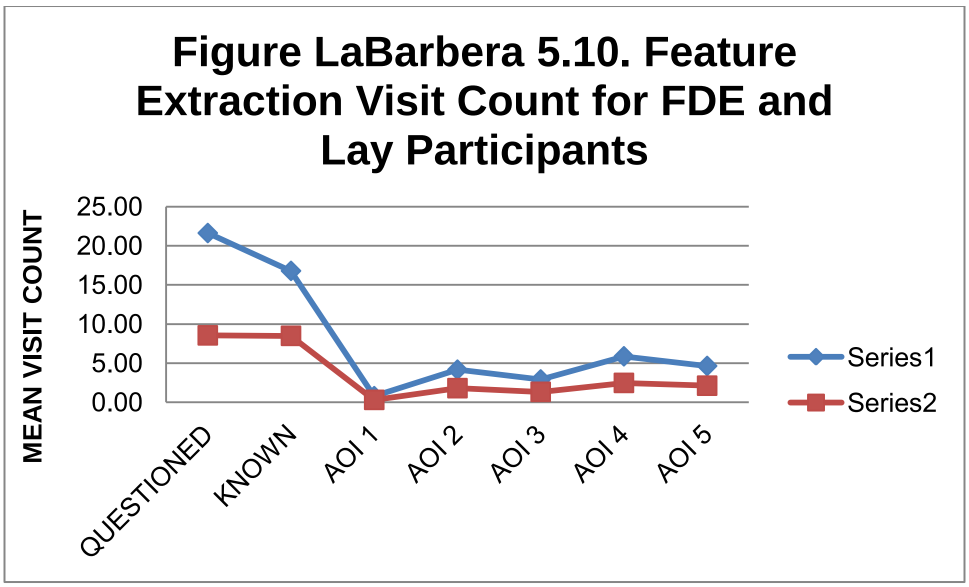
	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	19.09	14.36	14.89	12.56	0.77	1.10	4.08	3.35
Lay	7.69	8.30	7.69	10.29	0.30	0.60	1.77	1.73

	AOI 3		AOI 4		AOI 5	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.87	2.51	5.52	4.49	4.38	3.83
Lay	1.32	1.43	2.40	3.41	2.05	2.97

<u>*Total Visit Count*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .213, $F(5, 83) = 3.18$, $p = .005$, multivariate $\eta^2 = .213$. Figure LaBarbera 5.10 presents the mean visit counts by AOI.

Figure LaBarbera 5.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit counts for the questioned signature and known signatures were significantly greater for FDEs than for Lay participants, $F(1, 88) = 20.446$, $p < .001$, partial $\eta^2 = .189$, and $F(1, 88) = 9.44$, $p = .003$, partial $\eta^2 = .097$.

Visit counts in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 6.23$, $p = .014$ partial $\eta^2 = .066$; AOI 2, $F(1, 88) = 16.48$, $p < .001$, partial $\eta^2 = .158$; AOI 3, $F(1, 88) = 12.88$, $p = .001$, partial $\eta^2 = .128$; AOI 4, $F(1, 88) = 14.83$, $p < .001$, partial $\eta^2 = .144$; AOI 5, *F*(1, 88) = 11.03, *p* = .001, partial η^2 = .111). Table LaBarbera 5.7 presents the means and standard deviations for areas of interest by participant type.

Table LaBarbera 5.7

Feature Extraction Analysis Visit Counts for FDE and Lay Participants

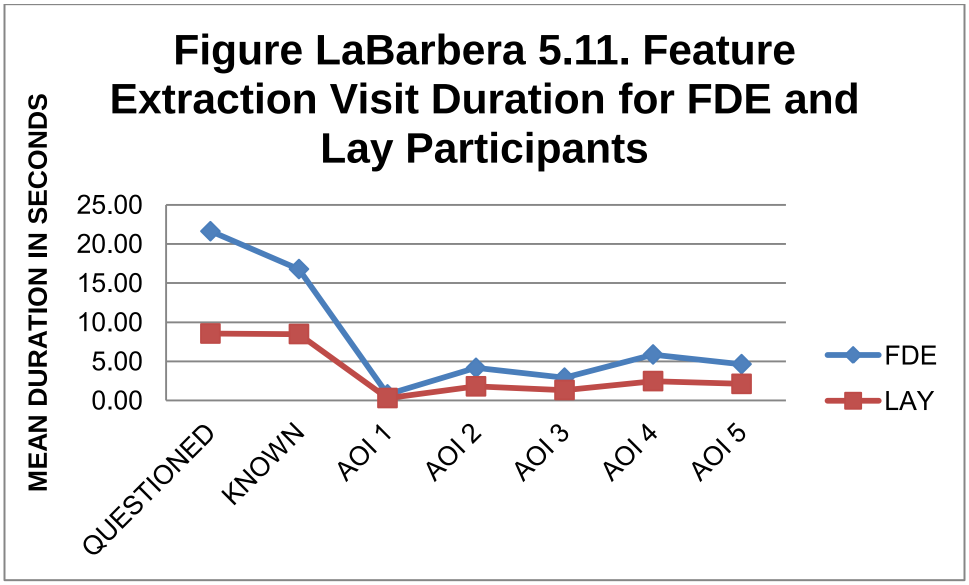
	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	21.61	16.66	16.78	14.32	0.77	1.10	4.16	3.43
Lay	8.54	9.43	8.48	10.89	0.30	0.60	1.80	1.75

	AOI 3		AOI 4		AOI 5	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.91	2.54	5.87	4.70	4.63	4.02
Lay	1.33	1.44	2.47	3.53	2.11	3.07

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .213, *F*(7,82) = 3.18, *p* = .005, multivariate η^2 = .213. Figure LaBarbera 5.11 presents the mean visit durations by AOI.

Figure LaBarbera 5.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit durations for the questioned signature and known signatures were significantly greater for FDEs than for Lay participants, $F(1, 88) = 20.46$, $p < .001$, partial $\eta^2 = .189$, and $F(1, 88) = 9.44$, $p = .003$, partial $\eta^2 = .097$.

Visit durations in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 6.23$, $p = .014$, partial $\eta^2 = .066$; AOI 2, $F(1, 88) = 16.48$, $p < .001$, partial $\eta^2 = .158$; AOI 3, $F(1, 88) = 12.88$, $p = .001$, partial $\eta^2 = .128$; AOI 4, $F(1, 88) = 14.83$, $p < .001$, partial $\eta^2 = .144$; $F(1, 88) = 11.03$, $p = .001$, partial $\eta^2 = .111$). Table LaBarbera 5.8 presents the means and standard deviations for areas of interest by participant type.

Table LaBarbera 5.8

Feature Extraction Analysis Fixation Durations for FDE and Lay Participants

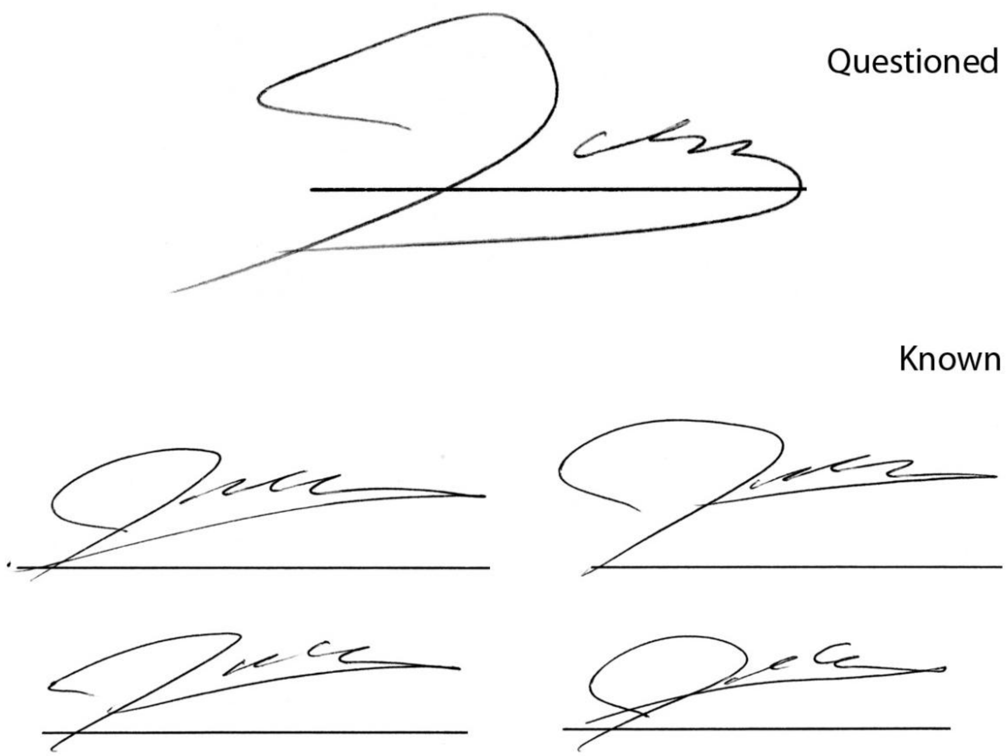
	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	21.61	16.66	16.78	14.32	0.77	1.10	4.16	3.43
Lay	8.54	9.43	8.48	10.89	0.30	0.60	1.80	1.75

	AOI 3		**AOI 4**		**AOI 5**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.91	2.54	5.87	4.70	4.63	4.02
Lay	1.33	1.44	2.47	3.53	2.11	3.07

LaBarbera Signature 6: Freehand Simulation (Non-Genuine)

Of the 49 FDE participants, 39 responded correctly that the signature was a non-genuine specimen, while 7 identified the signature as genuine. Two FDEs declined to respond. Of the 43 Lay participants, 36 responded correctly that the signature was non-genuine, while 7 identified the signature as genuine. This difference was not statistically significant, $p = .41$, *ns.* Figure LaBarbera 6.1 presents the comparison view of this signature.

Figure LaBarbera 6.1. Questioned-Known Comparison Stimulus for Signature LaBarbera 6.

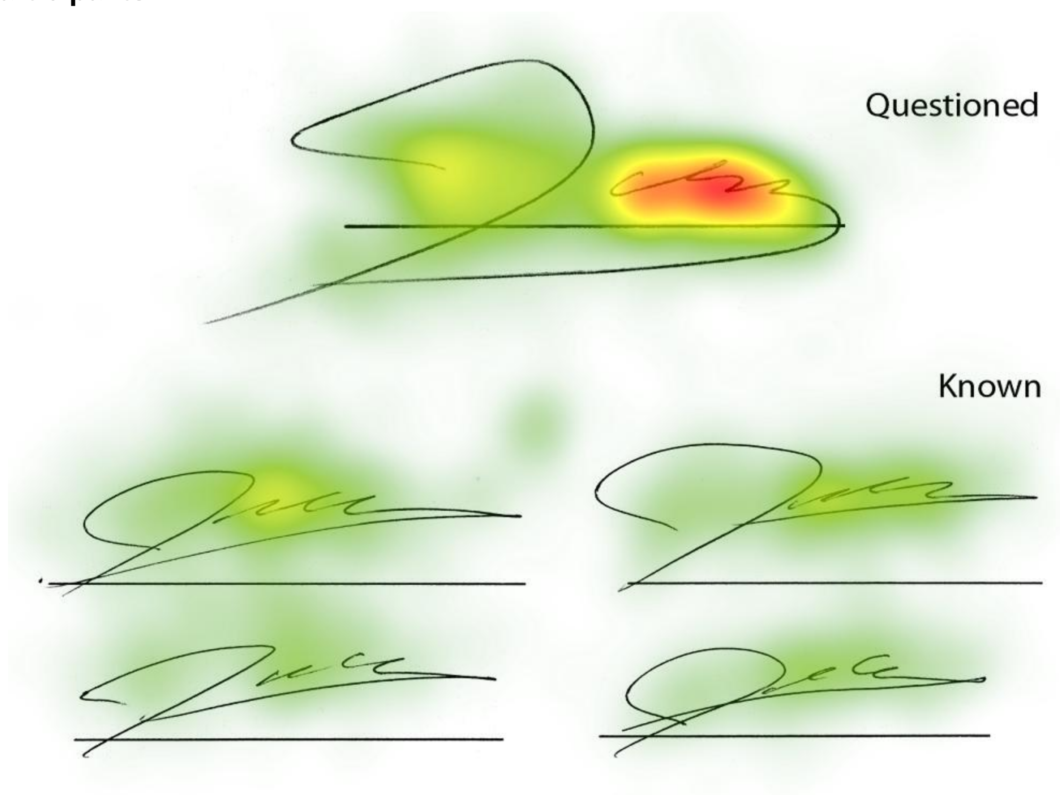


Selection of Areas of Interest (AOIs)

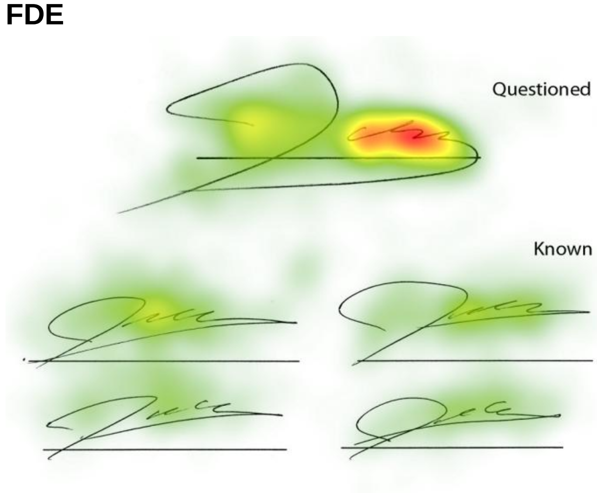
Figure Labarera 6.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were three locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of three AOIs for this stimulus. Figure LaBarbera 6.3 presents the location of the AOIs identified in the heat map.

Figure LaBarbera 6.2. Heat map for LaBarbera signature 6, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

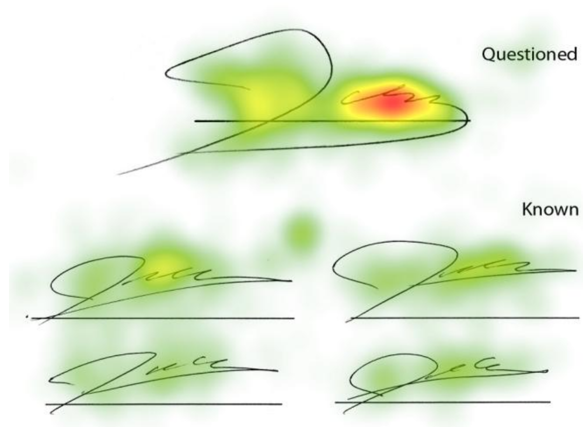


Figure LaBarbera 6.3. Areas of Interest (AOIs) for LaBarbera Signature 6.

Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

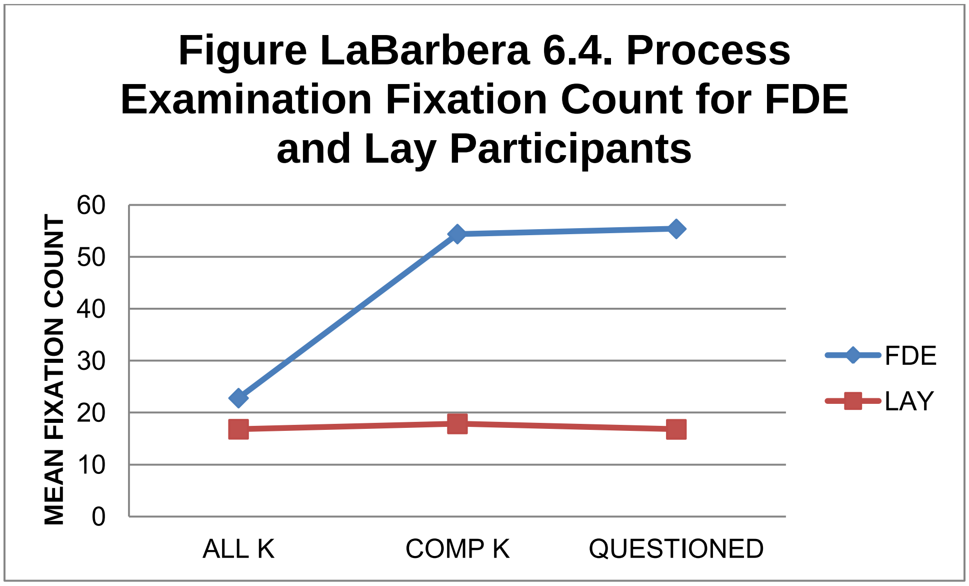
Examination Process Analyses

The examination process analyses are based on AOIs in the LaBarbera known signature stimulus (Knowns, not pictured here), LaBarbera1 K all (encompassing all the known signatures on the questioned/known comparison stimulus), and LaBarbera6 Q (the LaBarbera questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 2) are included in subsequent analyses.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .355, F (3, 85) = 15.59, p < .001, multivariate η^2 = .355. Figure LaBarbera 6.4 presents the mean fixation counts by AOI.

Figure LaBarbera 6.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation counts in two of the three areas of interest. Total fixation counts for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, F (1, 87) = 45.43, p < .001, partial η^2 = .343, and F (1, 87) = 35.53, p < .001, partial η^2 = .290.

Fixation counts in the known signature stimulus (ALL K) were not significantly different, p = .131, *ns*.

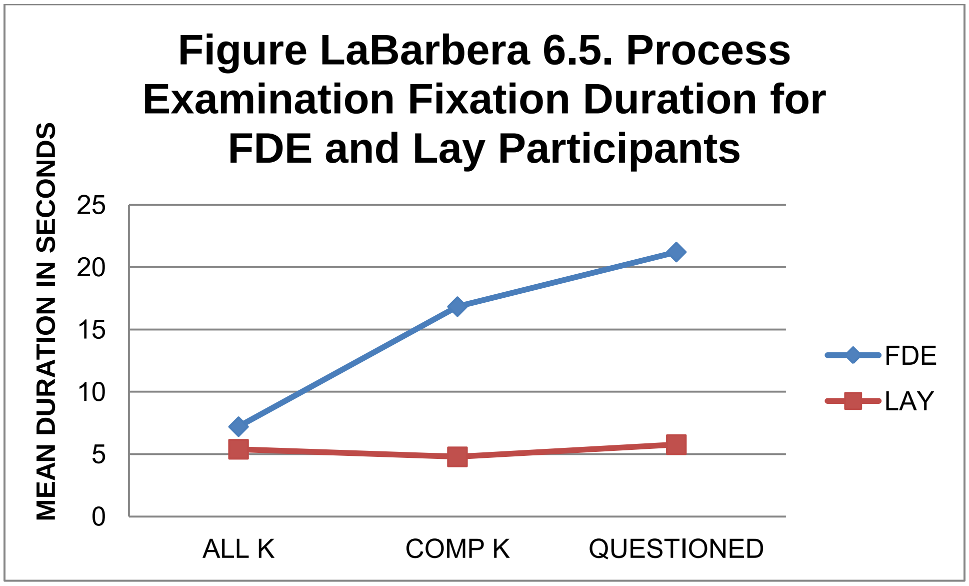
Table LaBarbera 6.1
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	22.8	20.32	54.39	36.72	55.39	35.5
Lay	16.81	16.42	17.84	16.94	16.79	12.62

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .348, F (3, 85) = 15.10, p < .001, multivariate η^2 = .348. Figure LaBarbera 6.5 presents the mean fixation durations by AOI.

Figure LaBarbera 6.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation durations in two of the three areas of interest. Total fixation durations for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, F (1, 87) = 43.48, p < .001, partial η^2 = .333, and F (1, 87) = 32.81, p < .001, partial η^2 = .274.

Fixation durations in the known signature stimulus (ALL K) were not significantly different, p = .193, *ns*.

Table LaBarbera 6.2

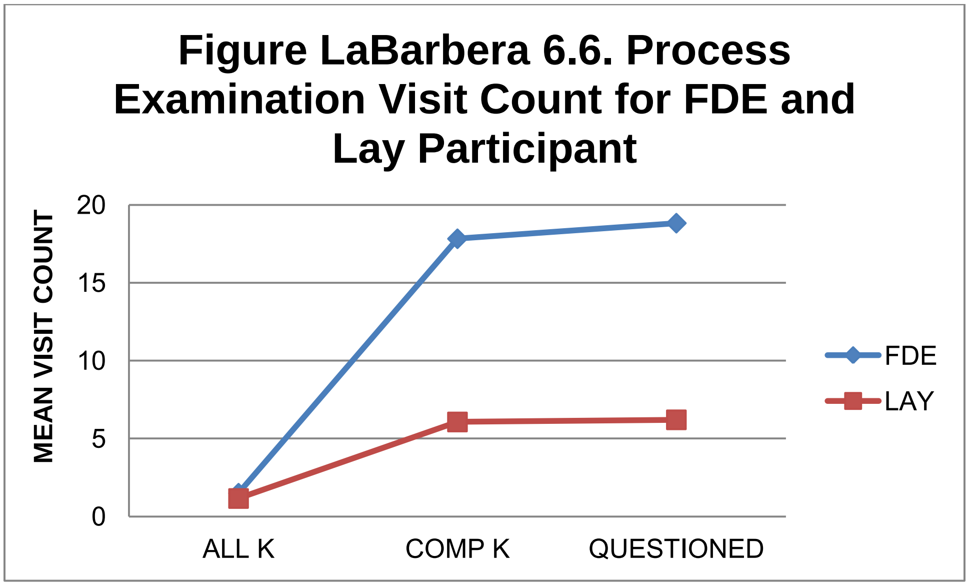
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	7.21	6.93	16.84	13.09	21.22	14.8
Lay	5.4	6.01	4.79	4.49	5.77	4.28

Total Visit Count

MANOVA results reveal significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .381, F (3, 85) = 17.45, p < .001, multivariate η^2 = .381. Figure LaBarbera 6.6 presents the mean visit counts by AOI.

Figure LaBarbera 6.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in two of the three areas of interest. Total visit counts for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, F (1, 87) = 49.25, p < .001, partial η^2 = .361, and F (1, 87) = 45.75, p < .001, partial η^2 = .345.

Visit counts in the known signature stimulus (ALL K) were not significantly different, p = .116, *ns*.

Table LaBarbera 6.3

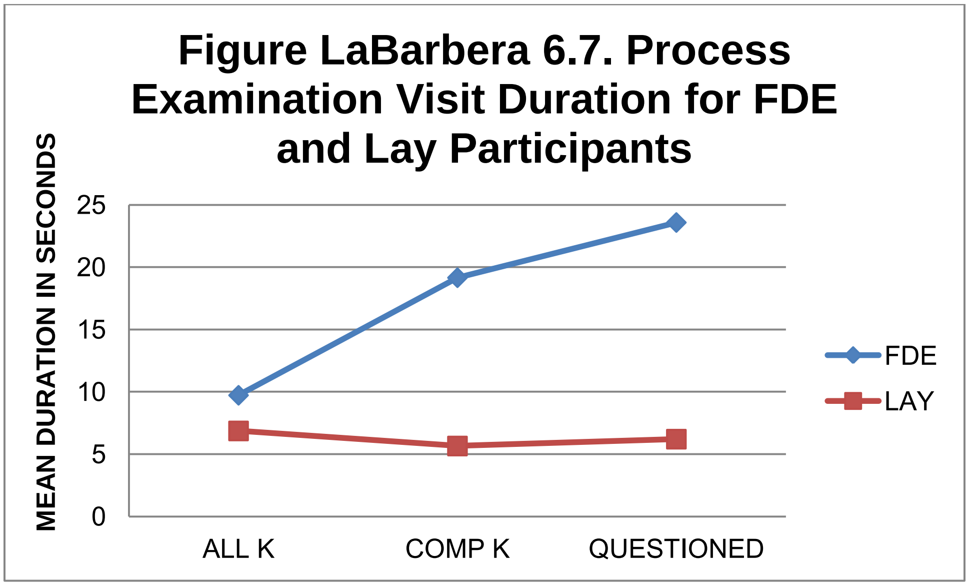
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.5	1.22	17.83	10.48	18.83	10.86
Lay	1.16	0.69	6.07	4.63	6.21	4.75

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .353, F (3, 85) = 15.49, p < .001, multivariate η^2 = .353. Figure LaBarbera 6.7 presents the mean visit durations by AOI.

Figure LaBarbera 6.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in two of the three areas of interest. Total visit durations for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, F (1, 87) = 46.41, p < .001, partial η^2 = .348, and F (1, 87) = 34.45, p < .001, partial η^2 = .284.

Visit durations in the known signature stimulus (ALL K) were not significantly different, p = .121, *ns*.

Table LaBarbera 6.4

Process Analysis Visit Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	9.73	9.86	19.16	14.14	23.59	16.12
Lay	6.87	6.98	5.66	5.41	6.21	4.61

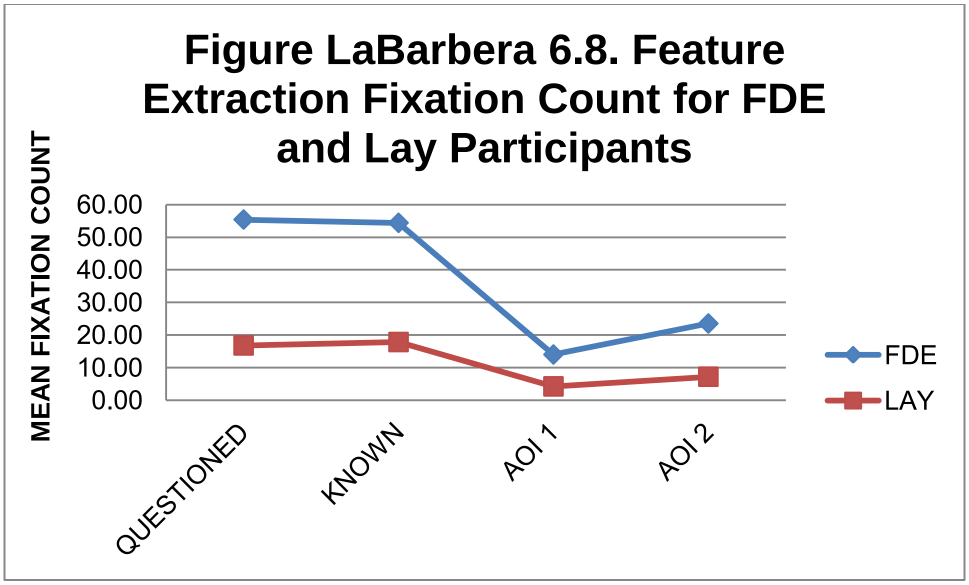
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .358, $F(4, 84) = 11.71$, $p < .001$, multivariate $\eta^2 = .358$. Figure LaBarbera 6.8 presents the mean fixation counts by AOI.

Figure LaBarbera 6.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation counts for the questioned signature and known signatures were significantly greater for FDEs than for Lay participants, $F(1, 87) = 45.43$, $p < .001$, partial $\eta^2 = .343$, and $F(1, 87) = 35.53$, $p < .001$, partial $\eta^2 = .290$.

Fixations counts in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 29.73$, $p < .001$, partial $\eta^2 = .255$; AOI 2, $F(1, 87) = 34.49$, $p = .001$, partial $\eta^2 < .284$). Table LaBarbera 6.5 presents the means and standard deviations for areas of interest by participant type.

LaBarbera 6.5

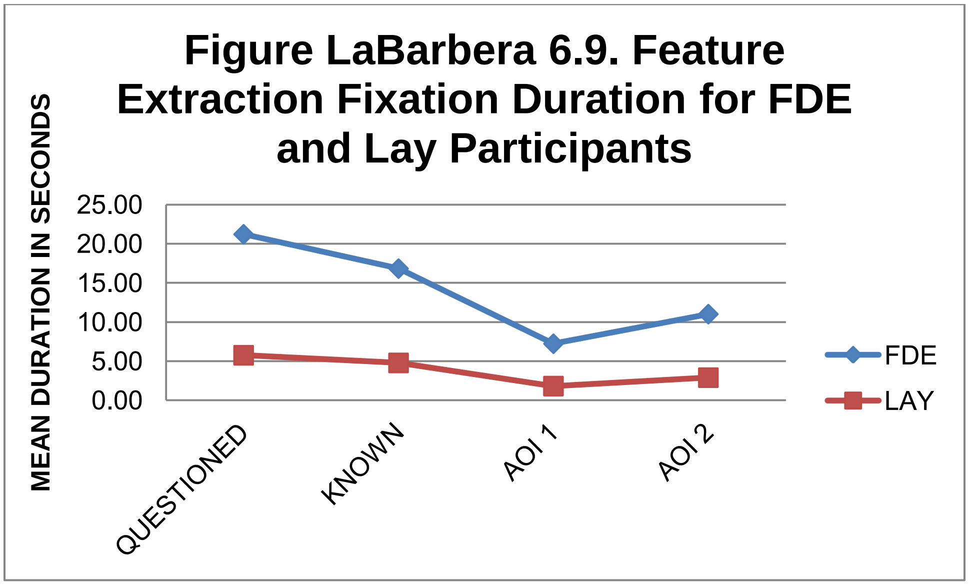
Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	55.39	35.50	54.39	36.72	14.00	11.07	23.52	17.18
Lay	16.79	12.62	17.84	16.94	4.23	4.07	7.21	6.24

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .357, $F(4, 84) = 11.66$, $p < .001$, multivariate $\eta^2 = .357$. Figure LaBarbera 6.9 presents the mean fixation durations by AOI.

Figure LaBarbera 6.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation durations in all areas of interest. Total fixation durations for the questioned signature and known signatures were significantly greater for FDEs than for Lay participants, $F(1, 87) = 43.48$, $p < .001$, partial $\eta^2 = .333$, and $F(1, 87) = 32.81$, $p < .001$, partial $\eta^2 = .274$.

Fixation durations in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 30.19$, $p < .001$, partial $\eta^2 = .258$; AOI 2, $F(1, 87) = 36.05$, $p < .001$, partial $\eta^2 = .293$). Table LaBarbera 6.6 presents the means and standard deviations for areas of interest by participant type,

Table LaBarbera 6.6

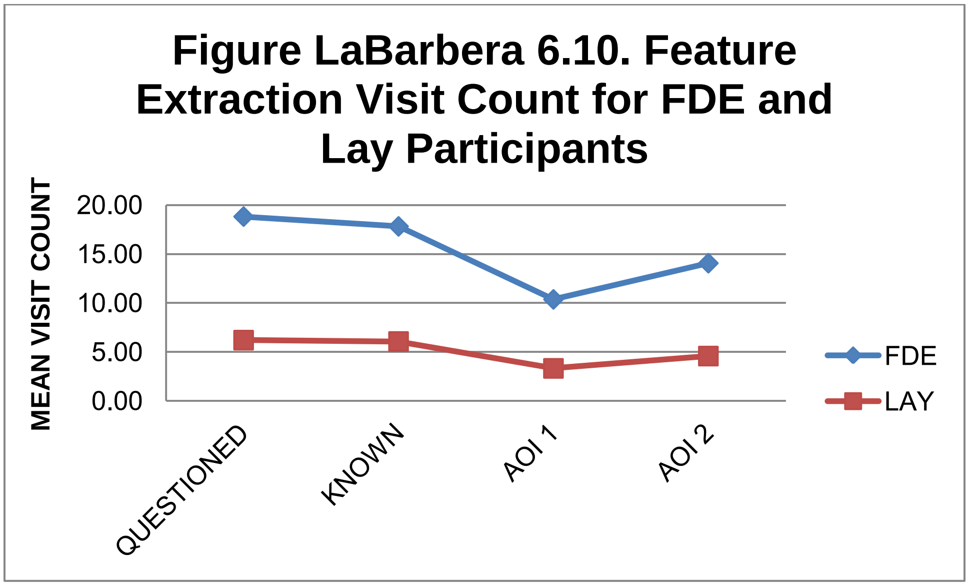
Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	21.22	14.80	16.84	13.09	7.24	6.23	11.02	8.52
Lay	5.77	4.28	4.79	4.49	1.82	1.75	2.90	2.52

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .374, $F(4, 84) = 12.53$, $p < .001$, multivariate $\eta^2 = .374$. Figure LaBarbera 6.10 presents the mean visit counts by AOI.

Figure LaBarbera 6.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit counts for the questioned signature and known signatures were significantly greater for FDEs than for Lay participants, $F(1, 87) = 49.25$, $p < .001$, partial $\eta^2 = .361$, and $F\ (1, 87) = 45.75$, $p < .001$, partial $\eta^2 = .345$.

Visit counts in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 30.77$, $p < .001$, partial $\eta^2 = .261$; AOI 2, $F(1, 87) = 36.56$, $p < .001$, partial $\eta^2 = .296$). Table LaBarbera 6.7 presents the means and standard deviations for areas of interest by participant type.

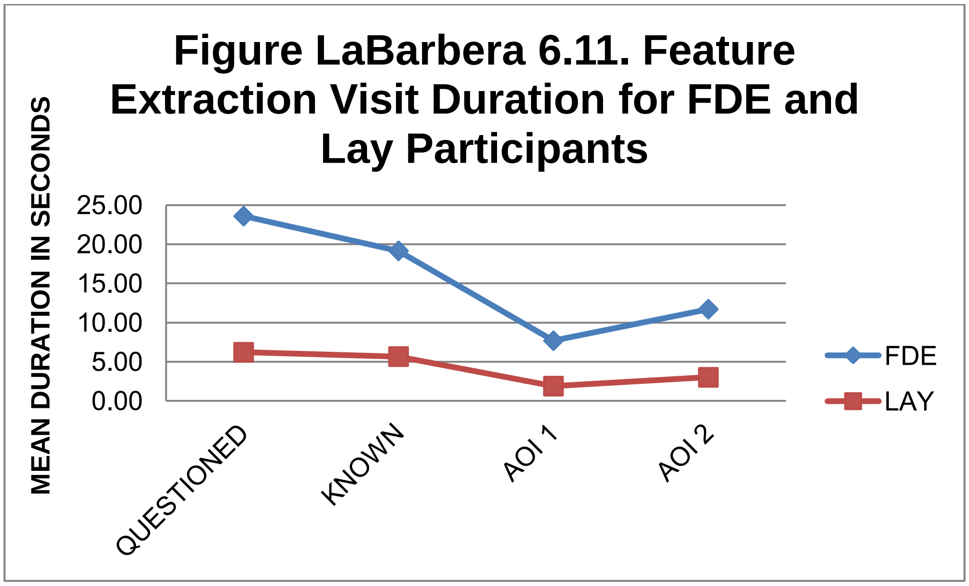
Table LaBarbera 6.7
Feature Extraction Analysis Visit Count for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	18.83	10.86	17.83	10.48	10.37	7.89	14.07	9.60
Lay	6.21	4.75	6.07	4.63	3.33	2.75	4.58	3.81

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .371, $F(4, 84) = 4.39$, $p < .001$, multivariate $\eta^2 = .371$. Figure LaBarbera 6.11 presents the mean visit duration by AOI.

Figure LaBarbera 6.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit durations for the questioned signature and known signatures were significantly greater for FDEs than for Lay participants, $F(1, 87) = 46.41$, $p < .001$, partial $\eta^2 = .348$, and $F(1, 87) = 34.45$, $p < .001$, partial $\eta^2 = .284$.

Visit durations in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 31.47$, $p < .001$, partial $\eta^2 = .266$; AOI 2, $F(1, 87) = 37.71$, $p < .001$, partial $\eta^2 = .302$). Table LaBarbera 6.8 presents the means and standard deviations for areas of interest by participant type.

Table LaBarbera 6.8

Feature Extraction Analysis Visit Duration for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	23.59	16.12	19.16	14.14	7.68	6.54	11.71	8.92
Lay	6.21	4.61	5.66	5.41	1.89	1.83	3.01	2.65

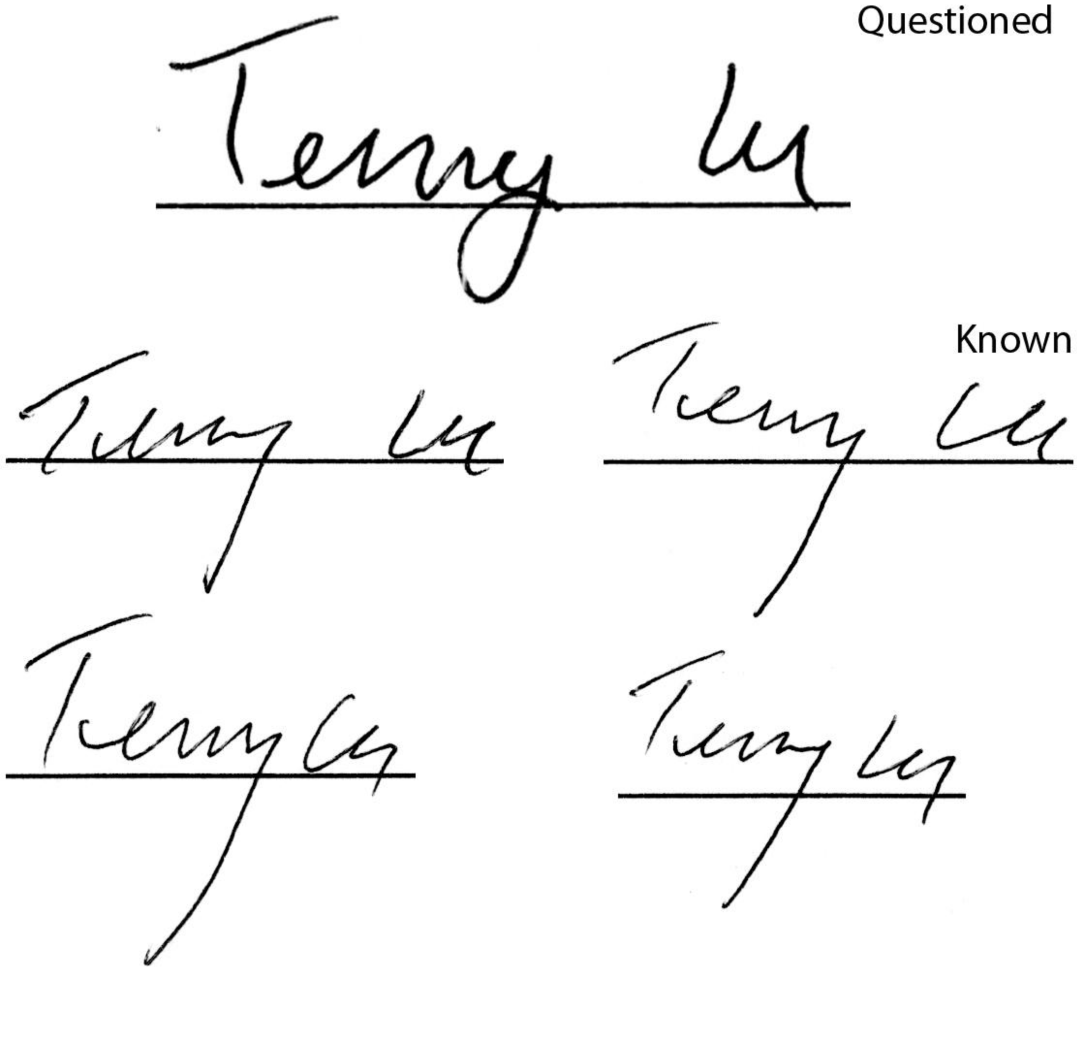
SIGNATURE 5: Terry Lu

The signature of Terry Lu is characterized as a low-complexity text-type signature. The set of Lu signature specimens included three genuine signatures. Of the non-genuine signatures, one was traced, and two were freehand simulations. No disguised signatures were included in the set.

Lu Signature 1: Freehand Simulation (Non-Genuine)

Of the 49 FDE participants, 48 responded correctly that the signature was non-genuine, and 1 responded that it was genuine. Of the 43 Lay participants, 38 responded correctly that the signature was non-genuine, and 5 responded that the signature was genuine. This difference was not statistically significant, p = .063, *ns*. Figure Lu 1.1 presents the comparison view of this signature.

Figure Lu 1.1. Questioned-Known Comparison Stimulus for Lu Signature 1.

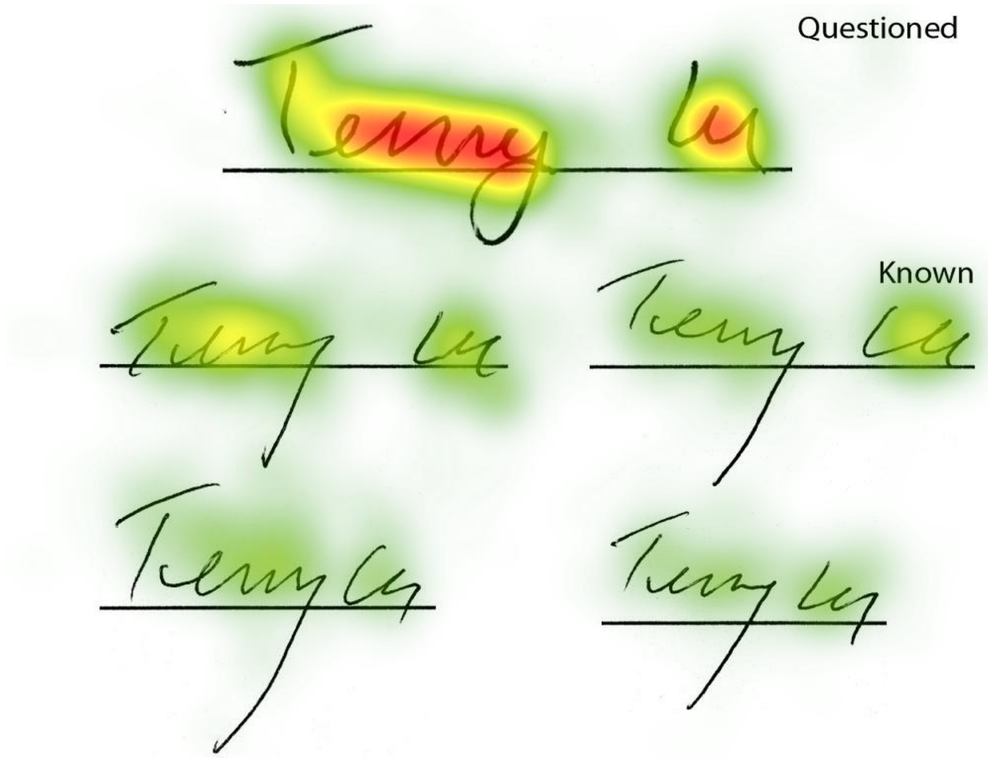


Selection of Areas of Interest (AOIs)

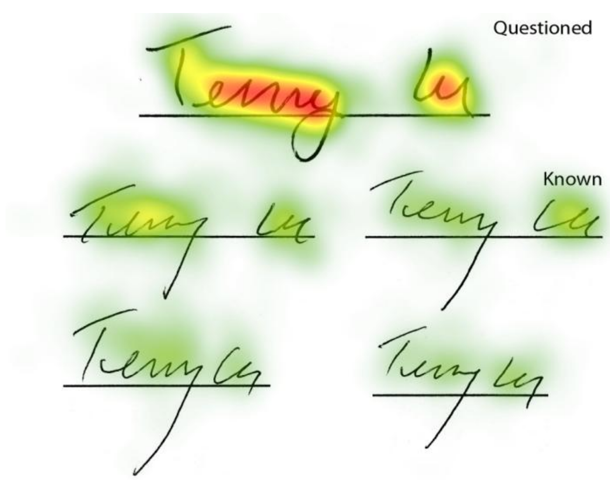
Figure Lu 1.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were two locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of two AOIs for this stimulus. Figure Lu 1.3 presents the location of the AOIs identified in the heat map.

Figure Lu 1.2. Heat map for Lu signature 1, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

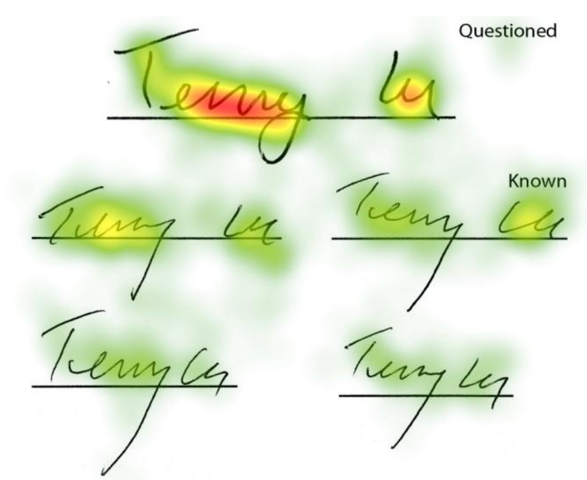
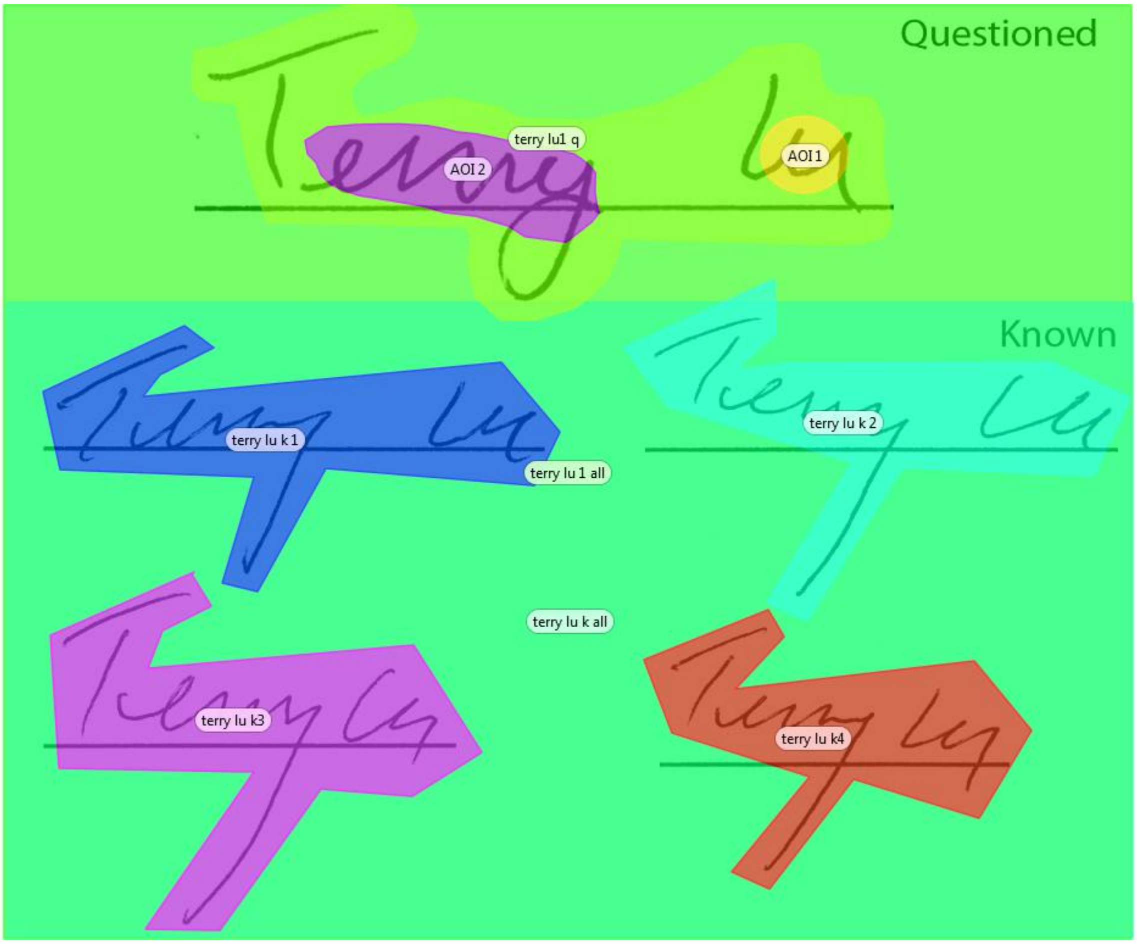


Figure Lu 1.3. Areas of Interest (AOIs) for Lu Signature 1.



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

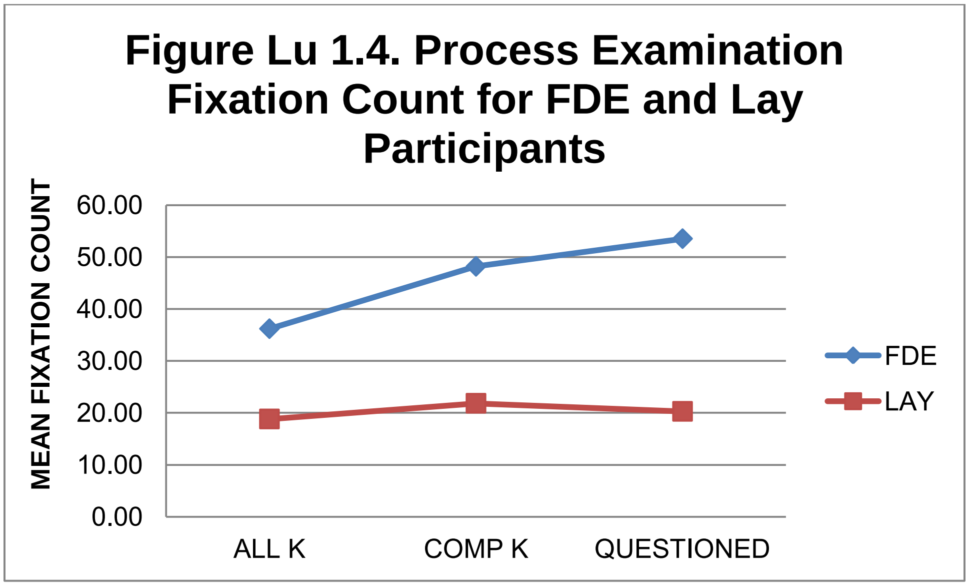
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Lu known signature stimulus (Knowns, not pictured here), Lu 1 K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Lu 1Q (the Lu questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 2) are included in subsequent analyses. Figure Lu 1.3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .202, $F(3, 86) = 7.25$, $p < .001$, multivariate $\eta^2 = .202$. Figure Lu 1.4 presents the mean fixation counts by AOI.

Figure Lu 1.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixations counts in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 88) = 21.28$, $p < .001$, partial $\eta^2 = .195$); known signature comparison stimulus (COMP K), $F(1, 88) = 13.48$, $p < .001$, partial $\eta^2 = .133$); and fixation counts in the known signature stimulus(ALL K), $F(1, 88) = 11.06$, $p = .001$, partial $\eta^2 = .112$). Table Lu 1.1 presents the means and standard deviations for areas of interest by participant type.

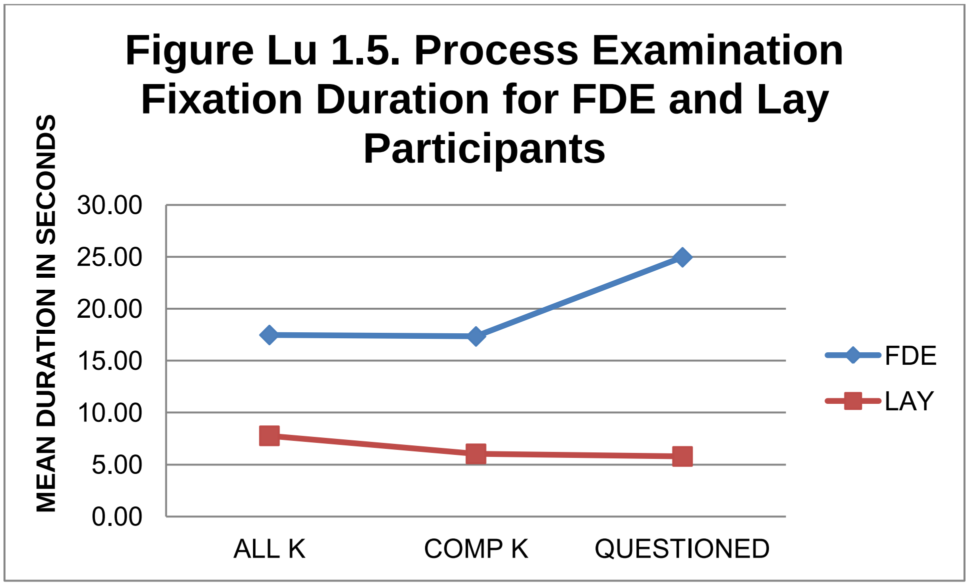
Table Lu 1.1
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	36.19	31.47	48.19	40.86	53.53	44.24
Lay	18.81	14.14	21.84	24.42	20.28	17.34

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .250, $F(3, 86) = 9.55$, $p < .001$, multivariate $\eta^2 = .250$. Figure Lu 1.5 presents the mean fixation counts by AOI.

Figure Lu 1.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation durations in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 88) = 14.36$, $p < .001$, partial $\eta^2 = .140$); known signature comparison stimulus, $F(1, 88) = 6.56$, $p = .012$, partial $\eta^2 = .069$). Fixation durations in the known signature stimulus (ALL K) were also statistically significant, $F(1, 88) = 9.79$, $p = .002$, partial $\eta^2 = 1.00$. Table Lu1.2 presents the means and standard deviations for areas of interest by participant type.

Table Lu 1.2

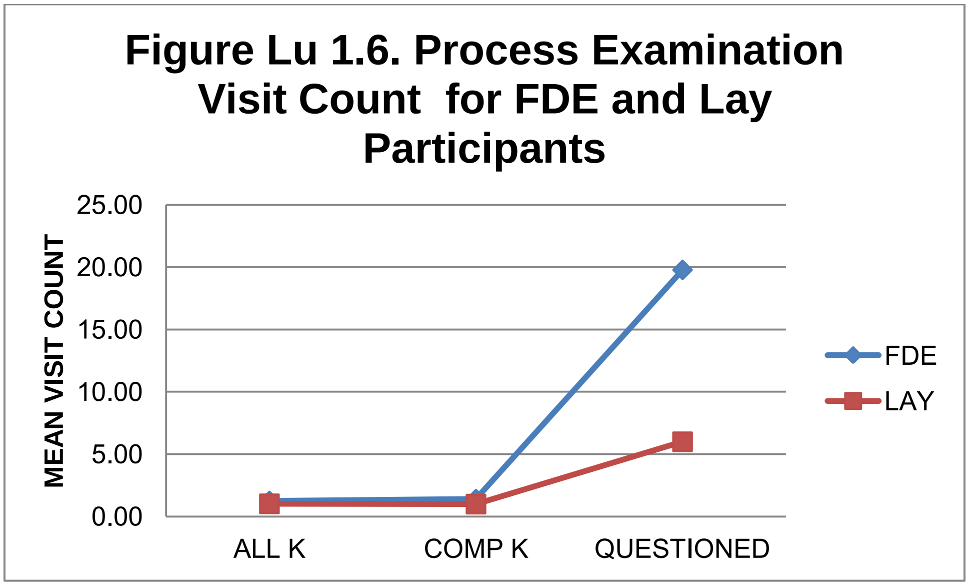
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	17.48	18.79	17.34	28.24	24.96	32.74
Lay	7.77	8.11	6.04	6.56	5.79	5.52

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .167, $F(3, 86) = 5.75$, $p = .001$, multivariate $\eta^2 = .167$. Figure Lu 1.6 presents the mean visit counts by AOI.

Figure Lu 1.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in two of the three areas of interest. Total visit count for the questioned signature were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 88) = 12.40$, $p = .001$, partial $\eta^2 = .124$, and for the known signature comparison stimulus (COMP K), $F(1, 88) = 6.55$, $p = .012$, partial $\eta^2 = .069$.

No significant differences were found in visit counts for the known signature stimulus (ALL K), $p = .156$, *ns*. Table Lu 1.3 presents the means and standard deviations for areas of interest by participant type.

Table Lu 1.3

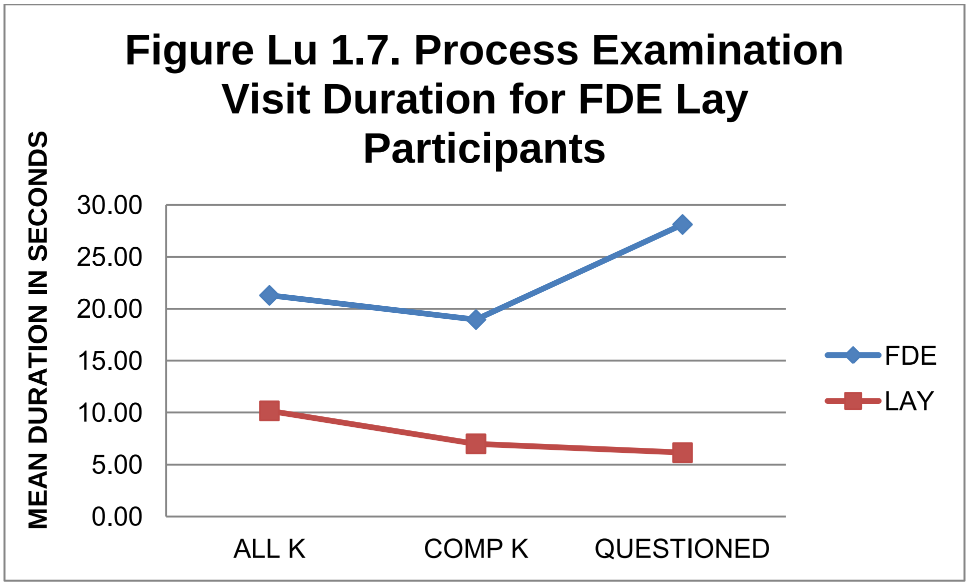
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.26	1.01	1.40	0.99	19.79	25.27
Lay	1.02	0.34	1.00	0.31	6.00	4.63

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .288, $F(3, 86) = 11.61$, $p < .001$, multivariate $\eta^2 = .288$. Figure Lu 1.7 presents the mean visit durations by AOI.

Figure Lu 1.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants (questioned signature, $F(1, 88) = 16.68$, $p < .001$, partial $\eta^2 = .159$); known signature comparison stimulus, $F(1, 88) = 6.15$, $p = .02$, partial $\eta^2 = .065$); and for the known signatures (ALL K), $F(1, 88) = 10.17$, $p = .002$, partial $\eta^2 = .104$). Table Lu 1.4 presents the means and standard deviations for areas of interest by participant type.

Table Lu 1.4

Process Analysis Visit Durations for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	21.29	21.04	18.96	30.81	28.12	34.81
Lay	10.18	9.31	7.00	7.39	6.15	5.86

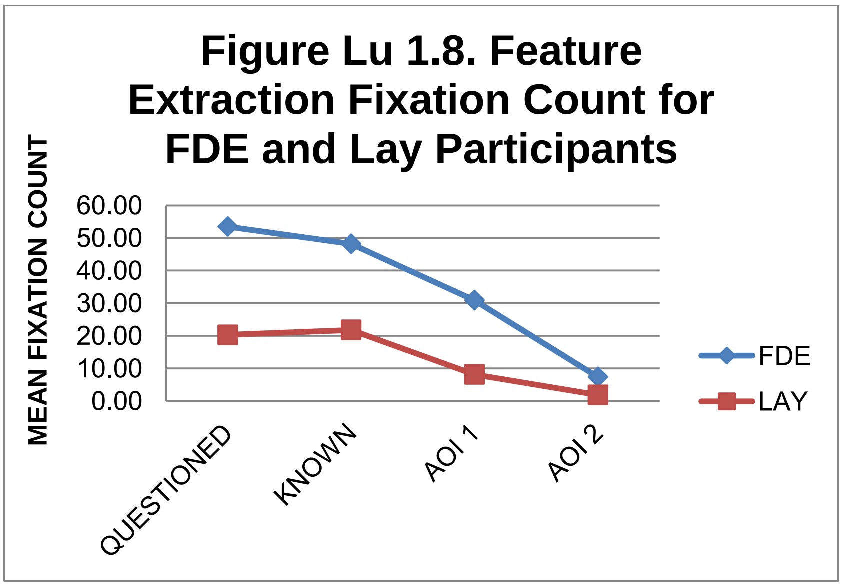
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .226, $F(4, 85) = 6.19$, $p < .001$, multivariate $\eta^2 = .226$. Figure Lu 1.8 presents the mean fixation counts by AOI.

Figure Lu 1.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 88) = 21.28$, $p < .001$, partial $\eta^2 = .195$, and $F(1, 88) = 13.48$, $p < .001$, partial $\eta^2 = .133$.

Fixations counts in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 14.67$, $p < .001$, partial $\eta^2 = .143$; AOI 2, $F(1, 88) = 10.60$, $p = .002$, partial $\eta^2 = .108$). Table Lu 1.5 presents the means and standard deviations for areas of interest by participant type.

Table Lu 1.5
Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

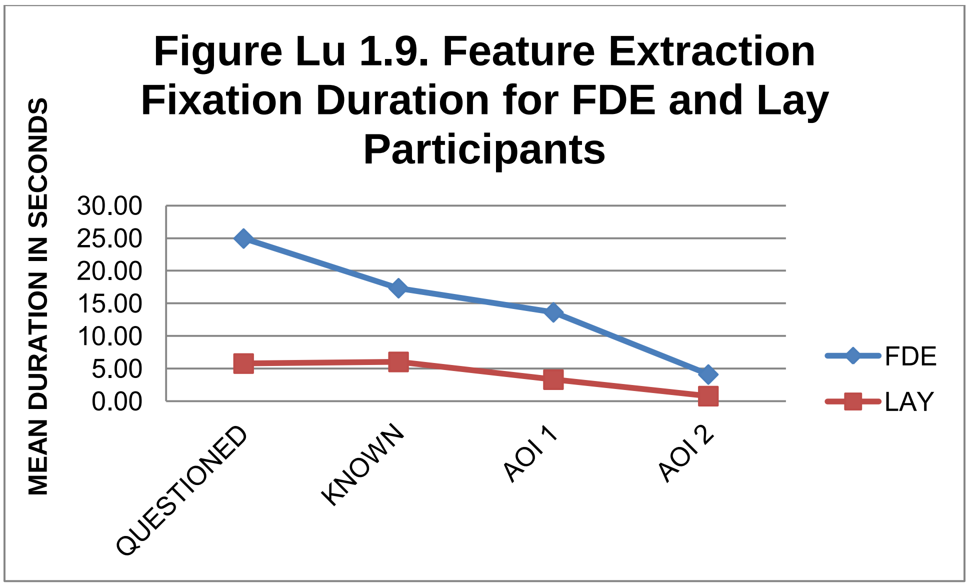
	QUESTIONED		KNOWNS		AOI1		AOI2	
Participants	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	53.53	44.24	48.19	40.86	30.94	38.42	7.40	10.94

Lay	20.28	17.34	21.84	24.42	8.16	6.80	1.88	2.06

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .255, $F(4, 85) = 4.72$, $p < .001$, multivariate $\eta^2 = .255$. Figure Lu 1.9 presents the mean fixation durations by AOI.

Figure Lu 1.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 88) = 14.36$, $p < .001$, partial $\eta^2 = .140$, and $F(1, 88) = 6.56$, $p = .012$, partial $\eta^2 = .069$.

Fixation durations in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 12.05$, $p = .001$, partial $\eta^2 = .120$; AOI 2, $F(1, 88) = 10.02$, $p = .002$, partial $\eta^2 = .102$). Table Lu 1.6 presents the means and standard deviations for areas of interest by participant type.

Table Lu 1.6

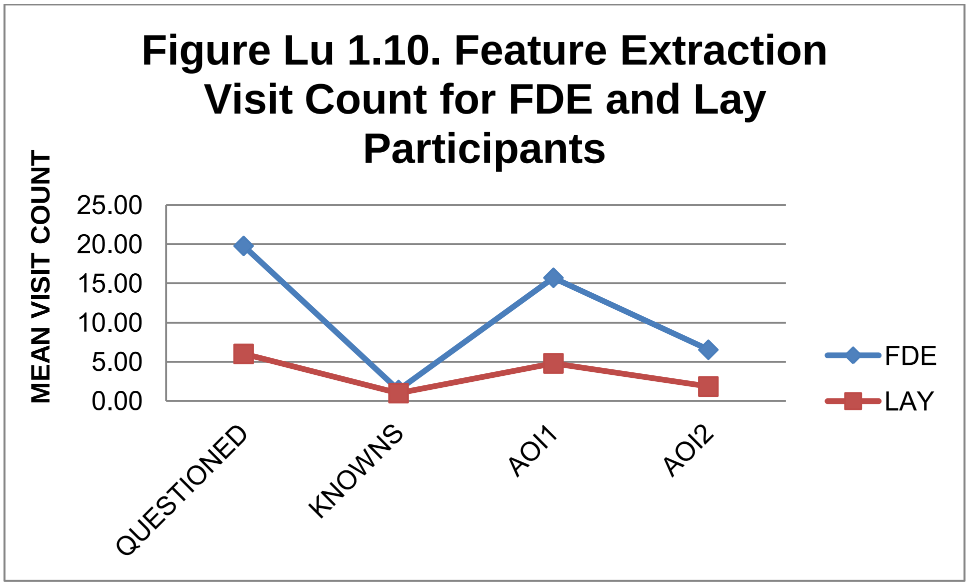
Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

	QUESTIONED		KNOWNS		AOI1		AOI2	
Participants	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	24.96	32.74	17.34	28.24	13.64	19.21	4.11	6.82
Lay	5.79	5.52	6.04	6.56	3.32	3.29	0.79	0.86

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .181, $F(4, 85) = 4.69$, $p = .002$, multivariate $\eta^2 = .181$. Figure Lu 1.10 presents the mean fixation durations by AOI.

Figure Lu 1.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 88) = 12.40$, $p = .001$, partial $\eta^2 = .124$, and $F(1, 88) = 6.55$, $p = .012$, partial $\eta^2 = .069$.

Visit counts in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 12.97$, $p = .001$, partial $\eta^2 = .128$; AOI 2, $F(1, 88) = 10.25$, $p = .002$, partial $\eta^2 = .104$). Table Lu 1.7 presents the means and standard deviations for areas of interest by participant type.

Table Lu 1.7

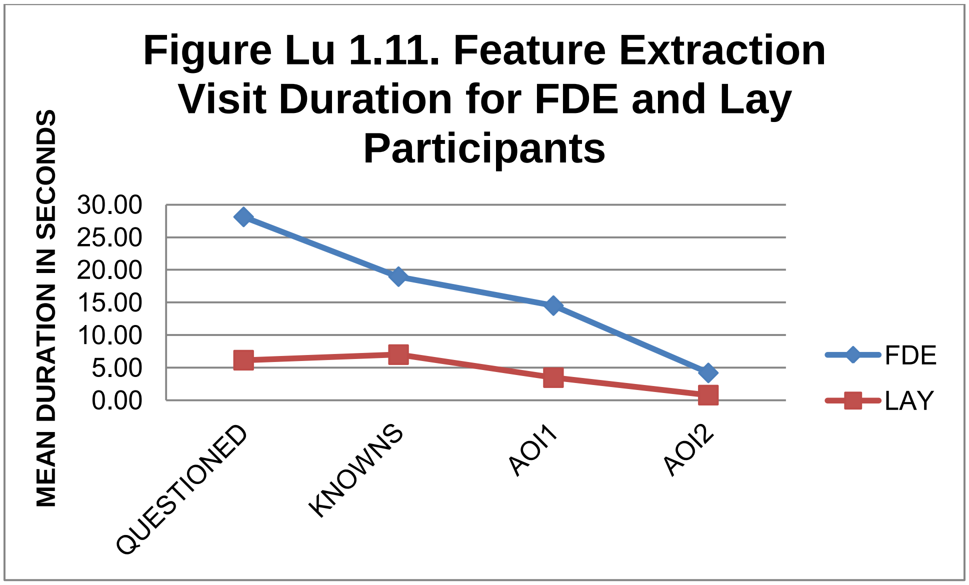
Feature Extraction Analysis Visit Count for FDE and Lay Participants

	QUESTIONED		KNOWNS		AOI1		AOI2	
Participants	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	19.79	25.27	1.40	0.99	15.72	19.57	6.53	9.42
Lay	6.00	4.63	1.00	0.31	4.79	3.76	1.84	1.99

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .273, $F(4, 85) = 7.98$, $p < .001$, multivariate $\eta^2 = .273$. Figure Lu 1.11 presents the mean fixation durations by AOI.

Figure Lu 1.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 88) = 16.68$, $p < .001$, partial $\eta^2 = .159$, and $F(1, 88) = 6.15$, $p = .015$, partial $\eta^2 = .065$.

Visit duration in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 12.36$, $p = .001$, partial $\eta^2 = .123$; AOI 2, $F(1, 88) = 9.90$, $p = .002$, partial $\eta^2 = .101$). Table Lu 1.8 presents the means and standard deviations for areas of interest by participant type.

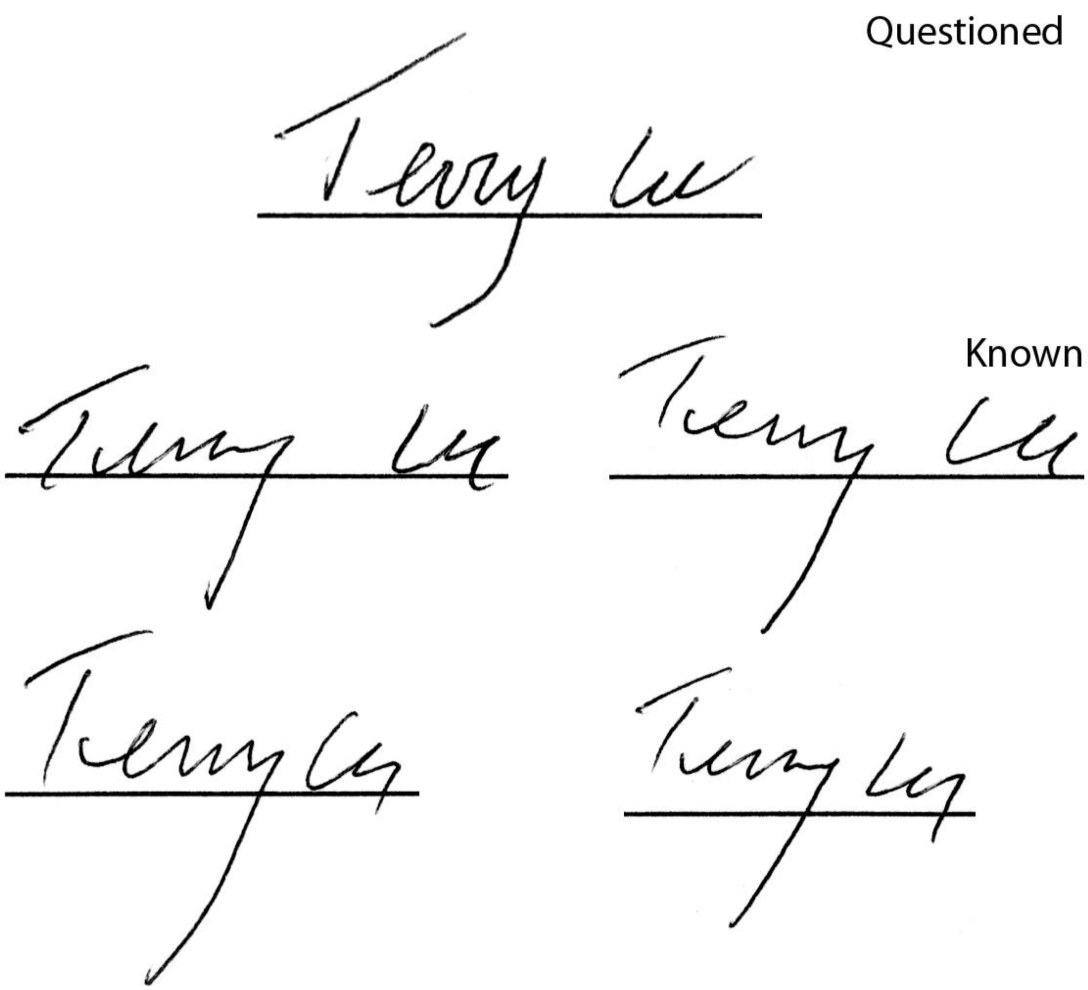
Table Lu 1.8
Feature Extraction Analysis Visit Count for FDE and Lay Participants

	QUESTIONED		KNOWNS		AOI1		AOI2	
PARTICIPANT	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	28.12	34.81	18.96	30.81	14.52	20.32	4.20	7.05
LAY	6.15	5.86	7.00	7.39	3.48	3.40	0.80	0.86

Lu Signature 2: Freehand Simulation (Non-Genuine)

Of the 49 FDE participants, 45 responded correctly that the signature was non-genuine and 3 responded that it was genuine. One FDE declined to respond. Of the 43 Lay participants, 37 responded correctly that the signature was genuine, and 6 responded that the signature was genuine. This difference was not statistically significant, $p = .301$, *ns*. Figure Lu 2.1 presents the comparison view of this signature.

Figure Lu 2.1. Questioned-Known Comparison Stimulus for Lu Signature 2.

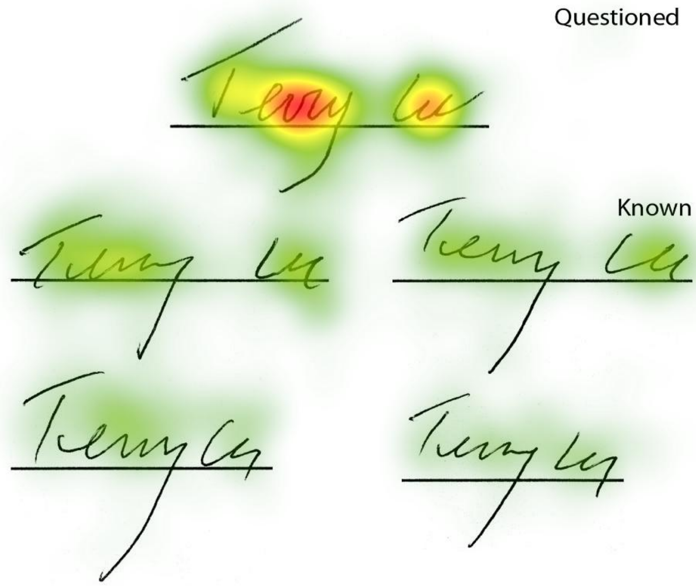


Selection of Areas of Interest (AOIs)

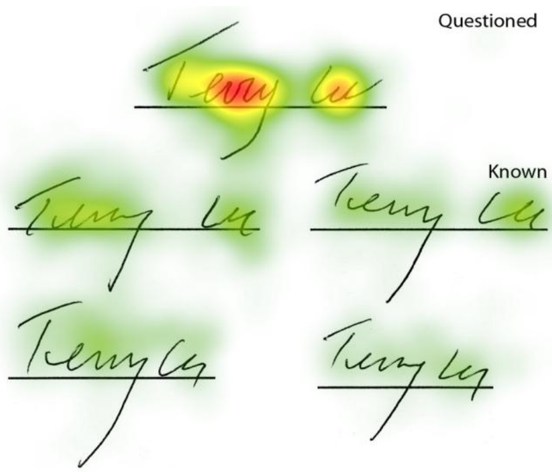
Figure Lu 2.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were two locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of two AOIs for this stimulus. Figure Lu 2.3 presents the location of the AOIs identified in the heat map.

Figure Lu 2.2. Heat map for Lu Signature 2, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

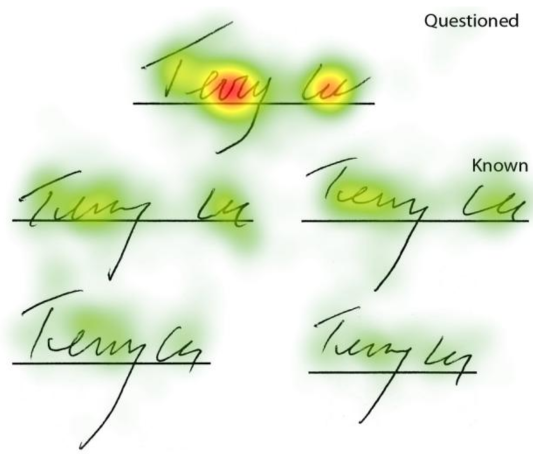
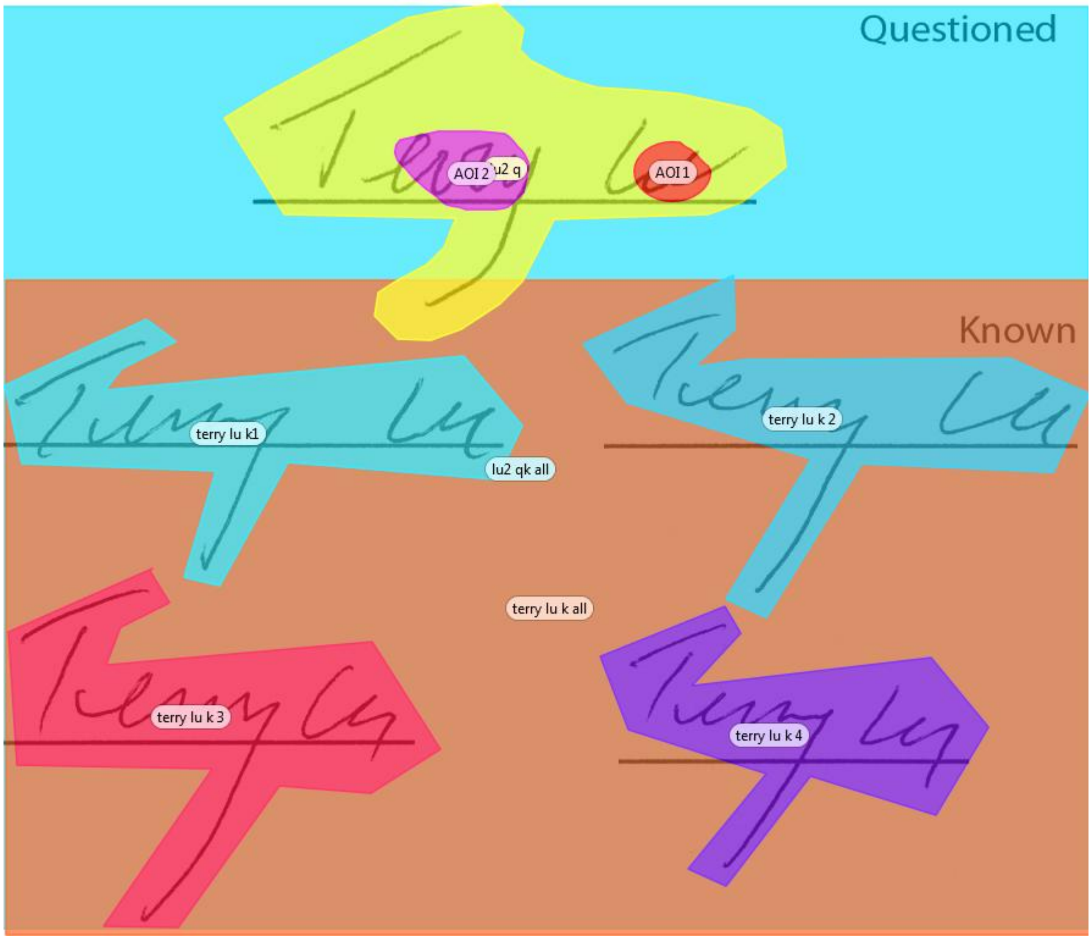


Figure Lu 2.3. Areas of Interest (AOIs) for Lu Signature 2.



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

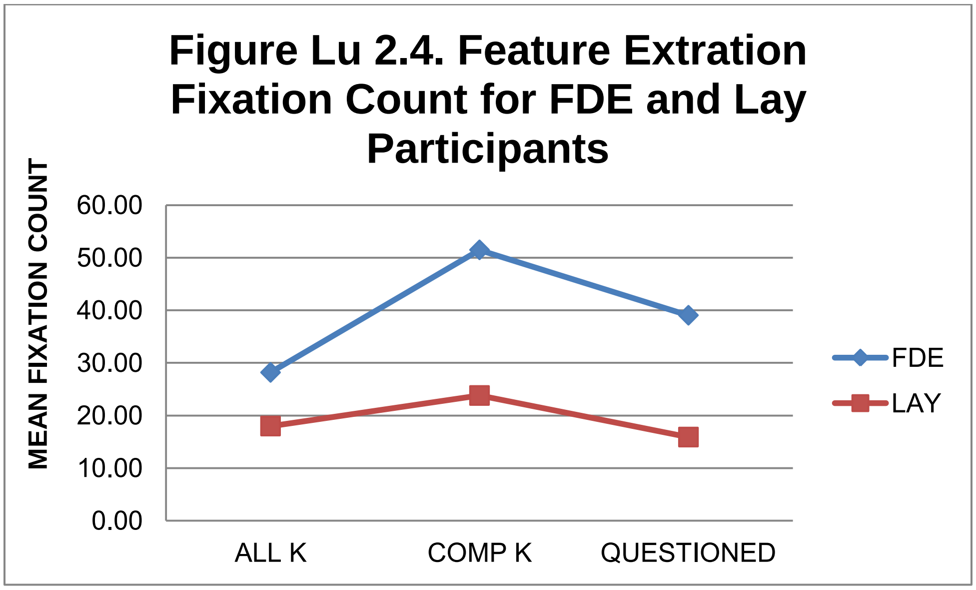
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Lu known signature stimulus (Knowns, not pictured here), Lu 2 K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Lu 2Q (the Lu questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 2) are included in subsequent analyses. Figure Lu 2.3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .206, $F(3, 85) = 7.36$, $p < .001$, multivariate $\eta^2 = .206$. Figure Lu 2.4 presents the mean fixation counts by AOI.

Figure Lu 2.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixations counts in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 87) = 19.88$, $p < .001$, partial $\eta^2 = .186$); known signature comparison stimulus (COMP K), $F(1, 87) = 15.69$, $p < .001$, partial $\eta^2 = .153$); and fixation counts in the known signature stimulus (ALL K), $F(1, 87) = 8.43$, $p = .005$, partial $\eta^2 = .088$. Table Lu 2.1 presents the means and standard deviations for areas of interest by participant type.

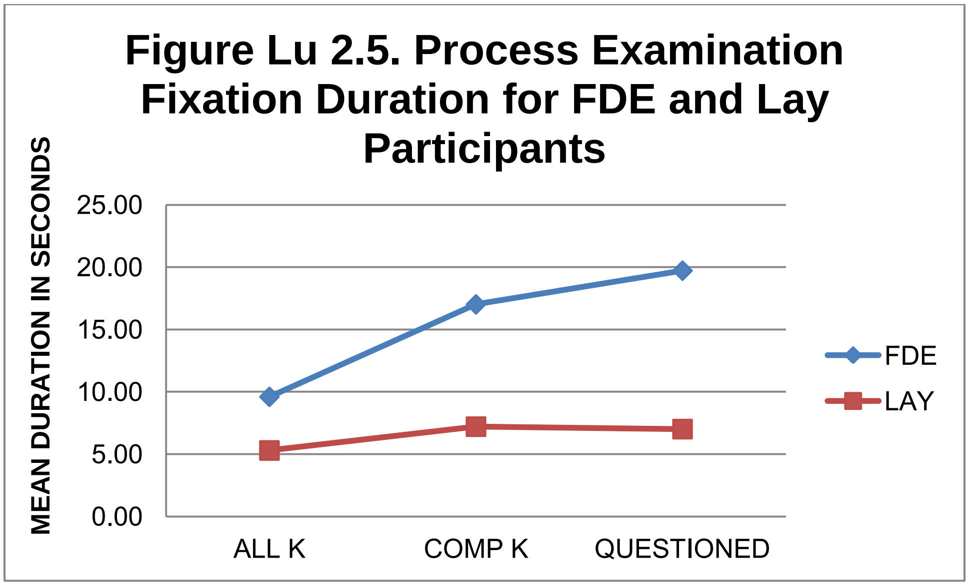
Table Lu 2.1
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	28.17	19.17	51.48	41.87	39.04	30.00
Lay	17.98	13.19	23.79	19.26	15.88	16.68

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .280, $F(3, 85) = 11.00$, $p < .001$, multivariate $\eta^2 = .280$. Figure Lu 2.5 presents the mean fixation counts by AOI.

Figure Lu 2.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation durations in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 87) = 29.52$, $p < .001$, partial $\eta^2 = .253$); known signature comparison stimulus (COMP K), $F(1, 87) = 17.15$, $p < .001$, partial $\eta^2 = .165$); known signature stimulus (ALL K), $F(1, 87) = 9.19$, $p = .003$, partial $\eta^2 = .096$. Table Lu 2.2 presents the means and standard deviations for areas of interest by participant type.

Table Lu 2.2

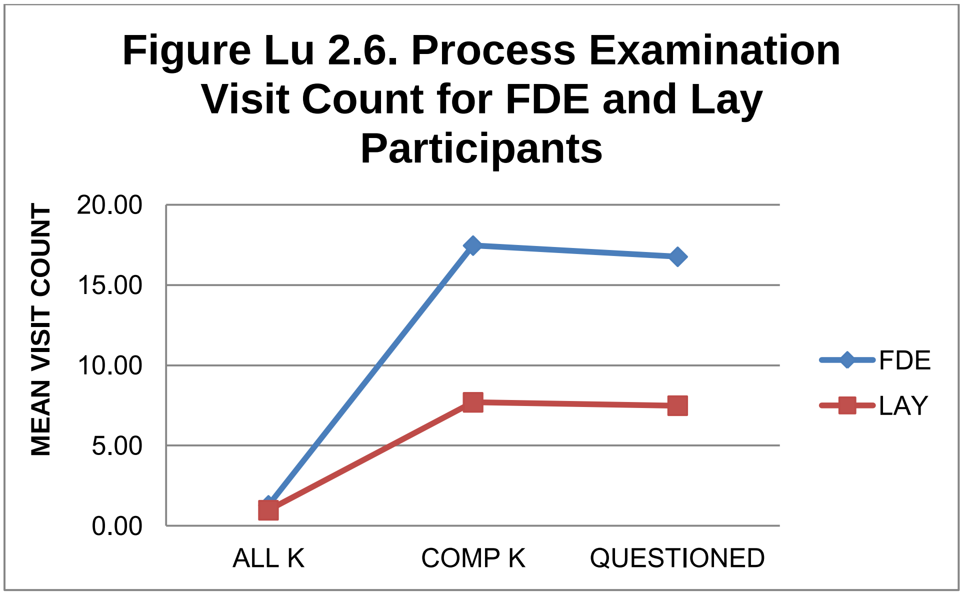
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	9.60	8.45	17.02	14.68	19.73	14.17
Lay	5.30	4.03	7.21	5.23	7.02	6.07

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .273, $F(3, 86) = 10.62$, $p < .001$, multivariate $\eta^2 = .273$. Figure Lu 2.6.presents the mean visit counts by AOI.

Figure Lu 2.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 87) = 21.72$, $p = .001$, partial $\eta^2 = .200$); known signature comparison stimulus(COMP K), $F(1, 87) = 23.93$, $p < .001$, partial $\eta^2 = .216$); known signature stimulus (ALL K), $F(1, 87) = 2.08$, $p = .017$, partial $\eta^2 = .064$). Table Lu 2.3 presents the means and standard deviations for areas of interest by participant type.

Table Lu 2.3

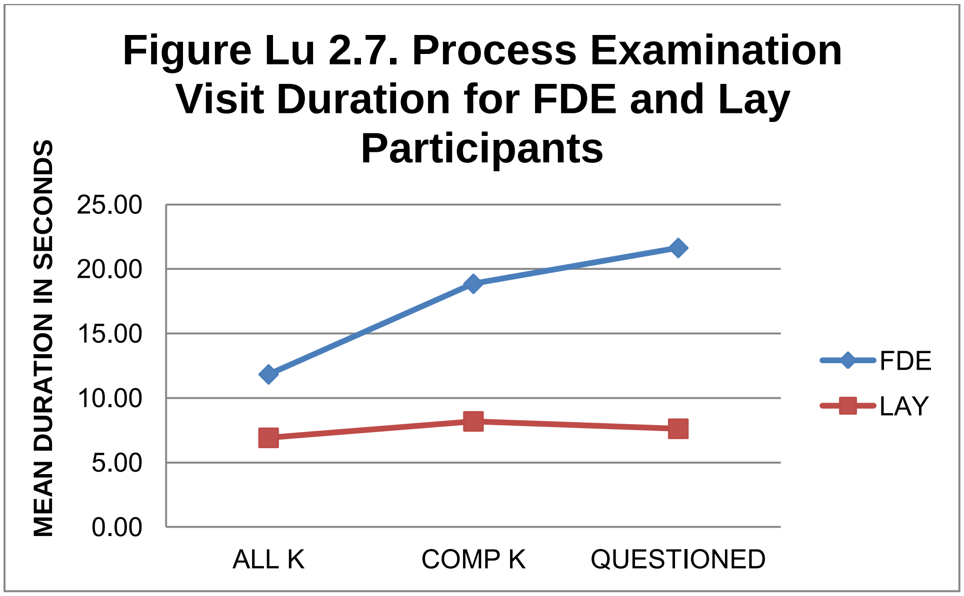
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.28	0.78	17.46	11.41	16.76	11.36
Lay	0.98	0.27	7.70	6.62	7.49	6.64

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .284, $F(3, 85) = 11.23$, $p < .001$, multivariate $\eta^2 = .284$. Figure Lu 2.7 presents the mean visit durations by AOI.

Figure Lu 2.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants (questioned signature, $F(1, 87) = 30.28$, $p < .001$, partial $\eta^2 = .258$); known signature comparison stimulus (COMP K), $F(1, 87) = 16.46$, $p < .001$, partial $\eta^2 = .159$); and for the known signature (ALL K), $F(1, 87) = 9.21$, $p = .003$, partial $\eta^2 = .096$. Table Lu 2.4 presents the means and standard deviations for areas of interest by participant type.

Table Lu 2.4

Process Analysis Visit Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	11.84	9.42	18.86	16.12	21.64	15.51
LAY	6.92	5.06	8.19	6.30	7.63	6.39

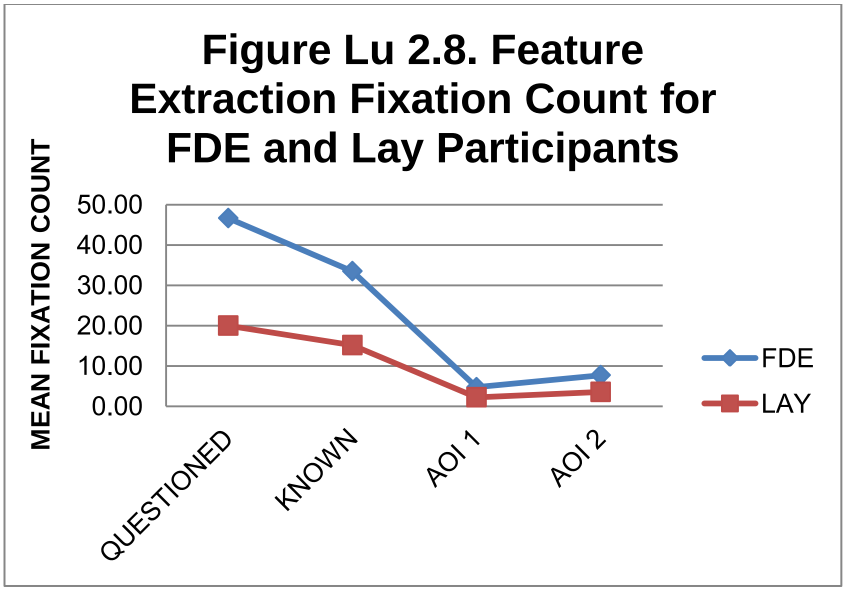
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .215, $F(4, 84) = 5.74$, $p < .001$, multivariate $\eta^2 = .215$. Figure Lu 2.8 presents the mean fixation counts by AOI.

Figure Lu 2.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 87) = 18.57$, $p < .001$, partial $\eta^2 = .176$, and $F(1, 87) = 15.25$, $p < .001$, partial $\eta^2 = .149$. Fixations counts in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 12.25$, $p = .001$, partial $\eta^2 = .123$; AOI 2, $F(1, 87) = 18.20$, $p = .001$, partial $\eta^2 = .173$). Table Lu 2.5 presents the means and standard deviations for areas of interest by participant type.

Table Lu 2.5

Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

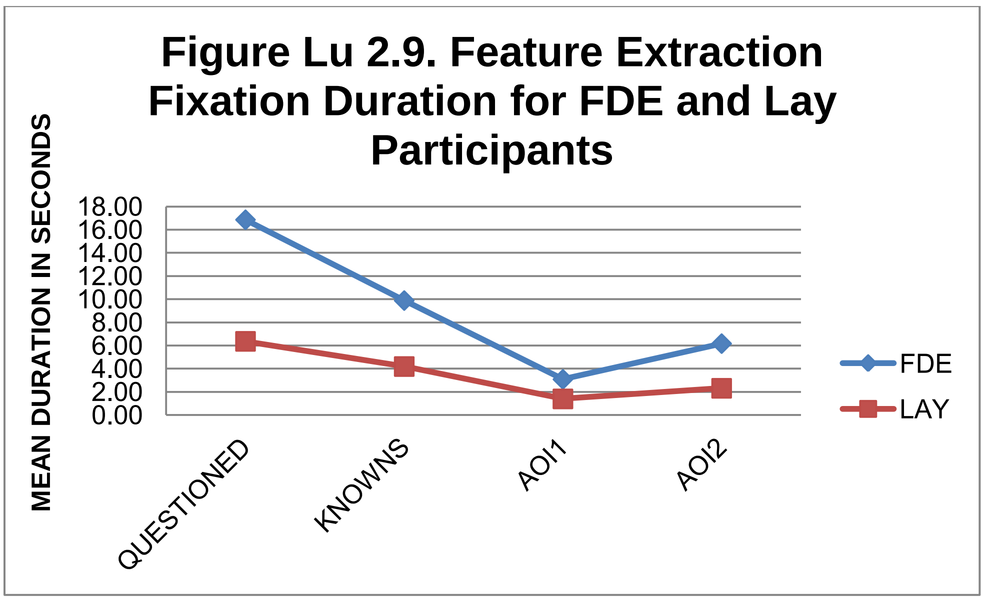
	QUESTIONED		KNOWNS		AOI1		AOI2	
PARTICIPANT	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	46.65	33.85	33.50	27.71	4.72	3.88	7.72	5.47

LAY	20.00	23.10	15.16	13.86	2.23	2.66	3.56	3.42

<u>*Total Fixation Duration*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .209, $F(4, 84) = 5.43$, $p < .001$, multivariate $\eta^2 = .209$. Figure Lu 2.9 presents the mean fixation durations by AOI.

Figure Lu 2.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 87) = 20.33$, $p < .001$, partial $\eta^2 = .189$, and $F(1, 87) = 12.89$, $p = .001$, partial $\eta^2 = .129$. Fixation durations in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 12.28$, $p = .001$, partial $\eta^2 = .124$; AOI 2, $F(1, 87) = 17.92$, $p < .001$, partial $\eta^2 = .171$). Table Lu 2.6 presents the means and standard deviations for areas of interest by participant type.

Table Lu 2.6

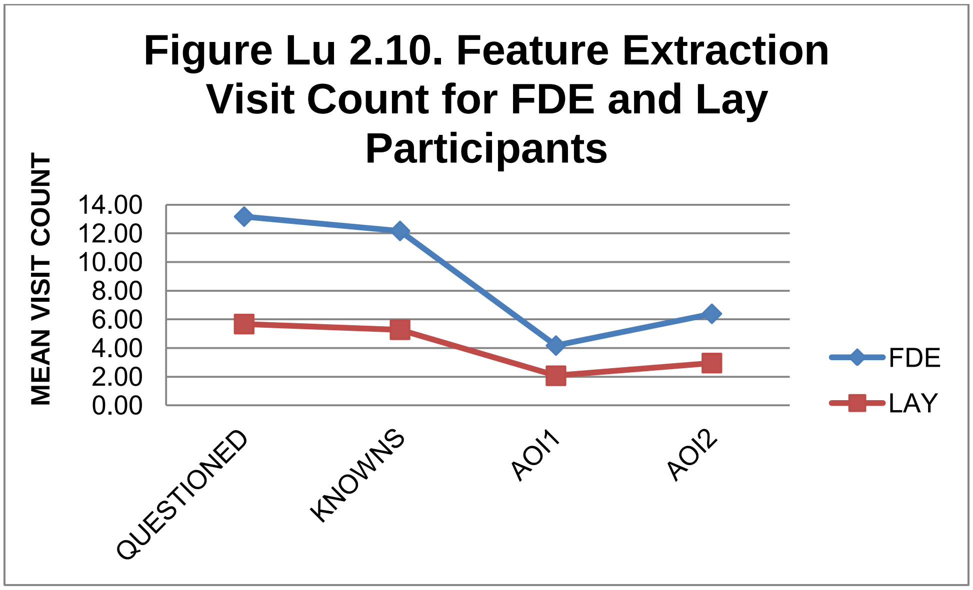
Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

	QUESTIONED		KNOWNS		AOI1		AOI2	
PARTICIPANT	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	16.87	13.78	9.89	9.70	3.09	2.84	6.18	5.55
LAY	6.37	6.79	4.19	3.90	1.40	1.44	2.32	2.28

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .202, $F(4, 84) = 5.32$, $p = .001$, multivariate $\eta^2 = .202$. Figure Lu 2.10 presents the mean visit counts by AOI.

Figure Lu 2.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 87) = 16.23$, $p < .001$, partial $\eta^2 = .157$, and $F(1, 87) = 17.65$, $p < .001$, partial $\eta^2 = .169$. Visit counts in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 11.30$, $p = .001$, partial $\eta^2 = .115$; AOI 2, $F(1, 87) = 18.18$, $p < .001$, partial $\eta^2 = .173$). Table Lu 2.7 presents the means and standard deviations for areas of interest by participant type.

Table Lu 2.7

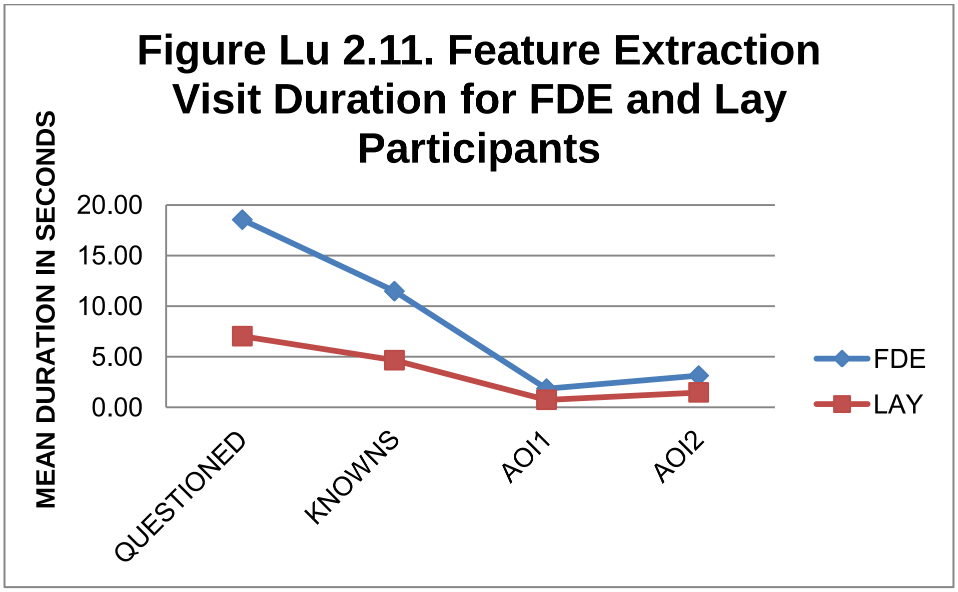
Feature Extraction Analysis Visit Count for FDE and Lay Participants

	QUESTIONED		KNOWNS		AOI1		AOI2	
PARTICIPANT	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	13.17	10.77	12.17	9.33	4.17	3.39	6.39	4.56
LAY	5.67	5.94	5.28	5.54	2.07	2.38	2.95	2.77

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .208, $F(4, 84) = 5.53$, $p = .001$, multivariate $\eta^2 = .208$. Figure Lu 2.11 presents the mean visit durations by AOI.

Figure Lu 2.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 87) = 20.64$, $p < .001$, partial $\eta^2 = .192$, and $F(1, 87) = 15.59$, $p < .001$, partial $\eta^2 = .152$. Visit duration in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 10.89$, $p = .001$, partial $\eta^2 = .111$; AOI 2, $F(1, 87) = 11.18$, $p = .001$, partial $\eta^2 = .114$). Table Lu 2.8 presents the means and standard deviations for areas of interest by participant type.

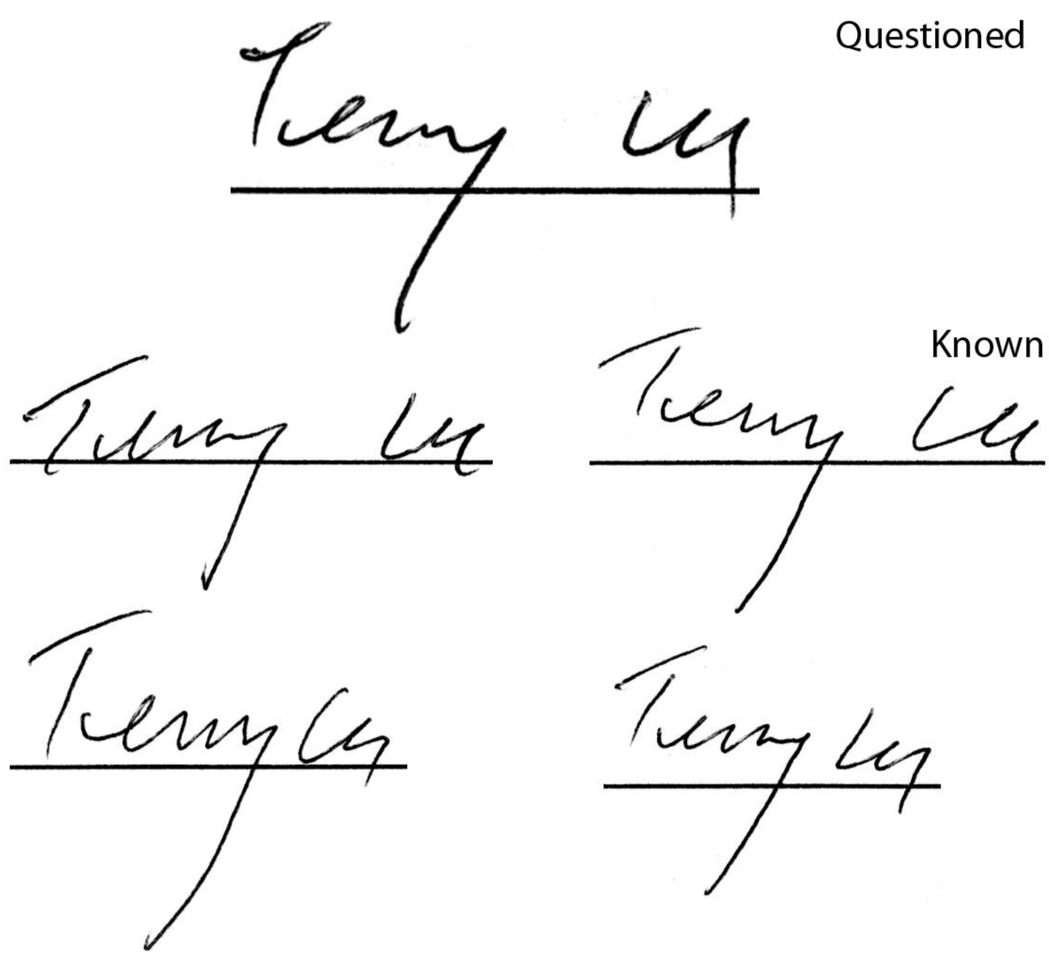
Table Lu 2.8
Feature Extraction Analysis Visit Duration for FDE and Lay Participants

	QUESTIONED		KNOWNS		AOI1		AOI2	
PARTICIPANT	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	18.54	14.98	11.47	10.52	1.85	1.99	3.13	2.89
LAY	7.03	7.42	4.66	4.33	0.75	0.92	1.48	1.54

Lu Signature 3: Genuine

Of the 49 FDE participants, 15 responded correctly that the signature was genuine and 33 responded that it was non-genuine. One FDE declined to respond. Of the 43 Lay participants, 42 responded correctly that the signature was genuine, and 1 responded that the signature was non-genuine. This difference was statistically significant, χ^2 (1, N = 92) = 43.70, p < .001. Figure Lu 3.1 presents the comparison view of this signature.

Figure Lu 3.1. Questioned-Known Comparison Stimulus for Lu Signature 3.

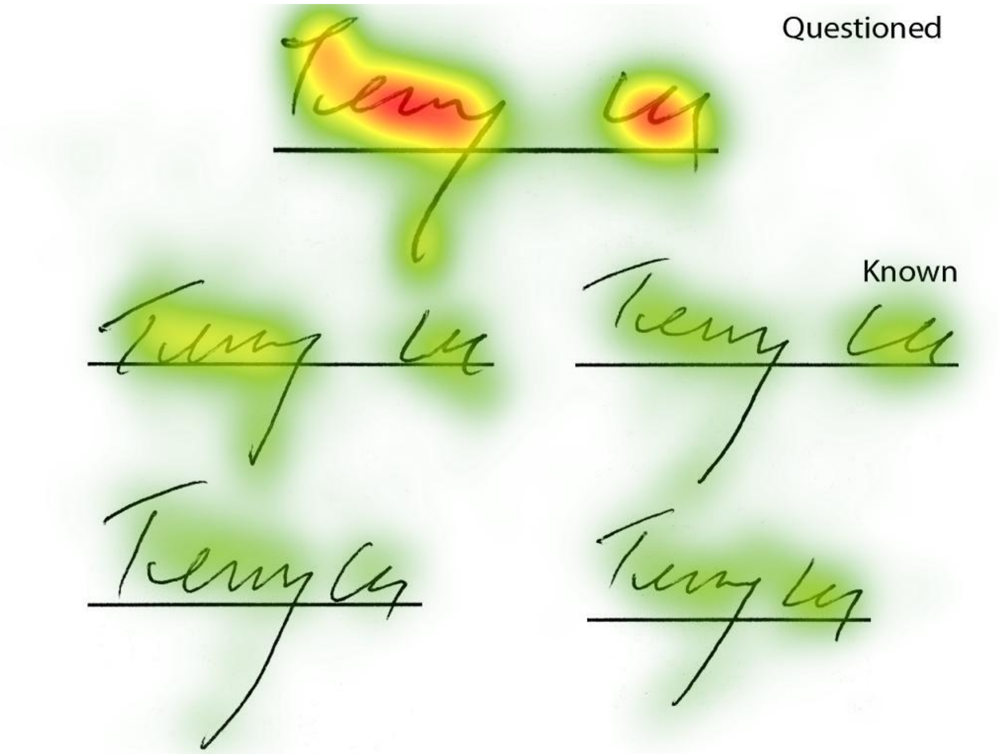


Selection of Areas of Interest (AOIs)

Figure Lu 3.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were three locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of three AOIs for this stimulus. Figure Lu 3.3 presents the location of the AOIs identified in the heat map.

Figure Lu 3.2. Heat map for Wulf signature 3, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE **Lay**

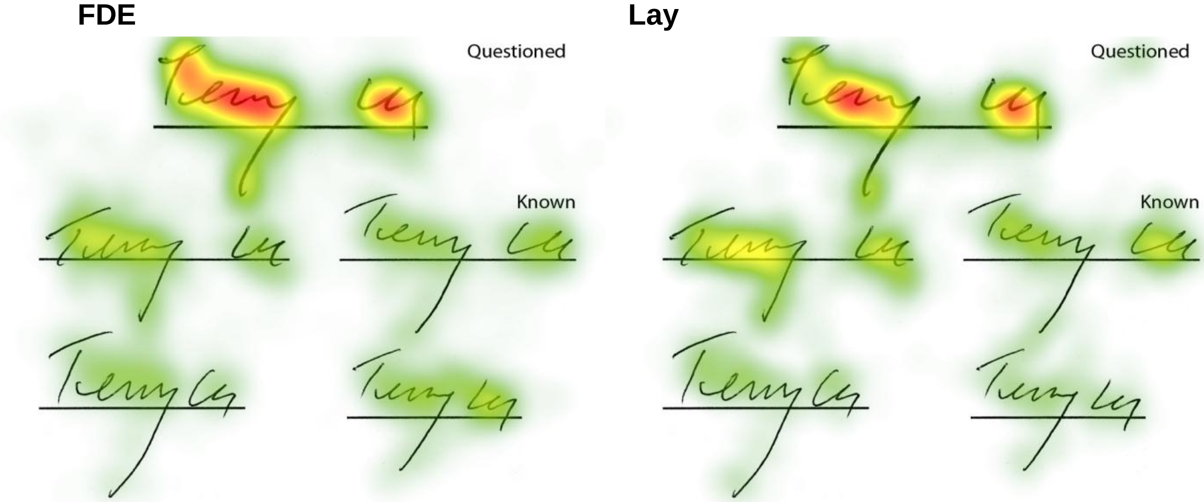
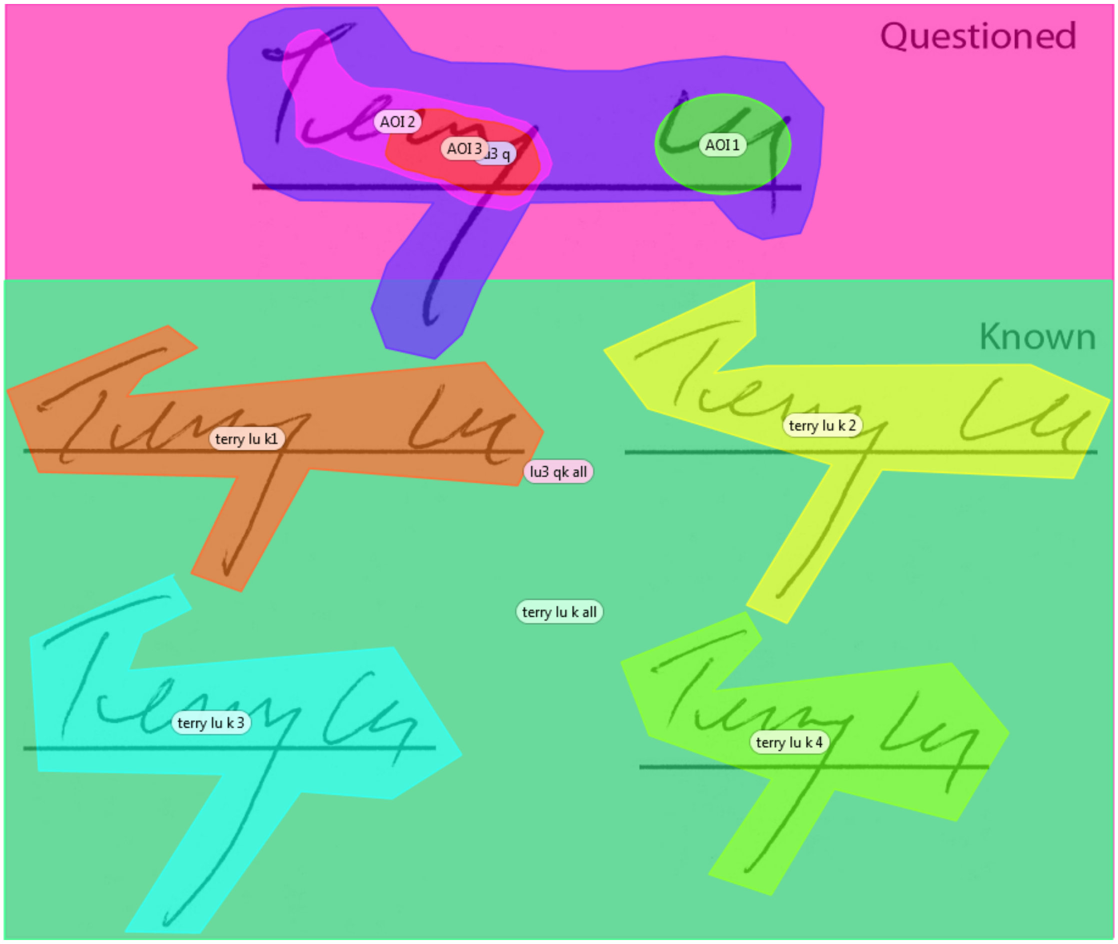


Figure Lu 3.3. Areas of Interest (AOIs) for Lu Signature 3.



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

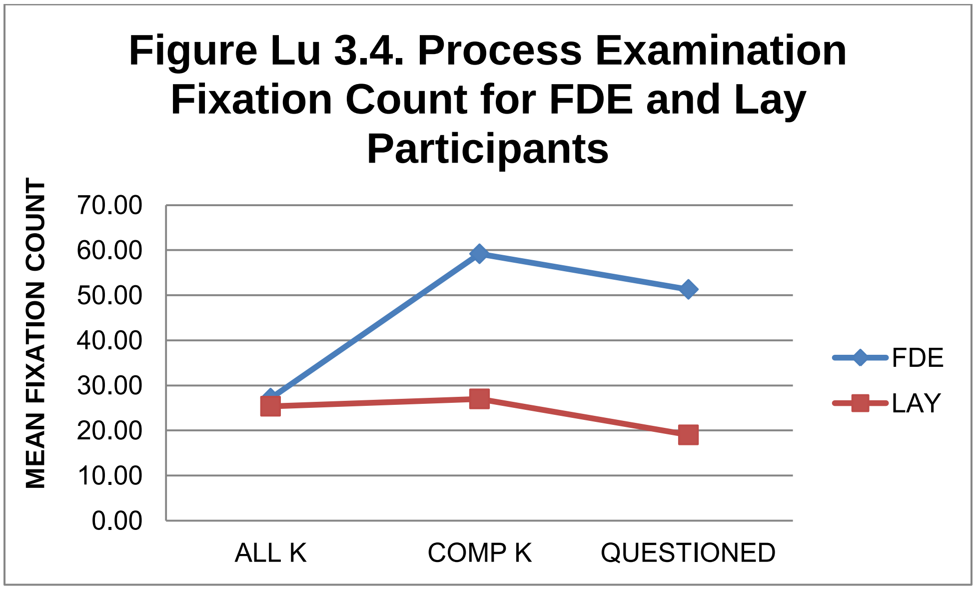
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Lu known signature stimulus (Knowns, not pictured here), Lu K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Lu 3Q (the Lu questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 3) are included in subsequent analyses. Figure Lu 3.3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .203, $F(3, 86) = 7.29$, $p < .001$, multivariate $\eta^2 = .203$. Figure Lu 3.4 presents the mean fixation counts by AOI.

Figure Lu 3.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixations counts in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 88) = 20.73$, $p < .001$, partial $\eta^2 = .191$) and known signature comparison stimulus (COMP K), $F(1, 88) = 16.38$ $p < .001$, partial $\eta^2 = .157$). There was no difference for the fixation counts in the known signature stimulus (ALL K), $p = .702$, *ns*. Table Lu 3.1 presents the means and standard deviations for areas of interest by participant type.

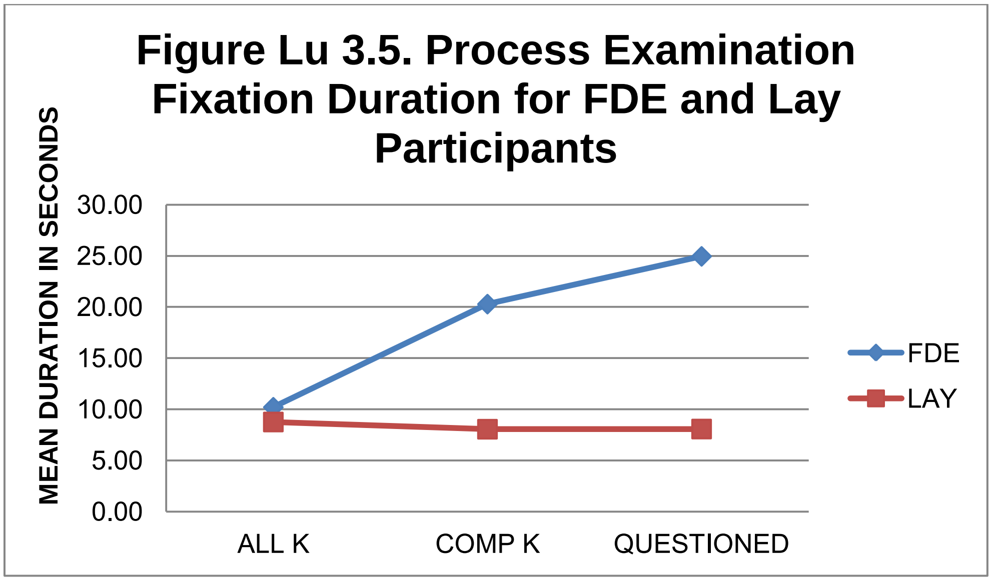
Table Lu 3.1
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	27.17	26.47	59.19	44.34	51.30	42.27
LAY	25.37	16.37	27.00	28.70	19.02	20.18

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .201, $F(3, 86) = 7.22$, $p < .001$, multivariate $\eta^2 = .201$. Figure Lu 3.5 presents the mean fixation counts by AOI.

Figure Lu 3.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation durations in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 88) = 21.56$, $p < .001$, partial $\eta^2 = .197$); known signature comparison stimulus, $F(1, 88) = 17.72$, $p < .001$, partial $\eta^2 = .168$). There were no differences in the known signature stimulus, $p = .488$, *ns*. Table Lu 3.2 presents the means and standard deviations for areas of interest by participant type.

Table Lu 3.2

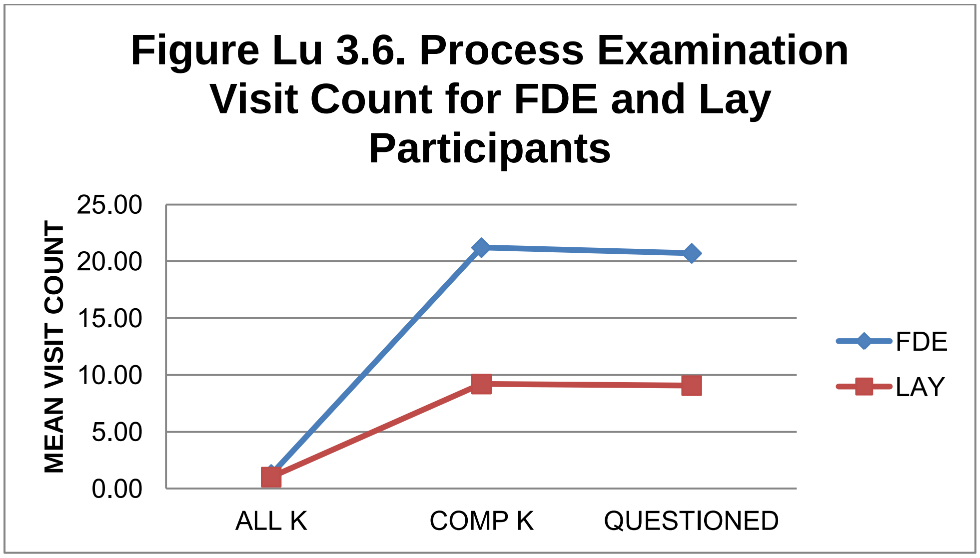
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	10.21	11.98	20.29	17.11	24.96	22.21
LAY	8.76	6.69	8.06	8.74	8.08	9.02

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .200, $F(3, 86) = 7.16$, $p < .001$, multivariate $\eta^2 = .200$. Figure X6 presents the mean visit counts by AOI.

Figure Lu 3.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 88) = 16.31$, $p < .001$, partial $\eta^2 = .156$); known signature comparison stimulus, $F(1, 88) = 17.02$, $p < .001$, partial $\eta^2 = .162$); known signature stimulus, $F(1, 88) = 4.86$, $p = .030$, partial $\eta^2 = .052$). Table Lu 3.3 presents the means and standard deviations for areas of interest by participant type.

Table Lu 3.3

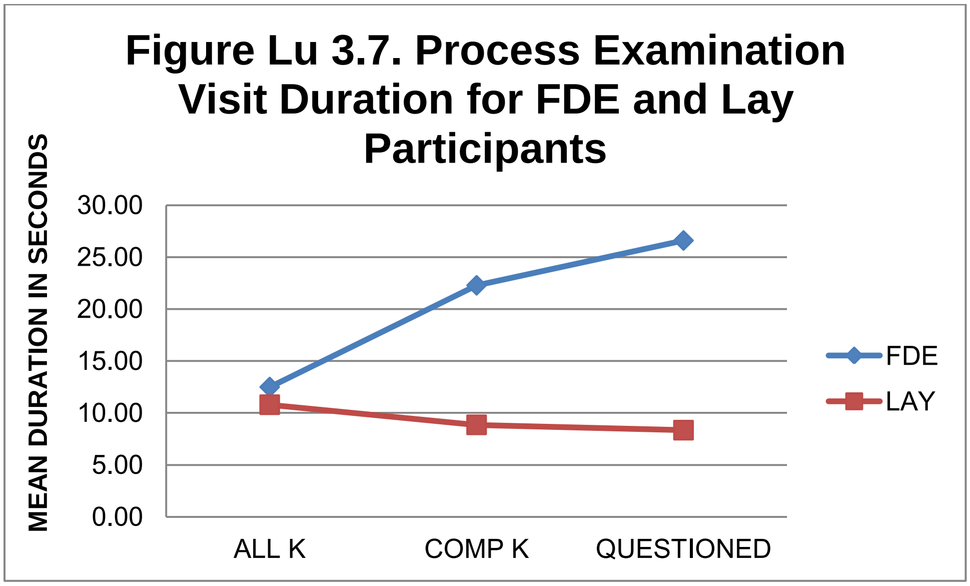
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.26	0.61	21.21	16.14	20.70	15.75
LAY	1.02	0.34	9.21	10.62	9.07	10.89

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .210, $F(3, 86) = 7.61$, $p < .001$, multivariate $\eta^2 = .210$. Figure Lu 3.7 presents the mean visit durations by AOI.

Figure Lu 3.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants (questioned signature, $F(1, 88) = 22.85$, $p < .001$, partial $\eta^2 = .206$); known signature comparison stimulus, $F(1, 88) = 18.83$, $p < .001$, partial $\eta^2 = .176$). There was no difference for the known signature, $p = .461$, *ns*. Table Lu 3.4 presents the means and standard deviations for areas of interest by participant type.

Table Lu 3.4

Process Analysis Visit Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	12.48	13.27	22.27	18.04	26.59	23.45
LAY	10.78	7.50	8.84	9.71	8.33	9.16

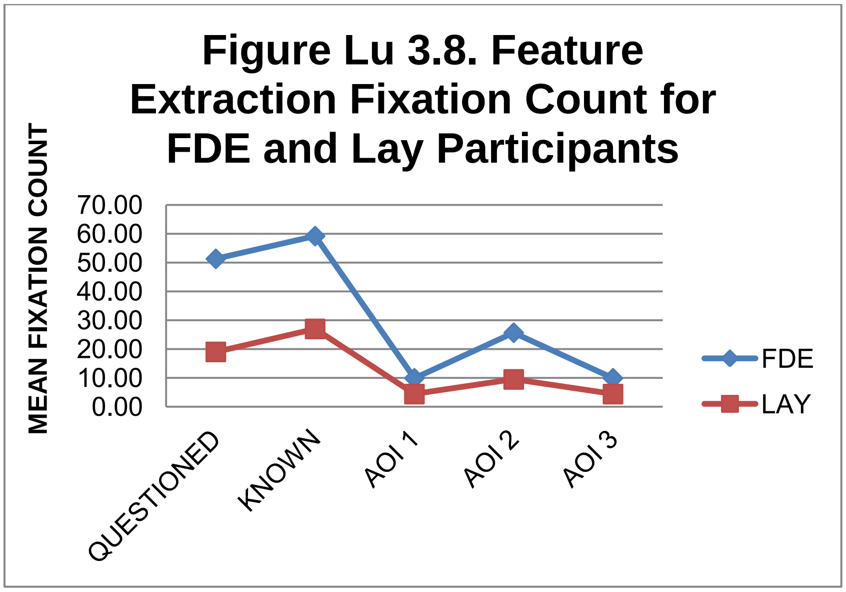
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .226, $F(5, 84) = 4.90$, $p = .001$, multivariate $\eta^2 = .226$. Figure Lu 3.8 presents the mean fixation counts by AOI.

Figure Lu 3.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 88) = 20.73$, $p < .001$, partial $\eta^2 = .191$, and $F(1, 88) = 16.38$, $p < .001$, partial $\eta^2 = .157$. Fixations counts in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 12.10$, $p = .001$, partial $\eta^2 = .121$; AOI 2, $F(1, 88) = 16.68$, $p < .001$, partial $\eta^2 = .159$; AOI 3, $F(1, 88) = 14.33$, $p < .001$, partial $\eta^2 = .140$). Table Lu 3.5 presents the means and standard deviations for areas of interest by participant type.

Table Lu 3.5

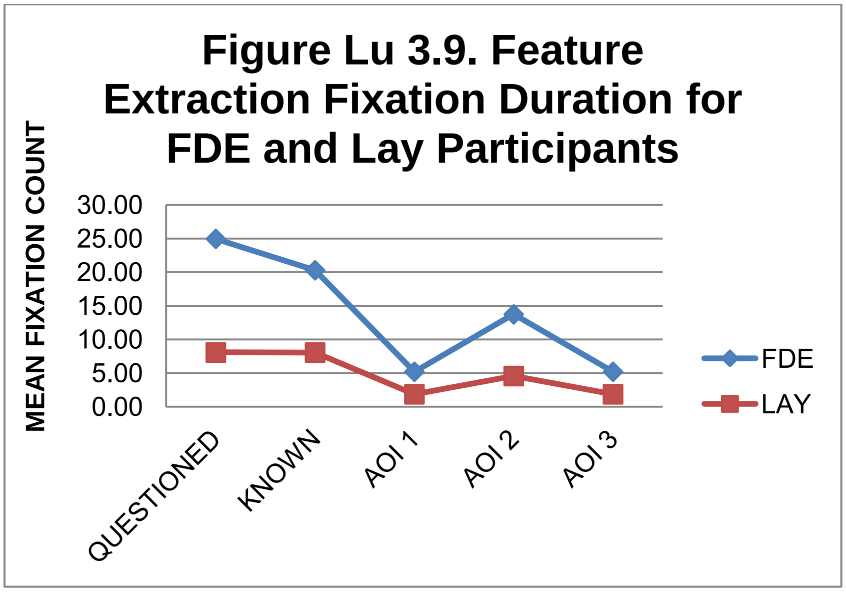
Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

	QUESTIONED		KNOWNS		AOI1		AOI2		AOI3	
PARTICIPANT	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	51.30	42.27	59.19	44.34	9.89	9.31	25.68	23.99	12.19	12.08
LAY	19.02	20.18	27.00	28.70	4.40	4.75	9.49	10.47	4.67	5.08

<u>Total Fixation Duration</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .239, $F(5, 84) = 5.27$, $p < .001$, multivariate $\eta^2 = .239$. Figure Lu 3.9 presents the mean fixation durations by AOI.

Figure Lu 3.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 88) = 21.56$, $p < .001$, partial $\eta^2 = .197$, and $F(1, 88) = 17.72$, $p < .001$, partial $\eta^2 = .168$. Fixation durations in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 13.13$, $p < .001$, partial $\eta^2 = .130$; AOI 2, $F(1, 88) = 17.67$, $p < .001$, partial $\eta^2 = .167$; AOI 3, $F(1, 88) = 13.30$, $p < .001$, partial $\eta^2 = .131$). Table Lu 3.6 presents the means and standard deviations for areas of interest by participant type.

Table Lu 3.6

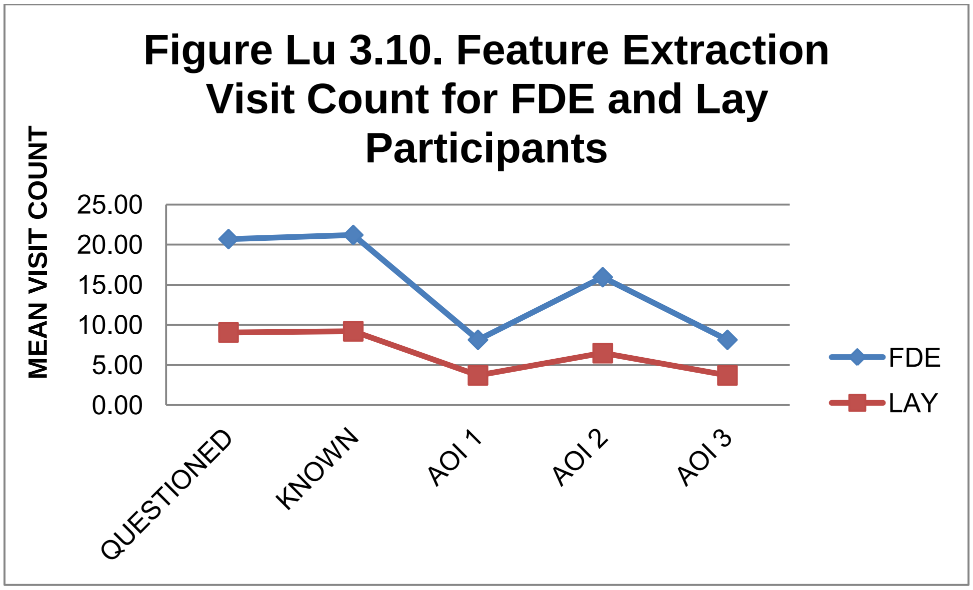
Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

	QUESTIONED		KNOWNS		AOI1		AOI2		AOI3	
PARTICIPANT	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	24.96	22.21	20.29	17.11	5.20	5.61	13.73	13.40	6.63	7.08
LAY	8.08	9.02	8.06	8.74	1.86	2.33	4.57	5.20	2.38	2.98

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .187, $F(5, 84) = 3.86$, $p = .003$, multivariate $\eta^2 = .187$. Figure Lu 3.10 presents the mean visit counts by AOI.

Figure Lu 3.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 88) = 16.31$, $p < .001$, partial $\eta^2 = .156$, and $F(1, 88) = 17.02$, $p < .001$, partial $\eta^2 = .162$. Visit counts in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 12.49$, $p = .001$, partial $\eta^2 = .124$; AOI 2, $F(1, 88) = 17.97$, $p < .001$, partial $\eta^2 = .170$; AOI 3, $F(1, 88) = 15.94$, $p < .001$, partial $\eta^2 = .153$). Table Lu 3.7 presents the means and standard deviations for areas of interest by participant type.

Table Lu 3.7

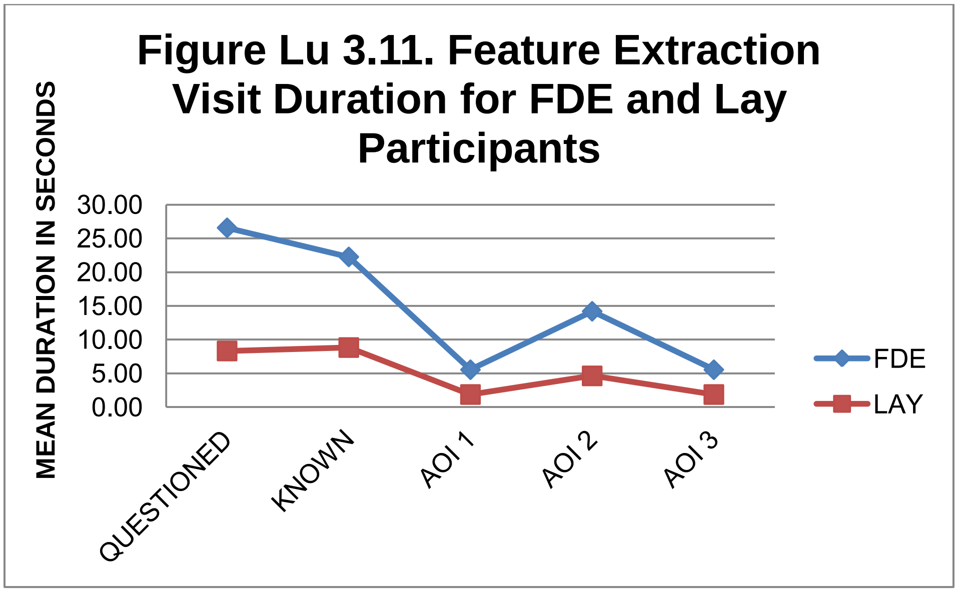
Feature Extraction Analysis Visit Count for FDE and Lay Participants

	QUESTIONED		KNOWNS		AOI1		AOI2		AOI3	
PARTICIPANT	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	20.70	15.75	21.21	16.14	8.15	7.36	15.96	12.76	10.09	9.04
LAY	9.07	10.89	9.21	10.62	3.72	3.81	6.49	7.52	4.05	4.26

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .242, $F(5, 84) = 5.38$, $p < .001$, multivariate $\eta^2 = .242$. Figure Lu 3.11 presents the mean visit counts by AOI.

Figure Lu 3.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 88) = 22.85$, $p < .001$, partial $\eta^2 = .206$, and $F(1, 88) = 18.83$, $p < .001$, partial $\eta^2 = .176$. Visit duration in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 14.71$, $p < .001$, partial $\eta^2 = .143$; AOI 2, $F(1, 88) = 17.62$, $p < .001$, partial $\eta^2 = .167$; AOI 3, $F(1, 88) = 13.35$, $p < .001$, partial $\eta^2 = .132$). Table Lu 3.8 presents the means and standard deviations for areas of interest by participant type.

Table Lu 3.8

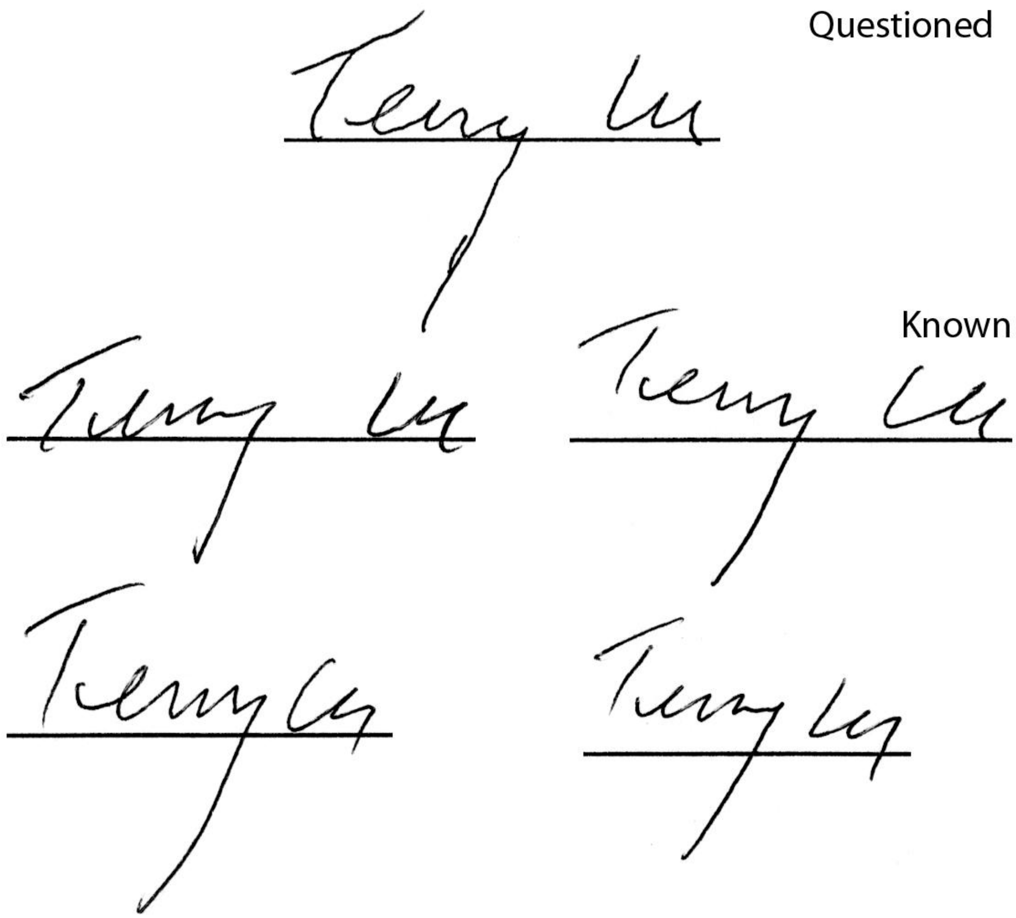
Feature Extraction Analysis Visit Duration for FDE and Lay Participants

	QUESTIONED		KNOWNS		AOI1		AOI2		AOI3	
PARTICIPANT	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	26.59	23.45	22.27	18.04	5.56	5.87	14.21	14.06	6.75	7.27
LAY	8.33	9.16	8.84	9.71	1.89	2.34	4.65	5.28	2.39	3.00

Lu Signature 4: Traced (Non-Genuine)

Of the 49 FDE participants, 48 responded correctly that the signature was non-genuine and 1 responded that it was genuine. One FDE declined to respond. Of the 43 Lay participants, 40 responded correctly that the signature was non-genuine, and 3 responded that the signature was genuine. This difference was not statistically significant, $p = .113$, *ns*. Figure Lu 4.1 presents the comparison view of this signature.

Figure Lu 4.1. Questioned-Known Comparison Stimulus for Lu Signature 4.

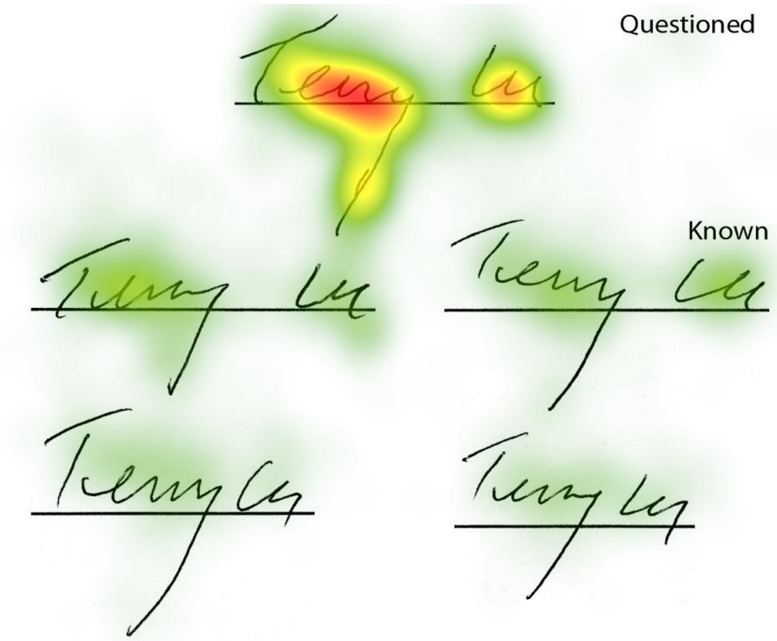


Selection of Areas of Interest (AOIs)

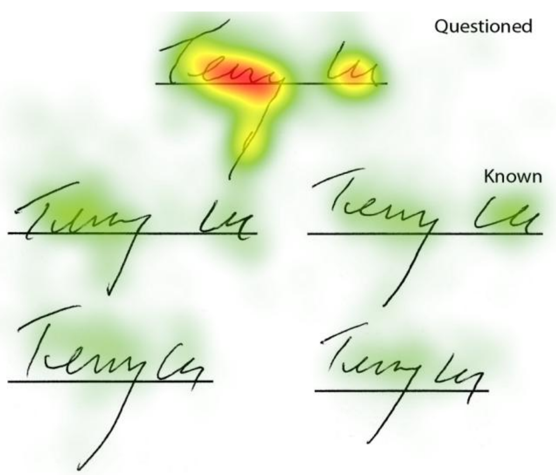
Figure Lu 4.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were three locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of three AOIs for this stimulus. Figure Lu 4.3 presents the location of the AOIs identified in the heat map.

Figure Lu 4.2. Heat map for Lu signature 4, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

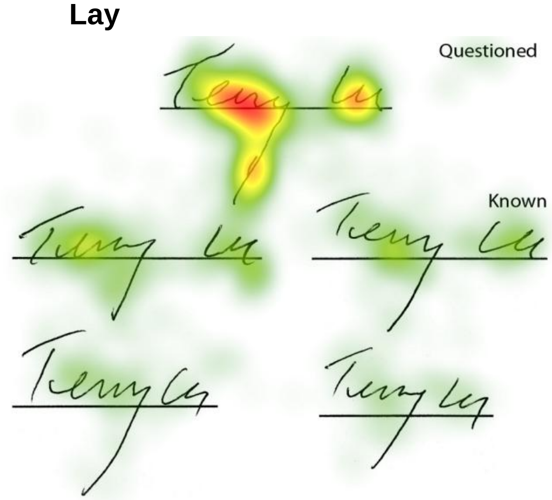
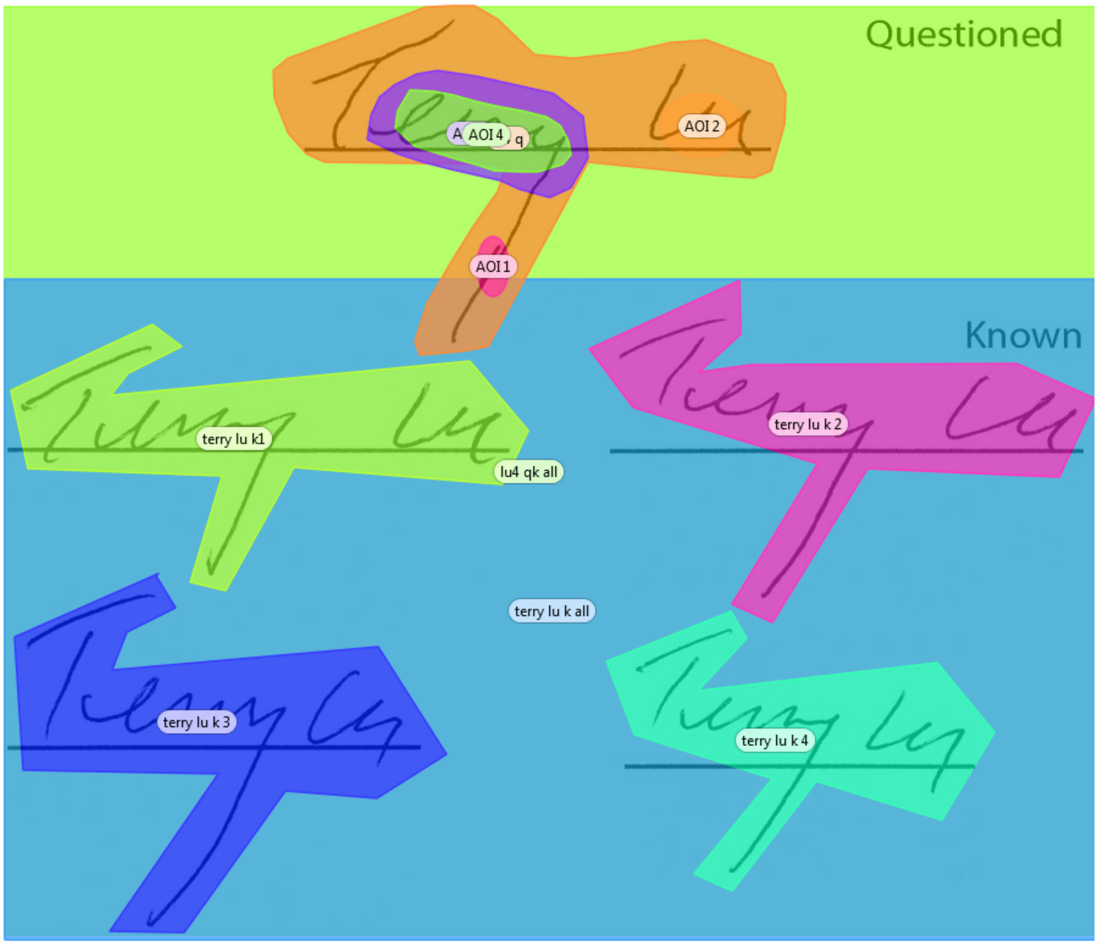


Figure Lu 4.3. Areas of Interest (AOIs) for Lu Signature 4.



Eye-Tracking Metrics Analyses

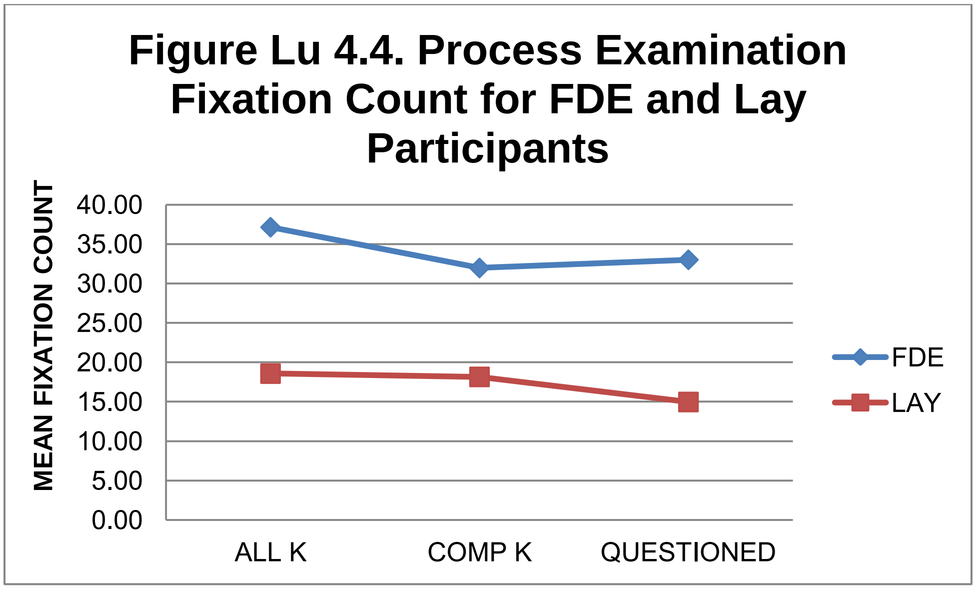
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Lu known signature stimulus (Knowns, not pictured here), Lu K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Lu 4Q (the Lu questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 4) are included in subsequent analyses.

<u>Total Fixation Count</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .208, $F(3, 86) = 7.55$, $p < .001$, multivariate $\eta^2 = .208$. Figure Lu 4.4 presents the mean fixation counts by AOI.

Figure Lu 4.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixations counts in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 88) = 15.64$, $p < .001$, partial $\eta^2 = .151$); known signature comparison stimulus, $F(1, 88) = 16.38$ $p = .003$, partial $\eta^2 = .095$); known signature stimulus, $F(1, 88) = 9.88$, $p = .002$, partial $\eta^2 = .101$). Table Lu 4.1 presents the means and standard deviations for areas of interest by participant type.

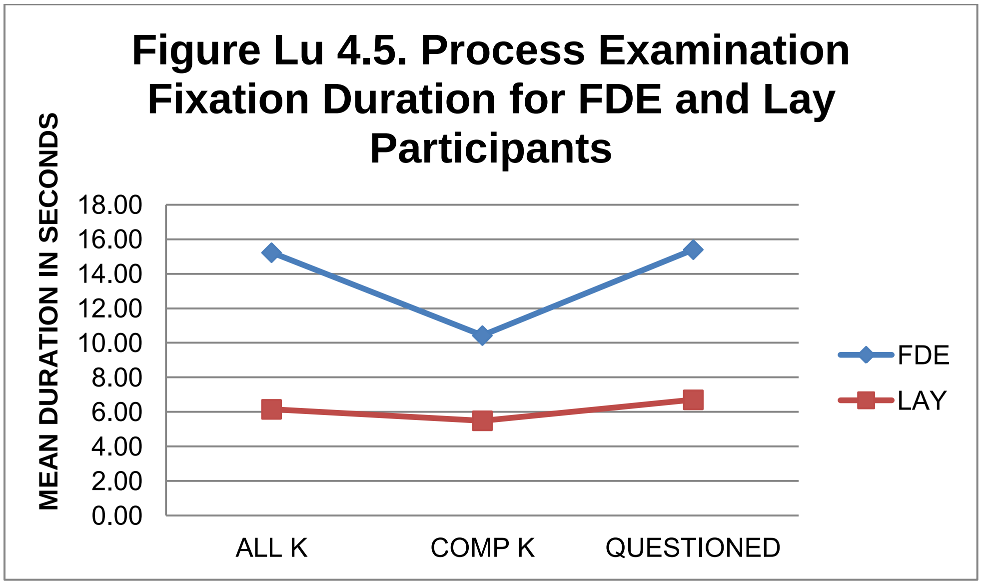
Table Lu 4.1
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	37.15	37.05	31.98	26.64	33.02	28.27
Lay	18.58	11.75	18.16	14.01	14.98	10.20

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .233, $F(3, 86) = 8.70$, $p < .001$, multivariate $\eta^2 = .233$. Figure Lu 4.5 presents the mean fixation counts by AOI.

Figure Lu 4.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation durations in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 88) = 17.36$, $p < .001$, partial $\eta^2 = .165$); known signature comparison stimulus, $F(1, 88) = 9.29$, $p = .003$, partial $\eta^2 = .096$); known signature stimulus, $F(1, 88) = 12.07$, $p = .001$, partial $\eta^2 = .121$. Table Lu 4.2 presents the means and standard deviations for areas of interest by participant type.

Table Lu 4.2

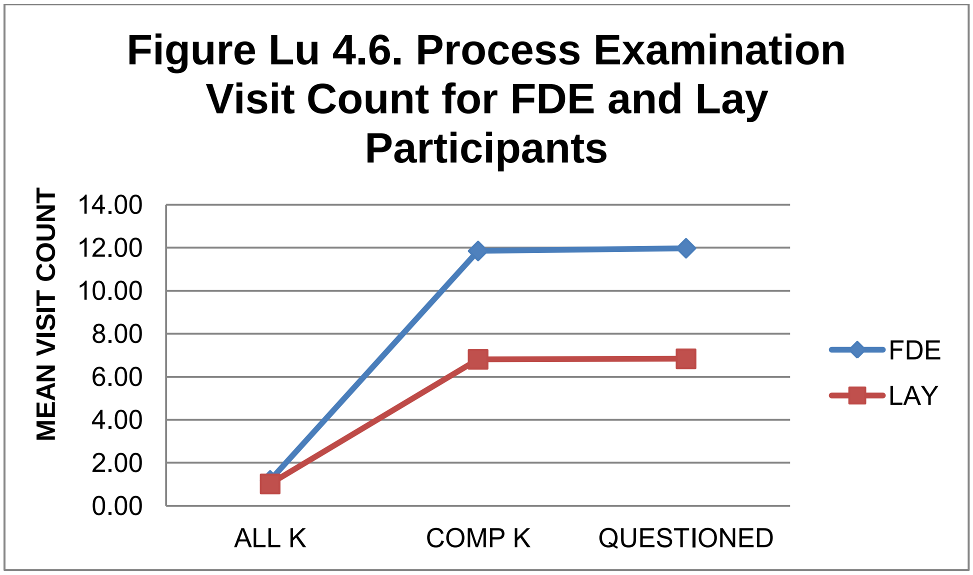
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	15.23	16.54	10.43	9.56	15.40	12.91
Lay	6.15	4.60	5.49	4.82	6.71	4.72

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .156, $F(3, 86) = 5.28$, $p = .002$, multivariate $\eta^2 = .156$. Figure 4.6 presents the mean visit counts by AOI.

Figure Lu 4.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 88) = 11.86$, $p = .001$, partial $\eta^2 = .119$); known signature comparison stimulus, $F(1, 88) = 12.60$, $p = .001$, partial $\eta^2 = .125$). There was no difference for the known signature stimulus, $p = .051$, *ns*). Table Lu 4.3 presents the means and standard deviations for areas of interest by participant type.

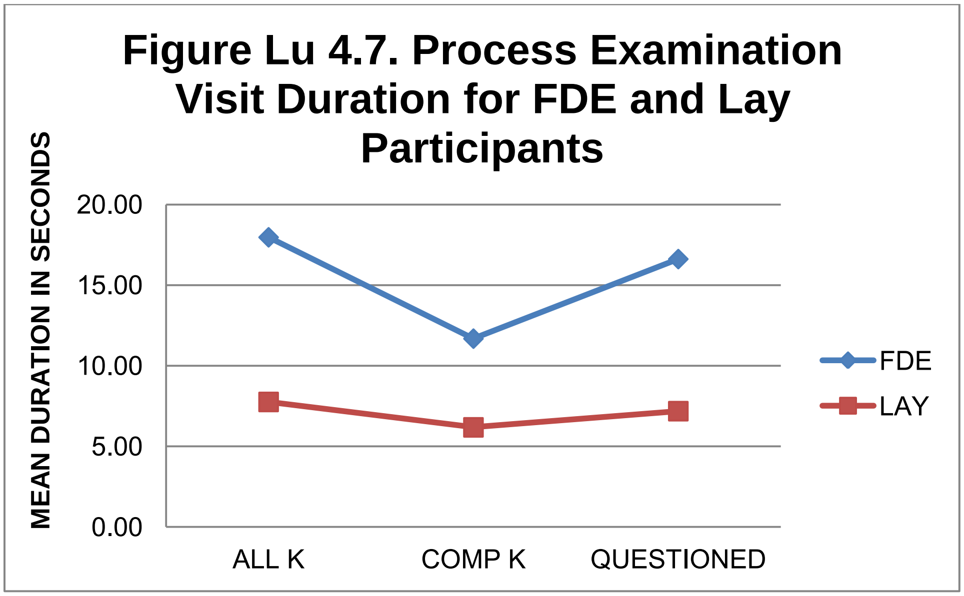
Table Lu 4.3
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.19	0.50	11.85	8.14	11.98	8.59
Lay	1.02	0.27	6.81	4.72	6.84	4.90

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .244, $F(3, 86) = 9.24$ $p < .001$, multivariate $\eta^2 = .244$. Figure Lu 4.7 presents the mean visit durations by AOI.

Figure Lu 4.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants (questioned signature, $F(1, 88) = 18.03$, $p < .001$, partial $\eta^2 = .170$); known signature comparison stimulus, $F(1, 88) = 9.58$, $p = .003$, partial $\eta^2 = .098$); known signature, $F(1, 88) = 11.74$, $p = .001$, partial $\eta^2 = .118$. Table Lu 4.4 presents the means and standard deviations for areas of interest by participant type.

Table Lu 4.4
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	17.97	18.82	11.69	10.45	16.62	13.78
Lay	7.76	5.47	6.19	5.40	7.19	4.93

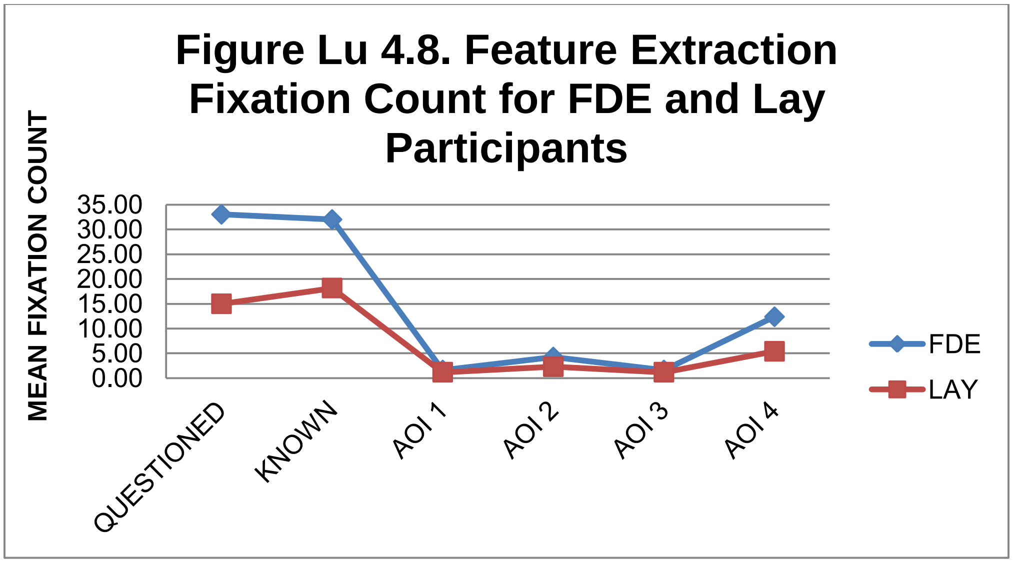
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .177, $F(6, 83) = 2.97$, $p = .011$, multivariate $\eta^2 = .177$. Figure Lu 4.8 presents the mean fixation counts by AOI.

Figure Lu 4.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 88) = 15.64$, $p < .001$, partial $\eta^2 = .151$, and $F(1, 88) = 9.23$, $p = .003$, partial $\eta^2 = .095$.

Fixations counts for AOIs 2 through 4 were significantly greater for FDEs than for Lay participants (AOI 2, $F(1, 88) = 5.52$, $p = .021$, partial $\eta^2 = .059$; AOI 3, $F(1, 88) = 11.99$, $p = .001$, partial $\eta^2 = .120$; AOI 4, $F(1, 88) = 10.86$, $p = .001$, partial $\eta^2 = .110$).

There was no difference in the fixation counts for AOI 1, $p = .193$, *ns*. Table Lu 4.5 presents the means and standard deviations for areas of interest by participant type.

Table Lu 4.5
Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

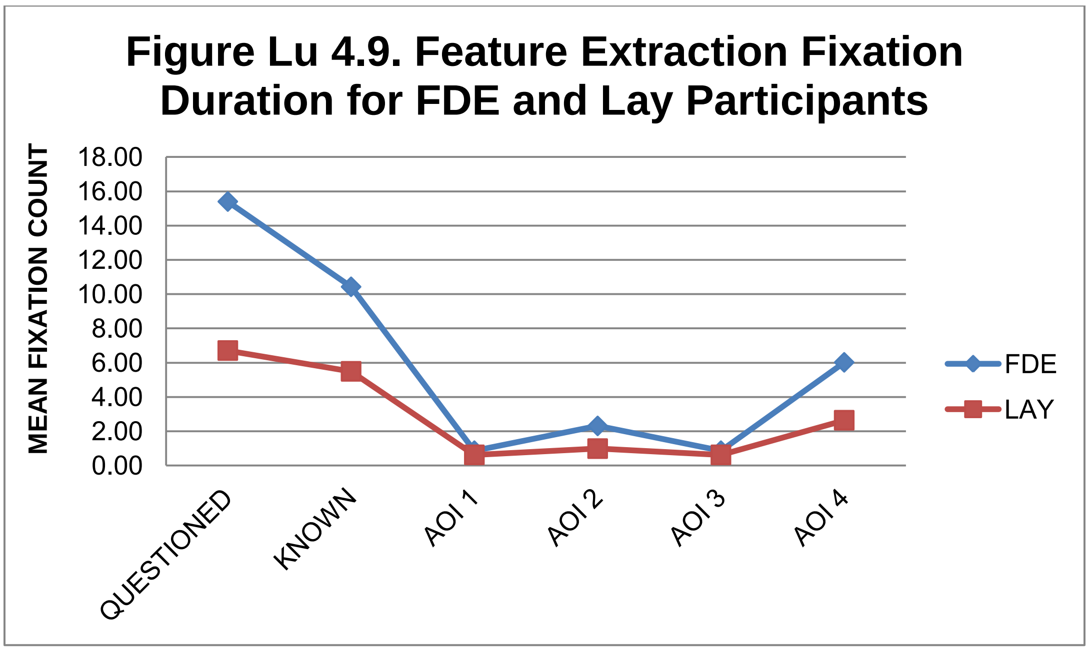
	QUESTIONED		KNOWNS		AOI1	
PARTICIPANT	***M***	***SD***	***M***	***SD***	***M***	***SD***

FDE	33.02	28.27	31.98	26.64	1.62	1.70
LAY	14.98	10.20	18.16	14.01	1.19	1.38
	AOI2		**AOI3**		**AOI4**	
PARTICIPANT	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	4.23	5.01	16.85	16.80	12.36	13.29
LAY	2.30	2.11	7.53	5.60	5.40	4.10

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .204, $F(6, 83) = 3.54$, $p = .004$, multivariate $\eta^2 = .204$. Figure Lu 4.9 presents the mean fixation durations by AOI.

Figure Lu 4.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 88) = 17.36$, $p < .001$, partial $\eta^2 = .165$, and $F(1, 88) = 9.29$, $p = .003$, partial $\eta^2 = .096$.

Fixation durations for AOIs 2 through 4 were significantly greater for FDEs than for Lay participants (AOI 2, $F(1, 88) = 6.89$, $p = .010$, partial $\eta^2 = .073$; AOI 3, $F(1, 88) = 11.71$, $p = .001$, partial $\eta^2 = .117$; AOI 4, $F(1, 88) = 10.91$, $p = .001$, partial $\eta^2 = .110$).

There was no difference in the fixation durations for AOI 1, p = .234, *ns*. Table Lu 4.6 presents the means and standard deviations for areas of interest by participant type.

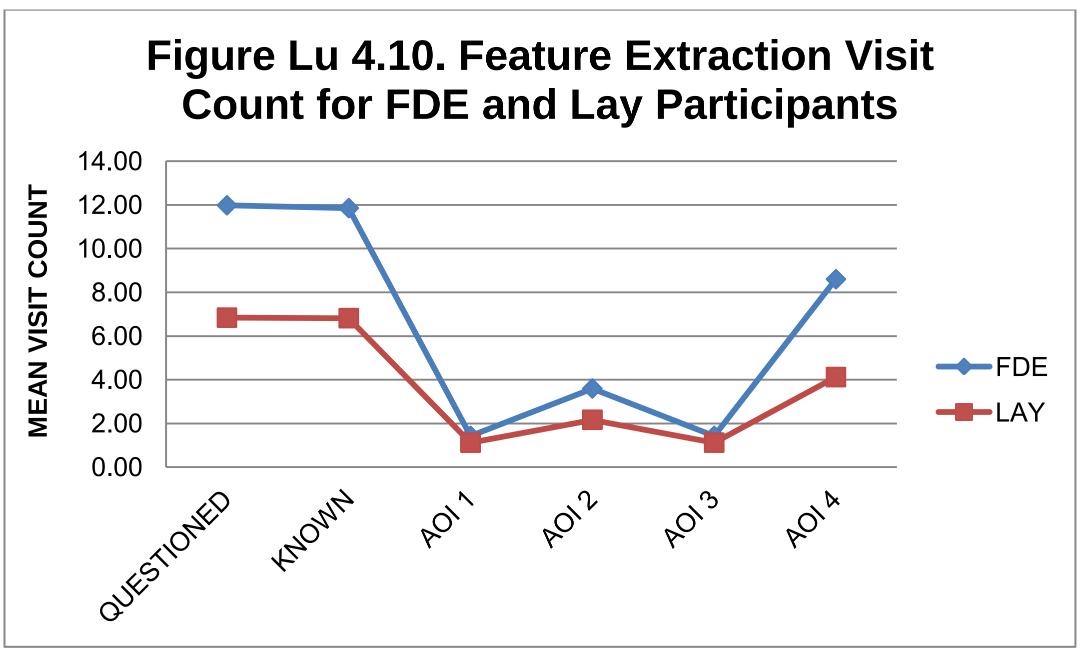
Table Lu 4.6
Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

	QUESTIONED		KNOWNS		AOI1	
PARTICIPANT	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	15.40	12.91	10.43	9.56	0.86	1.02
LAY	6.71	4.72	5.49	4.82	0.62	0.89
	AOI2		**AOI3**		**AOI4**	
PARTICIPANT	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.31	3.14	7.96	7.96	6.02	6.36
LAY	0.98	1.09	3.57	2.84	2.64	2.22

<u>*Total Visit Count*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .169, F(6, 83) = 2.82, p = .015, multivariate η^2 = .169. Figure Lu 4.10 presents the mean fixation durations by AOI.

Figure Lu 4.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 88) = 11.86$, $p = .001$, partial $\eta^2 = .119$, and $F(1, 88) = 12.60$, $p = .001$, partial $\eta^2 = .125$.

Visit counts for AOIs 2 through 4 were significantly greater for FDEs than for Lay participants (AOI 2, $F(1, 88) = 4.54$, $p = .036$, partial $\eta^2 = .049$; AOI 3, $F(1, 88) = 14.95$, $p < .001$, partial $\eta^2 = .145$; AOI 4, $F(1, 88) = 13.35$, $p < .001$, partial $\eta^2 = .132$).

There was no difference in the visit counts for AOI 1, $p = .271$, *ns*. Table Lu 4.7 presents the means and standard deviations for areas of interest by participant type.

Table Lu 4.7

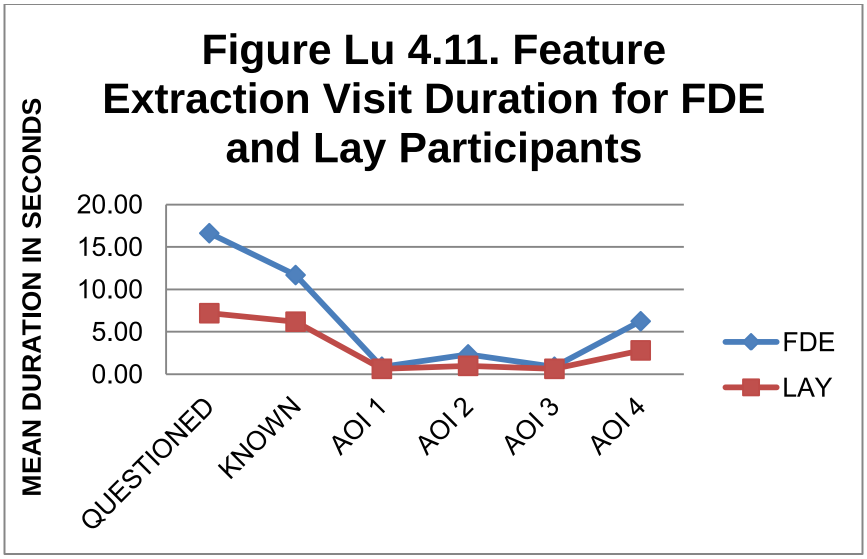
Feature Extraction Analysis Visit Count for FDE and Lay Participants

	QUESTIONED		KNOWNS		AOI1	
PARTICIPANT	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	11.98	8.59	11.85	8.14	1.43	1.47
LAY	6.84	4.90	6.81	4.72	1.12	1.14
	AOI2		**AOI3**		**AOI4**	
PARTICIPANT	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	3.60	4.04	10.51	8.35	8.60	7.54
LAY	2.16	1.84	5.23	3.37	4.12	2.91

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .207, $F(6, 83) = 3.61$, $p = .003$, multivariate $\eta^2 = .207$. Figure Lu 4.11 presents the mean visit durations by AOI.

Figure Lu 4.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 88) = 18.03$, $p < .001$, partial $\eta^2 = .170$ and $F(1, 88) = 9.58$, $p = .003$, partial $\eta^2 = .098$.

Visit duration for AOIs 2 through 4 were significantly greater for FDEs than for Lay participants (AOI 2, $F(1, 88) = 7.02$, $p = .010$, partial $\eta^2 = .074$; AOI 3, $F(1, 88) = 11.19$, $p = .001$, partial $\eta^2 = .113$; AOI 4, $F(1, 88) = 10.36$, $p = .002$, partial $\eta^2 = .105$).

There was no difference in the visit duration for AOI 1, $p = .244$, *ns*. Table Lu 4.8 presents the means and standard deviations for areas of interest by participant type.

Table Lu 4.8

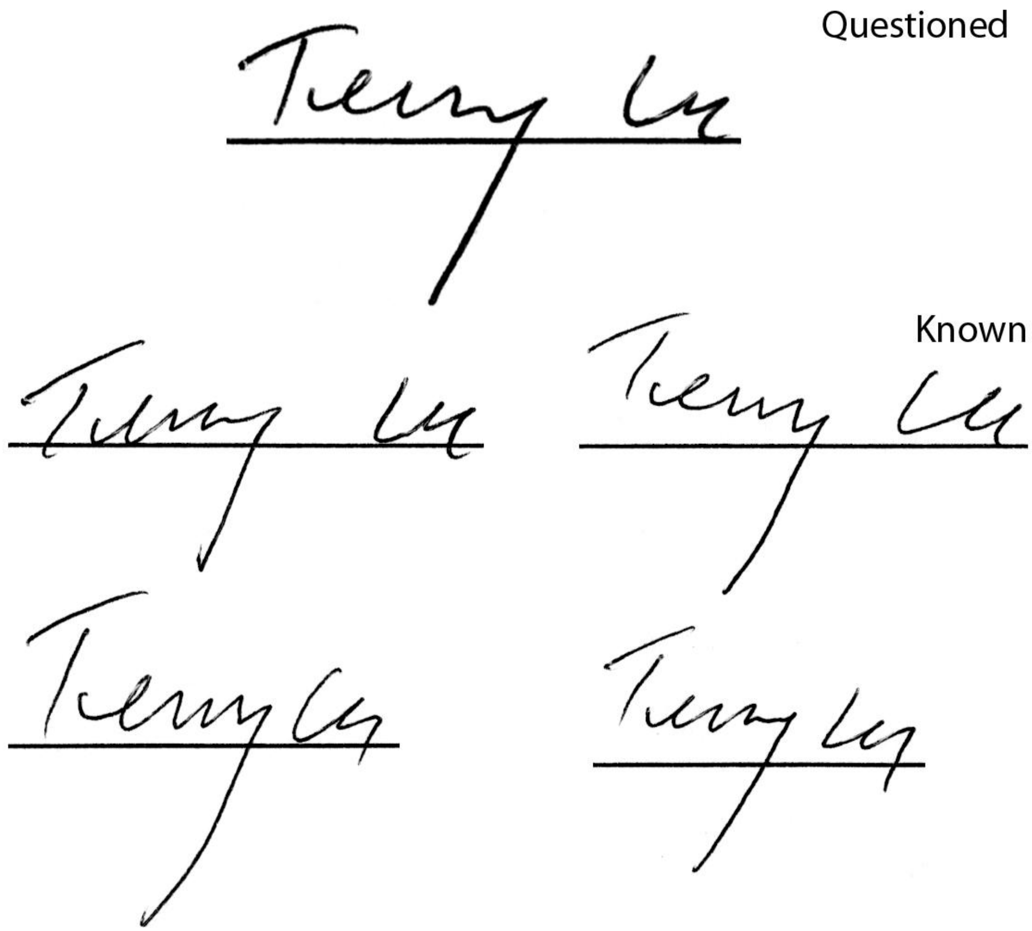
Feature Extraction Analysis Visit Count for FDE and Lay Participants

	QUESTIONED		KNOWNS		AOI1	
PARTICIPANT	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	16.62	13.78	11.69	10.45	0.88	1.03
LAY	7.19	4.93	6.19	5.40	0.63	0.96
	AOI2		**AOI3**		**AOI4**	
PARTICIPANT	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.34	3.18	8.30	8.40	6.24	6.65
LAY	0.99	1.09	3.78	2.95	2.81	2.27

Lu Signature 5: Genuine

Of the 49 FDE participants, 31 responded correctly that the signature was genuine and 16 responded that it was non-genuine. Two FDEs declined to respond. All 43 Lay participants responded correctly that the signature was genuine. This difference was statistically significant, χ^2 (1, N = 92) = 19.64, p < .001. Figure Lu 5.1 presents the comparison view of this signature.

Figure Lu 5.1. Questioned-Known Comparison Stimulus for Lu Signature 5.

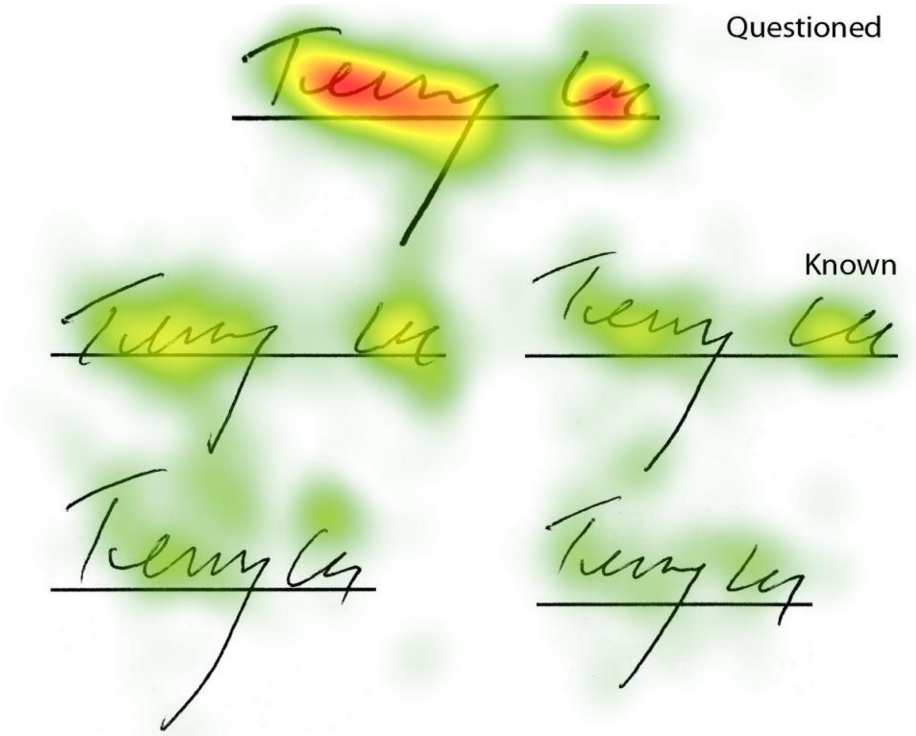


Selection of Areas of Interest (AOIs)

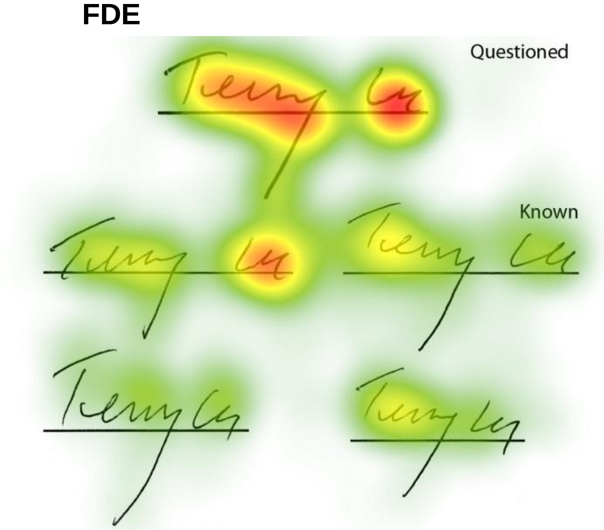
Figure Lu 5.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were six locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of six AOIs for this stimulus. Figure Lu 5.3 presents the location of the AOIs identified in the heat map.

Figure Lu 5.2. Heat map for Lu signature 5, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

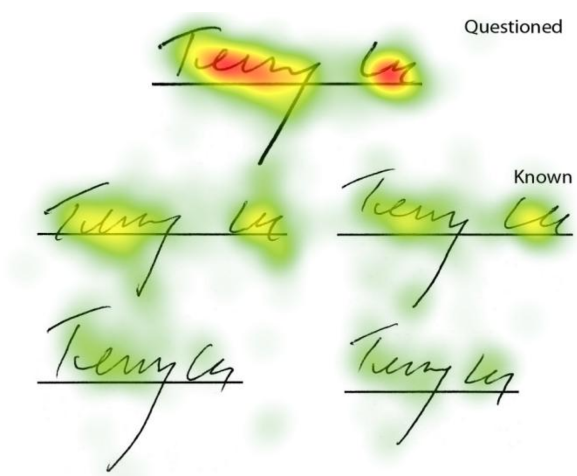
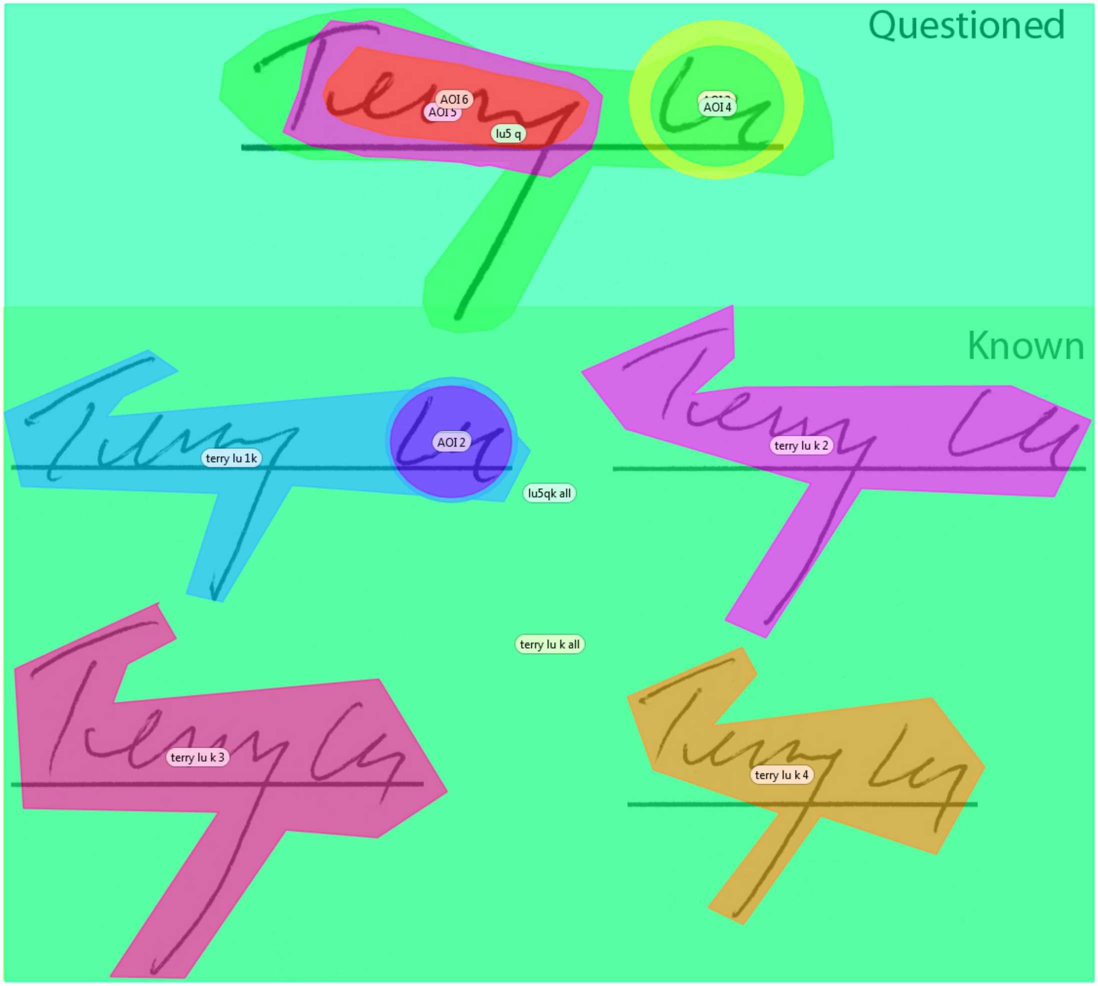


Figure Lu 5.3. Areas of Interest (AOIs) for Lu Signature 5.



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

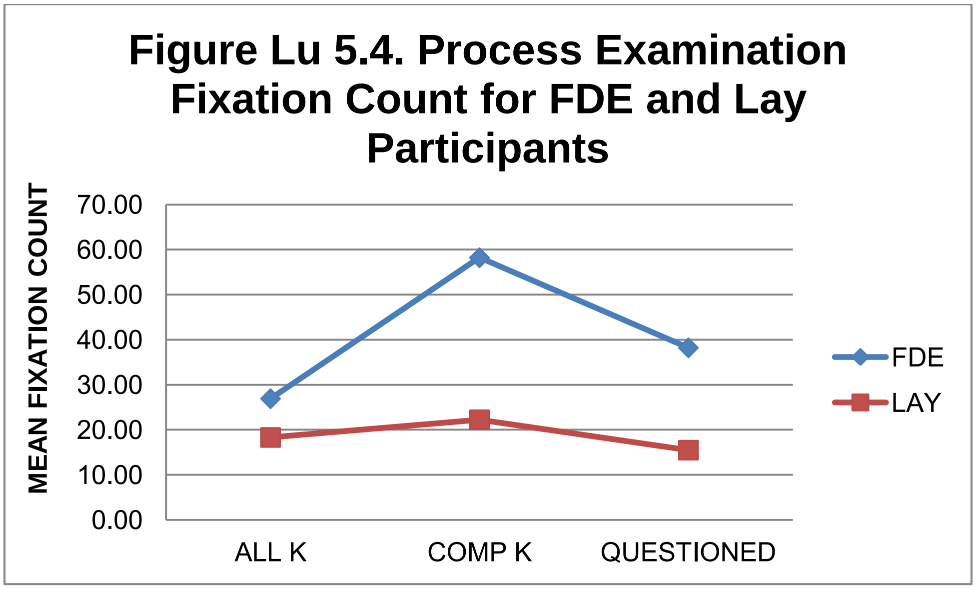
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Lu known signature stimulus (Knowns, not pictured here), Lu K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Lu 6Q (the Lu questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 6) are included in subsequent analyses. Figure Lu 5.3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .248, $F(3, 85) = 9.36$, $p < .001$, multivariate $\eta^2 = .248$. Figure Lu 5.4 presents the mean fixation counts by AOI.

Figure Lu 5.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixations counts in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 87) = 16.58$ $p < .001$, partial $\eta^2 = .160$); known signature comparison stimulus (COMP K), $F(1, 87) = 25.14$, $p < .001$, partial $\eta^2 = .224$); known signature stimulus (ALL K), $F(1, 87) = 5.43$, $p = .022$, partial $\eta^2 = .059$). Table Lu 5.1 presents the means and standard deviations for areas of interest by participant type.

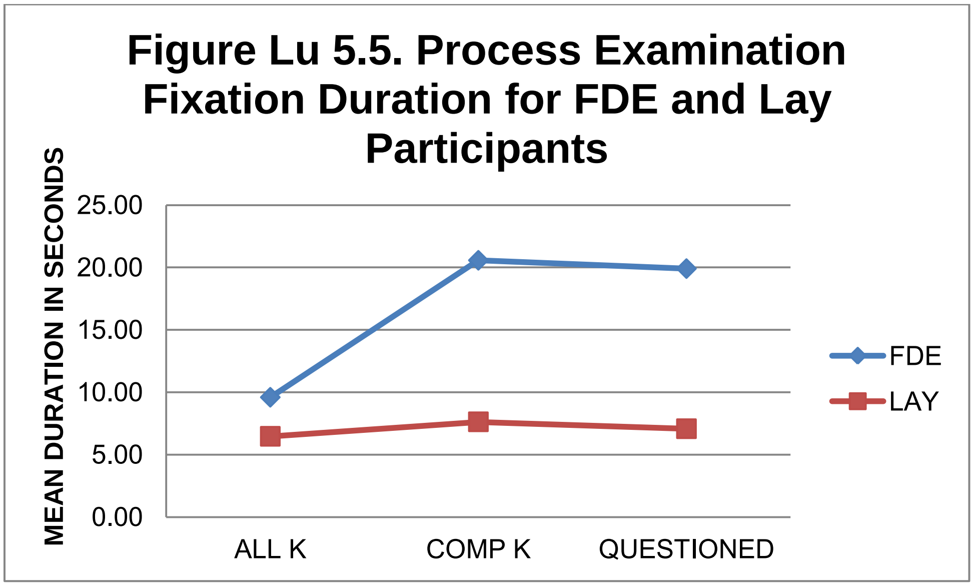
Table Lu 5.1
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	26.93	20.22	58.24	41.64	38.24	34.28
Lay	18.33	13.77	22.26	22.65	15.51	13.22

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .217, $F(3, 85) = 7.83$, $p < .001$, multivariate $\eta^2 = .217$. Figure Lu 5.5 presents the mean fixation counts by AOI.

Figure Lu 5.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation durations in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 87) = 19.80$, $p < .001$, partial $\eta^2 = .185$); known signature comparison stimulus (COMP K), $F(1, 87) = 21.51$, $p < .013$, partial $\eta^2 = .198$); known signature stimulus (ALL K), $F(1, 87) = 4.44$, $p = .038$, partial $\eta^2 = .049$. Table Lu 5.2 presents the means and standard deviations for areas of interest by participant type.

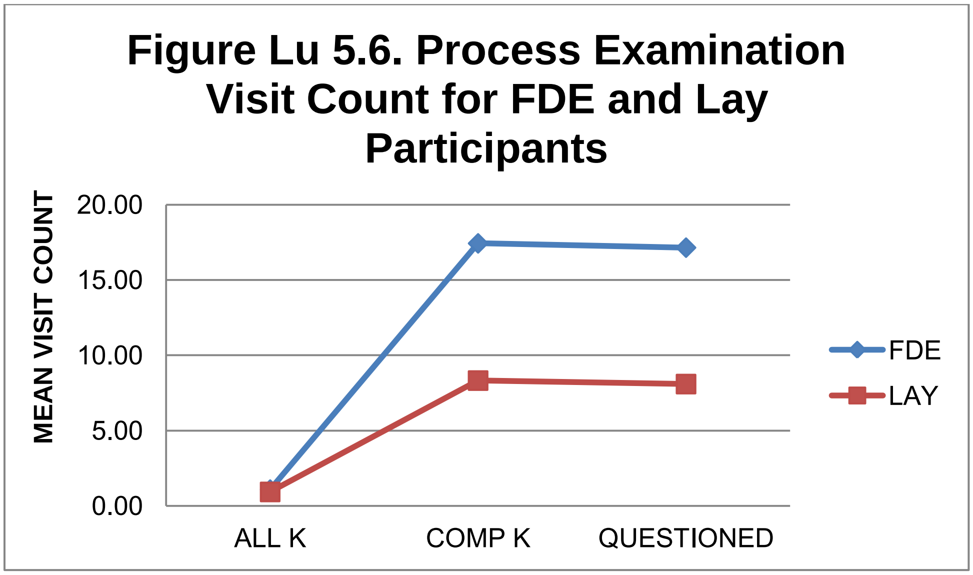
Table Lu 5.2
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	9.59	8.03	20.57	16.56	19.91	17.88
Lay	6.47	5.70	7.63	8.04	7.07	6.36

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .214, $F(3, 85) = 7.70$, $p < .001$, multivariate $\eta^2 = .214$. Figure Lu 5.6 presents the mean visit counts by AOI.

Figure Lu 5.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 87) = 16.76$, $p < .001$, partial $\eta^2 = .162$); known signature comparison stimulus (COMP K), $F(1, 87) = 17.12$, $p < .001$, partial $\eta^2 = .164$); known signature stimulus(ALL K), $F(1, 87) = 5.63$, $p = .020$, partial $\eta^2 = .061$). Table Lu 5.3 presents the means and standard deviations for areas of interest by participant type.

Table Lu 5.3

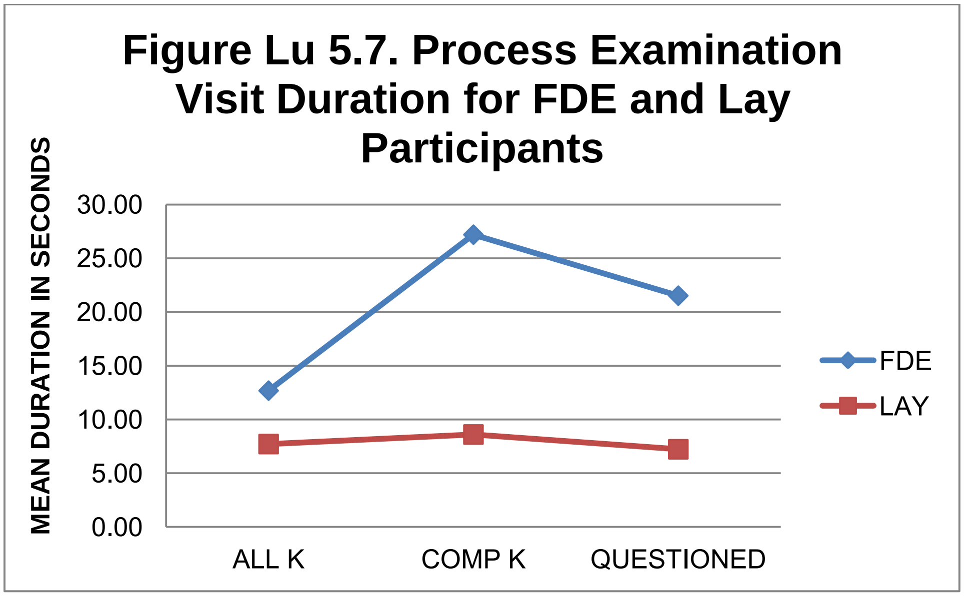
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.09	0.35	17.43	12.53	17.15	12.68
Lay	0.93	0.26	8.33	7.42	8.09	7.30

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .257, $F(3, 85) = 9.82$ $p < .001$, multivariate $\eta^2 = .257$. Figure Lu 5.7 presents the mean visit durations by AOI.

Figure Lu 5.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants (questioned signature, $F(1, 87) = 21.32$, $p < .001$, partial $\eta^2 = .197$); known signature comparison stimulus (COMP K), $F(1, 87) = 20.38$, $p < .001$, partial $\eta^2 = .190$); known signature (ALL K), $F(1, 87) = 5.85$, $p = .018$, partial $\eta^2 = .063$. Table Lu 5.4 presents the means and standard deviations for areas of interest by participant type.

Table Lu 5.4

Process Analysis Visit Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	12.70	11.99	27.20	25.61	21.53	19.28
Lay	7.73	6.32	8.62	8.78	7.24	6.50

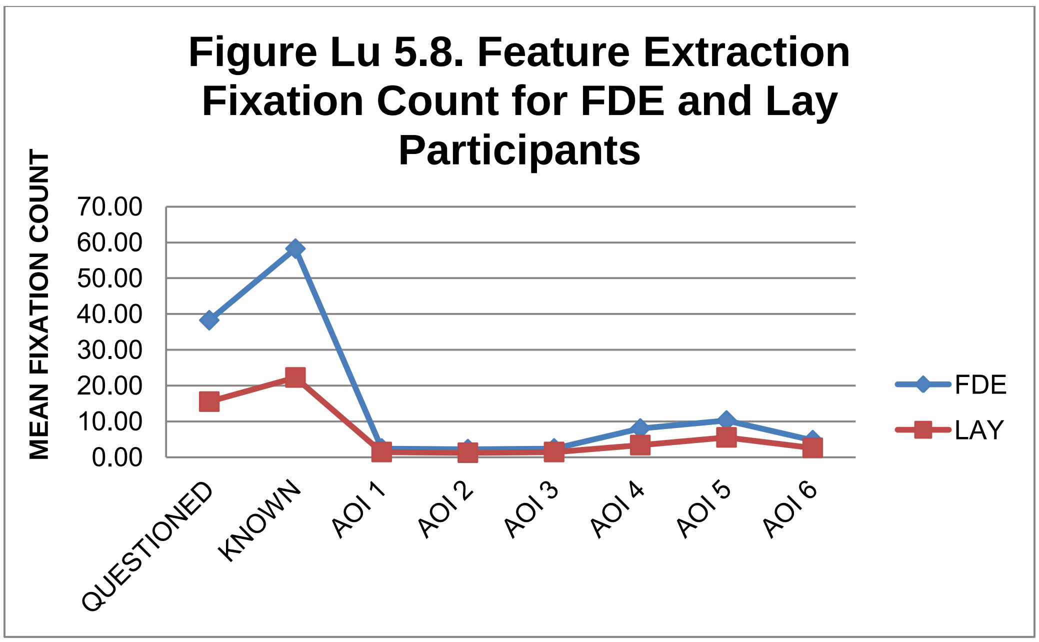
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .309, $F(8, 80) = 4.46$, $p < .001$, multivariate $\eta^2 = .309$. Figure Lu 5.8 presents the mean fixation counts by AOI.

Figure Lu 5.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 87) = 16.58$, $p < .001$, partial $\eta^2 = .160$, and $F(1, 87) = 25.14$, $p < .001$, partial $\eta^2 = .224$.

Fixations counts for AOIs 3 through 6 were significantly greater for FDEs than for Lay participants (AOI 3, $F(1, 87) = 4.53$, $p = .036$, partial $\eta^2 = .049$; AOI 4, $F(1, 87) = 9.00$, $p = .004$, partial $\eta^2 = .094$; AOI 5, $F(1, 87) = 7.84$, $p = .006$, partial $\eta^2 = .083$; AOI 6, $F(1, 87) = 5.89$, $p = .017$, partial $\eta^2 = .063$).

There was no difference in the fixation counts for AOI 1 ($F(1, 87) = 2.54$, $p = .114$, partial $\eta^2 = .028$, *ns*) or AOI 2 ($p = .100$, *ns*). Table Lu 5.6 presents the means and standard deviations for areas of interest by participant type.

Table Lu 5.5

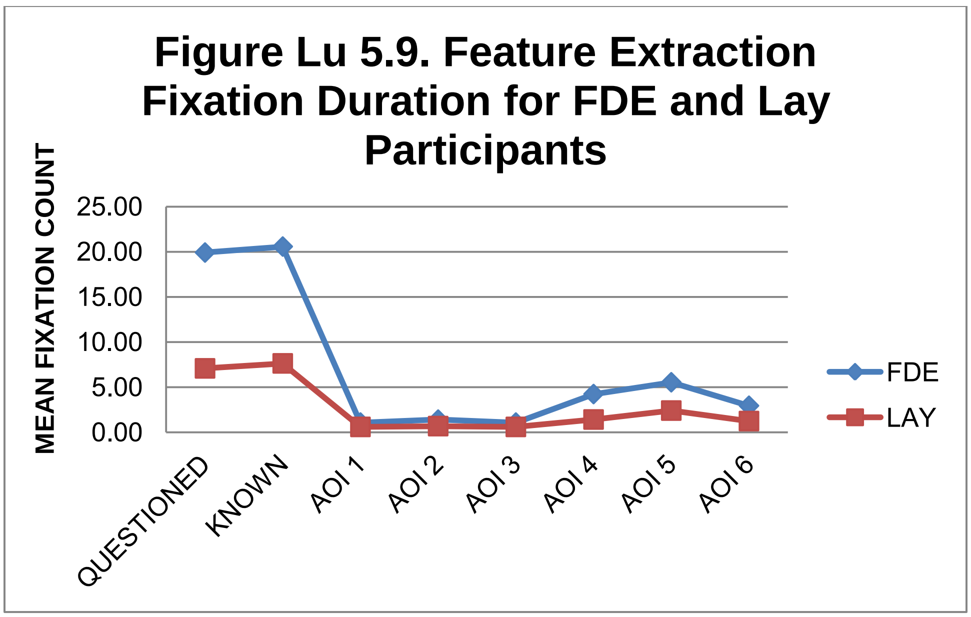
Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

	QUESTIONED		KNOWNS		AOI1		AOI2	
PARTICIPANT	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	38.24	34.28	58.24	41.64	2.43	3.51	2.24	3.59
LAY	15.51	13.22	22.26	22.65	1.44	2.15	1.23	1.74
	AOI3		**AOI4**		**AOI5**		**AOI6**	
PARTICIPANT	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.02	1.58	8.00	9.37	10.24	9.92	4.74	5.14
LAY	0.44	0.85	3.37	3.95	5.51	5.07	2.60	2.70

<u>*Total Fixation Duration*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .289, $F(8, 80) = 4.07$, $p < .001$, multivariate $\eta^2 = .289$. Figure Lu 5.9 presents the mean fixation durations by AOI.

Figure Lu 5.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 87) = 19.80$, $p < .001$, partial $\eta^2 = .185$, and $F(1, 87) = 21.51$, $p < .001$, partial $\eta^2 = .198$.

Fixation durations for AOIs 3 through 6 were significantly greater for FDEs than for Lay participants (AOI 3, $F(1, 87) = 6.41$, $p = .013$, partial $\eta^2 = .069$; AOI 4, $F(1, 87) = 9.91$ $p = .002$, partial $\eta^2 = .102$; AOI 5, $F(1, 87) = 13.40$, $p < .001$, partial $\eta^2 = .133$; AOI 6, $F(1, 87) = 9.28$, $p = .003$, partial $\eta^2 = .096$).

There was no difference in the fixation durations for AOI 1 ($p = .114$, *ns*) or AOI 2 ($p = .100$, *ns*). Table Lu 5.6 presents the means and standard deviations for areas of interest by participant type.

Table Lu 5.6

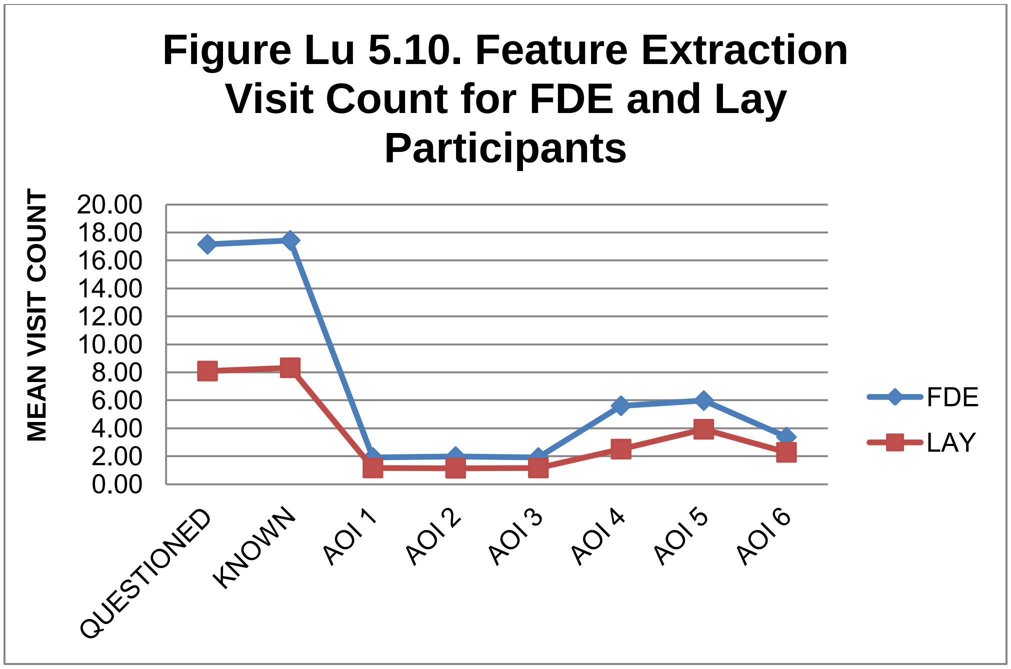
Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

	QUESTIONED		**KNOWNS**		**AOI1**		**AOI2**	
PARTICIPANT	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	19.91	17.88	20.57	16.56	1.07	1.67	1.40	2.53
LAY	7.07	6.36	7.63	8.04	0.59	0.79	0.68	1.20
	AOI3		**AOI4**		**AOI5**		**AOI6**	
PARTICIPANT	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	0.48	0.82	4.23	5.53	5.53	5.07	2.93	3.38
LAY	0.15	0.28	1.41	2.03	2.40	2.49	1.24	1.43

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .244, $F(8, 80) = .244$, $p = .003$, multivariate $\eta^2 = .244$. Figure Lu 5.10 presents the mean visit counts by AOI.

Figure Lu 5.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 87) = 16.76$, $p < .001$, partial $\eta^2 = .162$, and $F(1, 87) = 17.12$, $p < .001$, partial $\eta^2 = .164$.

Visit counts for AOIs 3 through 5 were significantly greater for FDEs than for Lay participants (AOI 3, $F(1, 87) = 5.61$, $p = .020$, partial $\eta^2 = .061$; AOI 4, $F(1, 87) = 10.98$, $p = .001$, partial $\eta^2 = .112$; AOI 5, $F(1, 87) = 4.79$, $p = .031$, partial $\eta^2 = .052$).

There was no difference in the visit counts for AOI 1 ($p = .087$, *ns*), AOI 2 ($p = .0671$, *ns*), and AOI 6 ($p = .068$, *ns*). Table Lu 5.7 presents the means and standard deviations for areas of interest by participant type.

Table Lu 5.7

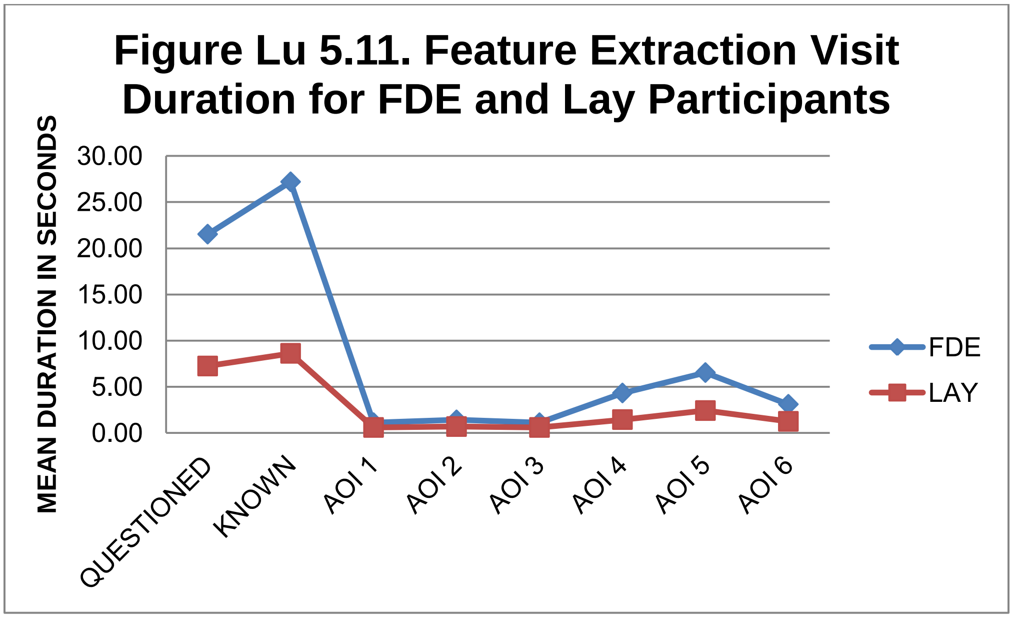
Feature Extraction Analysis Visit Count for FDE and Lay Participants

	QUESTIONED		KNOWNS		AOI1		AOI2	
PARTICIPANT	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	17.15	12.68	17.43	12.53	1.91	2.38	1.98	2.59
LAY	8.09	7.30	8.33	7.42	1.16	1.60	1.14	1.51
	AOI3		**AOI4**		**AOI5**		**AOI6**	
PARTICIPANT	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.02	1.58	5.61	5.43	5.98	5.15	3.37	3.12
LAY	0.40	0.73	2.51	2.93	3.93	3.45	2.28	2.38

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .305, $F(8, 80) = 4.40$, $p < .001$, multivariate $\eta^2 = .305$. Figure Lu 5.10 presents the mean visit durations by AOI.

Figure Lu 5.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 87) = 21.32$, $p < .001$, partial $\eta^2 = .197$ and $F(1, 87) = 20.38$, $p < .001$, partial $\eta^2 = .190$.

Visit duration for AOIs 3 through 6 were significantly greater for FDEs than for Lay participants (AOI 3, $F(1, 87) = 6.31$, $p = .014$, partial $\eta^2 = .068$; AOI 4, $F(1, 87) = 9.85$, $p = .002$, partial $\eta^2 = .102$; AOI 5, $F(1, 87) = 13.25$, $p < .001$, partial $\eta^2 = .132$; AOI 6, $F(1, 87) = 10.33$, $p = .002$, partial $\eta^2 = .106$).

There was no difference in the fixation counts for AOI 1 ($p = .080$, *ns*) or AOI 2 ($p = .095$, *ns*). Table Lu 5.8 presents the means and standard deviations for areas of interest by participant type.

Table Lu 5.8

Feature Extraction Analysis Visit Duration for FDE and Lay Participants

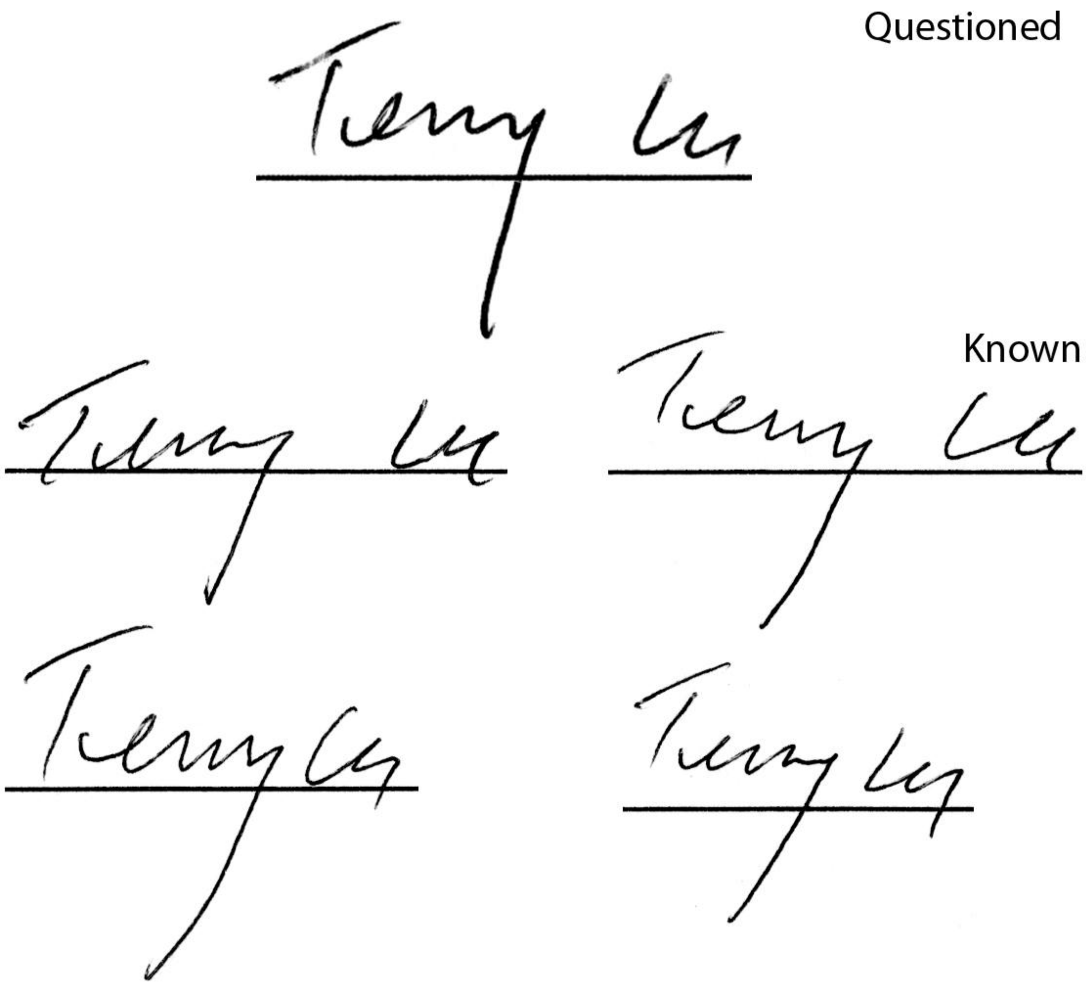
	QUESTIONED		KNOWNS		AOI1		AOI2	
PARTICIPANT	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	21.53	19.28	27.20	25.61	1.11	1.76	1.41	2.56
LAY	7.24	6.50	8.62	8.78	0.59	0.80	0.69	1.24

	AOI3		AOI4		AOI5		AOI6	
PARTICIPANT	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	0.48	0.82	4.32	5.65	6.54	7.01	3.10	3.49
LAY	0.15	0.29	1.44	2.14	2.42	2.51	1.25	1.45

Lu Signature 6: Genuine

All 49 FDE participants responded correctly that the signature was genuine. Of the 43 Lay participants, 41 responded correctly that the signature was genuine, while 2 responded that the signature was non-genuine. This difference was not statistically significant, χ^2 (1, N = 92) = 2.33, *p* = .127, *ns*. Figure Lu 6.1 presents the comparison view of this signature.

Figure Lu 6.1. Questioned-Known Comparison Stimulus for Signature Lu 6.

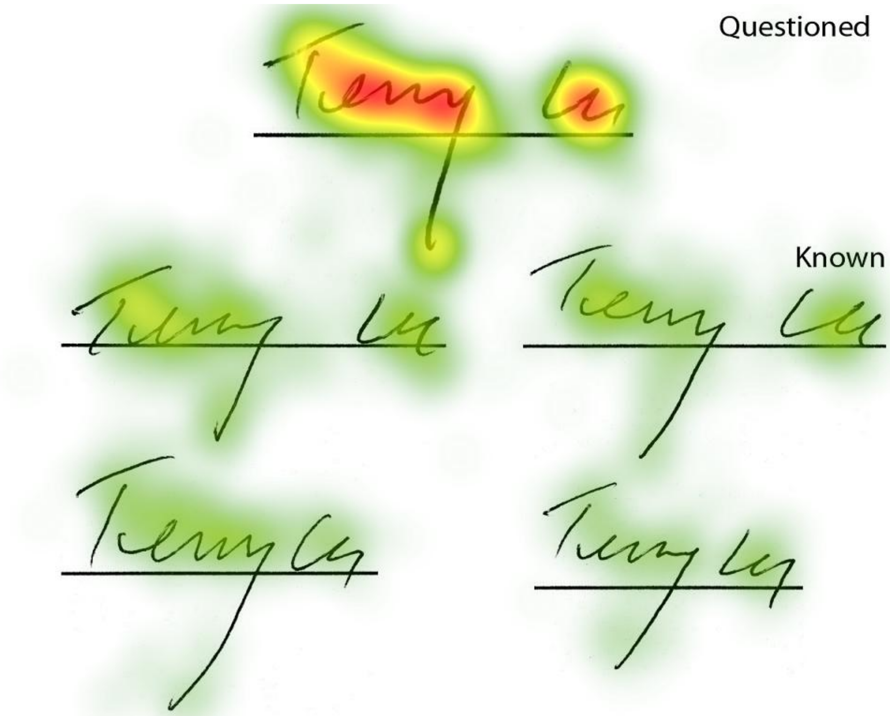


Selection of Areas of Interest (AOIs)

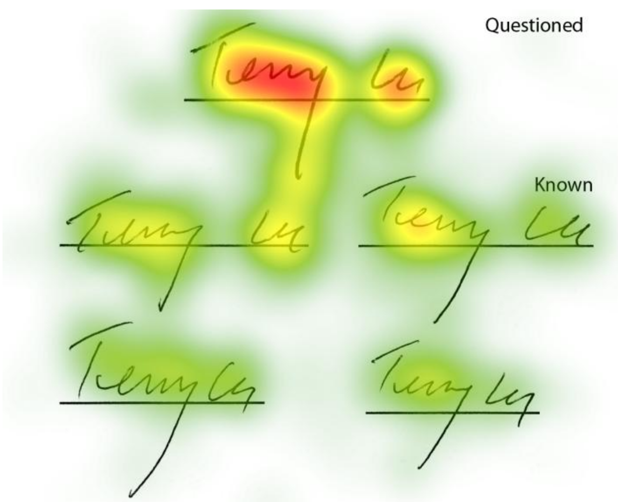
Figure Lu 6.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were six locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of six AOIs for this stimulus. Figure Lu 6.3 presents the location of the AOIs identified in the heat map.

Figure Lu 6.2. Heat map for Lu signature 6, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

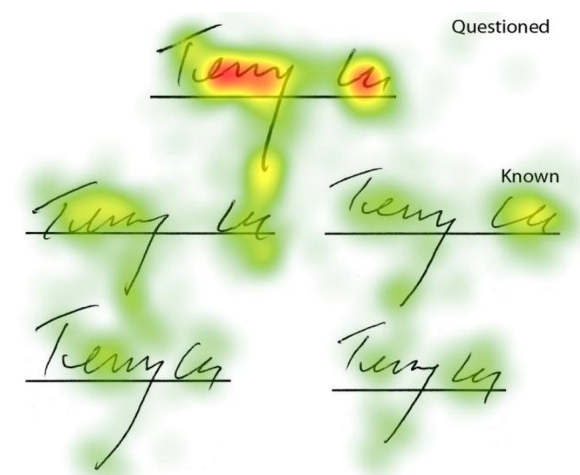
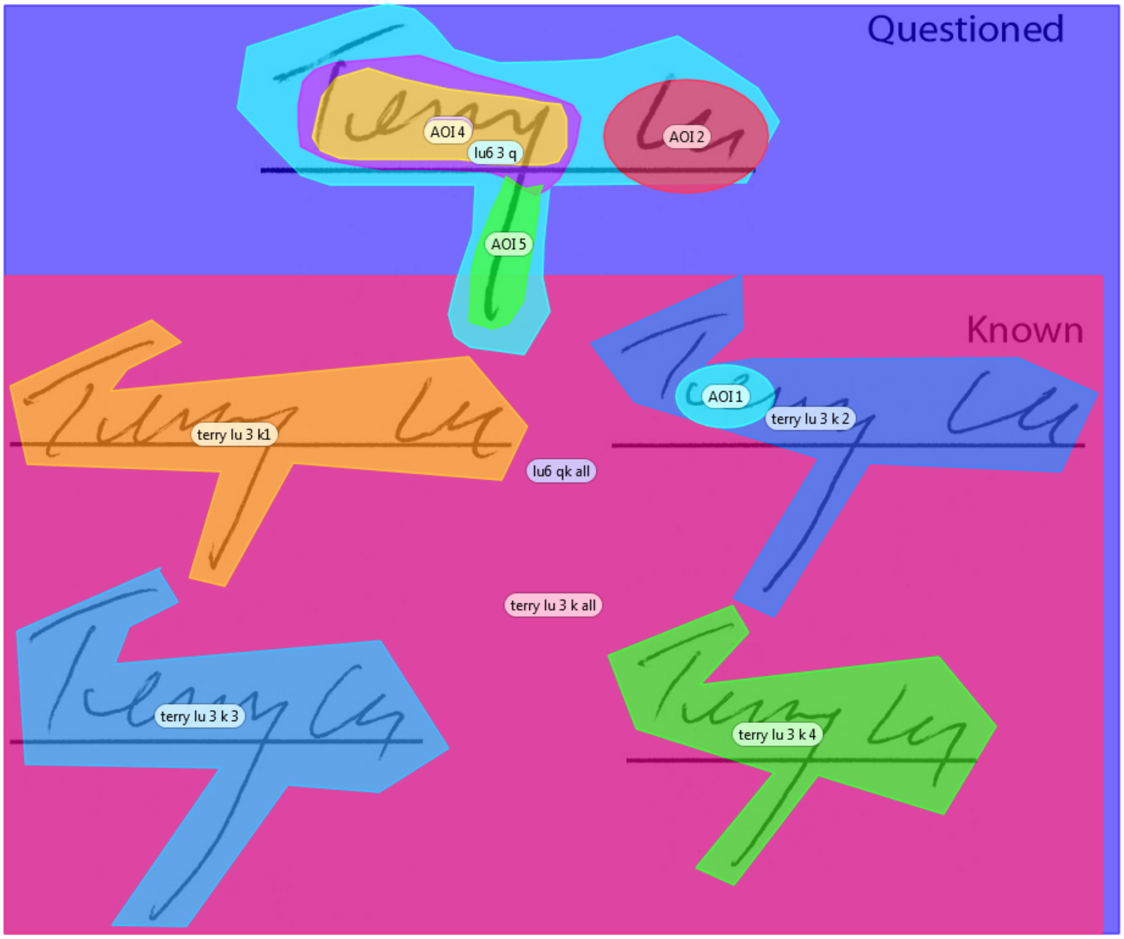


Figure Lu 6.3. Areas of Interest (AOIs) for Lu Signature 6.



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

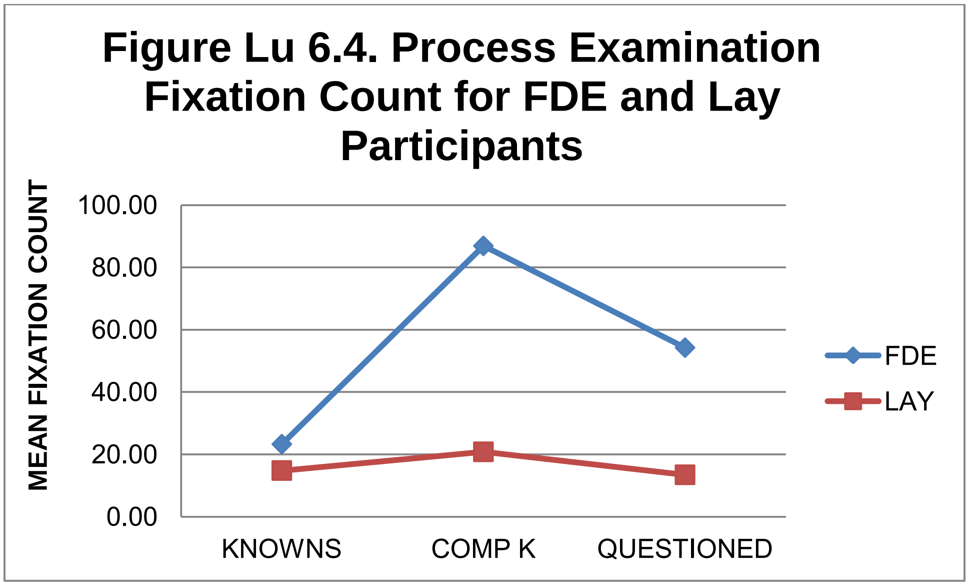
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Lu known signature stimulus (Knowns, not pictured here), Lu K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Lu 6Q (the Lu questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 5) are included in subsequent analyses. Figure Lu 6.3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .261, $F(3, 85) = 0.03$, $p < .001$, multivariate $\eta^2 = .261$. Figure Lu 6.4 presents the mean fixation counts by AOI.

Figure Lu 6.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 87) = 28.71$, $p < .001$, partial $\eta^2 = .248$); known signature comparison stimulus (COMP K), $F(1, 87) = 25.08$, $p < .001$, partial $\eta^2 = .224$); known signature stimulus(ALL K), $F(1, 87) = 6.58$, $p = .012$, partial $\eta^2 = .070$). Table Lu 6.1 presents the means and standard deviations for areas of interest by participant type.

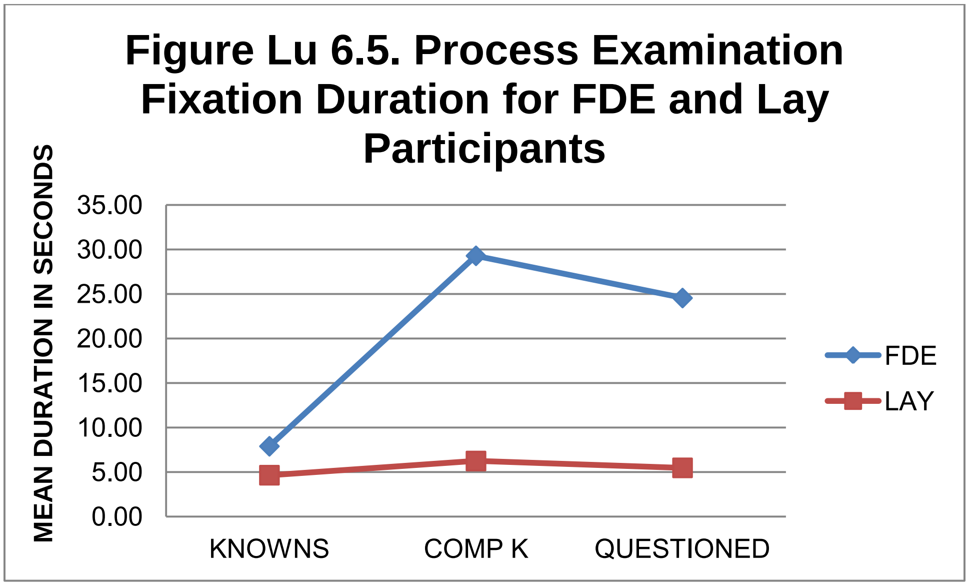
Table Lu 6.1
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	23.26	18.61	86.89	84.81	54.24	48.92
LAY	14.81	11.32	20.81	17.58	13.44	10.27

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .339, $F(3, 85) = 14.50$, $p < .001$, multivariate $\eta^2 = .339$. Figure Lu 6.5 presents the mean fixation counts by AOI.

Figure Lu 6.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 87) = 42.58$, $p < .001$, partial $\eta^2 = .329$); known signature comparison stimulus (COMP K), $F(1, 87) = 25.71$, $p < .001$, partial $\eta^2 = .228$); known signature stimulus(ALL K), $F(1, 87) = 7.76$, $p = .007$, partial $\eta^2 = .082$). Table Lu 6.2 presents the means and standard deviations for areas of interest by participant type.

Table Lu 6.2

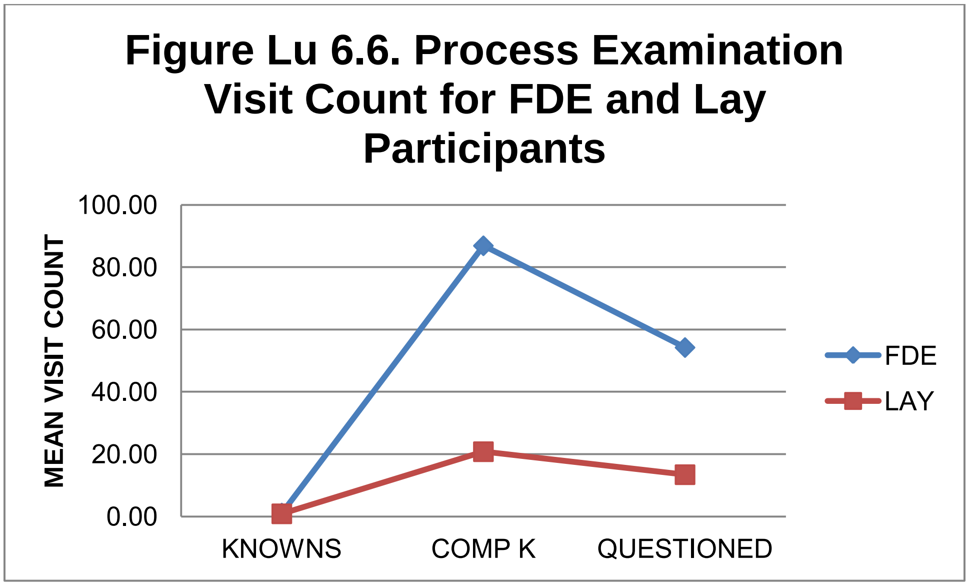
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	7.89	6.73	29.28	29.29	24.54	18.71
LAY	4.65	3.74	6.24	5.65	5.47	4.25

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .337, $F(3, 85) = 7.70$, $p < .001$, multivariate $\eta^2 = .337$. Figure Lu 6.6 presents the mean visit counts by AOI.

Figure Lu 6.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 87) = 28.71$, $p < .001$, partial $\eta^2 = .248$); known signature comparison stimulus (COMP K), $F(1, 87) = 25.08$, $p < .001$, partial $\eta^2 = .224$); known signature stimulus(ALL K), $F(1, 87) = 10.11$, $p = .002$, partial $\eta^2 = .104$). Table Lu 6.2 presents the means and standard deviations for areas of interest by participant type.

Table Lu 6.3

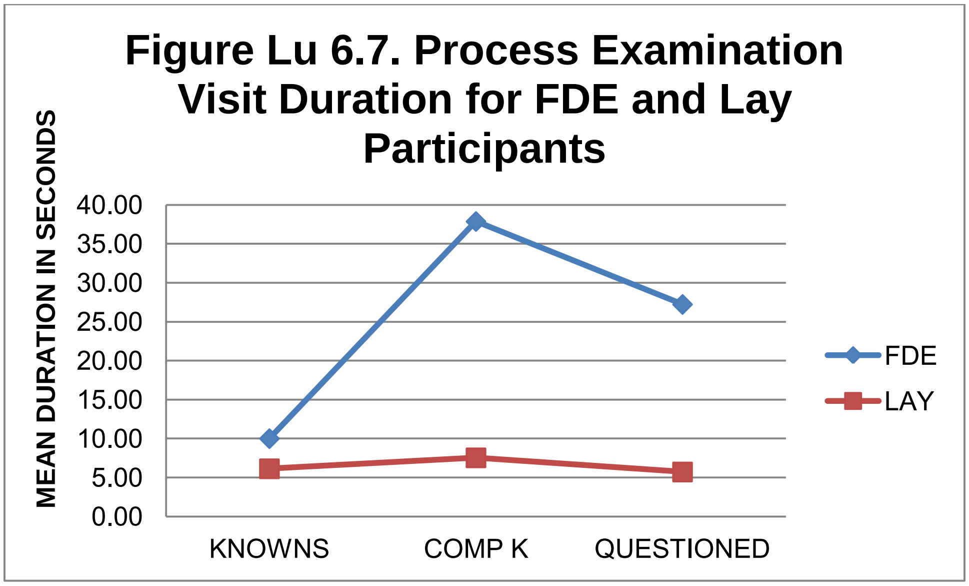
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.13	0.40	86.89	84.81	54.24	48.92
LAY	0.88	0.32	20.81	17.58	13.44	10.27

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .320, $F(3, 85) = 9.82$ $p < .001$, multivariate $\eta^2 = .320$. Figure Lu 6.7 presents the mean visit durations by AOI.

Figure Lu 6.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 87) = 39.18$, $p < .001$, partial $\eta^2 = .310$); known signature comparison stimulus (COMP K), $F(1, 87) = 17.95$, $p < .001$, partial $\eta^2 = .171$); known signature stimulus(ALL K), $F(1, 87) = 6.34$, $p = .014$, partial $\eta^2 = .068$). Table Lu 6.2 presents the means and standard deviations for areas of interest by participant type.

Table Lu 6.4

Process Analysis Visit Durations for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	10.00	8.98	37.87	46.49	27.23	22.12
LAY	6.13	4.72	7.54	6.70	5.72	4.38

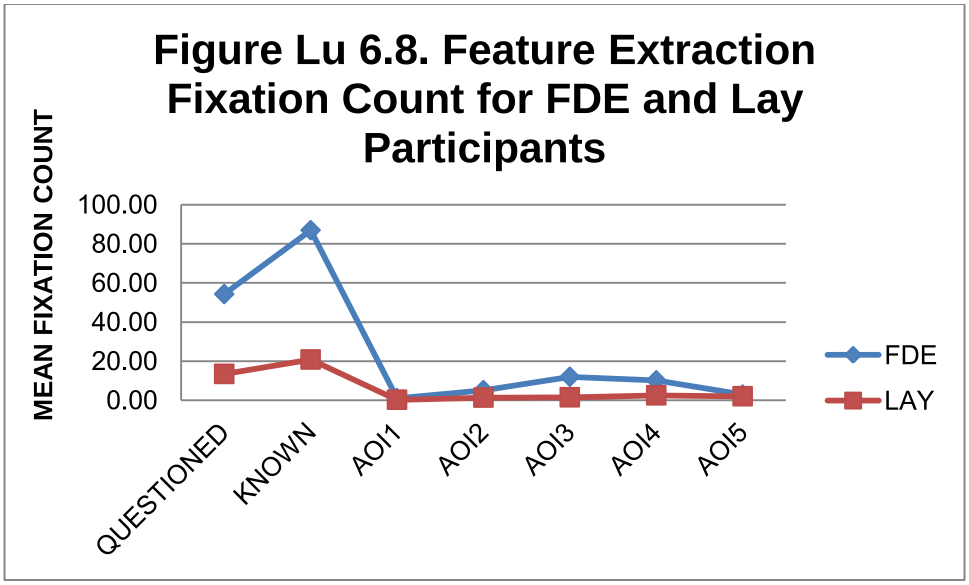
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .331, $F(7, 81) = 5.74$, $p < .001$, multivariate $\eta^2 = .331$. Figure Lu 6.8 presents the mean fixation counts by AOI.

Figure Lu 6.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all but one area of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 87) = 28.71$, $p < .001$, partial $\eta^2 = .248$, and $F(1, 87) = 25.08$, $p < .001$, partial $\eta^2 = .224$.

Fixations counts for AOIs 1 through 4 were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 16.29$, $p < .001$, partial $\eta^2 = .158$; AOI 2, $F(1, 87) = 32.39$, $p < .001$, partial $\eta^2 = .271$; AOI 3, $F(1, 87) = 35.38$, $p < .001$, partial $\eta^2 = .289$; AOI 4, $F(1, 87) = 29.25$, $p < .001$, partial $\eta^2 = .252$).

There was no difference in the fixation counts for AOI 5 ($p = .320$, *ns*). Table Lu 6.6 presents the means and standard deviations for areas of interest by participant type.

Table Lu 6.5
Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

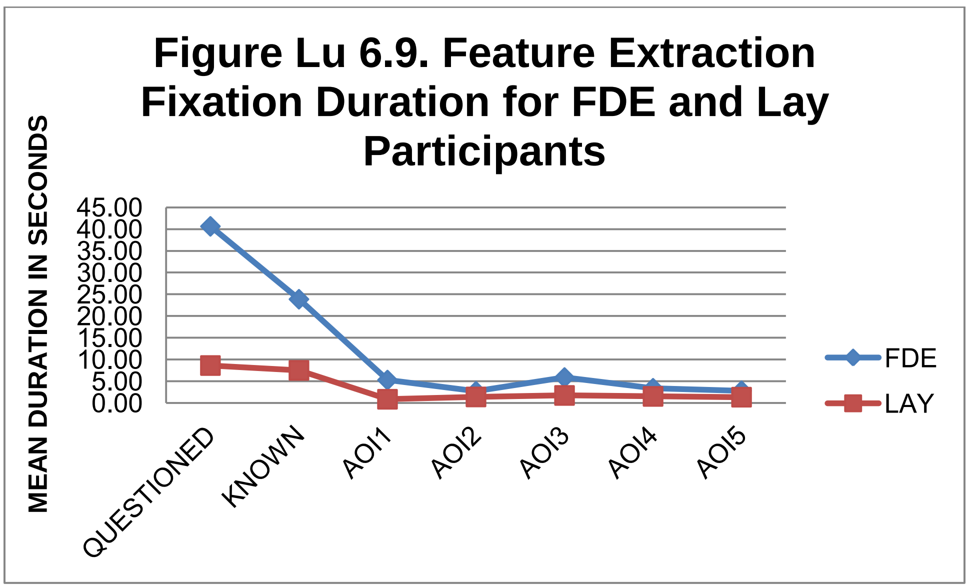
	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	54.24	48.92	86.89	84.81	1.04	1.20	5.13	4.14
LAY	13.44	10.27	20.81	17.58	0.26	0.40	1.35	1.36

	AOI 3		AOI 4		AOI 5	
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	11.98	11.37	10.16	9.06	2.89	5.18
LAY	1.51	2.04	2.51	2.05	2.03	2.22

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .344, $F(7, 81) = 6.06$, $p < .001$, multivariate $\eta^2 = .344$. Figure Lu 6.9 presents the mean fixation durations by AOI.

Figure Lu 6.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all but one area of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 87) = 42.58$, $p < .001$, partial $\eta^2 = .329$, and $F(1, 87) = 25.71$, $p < .001$, partial $\eta^2 = .228$.

Fixations counts for AOIs 1 through 4 were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 18.30$, $p < .001$, partial $\eta^2 = .174$; AOI 2, $F(1, 87) = 28.47$, $p < .001$, partial $\eta^2 = .247$; AOI 3, $F(1, 87) = 31.58$, $p < .001$, partial $\eta^2 = .266$; AOI 4, $F(1, 87) = 28.33$, $p < .001$, partial $\eta^2 = .246$).

There was no difference in the fixation counts for AOI 5 (p = .135, *ns*). Table Lu 6.6 presents the means and standard deviations for areas of interest by participant type.

Table Lu 6.6
Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

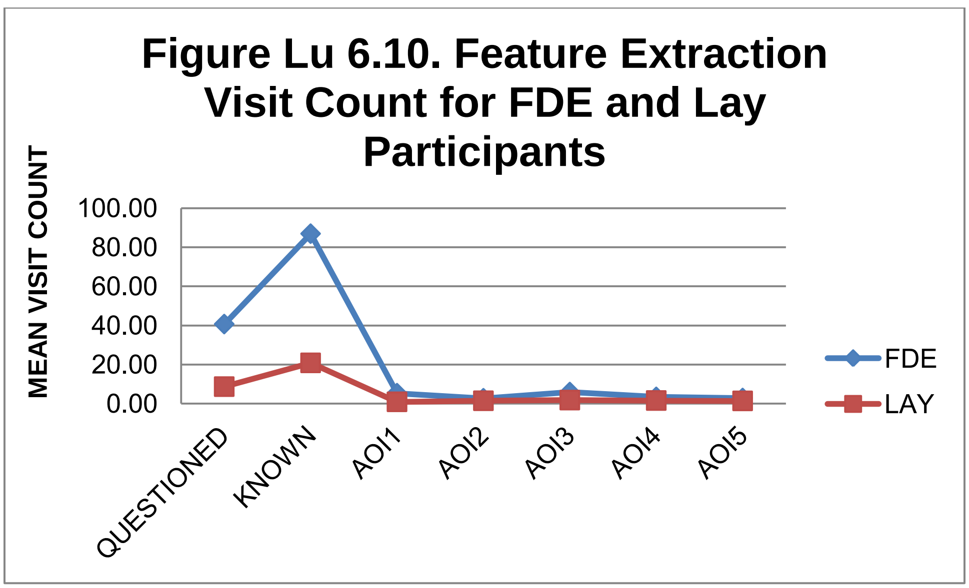
	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	40.65	29.46	23.89	23.86	5.31	4.71	2.71	3.98
LAY	8.65	7.60	7.53	6.82	0.89	1.14	1.42	1.83

	AOI 3		AOI 4		AOI 5	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	5.89	4.36	3.42	2.67	2.84	2.17
LAY	1.76	1.72	1.55	1.62	1.37	1.53

<u>*Total Visit Count*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .320, $F(7, 81) = 5.45$, $p < .001$, multivariate $\eta^2 = .320$. Figure Lu 6.10 presents the mean visit counts by AOI.

Figure Lu 6.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all but one area of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for

FDEs than for Lay participants, $F(1, 87) = 28.71$, $p < .001$, partial $\eta^2 = .248$, and $F(1, 87) = 25.08$, $p < .001$, partial $\eta^2 = .224$.

Fixations counts for AOIs 1 through 4 were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 17.31$, $p < .001$, partial $\eta^2 = .166$; AOI 2, $F(1, 87) = 26.92$, $p < .001$, partial $\eta^2 = .236$; AOI 3, $F(1, 87) = 33.48$, $p < .001$, partial $\eta^2 = .278$; AOI 4, $F(1, 87) = 28.68$, $p < .001$, partial $\eta^2 = .248$).

There was no difference in the fixation counts for AOI 5 ($p = .318$, *ns*). Table Lu 6.7 presents the means and standard deviations for areas of interest by participant type.

Table Lu 6.7

Feature Extraction Analysis Visit Count for FDE and Lay Participants

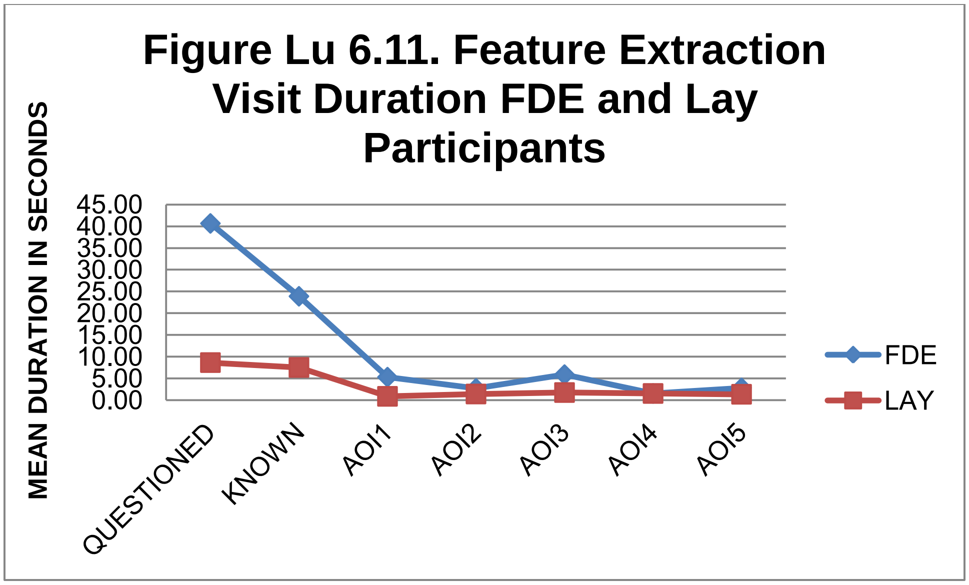
	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	40.65	29.46	23.89	23.86	5.31	4.71	2.71	3.98
LAY	8.65	7.60	7.53	6.82	0.89	1.14	1.42	1.83

	AOI 3		**AOI 4**		**AOI 5**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	5.89	4.36	3.42	2.67	2.84	2.17
LAY	1.76	1.72	1.55	1.62	1.37	1.53

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .339, $F(7, 81) = 5.93$, $p < .001$, multivariate $\eta^2 = .339$. Figure Lu 6.10 presents the mean visit durations by AOI.

Figure Lu 6.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all but one area of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 87) = 39.18$, $p < .001$, partial $\eta^2 = .310$, and $F(1, 87) = 17.95$, $p < .001$, partial $\eta^2 = .171$.

Fixations counts for AOIs 1 through 4 were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 18.87$, $p < .001$, partial $\eta^2 = .178$; AOI 2, $F(1, 87) = 29.20$, $p < .001$, partial $\eta^2 = .251$; AOI 3, $F(1, 87) = 39.23$, $p < .001$, partial $\eta^2 = .311$; AOI 4, $F(1, 87) = 34.25$, $p < .001$, partial $\eta^2 = .282$).

There was no difference in the fixation counts for AOI 5 ($p = .043$, *ns*). Table Lu 6.8 presents the means and standard deviations for areas of interest by participant type.

Table Lu 6.8

Feature Extraction Analysis Visit Duration for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	40.65	29.46	23.89	23.86	5.31	4.71	2.71	3.98
LAY	8.65	7.60	7.53	6.82	0.89	1.14	1.42	1.83

	AOI 3		AOI 4		AOI 5	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	5.89	4.36	3.42	2.67	2.84	2.17
LAY	1.76	1.72	1.55	1.62	1.37	1.53

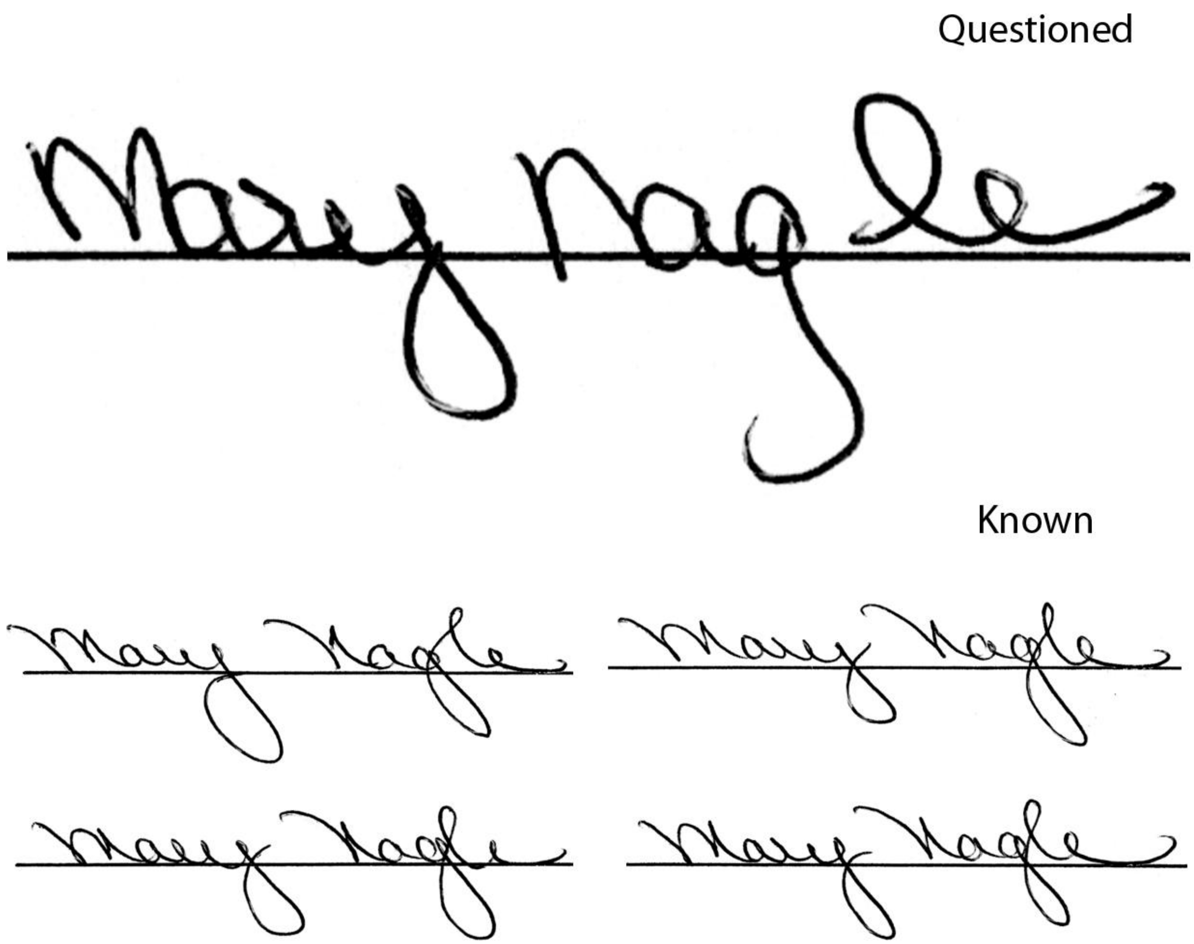
SIGNATURE 6: Mary Nagle

The signature of Mary Nagle is characterized as a high-complexity text-type signature. The set of Nagle signature specimens included one genuine signature. Of the non-genuine signatures, three were traced, one was a freehand simulation, and one was disguised.

Nagle Signature 1: Disguised (Non-Genuine)

Of the 49 FDE participants, 47 responded correctly that the signature was non-genuine, and 1 responded that it was genuine. One FDE declined to respond. Of the 43 Lay participants, 41 responded correctly that the signature was non-genuine, and 2 responded that the signature was non-genuine. This difference was not statistically significant, $p = .507$, *ns*. Figure Nagle 1.1 presents the comparison view of this signature.

Figure Nagle 1.1. Questioned-Known Comparison Stimulus for Nagle Signature 1.

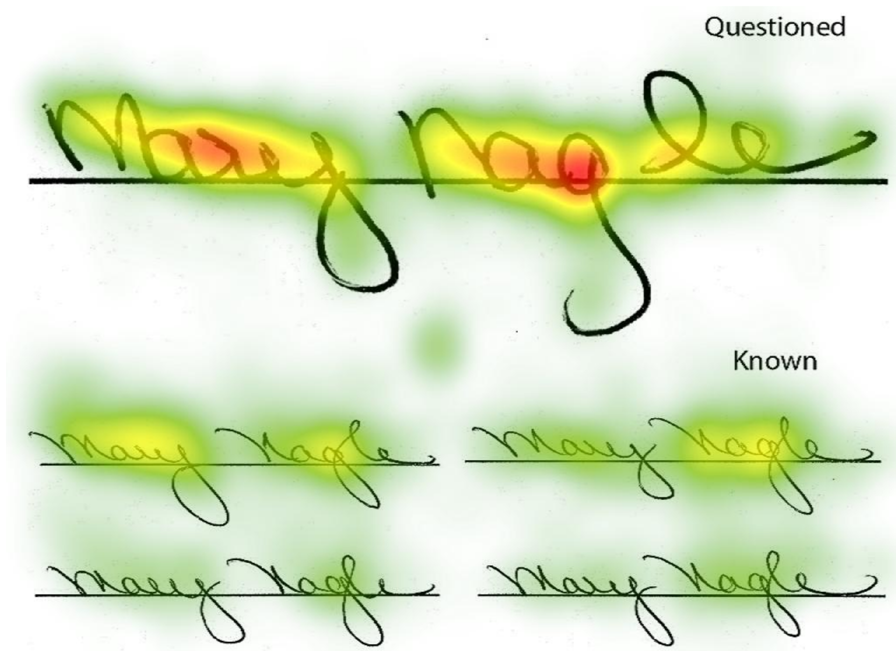


Selection of Areas of Interest (AOIs)

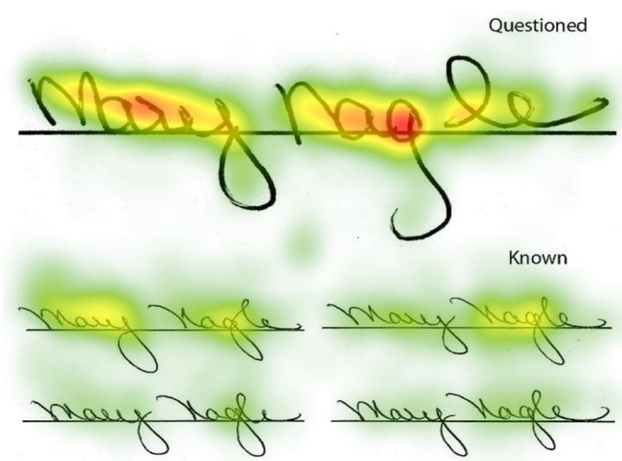
Figure Nagle 1.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were four locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of four AOIs for this stimulus. Figure Nagle 1.3 presents the location of the AOIs identified in the heat map.

Figure Nagle 1.2. Heat map for Nagle signature 1, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

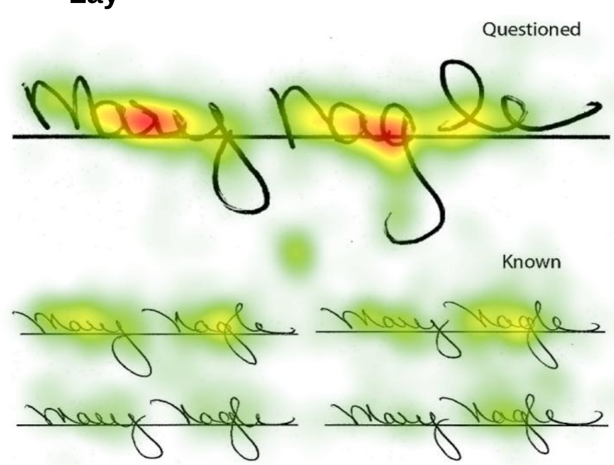
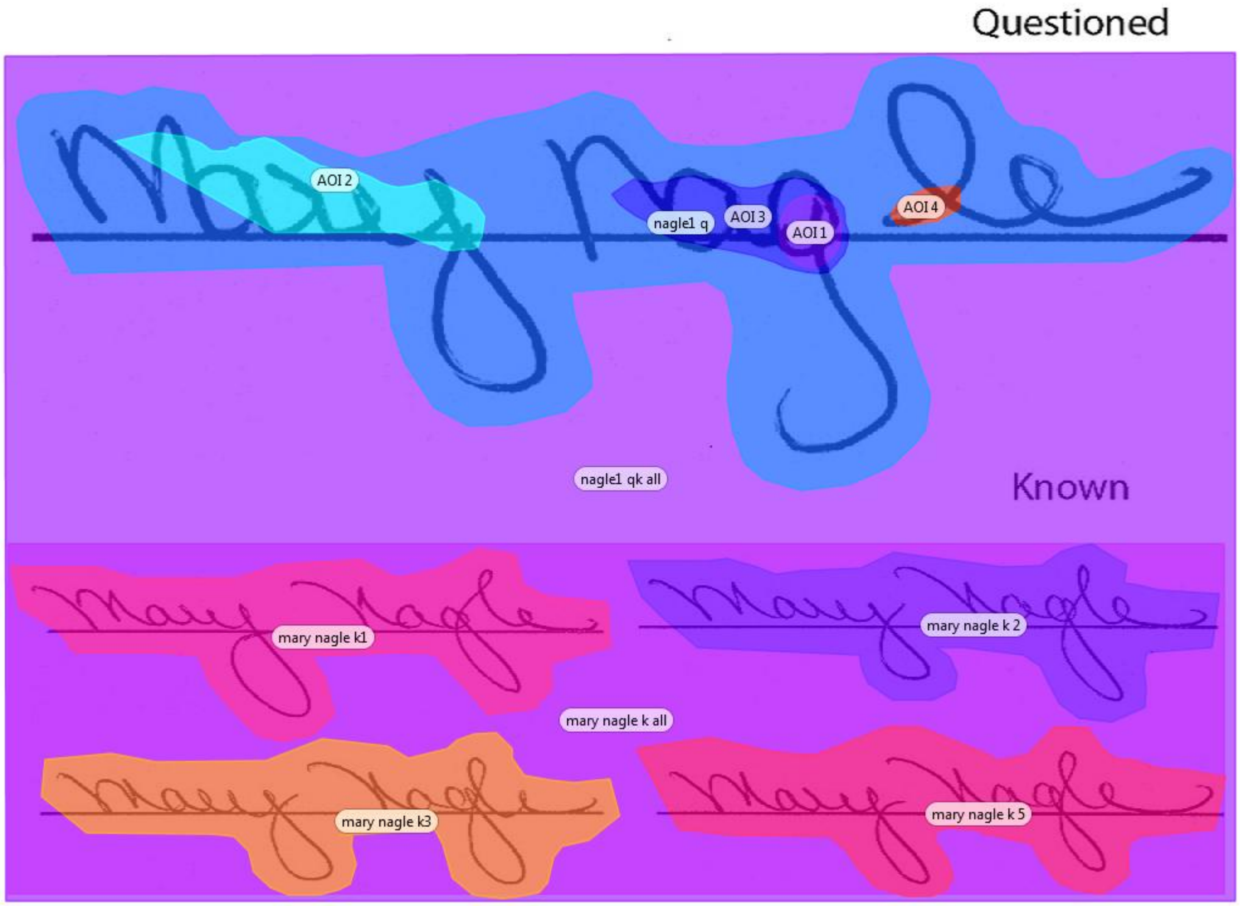


Figure Nagle 1.3. Areas of Interest (AOIs) for Nagle Signature 1.



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

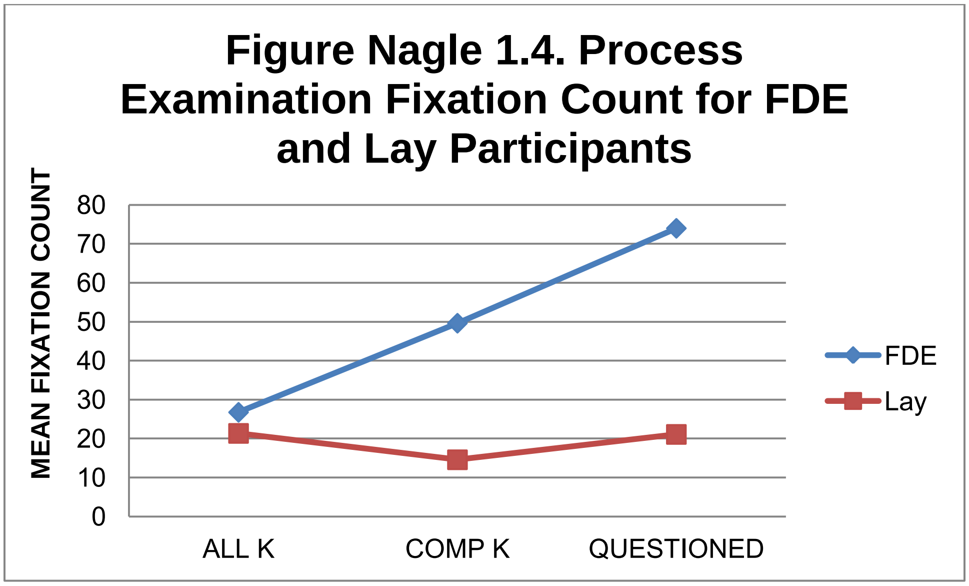
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Nagle known signature stimulus (Knowns, not pictured here), Nagle 1 K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Nagle 1Q (the Nagle questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 4) are included in subsequent analyses. Figure Nagle 1.3 demonstrates all AOIs identified for this signature.

<u>*Total Fixation Count*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .302, $F(3, 86) = 12.378$, $p < .001$, multivariate $\eta^2 = .302$. Figure Nagle 1.4 presents the mean fixation counts by AOI.

Figure Nagle 1.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 88) = 35.10$, $p > .001$, partial $\eta^2 = .285$); known signature comparison stimulus (COMP K), $F(1, 88) = 23.98$, $p < .001$, partial $\eta^2 = .214$). Fixation count in the known signature stimulus was not statistically significant (ALL K), $p = .314$, *ns*. Table Nagle 1.1 presents the means and standard deviations for areas of interest by participant type.

Table Nagle 1.1

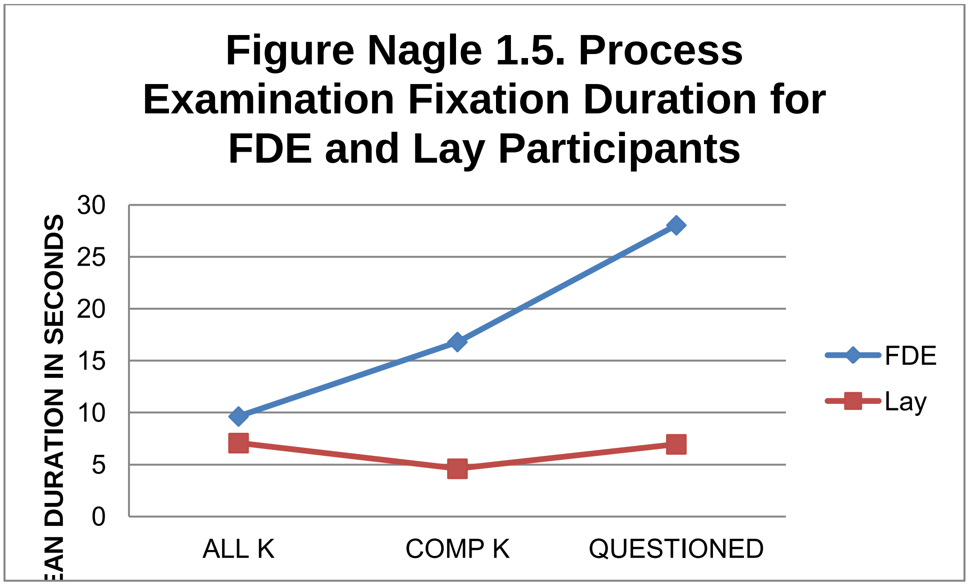
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	26.76	29.89	49.63	45.29	74.00	56.11
Lay	21.35	19.15	14.58	12.85	21.09	17.45

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .281, $F(3, 86) = 11.178$, $p < .001$, multivariate $\eta^2 = .281$. Figure Nagle 1.5 presents the mean fixation duration by AOI.

Figure Nagle 1.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 88) = 31.38$, $p > .001$, partial $\eta^2 = .263$); known signature comparison stimulus (COMP K), $F(1, 88) = 20.56$, $p < .001$, partial $\eta^2 = .189$). Fixation duration in the known signature stimulus was not statistically significant (ALL K), $p = .210$, *ns*. Table Nagle 1.2 presents the means and standard deviations for areas of interest by participant type.

Table Nagle 1.2

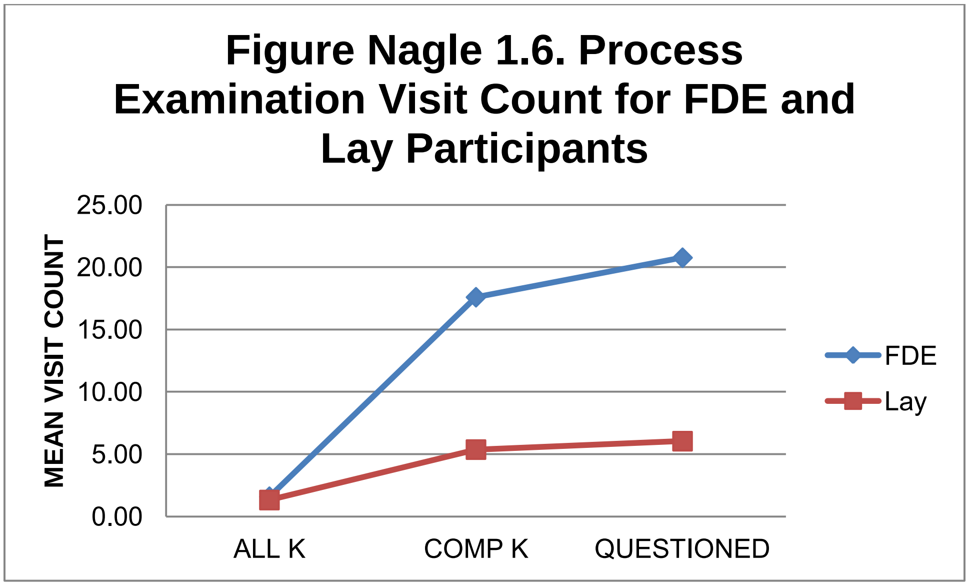
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	9.63	10.60	16.80	17.16	28.04	23.91
Lay	7.07	7.86	4.60	4.26	6.95	6.40

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .261, $F(3, 86) = 10.13$, $p < .001$, multivariate $\eta^2 = .261$. Figure Nagle 1.6 presents the mean visit counts by AOI.

Figure Nagle 1.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in two of the three areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 88) = 29.21$, $p > .001$, partial $\eta^2 = .249$); known signature comparison stimulus (COMP K), $F(1, 88) = 26.35$, $p < .001$, partial $\eta^2 = .230$). Visit count in the known signature stimulus was not statistically significant (ALL K), $p = .343$, *ns*. Table Nagle 1.3 presents the means and standard deviations for areas of interest by participant type.

Table Nagle 1.3

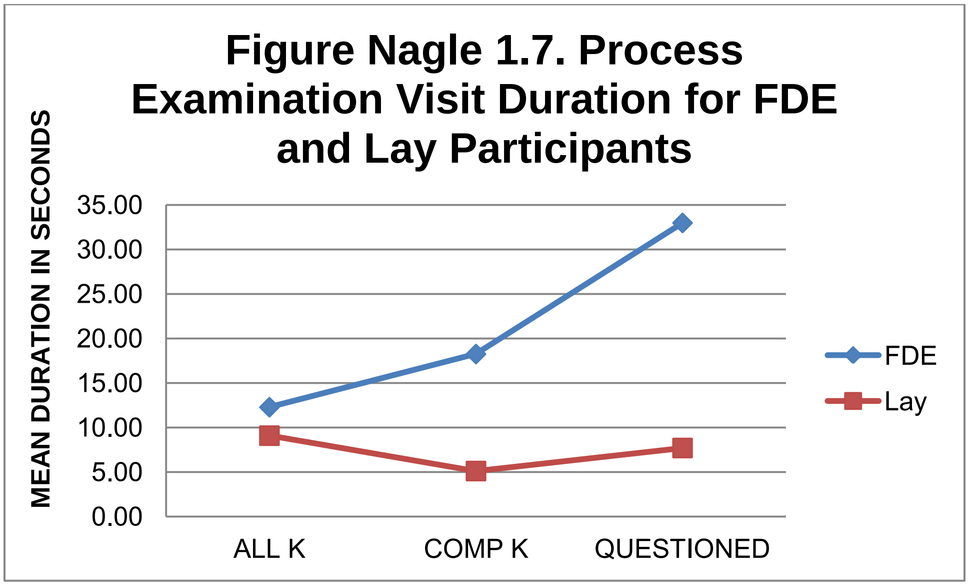
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.60	1.54	17.60	14.61	20.77	16.94
Lay	1.33	1.08	5.37	5.73	6.05	5.88

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .237, $F(3, 86) = 13.96$, $p < .001$, multivariate $\eta^2 = .327$. Figure Nagle 1.7 presents the mean visit durations by AOI.

Figure Nagle 1.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all of the three areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 88) = 41.10$, $p > .001$, partial $\eta^2 = .318$); known signature comparison stimulus (COMP K), $F(1, 88) = 21.04$, $p < .001$, partial $\eta^2 = .193$). Visit duration in the known signature stimulus was not statistically significant (ALL K), $p = .186$, *ns*. Table Nagle 1.4 presents the means and standard deviations for areas of interest by participant type.

Table Nagle 1.4

Process Analysis Visit Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	12.28	13.25	18.25	18.26	32.98	25.00
Lay	9.09	8.82	5.11	4.56	7.70	6.87

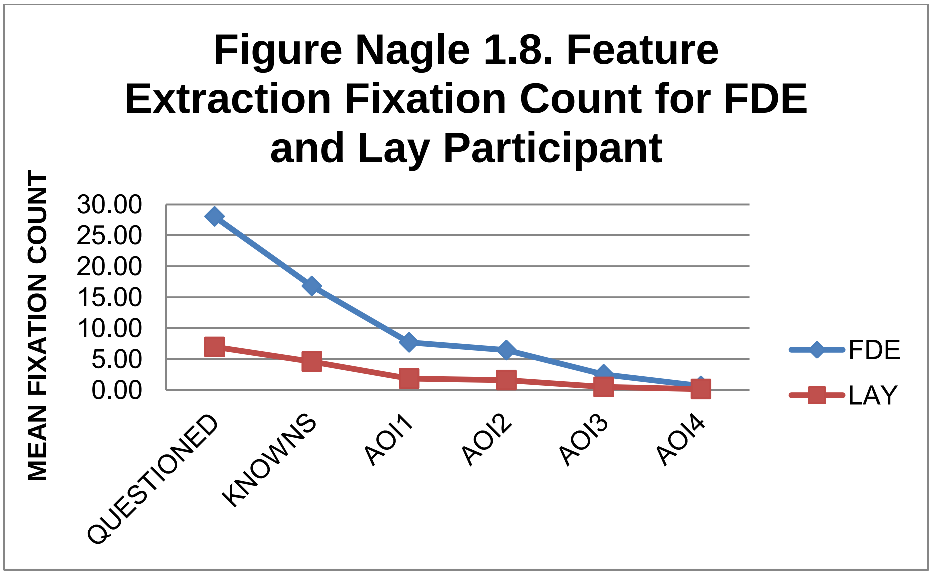
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .273, $F(6, 83) = 5.19$, $p < .001$, multivariate $\eta^2 = .273$. Figure Nagle 1.8 presents the mean fixation counts by AOI.

Figure Nagle 1.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 88) = 31.38$, $p < .001$, partial $\eta^2 = .263$, and F(1, 88) = 20.56, p < .001, partial $\eta^2 = .189$.

Fixations count in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 24.171$, $p = .001$, partial $\eta^2 = .215$; AOI 2, $F(1, 88) = 19.86$, $p < .001$, partial $\eta^2 = .184$; AOI 3, $F(1, 88) = 14.17$, $p = .001$, partial $\eta^2 = .139$; AOI 4, $F(1, 88) = 10.77$, $p < .001$, partial $\eta^2 = .109$). Table Nagle 1.5 presents the means and standard deviations for areas of interest by participant type.

Table Nagle 1.5

Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

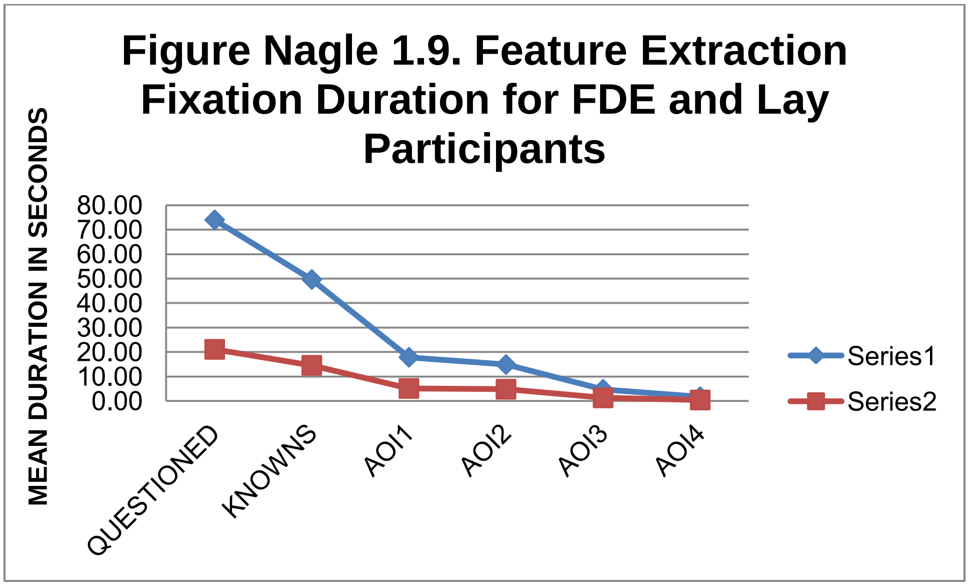
	QUESTIONED		KNOWNS		AOI1	
PARTICIPANT	***M***	***SD***	***M***	***SD***	***M***	***SD***

FDE	28.04	23.91	16.80	17.16	7.70	7.61
LAY	6.95	6.40	4.60	4.26	1.85	1.75
	AOI2		**AOI3**		**AOI4**	
PARTICIPANT	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	6.44	7.00	2.53	3.51	0.65	0.95
LAY	1.60	1.41	0.49	0.66	0.16	0.28

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .286, $F(6, 83) = 5.54$, $p <.001$, multivariate $\eta^2 = .286$. Figure Nagle 1.9 presents the mean fixation durations by AOI.

Figure Nagle 1.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 88) = 35.10$, $p < .001$, partial $\eta^2 = .285$, and $F(1, 88) =23.98$, p < .001, partial $\eta^2 = .214$.

Fixation durations in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 26.93$, $p < .001$, partial $\eta^2 = .234$; AOI 2, $F(1, 88) = 22.11$, $p < .001$, partial $\eta^2 = .201$; AOI 3, $F(1, 88) = 18.09$, $p < .001$, partial $\eta^2 = .171$; AOI 4, $F(1, 88) = 14.07$, $p < .001$, partial $\eta^2 = .138$). Table Nagle 1.6 presents the means and standard deviations for areas of interest by participant type.

Table Nagle 1.6

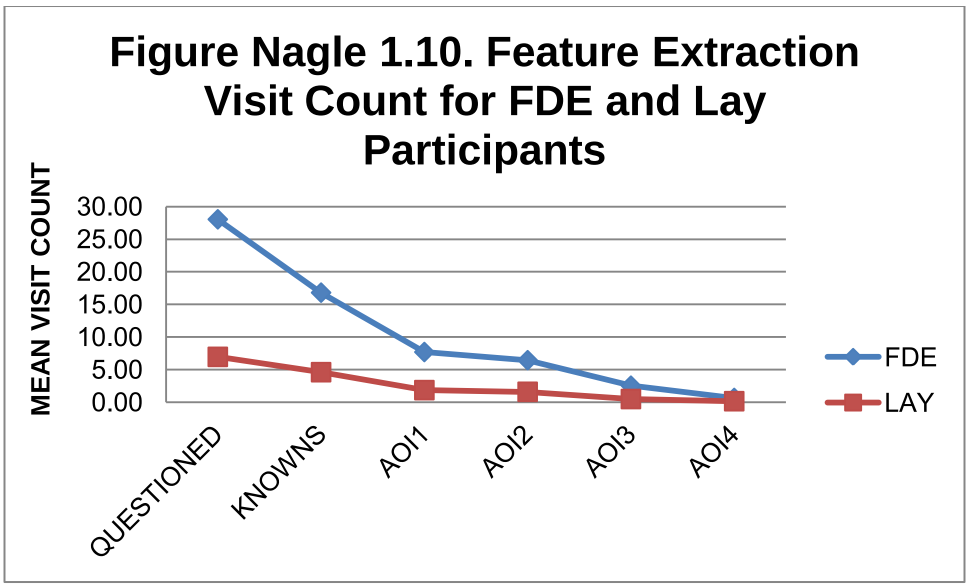
Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

	QUESTIONED		KNOWNS		AOI1	
PARTICIPANT	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	74.00	56.11	49.64	45.29	17.87	15.51
LAY	21.09	17.45	14.58	12.85	5.14	4.46
	AOI2		**AOI3**		**AOI4**	
PARTICIPANT	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	14.89	13.63	4.79	5.25	1.77	2.26
LAY	4.81	3.57	1.28	1.35	0.42	0.70

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .322, $F(6, 83) = 6.59$, $p < .001$, multivariate $\eta^2 = .322$. Figure Nagle 1.10 presents the mean visit counts by AOI.

Figure Nagle 1.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 88) = 41.10$, $p < .001$, partial $\eta^2 = .318$, and F(1, 88) = 21.04, p < .001, partial $\eta^2 = .193$.

Visit counts in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 25.96$, $p < .001$, partial $\eta^2 = .228$; AOI 2, $F(1, 88) = 21.58$, $p < .001$, partial $\eta^2 = .197$; AOI 3, *F*(1, 88) = 18.45, $p < .001$, partial $\eta^2 = .173$; AOI 4, *F*(1, 88) = 15.10, $p < .001$, partial $\eta^2 = .146$). Table Nagle 1.7 presents the means and standard deviations for areas of interest by participant type.

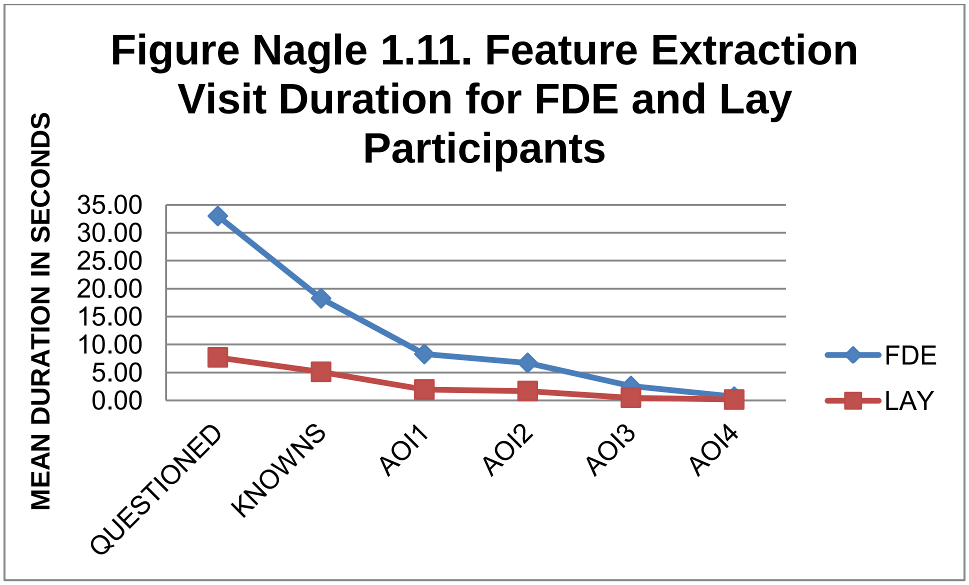
Table Nagle 1.7
Feature Extraction Analysis Visit Count for FDE and Lay Participants

	QUESTIONED		KNOWNS		AOI1	
PARTICIPANT	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	28.04	23.91	16.80	17.16	7.70	7.61
LAY	6.95	6.40	4.60	4.26	1.85	1.75
	AOI2		**AOI3**		**AOI4**	
PARTICIPANT	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	6.44	7.00	2.53	3.51	0.65	0.95
LAY	1.60	1.41	0.49	0.66	0.16	0.28

<u>*Total Visit Duration*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .328, *F*(6, 83) = 6.76, $p < .001$, multivariate $\eta^2 = .328$. Figure Nagle 1.11 presents the mean visit durations by AOI.

Figure Nagle 1.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 88) = 41.10$, $p < .001$, partial $\eta^2 = .318$, and $F(1, 88) = 21.04$, $p < .001$, partial $\eta^2 = .193$.

Visit durations in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 25.29$, $p < .001$, partial $\eta^2 = .223$; AOI 2, $F(1, 88) = 20.80$, $p < .001$, partial $\eta^2 = .191$; AOI 3, $F(1, 88) = 14.47$, $p < .001$, partial $\eta^2 = .141$; AOI 4, $F(1, 88) = 10.88$, $p < .001$, partial $\eta^2 = .110$). Table Nagle 1.8 presents the means and standard deviations for areas of interest by participant type.

Table Nagle 1.8

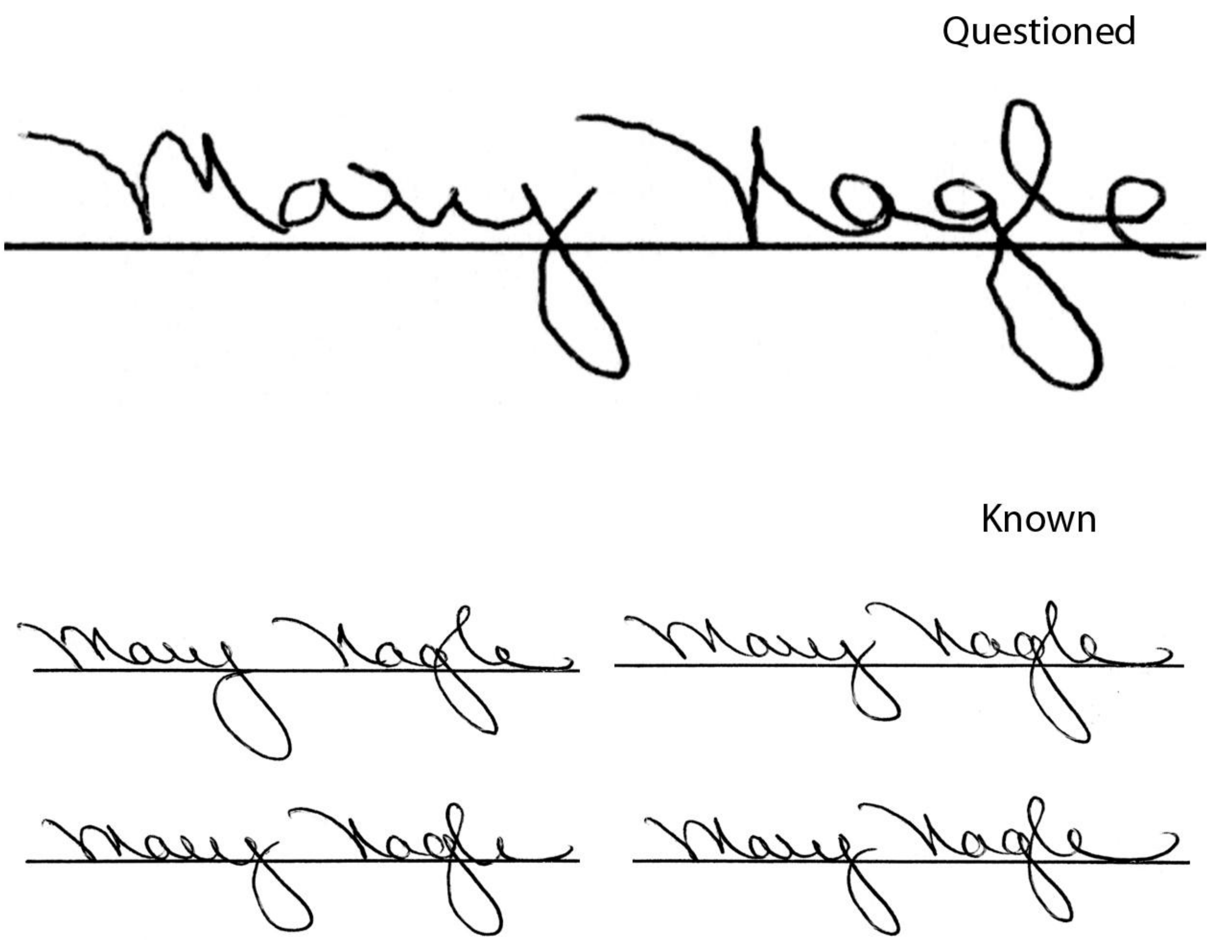
Feature Extraction Analysis Visit Duration for FDE and Lay Participants

	QUESTIONED		**KNOWNS**		**AOI1**	
PARTICIPANT	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	32.98	25.00	18.25	18.26	8.29	8.06
LAY	7.70	6.87	5.11	4.56	1.96	1.88
	AOI2		**AOI3**		**AOI4**	
PARTICIPANT	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	6.71	7.10	2.57	3.53	0.67	0.98
LAY	1.67	1.52	0.49	0.67	0.16	0.28

Nagle Signature 2: Traced (Non-Genuine)

This signature is a traced signature of Mary Nagle, which is characterized as a high-complexity, text-based signature. Of the 49 FDE participants, all 49 responded correctly that the signature was non-genuine. Of the 43 Lay participants, 40 responded correctly that the signature was non-genuine, and 3 responded that the signature was genuine. This difference was not statistically significant, p = .060, *ns*. Figure Nagle 2.1 presents the comparison view of this signature.

Figure Nagle 2.1. Questioned-Known Comparison Stimulus for Nagle Signature 2.

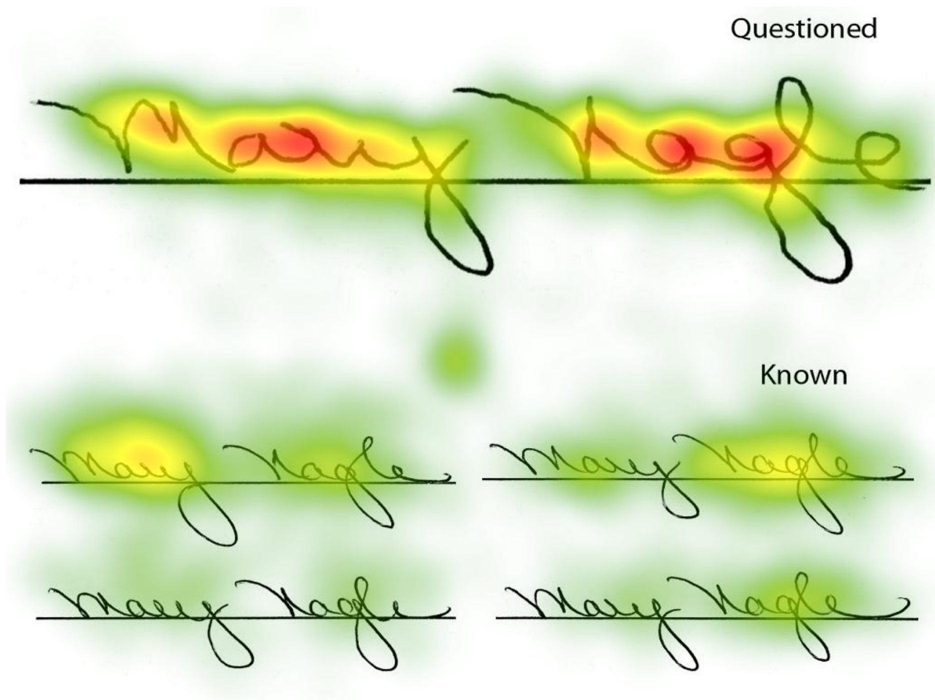


Selection of Areas of Interest (AOIs)

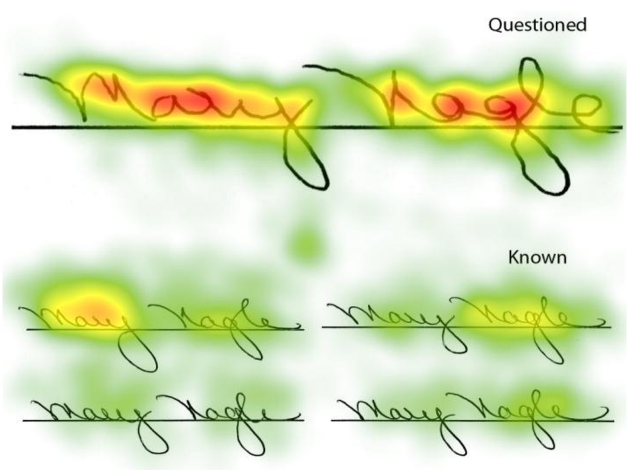
Figure Nagle 2.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were six locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of six AOIs for this stimulus. Figure Nagle 2.2 presents the location of the AOIs identified in the heat map.

Figure Nagle 2.2. Heat map for Nagle Signature 2, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

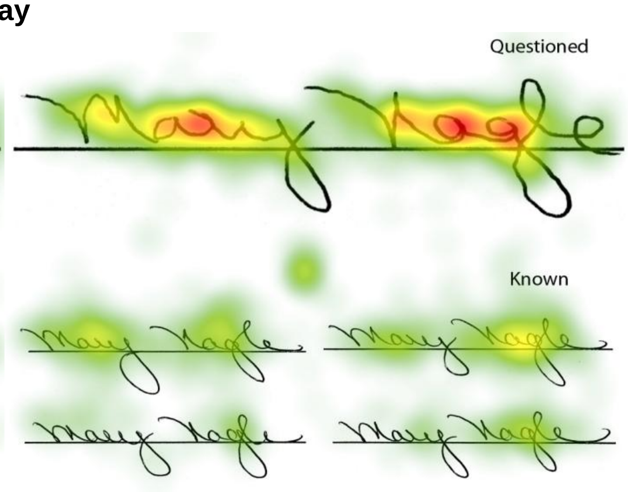
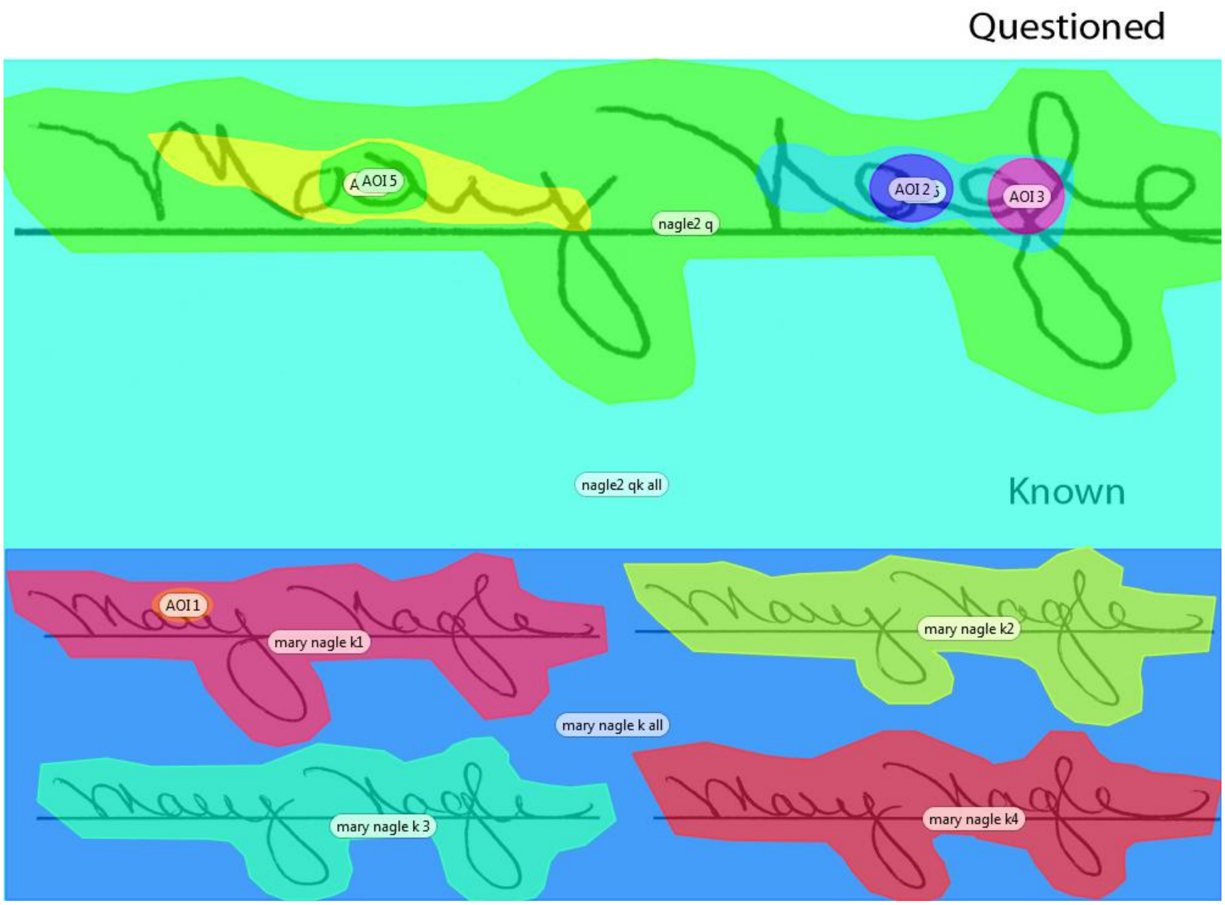


Figure Nagle 2.3. Areas of Interest (AOIs) for Nagle Signature 2.



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

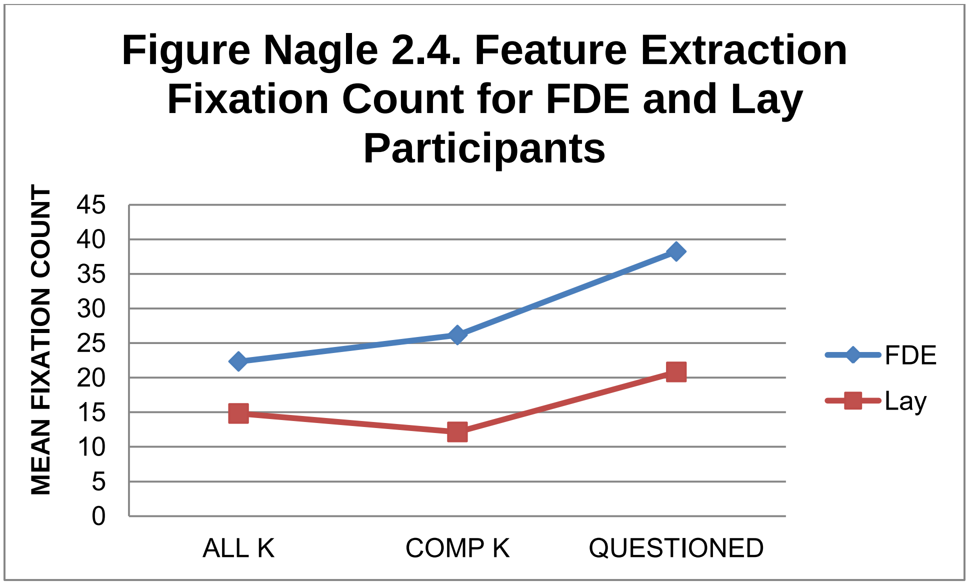
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Nagle known signature stimulus (Knowns, not pictured here), Nagle 1 K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Nagle 2Q (the Nagle questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 6) are included in subsequent analyses. Figure Nagle 2.3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .108, $F(3, 85) = 3.43$, $p < .001$, multivariate $\eta^2 = .108$. Figure Nagle 2.4 presents the mean fixation counts by AOI.

Figure Nagle 2.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 87) = 10.02$, $p = .002$, partial $\eta^2 = .103$); known signature comparison stimulus, $F(1, 87) = 7.40$, $p = .008$, partial $\eta^2 = .078$). Fixation count in the known signature stimulus was not statistically significant, $F(1, 87) = 2.44$, $p = .122$, partial $\eta^2 = .027$. Table Nagle 2.1 presents the means and standard deviations for areas of interest by participant type.

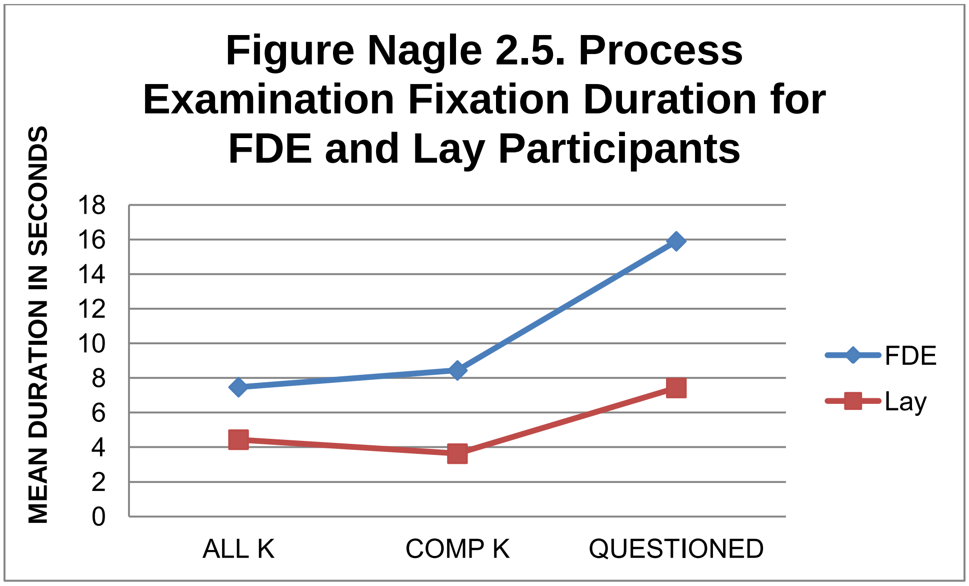
Table Nagle 2.1
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		Comp Knowns		QUESTIONED	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	22.33	27.12	26.15	29.58	38.22	28.92
Lay	14.81	16.64	12.14	16.86	20.81	22.26

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .123, $F(3, 85) = 3.97$, $p = .011$, multivariate $\eta^2 = .123$. Figure Nagle 2.5 presents the mean fixation duration by AOI.

Figure Nagle 2.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 87) = 10.60$, $p = .002$, partial $\eta^2 = .109$); known signature comparison stimulus, $F(1, 87) = 7.13$, $p = .009$, partial $\eta^2 = .076$). Fixation duration in the known signature stimulus approached statistical significance, $F(1, 87) = 3.70$, $p = .058$, partial $\eta^2 = .041$. Table Nagle 2.2 presents the means and standard deviations for areas of interest by participant type.

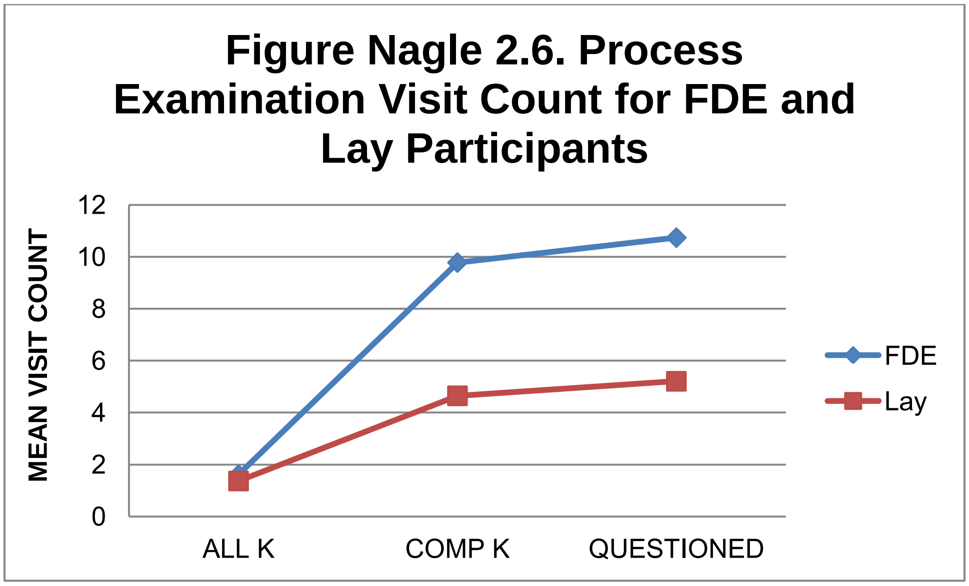
Table Nagle 2.2
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	7.47	9.56	8.44	10.99	15.90	15.07
Lay	4.44	4.01	3.63	4.48	7.43	8.26

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .131, $F(3, 85) = 4.28$, $p < .007$, multivariate $\eta^2 = .131$. Figure Nagle 2.6 presents the mean visit counts by AOI.

Figure Nagle 2.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in two of the three areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 87) = 11.82$, $p > .001$, partial $\eta^2 = .120$); known signature comparison stimulus, $F(1, 87) = 9.90$, $p = .002$, partial $\eta^2 = .102$). Visit count in the known signature stimulus was not statistically significant, $p = .377$, *ns*. Table Nagle 2.3 presents the means and standard deviations for areas of interest by participant type.

Table Nagle 2.3

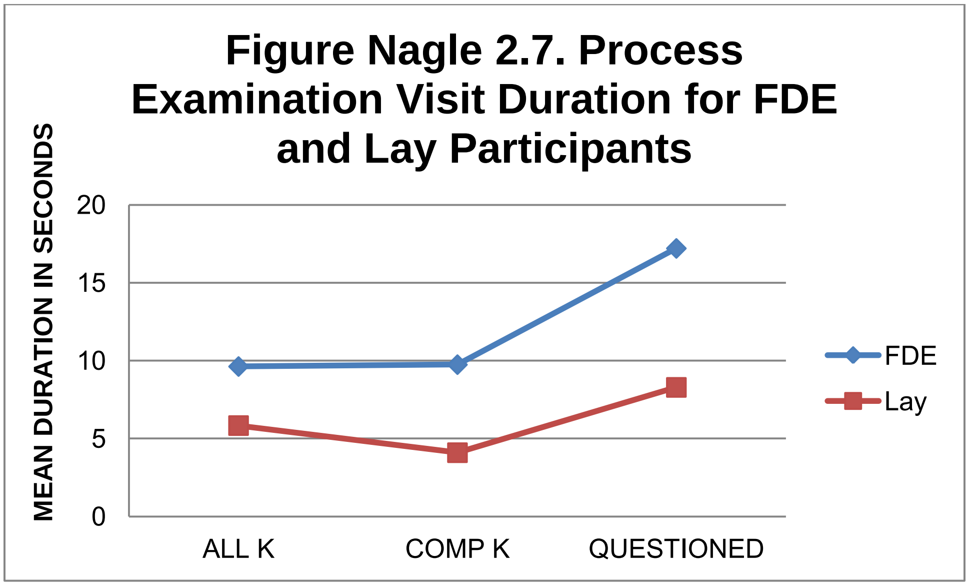
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.61	1.39	9.78	8.93	10.74	8.94
Lay	1.37	1.09	4.65	6.08	5.21	5.79

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .124, $F(3, 85) = 4.02$, $p = .010$, multivariate $\eta^2 = .124$. Figure Nagle 2.7 presents the mean visit durations by AOI.

Figure Nagle 2.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all of the three areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 87) = 10.44$, $p > .002$, partial $\eta^2 = .107$); known signature comparison stimulus, $F(1, 87) = 7.66$, $p = .007$, partial $\eta^2 = .081$). Visit duration in the known signature stimulus was also statistically significant, $F(1, 87) = 4.08$, $p = .046$, partial $\eta^2 = .045$. Table Nagle 1.4 presents the means and standard deviations for areas of interest by participant type.

Table Nagle 2.4
Process Analysis Visit Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	9.63	10.91	9.75	12.31	17.21	15.96
Lay	5.84	5.84	4.10	5.45	8.29	8.80

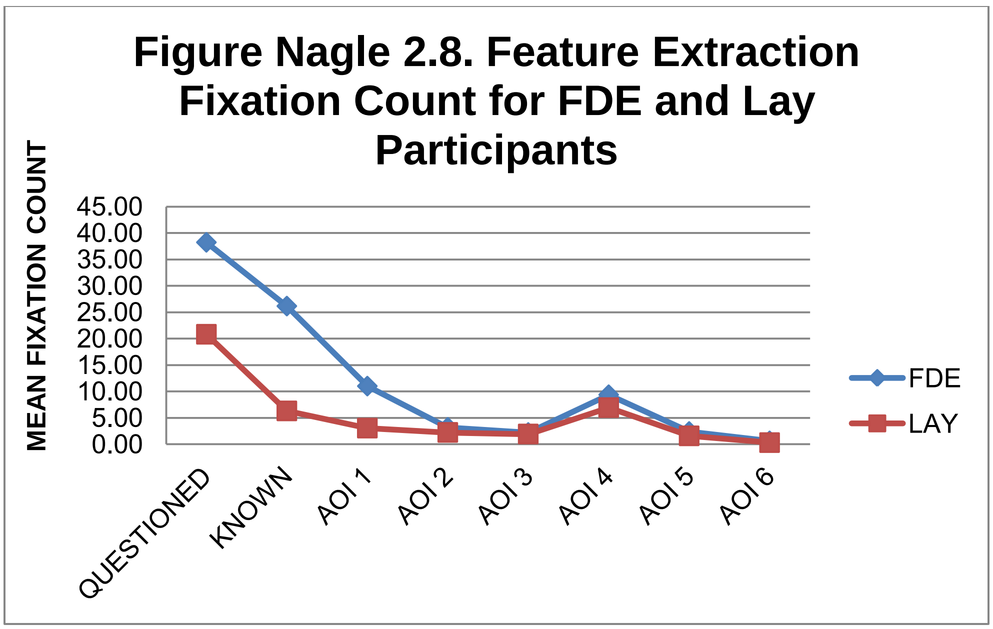
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .279, $F(8, 80) = 3.88$, $p < .001$, multivariate $\eta^2 = .279$. Figure Nagle 2.8 presents the mean fixation counts by AOI.

Figure Nagle 2.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 87) = 10.02$, $p = .002$, partial $\eta^2 = .103$, and $F(1, 87) = 7.40$, $p = .008$, partial $\eta^2 = .078$.

Fixations count in one AOI was significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 6.86$, $p = .010$, partial $\eta^2 = .073$), however no other fixation counts in AOIs were statistically significant (AOI 2, $p < .142$, *ns*; AOI 3, $p = .674$, *ns*; AOI 4, $p = .207$, *ns*; AOI 5, $p = .182$, *ns*; AOI 6, $p = .110$, *ns*). Table Nagle 2.5 presents the means and standard deviations for areas of interest by participant type.

Table Nagle 2.5

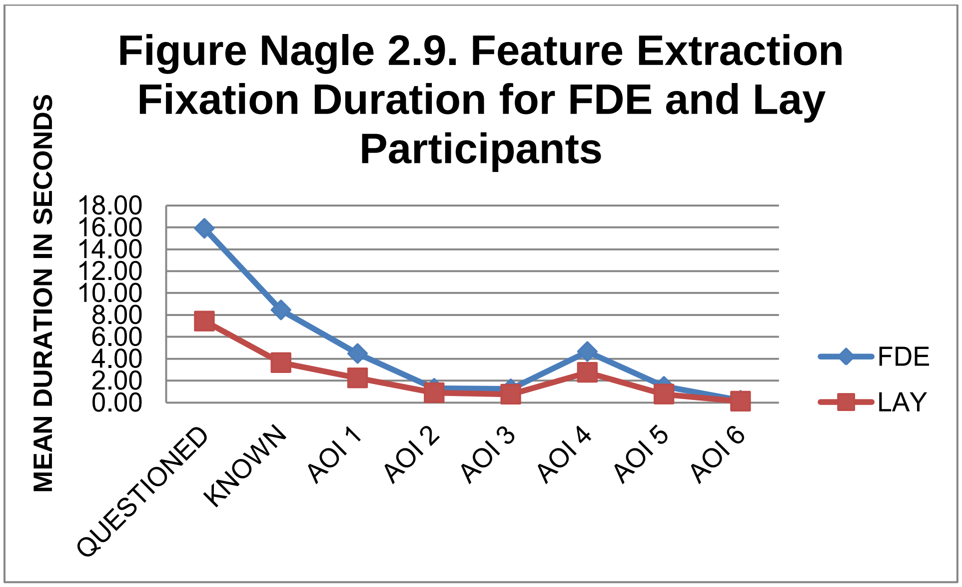
Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	38.22	28.92	26.15	29.58	11	7.62	3.2	2.49
Lay	20.81	22.26	12.14	16.86	6.3	9.27	2.23	3.58
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.22	2.87	9.37	9.55	2.41	3.46	0.63	1.16
Lay	1.93	3.52	6.93	8.48	1.58	2.17	0.3	0.67

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .237, $F(8, 80) = 3.11$, $p = .004$, multivariate $\eta^2 = .237$. Figure Nagle 2.9 presents the mean fixation durations by AOI.

Figure Nagle 2.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 87) = 10.60$, $p = .002$, partial $\eta^2 = .109$, and $F(1, 87) = 7.13$, $p < .009$, partial $\eta^2 = .076$.

Fixation durations in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 7.40$, $p = .008$, partial $\eta^2 = .078$; AOI 2, $F(1, 87) = 1.76$, $p = .189$, partial $\eta^2 = .020$; AOI 3, $F(1, 87) = 1.32$, $p = .253$, partial $\eta^2 = .015$; AOI 4, $F(1, 87) = 2.38$, $p = .127$, partial $\eta^2 = .027$; AOI 5,

$F(1, 87) = 1.82$, $p < .181$, partial $\eta^2 = .020$; AOI 6, $F(1, 87) = 1.21$, $p = .275$, partial $\eta^2 = .014$). Table Nagle 2.6 presents the means and standard deviations for areas of interest by participant type.

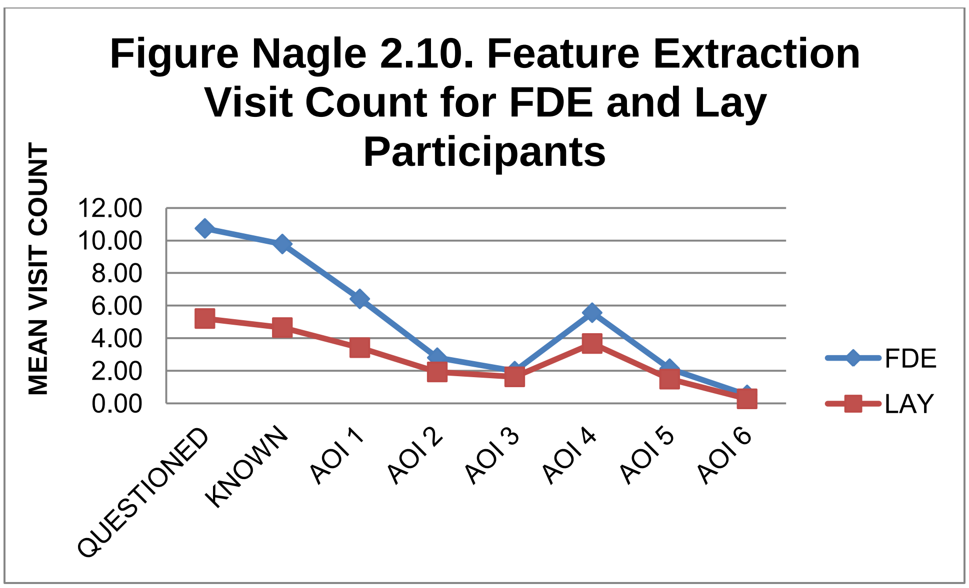
Table Nagle 2.6
Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	15.9	15.07	8.44	10.99	4.47	4.05	1.29	1.19
Lay	7.43	8.26	3.63	4.48	2.24	3.64	0.89	1.67
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.24	2.46	4.65	7.35	1.47	3.27	0.19	0.36
Lay	0.75	1.36	2.75	3.47	0.76	1.1	0.11	0.29

<u>*Total Visit Count*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .284, $F(8, 80) = 3.96$, $p < .001$, multivariate $\eta^2 = .284$. Figure Nagle 2.10 presents the mean visit counts by AOI.

Figure Nagle 2.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 87) = 11.82$, $p < .001$, partial $\eta^2 = .120$, and $F(1, 87) = 9.90$, $p = .002$, partial $\eta^2 = .102$.

Visit counts in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 11.94$, $p < .001$, partial $\eta^2 = .121$; AOI 2, $F(1, 87) = 2.84$, $p = .095$, partial $\eta^2 = .032$; AOI 3, $F(1, 87) = 0.456$, $p < .502$, partial $\eta^2 = .005$; AOI 4, $F(1, 87) = 3.56$, $p = .062$, partial $\eta^2 = .039$; AOI 5, $F(1, 87) = 1.61$, $p = .207$, partial $\eta^2 = .018$; AOI 6, $F(1, 87) = 2.58$, $p = .112$, partial $\eta^2 = .029$). Table Nagle 2.7 presents the means and standard deviations for areas of interest by participant type.

Table Nagle 2.7

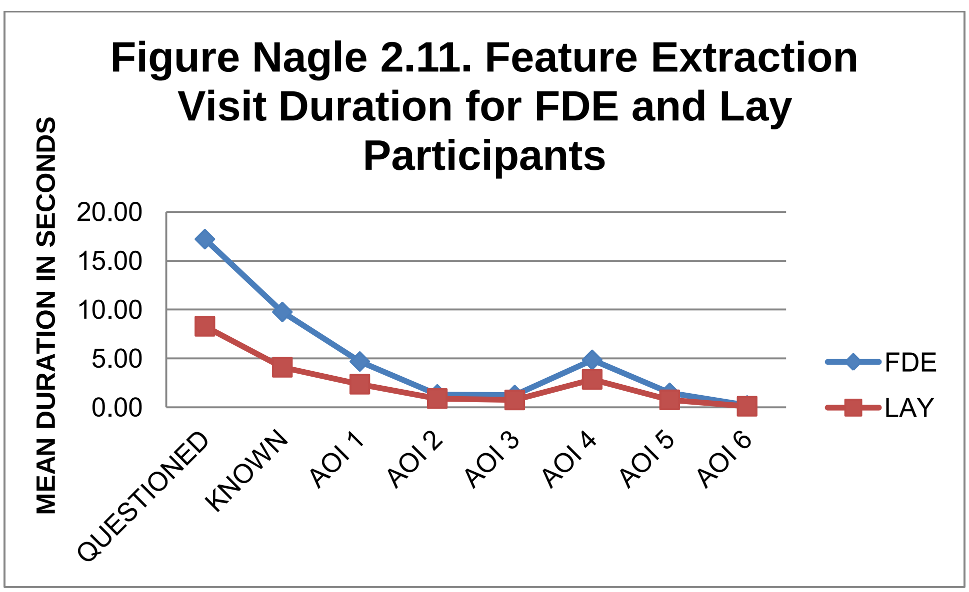
Feature Extraction Analysis Visit Count for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	10.74	8.94	9.78	8.93	6.41	4.39	2.8	2.09
Lay	5.21	5.79	4.65	6.08	3.42	3.73	1.93	2.77
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.98	2.29	5.57	5.12	2.13	2.7	0.52	0.81
Lay	1.63	2.61	3.67	4.25	1.49	1.99	0.28	0.59

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .237, $F(8, 80) = 3.11$, $p = .004$, multivariate $\eta^2 = .237$. Figure Nagle 2.11 presents the mean visit counts by AOI.

Figure Nagle 2.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 87) = 10.44$, $p = .002$, partial $\eta^2 = .107$, and $F(1, 87) = 7.66$, $p = .007$, partial $\eta^2 = .081$.

Visit durations in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 7.64$, $p < .007$, partial $\eta^2 = .081$; AOI 2, $F(1, 87) = 1.80$, $p = .183$, partial $\eta^2 = .020$; AOI 3, $F(1, 87) = 1.35$, $p = .249$, partial $\eta^2 = .015$; AOI 4, $F(1, 87) = 2.53$, $p = .116$, partial $\eta^2 = .028$; AOI 5, $F(1, 87) = 1.84$, $p = .178$, partial $\eta^2 = .021$; AOI 6, $F(1, 87) = 1.14$, $p = .290$, partial $\eta^2 = .013$). Table Nagle 2.8 presents the means and standard deviations for areas of interest by participant type.

Table Nagle 2.8

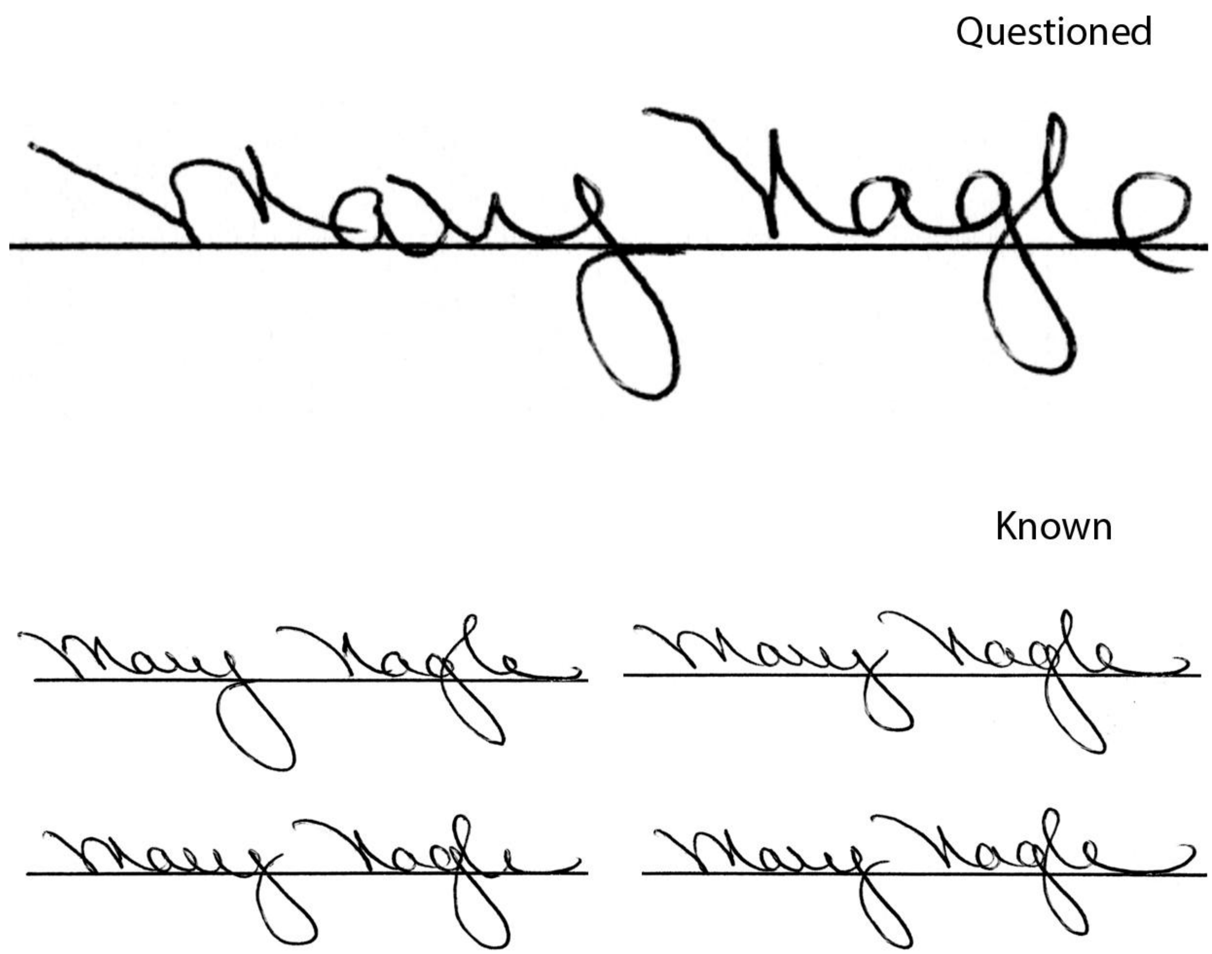
Feature Extraction Analysis Visit Duration for FDE and Lay Participants

	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	17.21	15.96	9.75	12.31	4.69	4.08	1.32	1.21
Lay	8.29	8.8	4.1	5.45	2.37	3.82	0.9	1.74
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.25	2.48	4.86	7.46	1.48	3.27	0.19	0.36
Lay	0.75	1.38	2.86	3.57	0.77	1.11	0.11	0.29

Nagle Signature 3: Traced (Non-Genuine)

Of the 49 FDE participants, 48 responded correctly that the signature was non-genuine, while 1 responded that the signature was genuine. Of the 43 Lay participants, 37 responded correctly that the signature was non-genuine, and 6 responded that the signature was genuine. This difference was statistically significant, χ^2 (1, N = 92) = 4.62, p = .032. Figure Nagle 3.1 presents the comparison view of this signature.

Figure Nagle 3.1. Questioned-Known Comparison Stimulus for Nagle Signature 3.

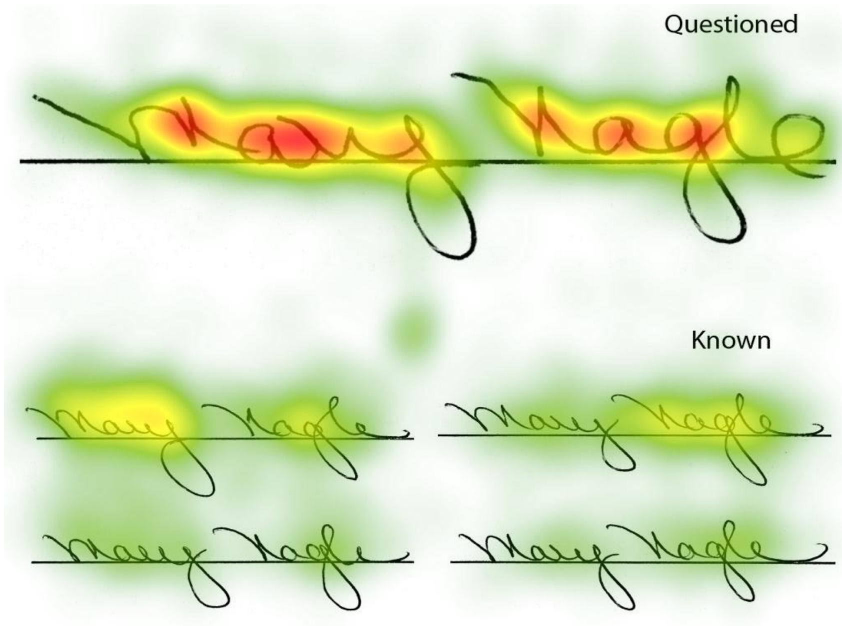


Selection of Areas of Interest (AOIs)

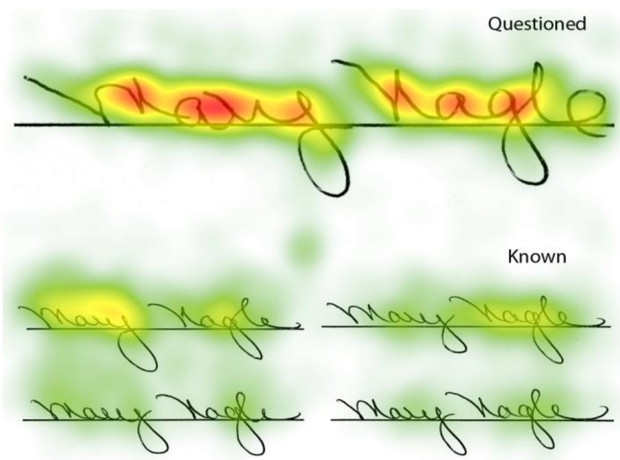
Figure Nagle 3.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were nine locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of nine AOIs for this stimulus. Figure Nagle 3.3 presents the location of the AOIs identified in the heat map.

Figure Nagle 3.2. Heat map for Nagle signature 3, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

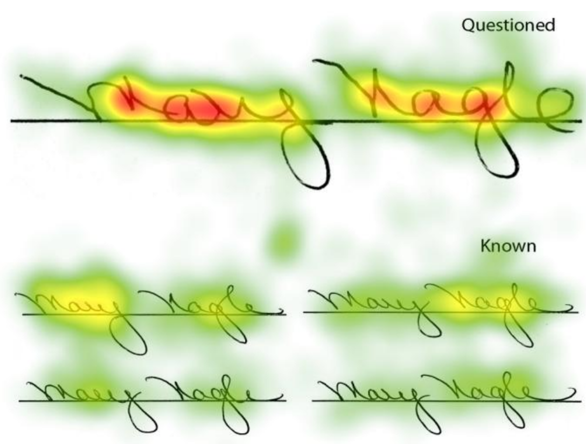
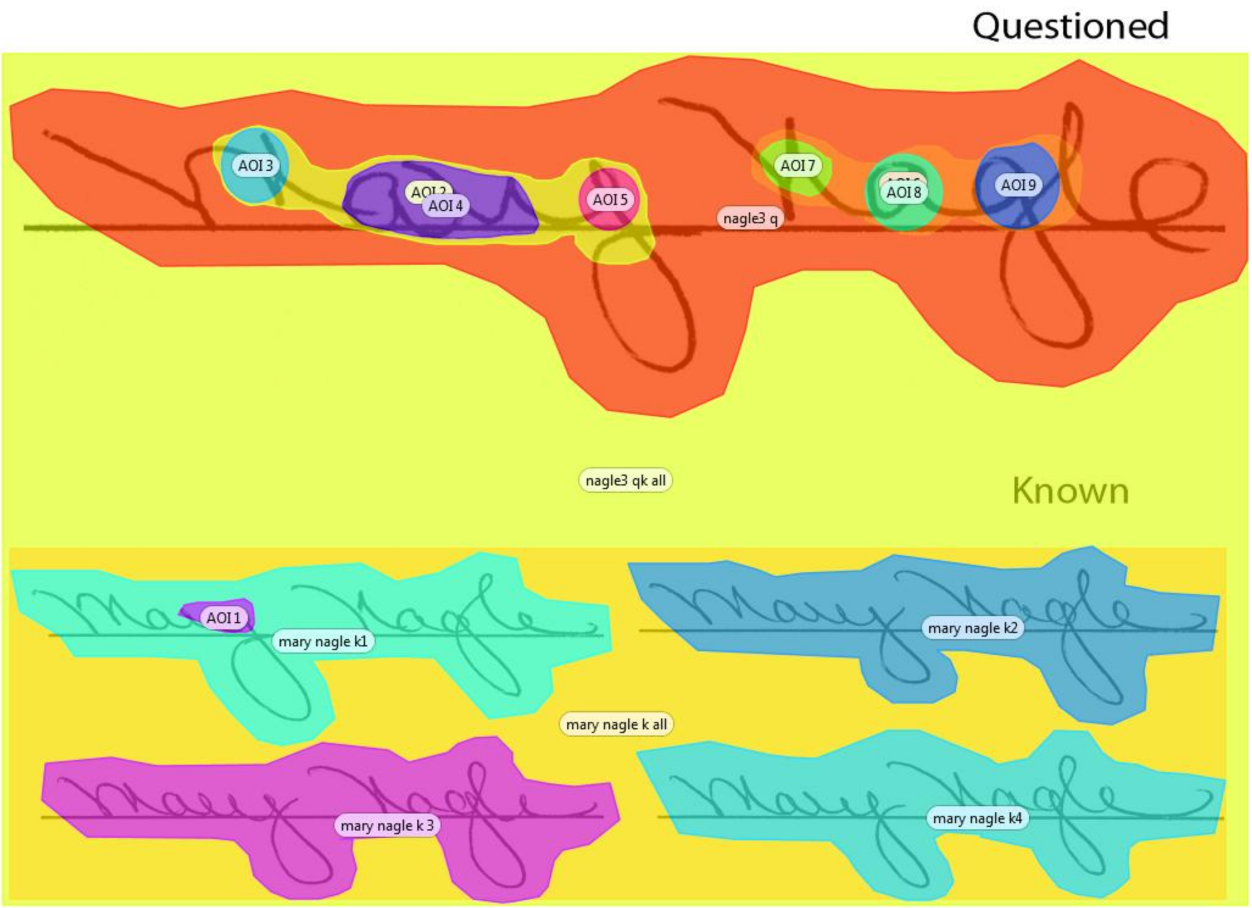


Figure Nagle 3.3. Areas of Interest (AOIs) for Nagle Signature 3.



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

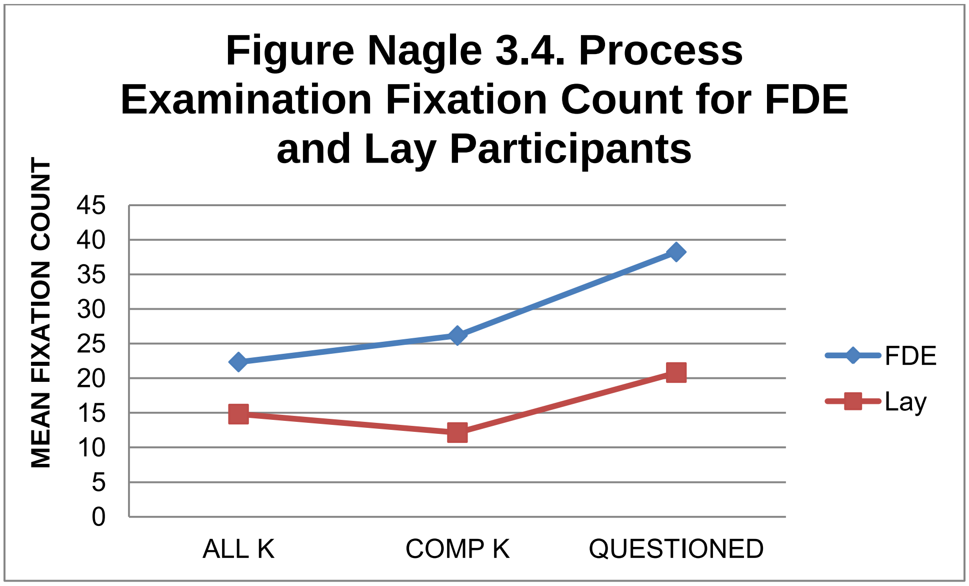
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Nagle known signature stimulus (Knowns, not pictured here), Nagle 1 K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Nagle 3Q (the Nagle questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 9) are included in subsequent analyses. Figure Nagle 3.3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .232, $F(3, 86) = 8.65$, $p < .001$, multivariate $\eta^2 = .232$. Figure Nagle 3.4 presents the mean fixation counts by AOI.

Figure Nagle 3.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 88) = 16.97$, $p < .001$, partial $\eta^2 = .162$); known signature comparison stimulus, $F(1, 88) = 7.22$, $p = .009$, partial $\eta^2 = .076$). Fixation count in the known signature stimulus was not statistically significant, $p = .800$, *ns*. Table Nagle 3.1 presents the means and standard deviations for areas of interest by participant type.

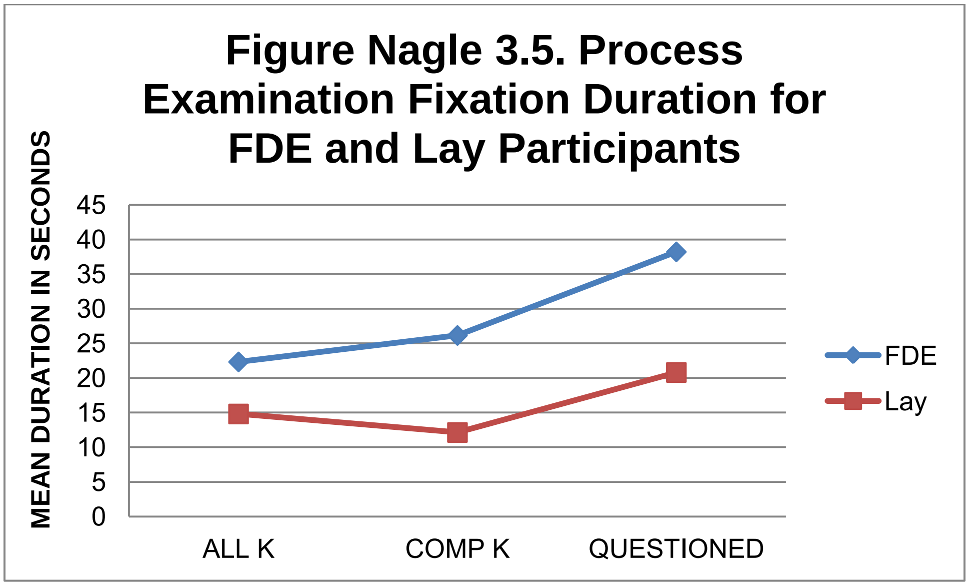
Table Nagle 3.1
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		Comp Knows		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	20.91	21.21	42.17	37.28	64.13	43.40
Lay	22.00	19.19	22.37	32.11	28.98	36.90

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .199, $F(3, 86) = 7.10$, $p < .001$, multivariate $\eta^2 = .199$. Figure Nagle 3.5 presents the mean fixation duration by AOI.

Figure Nagle 3.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 88) = 18.95$, $p < .001$, partial $\eta^2 = .177$); known signature comparison stimulus, $F(1, 88) = 8.80$, $p = .004$, partial $\eta^2 = .091$). Fixation duration in the known signature stimulus was not statistically significant, $p = .940$, *ns*. Table Nagle 3.2 presents the means and standard deviations for areas of interest by participant type.

Table Nagle 3.2

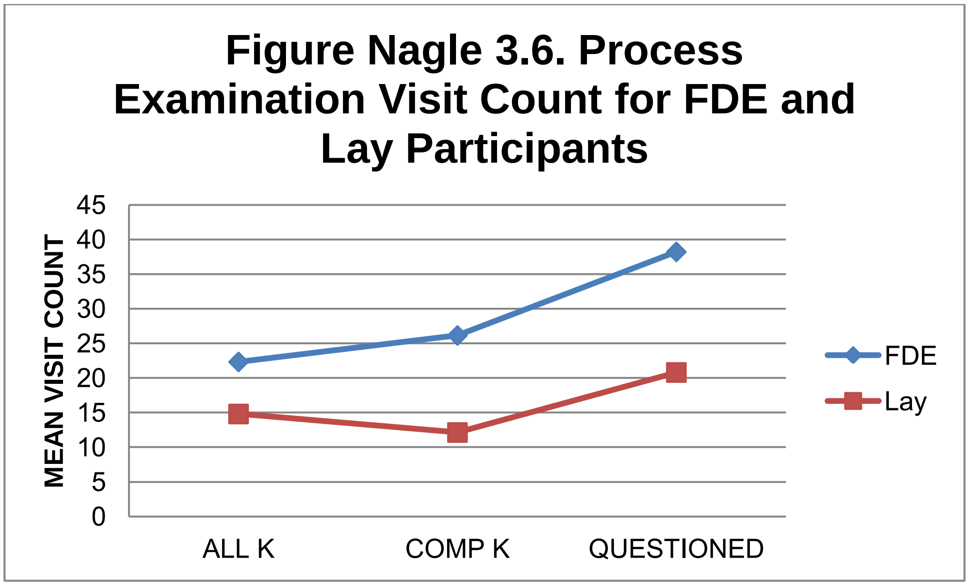
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	7.90	11.27	14.72	14.91	26.04	19.59
Lay	7.74	7.11	6.77	9.70	10.52	13.34

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .100, $F(3, 86) = 3.18$, $p = .028$, multivariate $\eta^2 = .100$. Figure Nagle 3.6 presents the mean visit counts by AOI.

Figure Nagle 3.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in two of the three areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 88) = 9.01$, $p = .003$, partial $\eta^2 = .093$); known signature comparison stimulus, $F(1, 88) = 9.41$, $p = .003$, partial $\eta^2 = .097$). Visit count in the known signature stimulus was not statistically significant, $p = .481$, *ns*. Table Nagle 3.3 presents the means and standard deviations for areas of interest by participant type.

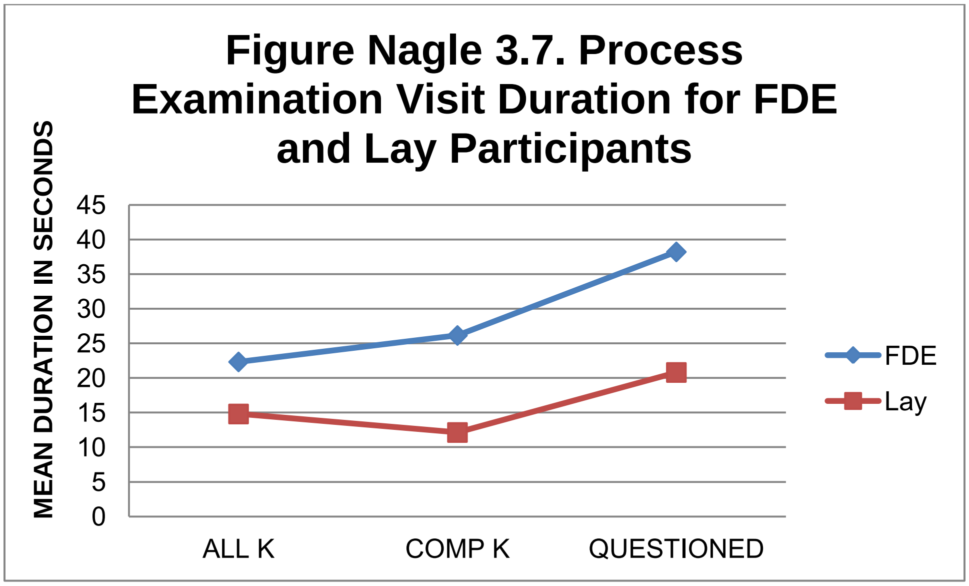
Table Nagle 3.3
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.55	1.32	16.30	13.55	17.36	13.90
Lay	1.37	1.09	8.05	11.81	8.98	12.47

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .261, $F(3, 86) = 10.11$, $p < .001$, multivariate $\eta^2 = .261$. Figure Nagle 3.7 presents the mean visit durations by AOI.

Figure Nagle 3.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all of the three areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 88) = 21.79$, $p < .001$, partial $\eta^2 = .198$); known signature comparison stimulus, $F(1, 88) = 8.39$, $p = .005$, partial $\eta^2 = .087$). Visit duration in the known signature stimulus was not statistically significant, $p = .725$, *ns*. Table Nagle 3.4 presents the means and standard deviations for areas of interest by participant type.

Table Nagle 3.4
Process Analysis Visit Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	9.67	12.40	16.09	15.76	28.92	20.39
Lay	10.51	9.59	7.77	10.77	11.42	14.37

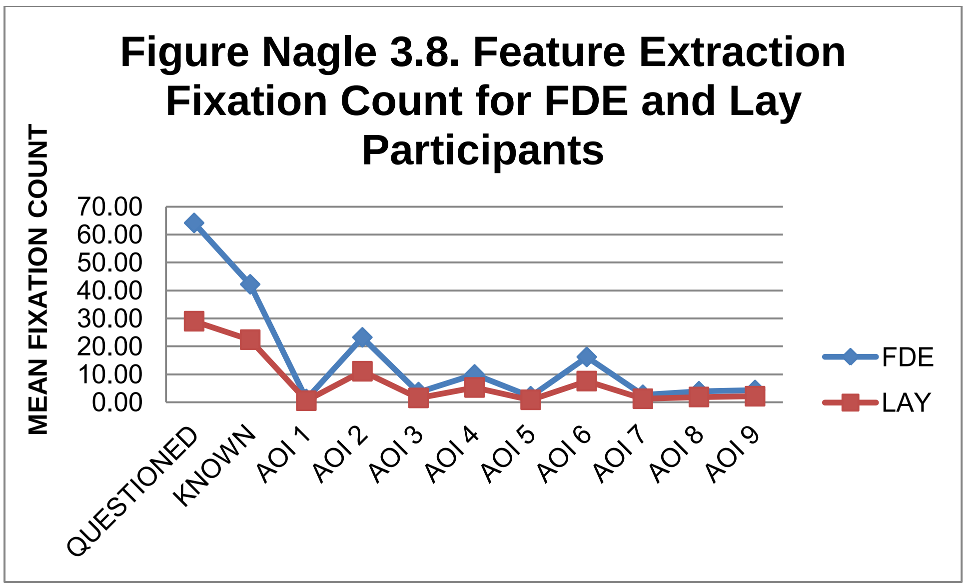
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

<u>Total Fixation Count</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .292, $F(11, 78) = 2.92$, $p = .003$, multivariate $\eta^2 = .292$. Figure Nagle 3.8 presents the mean fixation counts by AOI.

Figure Nagle 3.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 88) = 16.97$, $p < .001$, partial $\eta^2 = .162$, and $F(1, 88) = 7.22$, $p = .009$, partial $\eta^2 = .076$.

Fixations count in all but one AOI were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 3.44$, $p = .067$, partial $\eta^2 = .038$; AOI 2, $F(1, 88) = 12.02$, $p < .001$, partial $\eta^2 = .120$; AOI 3, $F(1, 88) = 9.04$, $p = .003$, partial $\eta^2 = .093$; AOI 4, $F(1, 88) = 8.06$, $p = .006$, partial $\eta^2 = .084$; AOI 5, $F(1, 88) = 7.51$, $p = .007$, partial $\eta^2 = .079$; AOI 6, $F(1, 88) = 12.31$, $p < .001$, partial $\eta^2 = .123$; AOI 7, $F(1, 88) = 8.35$, $p = .005$, partial $\eta^2 = .087$; AOI 8, $F(1, 88) = 11.05$, $p < .001$, partial $\eta^2 = .112$; AOI 9, $F(1, 88) = 7.06$, $p = .009$, partial $\eta^2 = .074$). Table Nagle 3.5 presents the means and standard deviations for areas of interest by participant type.

Table Nagle 3.5

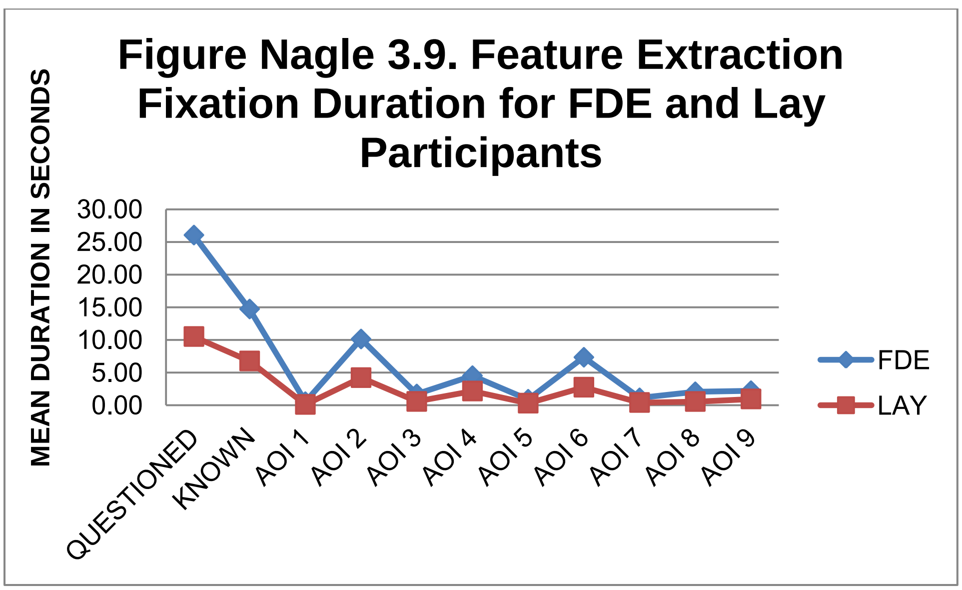
Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	64.13	43.4	42.17	37.28	1.15	1.65	23.19	17.04
Lay	28.98	36.9	22.37	32.11	0.53	1.47	11.07	16.05
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	3.62	3.6	9.94	7.93	2.13	2.35	16.19	12.37
Lay	1.53	2.89	5.26	7.68	0.86	2.01	7.56	10.82
	AOI 7		**AOI 8**		**AOI 9**			
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***		
FDE	2.66	2.86	3.91	3.24	4.36	4.13		
Lay	1.23	1.59	1.86	2.54	2.14	3.77		

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .253, $F(11, 78) = 2.41$, $p = .012$, multivariate $\eta^2 = .253$. Figure Nagle 3.9 presents the mean fixation durations by AOI.

Figure Nagle 3.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus were significantly greater for

FDEs than for Lay participants, $F(1, 88) = 18.95$, $p < .001$, partial $\eta^2 = .177$, and $F(1, 88) = 8.80$, $p = .004$, partial $\eta^2 = .091$.

Fixation durations in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 8.15$, $p = .005$, partial $\eta^2 = .085$; AOI 2, $F(1, 88) = 15.25$, $p < .001$, partial $\eta^2 = .148$; AOI 3, $F(1, 88) = 11.96$, $p < .001$, partial $\eta^2 = .120$; AOI 4, $F(1, 88) = 10.02$, $p = .002$, partial $\eta^2 = .102$; AOI 5, $F(1, 88) = 8.42$, $p = .005$, partial $\eta^2 = .087$; AOI 6, $F(1, 88) = 16.51$, $p < .001$, partial $\eta^2 = .158$; AOI 7, $F(1, 88) = 11.14$, $p < .001$, partial $\eta^2 = .112$; AOI 8, $F(1, 88) = 16.47$, $p < .001$, partial $\eta^2 = .158$; AOI 9, $F(1, 88) = 7.87$, $p = .006$, partial $\eta^2 = .082$). Table Nagle 3.6 presents the means and standard deviations for areas of interest by participant type.

Table Nagle 3.6

Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	26.04	19.59	14.72	14.91	0.54	0.92	10.13	8.21
Lay	10.52	13.34	6.77	9.7	0.12	0.31	4.22	5.83

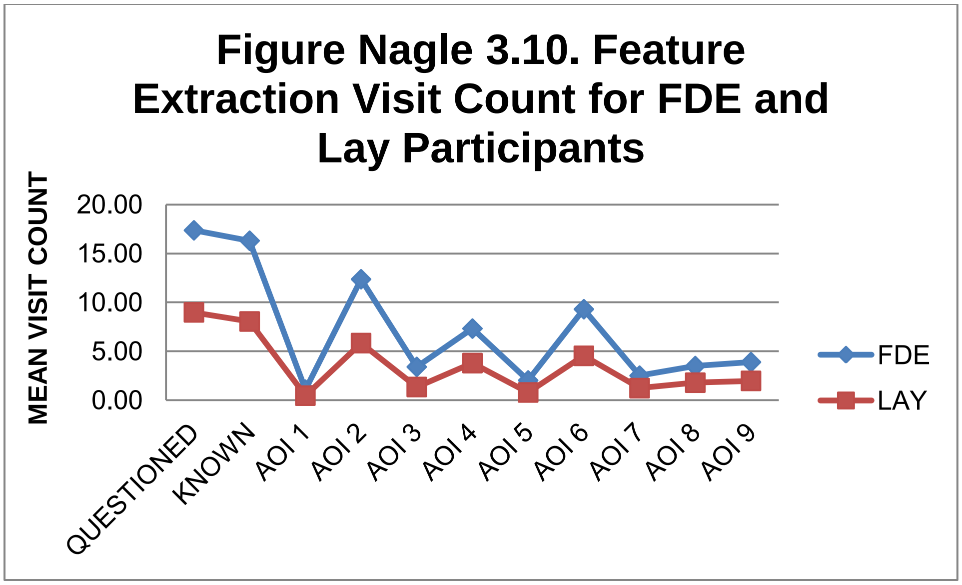
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.72	1.96	4.53	3.8	0.92	1.12	7.34	6.17
Lay	0.58	0.95	2.18	3.18	0.32	0.8	2.76	4.25

	AOI 7		**AOI 8**		**AOI 9**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.13	1.25	2.06	2.25	2.22	2.12
Lay	0.42	0.64	0.57	0.88	0.96	2.13

Total Visit Count

MANOVA results revealed that differences between FDEs and Lay participants on the dependant variables were insignificant, Pillai's Trace = .172, $F(11, 78) = 1.47$, $p = .160$, multivariate $\eta^2 = .172$. Figure Nagle 3.10 presents the mean visit counts by AOI.

Figure Nagle 3.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 88) = 9.01$, $p = .003$, partial $\eta^2 = .093$, and $F(1, 88) = 9.41$, $p = .003$, partial $\eta^2 = .097$.

Visit counts in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 4.57$, $p = .035$, partial $\eta^2 = .049$; AOI 2, $F(1, 88) = 13.53$, $p < .001$, partial $\eta^2 = .133$; AOI 3, $F(1, 88) = 11.36$, $p < .001$, partial $\eta^2 = .114$; AOI 4, $F(1, 88) = 9.88$, $p = .002$, partial $\eta^2 = .101$; AOI 5, $F(1, 88) = 8.13$, $p = .005$, partial $\eta^2 = .085$; AOI 6, $F(1, 88) = 11.57$, $p < .001$, partial $\eta^2 = .113$; AOI 7, $F(1, 88) = 7.59$, $p = .007$, partial $\eta^2 = .079$; AOI 8, $F(1, 88) = 9.37$, $p = .003$, partial $\eta^2 = .096$; AOI 9, $F(1, 88) = 7.00$, $p = .010$, partial $\eta^2 = .074$). Table Nagle 3.7 presents the means and standard deviations for areas of interest by participant type.

Table Nagle 3.7

Feature Extraction Analysis Visit Count for FDE and Lay Participants

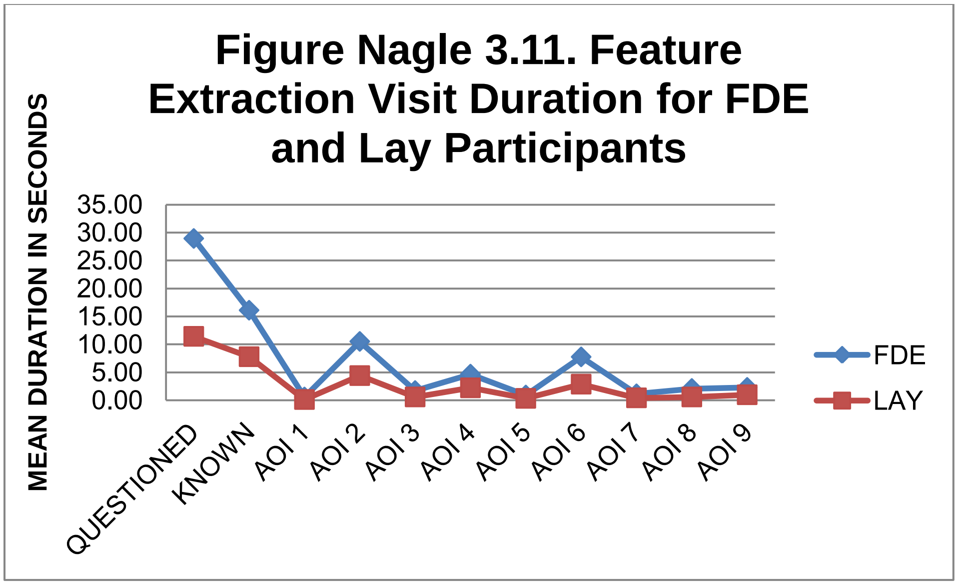
	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	17.36	13.9	16.3	13.55	1.09	1.54	12.36	9.27
Lay	8.98	12.47	8.05	11.81	0.47	1.16	5.84	7.35
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	3.4	3.45	7.32	5.43	2.02	2.22	9.3	7.18
Lay	1.35	2.11	3.79	5.19	0.79	1.83	4.53	6.26
	AOI 7		**AOI 8**		**AOI 9**			
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***		
FDE	2.51	2.64	3.49	2.9	3.89	3.56		

Lay	1.23	1.59	1.79	2.3	1.98	3.29

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .291, $F(11, 78) = 2.91$, $p = .003$, multivariate $\eta^2 = .291$. Figure Nagle 3.11 presents the mean visit durations by AOI.

Figure Nagle 3.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 88) = 21.79$, $p < .001$, partial $\eta^2 = .198$, and $F(1, 88) = 8.39$, $p = .005$, partial $\eta^2 = .087$.

Visit durations in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 8.73$, $p = .004$, partial $\eta^2 = .090$; AOI 2, $F(1, 88) = 15.13$, $p < .001$, partial $\eta^2 = .147$; AOI 3, $F(1, 88) = 11.90$, $p < .001$, partial $\eta^2 = .119$; AOI 4, $F(1, 88) = 10.17$, p .002, partial $\eta^2 = .104$; AOI 5, $F(1, 88) = 8.13$, $p = .005$, partial $\eta^2 = .085$; AOI 6, $F(1, 88) = 17.38$, $p < .001$, partial $\eta^2 = .165$; AOI 7, $F(1, 88) = 11.16$, $p < .001$, partial $\eta^2 = .113$; AOI 8, $F(1, 88) = 16.61$, $p < .001$, partial $\eta^2 = .159$; AOI 9, $F(1, 88) = 7.95$, $p = .006$, partial $\eta^2 = .083$). Table Nagle 3.8 presents the means and standard deviations for areas of interest by participant type.

Table Nagle 3.8

Feature Extraction Analysis Visit Duration for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	28.92	20.39	16.09	15.76	0.58	0.96	10.51	8.46
Lay	11.42	14.37	7.77	10.77	0.12	0.31	4.4	6.15

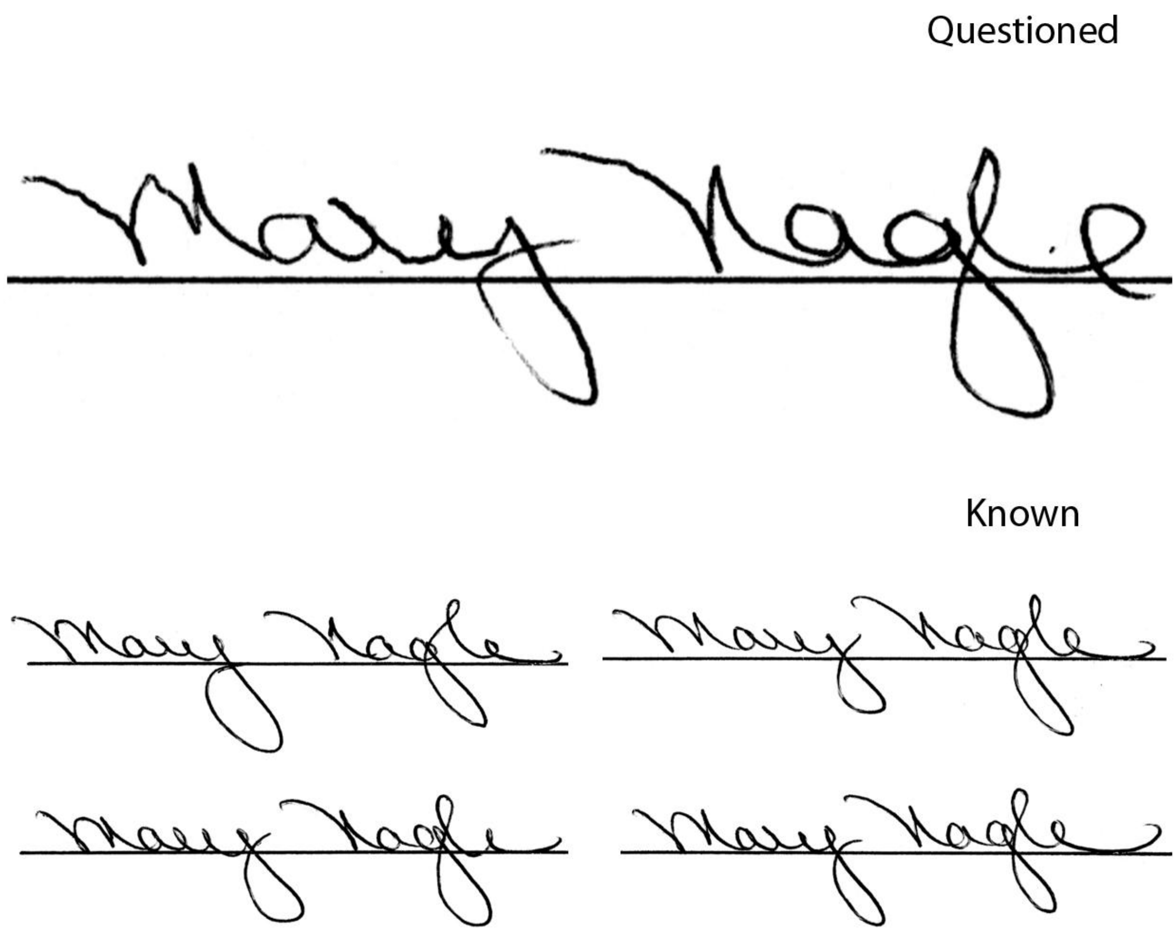
	AOI 3		AOI 4		AOI 5		AOI 6	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.73	1.97	4.66	3.93	0.93	1.13	7.75	6.38
Lay	0.58	0.97	2.21	3.28	0.33	0.84	2.87	4.46

	AOI 7		AOI 8		AOI 9	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.14	1.27	2.1	2.28	2.29	2.25
Lay	0.42	0.64	0.58	0.93	0.98	2.17

Nagle Signature 4: Traced (Non-Genuine)

Of the 49 FDE participants, 47 responded correctly that the signature was non-genuine, and 2 responded that it was genuine. Of the 43 Lay participants, 32 responded correctly that the signature was non-genuine, and 11 responded that the signature was genuine. This difference was statistically significant, χ^2 (1, N = 92) = 8.73, p = .003. Figure Nagle 4.1 presents the comparison view of this signature.

Figure Nagle 4.1. Questioned-Known Comparison Stimulus for Nagle Signature 4.

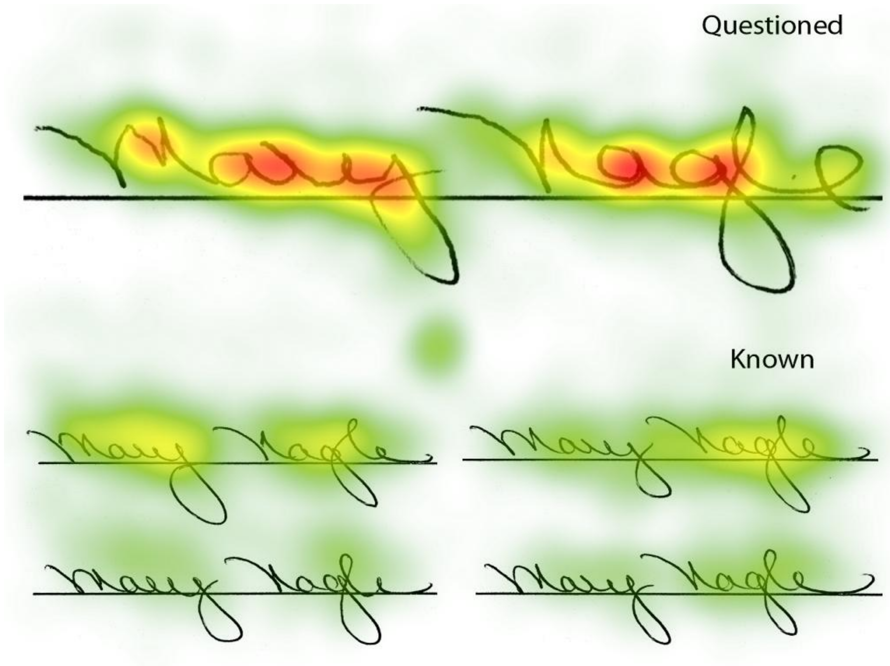


Selection of Areas of Interest (AOIs)

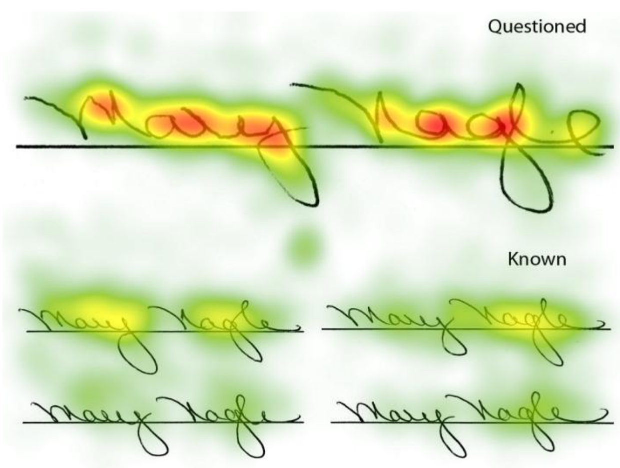
Figure Nagle 4.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were seven locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of seven AOIs for this stimulus. Figure Nagle 4.3 presents the location of the AOIs identified in the heat map.

Figure Nagle 4.2. Heat map for Nagle signature 4, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

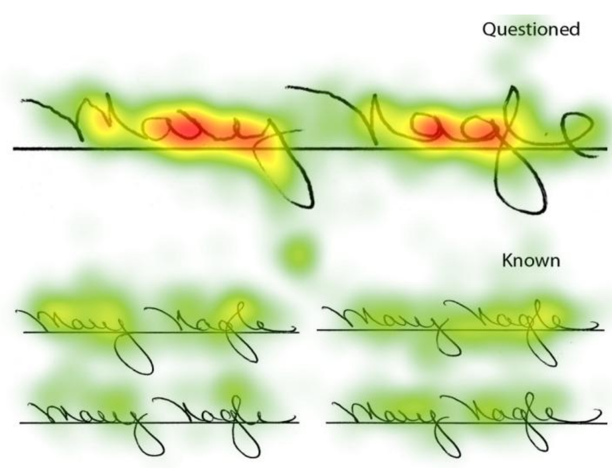
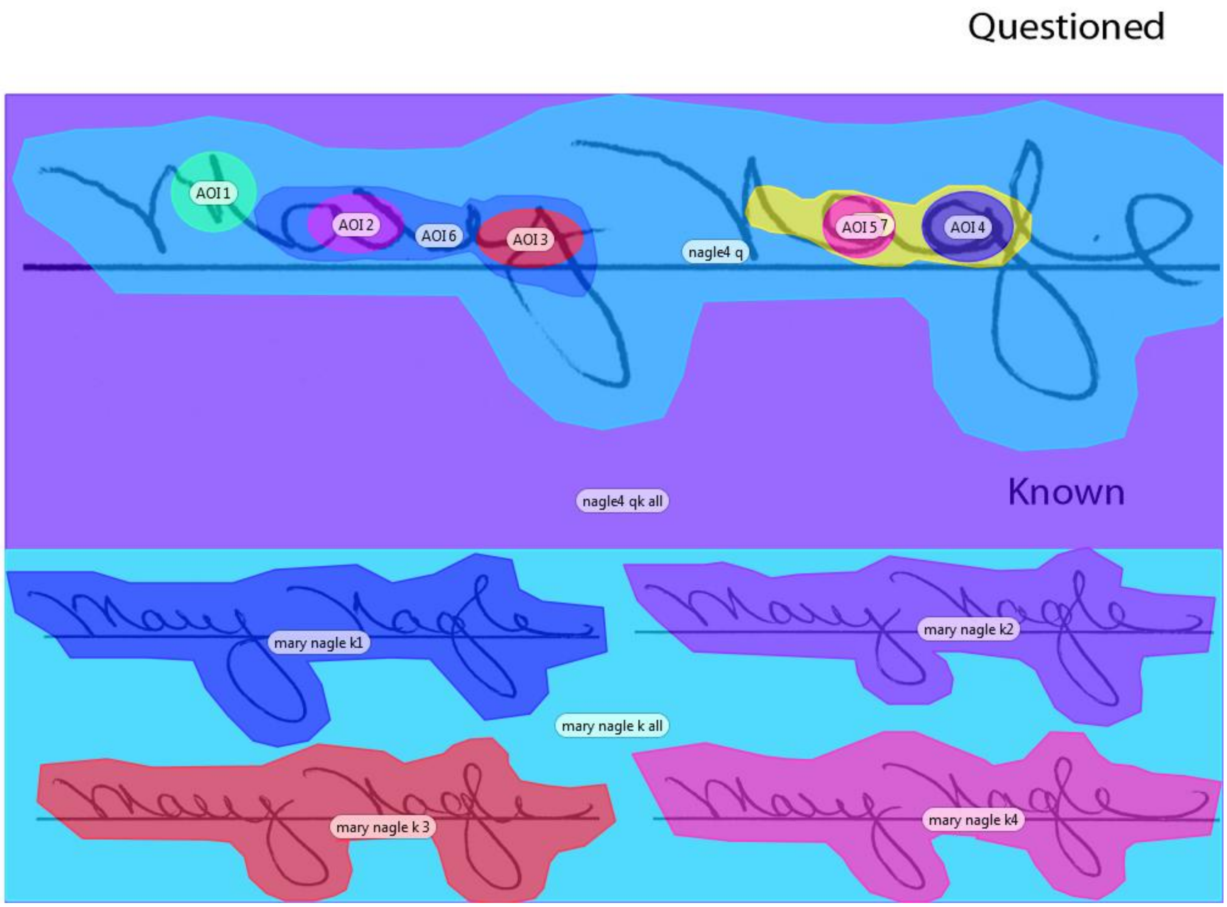


Figure Nagle 4.3. Areas of Interest (AOIs) for Nagle Signature 4.



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

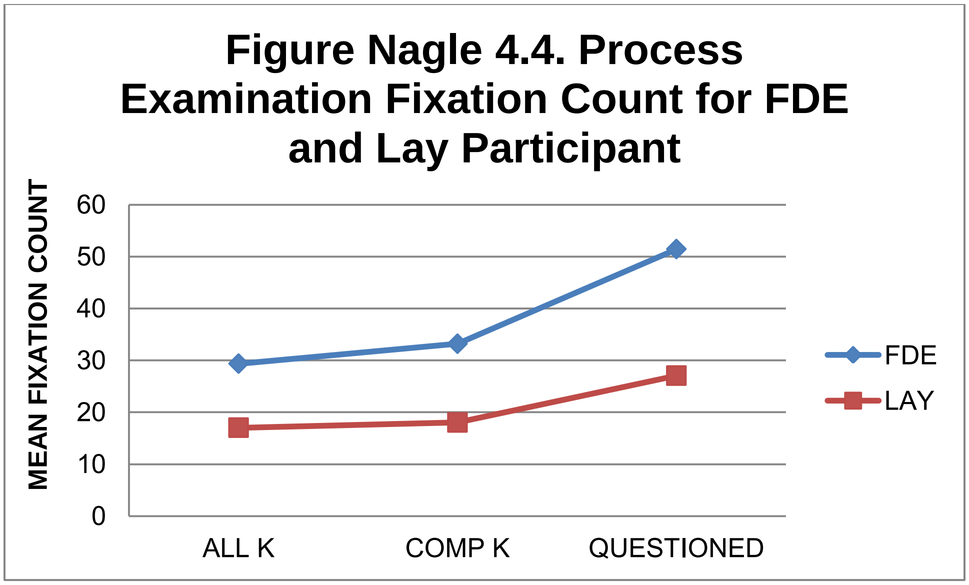
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Nagle known signature stimulus (Knowns, not pictured here), Nagle 1 K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Nagle 4Q (the Nagle questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 7) are included in subsequent analyses. Figure Nagle 4.3 demonstrates all AOIs identified for this signature.

<u>*Total Fixation Count*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .162, $F(3, 86) = 5.53$, $p = .002$, multivariate $\eta^2 = .162$. Figure Nagle 4.4 presents the mean fixation counts by AOI.

Figure Nagle 4.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 88) = 13.79$, $p < .001$, partial $\eta^2 = .136$); known signature comparison stimulus (COMP K), $F(1, 88) = 7.85$, $p = .006$, partial $\eta^2 = .082$). Fixation count in the known signature stimulus (ALL K) was also statistically significant, $F(1, 88) = 5.30$, $p = .024$, partial $\eta^2 = .057$. Table Nagle 4.1 presents the means and standard deviations for areas of interest by participant type.

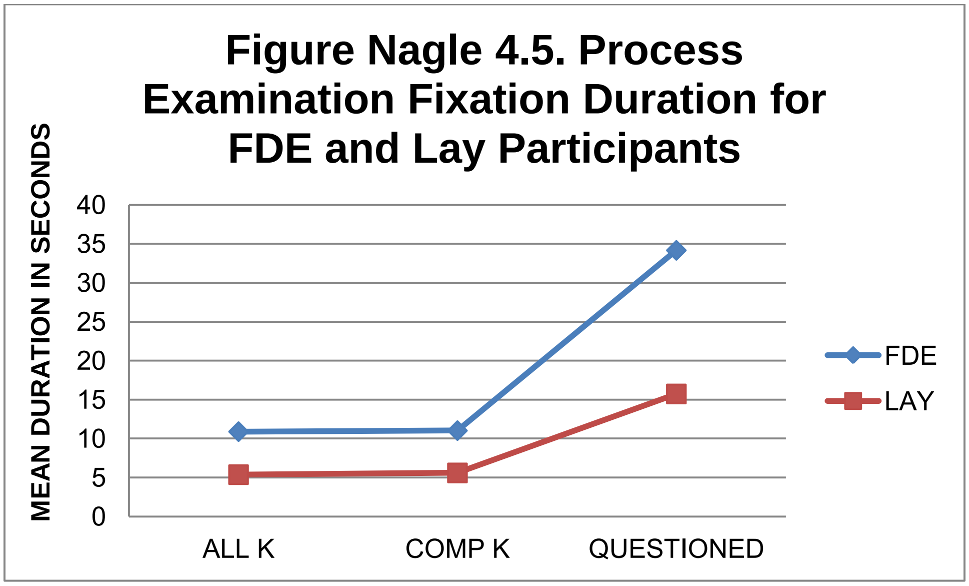
Table Nagle 4.1
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	29.36	32.19	33.19	27.13	51.43	29.29
Lay	17.02	14.70	18.02	23.92	27.05	32.97

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .230, $F(3, 86) = 8.55$, $p < .001$, multivariate $\eta^2 = .230$. Figure Nagle 4.5 presents the mean fixation duration by AOI.

Figure Nagle 4.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 88) = 16.27$, $p < .001$, partial $\eta^2 = .156$); known signature comparison stimulus (COMP K), $F(1, 88) = 9.13$, $p = .003$, partial $\eta^2 = .094$). Fixation duration in the known signature stimulus was also statistically significant (ALL K), $F(1, 88) = 6.44$, $p = .013$, partial $\eta^2 = .068$. Table Nagle 4.2 presents the means and standard deviations for areas of interest by participant type.

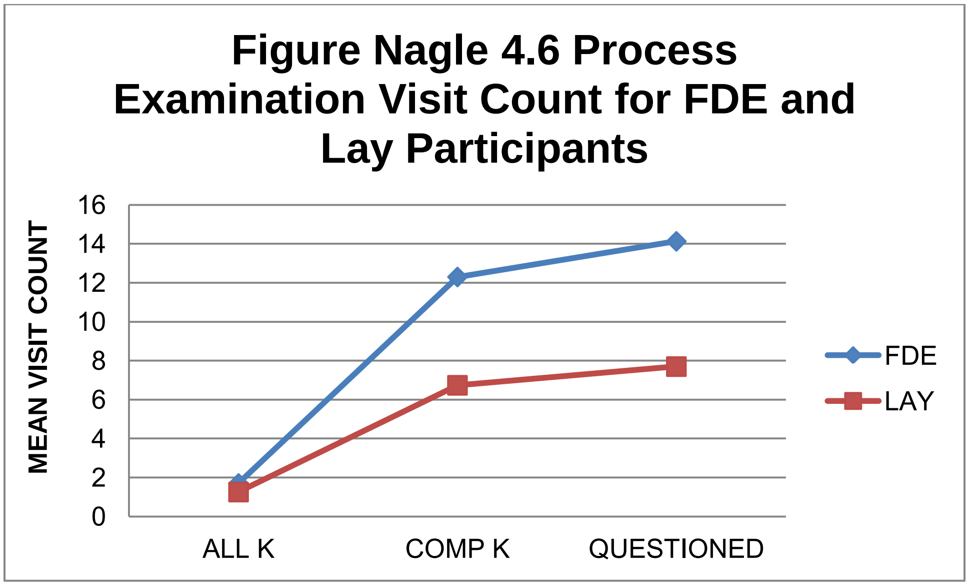
Table Nagle 4.2
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	10.90	13.57	11.03	9.01	34.17	23.08
Lay	5.38	4.54	5.60	7.95	15.74	19.98

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .142, $F(3, 86) = 4.73$, $p = .004$, multivariate $\eta^2 = .142$. Figure Nagle 4.6 presents the mean visit counts by AOI.

Figure Nagle 4.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in two of the three areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 88) = 11.14$, $p < .001$, partial $\eta^2 = .112$); known signature comparison stimulus (COMP K), $F(1, 88) = 9.32$, $p = .003$, partial $\eta^2 = .096$). Visit count in the known signature stimulus was not statistically significant (ALL K), $p = .099$, *ns*. Table Nagle 4.3 presents the means and standard deviations for areas of interest by participant type.

Table Nagle 4.3

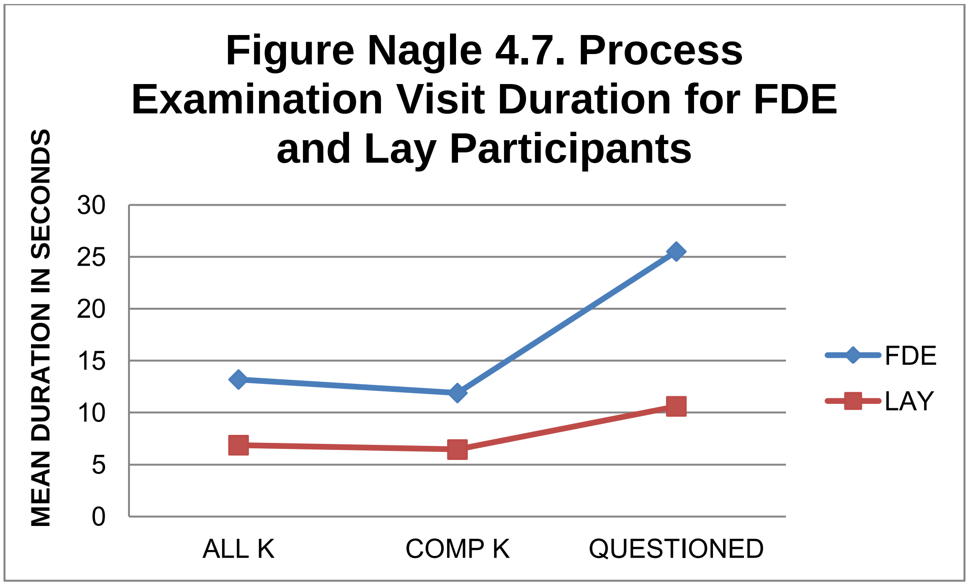
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.70	1.57	12.30	7.47	14.13	7.46
Lay	1.26	0.82	6.74	9.73	7.70	10.66

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .217, $F(3, 86) = 7.96$, $p < .001$, multivariate $\eta^2 = .217$. Figure Nagle 4.7 presents the mean visit durations by AOI.

Figure Nagle 4.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all of the three areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 88) = 21.71$, $p < .001$, partial $\eta^2 = .198$); known signature comparison stimulus (COMP K), $F(1, 88) = 7.63$, $p = .007$, partial $\eta^2 = .080$). Visit duration in the known signature stimulus was also statistically significant (ALL K), $F(1, 88) = 5.52$, $p = .021$, partial $\eta^2 = .059$. Table Nagle 4.4 presents the means and standard deviations for areas of interest by participant type.

Table Nagle 4.4

Process Analysis Visit Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	13.19	16.69	11.89	9.70	25.51	16.76
Lay	6.87	5.90	6.45	8.91	10.61	13.19

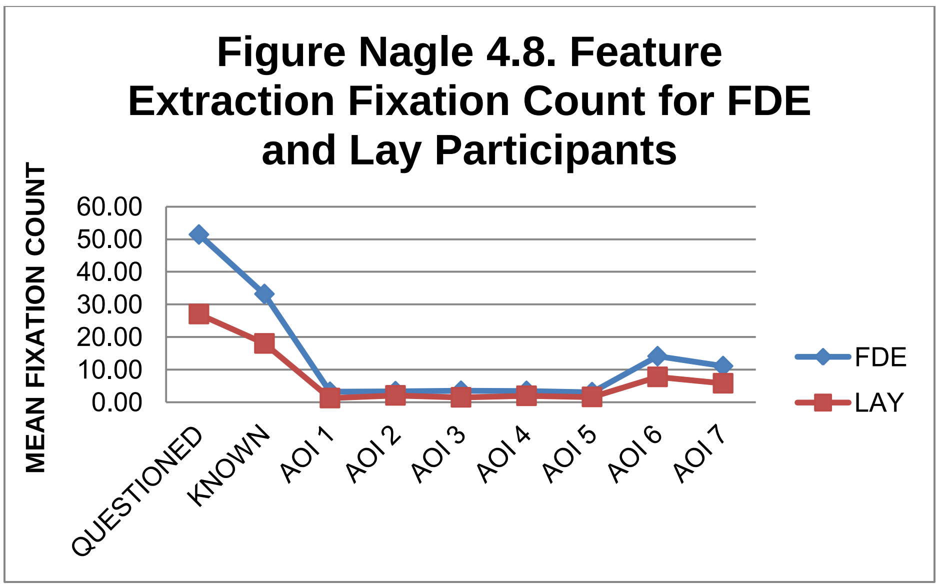
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .206, $F(9, 80) = 2.31$, $p = .023$, multivariate $\eta^2 = .206$. Figure Nagle 4.8 presents the mean fixation counts by AOI.

Figure Nagle 4.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 88) = 13.79$, $p < .001$, partial $\eta^2 = .136$, and $F(1, 88) = 7.85$, $p = .006$, partial $\eta^2 = .082$.

Fixations count in all but one AOI were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 14.59$, $p < .001$, partial $\eta^2 = .142$; AOI 2, $p = .056$, *ns*; AOI 3, $F(1, 88) = 10.44$, $p = .002$, partial $\eta^2 = .106$; AOI 4, $F(1, 88) = 5.35$, $p = .023$, partial $\eta^2 = .057$; AOI 5, $F(1, 88) = 6.12$, $p = .015$, partial $\eta^2 = .065$; AOI 6, $F(1, 88) = 8.63$, $p = .004$, partial $\eta^2 = .089$; AOI 7, $F(1, 88) = 9.50$, $p = .003$, partial $\eta^2 = .097$). Table Nagle 4.5 presents the means and standard deviations for areas of interest by participant type.

Table Nagle 4.5

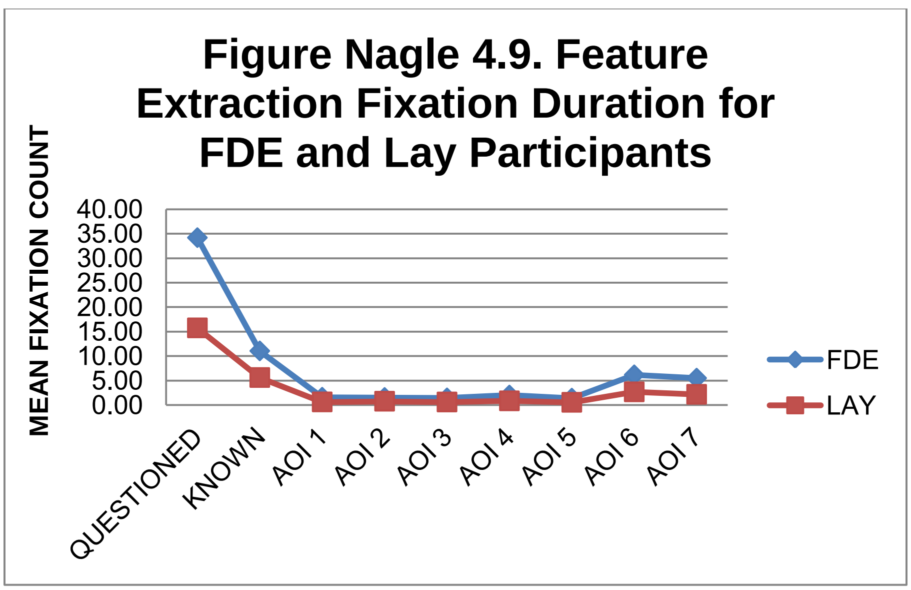
Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1	
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	51.43	29.29	33.19	27.13	3.21	2.87
Lay	27.05	32.97	18.02	23.92	1.28	1.74
	AOI 2		**AOI 3**		**AOI 4**	
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	3.38	3.57	3.51	3.17	3.49	3.65
Lay	2.09	2.63	1.51	2.65	1.98	2.36
	AOI 5		**AOI 6**		**AOI 7**	
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	3.09	3.1	14.11	9.72	11.09	9.08
Lay	1.63	2.41	7.77	10.74	5.81	6.88

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .228, $F(9, 80) = 2.63$, $p = .010$, multivariate $\eta^2 = .228$. Figure Nagle 4.9 presents the mean fixation durations by AOI.

Figure Nagle 4.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 88) = 16.27$, $p < .001$, partial $\eta^2 = .156$, and $F(1, 88) = 9.13$, $p = .003$, partial $\eta^2 = .094$.

Fixation durations in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 10.70$, $p = .002$, partial $\eta^2 = .108$; AOI 2, $F(1, 88) = 6.64$, $p < .012$, partial $\eta^2 = .070$; AOI 3, $F(1, 88) = 9.30$, $p = .003$, partial $\eta^2 = .096$; AOI 4, $F(1, 88) = 8.31$, $p = .005$, partial $\eta^2 = .086$; AOI 5, $F(1, 88) = 10.82$, $p < .001$, partial $\eta^2 = .109$; AOI 6, $F(1, 88) = 13.82$, $p < .001$, partial $\eta^2 = .136$; AOI 7, $F(1, 88) = 13.83$, $p < .001$, partial $\eta^2 = .136$). Table Nagle 4.6 presents the means and standard deviations for areas of interest by participant type.

Table Nagle 4.6

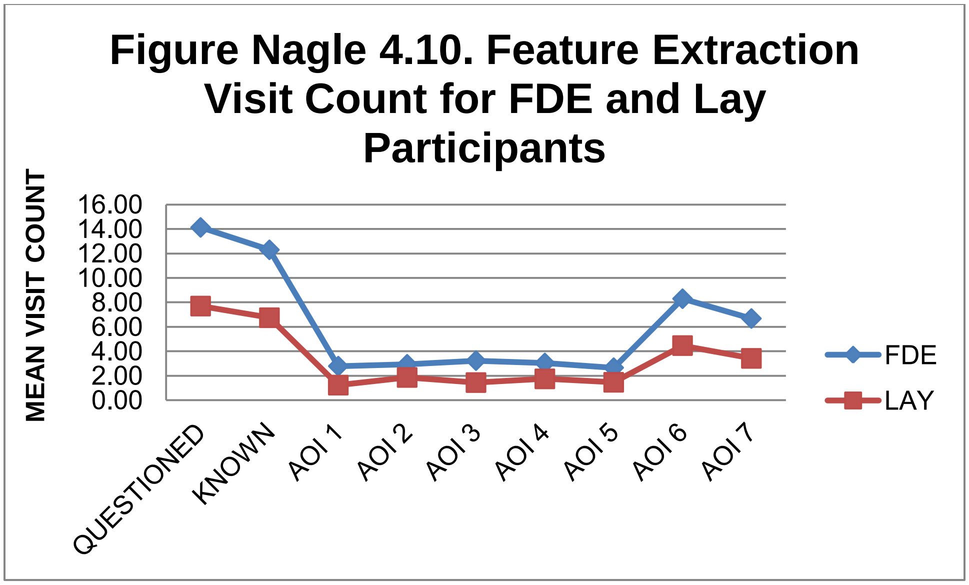
Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

	QUESTIONED		**KNOWN**		**AOI 1**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	34.17	23.08	11.03	9.01	1.58	1.68
Lay	15.74	19.98	5.6	7.95	0.62	0.97
	AOI 2		**AOI 3**		**AOI 4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.53	1.68	1.44	1.49	2.02	2.52
Lay	0.76	1.05	0.6	1.06	0.83	1.04
	AOI 5		**AOI 6**		**AOI 7**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.39	1.47	6.15	4.95	5.48	5.14
Lay	0.53	0.91	2.67	3.81	2.16	2.91

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .226, $F(9, 80) = 2.60$, $p = .011$, multivariate $\eta^2 = .226$. Figure Nagle 4.10 presents the mean visit counts by AOI.

Figure Nagle 4.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 88) = 11.14$, $p < .001$, partial $\eta^2 = .134$, and F(1, 88) = 9.33, $p = .003$, partial $\eta^2 = .096$.

Visit counts in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 13.59$, $p < .001$, partial $\eta^2 = .134$; AOI 2, $F(1, 88) = 3.85$, $p < .053$, partial $\eta^2 = .042$; AOI 3, $F(1, 88) = 10.39$, $p = .002$, partial $\eta^2 = .106$; AOI 4, $F(1, 88) = 5.66$, $p = .019$, partial $\eta^2 = .060$; AOI 5, $F(1, 88) = 5.79$, $p = .018$, partial $\eta^2 = .062$; AOI 6, $F(1, 88) = 12.74$, $p < .001$, partial $\eta^2 = .126$; AOI 7, $F(1, 88) = 11.01$, $p < .001$, partial $\eta^2 = .111$). Table Nagle 4.7 presents the means and standard deviations for areas of interest by participant type.

Table Nagle 4.7

Feature Extraction Analysis Visit Count for FDE and Lay Participants

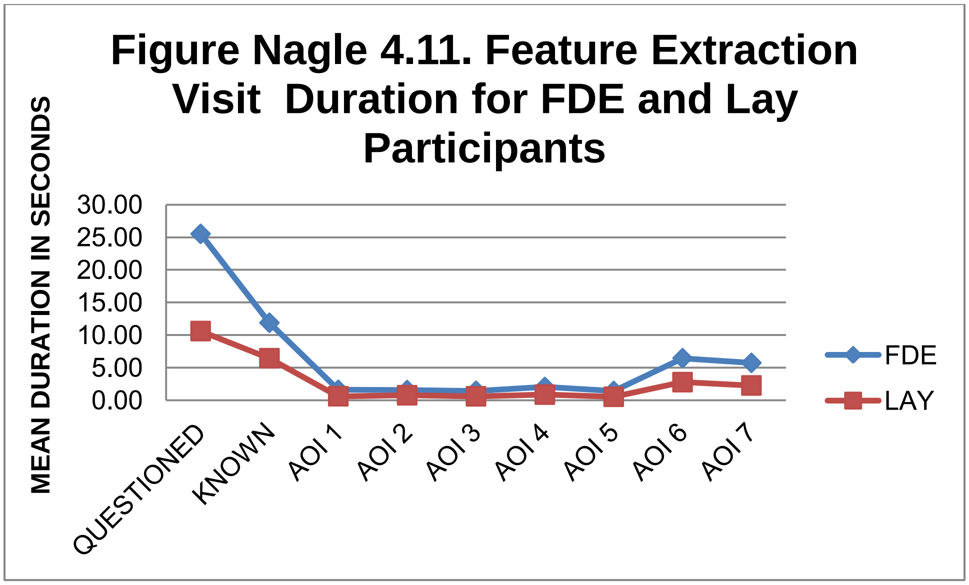
	QUESTIONED		KNOWN		AOI 1	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	14.13	7.46	12.3	7.47	2.79	2.27
Lay	7.7	10.66	6.74	9.73	1.23	1.65
	AOI 2		**AOI 3**		**AOI 4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.94	2.85	3.23	2.91	3.04	3.03
Lay	1.86	2.28	1.44	2.3	1.74	1.99
	AOI 5		**AOI 6**		**AOI 7**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.66	2.56	8.3	4.77	6.68	5

Lay	1.47	2.11	4.47	5.42	3.42	4.26

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .260, $F(9, 80) = 3.13$, $p = .003$, multivariate $\eta^2 = .260$. Figure Nagle 4.11 presents the mean visit counts by AOI.

Figure Nagle 4.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 88) = 21.71$, $p < .001$, partial $\eta^2 = .198$, and $F(1, 88) = 7.63$, $p = .007$, partial $\eta^2 = .080$.

Visit durations in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 10.70$, $p = .002$, partial $\eta^2 = .108$; AOI 2, $F(1, 88) = 6.66$, $p < .012$, partial $\eta^2 = .070$; AOI 3, $F(1, 88) = 8.96$, $p = .004$, partial $\eta^2 = .092$; AOI 4, $F(1, 88) = 7.87$, $p = .006$, partial $\eta^2 = .082$; AOI 5, $F(1, 88) = 10.97$, $p < .001$, partial $\eta^2 = .111$; AOI 6, $F(1, 88) = 13.96$, $p < .001$, partial $\eta^2 = .137$; AOI 7, $F(1, 88) = 14.48$, $p < .001$, partial $\eta^2 = .141$). Table Nagle 4.8 presents the means and standard deviations for areas of interest by participant type.

Table Nagle 4.8
Feature Extraction Analysis Visit Duration for FDE and Lay Participants

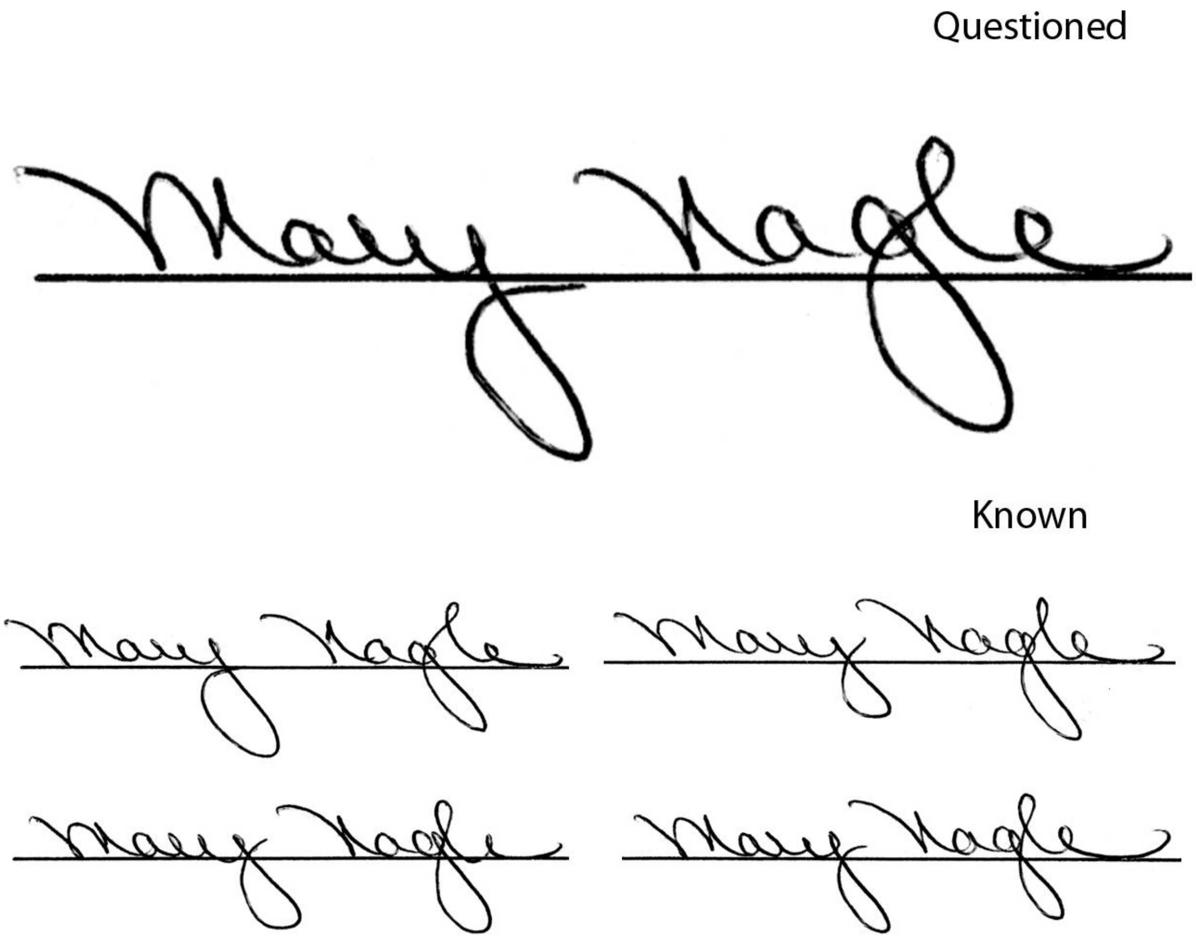
	QUESTIONED	KNOWN	AOI 1

Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	14.13	7.46	12.3	7.47	2.79	2.27
Lay	7.7	10.66	6.74	9.73	1.23	1.65
	AOI 2		**AOI 3**		**AOI 4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.94	2.85	3.23	2.91	3.04	3.03
Lay	1.86	2.28	1.44	2.3	1.74	1.99
	AOI 5		**AOI 6**		**AOI 7**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.66	2.56	8.3	4.77	6.68	5
Lay	1.47	2.11	4.47	5.42	3.42	4.26

Nagle Signature 5: Genuine

Of the 49 FDE participants, 46 responded correctly that the signature was genuine, and 2 responded that it was non-genuine. Of the 43 Lay participants, all 43 responded correctly that the signature was genuine. This difference was not statistically significant, $p = .099$, *ns.* Figure Nagle 5.1 presents the comparison view of this signature.

Figure Nagle 5.1. Questioned-Known Comparison Stimulus for Nagle Signature 5.

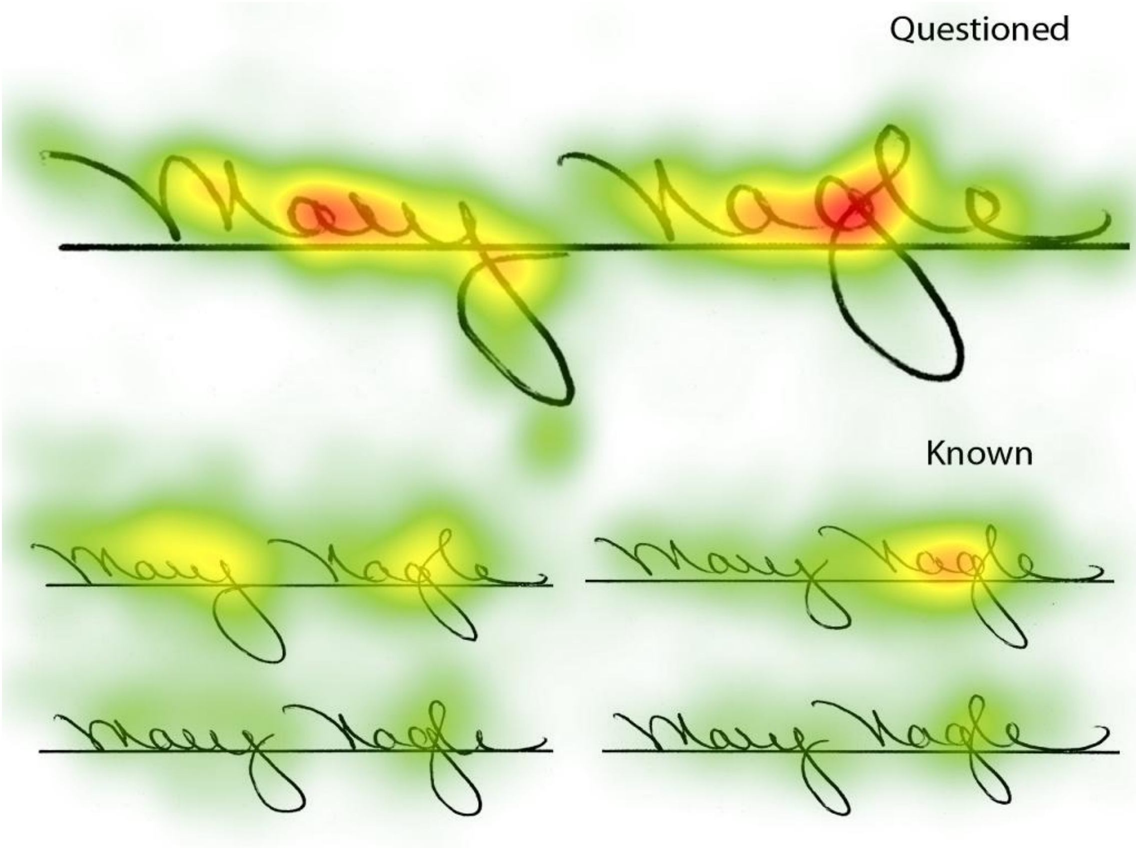


Selection of Areas of Interest (AOIs)

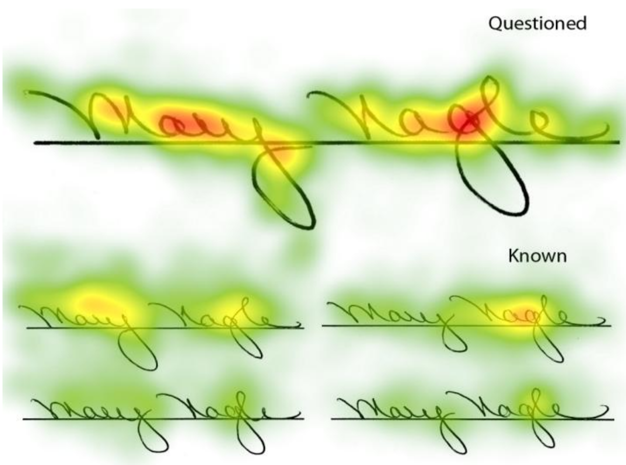
Figure Nagle 5.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were six locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of six AOIs for this stimulus. Figure Nagle 5.3 presents the location of the AOIs identified in the heat map.

Figure Nagle 5.2. Heat map for Nagle signature 5, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

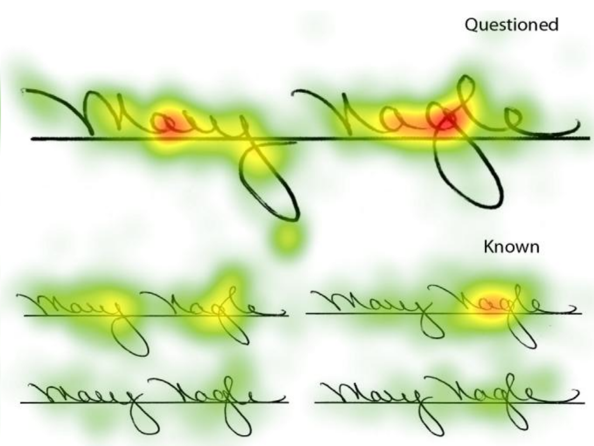
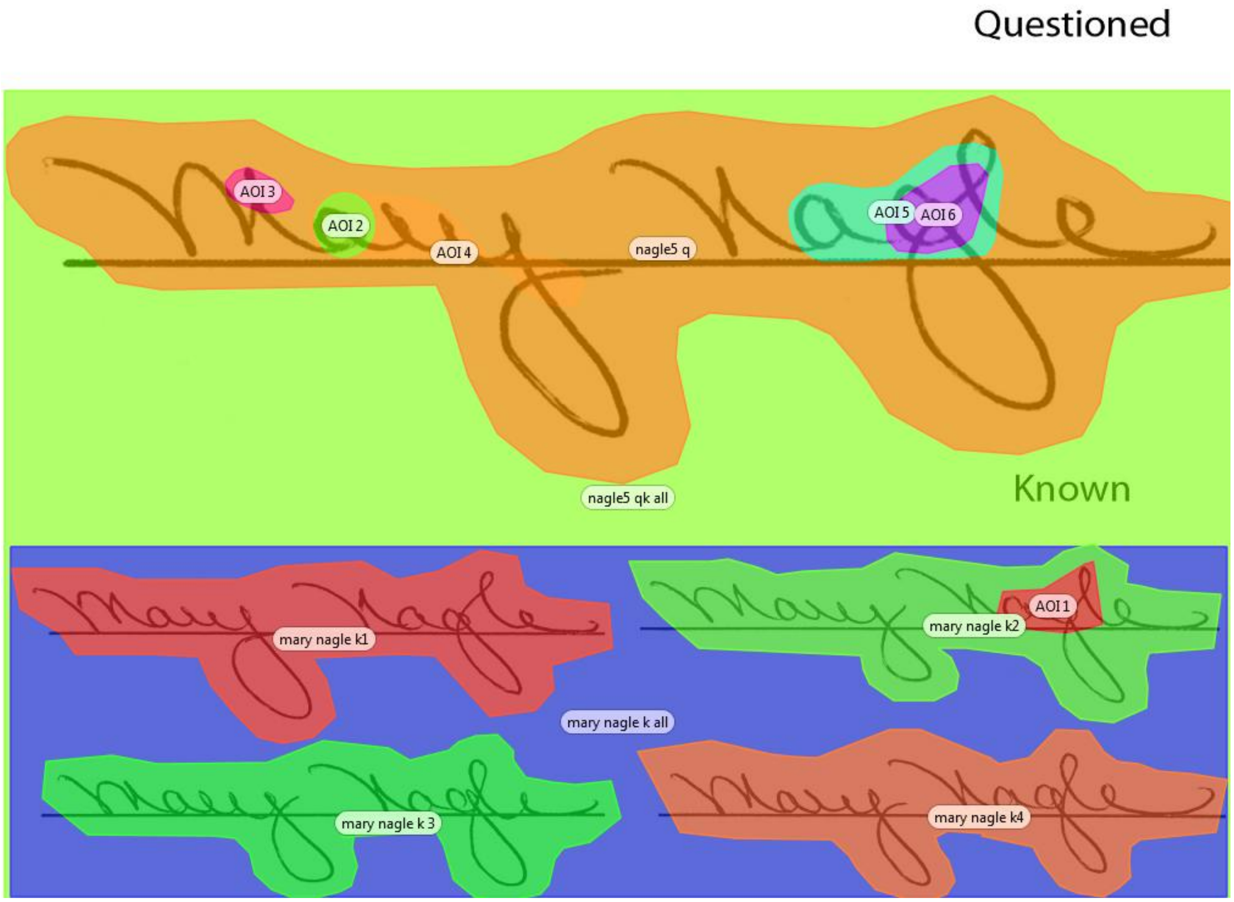


Figure Nagle 5.3. Areas of Interest (AOIs) for Nagle Signature 5.



Eye-Tracking Metrics Analyses

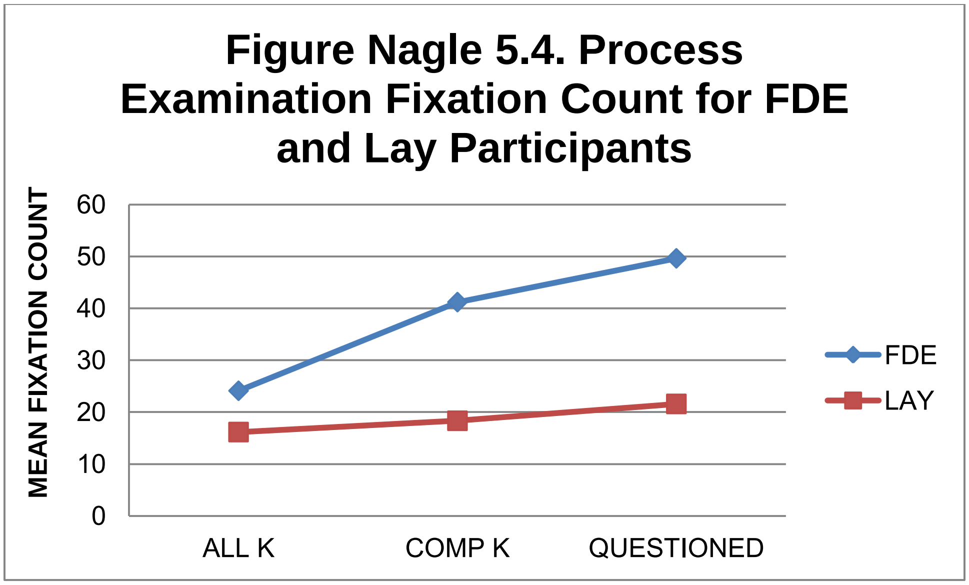
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .160, $F(3, 85) = 16.68$, $p = .002$, multivariate $\eta^2 = .160$. Figure Nagle 5.4 presents the mean fixation counts by AOI.

Figure Nagle 5.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 87) = 14.39$, $p < .001$, partial $\eta^2 = .142$); known signature comparison stimulus, $F(1, 87) = 9.82$, $p = .002$, partial $\eta^2 = .101$). Fixation count in the known signature stimulus was also statistically significant, $F(1, 87) = 4.54$, $p = .036$, partial $\eta^2 = .050$. Table Nagle 5.1 presents the means and standard deviations for areas of interest by participant type.

Table Nagle 5.1

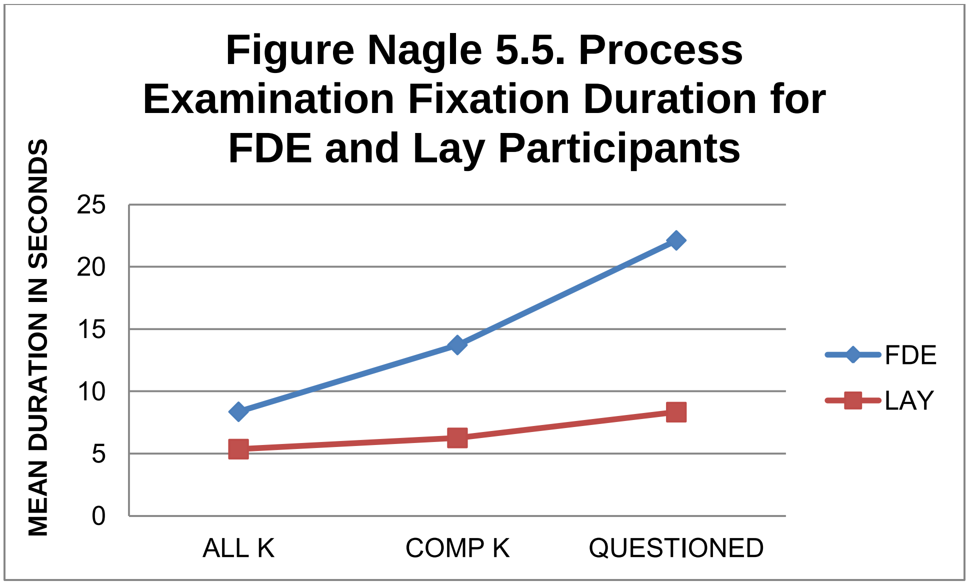
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	24.11	21.53	41.20	42.31	49.63	44.00
Lay	16.16	11.97	18.33	23.12	21.58	21.05

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .169, $F(3, 85) = 5.77$, $p < .001$, multivariate $\eta^2 = .169$. Figure Nagle5.5 presents the mean fixation duration by AOI.

Figure Nagle 5.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 87) = 17.23$, $p < .001$, partial $\eta^2 = .165$); known signature comparison stimulus, $F(1, 87) = 10.67$, $p = .002$, partial $\eta^2 = .109$). Fixation duration in the known signature stimulus was also statistically significant, $F(1, 87) = 4.78$, $p = .032$, partial $\eta^2 = .052$. Table Nagle 5.2 presents the means and standard deviations for areas of interest by participant type.

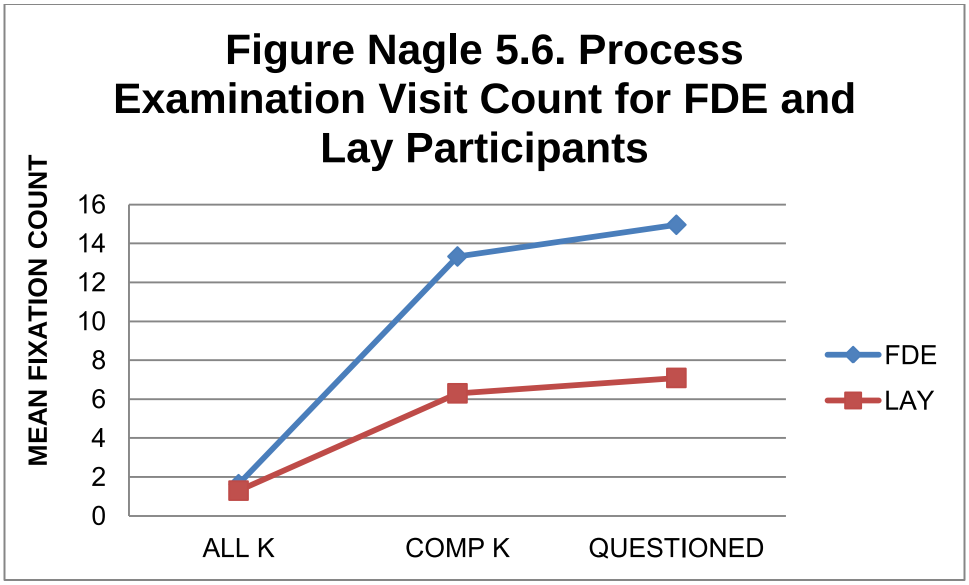
Table Nagle 5.2
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	8.36	7.98	13.72	12.22	22.12	19.60
Lay	5.36	4.28	6.26	8.94	8.33	9.82

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .161, $F(3, 85) = 5.45$, $p = .002$, multivariate $\eta^2 = .161$. Figure Nagle 5.6 presents the mean visit counts by AOI.

Figure Nagle 5.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in two of the three areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 87) = 15.77$, $p < .001$, partial $\eta^2 = .153$); known signature comparison stimulus, $F(1, 87) = 13.31$, $p < .001$, partial $\eta^2 = .133$). Visit count in the known signature stimulus was not statistically significant, $p = .422$, *ns*. Table Nagle 5.3 presents the means and standard deviations for areas of interest by participant type.

Table Nagle 5.3

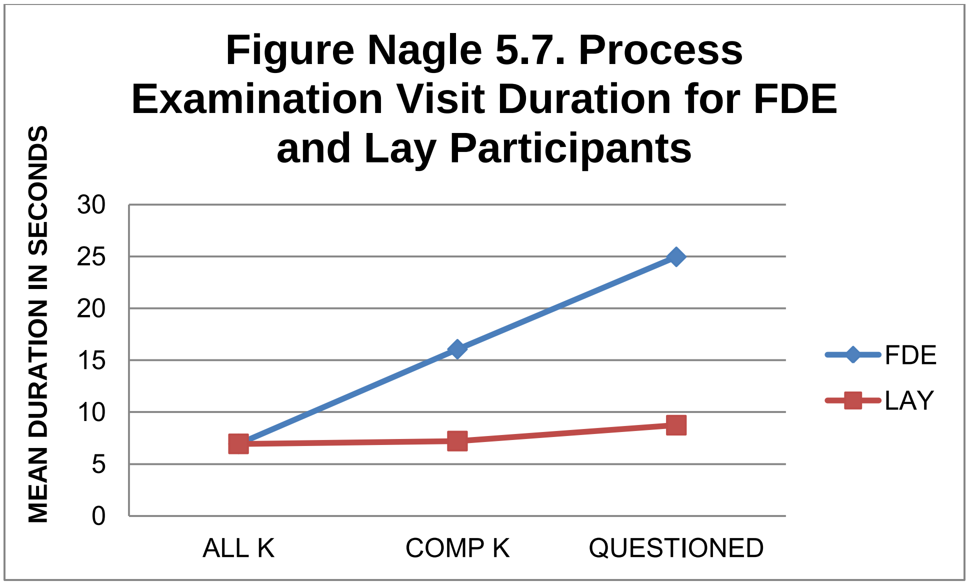
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.63	2.57	13.33	10.76	14.96	11.02
Lay	1.30	0.74	6.30	6.83	7.09	7.10

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .208, $F(3, 85) = 7.42$, $p < .001$, multivariate $\eta^2 = .208$. Figure Nagle 5.7 presents the mean visit durations by AOI.

Figure Nagle 5.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all of the three areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 87) = 21.38$, $p < .001$, partial $\eta^2 = .197$); known signature comparison stimulus, $F(1, 87) = 10.19$, $p = .002$, partial $\eta^2 = .105$). Visit duration in the known signature stimulus was also statistically significant, $F(1, 87) = 4.97$, $p = .028$, partial $\eta^2 = .054$. Table Nagle 5.4 presents the means and standard deviations for areas of interest by participant type.

Table Nagle 5.4

Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	10.88	10.22	16.06	15.53	24.96	20.78
Lay	6.94	5.63	7.21	9.79	8.74	10.19

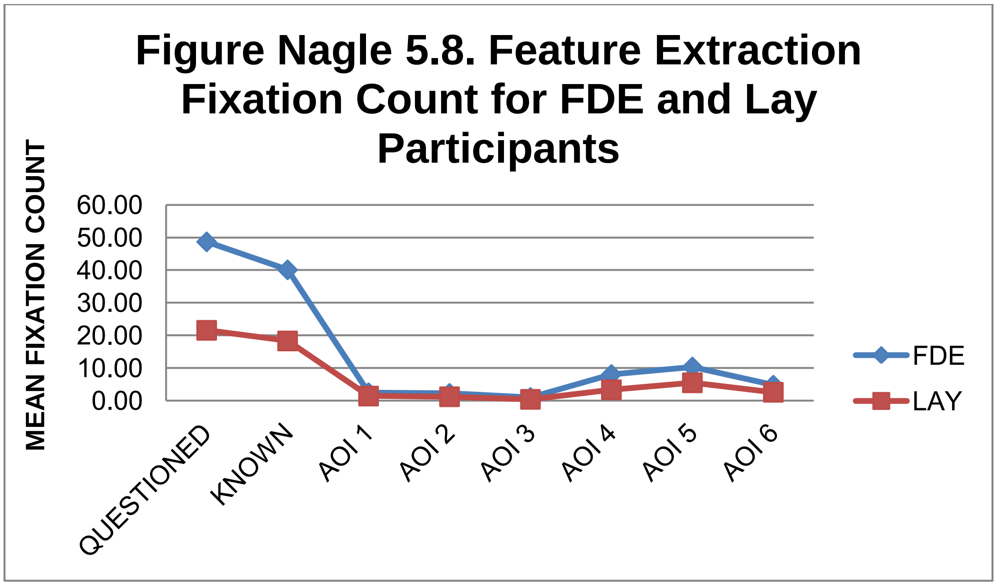
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

<u>*Total Fixation Count*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .177, $F(8, 79) = 2.12$, $p = .043$, multivariate $\eta^2 = .177$. Figure Nagle 5.8 presents the mean fixation counts by AOI.

Figure Nagle 5.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 86) = 13.37$, $p < .001$, partial $\eta^2 = .135$, and $F(1, 86) = 8.92$, $p = .004$, partial $\eta^2 = .094$.

Fixations count in all but two AOIs were significantly greater for FDEs than for Lay participants (AOI 1$p = .107$, *ns*; AOI 2, $p = .094$, *ns*; AOI 3, $F(1, 86) = 4.44$, $p = .038$, partial $\eta^2 = .049$; AOI 4, $F(1, 86) = 9.07$, $p = .003$, partial $\eta^2 = .095$; AOI 5, $F(1, 86) = 8.09$, $p = .006$, partial $\eta^2 = .086$; AOI 6, $F(1, 86) = 5.99$, $p = .016$, partial $\eta^2 = .065$). Table Nagle 5.5 presents the means and standard deviations for areas of interest by participant type.

Table Nagle 5.5

Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

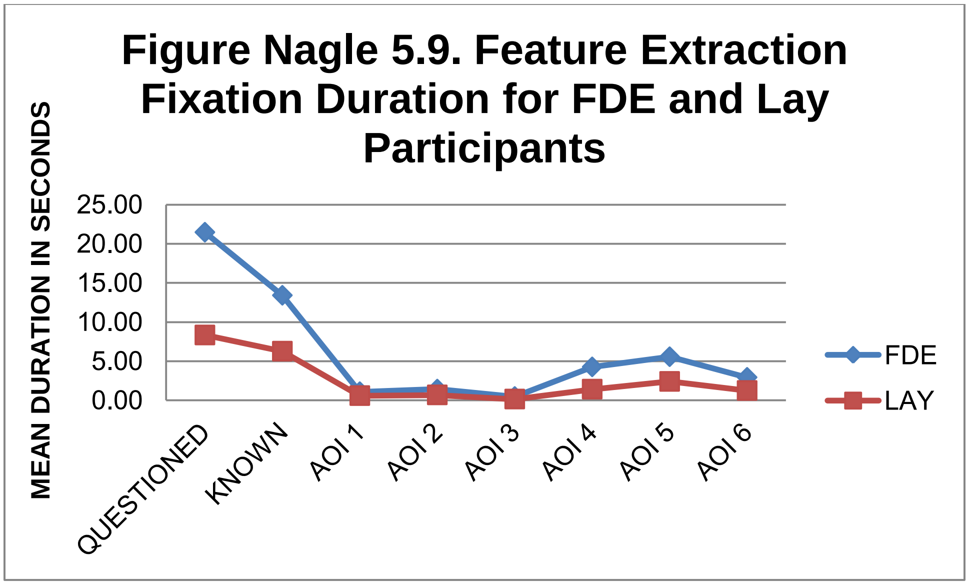
	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	48.69	44.03	40.11	42.14	2.47	3.55	2.27	3.63
Lay	21.58	21.05	18.33	23.12	1.44	2.15	1.23	1.74
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.02	1.6	8.07	9.46	10.36	10	4.78	5.19

Lay	0.44	0.85	3.37	3.95	5.51	5.07	2.6	2.7

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .240, $F(8, 79) = 3.11$, $p = .004$, multivariate $\eta^2 = .240$. Figure Nagle 5.9 presents the mean fixation durations by AOI.

Figure Nagle 5.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 86) = 15.95$, $p < .001$, partial $\eta^2 = .156$, and $F(1, 86) = 9.77$, $p = .002$, partial $\eta^2 = .102$.

Fixation durations in all but two AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $p = .082$, *ns*; AOI 2, $p = .087$, *ns*; AOI 3, $F(1, 86) = 6.13$, $p = .015$, partial $\eta^2 = .067$; AOI 4, $F(1, 86) = 9.87$, $p = .002$, partial $\eta^2 = .103$; AOI 5, $F(1, 86) = 13.27$, $p < .001$, partial $\eta^2 = .134$; AOI 6, $F(1, 86) = 8.95$, $p = .004$, partial $\eta^2 = .094$). Table Nagle 5.6 presents the means and standard deviations for areas of interest by participant type.

Table Nagle 5.6
Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

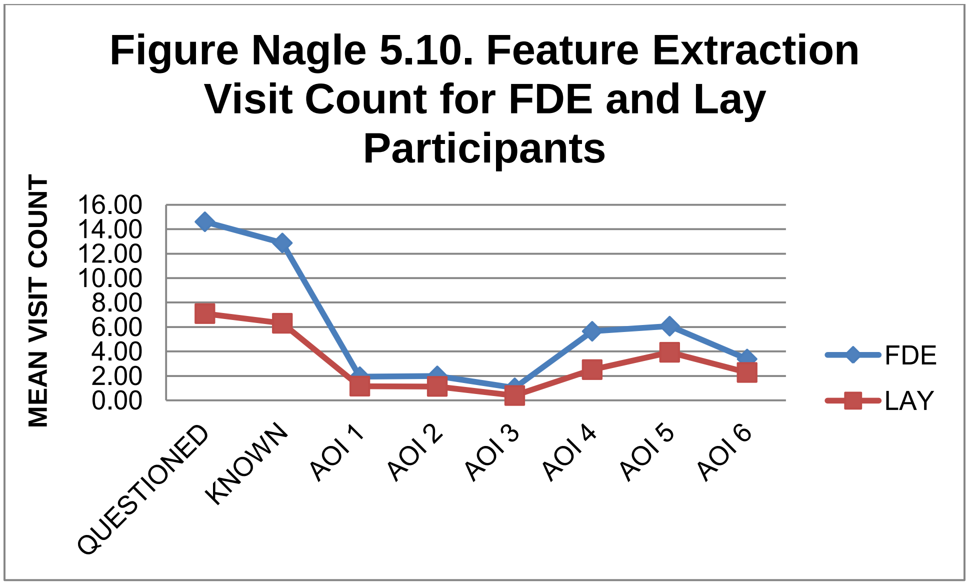
	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***

FDE	21.46	19.3	13.4	12.16	1.09	1.69	1.42	2.56
Lay	8.33	9.82	6.26	8.94	0.59	0.79	0.68	1.2
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	0.48	0.82	4.25	5.59	5.55	5.13	2.92	3.42
Lay	0.15	0.28	1.41	2.03	2.4	2.49	1.24	1.43

<u>*Total Visit Count*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .229, $F(8, 79) = 2.93$, $p = .006$, multivariate $\eta^2 = .229$. Figure Nagle 5.10 presents the mean visit count by AOI.

Figure Nagle 5.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 86) = 14.56$, $p < .001$, partial $\eta^2 = .145$, and $F(1, 86) = 12.11$, $p < .001$, partial $\eta^2 = .123$.

Visit counts in all but three AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $p = .082$, *ns*; AOI 2, $p = .063$, *ns*; AOI 3, $F(1, 86) = 5.49$, $p = .021$, partial $\eta^2 = .060$; AOI 4, $F(1, 86) = 11.00$, $p = .001$, partial $\eta^2 = .113$; AOI 5, $F(1, 86) = 5.15$, $p = .026$, partial $\eta^2 = .057$; AOI 6, $p = .069$, *ns*). Table Nagle 5.7 presents the means and standard deviations for areas of interest by participant type.

Table Nagle 5.7

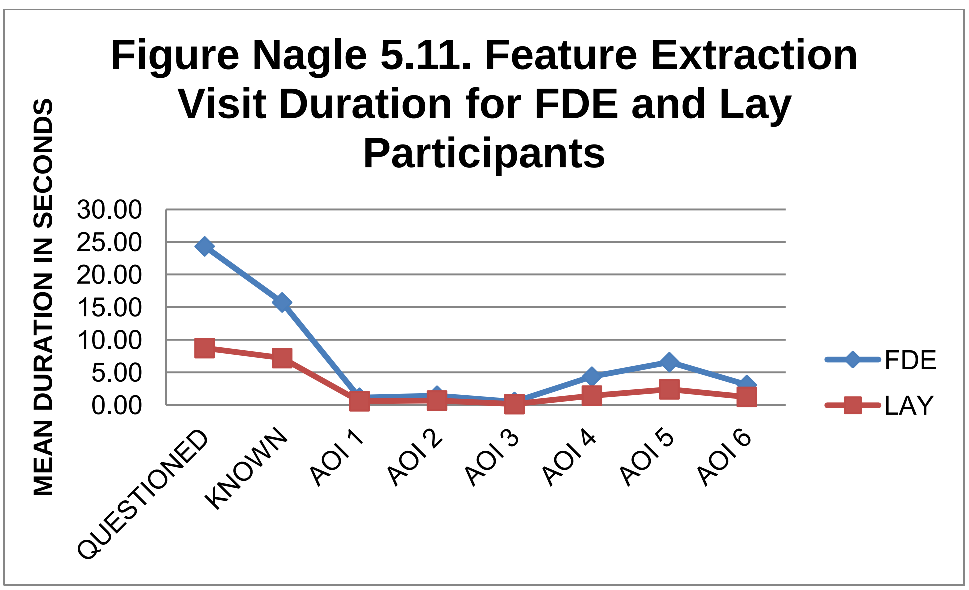
Feature Extraction Analysis Visit Count for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	14.6	10.87	12.87	10.42	1.93	2.41	2	2.61
Lay	7.09	7.1	6.3	6.83	1.16	1.6	1.14	1.51
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.02	1.6	5.64	5.49	6.07	5.17	3.38	3.15
Lay	0.4	0.73	2.51	2.93	3.93	3.45	2.28	2.38

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .272, $F(8, 79) = 3.69$, $p < .001$, multivariate $\eta^2 = .272$. Figure Nagle 5.11 presents the mean visit durations by AOI.

Figure Nagle 5.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 86) = 20.00$, $p < .001$, partial $\eta^2 = .189$, and $F(1, 86) = 9.39$, $p = .003$, partial $\eta^2 = .098$.

Visit durations in all but two AOIs were significantly greater for FDEs than for Lay participants (AOI 1, p = .074, *ns*; AOI 2, p = .089, *ns*; AOI 3, $F(1, 86) = 6.03$, p = .016, partial η^2 = .066; AOI 4, $F(1, 86) = 9.82$, p = .002, partial η^2 = .102; AOI 5, $F(1, 86) = 13.24$, p < .001, partial η^2 = .133; AOI 6, $F(1, 86) = 10.00$, p = .002, partial η^2 = .104). Table Nagle 5.8 presents the means and standard deviations for areas of interest by participant type.

Table Nagle 5.8

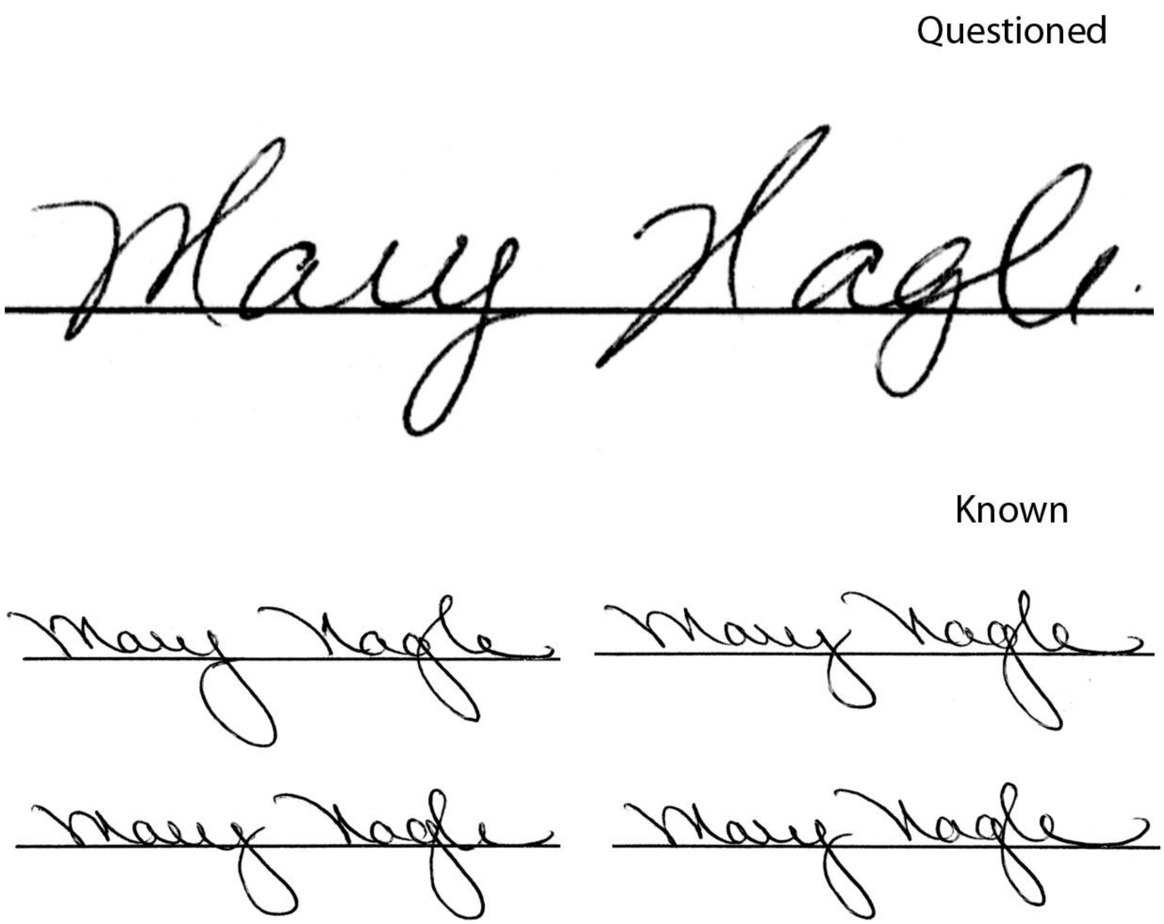
Feature Extraction Analysis Visit Duration for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	24.33	20.57	15.74	15.54	1.12	1.77	1.44	2.58
Lay	8.74	10.19	7.21	9.79	0.59	0.8	0.69	1.24
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	0.48	0.82	4.35	5.71	6.58	7.08	3.09	3.53
Lay	0.15	0.29	1.44	2.14	2.42	2.51	1.25	1.45

Nagle Signature 6: Freehand Simulation (Non-Genuine)

Of the 49 FDE participants, 47 responded correctly that the signature was non-genuine, and 2 responded that it was genuine. Of the 43 Lay participants, 40 responded correctly that the signature was non-genuine, and 3 responded that the signature was genuine. This difference was not statistically significant, $p = .541$, *ns*. Figure Nagle 6.1 presents the comparison view of this signature.

Figure Nagle 6.1. Questioned-Known Comparison Stimulus for Signature Nagle 6.

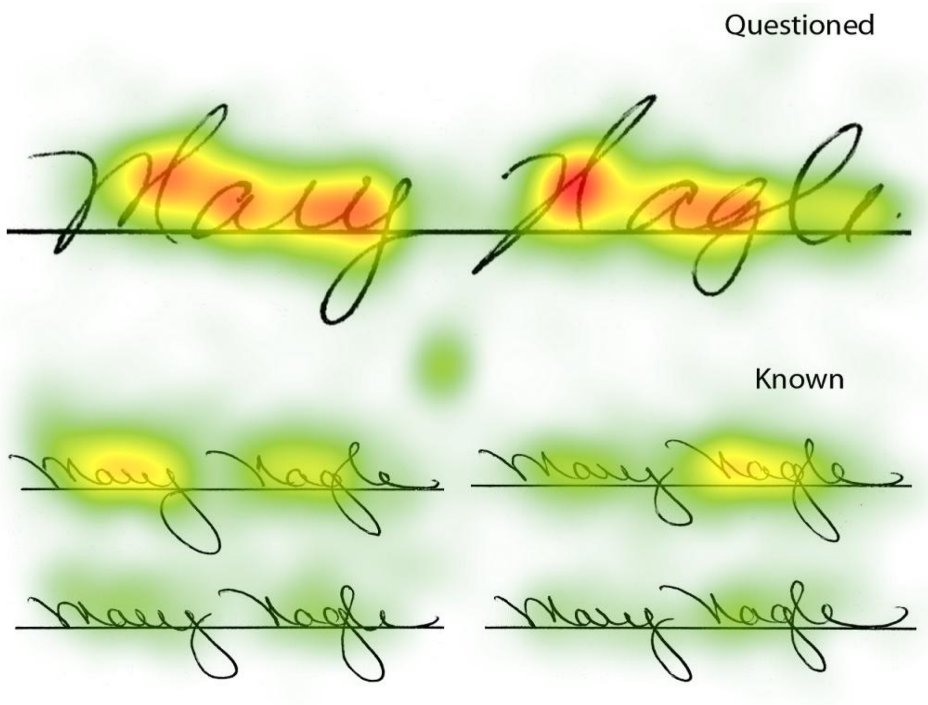


Selection of Areas of Interest (AOIs)

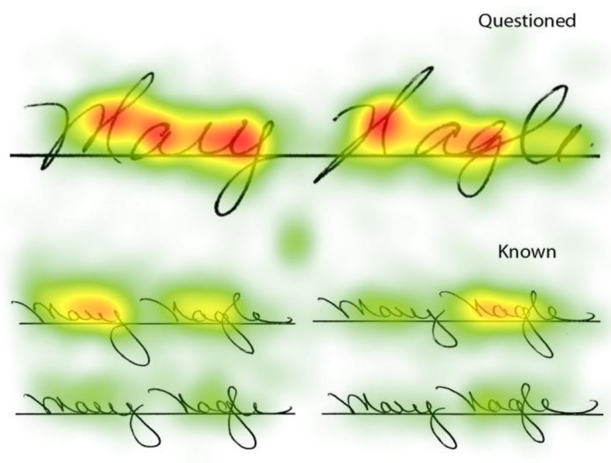
Figure Nagle 6.2 presents the heat map for this comparison slide. . Empirical examination of the heat map revealed that there were seven locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of seven AOIs for this stimulus. Figure Nagle 6.3 presents the location of the AOIs identified in the heat map.

Figure Nagle 6.2. Heat map for Nagle signature 6, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

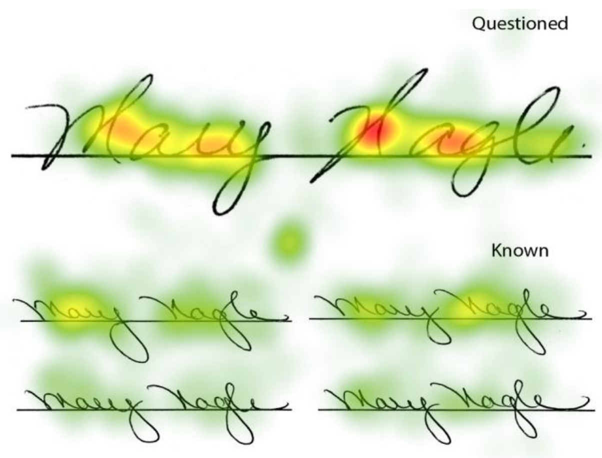
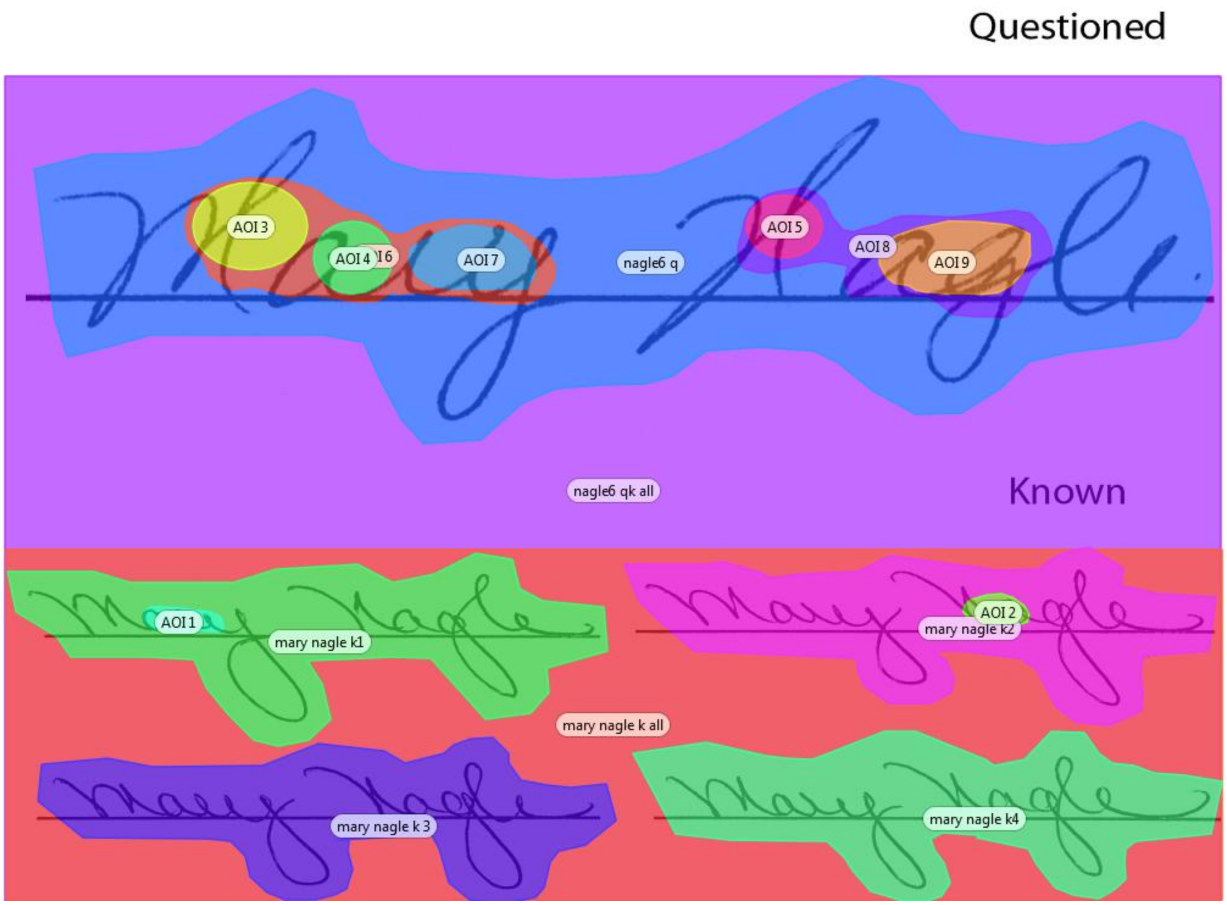


Figure Nagle 6.3. Areas of Interest (AOIs) for Nagle Signature 6.



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

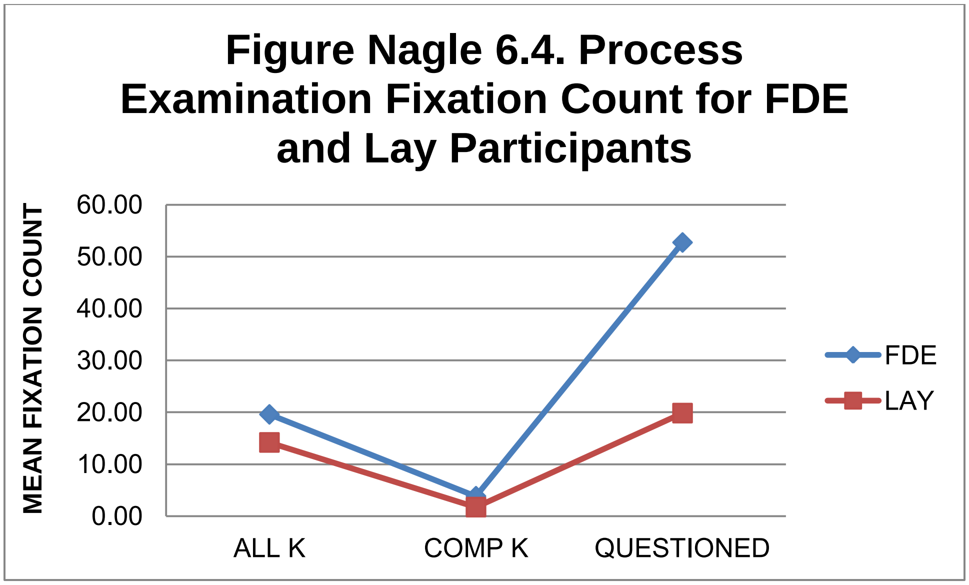
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Nagle known signature stimulus (Knowns, not pictured here), Nagle 1 K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Nagle 6Q (the Nagle questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 9) are included in subsequent analyses. Figure Nagle 6.3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .271, $F(3, 85) = 10.55$, $p < .001$, multivariate $\eta^2 = .271$. Figure Nagle 6.4 presents the mean fixation counts by AOI.

Figure Nagle 6.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all but one area of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 87) = 30.06$, $p < .001$, partial $\eta^2 = .257$); known signature comparison stimulus (ALL K), $F(1, 87) = 4.87$, $p = .030$, partial $\eta^2 = .053$). Fixation count in the known signature comparison stimulus (COMP K) was not statistically significant, $p = .140$, *ns*. Table Nagle 6.4 presents the means and standard deviations for areas of interest by participant type.

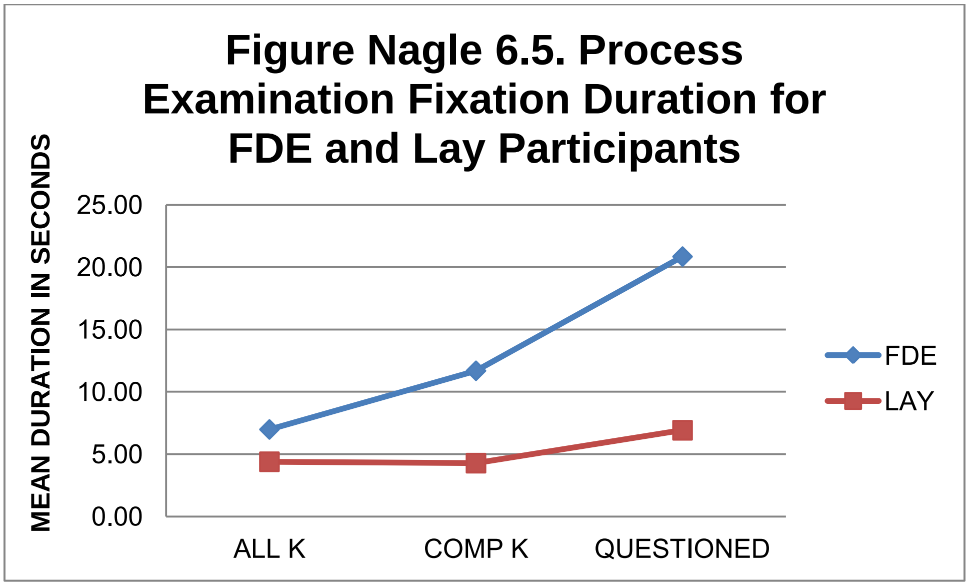
Table Nagle 6.4
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	19.57	22.11	3.80	5.68	52.70	35.96
Lay	14.16	9.14	1.70	2.72	19.81	16.46

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .296, $F(3, 85) = 11.91$, $p < .001$, multivariate $\eta^2 = .296$. Figure Nagle 6.5 presents the mean fixation duration by AOI.

Figure Nagle 6.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all but one area of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 87) = 30.20$, $p < .001$, partial $\eta^2 = .258$); known signature comparison stimulus (COMP K), $F(1, 87) = 13.21$, $p < .001$, partial $\eta^2 = .132$). Fixation duration in the known signature stimulus was also statistically significant (ALL K), $p = .086$, *ns*. Table Nagle 6.2 presents the means and standard deviations for areas of interest by participant type.

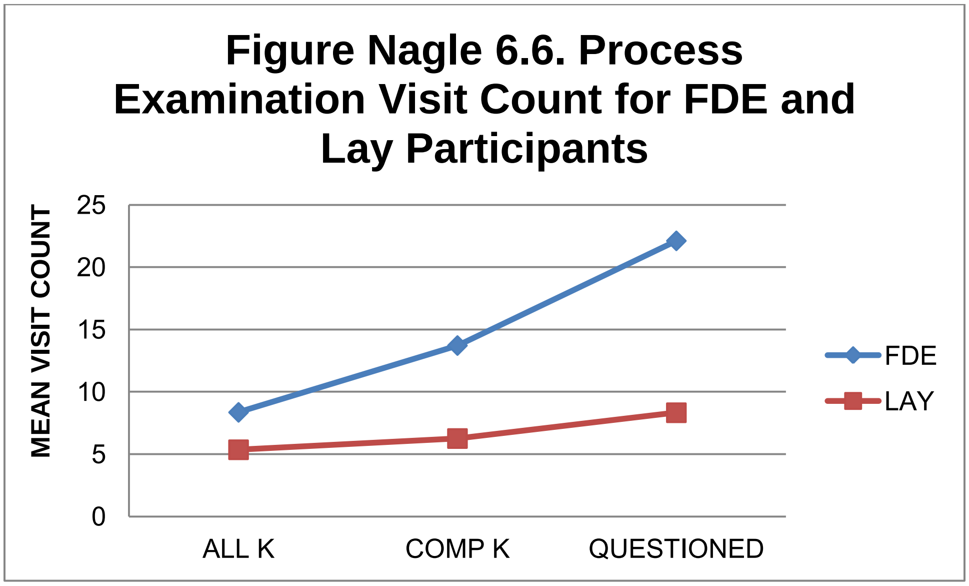
Table Nagle 6.2
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	6.99	9.20	11.69	12.16	20.86	15.53
Lay	4.40	3.44	4.28	5.73	6.92	6.11

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .292, $F(3, 85) = 11.70$, $p < .001$, multivariate $\eta^2 = .292$. Figure Nagle 6.6 presents the mean visit counts by AOI.

Figure Nagle 6.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in two of the three areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 87) = 27.39$, $p < .001$, partial $\eta^2 = .239$); known signature comparison stimulus (COMP K), $F(1, 87) = 21.50$, $p = .003$, partial $\eta^2 = .096$). Visit count in the known signature stimulus was not statistically significant (ALL K), $p = .488$, *ns*. Table Nagle 6.3 presents the means and standard deviations for areas of interest by participant type.

Table Nagle 6.3

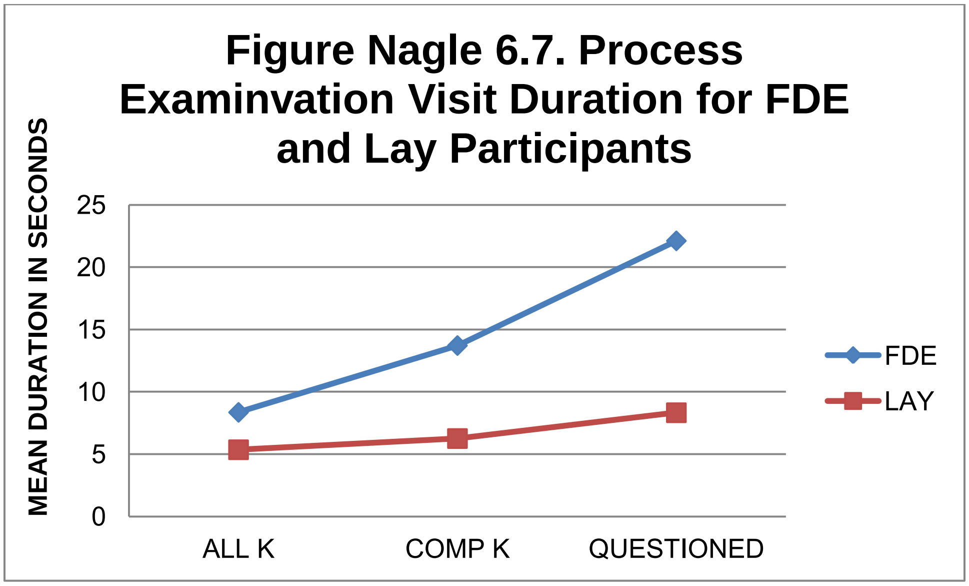
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.26	1.24	13.33	11.33	14.93	10.88
Lay	1.12	0.59	4.72	4.59	5.53	4.65

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .310, $F(3, 86) = 12.74$, $p < .001$, multivariate $\eta^2 = .310$. Figure Nagle 6.7 presents the mean visit durations by AOI.

Figure Nagle 6.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations two of the three areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 87) = 33.05$, $p < .001$, partial $\eta^2 = .198$); known signature comparison stimulus (COMP K), $F(1, 87) = 13.56$, $p < .001$, partial $\eta^2 = .135$). Visit duration in the known signature stimulus was not statistically significant (ALL K), $p = .134$, *ns*. Table Nagle 6.4 presents the means and standard deviations for areas of interest by participant type.

Table Nagle 6.4

Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	8.56	10.22	12.55	13.01	22.83	16.46
Lay	6.03	4.11	4.58	5.88	7.40	6.44

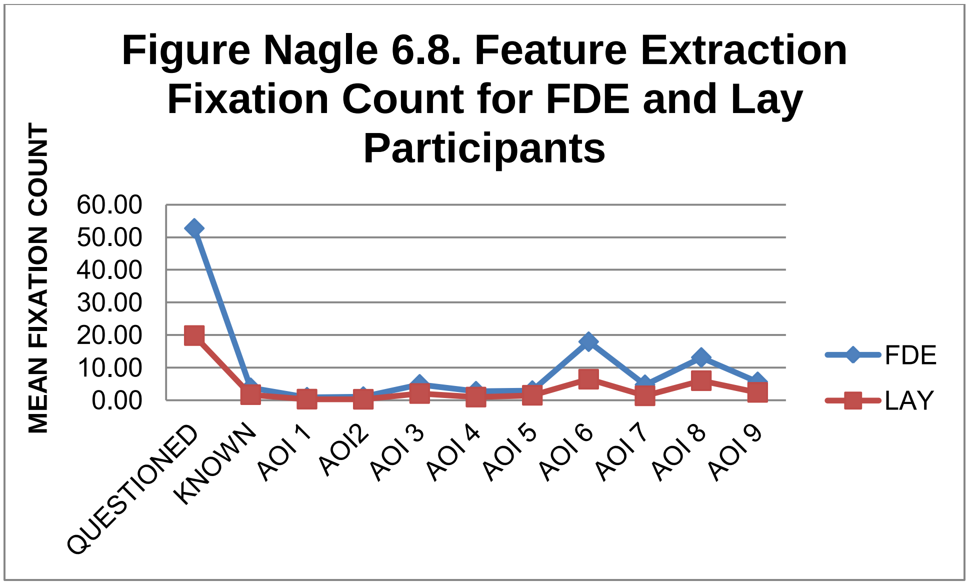
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .402, $F(11, 77) = 4.71$, $p < .001$, multivariate $\eta^2 = .402$. Figure Nagle 6.8 presents the mean fixation counts by AOI.

Figure Nagle 6.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 87) = 30.06$, $p < .001$, partial $\eta^2 = .257$, and $F(1, 87) = 4.87$, $p = .030$, partial $\eta^2 = .053$.

Fixations count in all AOI were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 7.02$, $p = .010$, partial $\eta^2 = .075$; AOI 2, $F(1, 87) = 5.66$, $p = .020$, partial $\eta^2 = .061$; AOI 3, $F(1, 87) = 11.99$, $p = .001$, partial $\eta^2 = .121$; AOI 4, $F(1, 87) = 12.88$, $p = .001$, partial $\eta^2 = .129$; AOI 5, $F(1, 87) = 5.71$, $p = .019$, partial $\eta^2 = .062$; AOI 6, $F(1, 87) = 21.16$, $p < .001$, partial $\eta^2 = .196$; AOI 7, $F(1, 87) = 19.28$, $p < .001$, partial $\eta^2 = .181$; AOI 8, $F(1, 87) = 13.15$, $p < .001$, partial $\eta^2 = .131$; AOI 9, $F(1, 87) = 12.66$, $p = .001$, partial $\eta^2 = .127$). Table Nagle 6.5 presents the means and standard deviations for areas of interest by participant type.

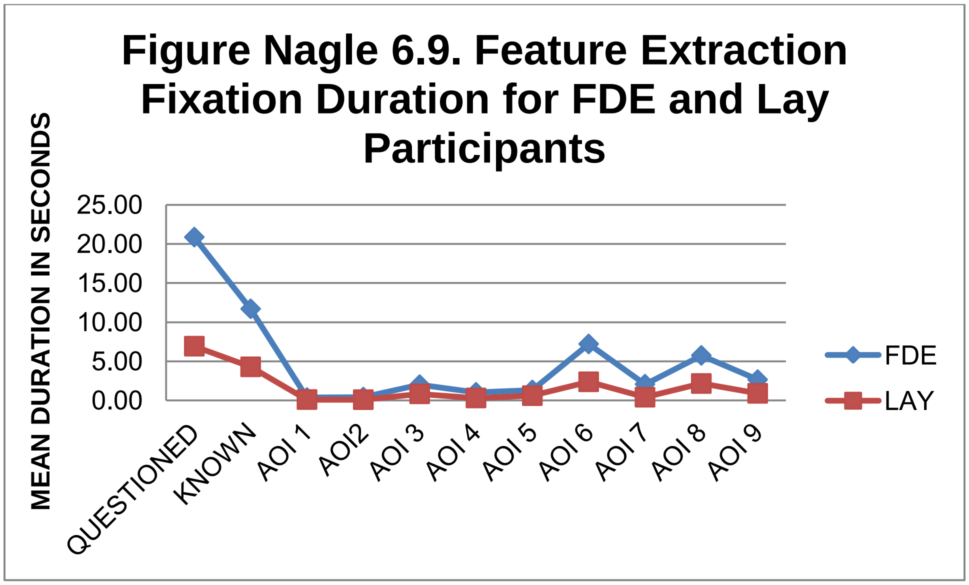
Table Nagle 6.5
Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	52.70	35.96	3.80	5.68	0.91	1.35	1.11	2.24
Lay	19.81	16.46	1.70	2.72	0.33	0.57	0.28	0.45
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	4.87	4.85	2.76	3.11	2.96	3.60	17.93	15.62
Lay	2.05	2.32	0.95	1.15	1.51	1.72	6.44	5.11
	AOI 7		**AOI 8**		**AOI 9**			
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***		
FDE	4.74	4.86	13.11	11.49	5.63	5.28		
Lay	1.35	1.45	5.98	6.05	2.40	2.85		

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .398, $F(11, 77) = 4.63$, $p < .001$, multivariate $\eta^2 = .398$. Figure Nagle 6.9 presents the mean fixation durations by AOI.

Figure Nagle 6.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus were significantly greater for

FDEs than for Lay participants, $F(1, 87) = 30.20$, $p < .001$, partial $\eta^2 = .258$, and $F(1, 87) = 13.21$, $p < .001$, partial $\eta^2 = .122$.

Fixation durations in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 5.83$, $p = .018$, partial $\eta^2 = .063$; AOI 2, $F(1, 87) = 5.16$, $p = .026$, partial $\eta^2 = .056$; AOI 3, $F(1, 87) = 11.52$, $p = .001$, partial $\eta^2 = .117$; AOI 4, $F(1, 87) = 14.99$, $p < .001$, partial $\eta^2 = .147$; AOI 5, $F(1, 87) = 6.12$, $p = .015$, partial $\eta^2 = .066$; AOI 6, $F(1, 87) = 23.59$, $p < .001$, partial $\eta^2 = .213$; AOI 7, $F(1, 87) = 23.66$, $p < .001$, partial $\eta^2 = .214$; AOI 8, $F(1, 87) = 13.87$, $p < .001$, partial $\eta^2 = .137$; AOI 9, $F(1, 87) = 13.42$, $p < .001$, partial $\eta^2 = .134$). Table Nagle 6.6 presents the means and standard deviations for areas of interest by participant type.

Table Nagle 6.6
Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	20.86	15.53	11.69	12.16	0.36	0.66	0.42	0.94
Lay	6.92	6.11	4.28	5.73	0.10	0.19	0.09	0.17

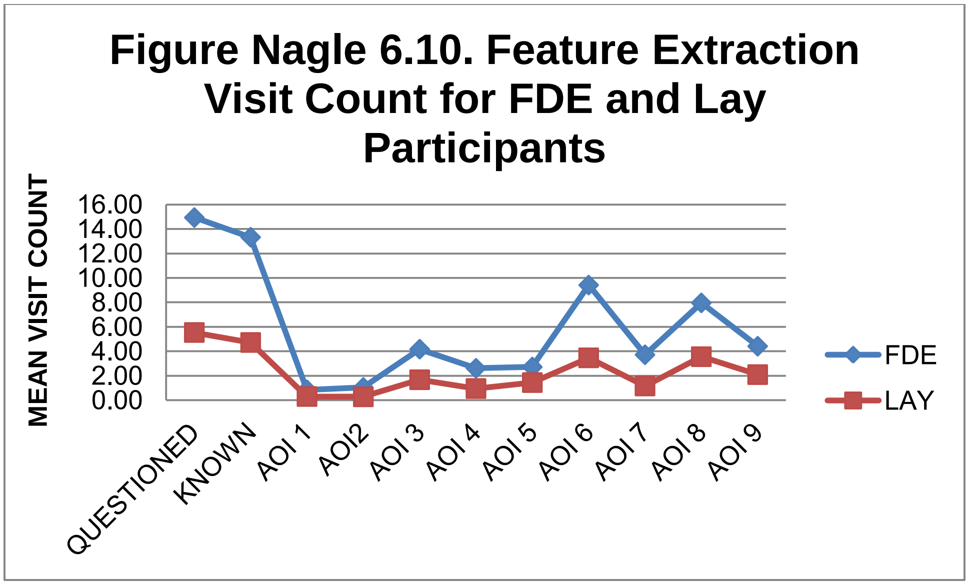
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.01	1.98	1.03	1.14	1.33	1.79	7.21	6.13
Lay	0.84	1.13	0.31	0.46	0.60	0.74	2.37	2.32

	AOI 7		**AOI 8**		**AOI 9**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.07	2.20	5.75	6.03	2.65	2.99
Lay	0.40	0.48	2.15	1.96	0.90	0.96

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .394, $F(11, 77)$ 4.56, $p < .001$, multivariate $\eta^2 = .394$. Figure Nagle 6.10 presents the mean visit counts by AOI.

Figure Nagle 6.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 87) = 27.39$, $p < .001$, partial $\eta^2 = .239$, and $F(1, 87) = 21.50$, $p < .001$, partial $\eta^2 = .198$.

Visit counts in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 6.93$, $p = .010$, partial $\eta^2 = .074$; AOI 2, $F(1, 87) = 6.06$, $p < .016$, partial $\eta^2 = .065$; AOI 3, $F(1, 87) = 14.05$, $p < .001$, partial $\eta^2 = .139$; AOI 4, $F(1, 87) = 13.69$, $p < .001$, partial $\eta^2 = .136$; AOI 5, $F(1, 87) = 5.06$, $p = .027$, partial $\eta^2 = .055$; AOI 6, $F(1, 87) = 23.97$, $p < .001$, partial $\eta^2 = .216$; AOI 7, $F(1, 87) = 20.71$, $p < .001$, partial $\eta^2 = .192$; AOI 8, $F(1, 87) = 12.76$, $p < .001$, partial $\eta^2 = .128$; AOI 9, $F(1, 87) = 9.85$, $p = .002$, partial $\eta^2 = .102$). Table Nagle 6.7 presents the means and standard deviations for areas of interest by participant type.

Table Nagle 6.7

Feature Extraction Analysis Visit Count for FDE and Lay Participants

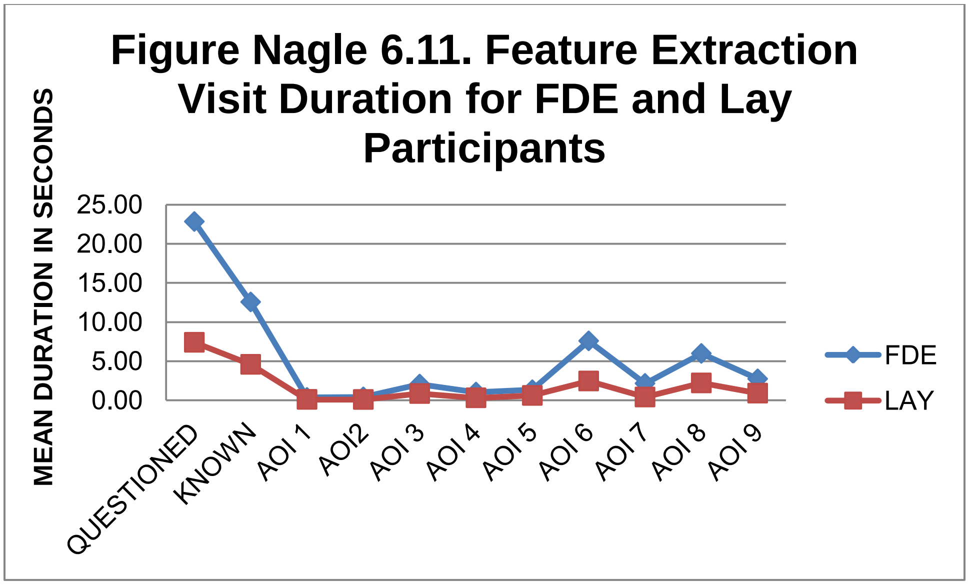
	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	14.93	10.88	13.33	11.33	0.85	1.26	1.04	1.99
Lay	5.53	4.65	4.72	4.59	0.30	0.51	0.28	0.45
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	4.17	4.03	2.61	2.71	2.72	3.36	9.41	7.54
Lay	1.67	1.74	0.95	1.15	1.44	1.64	3.47	2.67
	AOI 7		**AOI 8**		**AOI 9**			
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***		
FDE	3.72	3.49	7.96	7.51	4.41	4.37		

Lay	1.16	1.21	3.56	3.05	2.09	2.16

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .419, $F(11, 77) = 5.05$, $p < .001$, multivariate $\eta^2 = .419$. Figure Nagle 6.11 presents the mean visit counts by AOI.

Figure Nagle 6.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 87) = 33.05$, $p < .001$, partial $\eta^2 = .275$, and $F(1, 87) = 13.26$, $p < .001$, partial $\eta^2 = .135$.

Visit durations in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 5.82$, $p = .018$, partial $\eta^2 = .063$; AOI 2, $F(1, 87) = 5.15$, $p = .026$, partial $\eta^2 = .070$; AOI 3, $F(1, 87) = 11.50$, $p = .001$, partial $\eta^2 = .117$; AOI 4, $F(1, 87) = 14.92$, $p < .001$, partial $\eta^2 = .146$; AOI 5, $F(1, 87) = 6.14$, $p = .015$, partial $\eta^2 = .066$; AOI 6, $F(1, 87) = 24.00$, $p < .001$, partial $\eta^2 = .216$; AOI 7, $F(1, 87) = 24.54$, $p < .001$, partial $\eta^2 = .220$; AOI 8, $F(1, 87) = 14.60$, $p < .001$, partial $\eta^2 = .144$; AOI 9, $F(1, 87) = 14.35$, $p < .001$, partial $\eta^2 = .142$). Table Nagle 6.8 presents the means and standard deviations for areas of interest by participant type.

Table Nagle 6.8

Feature Extraction Analysis Visit Duration for FDE and Lay Participants

Participant	QUESTIONED *M*	QUESTIONED *SD*	KNOWN *M*	KNOWN *SD*	AOI 1 *M*	AOI 1 *SD*	AOI 2 *M*	AOI 2 *SD*
FDE	22.83	16.46	12.55	13.01	0.36	0.66	0.42	0.94
Lay	7.40	6.44	4.58	5.88	0.10	0.19	0.09	0.17

Participant	AOI 3 *M*	AOI 3 *SD*	AOI 4 *M*	AOI 4 *SD*	AOI 5 *M*	AOI 5 *SD*	AOI 6 *M*	AOI 6 *SD*
FDE	2.06	2.04	1.04	1.16	1.34	1.79	7.58	6.46
Lay	0.85	1.17	0.31	0.46	0.61	0.75	2.45	2.39

Participant	AOI 7 *M*	AOI 7 *SD*	AOI 8 *M*	AOI 8 *SD*	AOI 9 *M*	AOI 9 *SD*
FDE	2.15	2.26	5.98	6.17	2.73	3.02
Lay	0.41	0.48	2.21	2.03	0.90	0.96

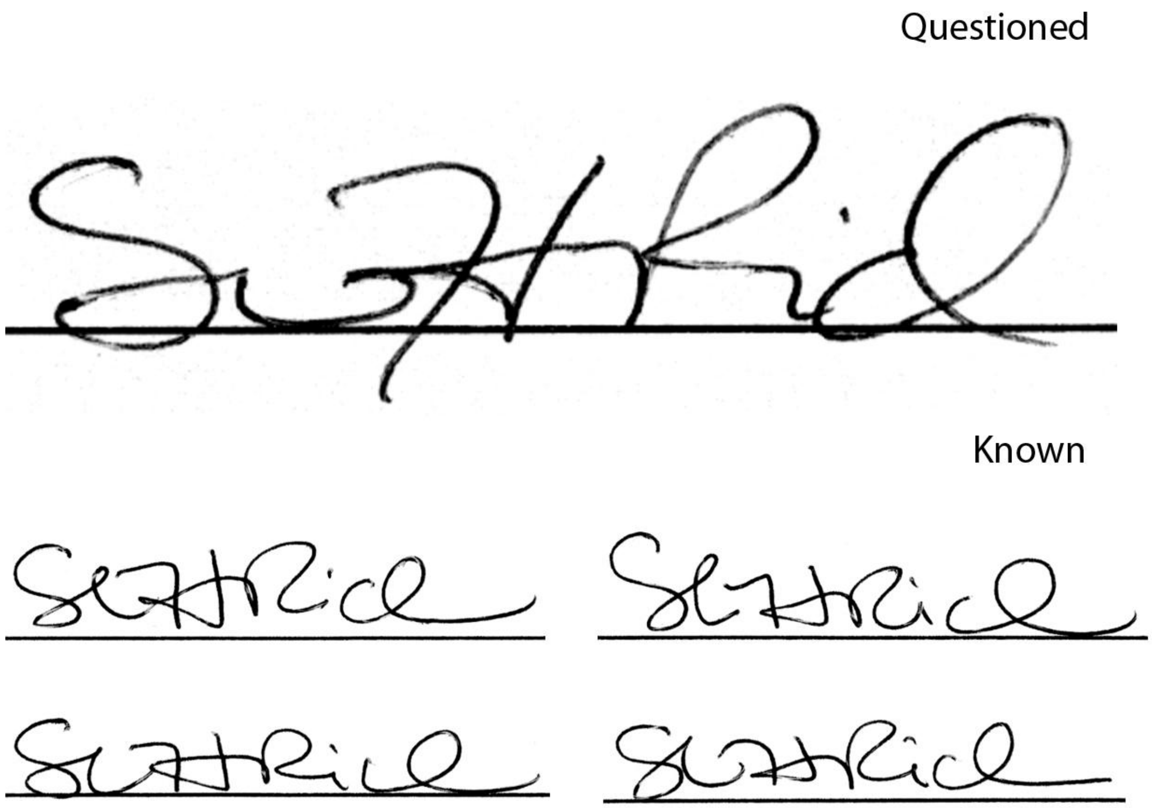
SIGNATURE 7: Shawn Richards

The signature of Shawn Richards is characterized as a low-complexity mixed-type signature. The set of Richards signature specimens included one genuine signature. Of the non-genuine signatures, three were freehand simulations, one was traced, and one was disguised.

Richards Signature 1: Freehand Simulation (Non-Genuine)

Of the 49 FDE participants, 45 responded correctly that the signature was non-genuine, while 4 responded that the signature was genuine. Of the 43 Lay participants, 34 responded correctly that the signature was non-genuine, while 9 responded that the signature was genuine. This difference was not statistically significant, p = .079, *n*s. Figure Richards 1.1 presents the comparison view of this signature.

Figure Richards1.1. Questioned-Known Comparison Stimulus for Richards Signature 1.

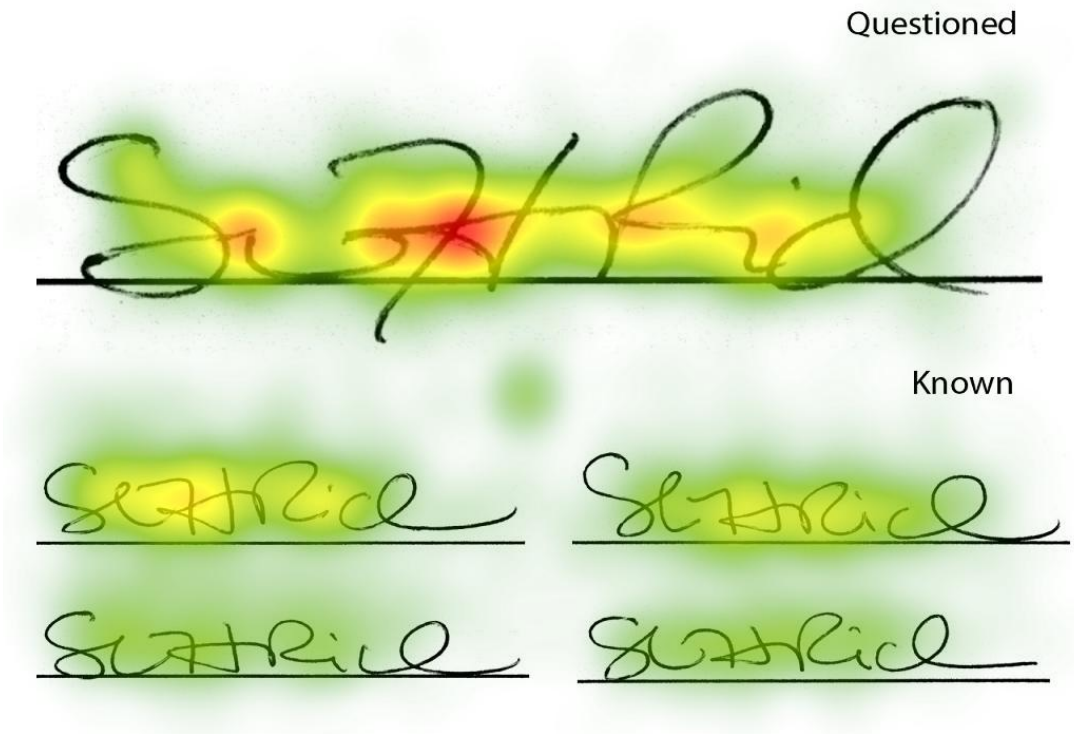


Selection of Areas of Interest (AOIs)

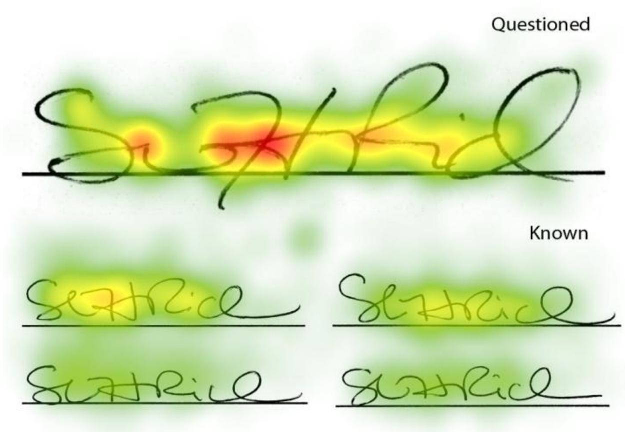
Figure Richards 1.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were three locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of three AOIs for this stimulus. Figure Richards 1.3 presents the location of the AOIs identified in the heat map.

Figure Richards 1.2. Heat map for Richards signature 1, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

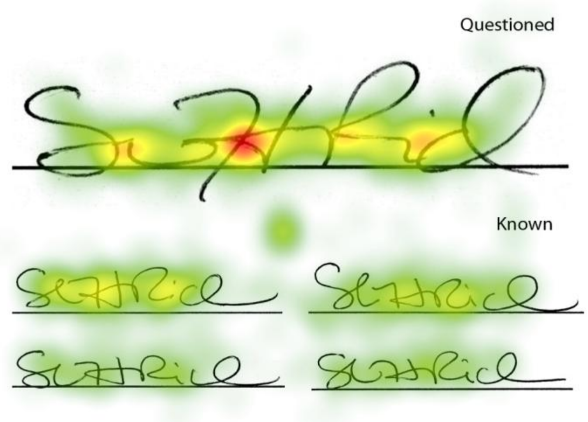
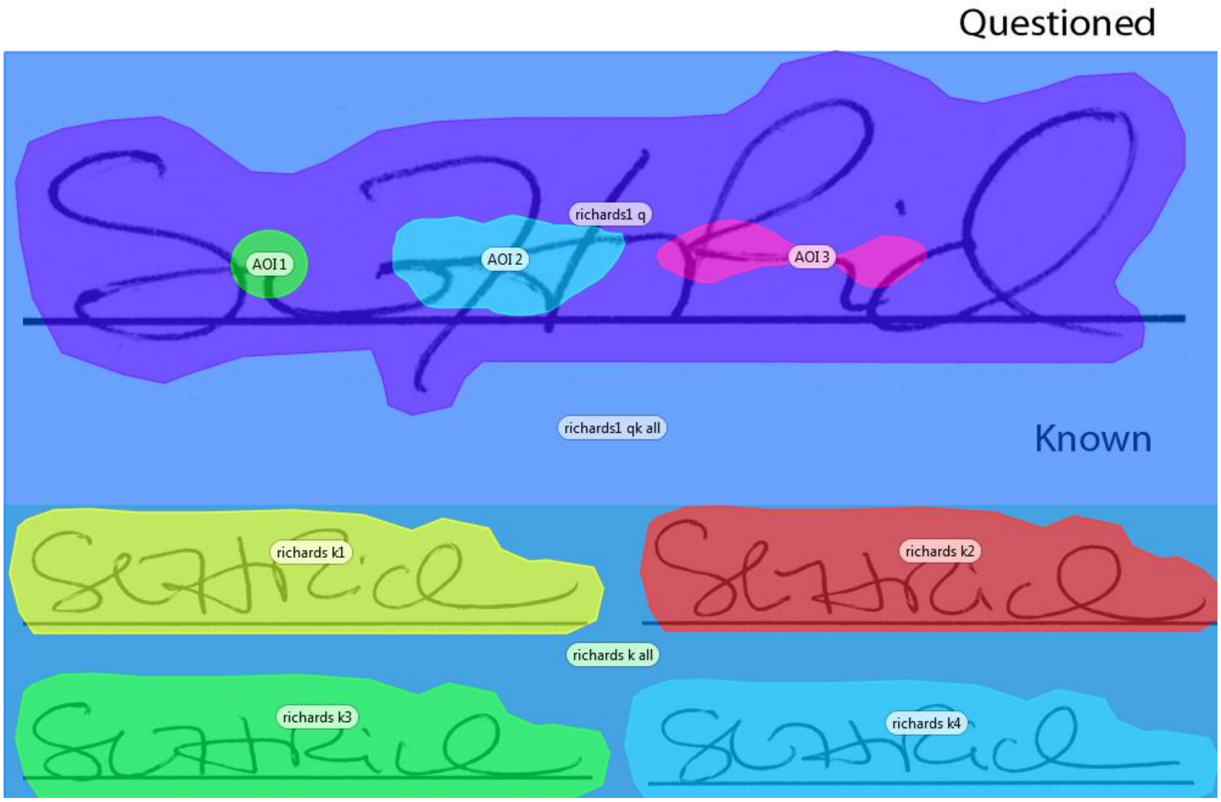


Figure Richards 1.3. Areas of Interest (AOIs) for Richards Signature 1.



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

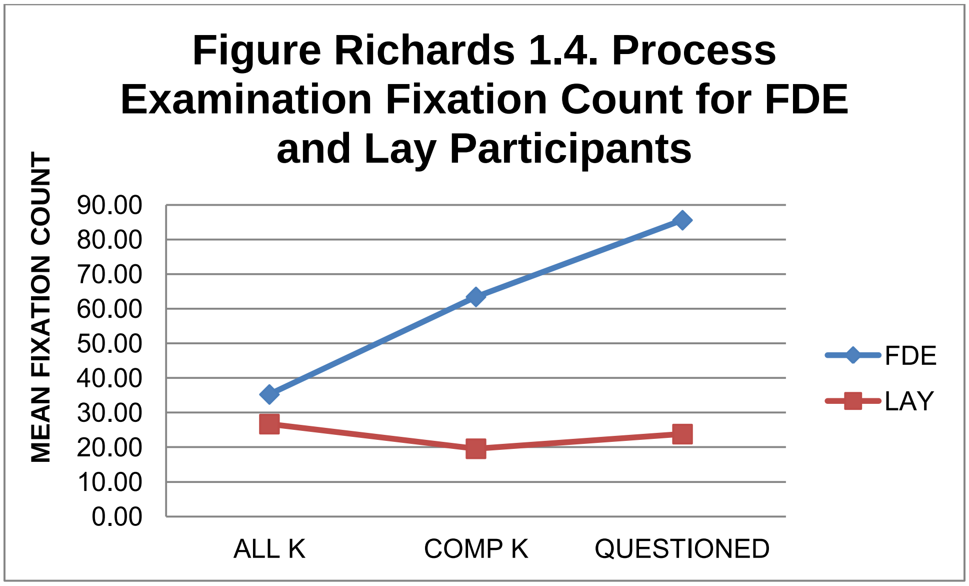
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Richards known signature stimulus (Knowns, not pictured here), Richards 1 K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Richards 1Q (the Richards questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 3) are included in subsequent analyses. Figure Richards 1.3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .428, $F(3, 85) = 21.19$, $p < .001$, multivariate $\eta^2 = .428$. Figure Richards 1.4 presents the mean fixation counts by AOI.

Figure Richards 1.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in two of the three areas of interest. Total fixation count for both the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for the Lay participants, (questioned signature, $F(1, 87) = 53.96$, $p < .001$, partial $\eta^2 = .383$; known signature comparison stimulus (COMP K), ($F(1, 87) = 30.00$, $p < .001$, partial $\eta^2 = .256$). Fixation count in the known comparison signature stimulus (ALL K) was not significantly different, $p = .180$, *ns*. Table Richards 1.1 presents the means and standard deviations for areas of interest by participant type.

Table Richards 1.1

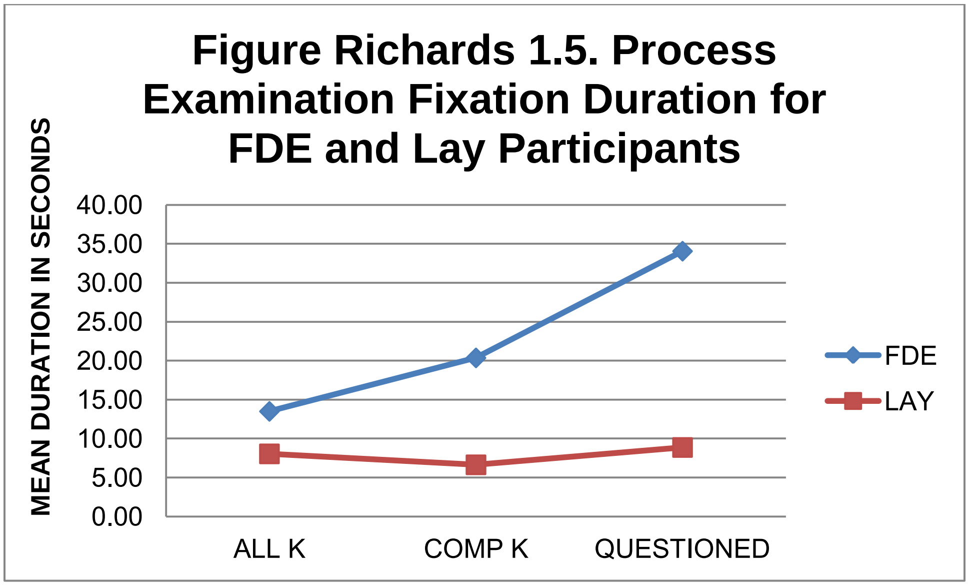
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	35.26	35.10	63.43	49.58	85.59	52.58
Lay	26.70	23.03	19.58	17.81	23.81	17.12

<u>Total Fixation Duration</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .423, $F(3, 85) = 20.75$, $p < .001$, multivariate $\eta^2 = .423$. Figure Richards 1.5 presents the mean fixation duration by AOI.

Figure Richards 1.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all three areas of interest. Total fixation duration for both the questioned signature and the known signature comparison stimulus (COMP K) was significantly greater for the FDEs than for Lay participants (questioned signature, $F(1, 87) = 57.84$, $p < .001$, partial $\eta^2 = .399$; $F(1, 87) = 26.45$, $p < .001$, partial $\eta^2 = .233$). A significant difference was also found for the known signature comparison stimulus (ALL K), $F(1, 87) = 6.47$, $p = .013$, partial $\eta^2 = .069$. Table Richards 1.2 presents the means and standard deviations for areas of interest by participant type.

Table Richards 1.2

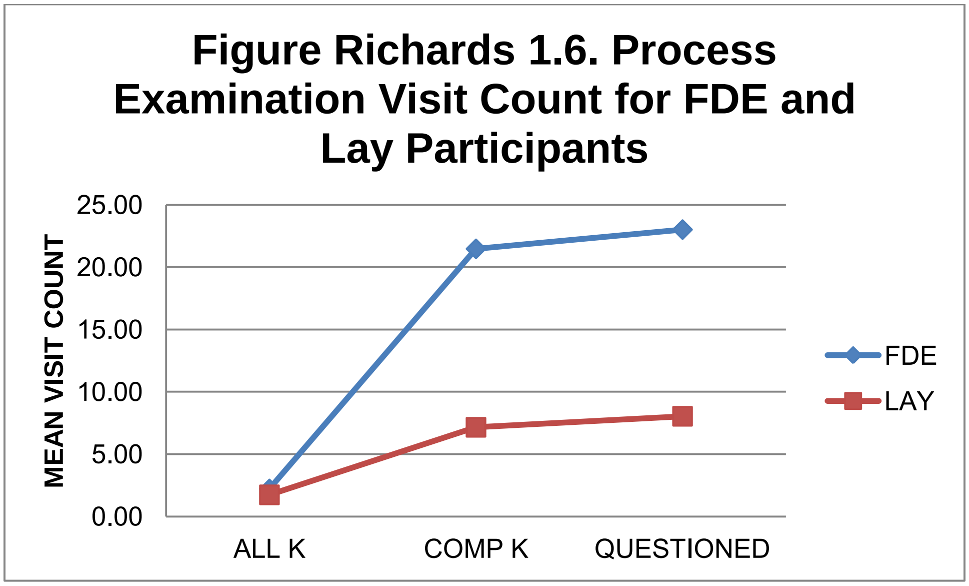
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	13.50	12.68	20.37	16.28	34.06	20.69
Lay	8.05	6.27	6.64	6.62	8.87	6.81

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .258, $F(3, 85) = 9.86$, $p < .001$, multivariate $\eta^2 = .258$. Figure Richards 1.6 presents the mean visit durations by AOI.

Figure Richards 1.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit duration in two of the three areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 87) = 29.05$, $p < .001$, partial $\eta^2 = .250$). Visit count in the known signature comparison stimulus (COMP K) was also statistically significant, $F(1, 87) = 27.85$, $p < .001$, partial $\eta^2 = .242$. No significant difference was found for the known signature stimulus (ALL K), $p = .295$, *ns*). Table Richards 1.3 presents the means and standard deviations for areas of interest by participant type.

Table Richards 1.3

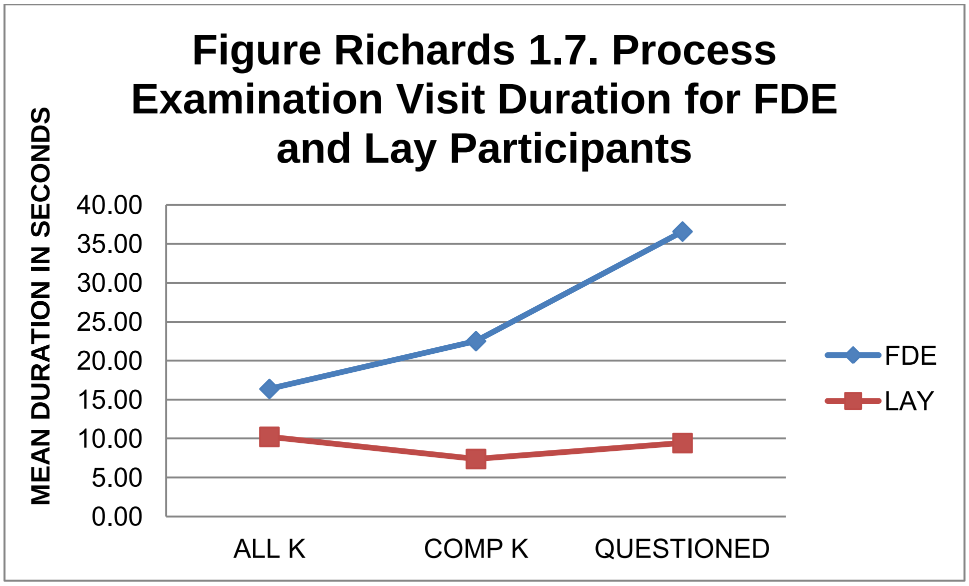
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.22	2.74	21.48	16.43	23.02	16.82
Lay	1.74	1.11	7.16	7.04	8.05	7.23

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .422, $F(3, 85) = 20.67$, $p < .001$, multivariate $\eta^2 = .422$. Figure Richards 1.7 presents the mean visit durations by AOI.

Figure Richards 1.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit duration in all three areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 87) = 59.52$, $p < .001$, partial $\eta^2 = .406$). Visit duration in the known signature comparison stimulus (COMP K) was also statistically significant, $F(1, 87) = 27.57$, $p < .001$, partial $\eta^2 = .241$. A significant difference was also found for the known signature stimulus (ALL K), $F(1, 87) = 5.78$, $p = .018$, partial $\eta^2 = .062$). Table Richards 1.4 presents the means and standard deviations for areas of interest by participant type.

Table Richards 1.4
Process Analysis Visit Duration for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	16.38	14.68	22.52	17.63	36.59	22.04
Lay	10.22	8.41	7.39	7.02	9.43	7.07

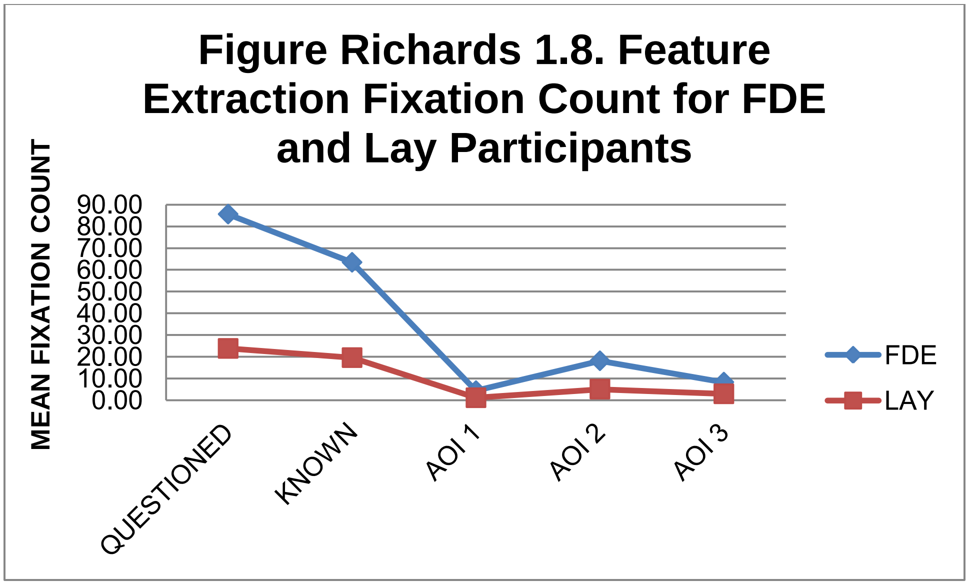
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .392, $F(5, 83) = 10.72$, $p < .001$, multivariate $\eta^2 = .392$. Figure Richards 1.8 presents the mean fixation counts by AOI.

Figure Richards 1.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 87) = 53.96$, $p < .001$, partial $\eta^2 = .383$, and $F(1, 87) = 30.00$, $p < .001$, partial $\eta^2 = .256$.

Fixation count in all AOIs was significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 23.32$, $p < .001$, partial $\eta^2 = .211$; AOI 2, $F(1, 87) = 41.61$, $p < .001$, partial $\eta^2 = .324$; AOI 3, $F(1, 87) = 24.35$, $p < .001$, partial $\eta^2 = .219$). Table Richards 1.5 presents the means and standard deviations for areas of interest by participant type.

Table Richards 1.5

Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

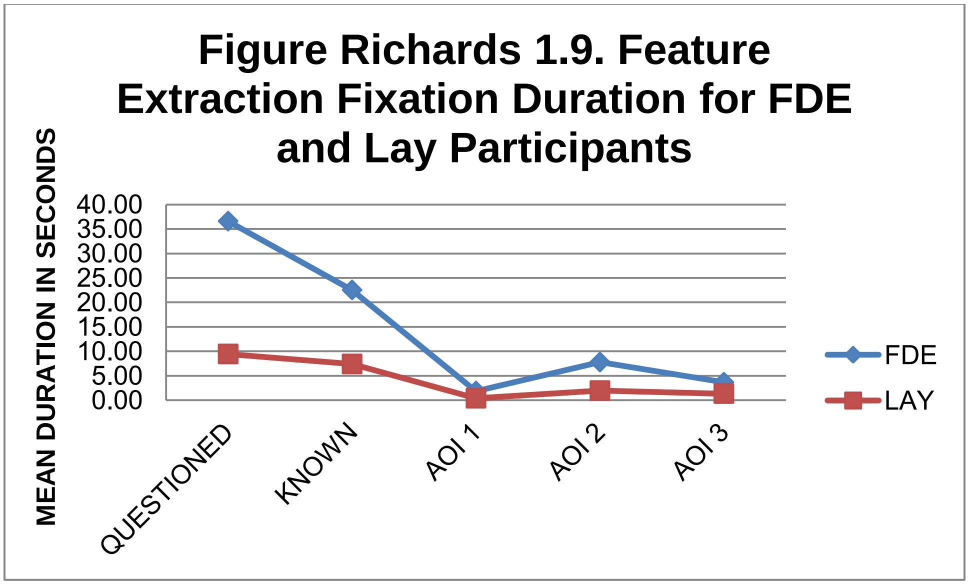
	QUESTIONED		KNOWN		AOI 1		AOI 2		AOI 3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***

FDE	85.59	52.58	63.43	49.58	4.41	4.30	18.13	12.60	8.33	6.59
Lay	23.81	17.12	19.58	17.81	1.14	1.17	5.09	4.22	2.95	2.84

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .428, $F(5, 83) = 12.44$, $p < .001$, multivariate $\eta^2 = .428$. Figure Richards 1.9 presents the mean fixation durations by AOI.

Figure Richards1.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 87) = 59.52$, $p < .001$, partial $\eta^2 = .406$, and $F(1, 87) = 27.57$, $p < .001$, partial $\eta^2 = .241$.

Fixation duration in all AOIs was significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 24.01$, $p < .001$, partial $\eta^2 = .216$; AOI 2, $F(1, 87) = 48.21$, $p < .001$, partial $\eta^2 = .357$; AOI 3, $F(1, 87) = 19.58$, $p < .001$, partial $\eta^2 = .184$). Table Richards 1.6 presents the means and standard deviations for areas of interest by participant type.

Table Richards 1.6

Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

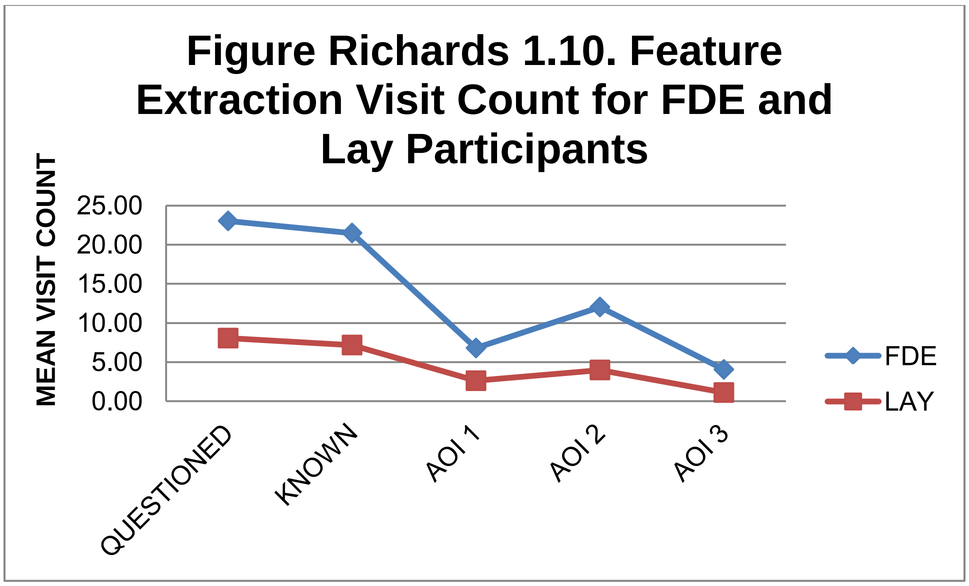
	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**		**AOI 3**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***

FDE	36.59	22.04	22.52	17.63	1.86	1.92	7.78	5.15	3.65	3.03
Lay	9.43	7.07	7.39	7.02	0.39	0.42	1.95	1.99	1.33	1.69

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .315, $F(5, 83) = 7.63$, $p < .001$, multivariate $\eta^2 = .315$. Figure Richards 1.10 presents the mean visit counts by AOI.

Figure Richards 1.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in all areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 87) = 29.05$, $p < .001$, partial $\eta^2 = .250$, and $F(1, 87) = 27.85$, $p < .001$, partial $\eta^2 = .242$.

Fixation count in all AOIs was significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 24.48$, $p < .001$, partial $\eta^2 = .220$; AOI 2, $F(1, 87) = 37.88$, $p < .001$, partial $\eta^2 = .303$; AOI 3, $F(1, 87) = 21.89$, $p < .001$, partial $\eta^2 = .201$). Table Richards 1.7 presents the means and standard deviations for areas of interest by participant type.

Table Richards 1.7

Feature Extraction Analysis Visit Count for FDE and Lay Participants

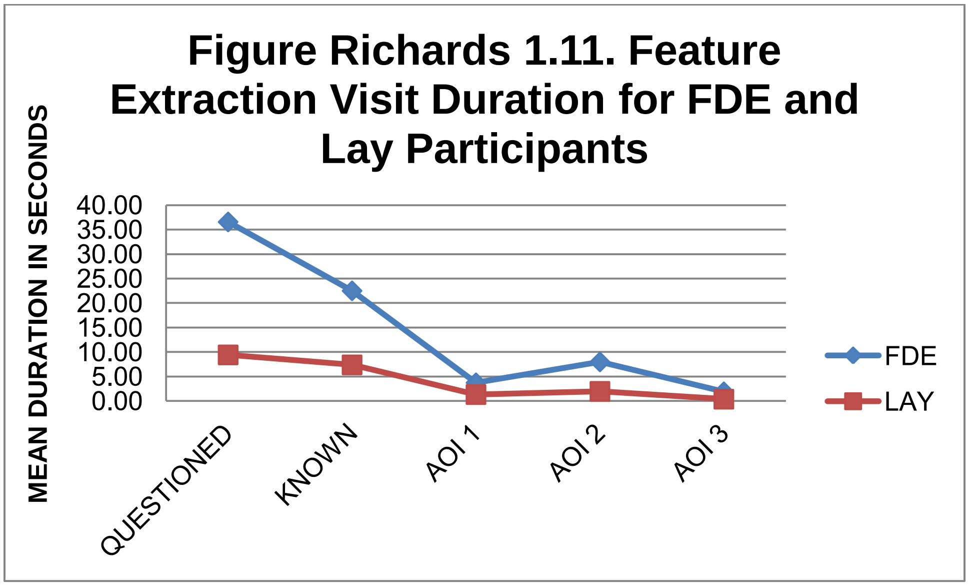
	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**		**AOI 3**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***

FDE	23.02	16.82	21.48	16.43	6.78	5.32	12.02	8.03	4.04	3.77
Lay	8.05	7.23	7.16	7.04	2.60	2.53	3.98	3.10	1.09	1.06

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .429, $F(5, 83) = 12.45$, $p < .001$, multivariate $\eta^2 = .429$. Figure Richards 1.11 presents the mean visit durations by AOI.

Figure Richards 1.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit duration in all areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 87) = 59.52$, $p < .001$, partial $\eta^2 = .406$, and F(1, 87) = 27.57, $p < .001$, partial $\eta^2 = .241$.

Fixation count in all AOIs was significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 24.00$, $p < .001$, partial $\eta^2 = .216$; AOI 2, $F(1, 87) = 48.22$, $p < .001$, partial $\eta^2 = .357$; AOI 3, $F(1, 87) = 19.89$, $p < .001$, partial $\eta^2 = .186$). Table Richards 1.8 presents the means and standard deviations for areas of interest by participant type.

Table Richards 1.8

Feature Extraction Analysis Visit Duration for FDE and Lay Participants

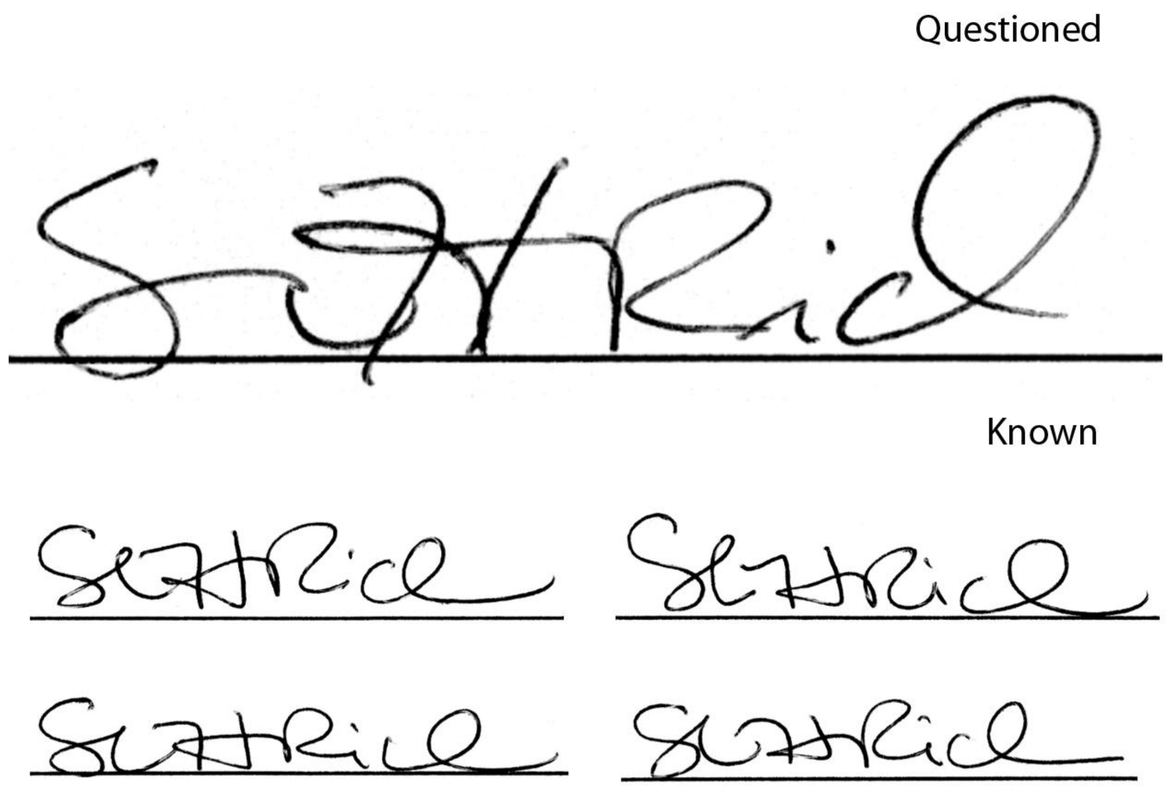
	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**		**AOI 3**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***

FDE	36.59	22.04	22.52	17.63	3.73	3.12	8.00	5.33	1.89	1.97
Lay	9.43	7.07	7.39	7.02	1.34	1.69	1.98	2.05	0.39	0.42

Richards Signature 2: Freehand Simulation (Non-Genuine)

Of the 49 FDE participants, 45 responded correctly that the signature was non-genuine, while 4 responded that the signature was genuine. All 43 Lay participants responded correctly that the signature was non-genuine. This difference was not statistically significant, $p = .055$, *n*s. Figure Richards 2.1 presents the comparison view of this signature.

Figure Richards 2.1. Questioned-Known Comparison Stimulus for Richards Signature 2.

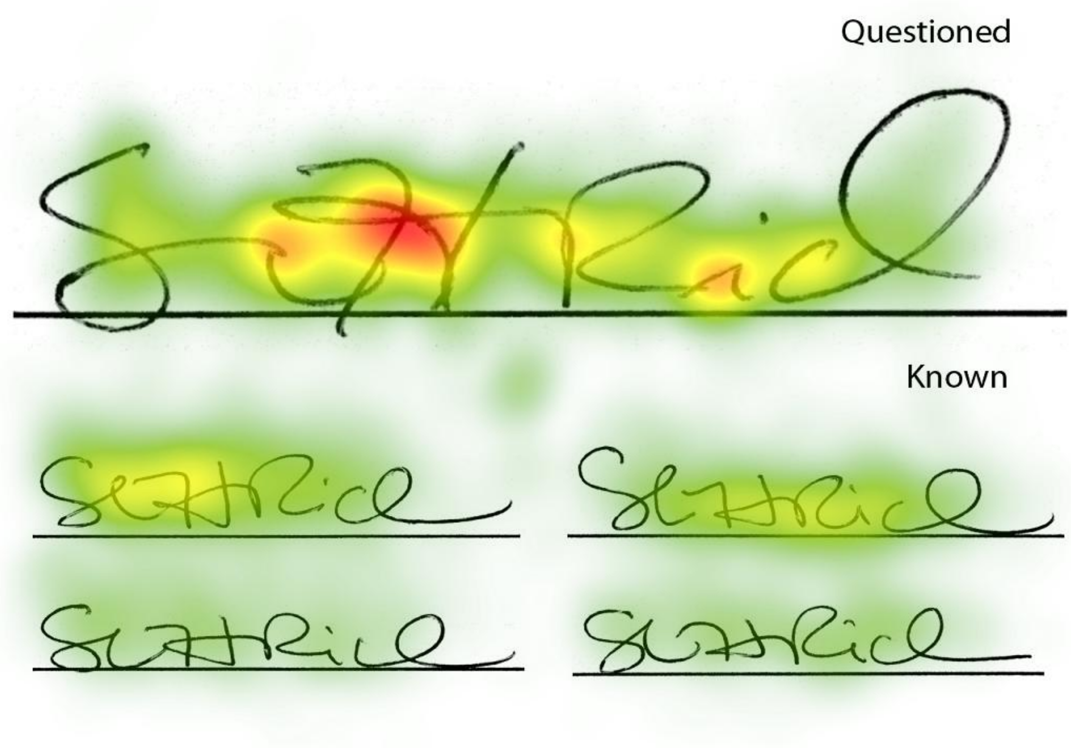


Selection of Areas of Interest (AOIs)

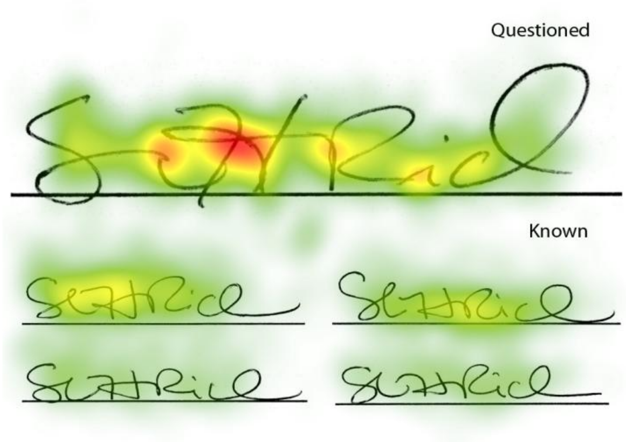
Figure Richards 2.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were four locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of four AOIs for this stimulus. Figure Richards 2.3 presents the location of the AOIs identified in the heat map.

Figure Richards 2.2. Heat map for Richards Signature 2, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

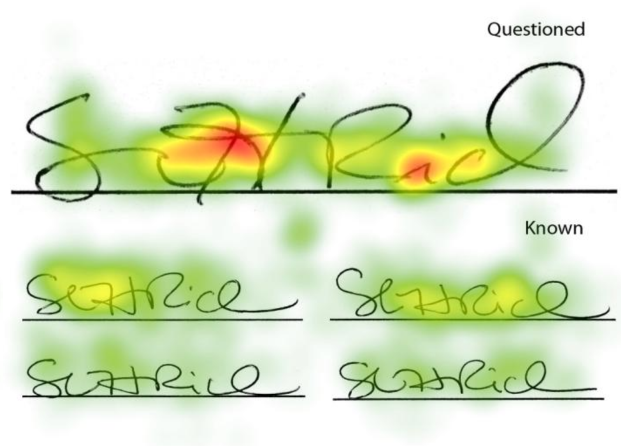
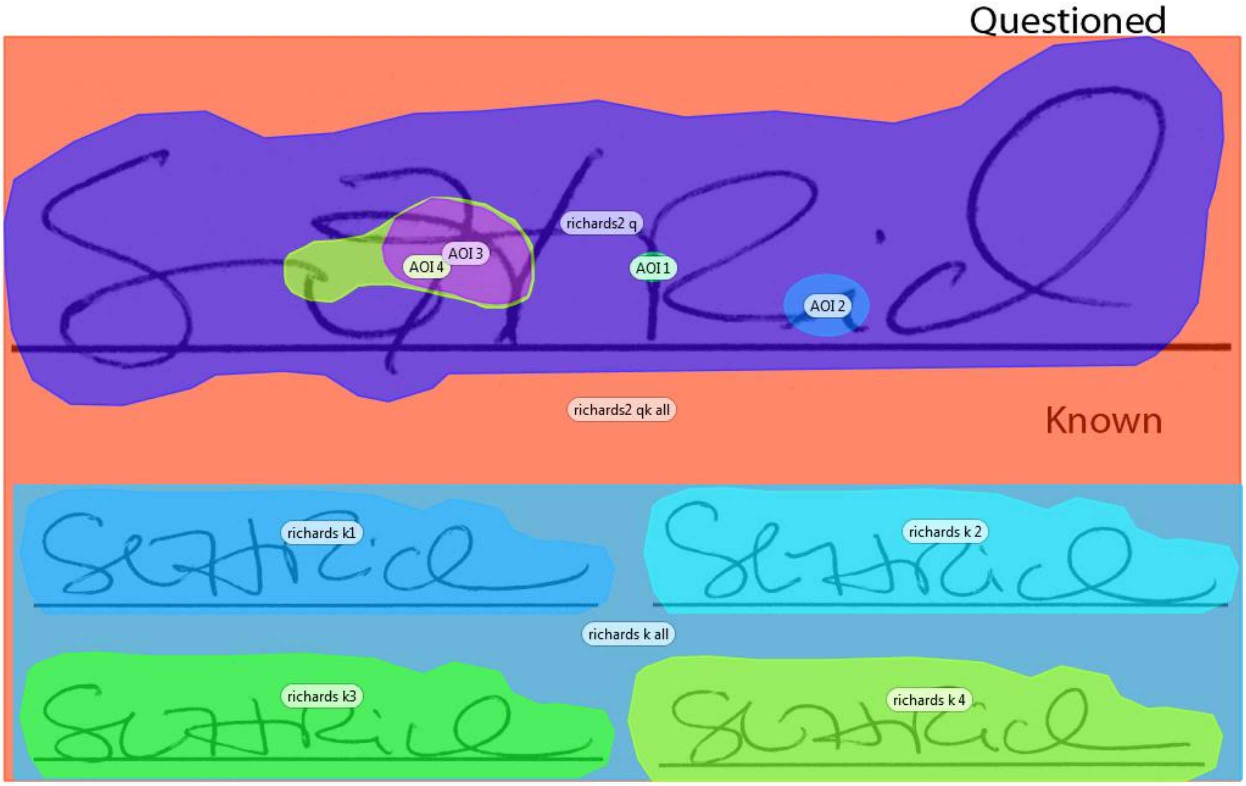


Figure Richards 2.3. Areas of Interest (AOIs) for Richards Signature 2.



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

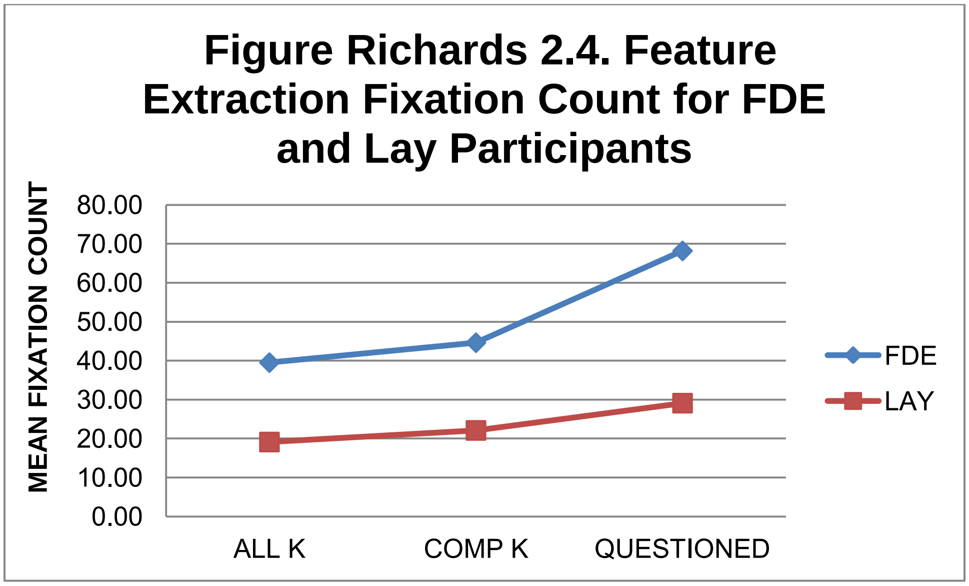
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Richards known signature stimulus (Knowns, not pictured here), Richards 1 K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Richards 2Q (the Richards questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 4) are included in subsequent analyses. Figure Richards 1.3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .253, $F(3, 85) = 21.19$, $p < .001$, multivariate $\eta^2 = .253$. Figure Richard 2.4 presents the mean fixation counts by AOI.

Figure Richards 2.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all three areas of interest. Total fixation count for both the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for the Lay participants, (questioned signature, $F(1, 87) = 20.99$, $p < .001$, partial $\eta^2 = .194$; known signature comparison stimulus(COMPK), ($F(1, 87) = 11.10$, $p = .001$, partial $\eta^2 = .113$). Fixation count in the known comparison signature stimulus (ALL K) was also significantly different, $F(1, 87) = 7.17$, $p = .009$, partial $\eta^2 = .076$. Table Richards 3.1 presents the means and standard deviations for areas of interest by participant type.

Table Richards 2.1

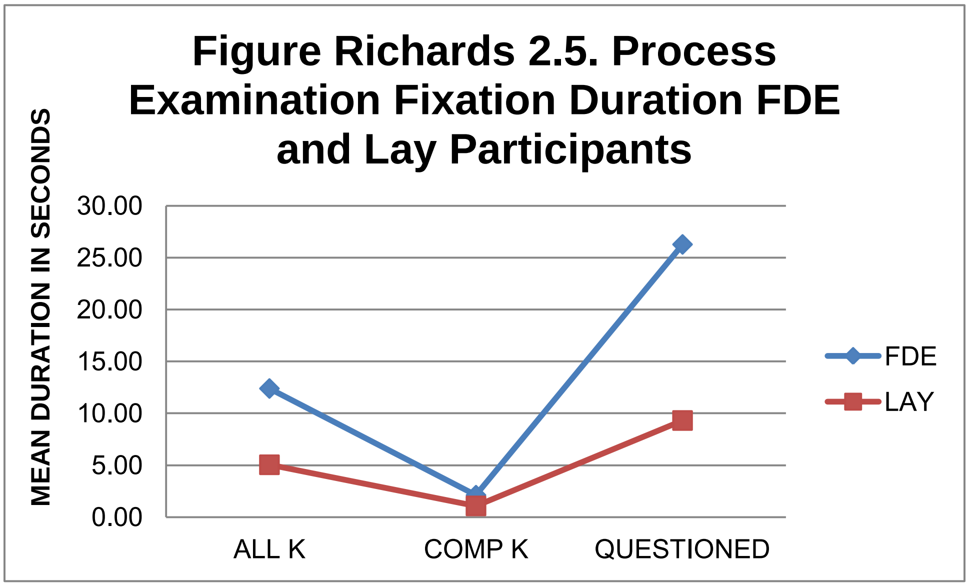
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	39.52	47.48	44.63	39.10	68.20	48.15
Lay	19.14	15.87	22.12	21.54	29.12	29.42

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .293, $F(3, 85) = 11.76$, $p < .001$, multivariate $\eta^2 = .293$. Figure Richards 2.5 presents the mean fixation duration by AOI.

Figure Richards 2.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all three areas of interest. Total fixation duration for both the questioned signature and the known signature comparison stimulus (COMP K)was significantly greater for the FDEs than for Lay participants (questioned signature, $F(1, 87) = 29.17$, $p < .001$, partial $\eta^2 = .251$; $F(1, 87) = 4.99$, $p = .028$, partial $\eta^2 = .054$). A significant difference was also found for the known signature comparison stimulus (ALL K), $F(1, 87) = 6.57$, $p = .012$, partial $\eta^2 = .070$. Table Richards 2.2 presents the means and standard deviations for areas of interest by participant type.

Table Richards 2.2

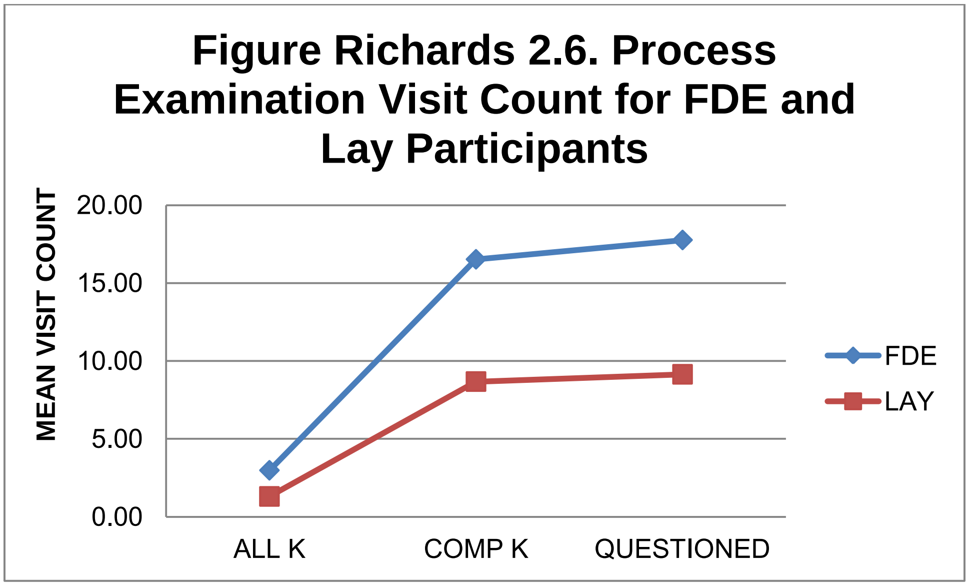
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	12.39	18.21	2.11	2.75	26.27	18.97
Lay	5.04	4.80	1.07	1.35	9.30	8.29

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .189, $F(3, 85) = 6.58$, $p < .001$, multivariate $\eta^2 = .189$. Figure Richards 2.6 presents the mean visit durations by AOI.

Figure Richards 2.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit duration in all three areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 87) = 12.62$, $p = .001$, partial $\eta^2 = .27$). Visit count in the known signature comparison stimulus (COMP K) was also statistically significant, $F(1, 87) = 10.32$, $p = .002$ partial $\eta^2 = .106$. A significant difference was found for the known signature stimulus (ALL K), $F(1, 87) = 8.35$, $p = .005$, partial $\eta^2 = .088$). Table Richards 2.3 presents the means and standard deviations for areas of interest by participant type.

Table Richards 2.3

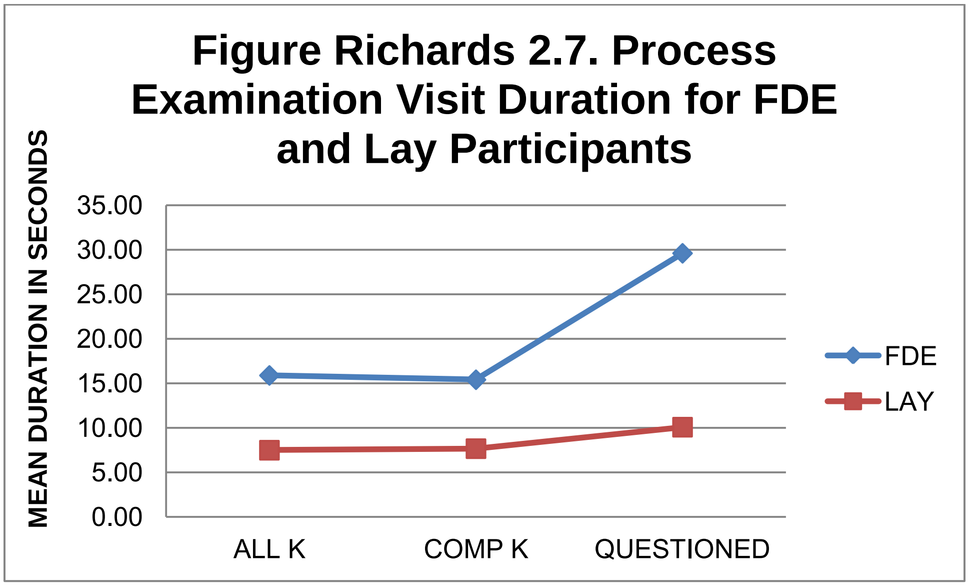
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.98	3.75	16.52	13.62	17.76	13.56
Lay	1.30	0.64	8.67	8.73	9.14	8.60

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .323, $F(3, 85) = 13.51$, $p < .001$, multivariate $\eta^2 = .323$. Figure X presents the mean visit durations by AOI.

Figure Richards 2.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit duration in all three areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus (COMP K) was significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 87) = 31.79$, $p < .001$, partial $\eta^2 = .268$). Visit duration in the known signature comparison stimulus (ALL K) was also statistically significant, $F(1, 87) = 10.55$, $p = .002$, partial $\eta^2 = .108$. A significant difference was also found for the known signature stimulus, $F(1, 87) = 6.04$, $p = .016$, partial $\eta^2 = .065$). Table Richards 2.4 presents the means and standard deviations for areas of interest by participant type.

Table Richards 2.4

Process Analysis Visit Duration for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	15.89	21.40	15.41	14.00	29.61	20.95
Lay	7.49	6.85	7.66	7.17	10.08	9.05

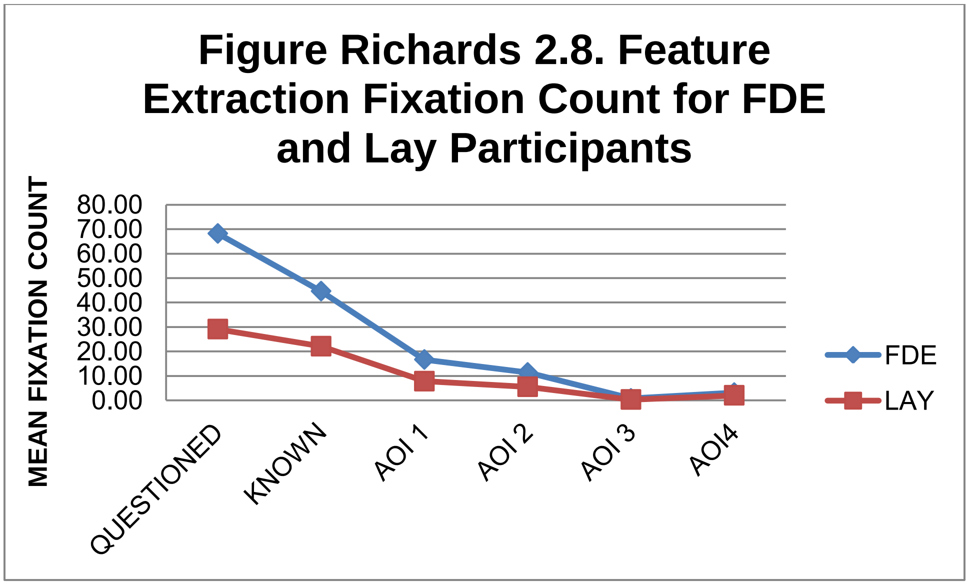
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .251, $F(6, 82) = 4.57$, $p < .001$, multivariate $\eta^2 = .251$. Figure Richards 2.8 presents the mean fixation counts by AOI.

Figure Richards 2.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all but two areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 87) = 20.99$, $p < .001$, partial $\eta^2 = .194$, and $F(1, 87) = 11.10$, $p = .001$, partial $\eta^2 = .113$.

Fixation count was significantly greater for FDEs than for Lay participants in two AOIs (AOI 1, $F(1, 87) = 22.42$, $p < .001$, partial $\eta^2 = .205$; AOI 2, $F(1, 87) = 18.44$, $p < .001$, partial $\eta^2 = .175$). No significant difference was found in AOI 3 ($F(1, 87) = 3.82$, $p = .054$, partial $\eta^2 = .042$, *ns*) or AOI 4 ($F(1, 87) = 3.51$, $p = .064$, partial $\eta^2 = .039$, *ns*). Table Richard 2.5 presents the means and standard deviations for areas of interest by participant type.

Table Richards 2.5

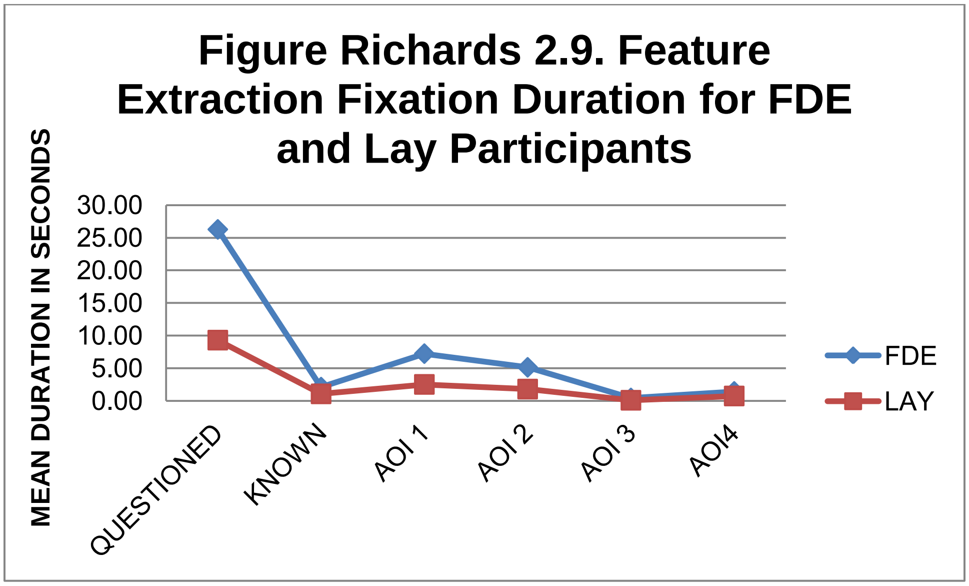
Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2		AOI 3		AOI 4	
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	68.20	48.15	44.63	39.10	16.67	9.92	11.37	7.35	0.76	1.30	3.13	2.55
Lay	29.12	29.42	22.12	21.54	7.81	7.47	5.53	5.21	0.33	0.68	2.05	2.90

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .343, $F(6, 82) = 7.12$, $p < .001$, multivariate $\eta^2 = .343$. Figure Richards 2.9 presents the mean visit durations by AOI.

Figure Richards 2.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 87) = 29.17$, $p < .001$, partial $\eta^2 = .251$, and $F(1, 87) = 4.99$, $p = .028$, partial $\eta^2 = .054$.

Fixation duration in all AOIs was significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 36.98$, $p < .001$, partial $\eta^2 = .298$; AOI 2, $F(1, 87) = 30.24$, $p < .001$, partial $\eta^2 = .258$; AOI 3, $F(1, 87) = 5.46$, $p = .022$, partial $\eta^2 = .059$; AOI 4, $F(1, 87) = 7.64$, $p = .007$, partial $\eta^2 = .081$). Table Richards 2.6 presents the means and standard deviations for areas of interest by participant type.

Table Richards 2.6

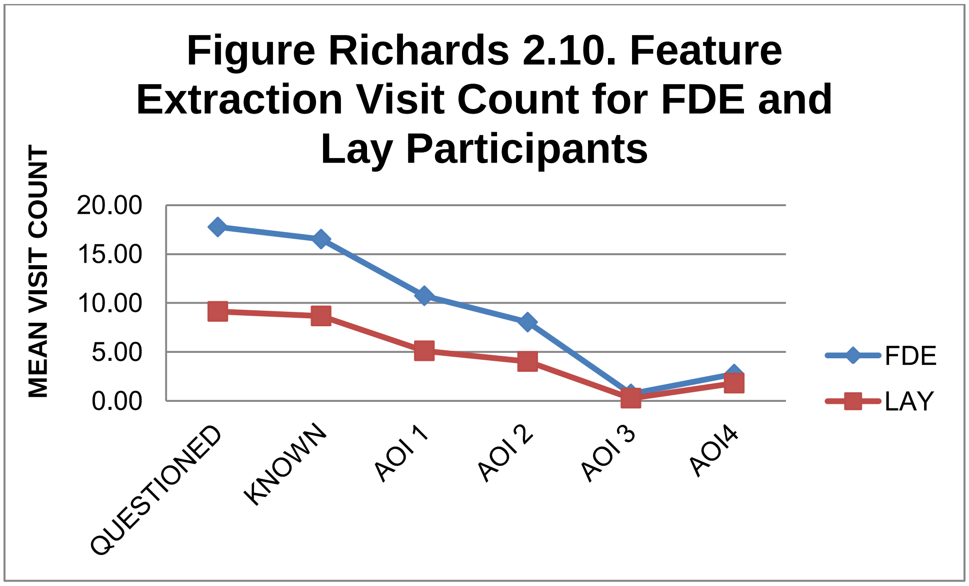
Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**		**AOI 3**		**AOI 4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	26.27	18.97	2.11	2.75	7.23	4.66	5.14	3.66	0.44	0.96	1.45	1.23
Lay	9.30	8.29	1.07	1.35	2.52	2.09	1.81	1.59	0.09	0.20	0.75	1.17

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .257, $F(6, 82) = 4.72$, $p < .001$, multivariate $\eta^2 = .257$. Figure Richards 2.10 presents the mean visit counts by AOI.

Figure Richards 2.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in all but one area of interest. Total visit count for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 87) = 12.62$, $p = .001$, partial $\eta^2 = .127$, and $F(1, 87) = 10.32$, $p = .002$, partial $\eta^2 = .106$.

Visit count in three AOIs was significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 25.59$, $p < .001$, partial $\eta^2 = .227$; AOI 2, $F(1, 87) = 21.13$, $p < .001$, partial $\eta^2 = .195$; AOI 3, $F(1, 87) = 4.76$, $p = .032$, partial $\eta^2 = .052$). No significant difference was found in AOI 4, $p = .059$, *ns*. Table Richards 2.7 presents the means and standard deviations for areas of interest by participant type.

Table Richards 2.7

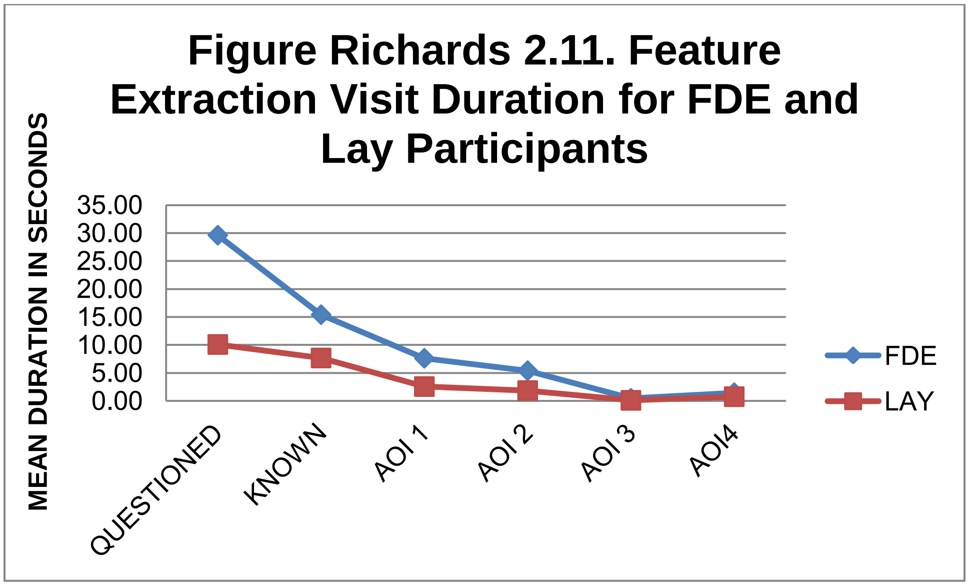
Feature Extraction Analysis Visit Count for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2		AOI 3		AOI 4	
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	17.76	13.56	16.52	13.62	10.74	5.84	8.04	4.65	0.72	1.20	2.74	2.15
Lay	9.14	8.60	8.67	8.73	5.12	4.51	4.02	3.47	0.28	0.55	1.81	2.41

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .393, $F(6, 82) = 8.84$, $p < .001$, multivariate $\eta^2 = .393$. Figure Richards 2.11 presents the mean visit durations by AOI.

Figure Richards 2.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit duration in all areas of interest. Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit duration in all areas of interest.

Total visit duration for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 87) = 31.79$, $p < .001$, partial $\eta^2 = .268$, and $F(1, 87) = 10.55$, $p = .002$, partial $\eta^2 = .108$. Fixation count in all AOIs was significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 39.45$, $p < .001$, partial $\eta^2 = .312$; AOI 2, $F(1, 87) = 33.04$, $p < .001$, partial $\eta^2 = .275$; AOI 3, $F(1, 87) = 5.52$, $p = .021$, partial $\eta^2 = .060$; AOI 4, $F(1, 87) = 7.76$, $p < .007$, partial $\eta^2 = .082$). Table Richards 2.8 presents the means and standard deviations for areas of interest by participant type.

Table Richards 2.8

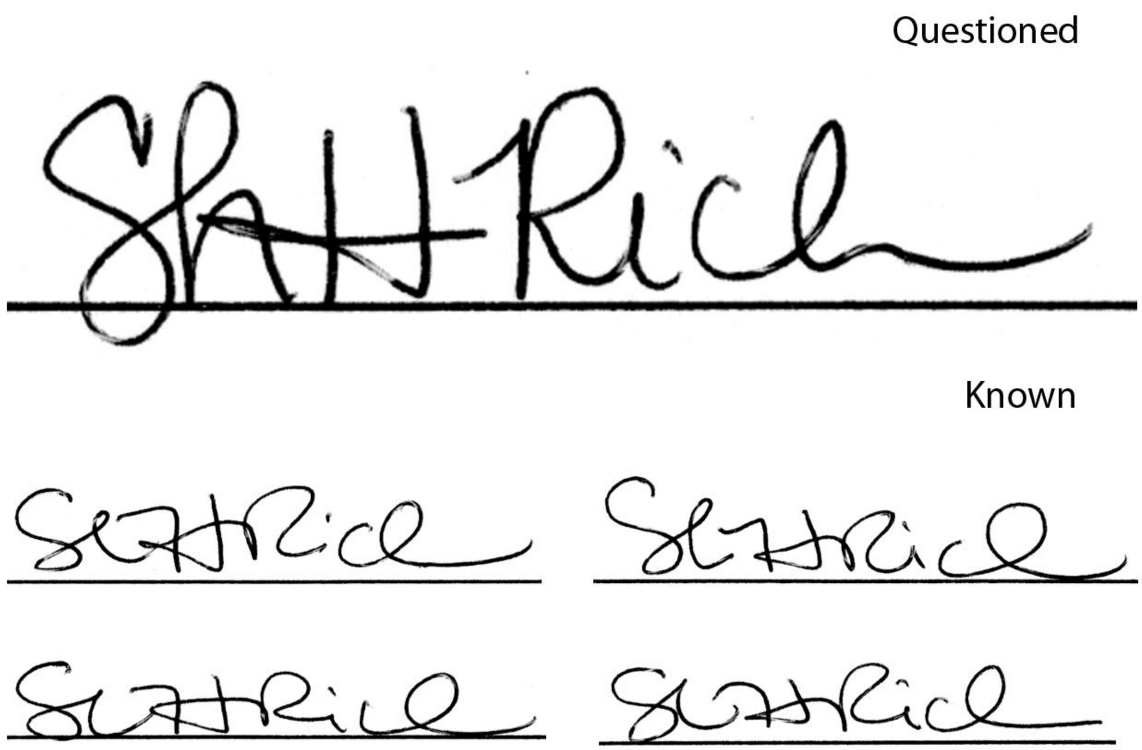
Feature Extraction Analysis Visit Duration for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2		AOI 3		AOI 4	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	29.61	20.95	15.41	14.00	7.61	4.86	5.39	3.75	0.45	0.97	1.46	1.24
Lay	10.08	9.05	7.66	7.17	2.56	2.13	1.83	1.61	0.09	0.20	0.75	1.17

Richards Signature 3: Traced (Non-Genuine)

Of the 49 FDE participants, 46 responded correctly that the signature was non-genuine, while 2 responded that the signature was genuine. One FDE declined to respond. Of the 43 Lay participants, 38 responded correctly that the signature was non-genuine, while 5 responded that the signature was genuine. This difference was not statistically significant, $p = .263$, *n*s. Figure Richards 3.1 presents the comparison view of this signature.

Figure Richards 3.1. Questioned-Known Comparison Stimulus for Richards Signature 3.

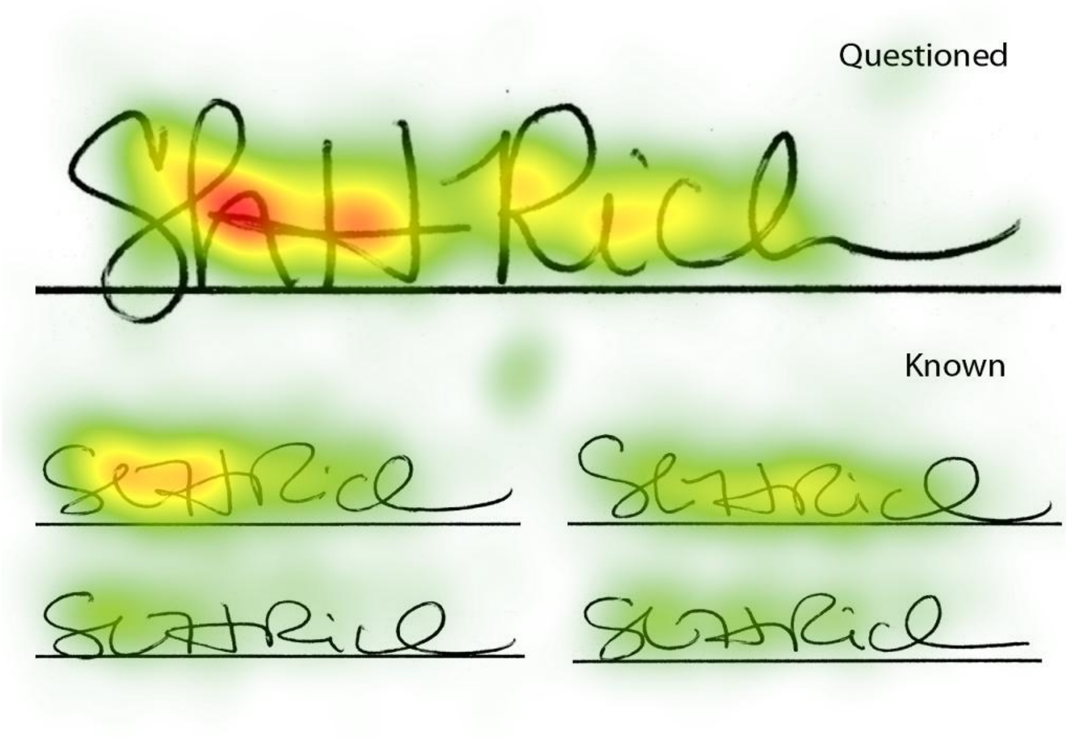


Selection of Areas of Interest (AOIs)

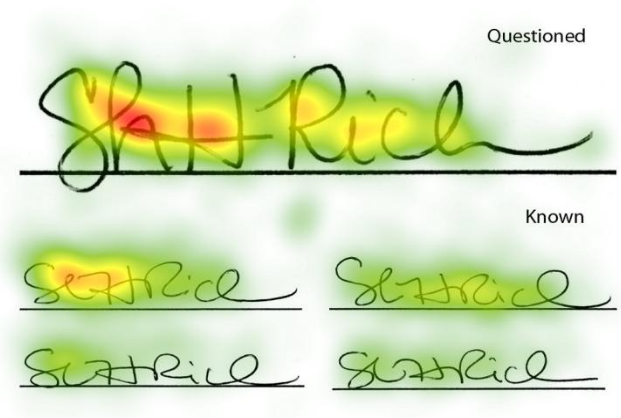
Figure Richards 3.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were six locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of six AOIs for this stimulus. Figure Richards 3.3 presents the location of the AOIs identified in the heat map.

Figure Richards 3.2. Heat map for Richards signature 3, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

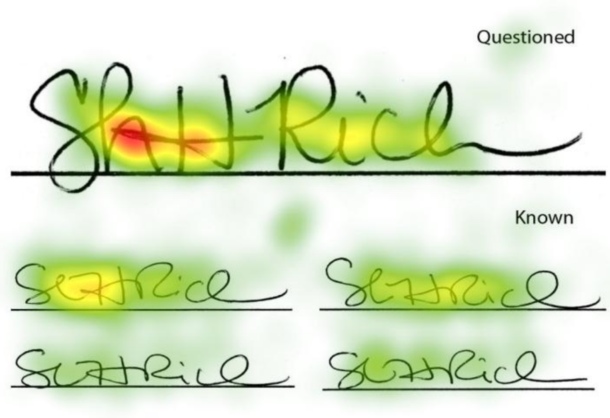


Figure Richards 3.3. Areas of Interest (AOIs) for Richards Signature 3.

Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

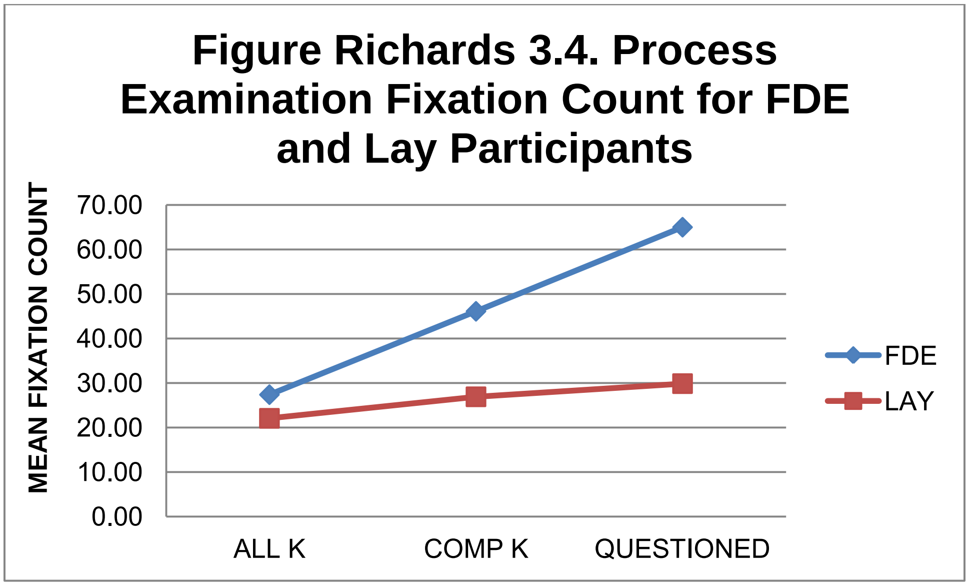
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Richards known signature stimulus (Knowns, not pictured here), Richards 1 K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Richards 3Q (the Richards questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 6) are included in subsequent analyses. Figure Richards 3.3 demonstrates all AOIs identified for this signature.

<u>*Total Fixation Count*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .245, $F(3, 86) = 9.32$, $p < .001$, multivariate $\eta^2 = .245$. Figure Richards 3.4 presents the mean fixation counts by AOI.

Figure Richards 3.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in two of the three areas of interest. Total fixation count for both the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for the Lay participants, (questioned signature, $F(1, 88)$ 16.89, $p < .001$, partial $\eta^2 = .161$; known signature comparison stimulus (COMP K), ($F(1, 88) = 5.60$, $p = .020$, partial $\eta^2 = .060$). Fixation count in the known signature stimulus (ALL K) was not significantly different, $p = .449$, *ns*. Table Richards 3.1 presents the means and standard deviations for areas of interest by participant type.

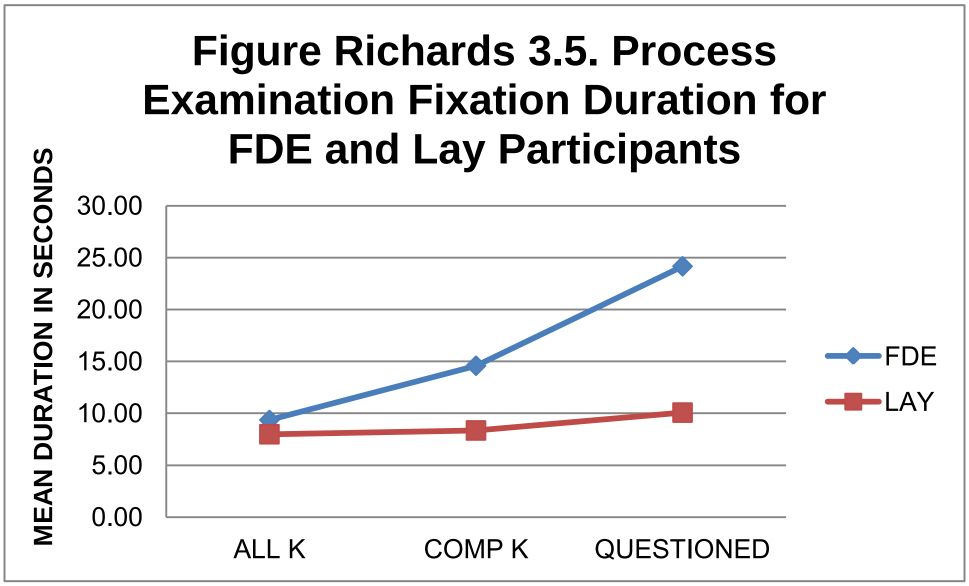
Table Richards 3.1
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	27.38	42.38	46.11	38.93	65.00	44.37
Lay	22.07	18.25	26.91	37.94	29.86	35.84

<u>Total Fixation Duration</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .254, $F(3, 86) = 9.74$, $p < .001$, multivariate $\eta^2 = .254$. Figure Richards 3.5 presents the mean fixation duration by AOI.

Figure Richards 3.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in two of the three areas of interest. Total fixation duration for both the questioned signature and the known signature comparison stimulus (COMP K) was significantly greater for the FDEs than for Lay participants (questioned signature, $F(1, 88) = 20.04$, $p < .001$, partial $\eta^2 = .186$; $F(1, 88) = 6.98$, $p = .010$, partial $\eta^2 = .073$). No significant difference was found for the known signature stimulus (ALL K), $p = .613$, *ns*. Table Richards 3.2 presents the means and standard deviations for areas of interest by participant type.

Table Richards 3.2

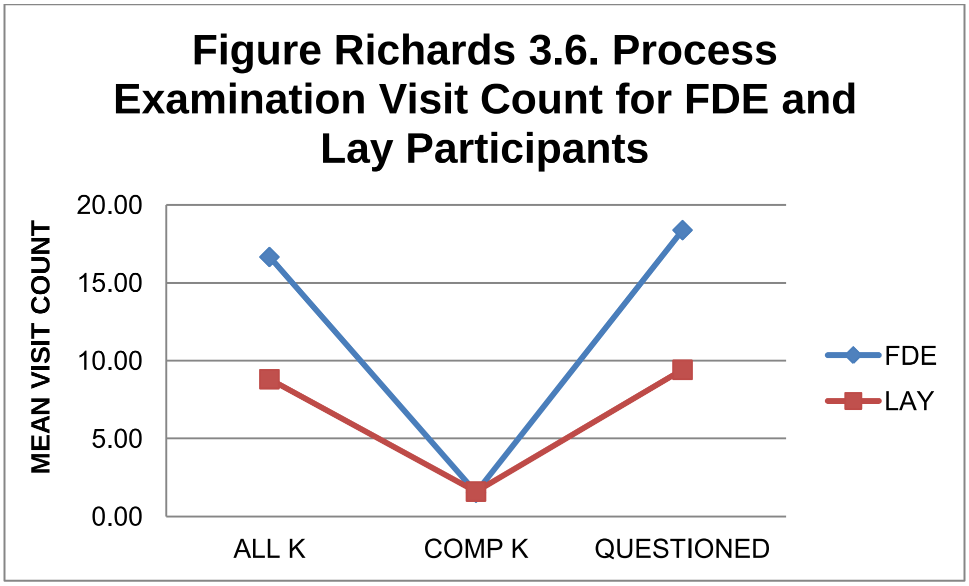
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	9.35	15.23	14.58	11.99	24.16	17.13
Lay	7.98	9.51	8.34	10.23	10.07	12.04

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .201, $F(3, 86) = 7.22$, $p < .001$, multivariate $\eta^2 = .201$. Figure Richards 3.6 presents the mean visit counts by AOI.

Figure Richards 3.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in two of the three areas of interest. Total visit count for the questioned signature was significantly greater for FDEs than for Lay participants, $F(1, 87) = 11.72$, $p = .001$, partial $\eta^2 = .118$). Visit count in the known signature stimulus (ALL K) was also statistically significant, $F(1, 87) = 8.57$, $p = .004$ partial $\eta^2 = .089$. No significant difference was found for the known signature stimulus (COMP K), $p = .790$, *ns*). Table Richards 3.3 presents the means and standard deviations for areas of interest by participant type.

Table Richards 3.3

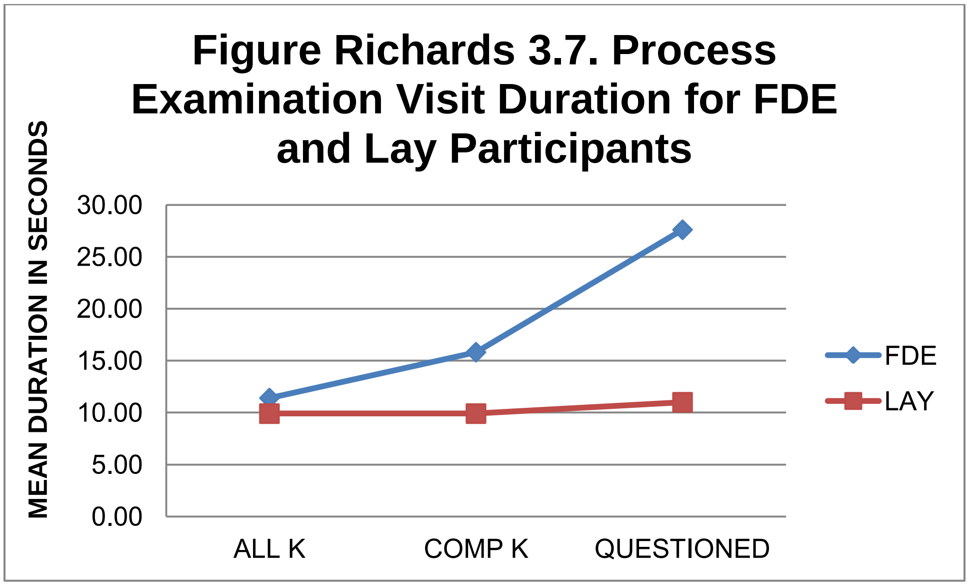
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	16.66	12.22	1.53	1.21	18.38	11.70
Lay	8.81	13.22	1.60	1.37	9.42	13.14

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .292, $F(3, 86) = 11.80$, $p < .001$, multivariate $\eta^2 = .292$. Figure Richards 3.7 presents the mean visit durations by AOI.

Figure Richards 3.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit duration in all three areas of interest. Total visit duration for the questioned signature was significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 88) = 23.87$, $p < .001$, partial $\eta^2 = .213$). Visit duration in the known signature comparison stimulus (COMP K) was also statistically significant, $F(1, 88) = 5.26$, $p = .024$, partial $\eta^2 = .056$. No significant difference was found for the known signature stimulus (ALL K), $p = .632$, *ns*). Table Richards 3.4 presents the means and standard deviations for areas of interest by participant type.

Table Richards 3.4

Process Analysis Visit Duration for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	11.41	18.15	15.82	13.10	27.61	18.79
Lay	9.91	9.79	9.91	12.03	11.00	12.53

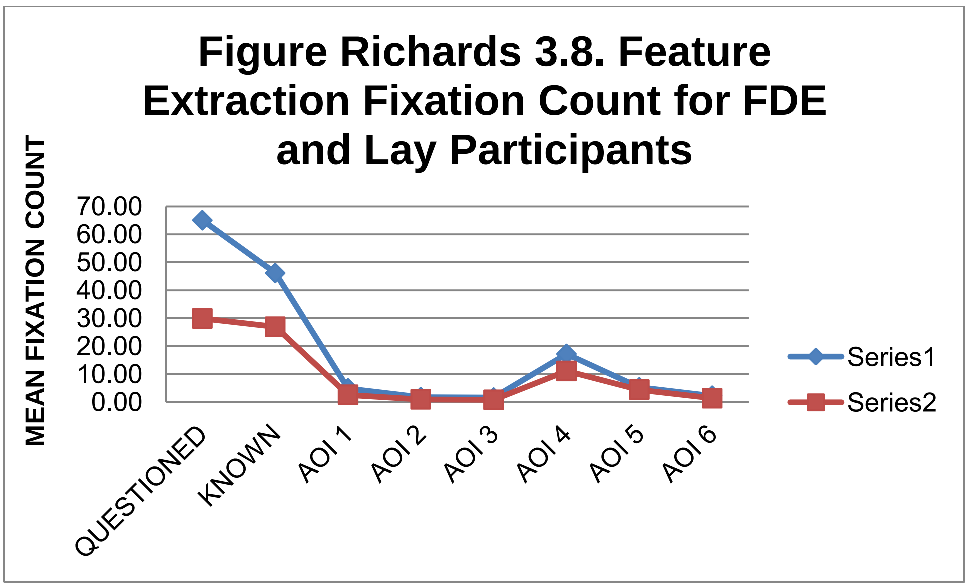
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .371, $F(6, 81) = 4.57$, $p < .001$, multivariate $\eta^2 = .371$. Figure Richards 3.8 presents the mean fixation counts by AOI.

Figure Richards 3.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all but three areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 88) = 16.89$, $p < .001$, partial $\eta^2 = .161$, and $F(1, 88) = 5.60$, $p = .020$, partial $\eta^2 = .060$.

Fixation count was significantly greater for FDEs than for Lay participants in three AOIs (AOI 1, $F(1, 88) = 3.99$, $p < .049$, partial $\eta^2 = .043$; AOI 3, $F(1, 88) = 5.17$, $p = .025$, partial $\eta^2 = .055$; AOI 4, $F(1, 88) = 4.78$, $p = .031$, partial $\eta^2 = .052$).

No significant difference was found in AOI 2 ($p = .056$, *ns*), AOI 5($p = .461$, *ns*), or AOI 6 ($p = .141$, *ns*). Table Richards 3.5 presents the means and standard deviations for areas of interest by participant type.

Table Richards 3.5

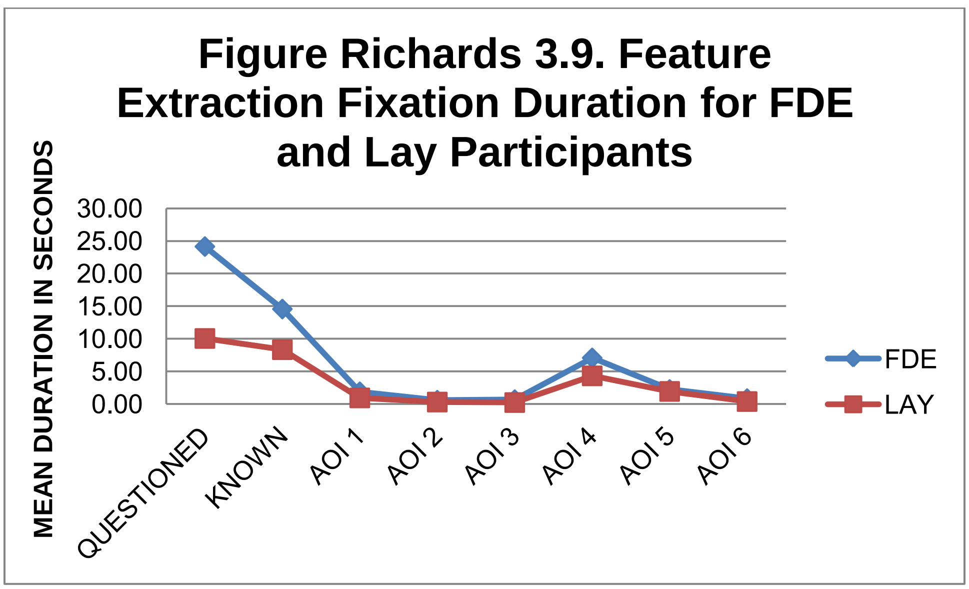
Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	65.00	44.37	46.11	38.93	4.85	4.91	1.72	2.25
Lay	29.86	35.84	26.91	37.94	2.58	5.85	0.95	1.36
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	1.57	1.86	17.17	14.78	5.23	5.11	2.23	3.42
Lay	0.77	1.46	11.09	11.15	4.42	5.34	1.35	1.97

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .358, $F(6, 81) = 5.64$, $p < .001$, multivariate $\eta^2 = .358$. Figure Richards 3.9 presents the mean fixation durations by AOI.

Figure Richards 3.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all but one area of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 88) = 20.04$, $p < .001$, partial $\eta^2 = .186$, and $F(1, 88) = 6.98$, $p = .010$, partial $\eta^2 = .073$.

Fixation duration in all AOI was significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 5.86$, $p = .018$, partial $\eta^2 = .062$; AOI 2, $F(1, 88) = 4.24$, $p = .043$, partial $\eta^2 = .046$; AOI 3, $F(1, 88) = 8.21$, $p = .005$, partial $\eta^2 = .085$; AOI 4, $F(1, 88) = 5.46$, $p = .022$, partial $\eta^2 = .058$; AOI 6, $F(1, 88) = 4.74$, $p = .032$, partial $\eta^2 = .051$).

No significant difference was found for AOI 5, p = .553, *ns*. Table Richards 3.6 presents the means and standard deviations for areas of interest by participant type.

Table Richards 3.6

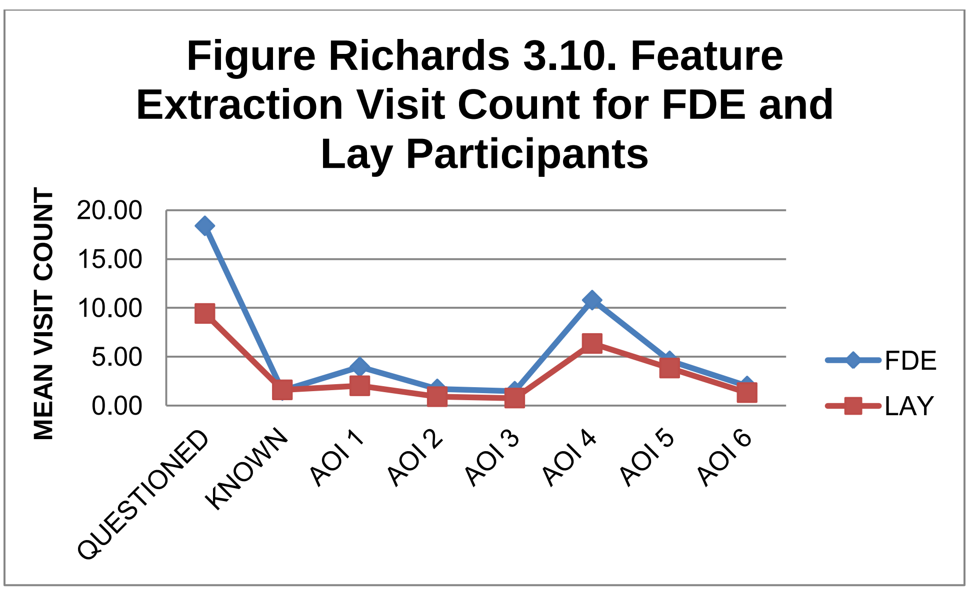
Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	24.16	17.13	14.58	11.99	1.89	1.98	0.60	0.74
Lay	10.07	12.04	8.34	10.23	0.95	1.66	0.32	0.53
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	0.69	0.93	7.09	6.50	2.25	2.59	0.85	1.26
Lay	0.24	0.47	4.33	4.38	1.95	2.18	0.40	0.55

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .233, $F(8, 81) = 3.08$, p = .004, multivariate η^2 = .233. Figure Richards 3.10 presents the mean visit counts by AOI.

Figure Richards 3.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in all but three areas of interest. Total visit count for the questioned signature was significantly greater for FDEs than for Lay participants, $F(1, 88) = 11.72$, $p = .001$, partial $\eta^2 = .118$.

Visit count in four AOIs was significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 5.19$, $p = .025$, partial $\eta^2 = .056$; AOI 2, $F(1, 88) = 4.20$, $p = .043$, partial $\eta^2 = .046$; AOI 3, $F(1, 88) = 4.55$, $p = .036$, partial $\eta^2 = .049$; AOI 4, $F(1, 88) = 7.27$, $p = .008$, partial $\eta^2 = .076$).

No significant difference was found in and the known signature comparison stimulus, $p = .790$, *ns*). No significant differences were found in AOI 5 or AOI 6 ($p = .423$, *ns*; $p = .189$, *ns*). Table Richards 3.7 presents the means and standard deviations for areas of interest by participant type.

Table Richards 3.7

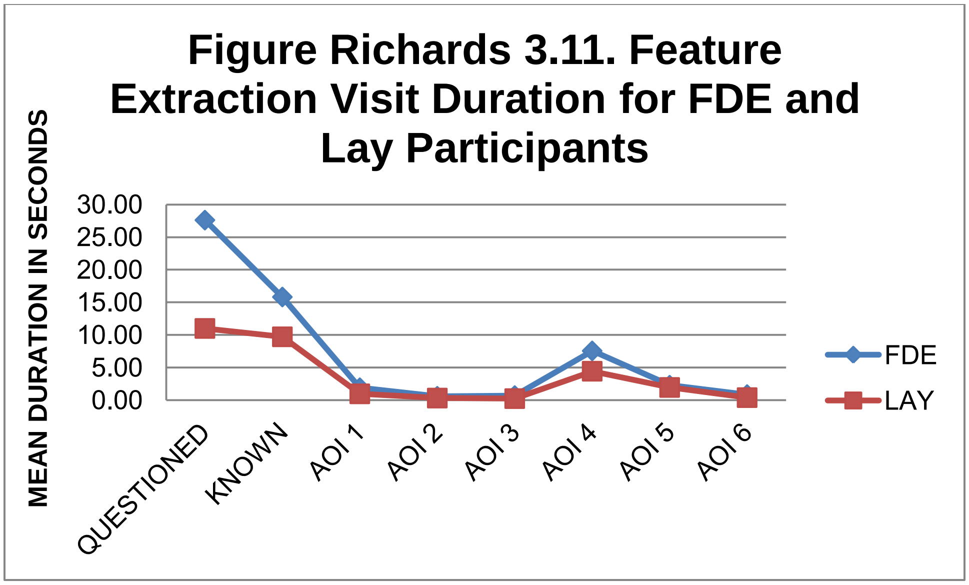
Feature Extraction Analysis Visit Count for FDE and Lay Participants

	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	18.38	11.70	1.53	1.21	3.96	3.78	1.70	2.25
Lay	9.42	13.14	1.60	1.37	2.02	4.28	0.91	1.23
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.47	1.64	10.79	8.67	4.57	4.42	2.00	2.84
Lay	0.77	1.46	6.35	6.71	3.84	4.25	1.33	1.85

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .381, $F(8, 81) = 6.24$, $p < .001$, multivariate $\eta^2 = .381$. Figure Richards 3.11 presents the mean fixation durations by AOI.

Figure Richards 3.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit duration in all but two areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 88) = 23.87$, $p < .001$, partial $\eta^2 = .213$, and $F(1, 88) = 5.26$, $p = .024$, partial $\eta^2 = .056$.

Visit durations in all but two AOIs was significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 5.63$, $p = .020$, partial $\eta^2 = .060$; AOI 3, $F(1, 88) = 7.99$, $p = .006$, partial $\eta^2 = .083$; AOI 4, $F(1, 88) = 6.41$, $p = .013$, partial $\eta^2 = .068$; AOI 6, $F(1, 88) = 6.41$, $p = .034$, partial $\eta^2 = .050$).

No significant differences were found in AOI 2 or AOI 5 ($p = .051$, *ns; p* = .511, *ns*). Table Richards 3.8 presents the means and standard deviations for areas of interest by participant type.

Table Richards 3.8

Feature Extraction Analysis Visit Duration for FDE and Lay Participants

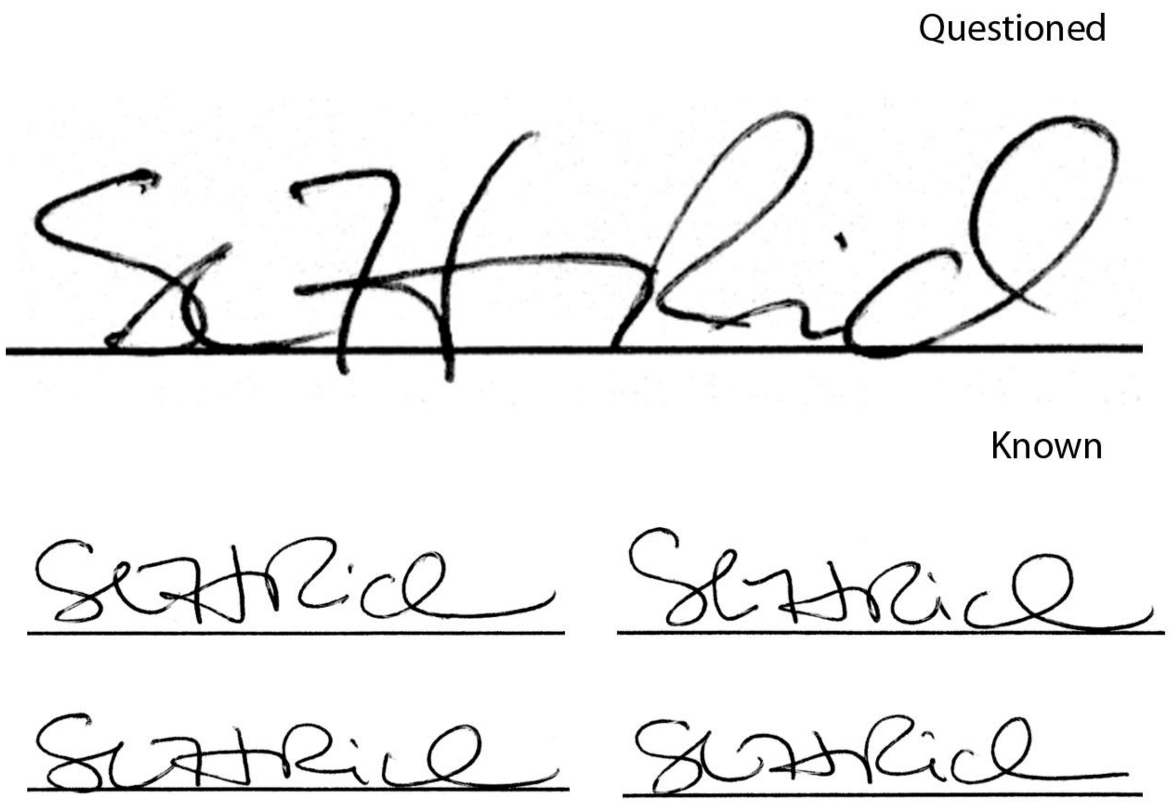
	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	27.61	18.79	15.82	13.10	1.91	2.02	0.60	0.74
Lay	11.00	12.53	9.72	12.03	0.98	1.70	0.33	0.55

	AOI 3		AOI 4		AOI 5		AOI 6	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	0.71	0.99	7.56	6.82	2.29	2.66	0.86	1.30
Lay	0.24	0.47	4.44	4.50	1.95	2.19	0.40	0.55

Richards Signature 4: Freehand Simulation (Non-Genuine)

Of the 49 FDE participants, 46 responded correctly that the signature was non-genuine, while 3 responded that the signature was genuine. One FDE declined to respond. Of the 43 Lay participants, 32 responded correctly that the signature was non-genuine, while 11 responded that the signature was genuine. This difference was statistically significant, χ^2 (2, N = 92) = 6.72, p = .010. Figure Richards 4.1 presents the comparison view of this signature.

Figure Richards 4.1. Questioned-Known Comparison Stimulus for Richards Signature 4.

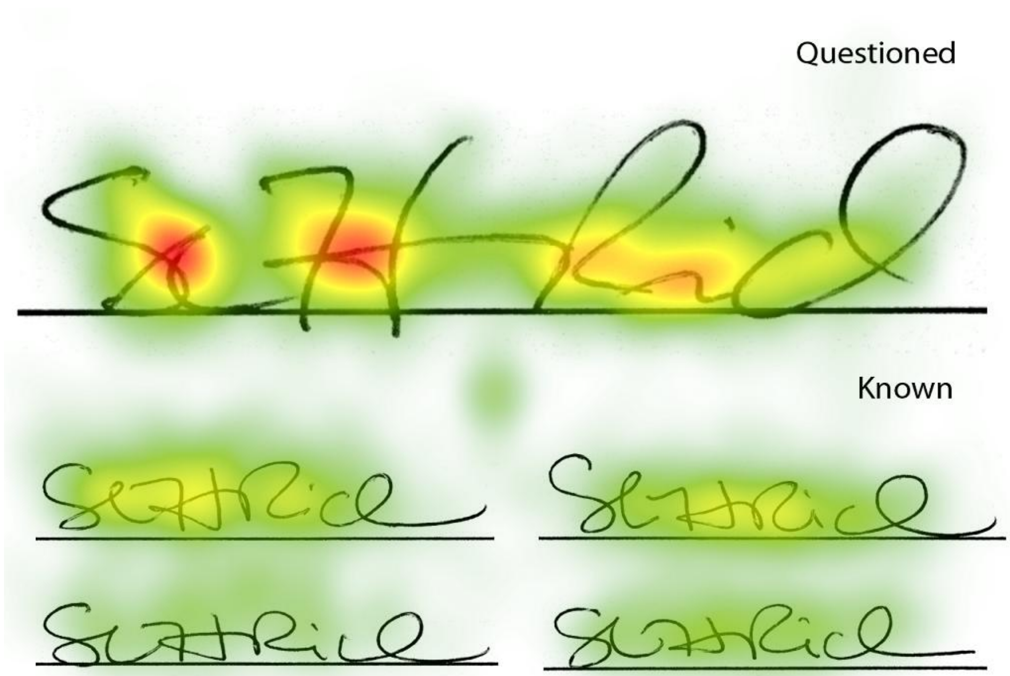


Selection of Areas of Interest (AOIs)

Figure Richards 4.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were five locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of five AOIs for this stimulus. Figure Richards 4.3 presents the location of the AOIs identified in the heat map.

Figure Richards 4.2. Heat map for Richards signature 4, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE

Lay

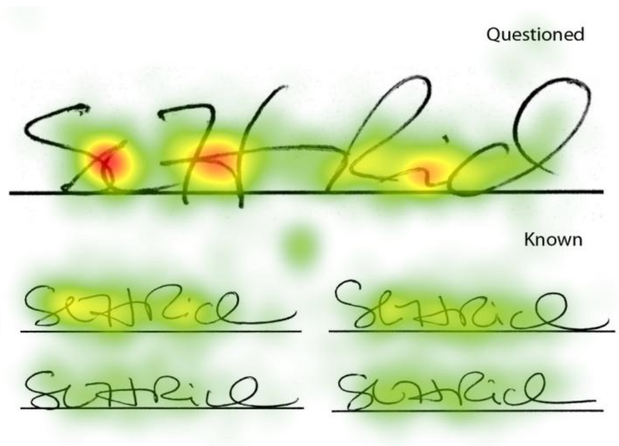
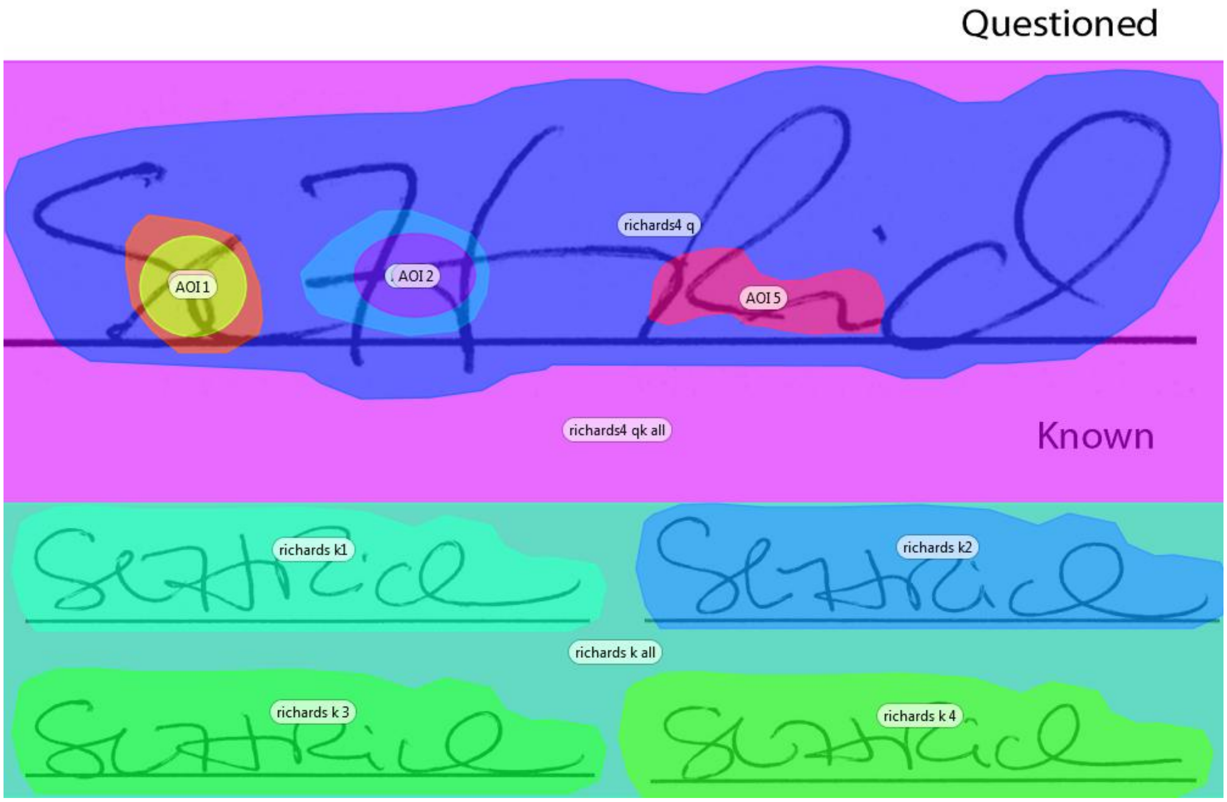


Figure Richards 4.3. Areas of Interest (AOIs) for Richards Signature 4.



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

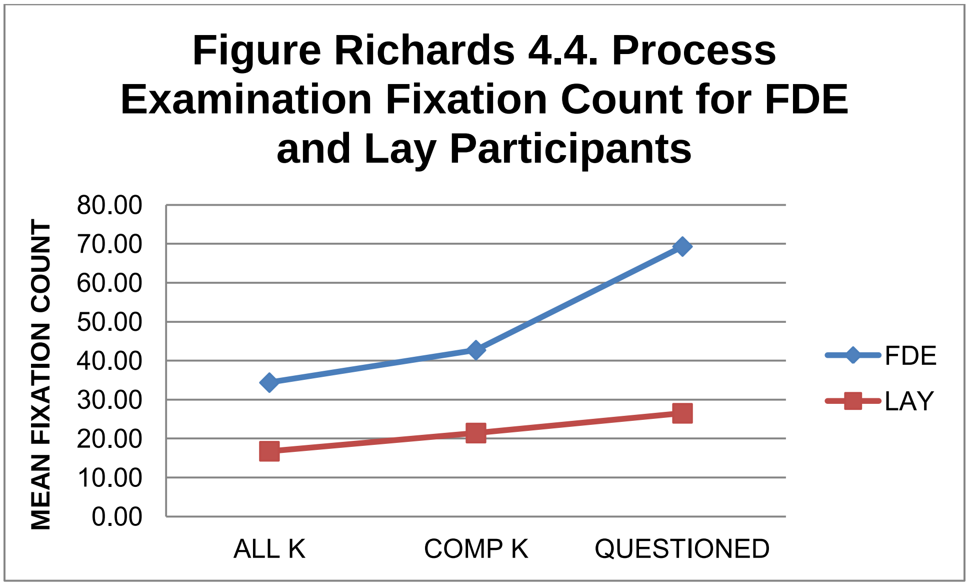
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Richards known signature stimulus (Knowns, not pictured here), Richards 1 K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Richards 4Q (the Richards questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 5) are included in subsequent analyses. Figure Richards 4.3 demonstrates all AOIs identified for this signature.

<u>*Total Fixation Count*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .370, $F(3, 86) = 16.83$, $p < .001$, multivariate $\eta^2 = .370$. Figure Richards 4.4 presents the mean fixation counts by AOI.

Figure Richards 4.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all three areas of interest. Total fixation count for both the questioned signature and the known signature comparison stimulus (COMP K) was significantly greater for FDEs than for the Lay participants, (questioned signature, $F(1, 88)$ 32.19, $p < .001$, partial $\eta^2 = .268$; known signature comparison stimulus, ($F(1, 88) = 10.66$, $p = .002$, partial $\eta^2 = .108$). Fixation count in the known signature stimulus (ALL K) was also significantly different, $F(1, 88) = 7.83$, $p = .006$, partial $\eta^2 = .082$. Table Richards 4.1 presents the means and standard deviations for areas of interest by participant type.

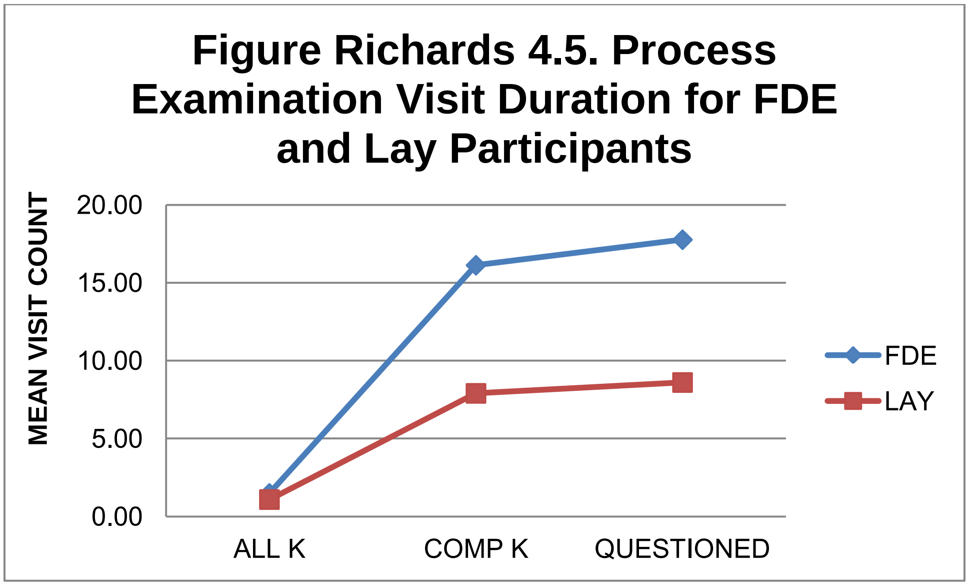
Table Richards 4.1
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	34.38	37.42	42.72	38.23	69.32	44.35
Lay	16.77	18.18	21.44	19.97	26.51	22.90

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .356, $F(3, 86) = 15.84$, $p < .001$, multivariate $\eta^2 = .356$. Figure Richards 4.5 presents the mean fixation duration by AOI.

Figure Richards 4.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all three areas of interest. Total fixation duration for both the questioned signature and the known signature comparison stimulus (COMP K) was significantly greater for the FDEs than for Lay participants (questioned signature, $F(1, 88) = 33.50$, $p < .001$, partial $\eta^2 = .276$; $F(1, 88) = 10.93$, $p = .001$, partial $\eta^2 = .111$). A significant difference was found for the known signature stimulus (ALL K), $F(1, 88) = 9.30$, $p = .003$, partial $\eta^2 = .096$. Table Richards 4.2 presents the means and standard deviations for areas of interest by participant type.

Table Richards 4.2

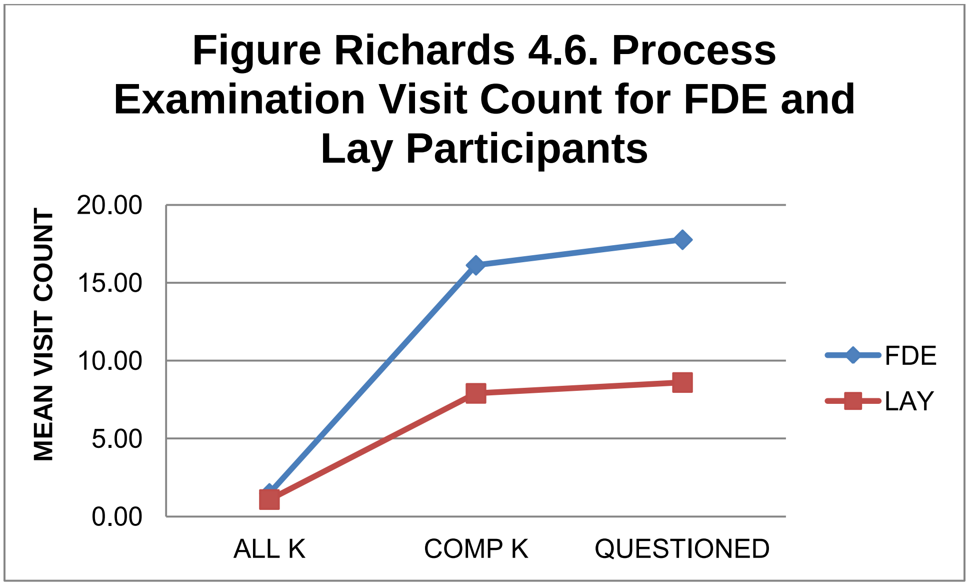
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	12.66	15.40	13.93	12.94	26.75	17.66
Lay	5.17	4.89	6.69	6.48	9.11	9.76

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .241, $F(3, 86) = 9.08$, $p < .001$, multivariate $\eta^2 = .241$. Figure Richards 4.6 presents the mean visit durations by AOI.

Figure Richards 4.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in all three areas of interest. Total visit count for the questioned signature was significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 88) = 20.68$, $p < .001$, partial $\eta^2 = .190$). Visit count in the known signature comparison stimulus was also statistically significant (COMP K), $F(1, 88) = 16.31$, $p < .001$ partial $\eta^2 = .156$. A significant difference was found for the known signature stimulus (ALL K), $F(1, 88) = 5.82$, $p = .018$, partial $\eta^2 = .062$. Table Richards 4.3 presents the means and standard deviations for areas of interest by participant type.

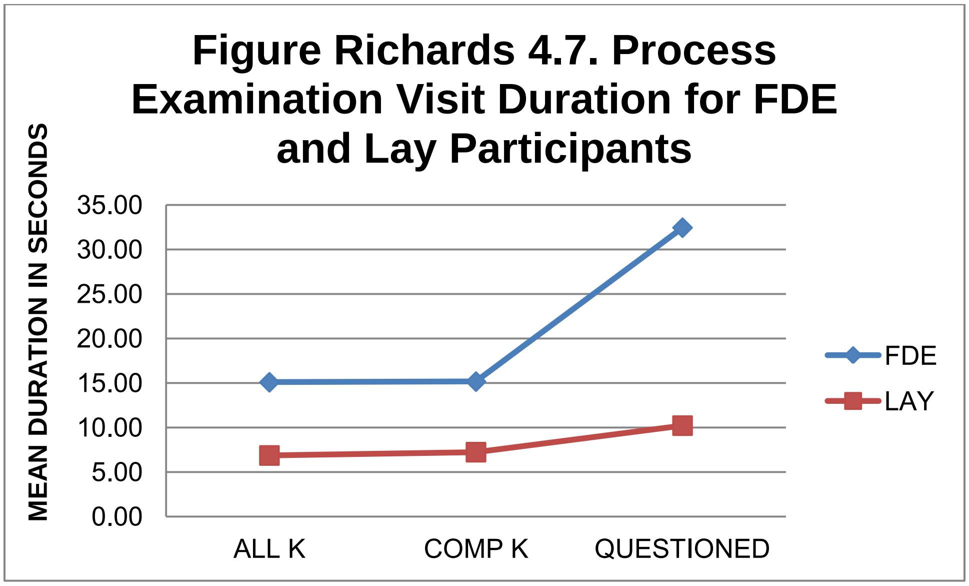
Table Richards 4.3
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.49	0.88	16.13	11.29	17.77	11.14
Lay	1.09	0.65	7.91	7.43	8.60	7.42

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .284, $F(3, 86) = 11.35$, $p < .001$, multivariate $\eta^2 = .284$. Figure Richards 4.7 presents the mean visit durations by AOI.

Figure Richards 4.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit duration in all three areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 88) = 31.89$, $p < .001$, partial $\eta^2 = .266$). Visit duration in the known signature comparison stimulus (COMP K) was also statistically significant, $F(1, 88) = 11.49$, $p = .001$, partial $\eta^2 = .116$. A significant difference was found for the known signature stimulus (ALL K), $F(1, 88) = 8.51$, $p = .004$, partial $\eta^2 = .088$). Table Richards 4.4 presents the means and standard deviations for areas of interest by participant type.

Table Richards 4.4

Process Analysis Visit Duration for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	15.08	17.50	15.16	13.83	32.44	23.91
Lay	6.86	6.15	7.23	6.90	10.21	10.16

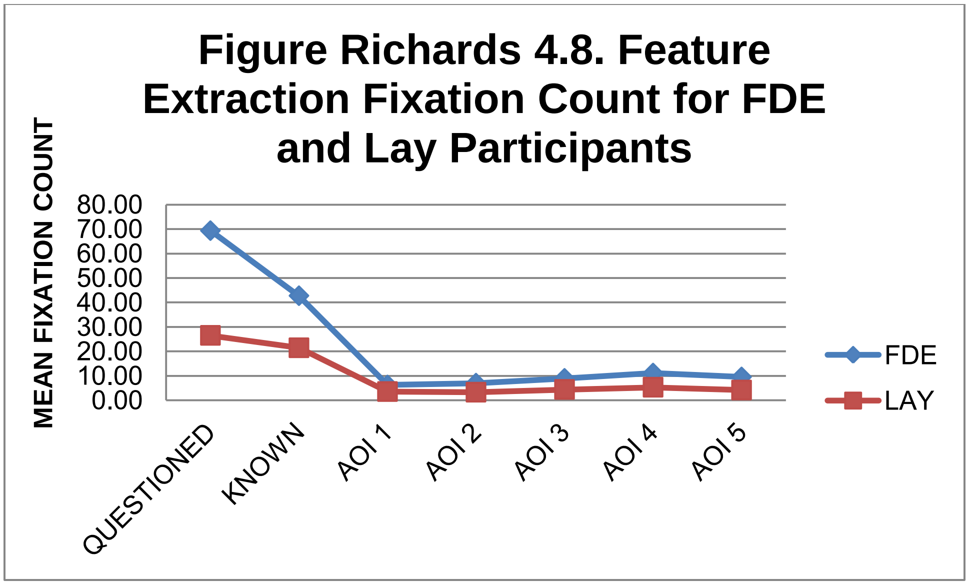
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .424, $F(7, 82) = 8.62$, $p < .001$, multivariate $\eta^2 = .424$. Figure Richards 4.8 presents the mean fixation counts by AOI.

Figure Richards 4.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 88) = 32.19$, $p < .001$, partial $\eta^2 = .268$, and $F(1, 88) = 10.66$, $p = .002$, partial $\eta^2 = .108$.

Fixation count was significantly greater for FDEs than for Lay participants in three AOIs (AOI 1, $F(1, 88) = 7.76$, $p = .007$, partial $\eta^2 = .081$; AOI 2, $F(1, 88) = 13.65$, $p < .001$, partial $\eta^2 = .134$; AOI 3, $F(1, 88) = 14.30$, $p < .001$, partial $\eta^2 = .140$; AOI 4 ($F(1, 88) = 16.29$, $p < .001$, partial $\eta^2 = .156$; AOI 5 ($F(1, 88) = 12.75$, $p = .001$, partial $\eta^2 = .127$). Table Richards 4.5 presents the means and standard deviations for areas of interest by participant type.

Table Richards 4.5

Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

	QUESTIONED	KNOWN	AOI 1	AOI 2

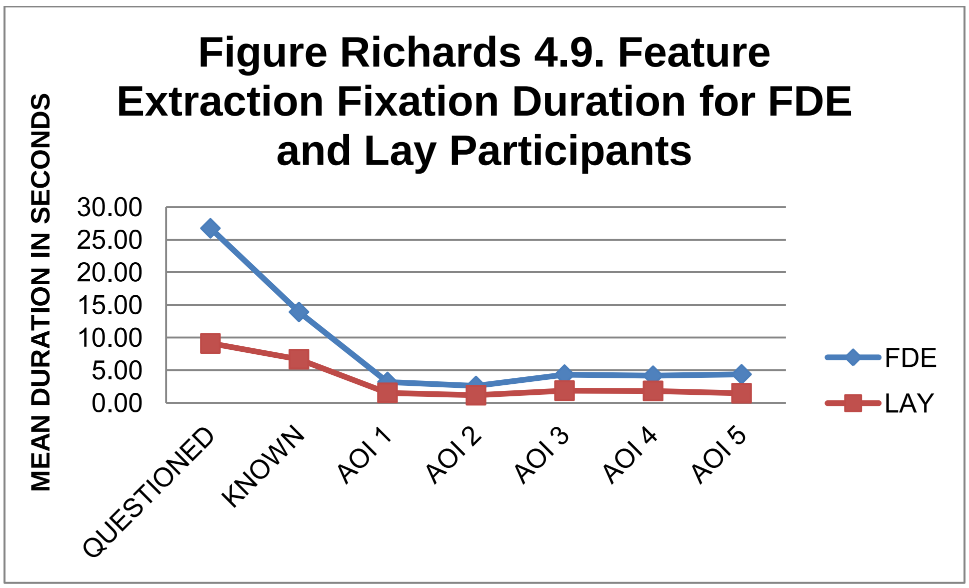
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	69.32	44.35	42.72	38.23	6.23	5.04	6.98	5.92
Lay	26.51	22.90	21.44	19.97	3.53	4.04	3.28	2.96

	AOI 3		AOI 4		AOI 5	
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	8.94	6.52	11.11	8.27	9.51	8.76
Lay	4.40	4.61	5.30	4.74	4.16	4.63

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .399, $F(7, 82) = 7.79$, $p < .001$, multivariate $\eta^2 = .399$. Figure Richards 4.9 presents the mean fixation durations by AOI.

Figure Richards 4.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 88) = 33.50$, $p < .001$, partial $\eta^2 = .276$, and $F(1, 88) = 10.93$, $p = .001$, partial $\eta^2 = .111$.

Fixation duration in all AOIs was significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 10.48$, $p = .002$, partial $\eta^2 = .106$; AOI 2, $F(1, 88) = 13.90$, $p < .001$, partial $\eta^2 = .136$; AOI 3, $F(1, 88) = 16.26$, $p < .001$, partial $\eta^2 = .156$; AOI 4, $F(1, 88) = 16.13$, $p < .001$, partial $\eta^2 = .155$; AOI 5, $F(1, 88) = 18.39$, $p < .001$, partial $\eta^2 = .173$). Table Richards 4.6 presents the means and standard deviations for areas of interest by participant type.

Table Richards 4.6

Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

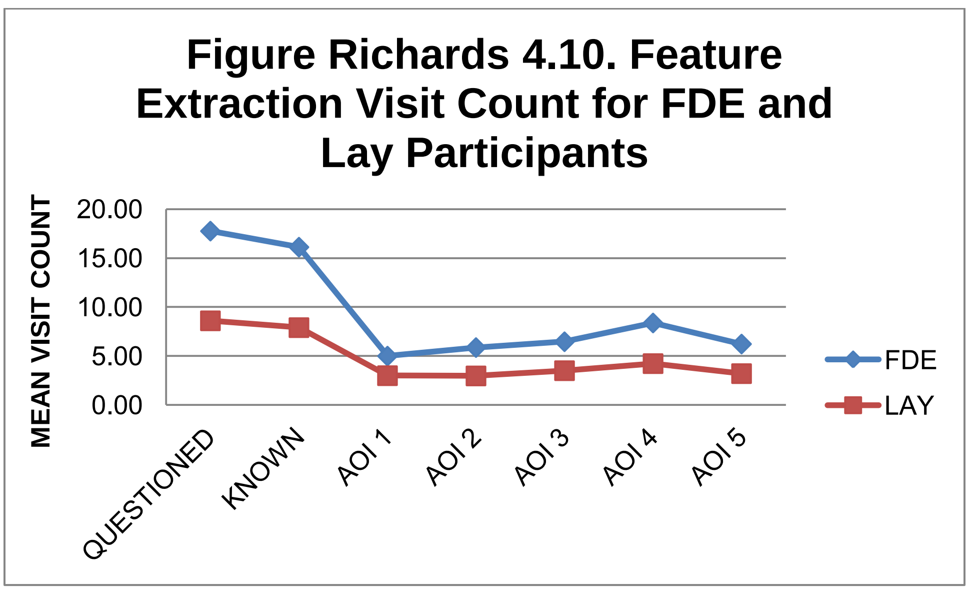
	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	26.75	17.66	13.93	12.94	3.21	2.88	2.59	2.19
Lay	9.11	9.76	6.69	6.48	1.54	1.84	1.18	1.19

	AOI 3		AOI 4		AOI 5	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	4.33	3.43	4.17	3.26	4.38	4.06
Lay	1.88	2.13	1.84	2.04	1.48	1.84

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .302, $F(7, 82) = 5.06$, $p < .001$, multivariate $\eta^2 = .302$. Figure Richards 4.10 presents the visit counts by AOI.

Figure Richards 4.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in all areas of interest. Total visit count for the questioned signature and for the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 88) = 20.68$, $p < .001$, partial $\eta^2 = .190$, and $F(1, 88) = 16.31$, $p < .001$, partial $\eta^2 = .156$, respectively.

Visit count in the remaining AOIs was significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 7.20$, $p = .009$, partial $\eta^2 = .076$; AOI 2, $F(1, 88) = 13.15$, $p < .001$, partial $\eta^2 = .130$; AOI 3, $F(1, 88) = 13.04$, $p = .001$, partial $\eta^2 = .129$; AOI 4, $F(1, 88) = 15.84$, $p < .001$, partial $\eta^2 = .153$; AOI 5, $F(1, 88) = 11.76$, $p = .001$, partial $\eta^2 = .118$). Table Richards 4.7 presents the means and standard deviations for areas of interest by participant type.

Table Richards 4.7

Feature Extraction Analysis Visit Count for FDE and Lay Participants

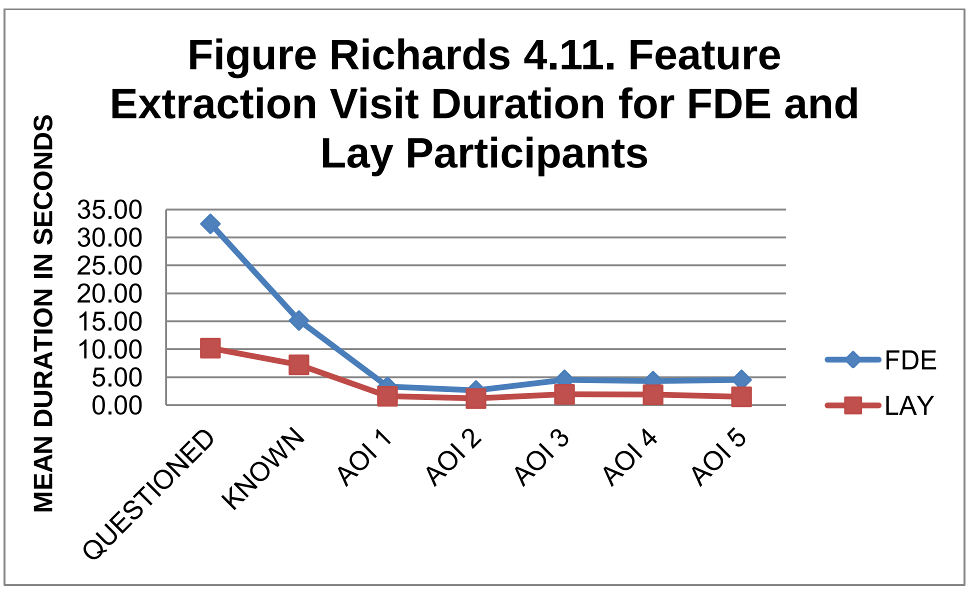
	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	17.77	11.14	16.13	11.29	5.00	3.97	5.87	4.60
Lay	8.60	7.42	7.91	7.43	3.00	2.98	2.98	2.60

	AOI 3		AOI 4		AOI 5	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	6.47	4.50	8.38	6.02	6.23	4.89
Lay	3.51	3.06	4.23	3.39	3.21	3.23

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .348, $F(7, 82) = 6.26$, $p < .001$, multivariate $\eta^2 = .348$. Figure Richards 4.11 presents the visit durations by AOI.

Figure Richards 4.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit duration in all areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 88) = 31.89$, $p < .001$, partial $\eta^2 = .266$, and $F(1, 88) = 11.49$, $p < .001$, partial $\eta^2 = .116$.

Visit duration in all the remaining AOIs was significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 10.16$, $p = .002$, partial $\eta^2 = .104$; AOI 2, $F(1, 88) = 13.91$, $p < .001$, partial $\eta^2 = .136$; AOI 3, $F(1, 88) = 16.78$, $p < .001$, partial $\eta^2 = .160$; AOI 4, $F(1, 88) = 16.41$, $p < .001$, partial $\eta^2 = .157$; AOI 5, $F(1, 88) = 18.53$, $p < .001$, partial $\eta^2 = .174$). Table Richards 4.8 presents the means and standard deviations for areas of interest by participant type.

Table Richards 4.8

Feature Extraction Analysis Visit Duration for FDE and Lay Participants

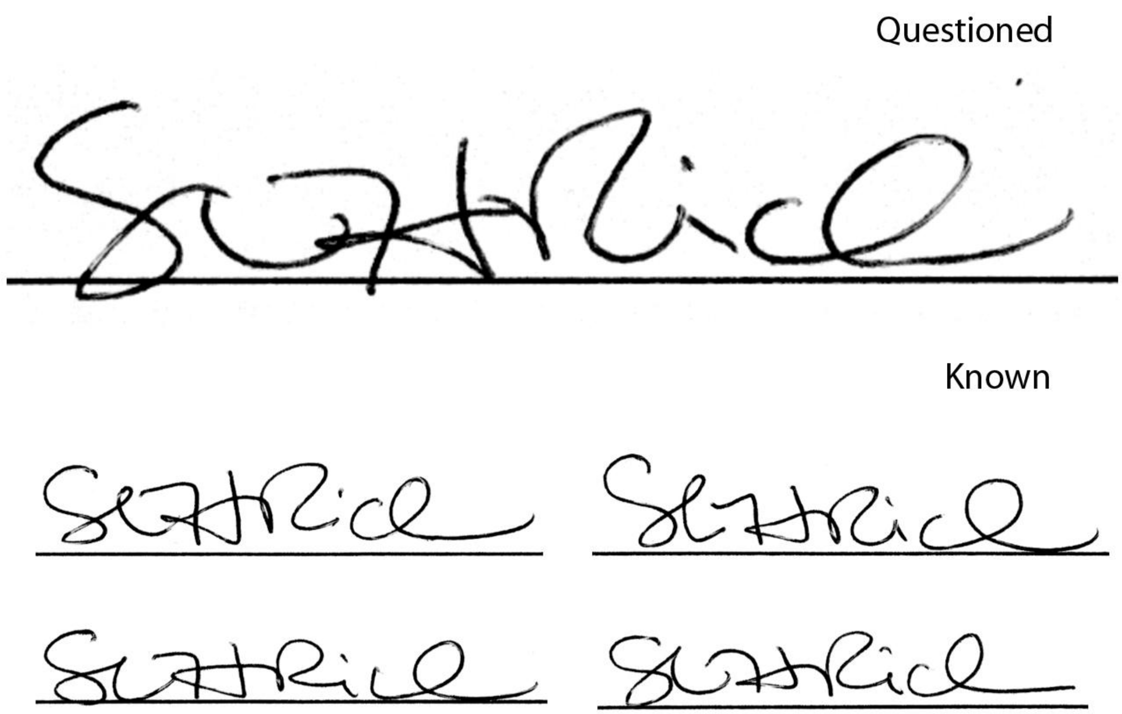
	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	32.44	23.91	15.16	13.83	3.31	2.98	2.65	2.27
Lay	10.21	10.16	7.23	6.90	1.60	1.95	1.20	1.20

	AOI 3		**AOI 4**		**AOI 5**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	4.55	3.58	4.32	3.38	4.55	4.27
Lay	1.94	2.22	1.89	2.10	1.51	1.87

Richards Signature 5: Traced (Non-Genuine)

Of the 49 FDE participants, 43 responded correctly that the signature was non-genuine specimen, while 5 identified the signature as genuine. One FDE declined to respond. Of the 43 Lay participants, 29 responded correctly that the signature was non-genuine, while 14 identified the signature as genuine. This difference was statistically significant, χ^2 (2, N = 92) = 7.63, p = .02. Figure Richards 5.1 presents the comparison view of this signature.

Figure Richards 5.1. Questioned-Known Comparison Stimulus for Richards Signature 5.

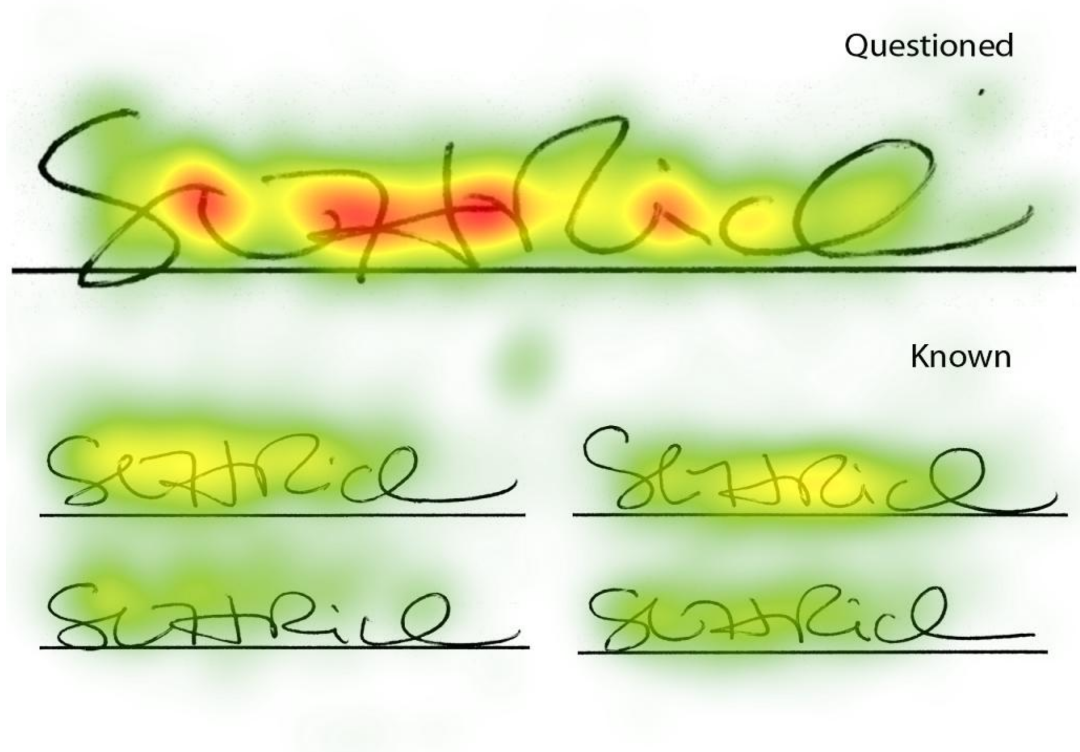


Selection of Areas of Interest (AOIs)

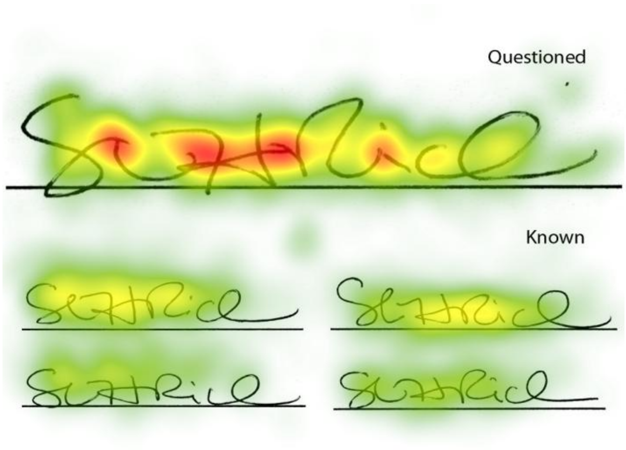
Figure Richards 5.3 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were eight locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of eight AOIs for this stimulus. Figure Richards 5.3 presents the location of the AOIs identified in the heat map.

Figure Richards 5.2. Heat map for Richards signature 5, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

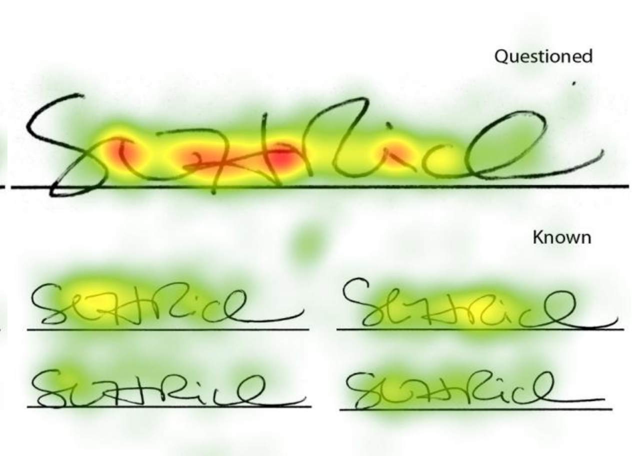
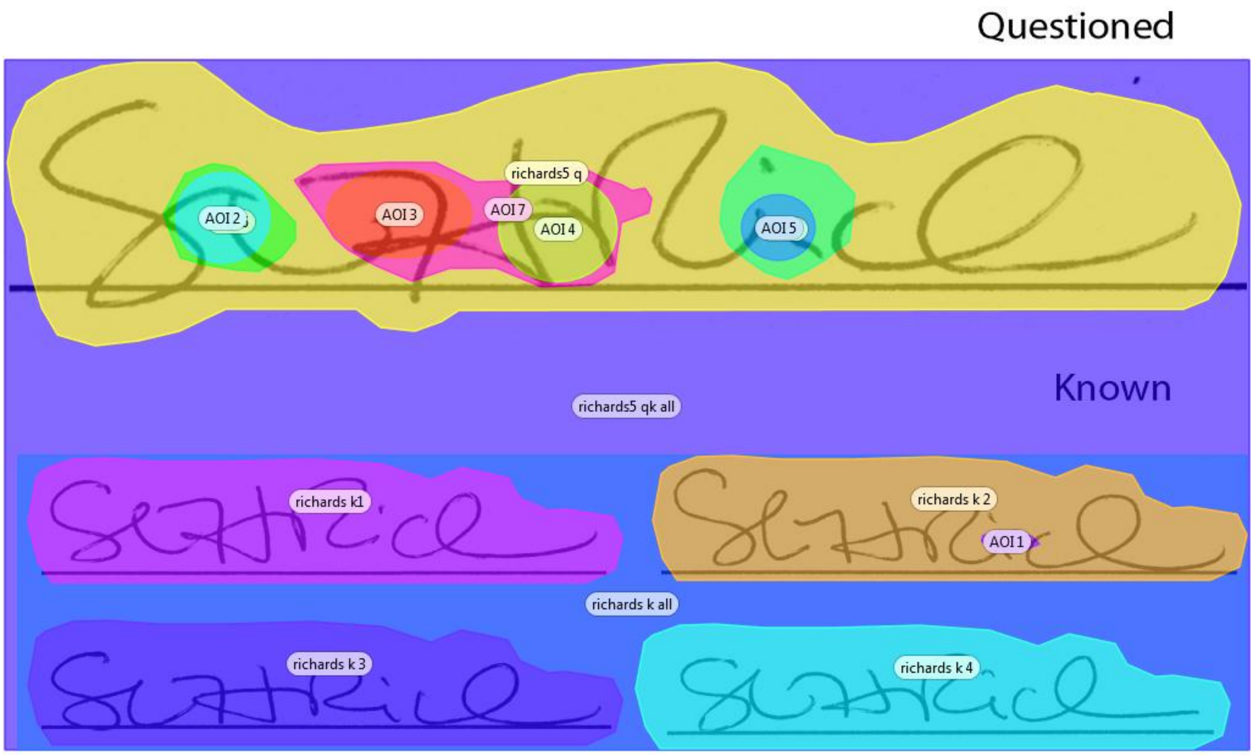


Figure Richards 5.3. Areas of Interest (AOIs) for Richards Signature 5.



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

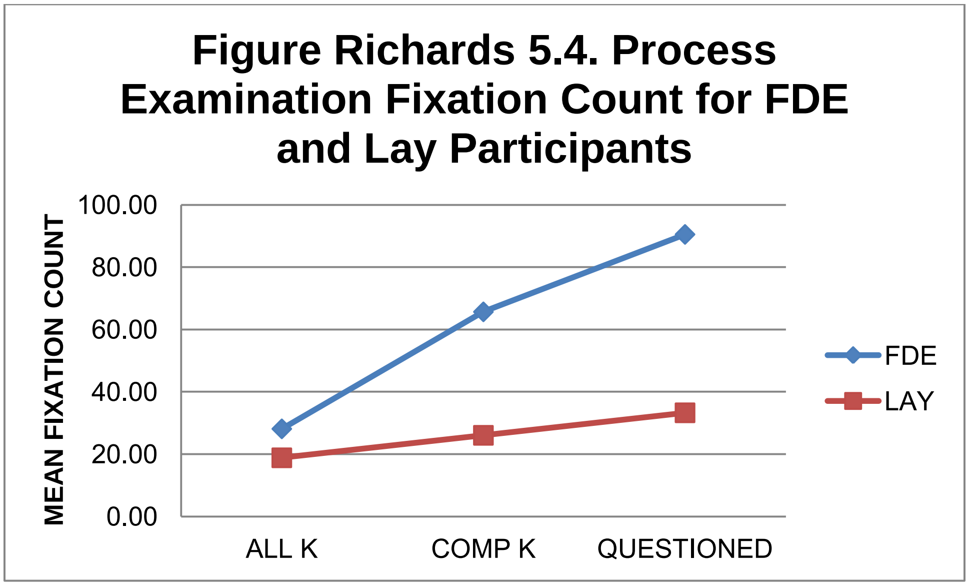
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Richards known signature stimulus (Knowns, not pictured here), Richards 1 K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Richards 5Q (the Richards questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 8) are included in subsequent analyses. Figure Richards 5.3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .196, F (3, 85) = 6.92, p < .001, multivariate η^2 = .196. Figure Richards 5.4 presents the mean fixation counts by AOI.

Figure Richards 5.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation counts in all but one area of interest. Total fixation count for the questioned signature was significantly greater for FDEs than for Lay participants, F (1, 87) = 18.82, p < .001, partial η^2 = .178. Fixation counts in the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, F (1, 87) = 10.99, p = .001, partial η^2 = .112.

Fixation counts in the known signature stimulus (ALL K) were not different between groups, p = .064, *ns*. Table Richards 5.1 presents the means and standard deviations for areas of interest by participant type.

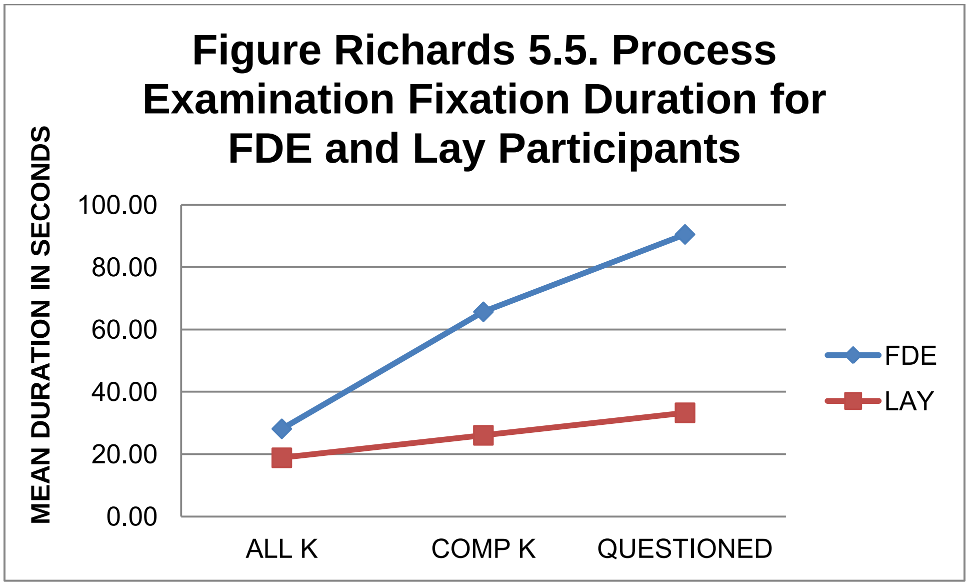
Table Richards 5.1
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	28.15	27.23	65.70	73.55	90.54	81.37
Lay	18.86	18.34	26.07	28.01	33.30	30.31

<u>Total Fixation Duration</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .20, F (3, 85) = 6.92, p < .001, multivariate η^2 = .20. Figure Richards 5.5 presents the mean fixation durations by AOI.

Figure Richards 5.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation durations in all but one area of interest. Total fixation duration for the questioned signature was significantly greater for FDEs than for Lay participants, F (1, 87) =18.82, p < .001, partial η^2 = .178. The known signature comparison stimulus (COMP K) was significantly greater for FDEs than for Lay participants, F (1, 87) = 10.99, p = .001, partial η^2 = .112.

Fixation duration in the known signature stimulus (ALL K) was not significantly different between groups, p = .06, *ns*. Table Richards 5.2 presents the means and standard deviations for areas of interest by participant type.

Table Richards 5.2

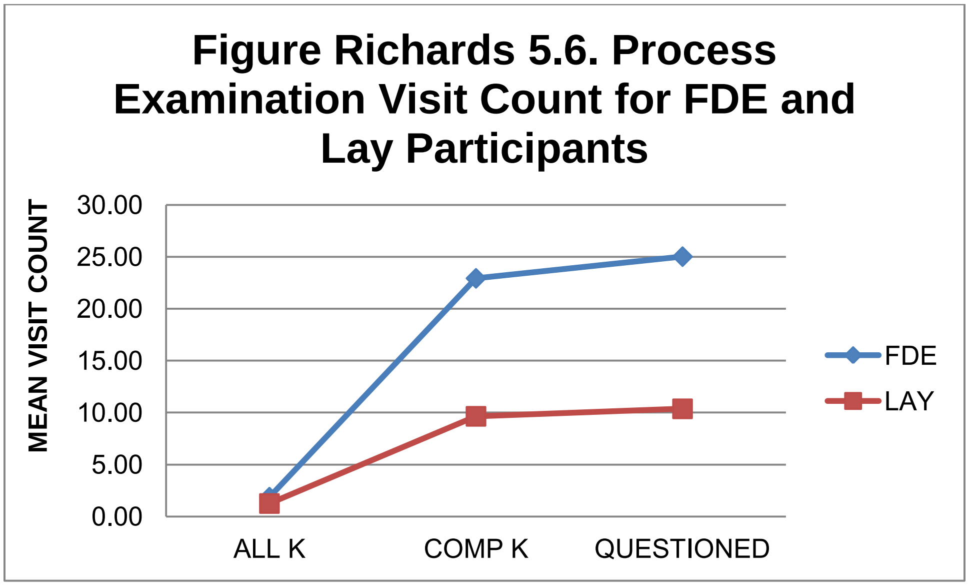
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	28.15	27.23	65.70	73.55	90.54	81.37
Lay	18.86	18.34	26.07	28.01	33.30	30.31

<u>Total Visit Count</u>

MANOVA results reveal significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .225, F (3, 85) = 8.22, p < .001, multivariate η^2 = .225. Figure Richards 5.6 presents the mean visit counts by AOI.

Figure Richards 5.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant. Total visit count for the questioned signature was significantly greater for FDEs than for Lay participants, F (1, 87) = 20.50, p < .001, partial η^2 = .191. Visit counts in the known signature comparison stimulus (COMP K) was significantly greater for FDEs than for Lay participants, F (1, 87) = 16.42, p < .001, partial η^2 = .159.

Visit count in the known signature stimulus (ALL K) was not significantly different between groups, p = .191, *ns*. Table Richards 5.3 presents the means and standard deviations for areas of interest by participant type.

Table Richards 5.3

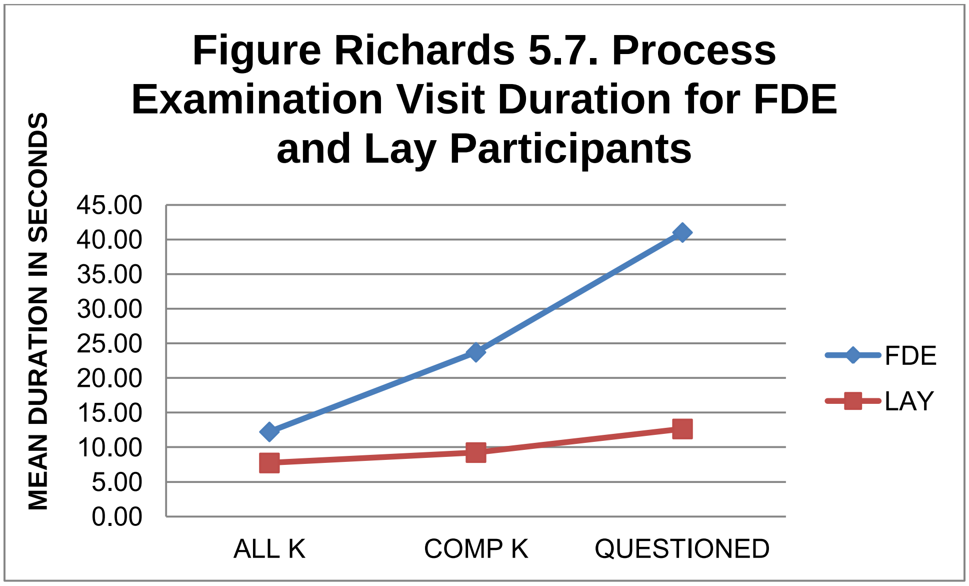
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.87	2.95	22.93	18.72	25.02	18.50
Lay	1.26	0.82	9.65	10.92	10.37	10.74

<u>Total Visit Duration</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .283, F (3, 85) = 11.18, p < .001, multivariate η^2 = .283. Figure Richards 5.7 presents the mean visit durations by AOI.

Figure Richards 5.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature was significantly greater for FDEs than for Lay participants, F (1, 87) = 26.26, p < .001, partial η^2 = .232. There was a statistical difference found in the known signature comparison stimulus (COMP K), F (1, 87) = 11.67, p = .001, partial η^2 = .118. Visit duration in the known signature stimulus (ALL K) was significantly greater for FDEs than for Lay participants, F (1, 87) = 4.51, p = .037, partial η^2 = .049. Table Richards 5.4 presents the means and standard deviations for areas of interest by participant type.

Table Richards 5.4

Process Analysis Visit Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	12.23	11.99	23.72	25.88	41.02	34.69
Lay	7.74	7.15	9.24	10.46	12.65	11.01

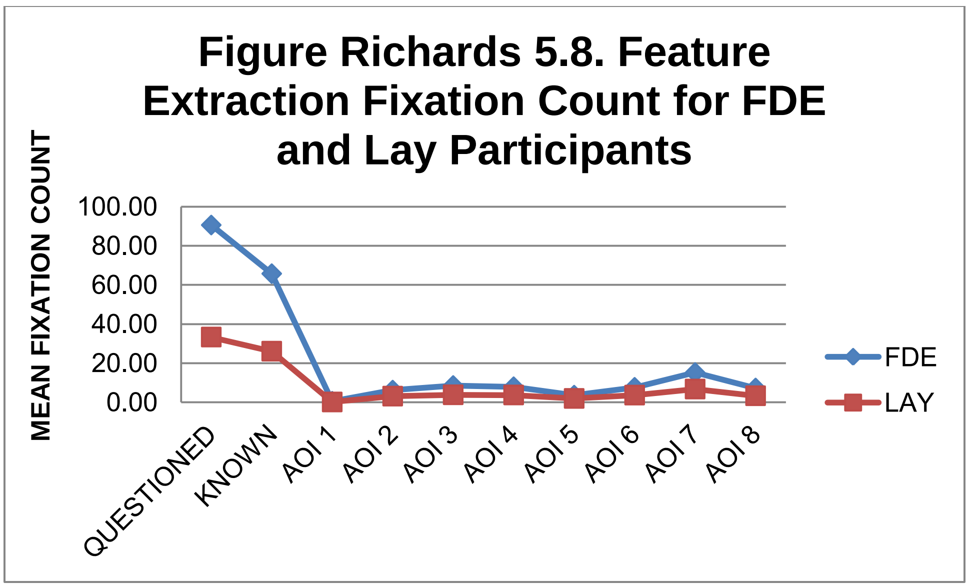
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .263, F (10, 78) = 2.79, p = .005, multivariate η^2 = .263. Figure Richards 5.8 presents the mean fixation counts by AOI.

Figure Richards 5.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature and known signatures was significantly greater for FDEs than for Lay participants, F (1, 87) = 18.82, p < .001, partial η^2 =.178, and F (1, 87) = 10.99, p = .001, partial η^2 = .112.

Fixations counts in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, F (1, 87) = 4.38, p = .005, partial η^2 = .048; AOI 2, F (1, 87) = 10.38, p = .002, partial η^2 = .107; AOI 3, F (1, 87) = 8.93, p = .004, partial η^2 = .093; AOI 4, F (1, 87) = 10.17, p = .002, partial η^2 = .105; AOI 5, F (1, 87) = 5.32, p = .023, partial η^2 = .058; AOI 6, F (1, 87) = 11.44, p = .001, partial η^2 = .116; AOI 7, F (1, 87) = 12.72, p = .001, partial η^2 = .128; AOI 8, F (1, 87) = 8.82, p = .004, partial η^2 = .092). Table Richards 5.5 presents the means and standard deviations for areas of interest by participant type.

Table Richards 5.5
Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

	QUESTIONED	**KNOWN**	**AOI 1**	**AOI 2**

Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	90.54	81.37	65.70	73.55	0.48	1.07	6.17	5.76
Lay	33.30	30.31	26.07	28.01	0.12	0.39	3.09	2.56
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	8.54	9.73	7.91	8.10	3.61	4.02	7.61	7.26
Lay	3.79	3.88	3.70	3.18	1.93	2.65	3.63	2.72
	AOI 7		**AOI 8**					
Participant	***M***	***SD***	***M***	***SD***				
FDE	15.15	14.63	7.26	7.86				
Lay	6.72	5.28	3.30	3.96				

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .268, F (10, 78) = 2.85, p = .004, multivariate η^2 = .268. Figure Richards 5.9 presents the mean fixation durations by AOI.

Figure Richards 5.9

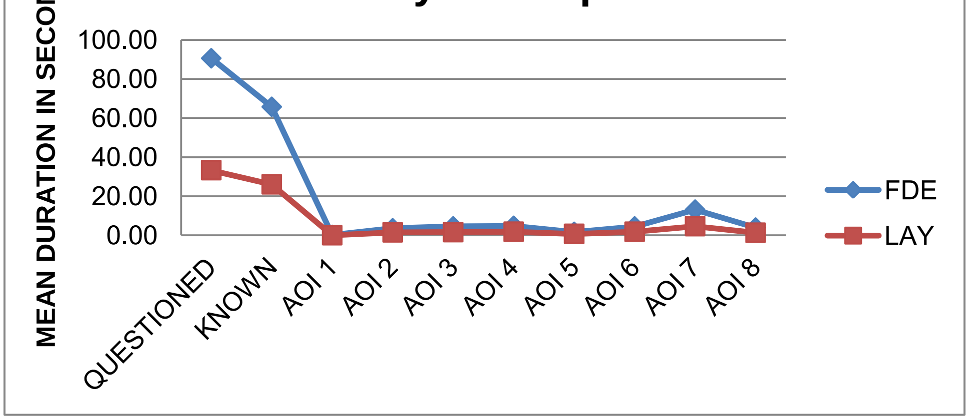


Figure Richards 5.9. Feature Extraction Fixation Duration for FDE and Lay Participants

Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and known signatures was significantly greater for FDEs than for Lay participants, F (1, 87) = 18.82, p < .001, partial η^2 =.178, and F (1, 87) = 10.99, p = .001, partial η^2 = .112.

Fixation durations in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, F (1, 87) = 5.20, p = .025, partial η^2 = .056; AOI 2, F (1, 87) = 13.62, p < .001, partial η^2 = .135; AOI 3, F (1, 87) = 12.39, p = .001, partial η^2 = .125; AOI 4, F (1, 87) = 12.30, p = .001, partial η^2 = .124; AOI 5, F (1, 87) = 7.32, p = .008, partial η^2 = .078; AOI 6, F (1, 87) = 16.28, p < .001, partial η^2 = .158; AOI 7, F (1, 87) = 15.59, p < .001, partial η^2 = .152; AOI 8, F (1, 87) = 14.13, p < .001, partial η^2 = .140). Table Richards 5.6 presents the means and standard deviations for areas of interest by participant type.

Table Richards 5.6

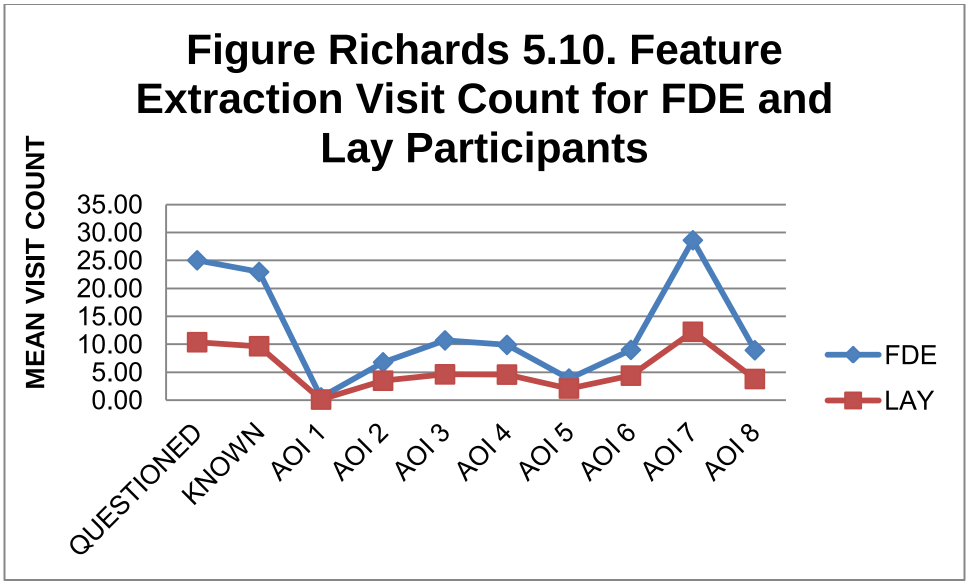
Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	90.54	81.37	65.70	73.55	0.18	0.41	3.55	3.39
Lay	33.30	30.31	26.07	28.01	0.03	0.11	1.48	1.45
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	4.54	5.23	4.81	5.38	1.73	2.27	4.51	4.13
Lay	1.61	1.62	1.80	1.70	0.71	1.04	1.79	1.63
	AOI 7		**AOI 8**					
Participant	***M***	***SD***	***M***	***SD***				
FDE	13.12	13.43	3.92	4.31				
Lay	4.66	4.24	1.29	1.63				

Total Visit Count

MANOVA results did reveal significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .263, F (10, 78) = 2.78, p = .005, multivariate η^2 = .263. Figure Richards 5.10 presents the mean total visit counts by AOI.

Figure Richards 5.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in all areas of interest. Total visit count for the questioned signature and known signatures was significantly greater for FDEs than for Lay participants, F (1, 87) = 20.60, p < .001, partial η^2 =.191, and F (1, 87) = 16.42, p < .001, partial η^2 = .159.

Visit counts in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, F (1, 87) = 4.75, p = .032, partial η^2 = .052; AOI 2, F (1, 87) = 10.02, p = .002, partial η^2 = .103; AOI 3, F (1, 87) = 8.16, p = .005, partial η^2 = .086; AOI 4, F (1, 87) = 8.94, p = .004, partial η^2 = .093; AOI 5, F (1, 87) = 4.97, p = .028, partial η^2 = .054; AOI 6, F (1, 87) = 10.91, p = .001, partial η^2 = .111; AOI 7, F (1, 87) = 10.56, p = .002, partial η^2 = .108; AOI 8, F (1, 87) = 9.60, p = .003, partial η^2 = .099). Table Richards 5.7 presents the means and standard deviations for areas of interest by participant type.

Table Richards 5.7

Feature Extraction Analysis Visit Count for FDE and Lay Participants

	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	25.02	18.50	22.93	18.72	0.50	1.09	6.78	6.10
Lay	10.37	10.74	9.65	10.92	0.12	0.39	3.49	3.17

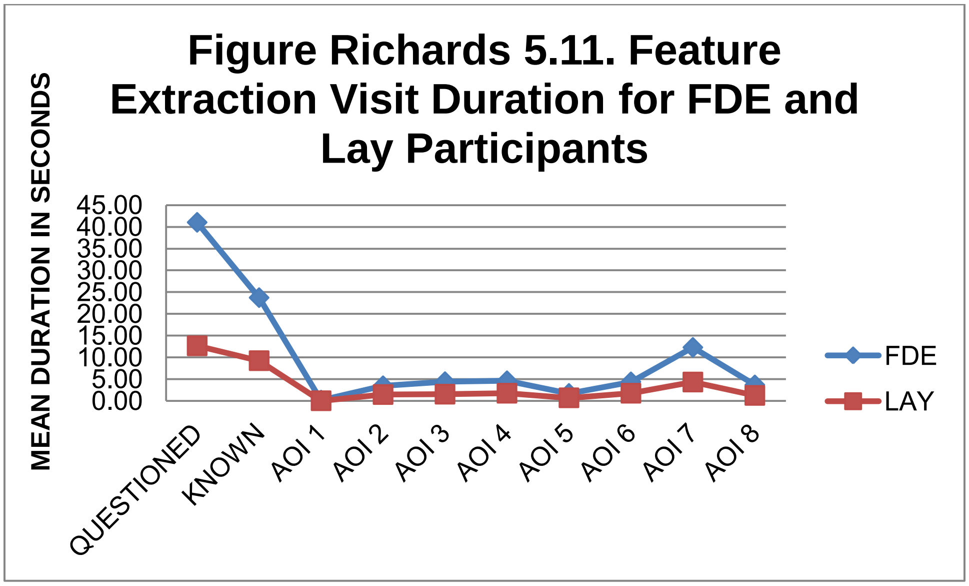
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	10.70	12.93	9.89	10.77	3.87	4.37	9.00	8.36
Lay	4.63	5.36	4.58	4.58	2.09	2.96	4.40	3.82

	AOI 7		**AOI 8**	
Participant	***M***	***SD***	***M***	***SD***
FDE	28.61	30.72	8.93	9.74
Lay	12.23	12.57	3.79	5.02

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .321, F (10, 78) = 3.69, p < .001, multivariate η^2 = .321. Figure Richards 5.11 presents the mean total visit durations by AOI.

Figure Richards 5.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit duration in all areas of interest. Total visit duration for the questioned signature and known signatures was significantly greater for FDEs than for Lay participants, F (1, 87) = 26.26, p < .001, partial η^2 =.232, and F (1, 87) = 11.67, p = .001, partial η^2 = .118.

Visit duration in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, F (1, 87) = 5.03, p = .027, partial η^2 = .055; AOI 2, F (1, 87) = 13.07, p = .001, partial η^2 = .131; AOI 3, F (1, 87) = 12.78, p = .001, partial η^2 = .128; AOI 4, F (1, 87) = 11.98, p = .001, partial η^2 = .121; AOI 5, F (1, 87) = 7.32, p = .008, partial η^2 = .078; AOI 6, F (1, 87) = 15.40, p < .001, partial η^2 = .150; AOI 7, F (1, 87) = 15.55, p < .001, partial η^2 = .152; AOI 8, F (1, 87) = 13.06, p = .001, partial η^2 = .131). Table Richards 5.8 presents the means and standard deviations for areas of interest by participant type.

Table Richards 5.8

Feature Extraction Analysis Visit Count for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	41.02	34.69	23.72	25.88	0.17	0.41	3.47	3.38
Lay	12.65	11.01	9.24	10.46	0.03	0.11	1.46	1.42
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	

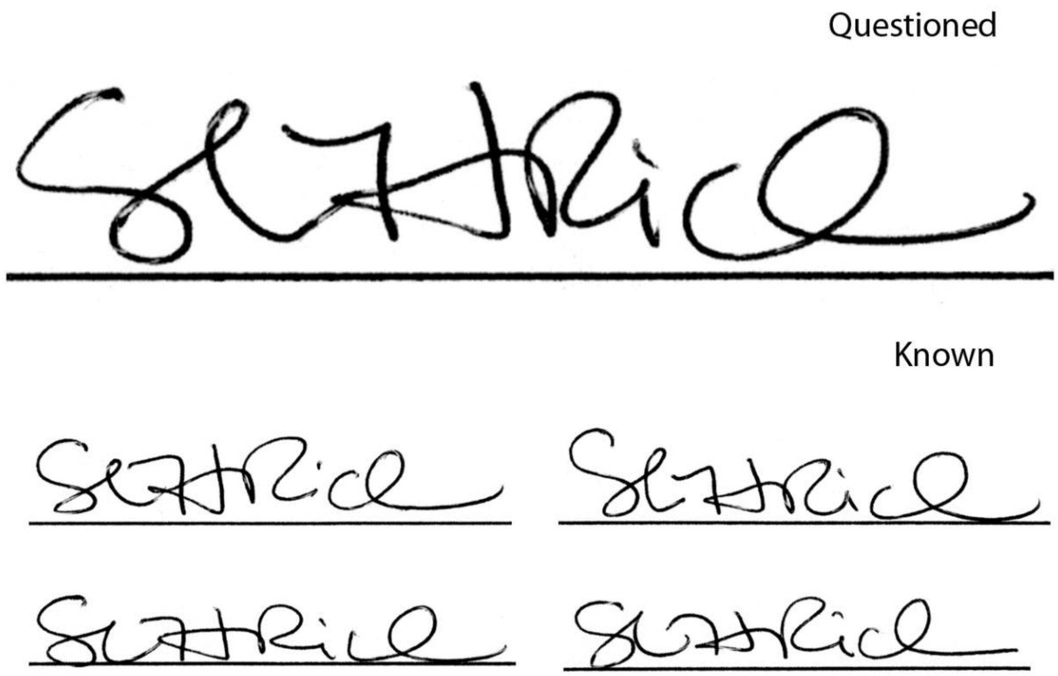
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	4.41	5.07	4.62	5.18	1.72	2.25	4.37	4.08
Lay	1.54	1.48	1.76	1.64	0.70	1.02	1.76	1.60

	AOI 7		AOI 8	
Participant	***M***	***SD***	***M***	***SD***
FDE	12.29	12.75	3.67	4.08
Lay	4.33	3.66	1.26	1.62

Richards Signature 6: Genuine

Of the 49 FDE participants, 45 responded correctly that the signature was genuine, while 4 identified the signature as non-genuine. One FDE declined to respond. Of the 43 Lay participants, 42 responded correctly that the signature was genuine, while 1 identified the signature as non-genuine. This difference was not statistically significant, $p = .218$, *ns*. Figure Richards 6.1 presents the comparison view of this signature.

Figure Richards 6.1. Questioned-Known Comparison Stimulus for Signature Richards 6.

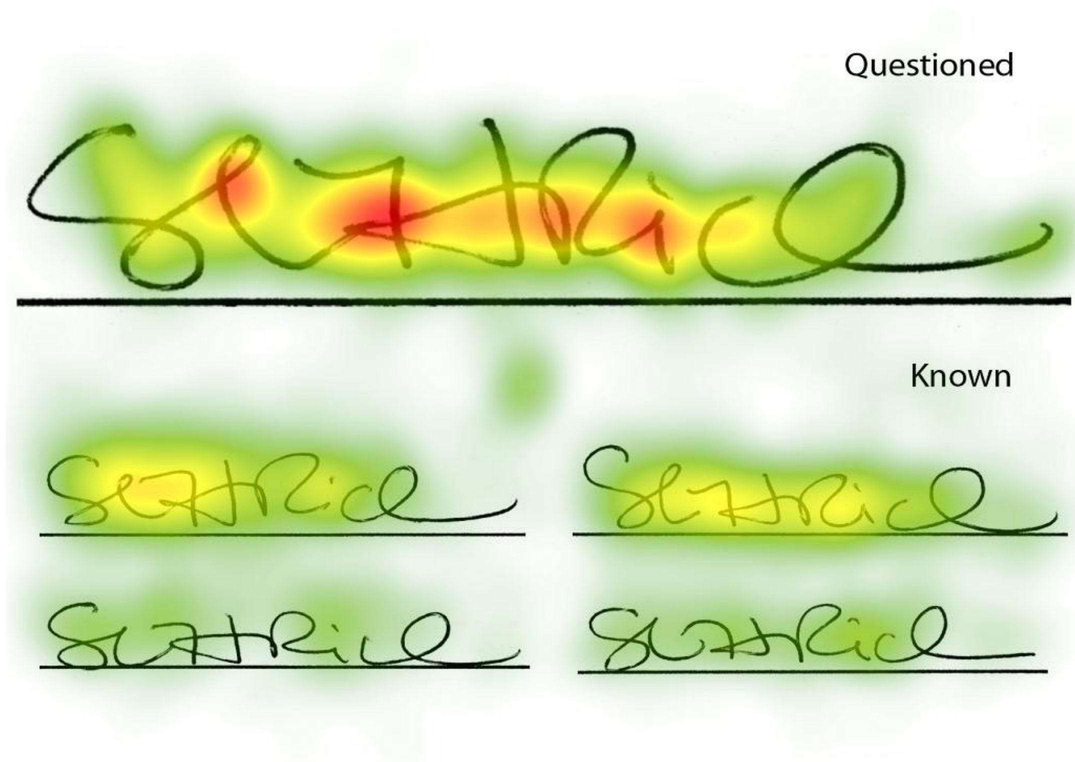


Selection of Areas of Interest (AOIs)

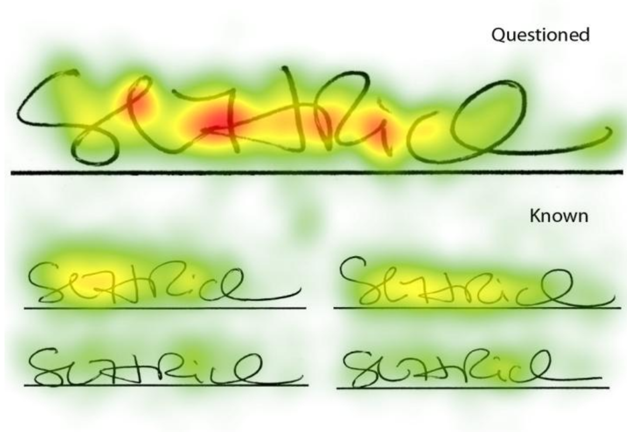
Figure Richards 6.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were seven locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of seven AOIs for this stimulus. Figure Richards 6.3 presents the location of the AOIs identified in the heat map.

Figure Richards 6.2. Heat map for Richards signature 6, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

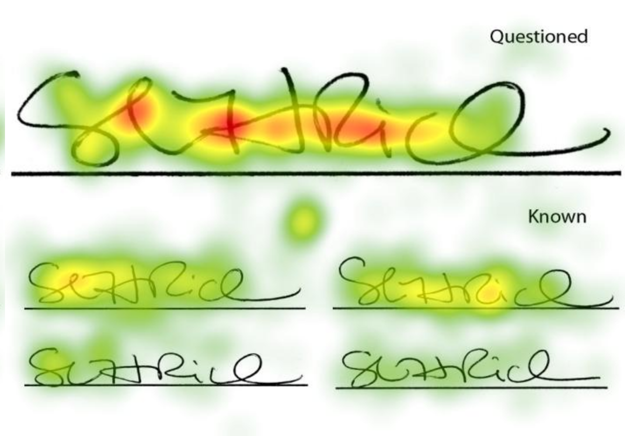
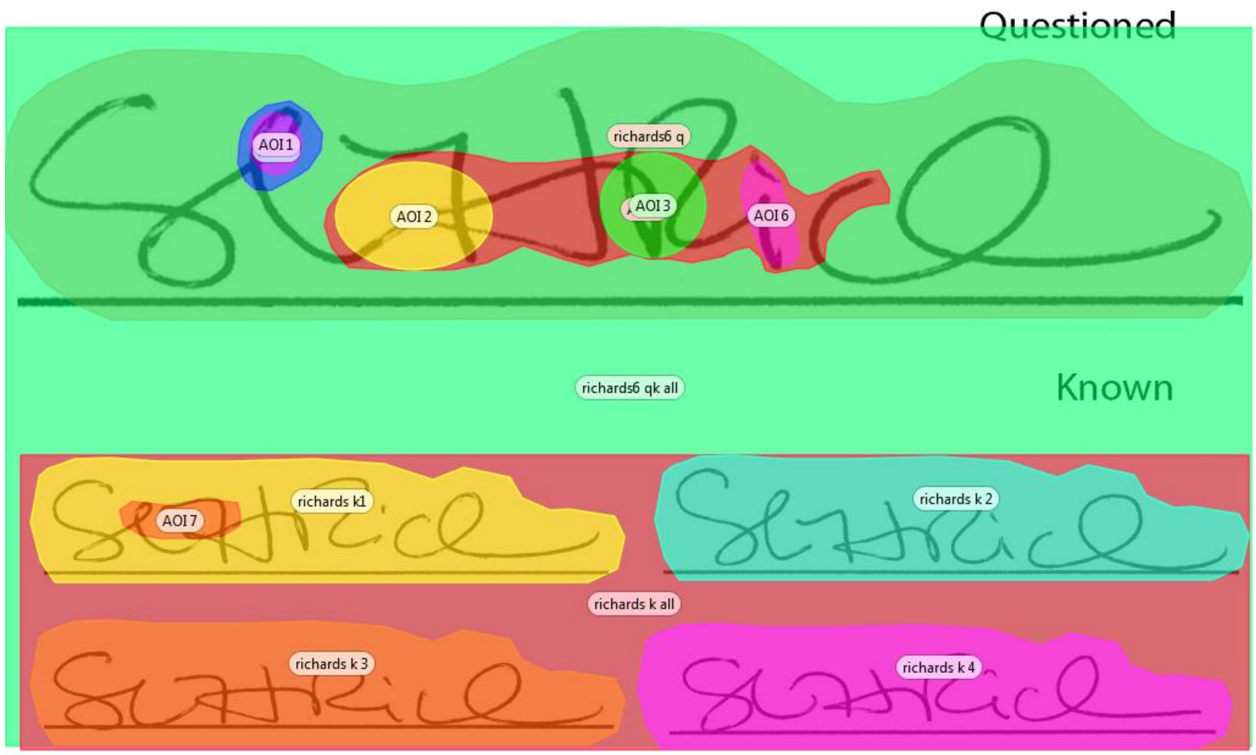


Figure Richards 6.3. Areas of Interest (AOIs) for Richards Signature 6.



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

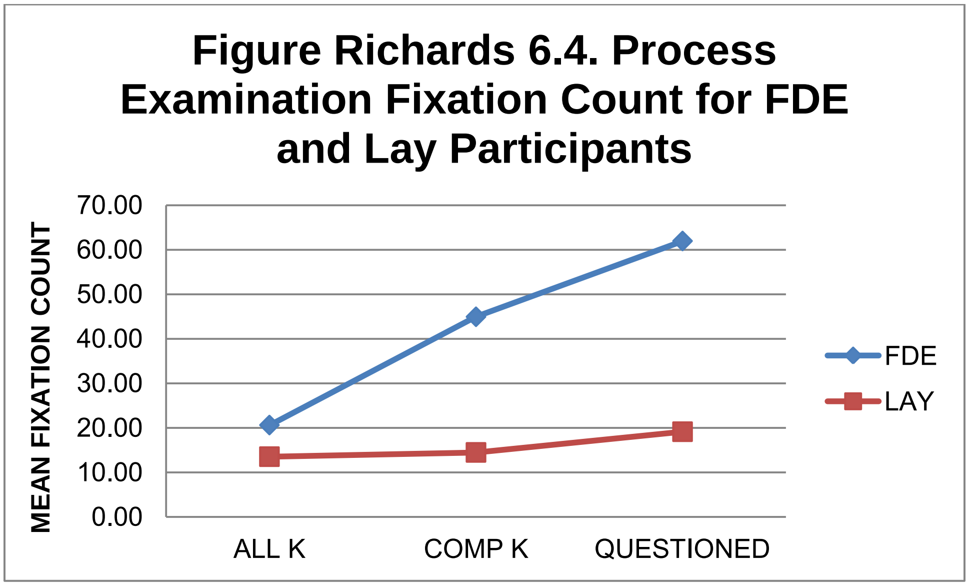
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Richards known signature stimulus (Knowns, not pictured here), Richards 1 K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Richards 6Q (the Richards questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 7) are included in subsequent analyses. Figure Richards 5.3 demonstrates all AOIs identified for this signature.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .281, F (3, 85) = 11.08, p < .001, multivariate η^2 = .281. Figure Richards 6.4 presents the mean fixation counts by AOI.

Figure Richards 6.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation counts in all but one area of interest. Total fixation count for the questioned signature was significantly greater for FDEs than for Lay participants, F (1, 87) = 33.34, p < .001, partial η^2 = .028. Fixation counts in the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, F (1, 87) = 21.95, p < .001, partial η^2 = .020.

Fixation counts in the known signature stimulus (ALL K) were not different between groups, p = .060, *ns*. Table Richards 6.1 presents the means and standard deviations for areas of interest by participant type.

Table Richards 6.1

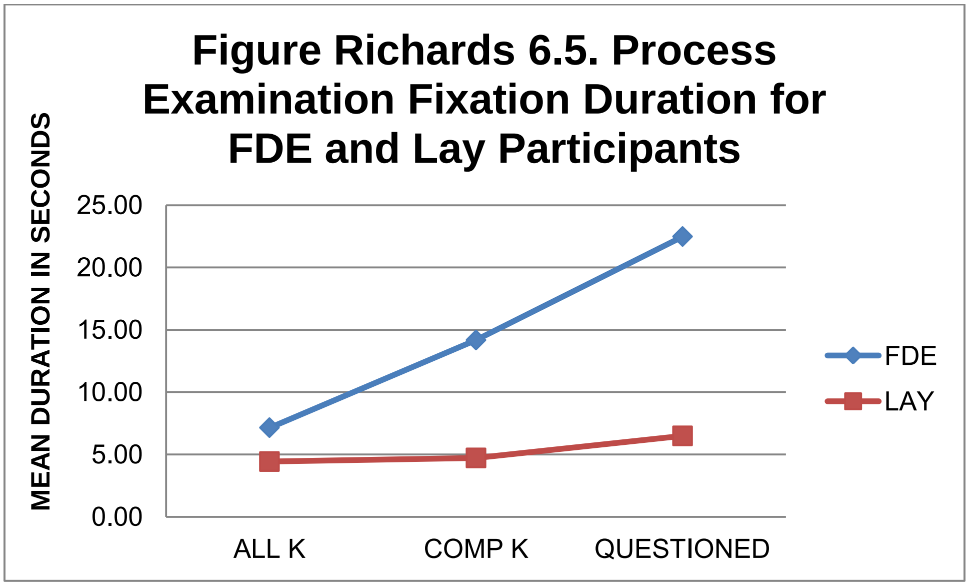
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	20.59	22.01	44.91	39.88	61.93	46.62
Lay	13.49	10.08	14.44	15.61	19.09	14.33

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .290, F (3, 85) = 6.92, p < .001, multivariate η^2 = .290. Figure Richards 6.5 presents the mean fixation durations by AOI.

Figure Richards 6.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation durations in all but one area of interest. Total fixation duration for the questioned signature was significantly greater for FDEs than for Lay participants, F (1, 87) = 33.85, p < .001, partial η^2 = .280. The known signature comparison stimulus (COMP K) was significantly greater for FDEs than for Lay participants, F (1, 87) = 20.23, p < .001, partial η^2 = .189.

Fixation duration in the known signature stimulus (ALL K) was also significantly different between groups, F (1, 87) = 4.33, p = .040, partial η^2 = .047. Table Richards 6.2 presents the means and standard deviations for areas of interest by participant type.

Table Richards 6.2

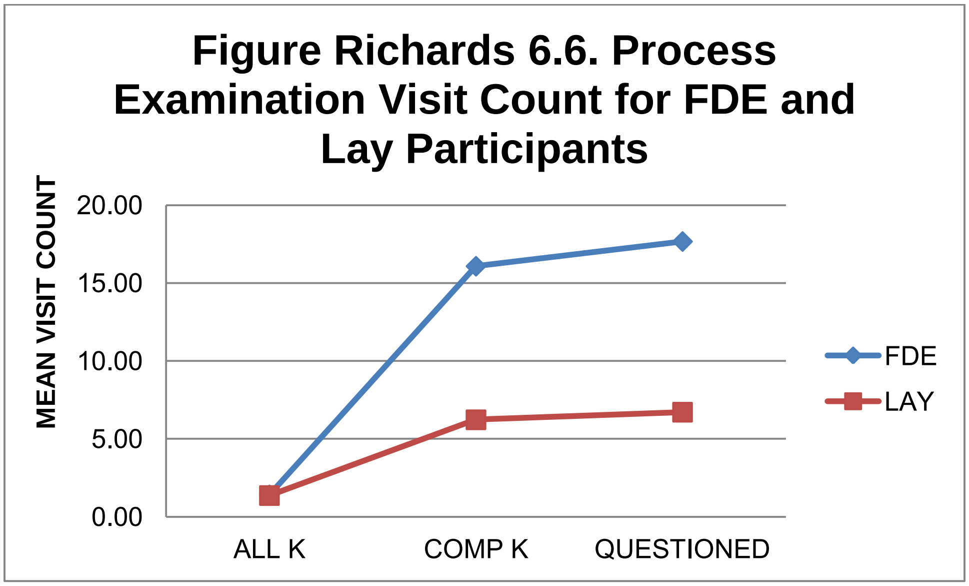
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	7.15	7.75	14.18	12.49	22.48	17.18
Lay	4.43	3.80	4.72	6.05	6.49	5.64

Total Visit Count

MANOVA results reveal significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .322, F (3, 85) = 13.43, p < .001, multivariate η^2 = .322. Figure Richards 6.6 presents the mean visit counts by AOI.

Figure Richards 6.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant. Total visit count for the questioned signature was significantly greater for FDEs than for Lay participants, F (1, 87) = 27.96, p < .001, partial η^2 = .243. Visit counts in the known signature comparison stimulus (COMP K) was significantly greater for FDEs than for Lay participants, F (1, 87) = 21.05, p < .001, partial η^2 = .195.

Visit count in the known signature stimulus (ALL K) was not significantly different between groups, p = .862, *ns*. Table Richards 6.3 presents the means and standard deviations for areas of interest by participant type.

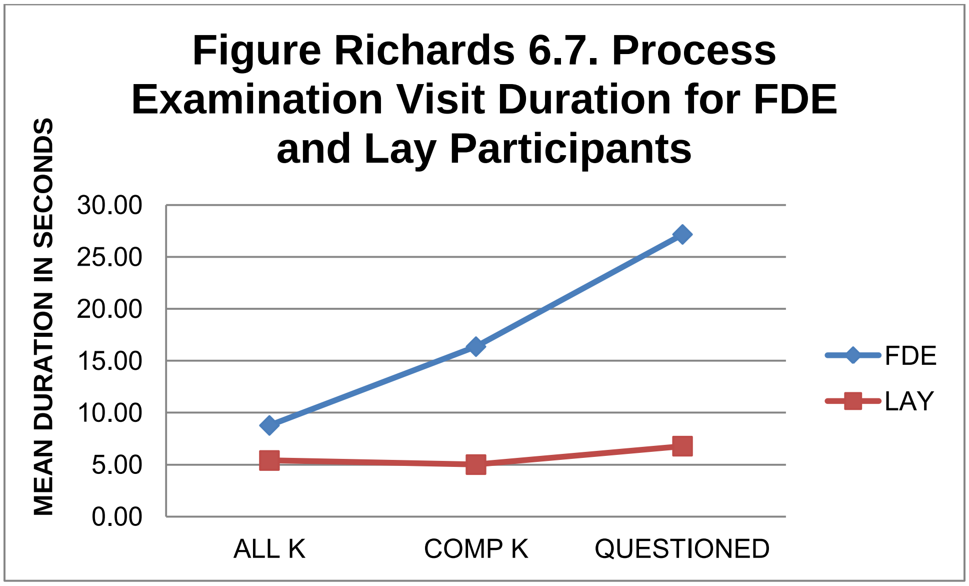
Table Richards 6.3
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.41	1.26	16.09	12.62	17.67	12.09
Lay	1.37	0.93	6.23	6.46	6.72	6.40

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .216, F (3, 85) = 7.81, p < .001, multivariate η^2 = .216. Figure Richards 6.7 presents the mean visit durations by AOI.

Figure Richards 6.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature was significantly greater for FDEs than for Lay participants, F (1, 87) = 16.87, $p <$ .001, partial η^2 = .162. There was a statistical difference for the known signature comparison stimulus (COMP K), F (1, 87) = 20.68, $p <$ .001, partial η^2 = .192. Visit duration in the known signature stimulus (ALL K) was significantly greater for FDEs than for Lay participants, F (1, 87) = 4.50, p = .037, partial η^2 = .049. Table Richards 6.4 presents the means and standard deviations for areas of interest by participant type.

Table Richards 6.4

Process Analysis Visit Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	8.78	9.54	16.36	15.18	27.17	32.07
Lay	5.40	4.35	5.01	6.33	6.78	5.67

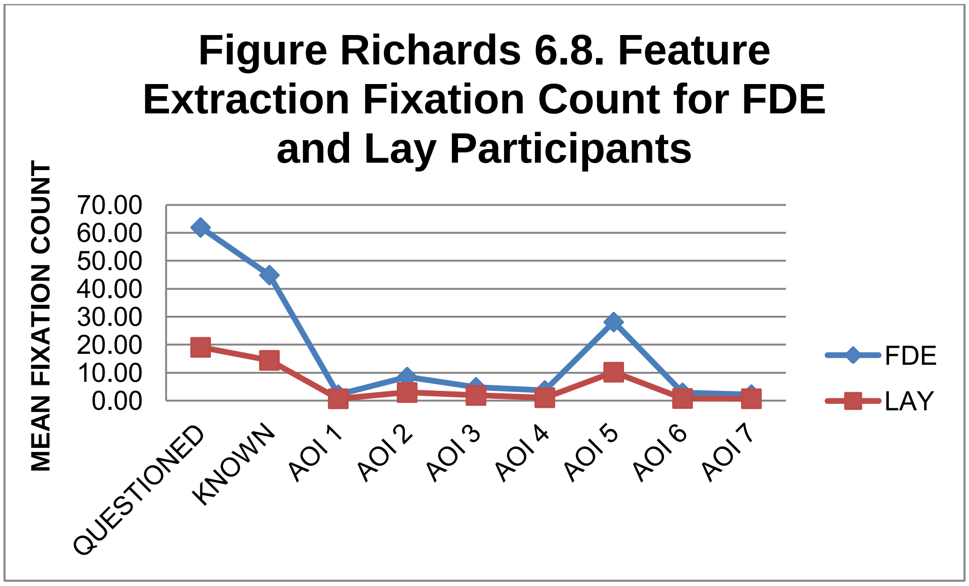
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .354, F (9, 79) = 4.09, p < .001, multivariate η^2 = .354. Figure Richards 6.8 presents the mean fixation counts by AOI.

Figure Richards 6.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature and known signatures was significantly greater for FDEs than for Lay participants, F (1, 87) = 33.34, p < .001, partial η^2 =.277, and F (1, 87) = 21.95, p < .001, partial η^2 = .201.

Fixations counts in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, F (1, 87) = 11.56, p = .001, partial η^2 = .117; AOI 2, F (1, 87) = 17.87, p < .001, partial η^2 = .170; AOI 3, F (1, 87) = 18.55, p < .001, partial η^2 = .176; AOI 4, F (1, 87) = 20.74, p < .001, partial η^2 = .195; AOI 5, F (1, 87) = 21.67, p < .001, partial η^2 = .199; AOI 6, F (1, 87) = 21.44, p < .001, partial η^2 = .198; AOI 7, F (1, 87) = 12.67, p = .001, partial η^2 = .127). Table Richards 6.5 presents the means and standard deviations for areas of interest by participant type.

Table Richards 6.5

Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

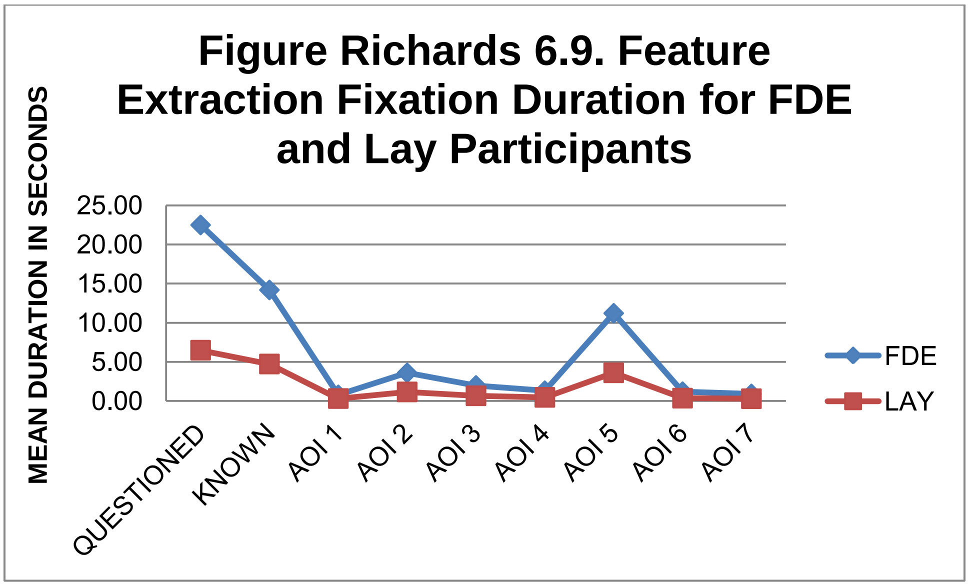
	QUESTIONED		**KNOWN**		**AOI 1**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	61.93	46.62	44.91	39.88	2.15	2.32
Lay	19.09	14.33	14.44	15.61	0.72	1.55
	AOI 2		**AOI 3**		**AOI 4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	8.50	8.16	4.83	4.13	3.70	3.33

Lay	2.95	2.82	1.91	1.70	1.09	1.78
	AOI 5		**AOI 6**		**AOI 7**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	28.13	24.27	2.83	2.64	2.20	2.49
Lay	10.21	7.13	0.81	1.10	0.72	1.12

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .369, F (9, 79) = 5.14, $p < .001$, multivariate $\eta^2 = .369$. Figure Richards 6.9 presents the mean fixation durations by AOI.

Figure Richards 6.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and known signatures was significantly greater for FDEs than for Lay participants, F (1, 87) = 33.85, $p < .001$, partial η^2 =.280, and F (1, 87) = 20.23, $p < .001$, partial η^2 = .189.

Fixation durations in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, F (1, 87) = 6.95, $p = .010$, partial $\eta^2 = .074$; AOI 2, F (1, 87) = 17.25, $p < .001$, partial $\eta^2 = .166$; AOI 3, F (1, 87) = 21.55, $p < .001$, partial $\eta^2 = .166$; AOI 4, F (1, 87) = 14.33, $p < .001$, partial $\eta^2 = .141$; AOI 5, F (1, 87) = 23.75, < .001, partial $\eta^2 = .214$; AOI 6, F (1, 87) = 14.95, $p < .001$, partial $\eta^2 = .147$; AOI 7, F (1, 87) = 12.64, $p < .001$, partial $\eta^2 = .127$). Table Richards 6.6 presents the means and standard deviations for areas of interest by participant type.

Table Richards 6.6

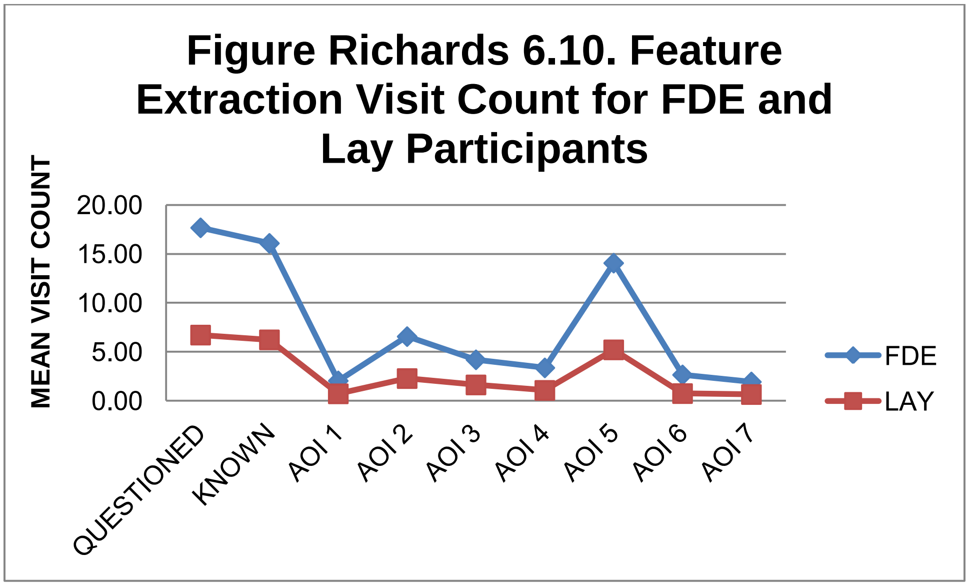
Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	22.48	17.18	14.18	12.49	0.78	0.89
Lay	6.49	5.64	4.72	6.05	0.31	0.78
	AOI 2		**AOI 3**		**AOI 4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	3.59	3.54	1.98	1.77	1.30	1.23
Lay	1.15	1.57	0.66	0.61	0.46	0.83
	AOI 5		**AOI 6**		**AOI 7**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	11.20	9.77	1.19	1.27	0.90	1.03
Lay	3.60	3.12	0.35	0.64	0.28	0.47

<u>*Total Visit Count*</u>

MANOVA results did reveal significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .382, F (9, 79) = 5.42, p < .001, multivariate η^2 = .382. Figure Richards 6.10 presents the mean total visit counts by AOI.

Figure Richards 6.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in all areas of interest. Total visit count for the questioned signature and known signatures was significantly greater for FDEs than for Lay participants, F (1, 87) = 27.96, p < .001, partial η^2 =.243, and F (1, 87) = 21.05, p < .001, partial η^2 = .195.

Visit counts in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, F (1, 87) = 10.82, p = .001, partial η^2 = .111; AOI 2, F (1, 87) = 21.17, p < .001, partial η^2 = .196; AOI 3, F (1, 87) = 21.86, p < .001, partial η^2 = .201; AOI 4, F (1, 87) = 20.81, p < .001, partial η^2 = .193; AOI 5, F (1, 87) = 29.47 p < .001, partial η^2 = .253; AOI 6, F (1, 87) = 23.26, p < .001, partial η^2 = .211; AOI 7, F (1, 87) = 13.03, p = .001, partial η^2 = .130). Table Richards 6.7 presents the means and standard deviations for areas of interest by participant type.

Table Richards 6.7

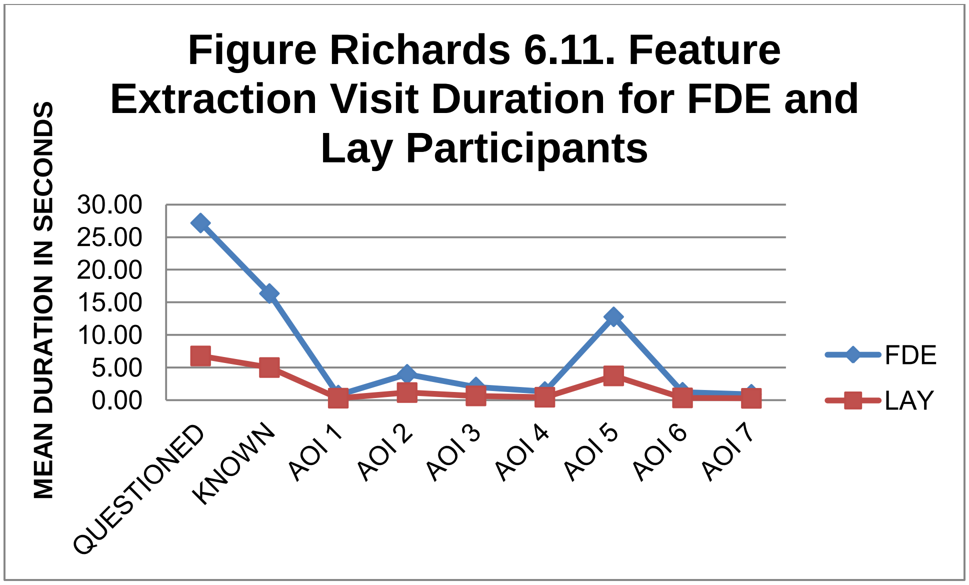
Feature Extraction Analysis Visit Count for FDE and Lay Participants

	QUESTIONED		**KNOWN**		**AOI 1**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	17.67	12.09	16.09	12.62	2.04	2.17
Lay	6.72	6.40	6.23	6.46	0.72	1.55
	AOI 2		**AOI 3**		**AOI 4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	6.57	5.85	4.20	3.37	3.37	2.89
Lay	2.28	1.82	1.63	1.31	1.07	1.67
	AOI 5		**AOI 6**		**AOI 7**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	14.07	10.14	2.65	2.44	1.93	2.13
Lay	5.21	3.53	0.74	0.90	0.65	0.97

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .307, F (9, 79) = 3.89, p < .001, multivariate η^2 = .307. Figure Richards 6.11 presents the mean total visit durations by AOI.

Figure Richards 6.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit duration in all areas of interest. Total visit duration for the questioned signature and known signatures was significantly greater for FDEs than for Lay participants, F (1, 87) = 16.87, p < .001, partial η^2 =.162, and F (1, 87) = 20.68, p < .001, partial η^2 = .192.

Visit duration in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, F (1, 87) = 7.03, p = .010, partial η^2 = .075; AOI 2, F (1, 87) = 13.42, p < .001, partial η^2 = .134; AOI 3, F (1, 87) = 20.47, p < .001, partial η^2 = .190; AOI 4, F (1, 87) = 14.64, p < .001, partial η^2 = .144; AOI 5, F (1, 87) = 15.33, p < .150, partial η^2 = .150; AOI 6, F (1, 87) = 15.09, p < .001, partial η^2 = .148; AOI 7, F (1, 87) = 12.79, p = .001, partial η^2 = .128). Table Richards 6.8 presents the means and standard deviations for areas of interest by participant type.

Table Richards 6.8

Feature Extraction Analysis Visit Count for FDE and Lay Participants

	QUESTIONED		**KNOWN**		**AOI 1**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	27.17	32.07	16.36	15.18	0.79	0.91
Lay	6.78	5.67	5.01	6.33	0.31	0.78
	AOI 2		**AOI 3**		**AOI 4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	3.98	4.78	2.03	1.90	1.33	1.26
Lay	1.17	1.58	0.66	0.61	0.46	0.83
	AOI 5		**AOI 6**		**AOI 7**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	12.78	14.86	1.22	1.32	0.91	1.06
Lay	3.73	3.13	0.36	0.64	0.28	0.47

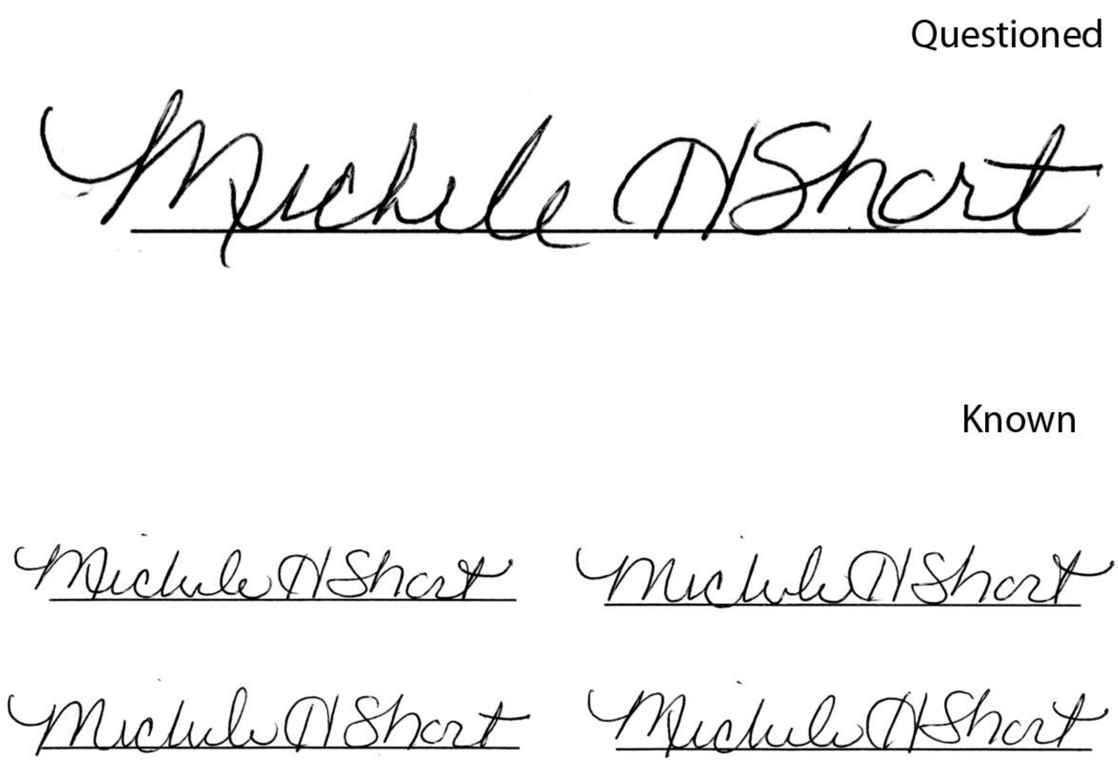
<u>SIGNATURE 8: Michele Short</u>

The signature of Michele Short is characterized as a high-complexity text-type signature. The set of Short signature specimens included one genuine signature. Of the non-genuine signatures, three were freehand simulations, and two were traced. No disguised signatures were included.

Short Signature 1: Traced (Non-Genuine)

Of the 49 FDE participants, 46 responded correctly that the signature was non-genuine, while 3 FDEs responded that the signature was genuine. Of the 43 Lay participants, 26 responded correctly that the signature was non-genuine, while 17 responded that the signature was genuine. This difference was statistically significant, χ^2 (2, N = 92) = 15.03, p < .001. Figure Short 1.1 presents the comparison view of this signature.

Figure Short 1.1. Questioned-Known Comparison Stimulus for Short Signature 1.

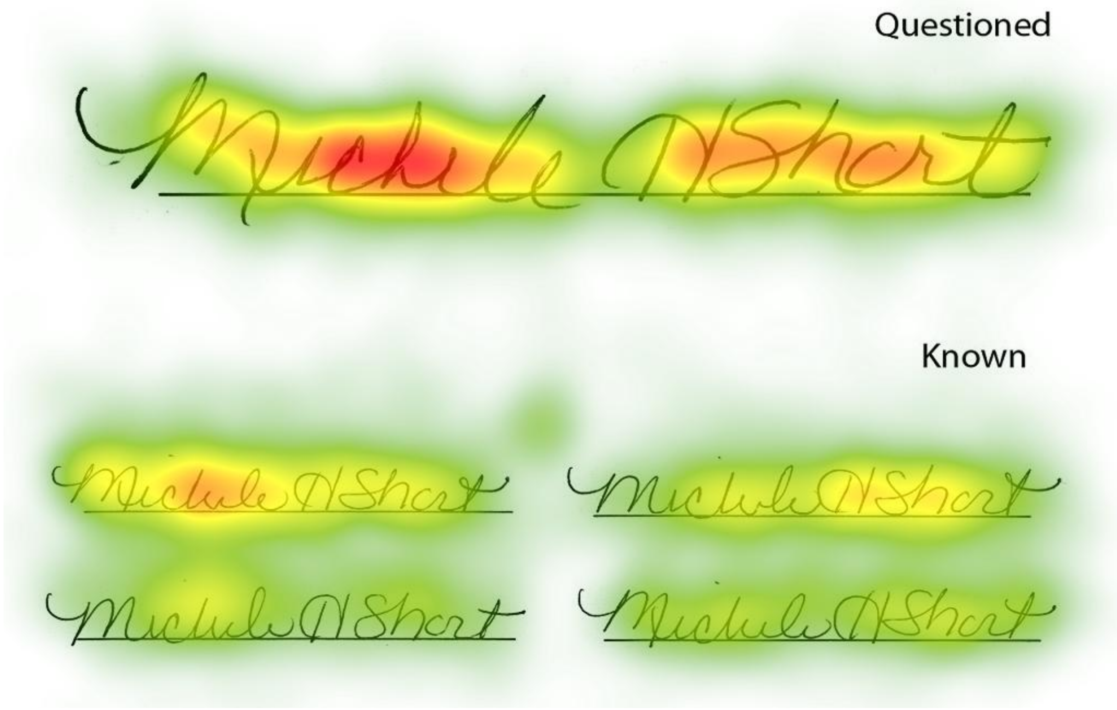


Selection of Areas of Interest (AOIs)

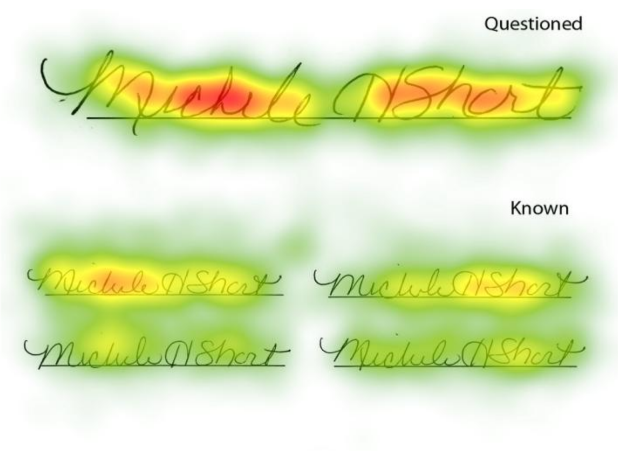
Figure Short 1.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were five locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of five AOIs for this stimulus. Figure Short 1.3 presents the location of the AOIs identified in the heat map.

Figure Short 1.2. Heat map for Short signature 1, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

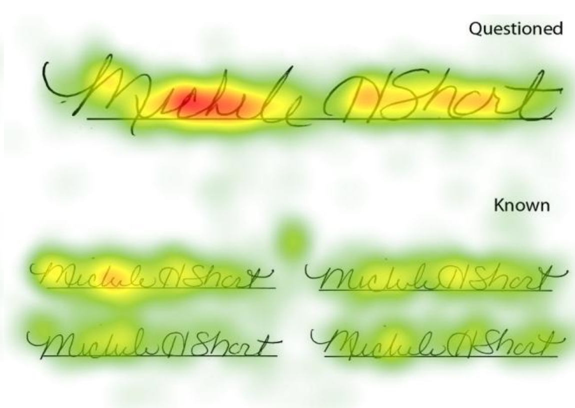
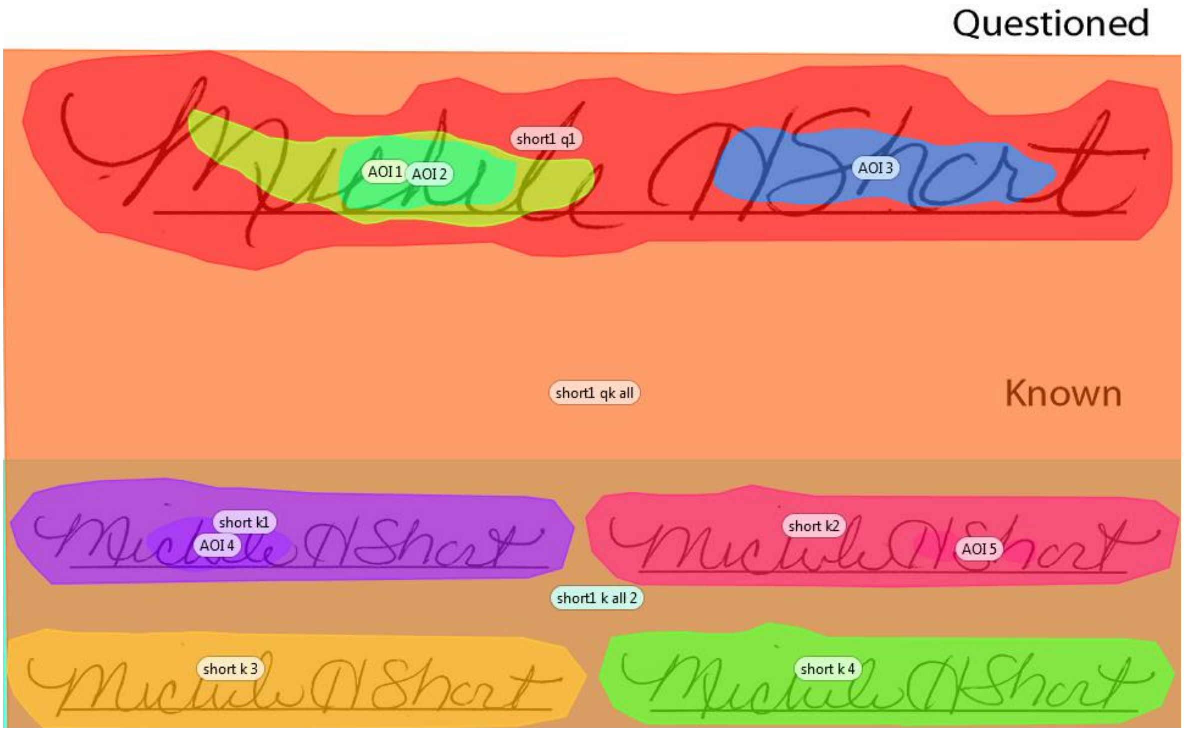


Figure Short 1.3. Areas of Interest (AOIs) for Short Signature 1.



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

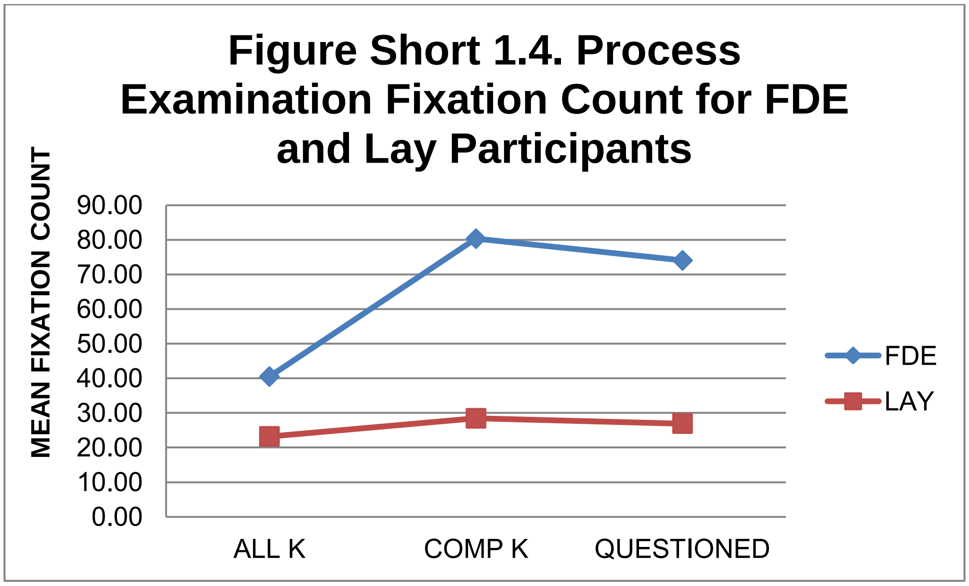
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Short known signature stimulus (Knowns, not pictured here), Short 1 K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Short 1Q (the Short questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 5) are included in subsequent analyses.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .261, $F(3, 85) = 10.02$, $p < .001$, multivariate $\eta^2 = .347$. Figure Short 1.4 presents the mean fixation counts by AOI.

Figure Short 1.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation counts in all of the areas of interest. Total fixation counts for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, $F(1, 87) = 27.56$, $p < .001$, partial $\eta^2 = .241$, $F(1, 87) = 27.94$, $p < .001$, partial $\eta^2 = .243$.

Fixation count in the known signature stimulus (ALL K) was also statistically significant, $F(1, 87) = 5.88$, $p = .017$, partial $\eta^2 = .063$. Table Short 1.1 presents the means and standard deviations for areas of interest by participant type.

Table Short 1.1

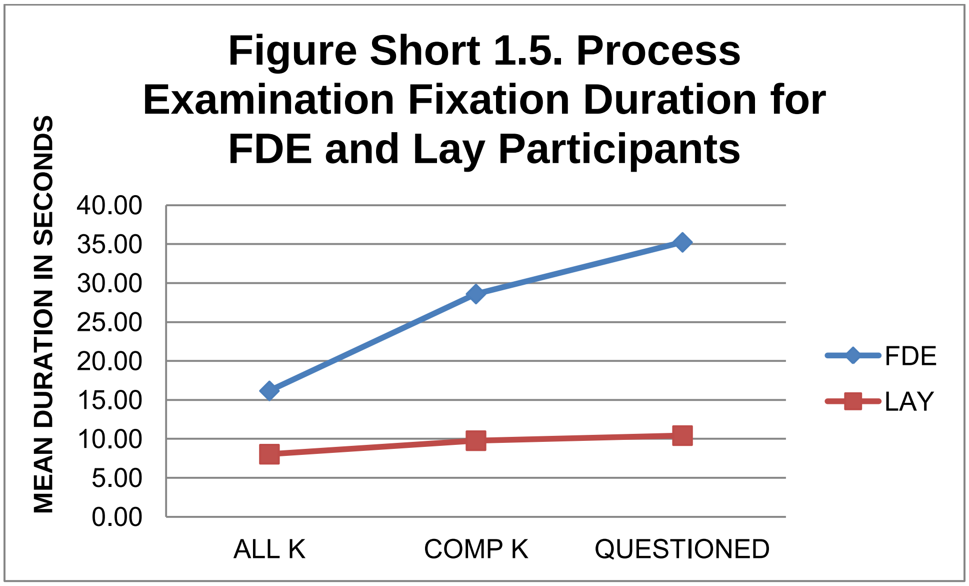
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	40.48	43.30	80.30	57.05	74.02	52.47
Lay	23.19	18.17	28.42	30.81	26.91	27.54

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .347, $F(3, 85) = 15.06$, $p = .001$, multivariate $\eta^2 = .347$. Figure Short 1.5 presents the mean fixation duration by AOI.

Figure Short 1.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, $F(1, 87) = 44.97$, $p > .001$, partial $\eta^2 = .341$, and $F(1, 87) = 28.08$, $p = .001$, partial $\eta^2 = .244$.

Fixation duration in the known signature stimulus (ALL K) was also statistically significant, $F(1, 87) = 7.84$, $p = .006$, partial $\eta^2 = .083$. Table Short 1.2 presents the means and standard deviations for areas of interest by participant type.

Table Short 1.2

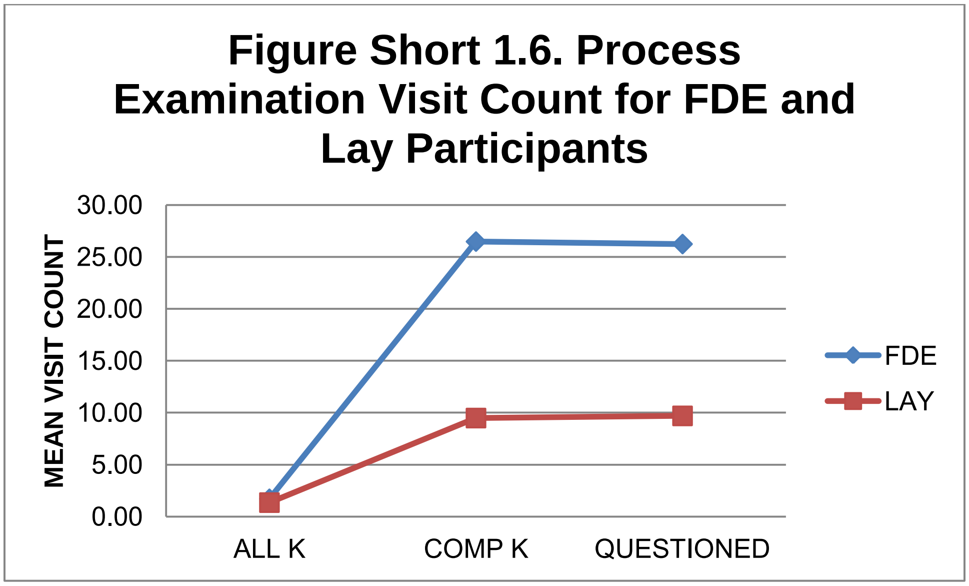
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	16.17	17.74	28.61	21.19	35.24	21.86
Lay	8.05	7.14	9.78	9.99	10.43	10.88

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .254, $F(3, 85) = 9.66$, $p < .001$, multivariate $\eta^2 = .254$. Figure Short 1.6 presents the mean visit durations by AOI.

Figure Short 1.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in two of the three of the areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, $F(1, 87) = 26.30$, $p < .001$, partial $\eta^2 = .232$, and $F(1, 87) = 29.18$, $p < .001$, partial $\eta^2 = .251$.

Visit count in the known signature stimulus (ALL K) was not statistically significant, $p = .256$, *ns*. Table Short 1.3 presents the means and standard deviations for areas of interest by participant type.

Table Short 1.3

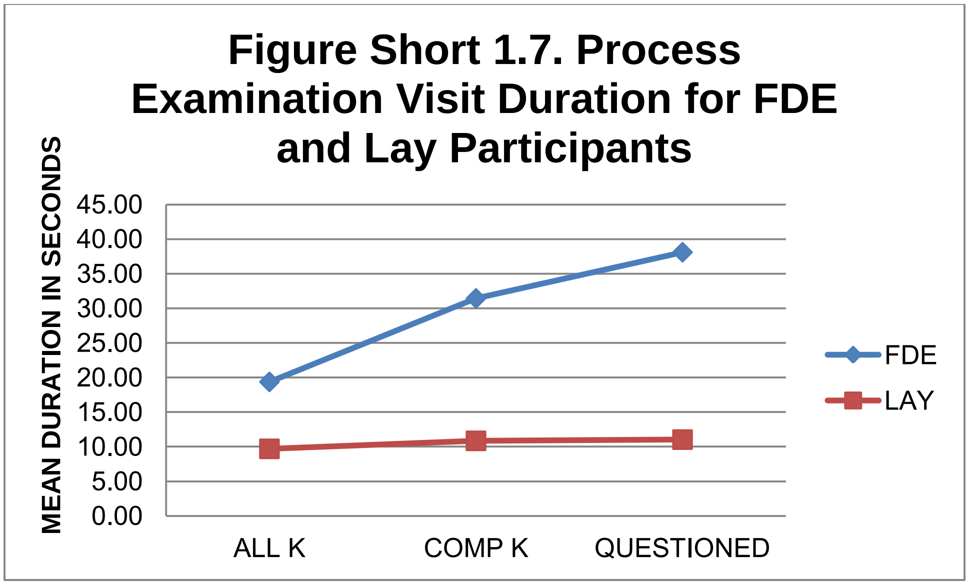
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.72	1.89	26.48	17.48	26.24	17.87
Lay	1.35	0.97	9.49	11.31	9.70	11.70

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .348, $F(3, 85) = 15.15$, $p < .001$, multivariate $\eta^2 = .348$. Figure Short 1.7 presents the mean visit durations by AOI.

Figure Short 1.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit duration in all three of the areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus (COMP K) was significantly greater for FDEs than for Lay participants, ($F(1, 87) = 46.15$, $p > .001$, partial $\eta^2 = .347$), and $F(1, 87) = 28.63$, $p > .001$, partial $\eta^2 = .248$). Visit duration in the known signature stimulus (ALL K) was also statistically significant, $F(1, 87) = 9.20$, $p = .003$, partial $\eta^2 = .096$. Table Short 1.4 presents the means and standard deviations for areas of interest by participant type.

Table Short 1.4

Process Analysis Visit Duration for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	19.36	19.43	31.43	22.83	38.11	23.73
Lay	9.69	7.97	10.85	11.09	11.03	11.32

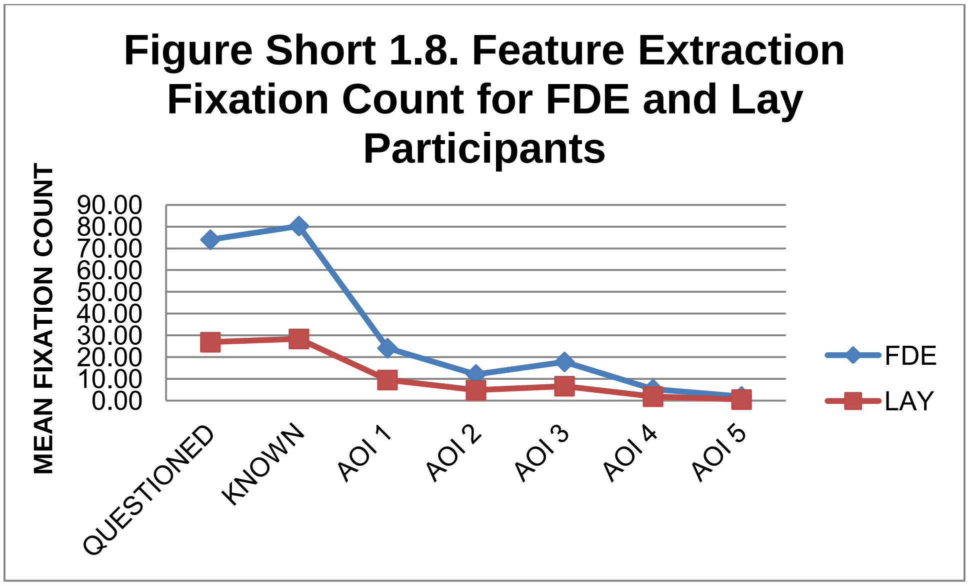
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .272, $F(7, 81) = 4.31$, $p < .001$, multivariate $\eta^2 = .272$. Figure Short 1.8 presents the mean fixation counts by AOI.

Figure Short 1.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 87) = 27.56$, $p < .001$, partial $\eta^2 = .241$, and $F(1, 87) = 27.94$, $p < .001$, partial $\eta^2 = .243$.

Fixation count in all AOIs was significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 24.24$, $p < .001$, partial $\eta^2 = .218$; AOI 2, $F(1, 87) = 19.67$, $p < .001$, partial $\eta^2 = .184$; AOI 3, $F(1, 87) = 19.58$, $p < .001$, partial $\eta^2 = .184$; AOI 4, $F(1, 87) = 9.01$, $p = .004$, partial $\eta^2 = .094$; AOI 5, $F(1, 87) = 27.56$, $p = .001$, partial $\eta^2 = .241$). Table X presents the means and standard deviations for areas of interest by participant type.

Table Short 1.5

Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	74.02	52.47	80.30	57.05	24.15	16.98	12.11	9.54
Lay	26.91	27.54	28.42	30.81	9.53	9.84	4.84	5.11

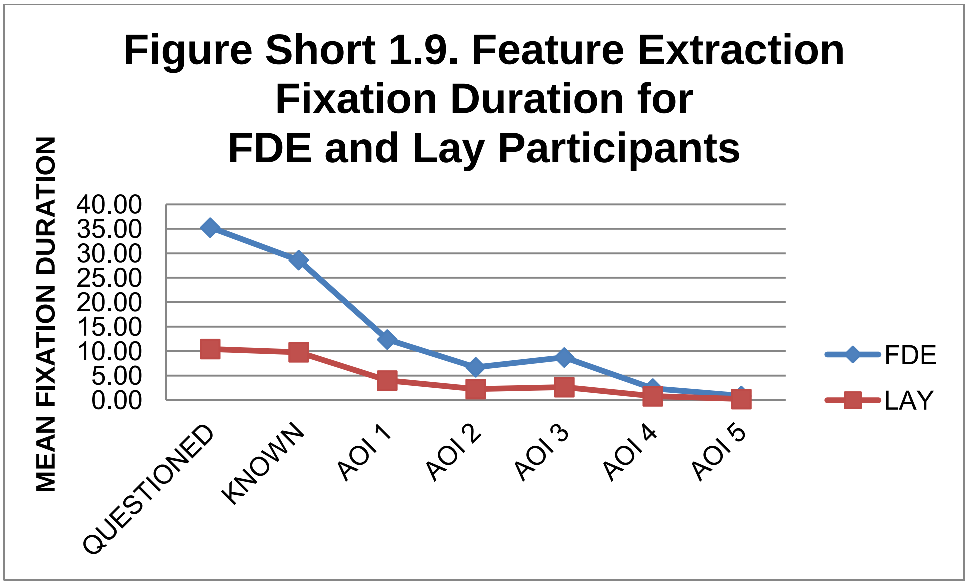
	AOI 3		AOI 4		AOI 5	
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	17.85	15.29	5.33	7.10	2.00	2.48

Lay	6.70	6.47	1.91	2.40	0.56	0.91

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .364, $F(7, 81) = 6.63$, $p < .001$, multivariate $\eta^2 = .364$. Figure Short 1.9 presents the mean fixation durations by AOI.

Figure Short 1.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 87) = 44.97$, $p < .001$, partial $\eta^2 = .341$, and $F(1, 87) = 28.08$, $p < .001$, partial $\eta^2 = .244$.

Fixation duration in all AOIs was significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 32.30$, $p < .001$, partial $\eta^2 = .271$; AOI 2, $F(1, 87) = 26.45$, $p < .001$, partial $\eta^2 = .233$; AOI 3, $F(1, 87) = 27.22$, $p < .001$, partial $\eta^2 = .238$; AOI 4, $F(1, 87) = 10.62$, $p = .002$, partial $\eta^2 = .109$; AOI 5, $F(1, 87) = 11.31$, $p = .001$, partial $\eta^2 = .115$). Table Short 1.6 presents the means and standard deviations for areas of interest by participant type.

Table Short 1.6

Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***

FDE	35.24	21.86	28.61	21.19	12.37	8.77	6.70	5.12
Lay	10.43	10.88	9.78	9.99	3.97	4.26	2.25	2.54

	AOI 3		**AOI 4**		**AOI 5**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	8.70	7.17	2.35	3.03	0.83	1.17
Lay	2.64	2.68	0.77	0.96	0.20	0.37

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .268, $F(7, 81) = 4.24$, $p < .001$, multivariate $\eta^2 = .268$. Figure Short 1.10 presents the mean visit counts by AOI.

Figure Short 1.10

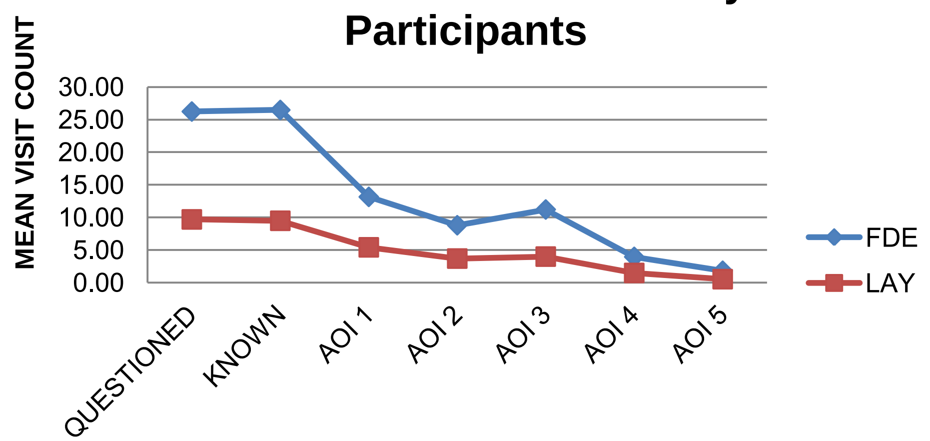


Figure Short 1.10. Feature Extraction Visit Count for FDE and Lay Participants

Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all but one areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 87) = 26.30$, $p < .001$, partial $\eta^2 = .232$, and F(1, 87) = 29.18, $p < .001$, partial $\eta^2 = .251$.

Visit count in all AOIs was significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 21.64$, $p < .001$, partial $\eta^2 = .199$; AOI 2, $F(1, 87) = 19.45$, $p < .001$, partial $\eta^2 = .183$; AOI 3, $F(1, 87) = 23.07$, $p < .001$, partial $\eta^2 = .210$; AOI 4, $F(1, 87) = 10.49$, $p = .002$, partial $\eta^2 = .108$; AOI 5, $F(1, 87) = 13.03$, $p = .001$, partial $\eta^2 = .130$). Table Short 1.7 presents the means and standard deviations for areas of interest by participant type.

Table Short 1.7

Feature Extraction Analysis Visit Count for FDE and Lay Participants

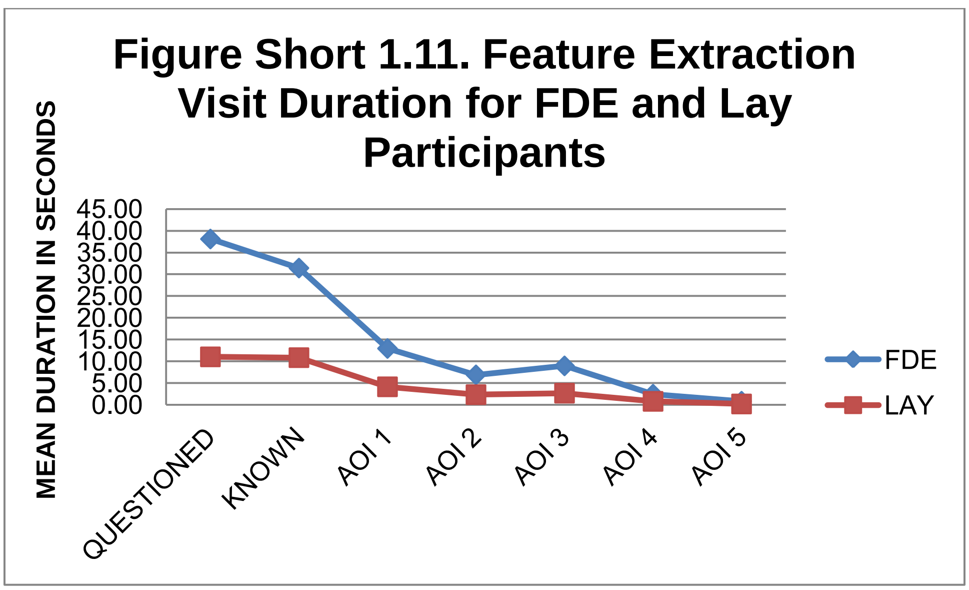
	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	26.24	17.87	26.48	17.48	13.15	9.49	8.80	6.73
Lay	9.70	11.70	9.49	11.31	5.42	5.55	3.70	3.64

	AOI 3		AOI 4		AOI 5	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	11.22	9.07	3.96	4.74	1.83	2.18
Lay	4.00	3.97	1.49	1.64	0.53	0.88

<u>*Total Visit Duration*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .380, $F(7, 81) = 7.09$, $p < .001$, multivariate $\eta^2 = .380$. Figure Short 1.11 presents the mean visit durations by AOI.

Figure Short 1.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all but one areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 87) = 46.15$, $p < .001$, partial $\eta^2 = .347$, and $F(1, 87) = 28.63$, $p < .001$, partial $\eta^2 = .248$.

Visit duration in (AOI 1, $F(1, 87) = 33.74$, $p < .001$, partial $\eta^2 = .279$; AOI 2, $F(1, 87) = 26.26$, $p < .001$, partial $\eta^2 = .232$; AOI 3, $F(1, 87) = 27.75$, $p < .001$, partial $\eta^2 = .242$; AOI 4, $F(1, 87) = 11.01$, $p = .001$, partial $\eta^2 = .112$; AOI 5, $F(1, 87) = 11.60$, $p = .001$, partial $\eta^2 = .118$). Table Short 1.8 presents the means and standard deviations for areas of interest by participant type.

Table Short 1.8

Feature Extraction Analysis Visit Duration for FDE and Lay Participants

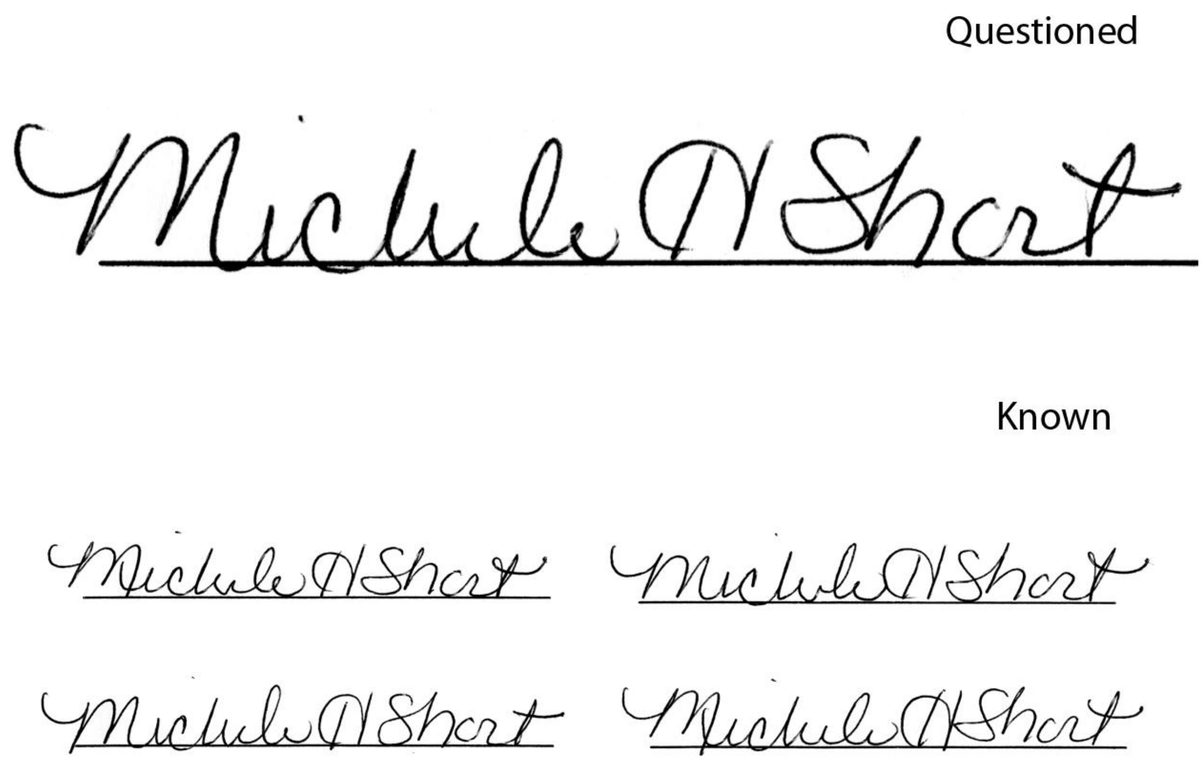
	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	38.11	23.73	31.43	22.83	12.95	9.00	6.89	5.26
Lay	11.03	11.32	10.85	11.09	4.14	4.37	2.33	2.60

	AOI 3		AOI 4		AOI 5	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	8.96	7.35	2.45	3.12	0.84	1.18
Lay	2.69	2.71	0.80	0.98	0.20	0.37

Short Signature 2: Genuine

Of the 49 FDE participants, 45 responded correctly that the signature was genuine, while 4 FDEs responded that the signature was non-genuine. Of the 43 Lay participants, 43 responded correctly that the signature was genuine, while none responded that the signature was non-genuine. This difference was not statistically significant, p = .055, *ns*. Figure Short 2.1 presents the comparison view of this signature.

Figure Short 2.1. Questioned-Known Comparison Stimulus for Short Signature 2.



Selection of Areas of Interest (AOIs)

Figure Short 2.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were six locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of six AOIs for this stimulus. Figure Short 2.3 presents the location of the AOIs identified in the heat map.

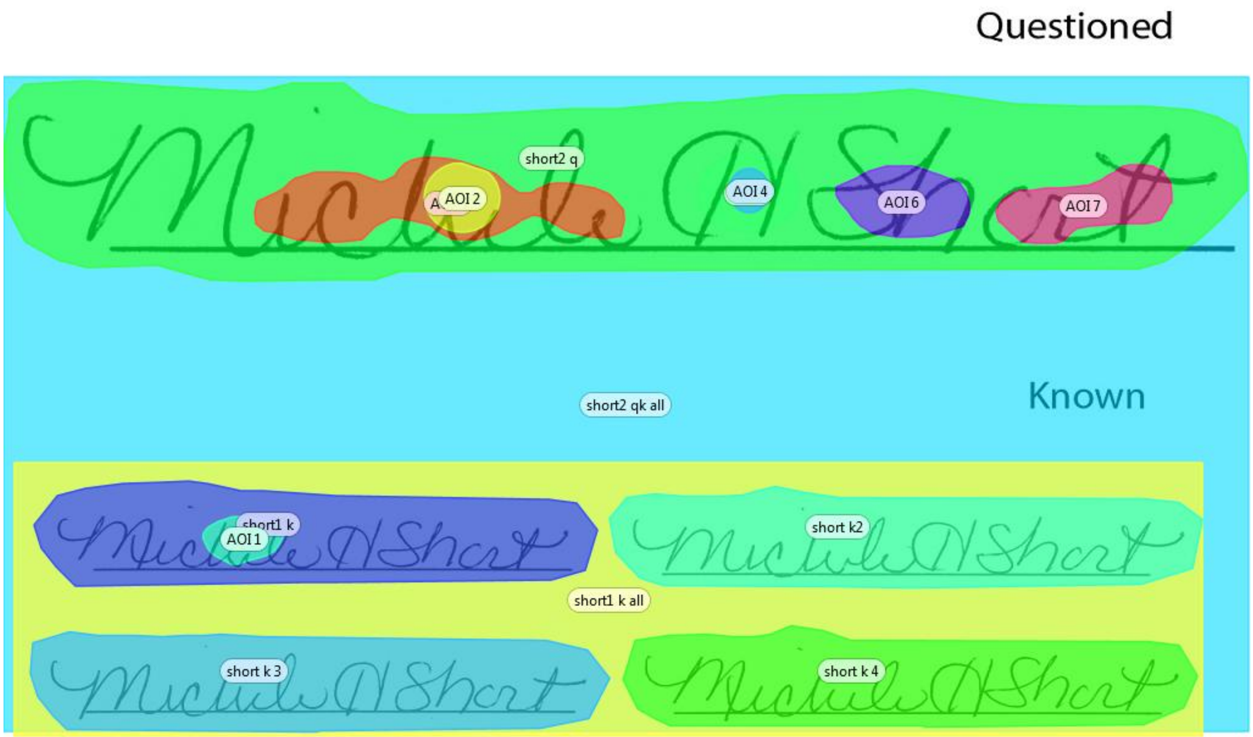
Figure Short 2.2. Heat map for Short Signature 2, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants

FDE

Lay

Figure Short 2.3. Areas of Interest (AOIs) for Short Signature 2.



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

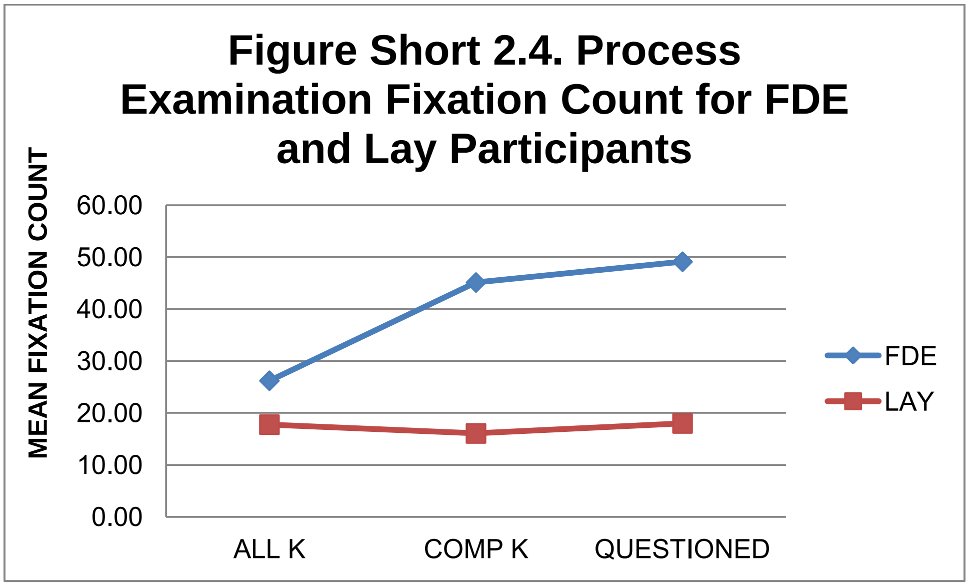
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Short known signature stimulus (Knowns, not pictured here), Short 1 K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Short 2Q (the Short questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 6) are included in subsequent analyses.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .153, $F(3, 86) = 10.02$, $p = .002$, multivariate $\eta^2 = .153$. Figure Short 2.4 presents the mean fixation counts by AOI.

Figure Short 2.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all of the areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, $F(1, 88) = 12.75$, $p = .001$, partial $\eta^2 = .127$, and $F(1, 88) = 8.73$, $p = .004$, partial $\eta^2 = .090$. Fixation count in the known signature stimulus (ALL K) was also statistically significant, $F(1, 88) = 4.54$, $p = .036$, partial $\eta^2 = .049$. Table Short 2.1 presents the means and standard deviations for areas of interest by participant type.

Table Short 2.1

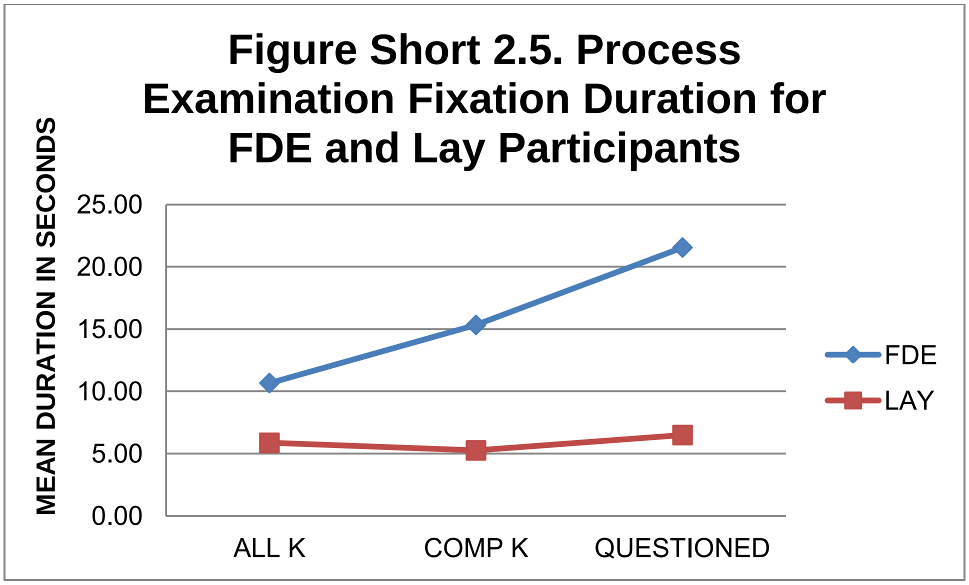
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	26.21	23.01	45.13	61.35	49.13	55.08
Lay	17.77	12.65	16.07	20.68	18.00	15.89

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .183, $F(3, 86) = 6.41$, $p = .001$, multivariate $\eta^2 = .183$. Figure Short 2.5 presents the mean fixation duration by AOI.

Figure Short 2.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, $F(1, 88) = 17.15$, $p > .001$, partial $\eta^2 = .163$, and $F(1, 88) = 14.45$, $p < .001$, partial $\eta^2 = .141$. Fixation duration in the known signature stimulus (ALL K) was also statistically significant, $F(1, 88) = 4.81$, $p = .031$, partial $\eta^2 = .052$. Table Short 2.2 presents the means and standard deviations for areas of interest by participant type.

Table Short 2.2

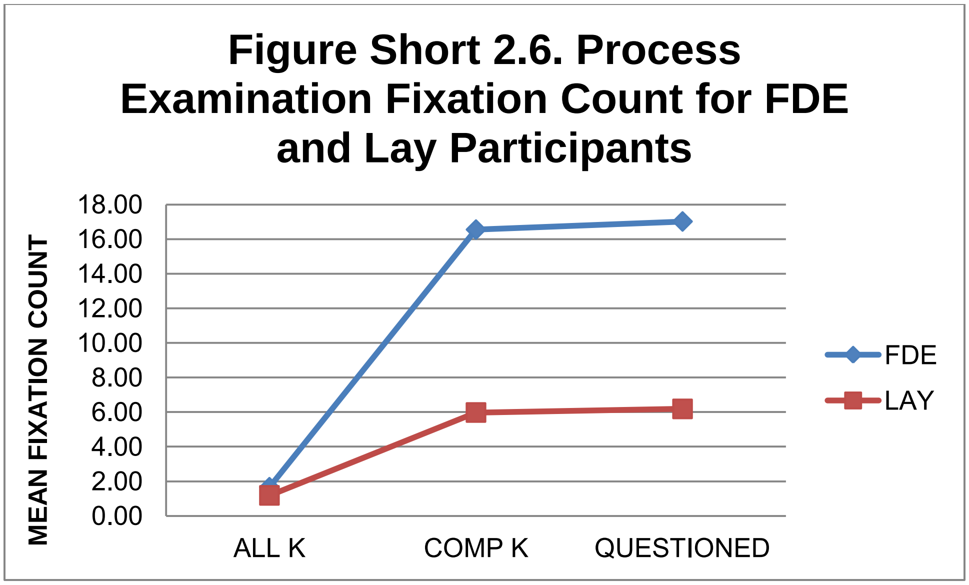
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	10.67	13.67	15.33	16.38	21.55	23.09
Lay	5.86	4.55	5.26	6.05	6.49	6.17

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .217, $F(3, 86) = 7.93$, $p < .001$, multivariate $\eta^2 = .217$. Figure Short 2.6 presents the mean visit durations by AOI.

Figure Short 2.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in two of the three of the areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, $F(1, 88) = 16.27$, $p < .001$, partial $\eta^2 = .156$, and known signature comparison stimulus, $F(1, 88) = 15.02$, $p < .001$, partial $\eta^2 = .146$. Visit count in the known signature stimulus (ALL K) was also statistically significant, $F(1, 88) = 5.90$, $p = .017$, partial $\eta^2 = .063$. Table Short 2.3 presents the means and standard deviations for areas of interest by participant type.

Table Short 2.3

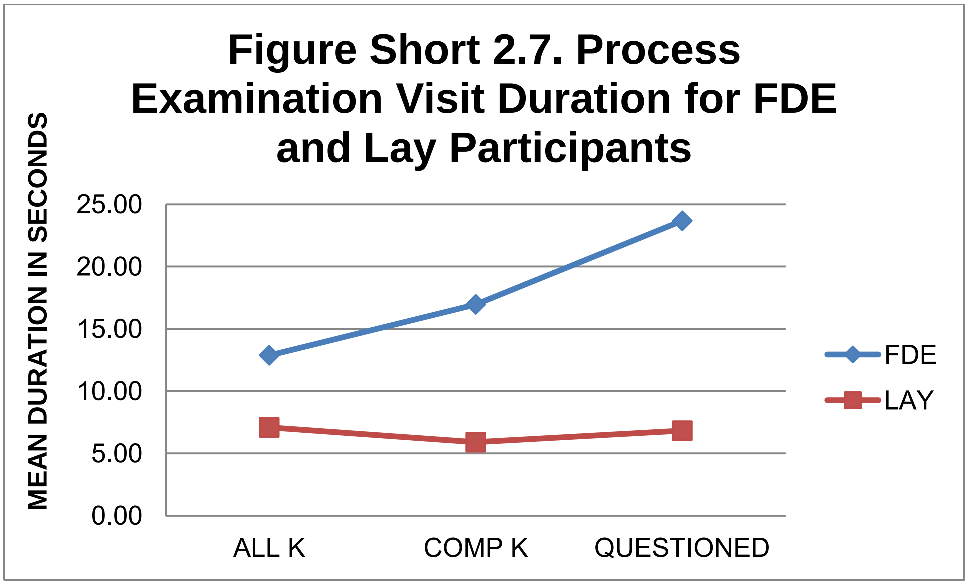
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.66	1.15	16.55	16.68	17.02	16.40
Lay	1.19	0.59	5.98	6.76	6.19	6.69

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .255, $F(8, 81) = 3.47$, $p = .002$, multivariate $\eta^2 = .255$. Figure Short 2.7 presents the mean visit durations by AOI.

Figure Short 2.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit duration in all three of the areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus (COMP K) was significantly greater for FDEs than for Lay participants, $F(1, 88) = 17.43$, $p > .001$, partial $\eta^2 = .165$, and $F(1, 88) = 11.29$, $p = .001$, partial $\eta^2 = .114$. Visit duration in the known signature stimulus (ALL K) was also statistically significant, $F(1, 88) = 6.07$, $p = .016$, partial $\eta^2 = .065$. Table Short 2.4 presents the means and standard deviations for areas of interest by participant type.

Table Short 2.4

Process Analysis Visit Duration for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	12.88	14.52	16.96	20.51	23.67	25.74
Lay	7.09	5.38	5.90	7.02	6.82	6.36

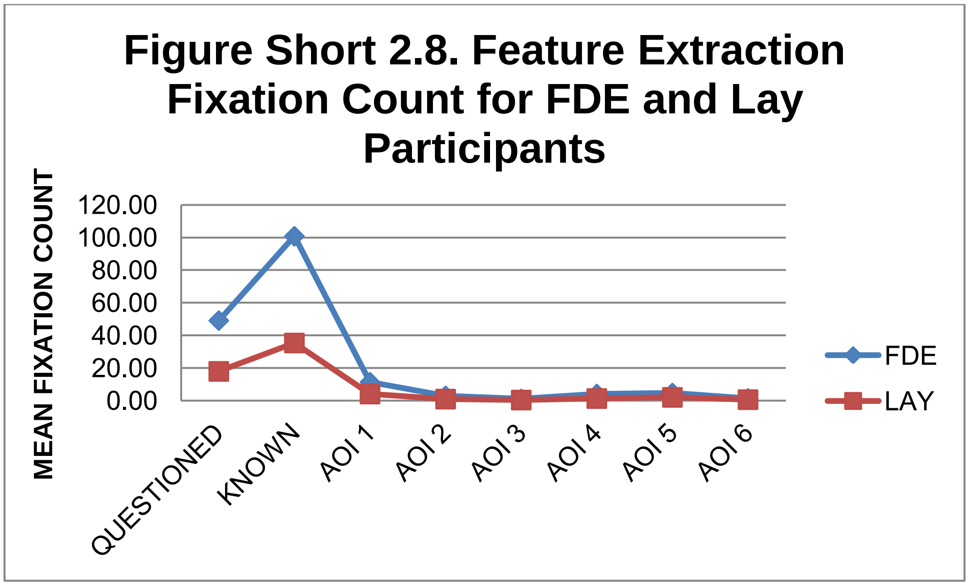
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .210, $F(8, 81) = 2.69$, $p = .011$, multivariate $\eta^2 = .210$. Figure Short 2.8 presents the mean fixation counts by AOI.

Figure Short 2.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all but one areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 88) = 11.94$, $p = .001$, partial $\eta^2 = .119$, and F(1, 88) = 12.75, $p = .001$, partial $\eta^2 = .243$.

Fixation count in all AOIs but one was significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 12.29$, $p = .001$, partial $\eta^2 = .123$; AOI 2, $F(1, 88) = 9.54$, $p = .003$, partial $\eta^2 = .098$; AOI 3, $F(1, 88) = 5.81$, $p = .018$, partial $\eta^2 = .062$; AOI 4, $F(1, 88) = 7.19$, $p = .009$, partial $\eta^2 = .076$; AOI 6, $F(1, 88) = 3.98$, $p = .049$, partial $\eta^2 = .043$).

No significant difference was found in AOI 5, $p = .053$, *ns*. Table Short 2.5 presents the means and standard deviations for areas of interest by participant type.

Table Short 2.5

Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

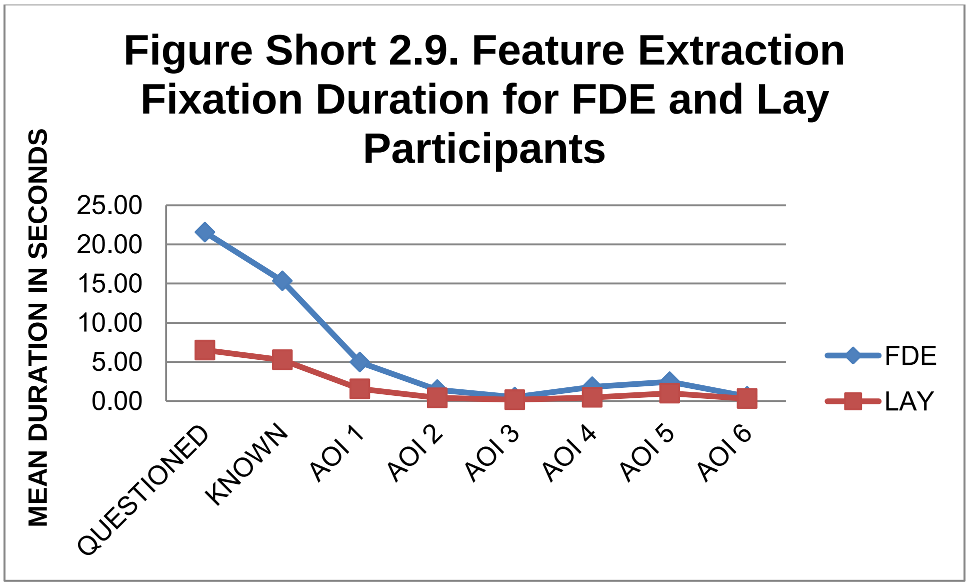
	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	49.13	55.08	100.81	119.05	11.36	12.87	2.98	3.78
Lay	18.00	15.89	35.40	36.66	4.12	4.44	1.02	1.78
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***

FDE	1.13	1.79	4.15	6.62	4.74	8.44	1.47	2.12
Lay	0.44	0.55	1.37	1.57	2.09	2.81	0.67	1.58

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .238, $F(8, 81) = 3.16$, $p = .004$, multivariate $\eta^2 = .238$. Figure Short 2.9 presents the mean fixation counts by AOI.

Figure Short 2.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all but one areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 88) = 17.15$, $p < .001$, partial $\eta^2 = .163$, and $F(1, 88) = 14.45$, $p < .001$, partial $\eta^2 = .141$.

Fixation count in all AOIs but one was significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 13.91$, $p < .001$, partial $\eta^2 = .137$; AOI 2, $F(1, 88) = 12.01$, $p = .001$, partial $\eta^2 = .120$; AOI 3, $F(1, 88) = 6.60$, $p = .012$, partial $\eta^2 = .070$; AOI 4, $F(1, 88) = 12.89$, $p = .001$, partial $\eta^2 = .128$; AOI 5, $F(1, 88) = 4.08$, $p = .046$, partial $\eta^2 = .044$).

No significant difference was found in AOI 6, $p = .126$, *ns*. Table Short 2.6 presents the means and standard deviations for areas of interest by participant type.

Table Short 2.6

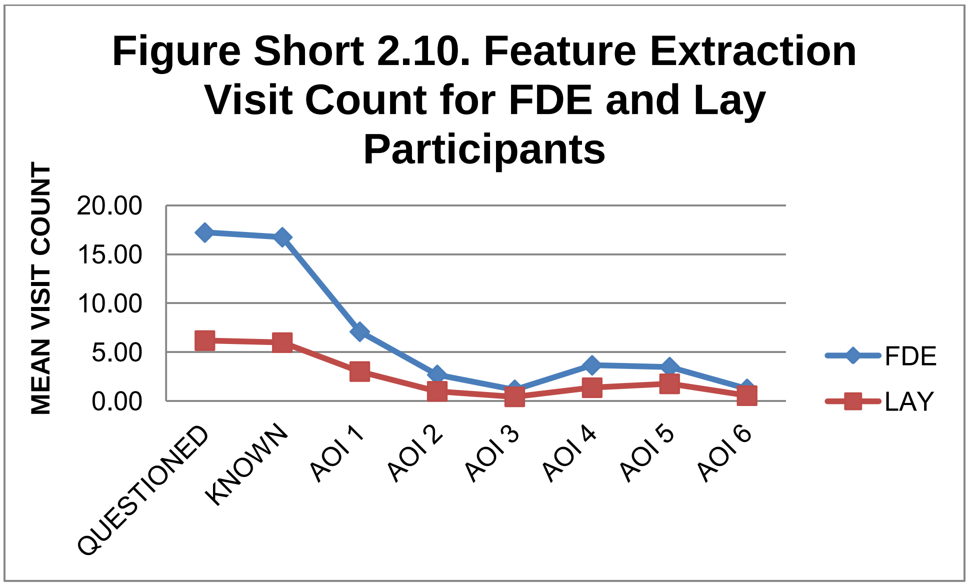
Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	21.55	23.09	15.33	16.38	4.96	5.76	1.45	1.88
Lay	6.49	6.17	5.26	6.05	1.54	1.82	0.40	0.68
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	0.49	0.85	1.82	2.40	2.46	4.44	0.59	0.95
Lay	0.15	0.22	0.46	0.60	0.99	1.78	0.31	0.75

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .281, $F(8, 78) = 3.81$, $p = .001$, multivariate $\eta^2 = .281$. Figure Short 2.10 presents the mean fixation counts by AOI.

Figure Short 2.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 85) = 15.91$, $p < .001$, partial $\eta^2 = .147$, and F(1, 85) = 14.68, $p < .001$, partial $\eta^2 = .147$.

Visit count in all AOIs was significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 85) = 10.95$, $p = .001$, partial $\eta^2 = .114$; AOI 2, $F(1, 85) = 8.55$, $p = .004$, partial $\eta^2 = .091$; AOI 3, $F(1, 85) = 6.00$, $p < .016$, partial $\eta^2 = .066$; AOI 4, $F(1, 85) = 7.30$, $p = .008$, partial $\eta^2 = .079$; AOI 5, $F(1, 85)$

= 4.02, *p* = .048, partial η^2 = .045; AOI 6, *F*(1, 85) = 4.84, *p* = .031, partial η^2 = .054). Table Short 2.7 presents the means and standard deviations for areas of interest by participant type.

Table Short 2.7

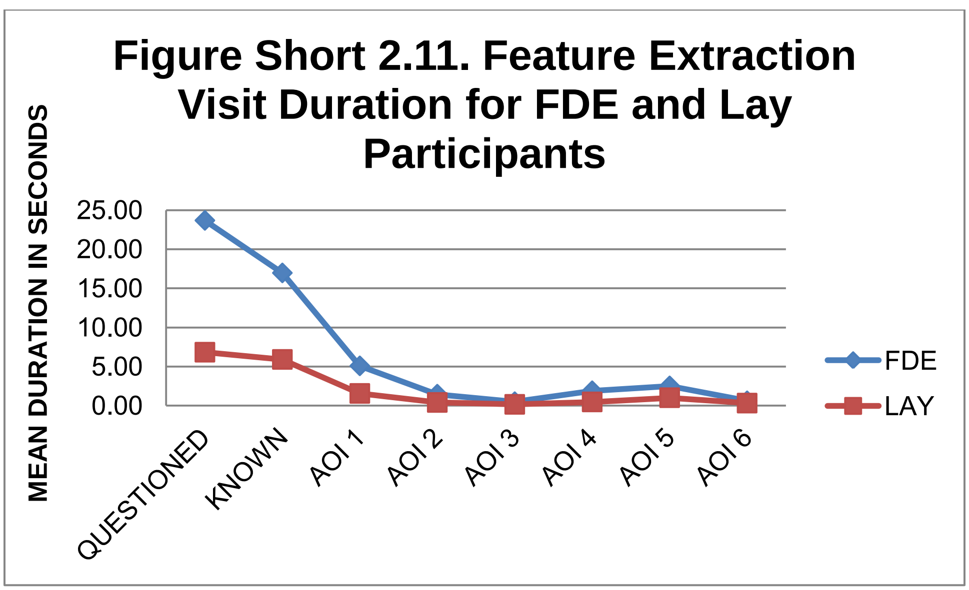
Feature Extraction Analysis Visit Count for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	17.23	16.90	16.75	17.18	7.09	7.52	2.68	3.42
Lay	6.19	6.69	5.98	6.76	3.02	2.92	1.00	1.60
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.16	1.84	3.66	5.39	3.48	5.26	1.25	1.63
Lay	0.44	0.55	1.37	1.35	1.77	1.93	0.56	1.28

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .255, *F*(8, 81) = 3.47, *p* = .002, multivariate η^2 = .255. Figure Short 2.11 presents the mean fixation counts by AOI.

Figure Short 2.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all but one areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 88) = 17.43$, $p < .001$, partial $\eta^2 = .165$, and $F(1, 88) = 11.29$, $p = .001$, partial $\eta^2 = .114$.

Visit duration in (AOI 1, $F(1, 88) = 13.77$, $p < .001$, partial $\eta^2 = .135$; AOI 2, $F(1, 88) = 12.04$, $p = .001$, partial $\eta^2 = .120$; AOI 3, $F(1, 88) = 6.60$, $p = .012$, partial $\eta^2 = .070$; AOI 4, $F(1, 88) = 10.49$, $p = .002$, partial $\eta^2 = .106$; AOI 5, $F(1, 88) = 4.06$, $p = .047$, partial $\eta^2 = .044$). No significant difference was found for AOI 6, $p = .120$, *ns*. Table Short 2.8 presents the means and standard deviations for areas of interest by participant type.

Table Short 2.8

Feature Extraction Analysis Visit Duration for FDE and Lay Participants

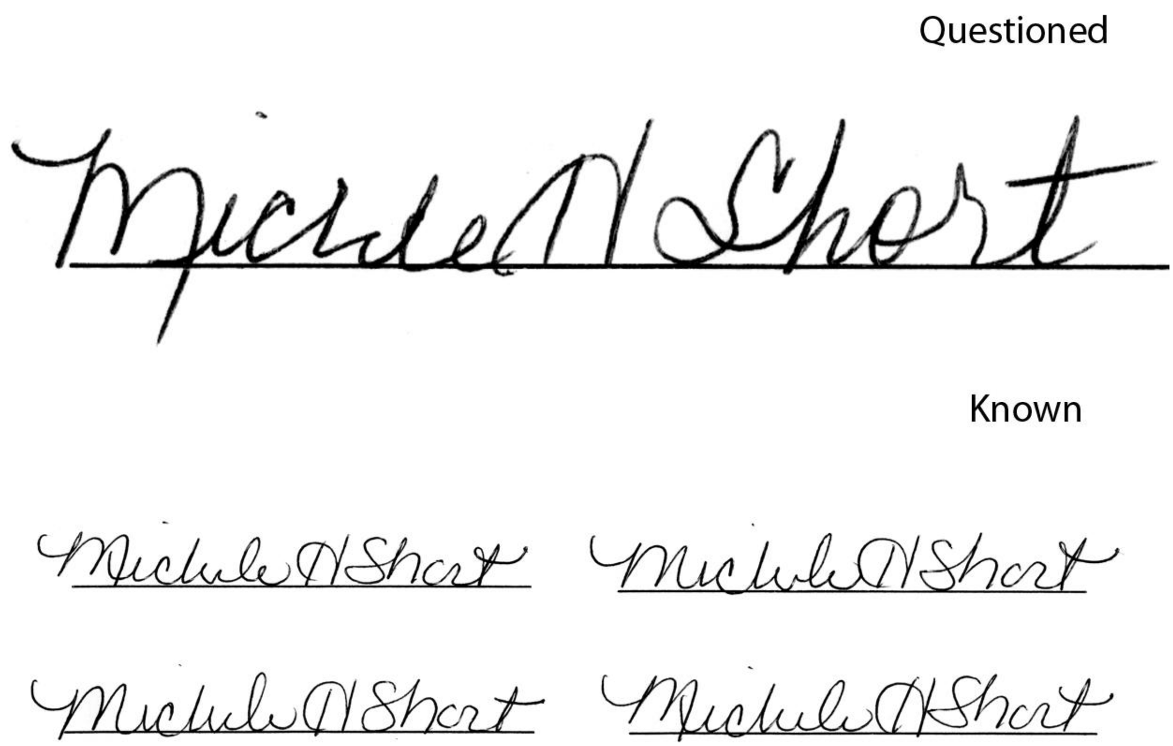
	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	23.67	25.74	16.96	20.51	5.07	5.97	1.46	1.89
Lay	6.82	6.36	5.90	7.02	1.55	1.85	0.40	0.68

	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	0.49	0.85	1.89	2.83	2.51	4.60	0.61	0.98
Lay	0.15	0.22	0.46	0.60	1.00	1.81	0.31	0.76

Short Signature 3: Freehand Simulation (Non-Genuine)

Of the 49 FDE participants, 48 responded correctly that the signature was non-genuine, while 1 FDE responded that the signature was non-genuine. Of the 43 Lay participants, 37 responded correctly that the signature was non-genuine, while 6 responded that the signature was genuine. This difference was statistically significant, χ^2 (2, N = 92) = 4.62, p = .032. Figure Short 3.1 presents the comparison view of this signature.

Figure Short 3.1. Questioned-Known Comparison Stimulus for Short Signature 3.

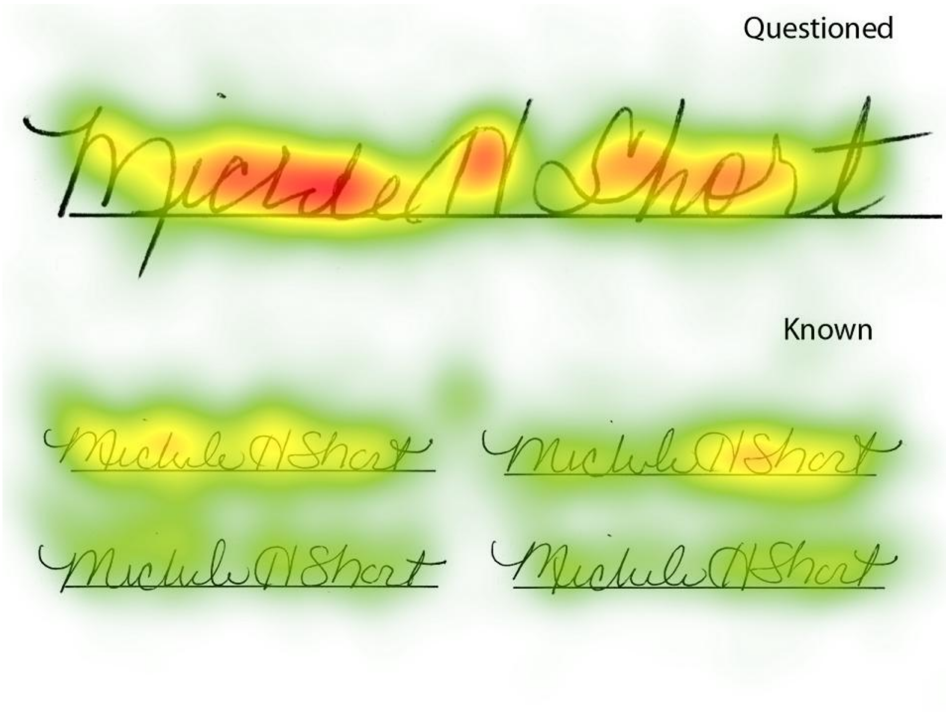


Selection of Areas of Interest (AOIs)

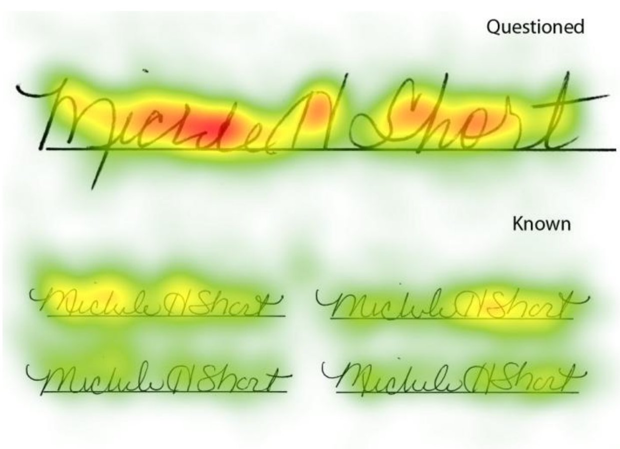
Figure Short 3.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were ten locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of ten AOIs for this stimulus. Figure Short 3.3 presents the location of the AOIs identified in the heat map.

Figure Short 3.2. Heat map for Short signature 3, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

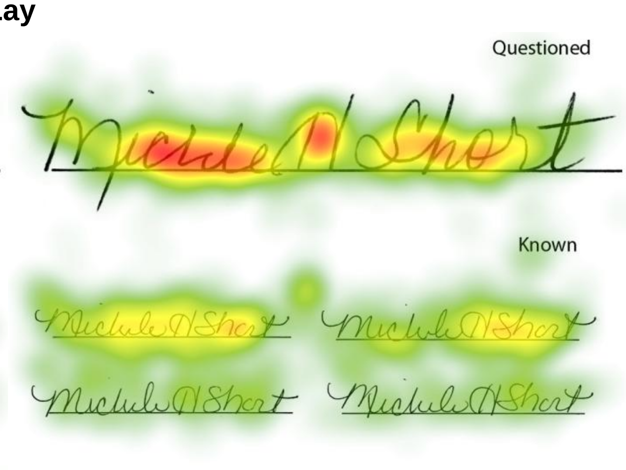
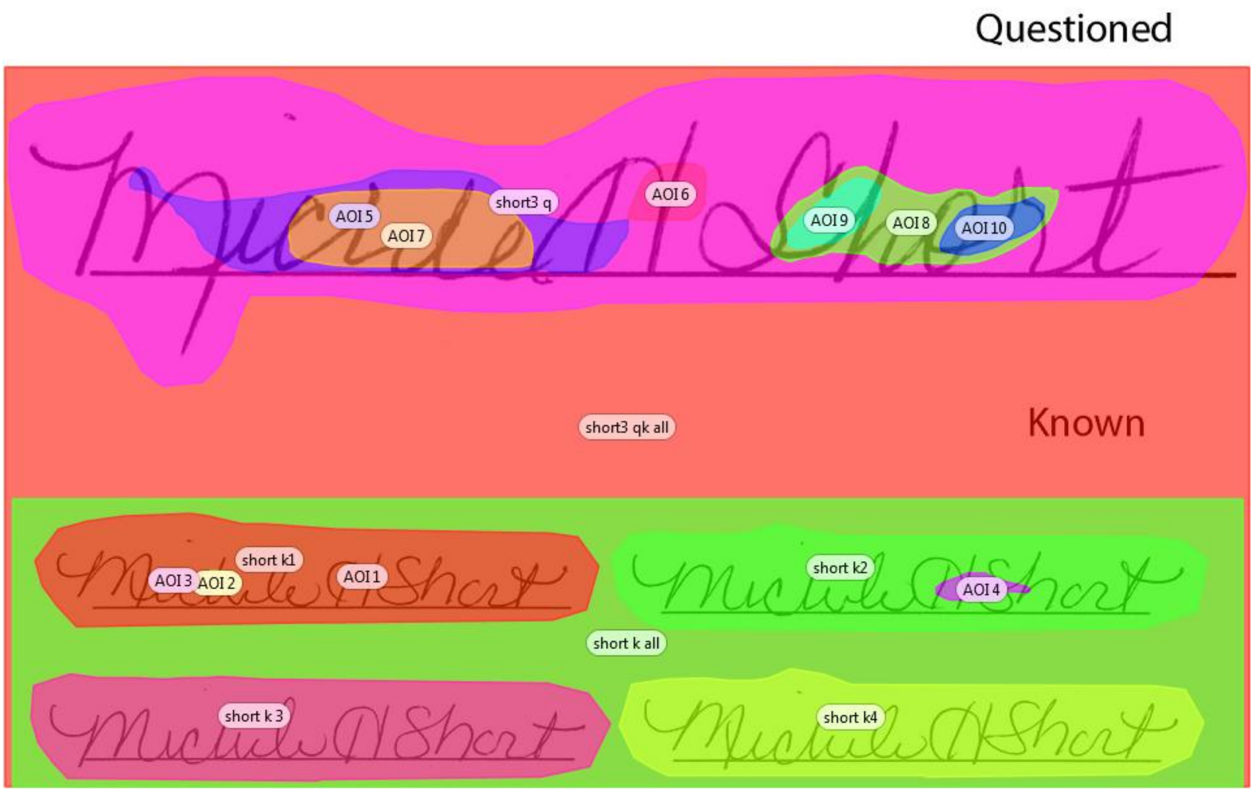


Figure Short 3.3. Areas of Interest (AOIs) for Short Signature 3.



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

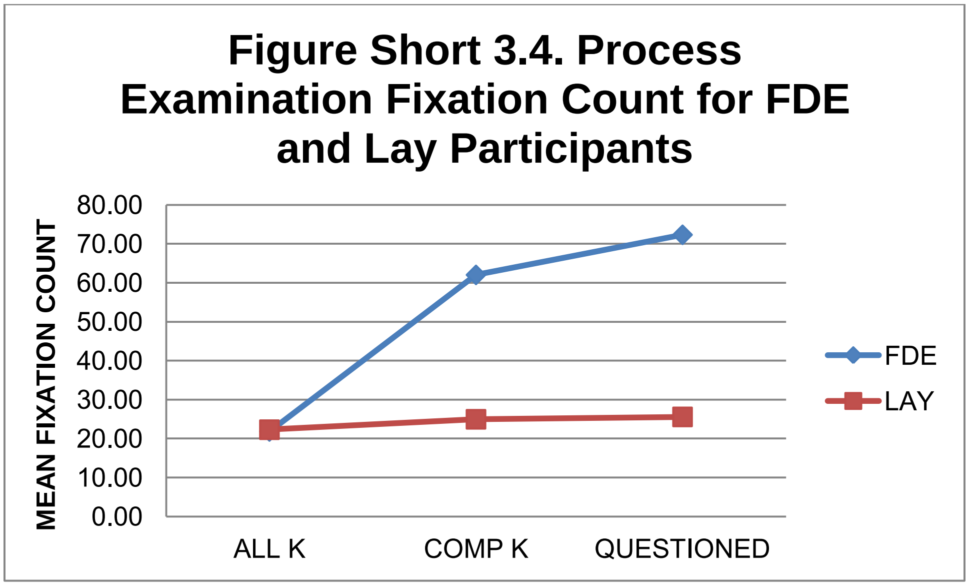
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Short known signature stimulus (Knowns, not pictured here), Short 1 K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Short 3Q (the Short questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 10) are included in subsequent analyses.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .154, $F(3, 86) = 5.22$, $p = .002$, multivariate $\eta^2 = .154$. Figure Short 3.4 presents the mean fixation counts by AOI.

Figure Short 3.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in two of the three areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus (COMP K) was significantly greater for FDEs than for the Lay participants, $F(1, 88) = 14.97$, $p < .001$, partial $\eta^2 = .14$, $F(1, 88) = 12.33$, $p = .001$, partial $\eta^2 = .123$.

Fixation count in the known signature stimulus (ALL K) was greater for the Lay participants than for the FDEs, but this difference was not statistically significant, $p = .910$, *ns*. Table Short 3.1 presents the means and standard deviations for areas of interest by participant type.

Table Short 3.1

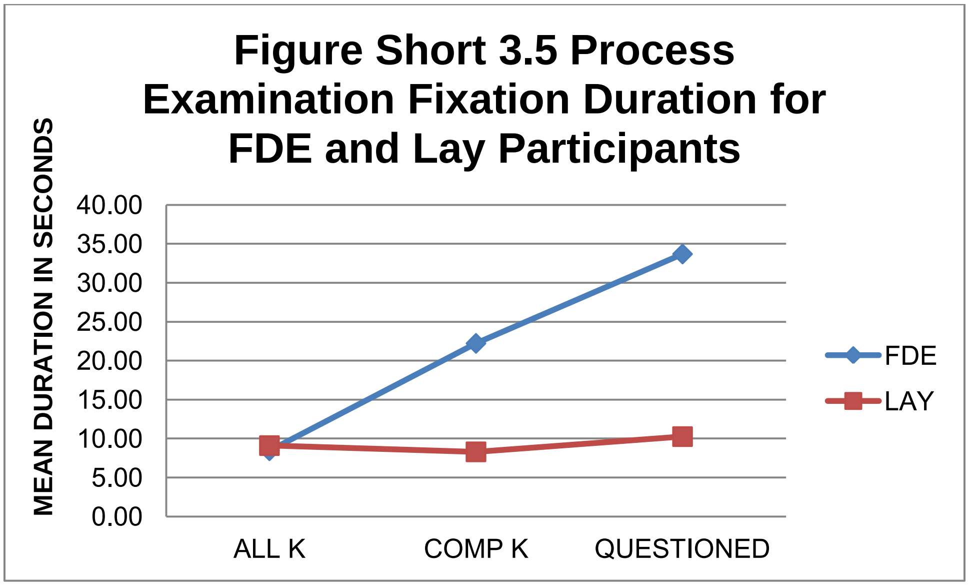
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	21.85	20.09	62.04	65.13	72.34	77.18
Lay	22.30	17.58	24.98	24.41	25.58	18.68

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .168, $F(3, 86) = 5.78$, $p = .001$, multivariate $\eta^2 = .168$. Figure Short 3.5 presents the mean fixation duration by AOI.

Figure Short 3.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, $F(1, 88) = 15.60$, $p < .001$, partial $\eta^2 = .151$, and $F(1, 88) = 12.67$, $p = .001$, partial $\eta^2 = .126$.

Fixation duration in the known signature stimulus (ALL K) was greater for the Lay participants than for the FDEs, but this difference was not statistically significant, $p = .778$, *ns*. Table Short 3.2 presents the means and standard deviations for areas of interest by participant type.

Table Short 3.2

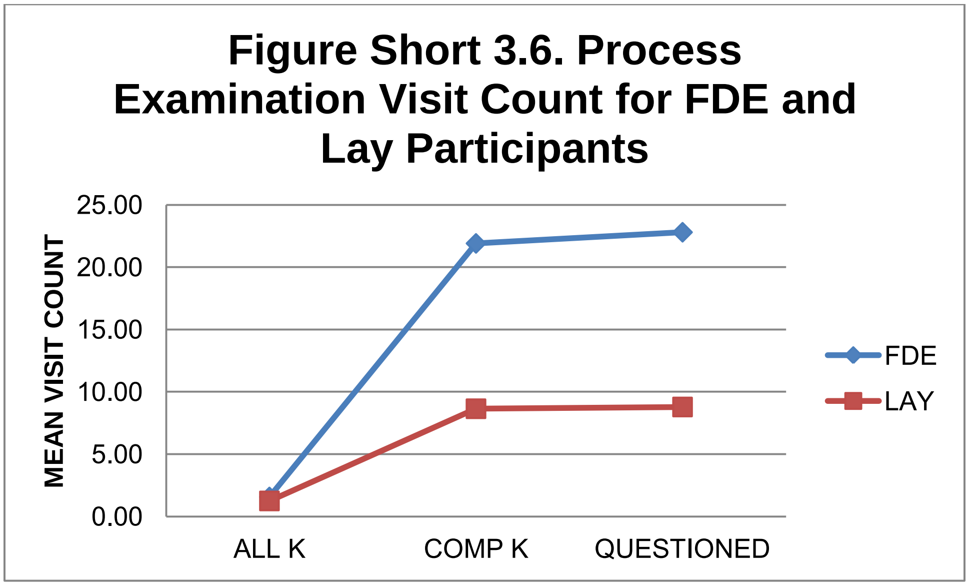
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		Comp Knows		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	8.45	10.25	22.23	24.52	33.70	38.05
Lay	9.11	11.96	8.31	7.83	10.26	8.41

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .217, $F(3, 86) = 7.97$, $p < .001$, multivariate $\eta^2 = .217$. Figure Short 3.6 presents the mean visit durations by AOI.

Figure Short 3.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in two of the three of the areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, $F(1, 88) = 16.82$, $p < .001$, partial $\eta^2 = .160$, and $F(1, 88) = 15.01$, $p < .001$, partial $\eta^2 = .146$).

Visit count in the known signature stimulus (ALL K) was greater for the Lay participants than for the FDEs, but this difference was not statistically significant, $p = .102$, *ns*. Table Short 3.3 presents the means and standard deviations for areas of interest by participant type.

Table Short 3.3

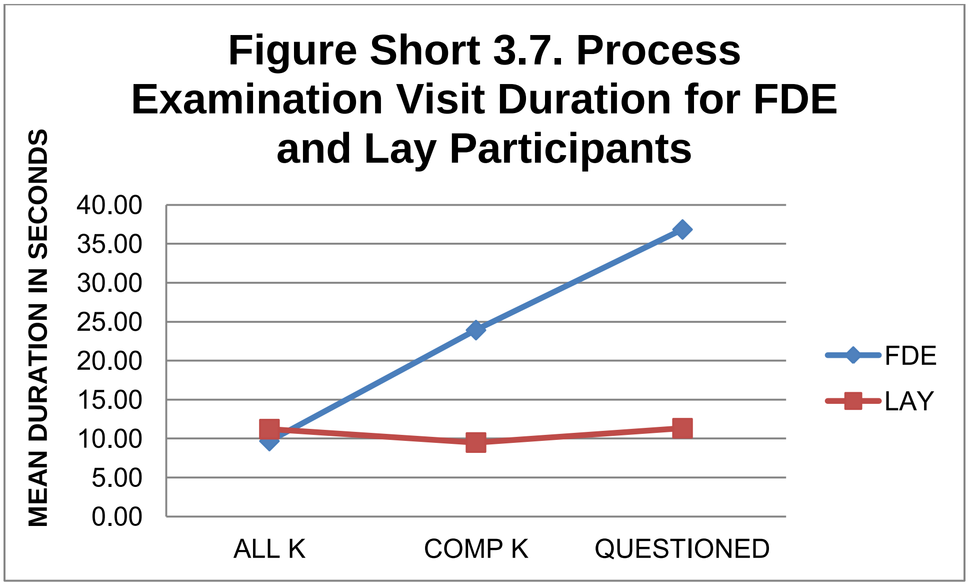
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.57	0.99	21.91	21.28	22.81	21.24
Lay	1.26	0.82	8.65	7.45	8.79	7.44

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .172, $F(3, 86) = 5.97$, $p = .001$, multivariate $\eta^2 = .172$. Figure Short 3.7 presents the mean visit durations by AOI.

Figure Short 3.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit duration in all three of the areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus (COMP K) was significantly greater for FDEs than for Lay participants, $F(1, 88) = 15.39$, $p > .001$, partial $\eta^2 = .149$, and $F(1, 88) = 12.05$, $p = .001$, partial $\eta^2 = .120$.

Visit duration in the known signature stimulus (ALL K) was greater for Lay participants than for FDEs, but this difference was not statistically significant, $p = .556$, *ns*. Table Short 3.4 presents the means and standard deviations for areas of interest by participant type.

Table Short 3.4

Process Analysis Visit Duration for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	9.69	10.91	23.93	26.02	36.85	41.73
Lay	11.22	13.56	9.50	8.47	11.33	9.10

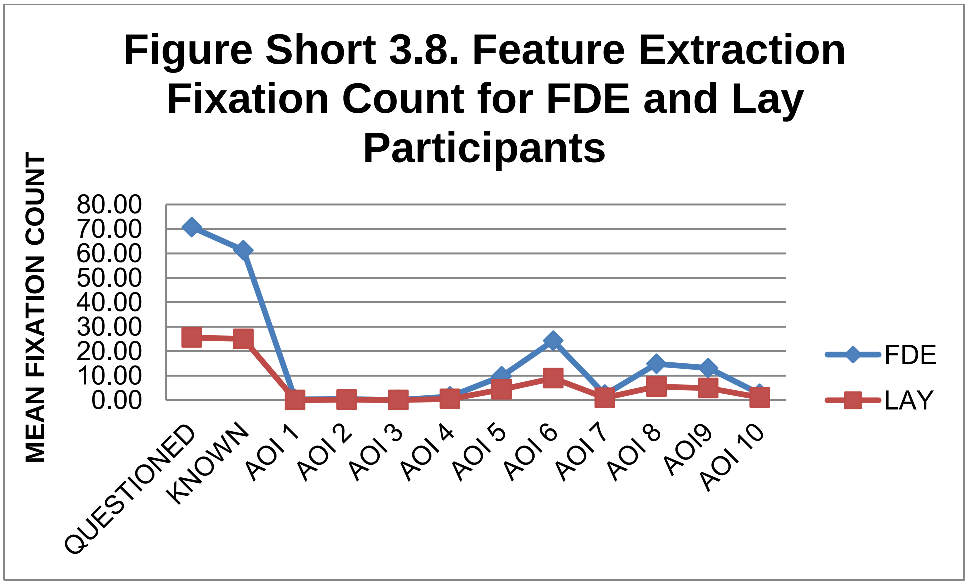
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .301, $F(11, 75) = 2.94$, $p = .003$, multivariate $\eta^2 = .301$. Figure Short 3.8 presents the mean fixation counts by AOI.

Figure Short 3.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all but one areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 85) = 14.85$, $p < .001$, partial $\eta^2 = .149$, and F(1, 85) = 11.79, $p = .001$, partial $\eta^2 = .122$.

Fixation count in all AOIs but two was significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 85) = 11.27$, $p = .001$, partial $\eta^2 = .117$; AOI 4, $F(1, 85) = 6.42$, $p = .013$, partial $\eta^2 = .070$; AOI 5, $F(1, 85) = 15.60$, $p < .001$, partial $\eta^2 = .151$; AOI 6, $F(1, 85) = 13.17$, $p < .001$, partial $\eta^2 = .134$; AOI 7, $F(1, 85) = 10.22$, $p = .002$, partial $\eta^2 = .107$; AOI 8, $F(1, 85) = 12.60$, $p = .001$, partial $\eta^2 = .129$; AOI 9, $F(1, 85) = 13.27$, $p = .002$, partial $\eta^2 = .103$; AOI 10, $F(1, 85) = 9.74$, $p = .002$, partial $\eta^2 = .103$).

No significant difference was found in AOI 2 ($Fp = .075$, *ns*) or in AOI 3 ($p = .161$, *ns*). Table Short 3.5 presents the means and standard deviations for areas of interest by participant type.

Table Short 3.5

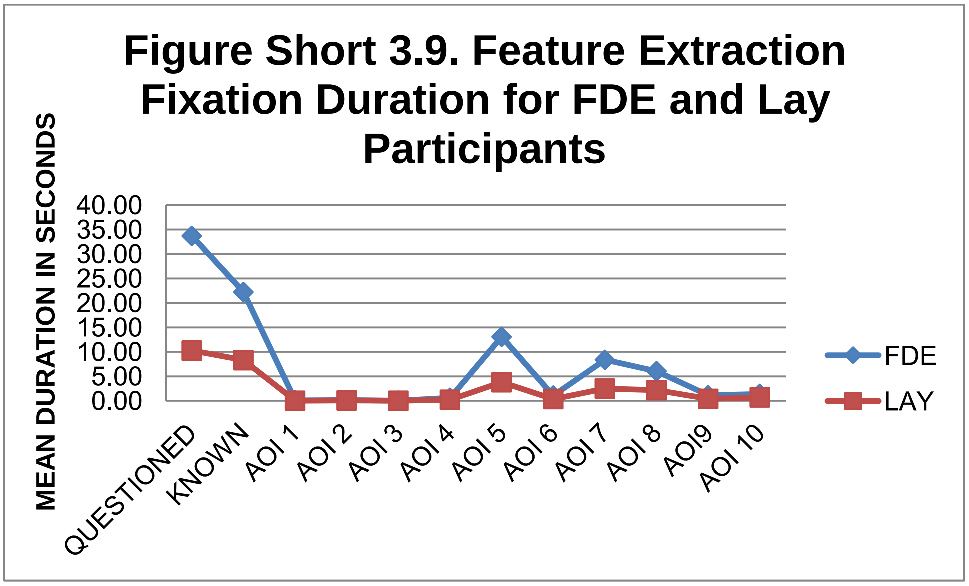
Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	70.66	74.45	61.23	64.87	0.25	0.49	0.41	0.79
Lay	25.58	18.68	24.98	24.41	0.00	0.00	0.16	0.43
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	0.05	0.21	1.41	2.31	9.70	6.62	24.25	26.78
Lay	0.00	0.00	0.44	0.98	4.37	3.26	8.95	6.92
	AOI 7		**AOI 8**		**AOI 9**		**AOI 10**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.20	2.49	14.80	16.69	13.05	14.13	2.55	2.97
Lay	0.88	1.07	5.49	4.17	4.88	4.09	1.02	1.20

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .267, $F(12, 77) = 2.34$, $p = .013$, multivariate $\eta^2 = .267$. Figure Short 3.9 presents the mean fixation counts by AOI.

Figure Short 3.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all but one areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 88) = 15.60$, $p < .001$, partial $\eta^2 = .151$, and $F(1, 88) = 12.67$, $p = .001$, partial $\eta^2 = .126$.

Fixation count in all AOIs but two was significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 8.20$, $p = .005$, partial $\eta^2 = .085$; AOI 4, $F(1, 88) = 5.16$, $p = .026$, partial $\eta^2 = .055$; AOI 5, $F(1, 88) = 15.60$, $p < .001$, partial $\eta^2 = .151$); AOI 6, $F(1, 88) = 11.83$, $p = .001$, partial $\eta^2 = .119$; AOI 7, $F(1, 88) = 15.84$, $p < .001$, partial $\eta^2 = .153$; AOI 8, $F(1, 88) = 12.48$, $p = .001$, partial $\eta^2 = .026$; AOI 9, $F(1, 88) = 11.81$, $p = .001$, partial $\eta^2 = .118$; AOI 10, $F(1, 88) = 4.57$, $p = .035$, partial $\eta^2 = .049$).

No significant difference was found in AOI 2 ($p = .395$, *ns*) or in AOI 3 ($p = .254$, *ns*). Table Short 3.6 presents the means and standard deviations for areas of interest by participant type.

Table Short 3.6

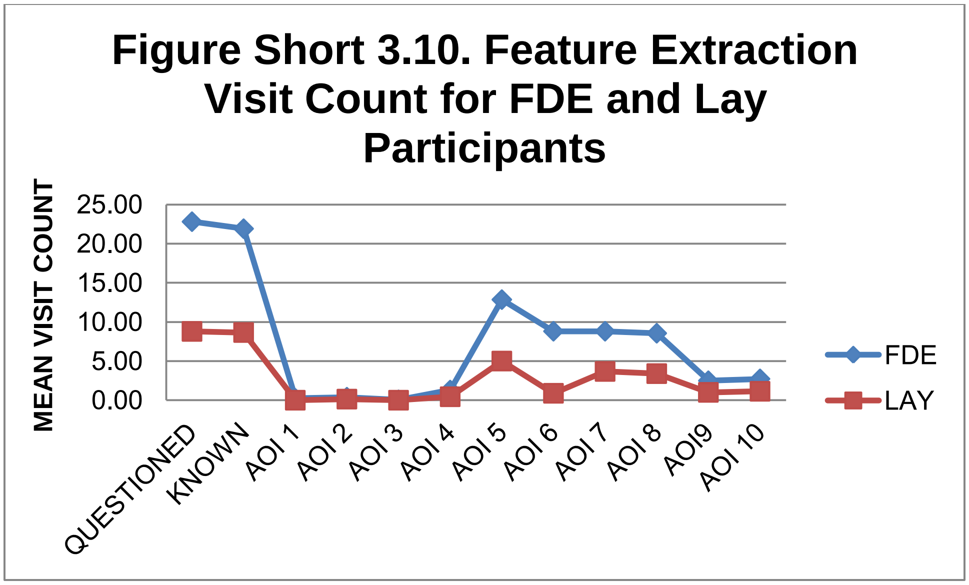
Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	33.70	38.05	22.23	24.52	0.09	0.20	0.14	0.37
Lay	10.26	8.41	8.31	7.83	0.00	0.00	0.07	0.34
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	0.02	0.09	0.61	1.06	13.08	15.03	1.06	1.23
Lay	0.00	0.00	0.21	0.48	3.80	3.50	0.36	0.52
	AOI 7		**AOI 8**		**AOI 9**		**AOI 10**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	8.37	9.42	6.05	6.77	1.14	1.35	1.41	1.75
Lay	2.49	2.39	2.18	2.52	0.39	0.52	0.69	1.40

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .296, $F(12, 77) = 2.70$, $p = .004$, multivariate $\eta^2 = .296$. Figure Short 3.10 presents the mean fixation counts by AOI.

Figure Short 3.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all but one areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 88) = 16.82$, $p < .001$, partial $\eta^2 = .160$, and F(1, 88) = 15.01, $p < .001$, partial $\eta^2 = .146$.

Visit count in all AOIs was significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 10.38$, $p = .002$, partial $\eta^2 = .106$; AOI 4, $F(1, 88) = 6.34$, $p = .014$, partial $\eta^2 = .067$; AOI 5, $F(1, 88) = 17.07$, $p < .001$, partial $\eta^2 = .162$); AOI 6, $F(1, 88) = 10.26$, $p = .001$, partial $\eta^2 = .162$; AOI 7, $F(1, 88) = 10.26$, $p = .002$, partial $\eta^2 = .104$; AOI 8, $F(1, 88) = 13.42$, $p < .001$, partial $\eta^2 = .132$; AOI 9, $F(1, 88) = 10.30$, $p = .002$, partial $\eta^2 = .105$; AOI 10, $F(1, 88) = 10.15$, $p = .002$, partial $\eta^2 = .103$).

No significant difference was found in AOI 2 ($p = .060$, *ns*) or in AOI 3 ($p = .175$, *ns*). Table Short 3.7 presents the means and standard deviations for areas of interest by participant type.

Table Short 3.7

Feature Extraction Analysis Visit Count for FDE and Lay Participants

	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	22.81	21.24	21.91	21.28	0.23	0.48	0.38	0.74
Lay	8.79	7.44	8.65	7.45	0.00	0.00	0.14	0.41
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	0.04	0.20	1.30	2.02	12.85	11.90	2.09	2.23
Lay	0.00	0.00	0.44	0.98	5.00	3.85	0.88	1.07
	AOI 7		**AOI 8**		**AOI 9**		**AOI 10**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	8.81	8.41	8.55	8.80	2.49	2.81	2.72	2.95

Lay	3.67	2.65	3.40	2.91	1.00	1.21	1.14	1.46

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .348, $F(12, 74) = 3.29$, $p = .001$, multivariate $\eta^2 = .348$. Figure Short 3.11 presents the mean fixation counts by AOI.

Figure Short 3.11

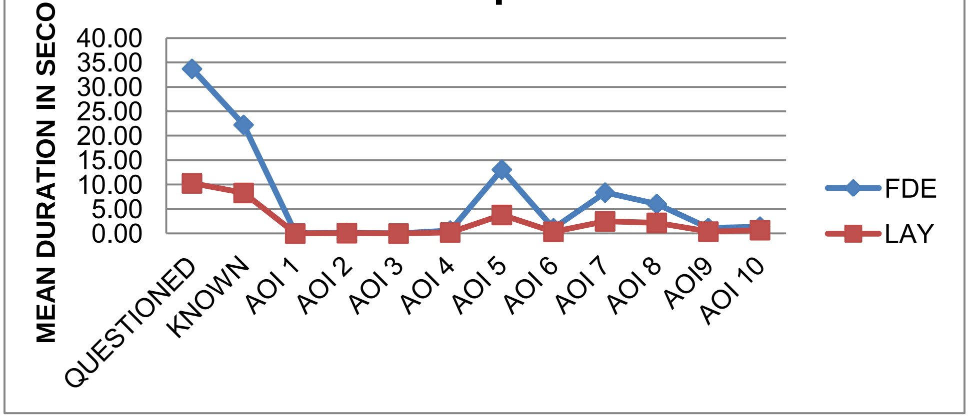


Figure Short 3.11. Feature Extraction Fixation Duration for FDE and Lay Participants

Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all but one areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 85) = 15.19$, $p < .001$, partial $\eta^2 = .152$, and $F(1, 85) = 11.41$, $p = .001$, partial $\eta^2 = .118$.

Visit duration in (AOI 1, $F(1, 85) = 8.87$, $p = .004$, partial $\eta^2 = .094$; AOI 4, $F(1, 85) = 5.30$, $p = .024$, partial $\eta^2 = .059$; AOI 5, $F(1, 85) = 14.24$, $p < .001$, partial $\eta^2 = .143$); AOI 6, $F(1, 85) = 12.24$, $p = .001$, partial $\eta^2 = .126$; AOI 7, $F(1, 85) = 14.72$, $p < .001$, partial $\eta^2 = .148$; AOI 8, $F(1, 85) = 11.00$, $p = .001$, partial $\eta^2 = .115$; AOI 9, $F(1, 85) = 9.86$, $p = .002$, partial $\eta^2 = .104$; AOI 10, $F(1, 85) = 3.62$, $p = .060$, partial $\eta^2 = .041$).

No significant difference was found in AOI 2 ($p = .399$, *ns*) or in AOI 3 ($p = .239$, *ns*). Table Short 3.8 presents the means and standard deviations for areas of interest by participant type.

Table Short 3.8

Feature Extraction Analysis Visit Duration for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	36.27	40.97	23.28	25.41	0.09	0.21	0.14	0.38
Lay	11.33	9.10	9.50	8.47	0.00	0.00	0.08	0.35

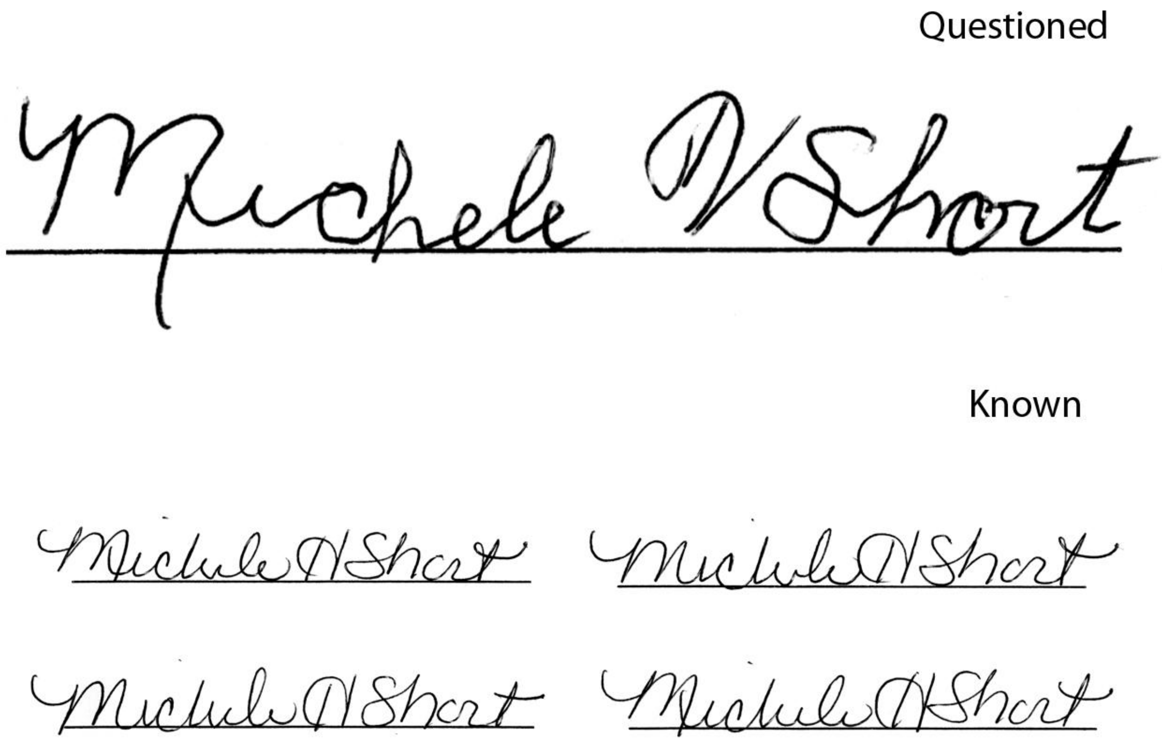
	AOI 3		AOI 4		AOI 5		AOI 6	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	0.02	0.09	0.62	1.09	13.84	16.50	1.10	1.29
Lay	0.00	0.00	0.21	0.48	4.13	3.60	0.36	0.52

	AOI 7		AOI 8		AOI 9		AOI 10	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	8.90	10.36	6.32	7.41	1.11	1.38	1.40	1.83
Lay	2.68	2.42	2.35	2.60	0.40	0.52	0.73	1.42

Short Signature 4: Freehand Simulation (Non-Genuine)

All 49 FDE participants responded correctly that the signature was non-genuine. Of the 43 Lay participants, 42 responded correctly that the signature was non-genuine, while 1 responded that the signature was genuine. This difference was not statistically significant, $p = .283$, *n*s. Figure Short 4.1 presents the comparison view of this signature.

Figure Short 4.1. Questioned-Known Comparison Stimulus for Short Signature 4.

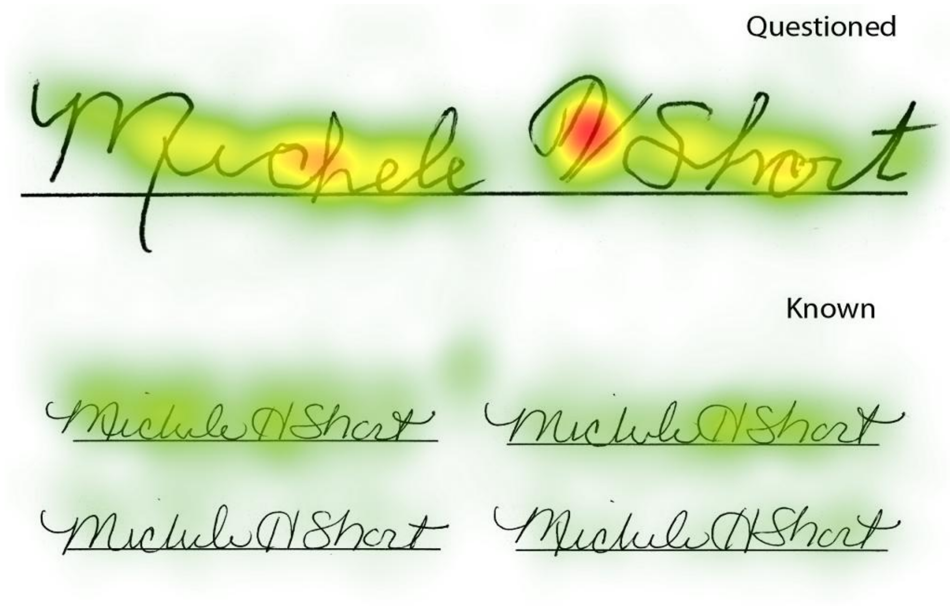


Selection of Areas of Interest (AOIs)

Figure Short 4.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were five locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of five AOIs for this stimulus. Figure Short 4.3 presents the location of the AOIs identified in the heat map.

Figure Short 4.2. Heat map for Short signature 4, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE

Lay

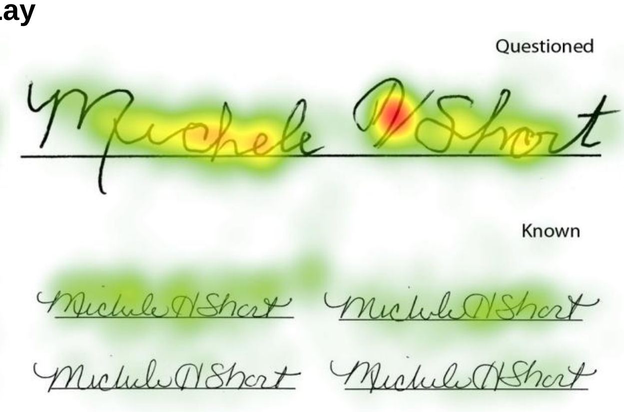
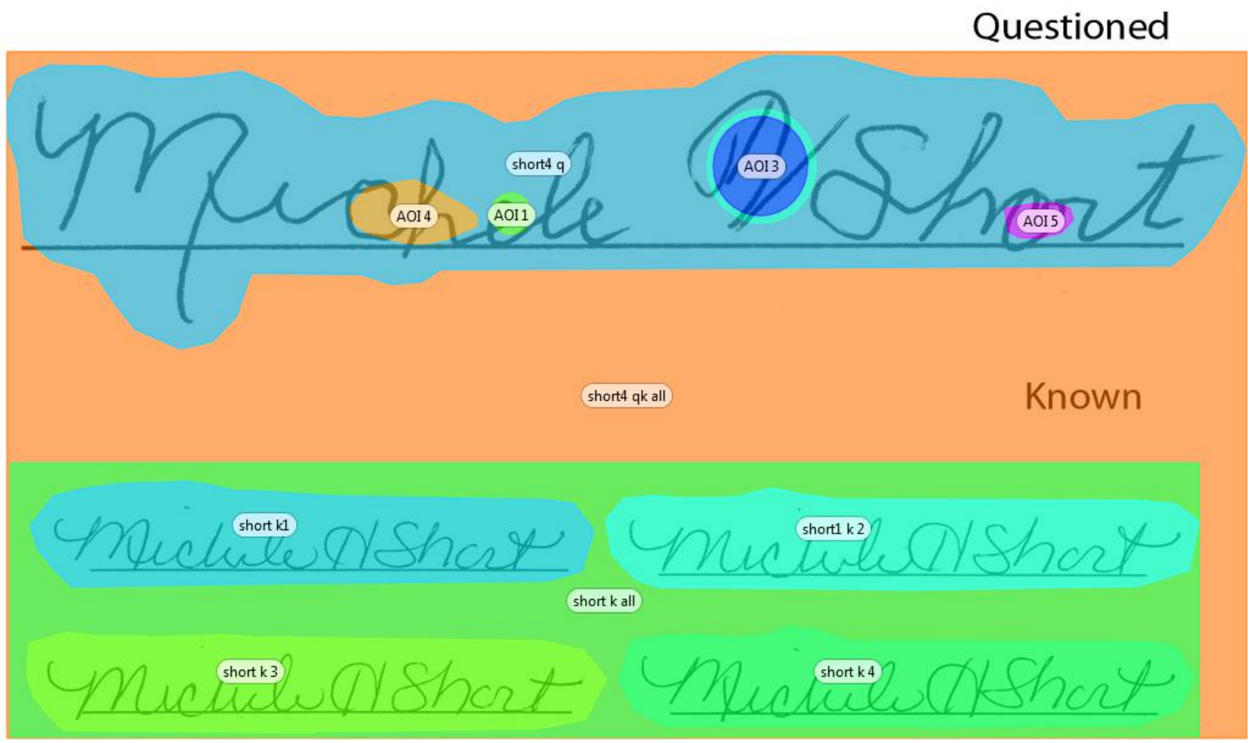


Figure Short 4.3. Areas of Interest (AOIs) for Short Signature 4.



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

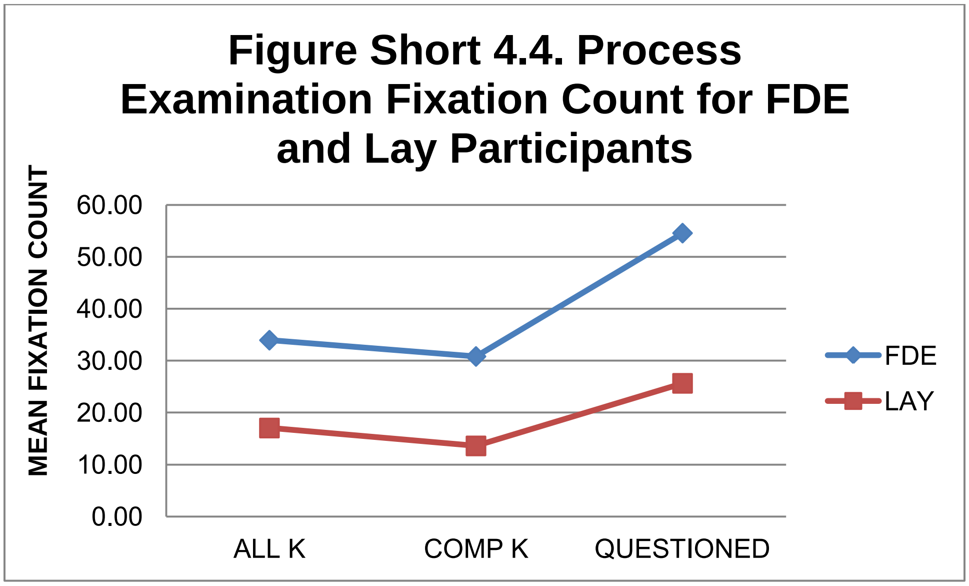
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Short known signature stimulus (Knowns, not pictured here), Short 1 K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Short 4Q (the Short questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 5) are included in subsequent analyses.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .173, $F(3, 86) = 5.99$, $p = .001$, multivariate $\eta^2 = .173$. Figure Short 4.4 presents the mean fixation counts by AOI.

Figure Short 4.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus (COMP K) was significantly greater for FDEs than for the Lay participants, $F(1, 88) = 16.35$, $p < .001$, partial $\eta^2 = .157$, $F(1, 88) = 11.14$, $p = .001$, partial $\eta^2 = .112$.

Fixation count in the known signature stimulus (ALL K) was greater for the Lay participants than for the FDEs, $F(1, 88) = 7.78$, $p = .006$, partial $\eta^2 = .081$. Table Short 4.1 presents the means and standard deviations for areas of interest by participant type.

Table Short 4.1

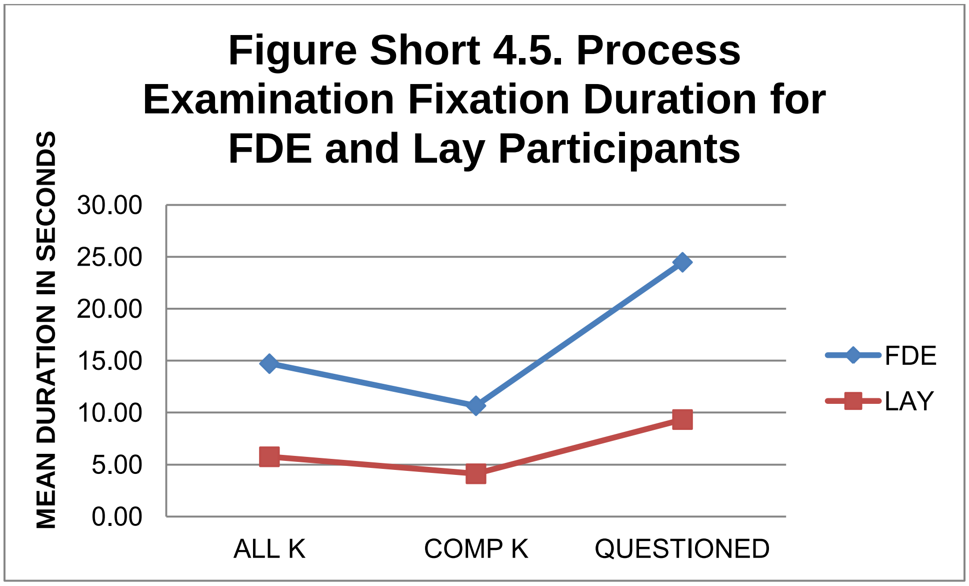
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	33.96	36.79	30.83	23.56	54.57	37.39
Lay	17.05	15.71	13.60	25.41	25.65	29.61

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .247, $F(3, 86) = 9.42$, $p < .001$, multivariate $\eta^2 = .247$. Figure Short 4.5 presents the mean fixation duration by AOI.

Figure Short 4.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, $F(1, 88) = 26.49$, $p < .001$, partial $\eta^2 = .231$, and $F(1, 88) = 17.89$, $p < .001$, partial $\eta^2 = .169$.

Fixation duration in the known signature stimulus (ALL K) was greater for the Lay participants than for the FDEs, $F(1, 88) = 9.15$, $p = .003$, partial $\eta^2 = .094$. Table Short 4.2 presents the means and standard deviations for areas of interest by participant type.

Table Short 4.2

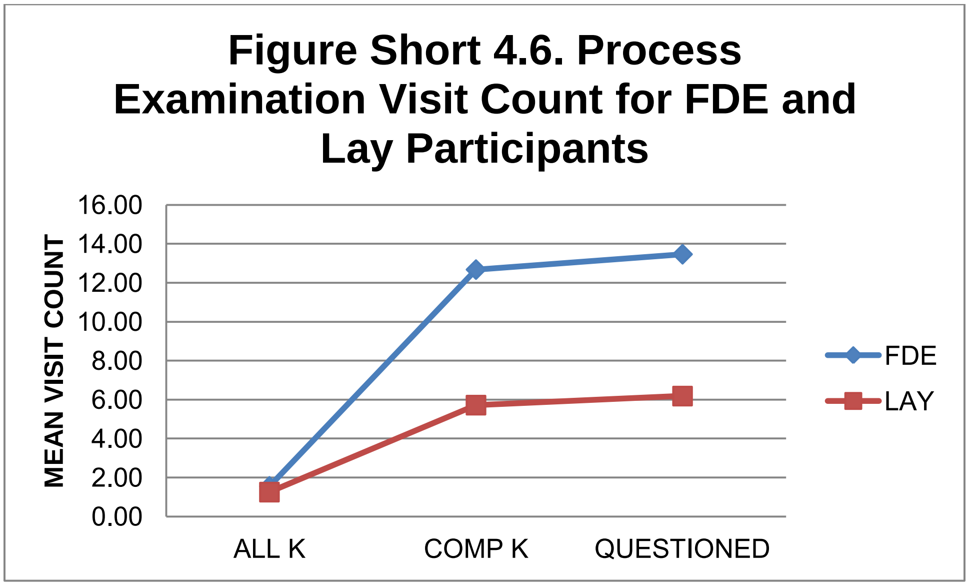
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	14.72	18.57	10.66	8.70	24.48	16.80
Lay	5.76	5.98	4.12	5.47	9.34	9.89

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .156, $F(3, 86) = 5.29$, $p = .002$, multivariate $\eta^2 = .156$. Figure Short 4.6 presents the mean visit counts by AOI.

Figure Short 4.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in two of the three areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, $F(1, 88) = 15.52$, $p < .001$, partial $\eta^2 = .150$, and $F(1, 88) = 15.28$, $p < .001$, partial $\eta^2 = .148$).

Visit count in the known signature stimulus (ALL K) was not statistically significant, $p = .162$, *ns*. Table Short 4.3 presents the means and standard deviations for areas of interest by participant type.

Table Short 4.3

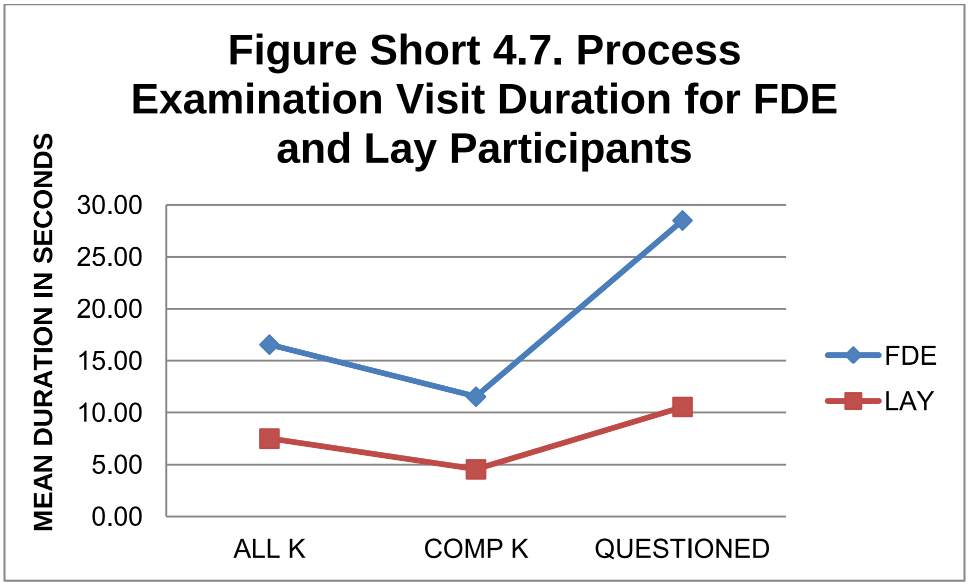
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.55	1.18	12.68	8.20	13.47	8.16
Lay	1.26	0.76	5.72	8.69	6.19	9.37

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .274, $F(3, 86) = 10.80$, $p < .001$, multivariate $\eta^2 = .274$. Figure Short 4.7 presents the mean visit durations by AOI.

Figure Short 4.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit duration in all three of the areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus (COMP K) was significantly greater for FDEs than for Lay participants, $F(1, 88) = 30.56$, $p > .001$, partial $\eta^2 = .258$, $F(1, 88) = 16.32$, $p < .001$, partial $\eta^2 = .156$).

Visit duration in the known signature stimulus (ALL K) was not statistically significant, $p = .007$, *ns*. Table Short 4.4 presents the means and standard deviations for areas of interest by participant type.

Table Short 4.4

Process Analysis Visit Duration for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	16.55	20.22	11.54	9.39	28.50	18.66
Lay	7.50	7.81	4.55	6.67	10.55	10.72

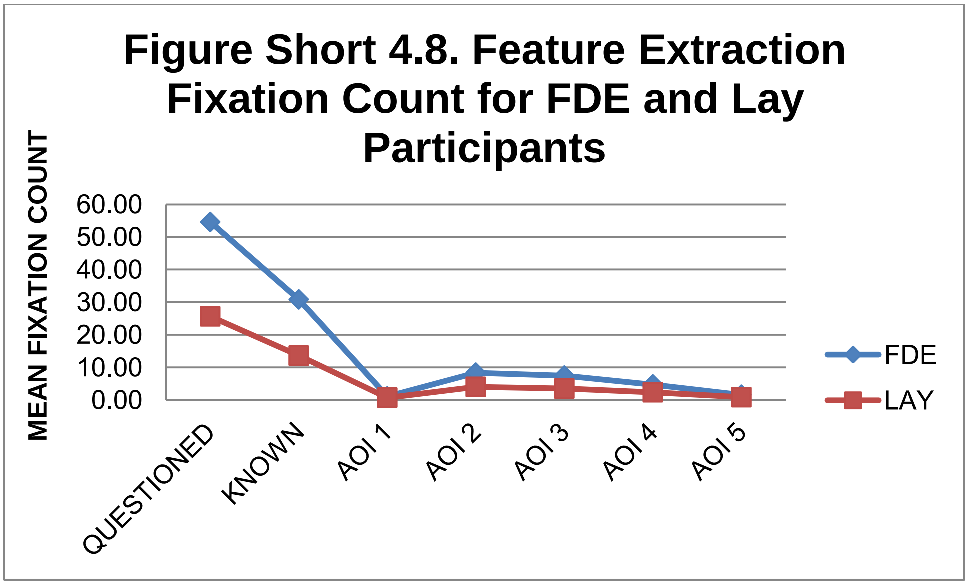
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .181, $F(7, 82) = 2.58$, $p = .019$, multivariate $\eta^2 = .181$. Figure Short 4.8 presents the mean fixation counts by AOI.

Figure Short 4.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all but one areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 88) = 16.35$, $p < .001$, partial $\eta^2 = .157$, and F(1, 88) = 11.14, $p = .001$, partial $\eta^2 = .112$.

Fixation count in all AOIs but one was significantly greater for FDEs than for Lay participants (AOI 2, $F(1, 88) = 11.44$, $p = .001$, partial $\eta^2 = .115$; AOI 3, $F(1, 88) = 10.92$, $p = .001$, partial $\eta^2 = .110$; AOI 4, $F(1, 88) = 9.06$, $p = .003$, partial $\eta^2 = .093$; AOI 5, $F(1, 88) = 4.45$, $p = .038$, partial $\eta^2 = .048$).

No significant difference was found in AOI 1, $p = .228$, *ns*. Table Short 4.5 presents the means and standard deviations for areas of interest by participant type.

Table Short 4.5

Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

	QUESTIONED	KNOWN	AOI 1	AOI 2

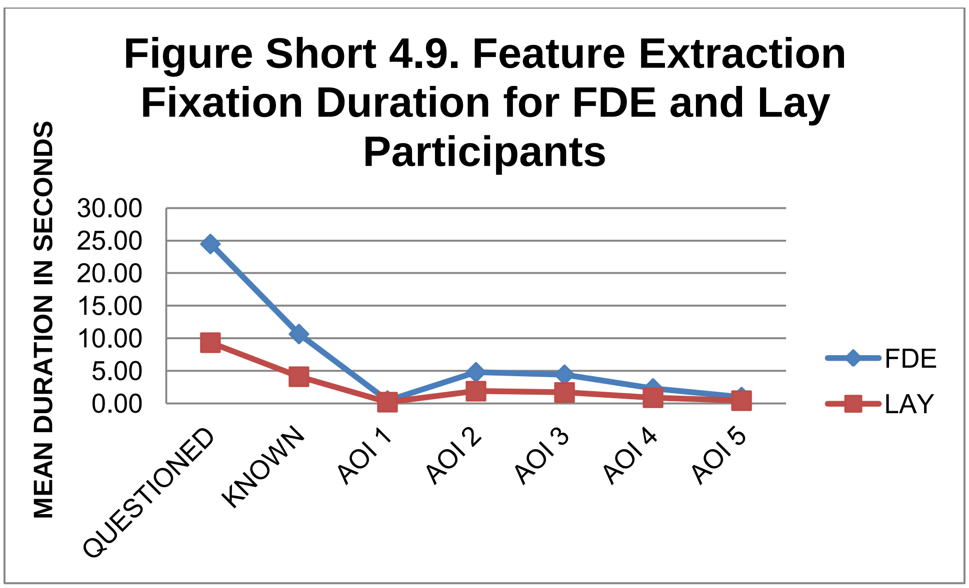
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	54.57	37.39	30.83	23.56	1.11	1.55	8.38	7.25
Lay	25.65	29.61	13.60	25.41	0.72	1.45	4.02	4.54

	AOI 3		AOI 4		AOI 5	
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	7.49	6.81	4.77	4.50	1.62	2.09
Lay	3.51	4.18	2.37	2.76	0.86	1.13

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .246, $F(7, 82) = 3.82$, $p = .001$, multivariate $\eta^2 = .246$. Figure Short 4.9 presents the mean fixation duration by AOI.

Figure Short 4.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 88) = 26.49$, $p < .001$, partial $\eta^2 = .231$, and $F(1, 88) = 17.89$, $p < .001$, partial $\eta^2 = .169$.

Fixation duration in all AOIs was significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 4.23$, $p = .043$, partial $\eta^2 = .046$; AOI 2, $F(1, 88) = 18.34$, $p < .001$, partial $\eta^2 = .046$; AOI 3, $F(1, 88) = 16.31$, $p < .001$, partial $\eta^2 = .159$); AOI 4, $F(1, 88) = 13.04$, $p = .001$, partial $\eta^2 = .129$; AOI 5, $F(1, 88) = 4.98$, $p < .028$, partial $\eta^2 = .054$). Table Short 4.6 presents the means and standard deviations for areas of interest by participant type.

Table Short 4.6

Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

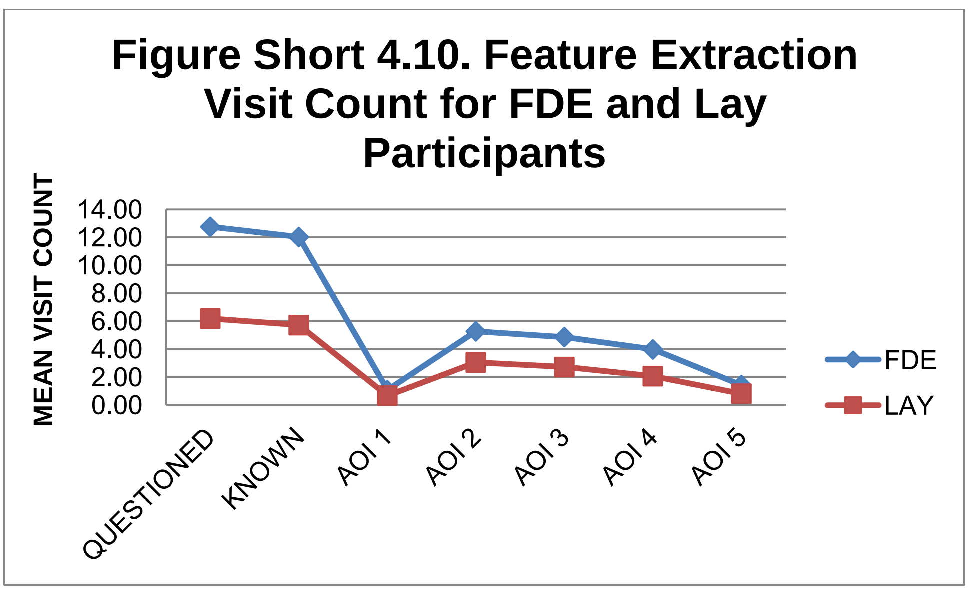
	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	24.48	16.80	10.66	8.70	0.46	0.70	4.80	3.92
Lay	9.34	9.89	4.12	5.47	0.21	0.39	1.90	2.17

	AOI 3		AOI 4		AOI 5	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	4.42	3.88	2.32	2.41	1.00	1.50
Lay	1.70	2.11	0.89	1.01	0.44	0.69

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .248, $F(7, 79) = 3.72$, $p = .002$, multivariate $\eta^2 = .248$. Figure Short 4.10 presents the mean visit counts by AOI.

Figure Short 4.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in all but one areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 88) = 13.49$ $p < .001$, partial $\eta^2 = .137$, and $F(1, 88) = 13.38$, $p < .001$, partial $\eta^2 = .136$.

Visit count in all AOIs was significantly greater for FDEs than for Lay participants (AOI 2, $F(1, 88) = 9.27$, $p = .003$, partial $\eta^2 = .098$; AOI 3, $F(1, 88) = 8.77$, $p = .004$, partial $\eta^2 = .094$; AOI 4, $F(1, 88) = 8.92$, $p = .004$, partial $\eta^2 = .095$).

No significant differences were found for AOI 1 ($p = .174$, *ns*), or for AOI 5, $p = .057$, *ns*). Table Short 4.7 presents the means and standard deviations for areas of interest by participant type.

Table Short 4.7

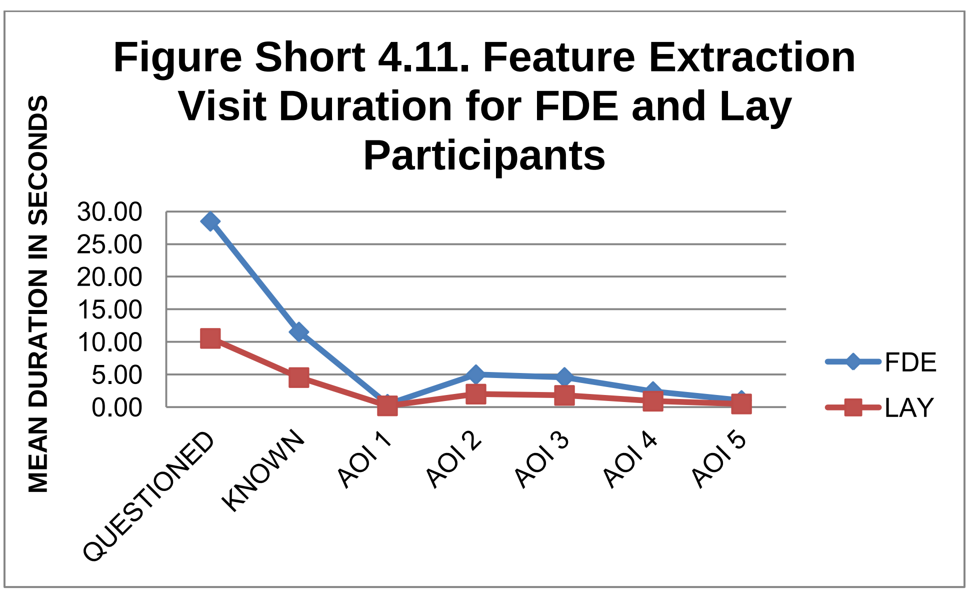
Feature Extraction Analysis Visit Count for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	12.75	7.18	12.02	7.33	1.07	1.44
Lay	6.19	9.37	5.72	8.69	0.67	1.23
	AOI 3		**AOI 4**		**AOI 5**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	4.86	3.84	3.98	3.60	1.43	1.85
Lay	2.72	2.81	2.07	2.16	0.81	1.01

<u>*Total Visit Duration*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .277, $F(7, 82) = 4.49$, $p < .001$, multivariate $\eta^2 = .277$. Figure Short 4.11 presents the mean visit durations by AOI.

Figure Short 4.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 88) = 30.56$, $p < .001$, partial $\eta^2 = .258$, and $F(1, 88) = 16.32$, $p < .001$, partial $\eta^2 = .156$.

Visit duration was statistically significant in all AOIs (AOI 1, $F(1, 88) = 4.35$, $p = .040$, partial $\eta^2 = .047$; AOI 2, $F(1, 88) = 17.51$, $p < .001$, partial $\eta^2 = .166$; AOI 3, $F(1, 88) = 15.67$, $p < .001$, partial $\eta^2 = .151$); AOI 4, $F(1, 88) = 13.40$, $p < .001$, partial $\eta^2 = .132$; AOI 5, $F(1, 88) = 4.22$, $p < .043$, partial $\eta^2 = .046$). Table Short 4.8 presents the means and standard deviations for areas of interest by participant type.

Table Short 4.8

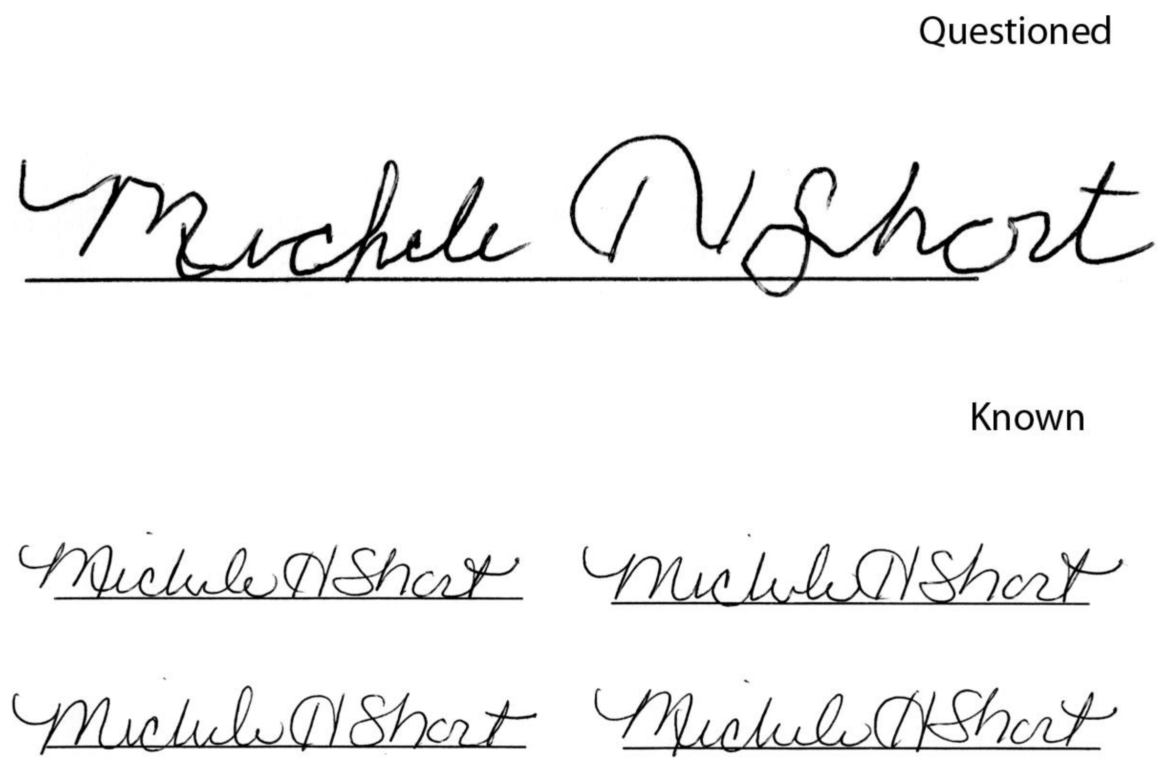
Feature Extraction Analysis Visit Duration for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	28.50	18.66	11.54	9.39	0.47	0.70
Lay	10.55	10.72	4.55	6.67	0.21	0.39
	AOI 3		**AOI 4**		**AOI 5**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	4.58	4.07	2.41	2.47	1.05	1.55
Lay	1.82	2.17	0.92	1.04	0.50	0.86

Short Signature 5: Freehand Simulation (Non-Genuine)

Of the 49 FDE participants, 47 responded correctly that the signature was non-genuine, while 1 responded that the signature was genuine. One FDE declined to respond. All 43 Lay participants responded correctly that the signature was non-genuine. This difference was not statistically significant, $p = .408$, *n*s. Figure Short 5.1 presents the comparison view of this signature.

Figure Short 5.1. Questioned-Known Comparison Stimulus for Short Signature 5.



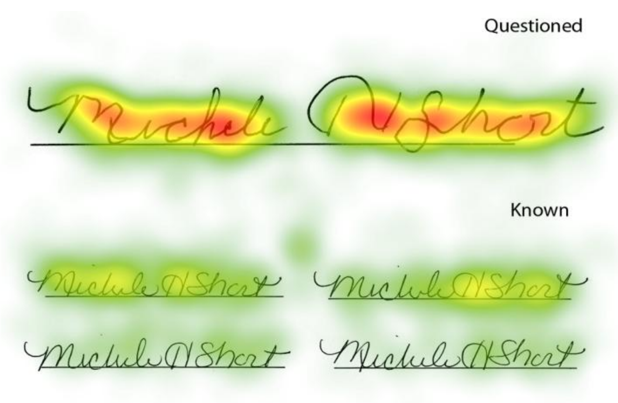
Selection of Areas of Interest (AOIs)

Figure Short 5.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were five locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of five AOIs for this stimulus. Figure Short 5.3 presents the location of the AOIs identified in the heat map.

Figure Short 5.2. Heat map for Short signature 5, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants

FDE



Lay

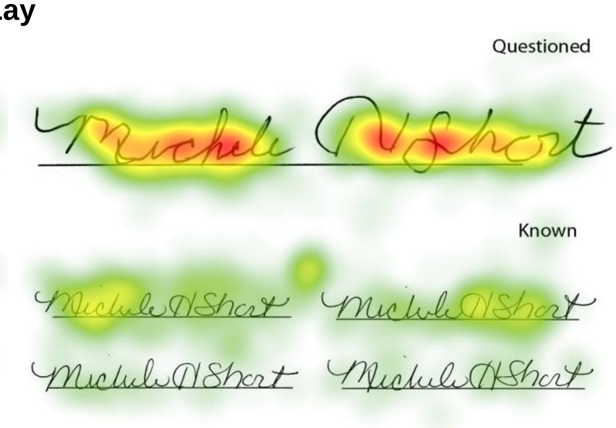
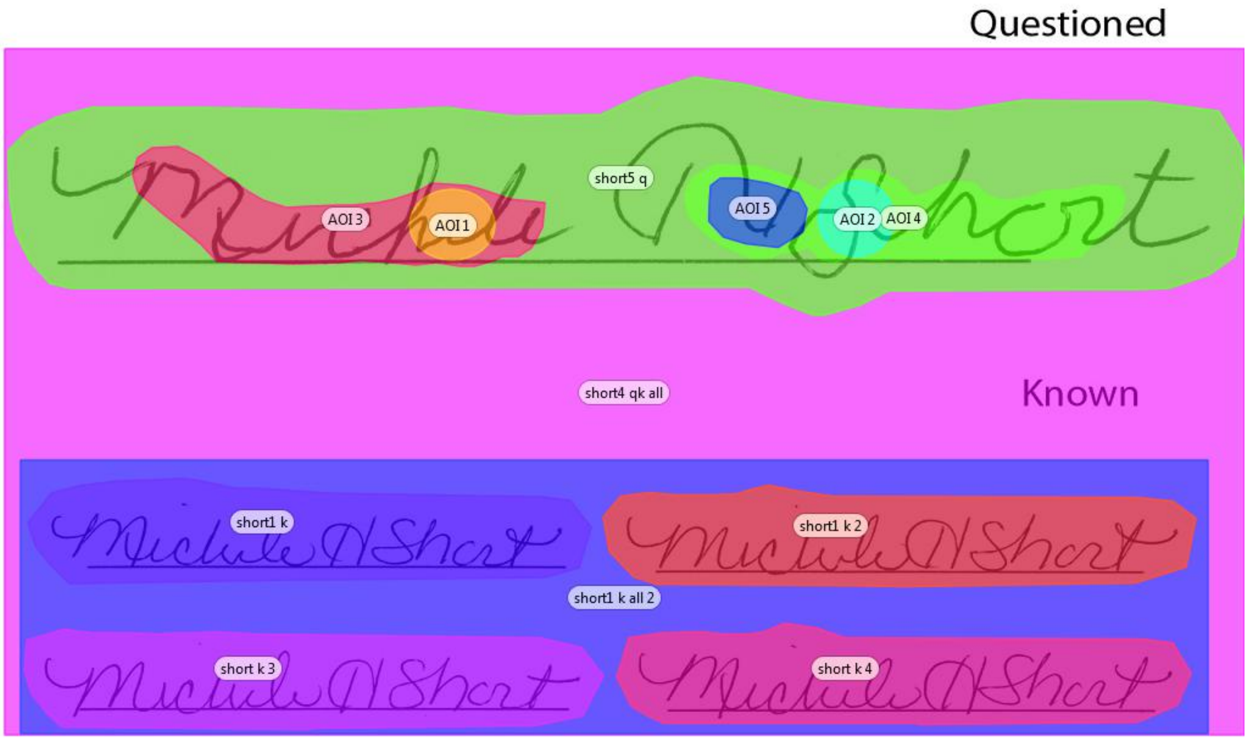


Figure Short 5.3. Areas of Interest (AOIs) for Short Signature 5.



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

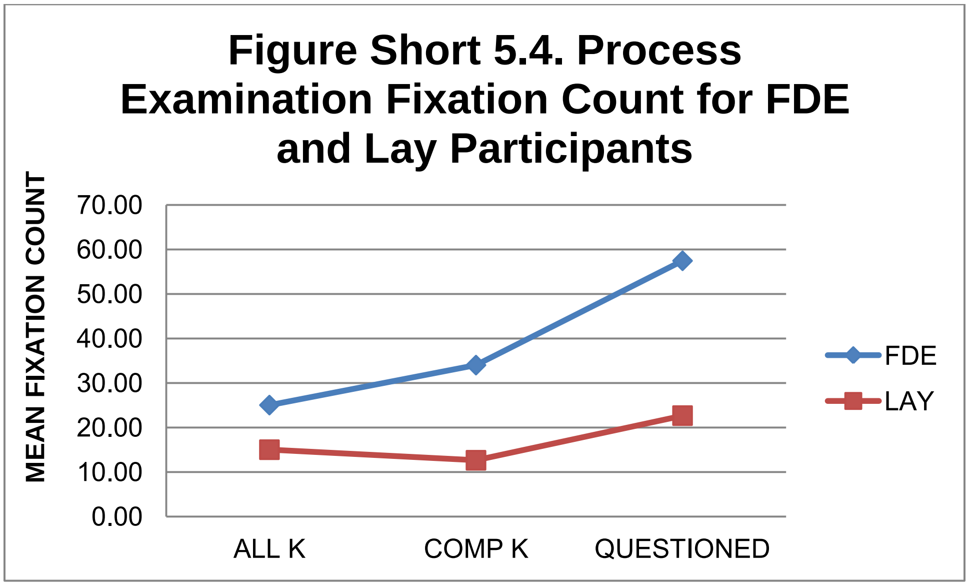
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Short known signature stimulus (Knowns, not pictured here), Short 1 K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Short 5Q (the Short questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 5) are included in subsequent analyses.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .194, $F(3, 85) = 5.99$, $p < .001$, multivariate $\eta^2 = .194$. Figure Short 5.4 presents the mean fixation counts by AOI.

Figure Short 5.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in two of the three areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus (COMP K) was significantly greater for FDEs than for the Lay participants, $F(1, 87) = 18.64$, $p < .001$, partial $\eta^2 = .176$, and $F(1, 87) = 14.29$, $p < .001$, partial $\eta^2 = .141$).

Fixation count in the known signature stimulus (ALL K) was greater for the Lay participants than for the FDEs, $F(1, 87) = 7.40$, $p = .008$, partial $\eta^2 = .078$. Table Short 5.1 presents the means and standard deviations for areas of interest by participant type.

Table Short 5.1

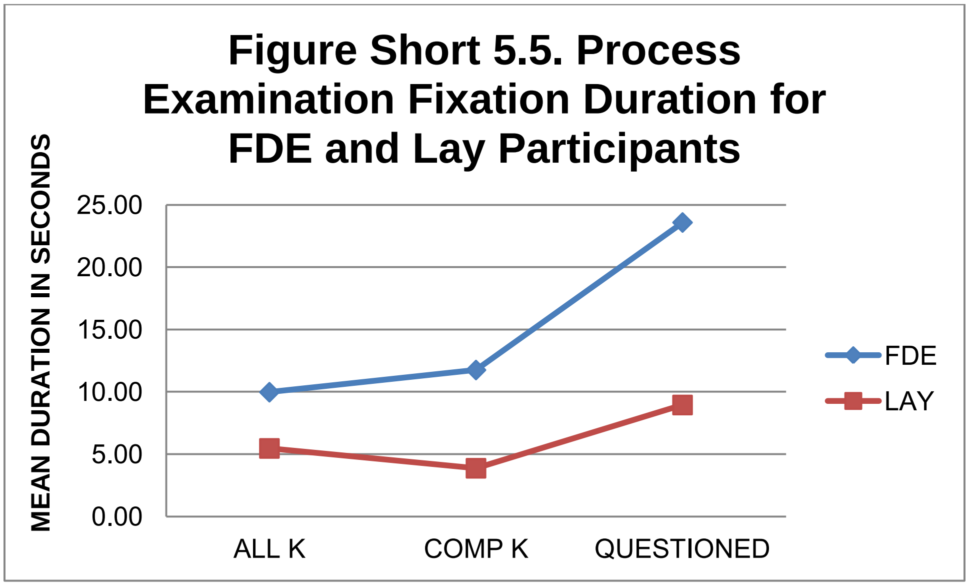
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	25.04	21.73	34.02	32.01	57.46	46.69
Lay	15.02	10.90	12.65	19.33	22.67	25.54

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .214, $F(3, 85) = 7.70$, $p < .001$, multivariate $\eta^2 = .214$. Figure Short 5.5 presents the mean fixation duration by AOI.

Figure Wulf 5.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, $F(1, 87) = 20.79$, $p < .001$, partial $\eta^2 = .160$, $F(1, 87) = 16.59$, $p < .001$, partial $\eta^2 = .160$).

Fixation duration in the known signature stimulus (ALL K) was greater for the Lay participants than for the FDEs, but this difference was also statistically significant, $p = .011$, *ns*). Table Short 5.2 presents the means and standard deviations for areas of interest by participant type.

Table Short 5.2

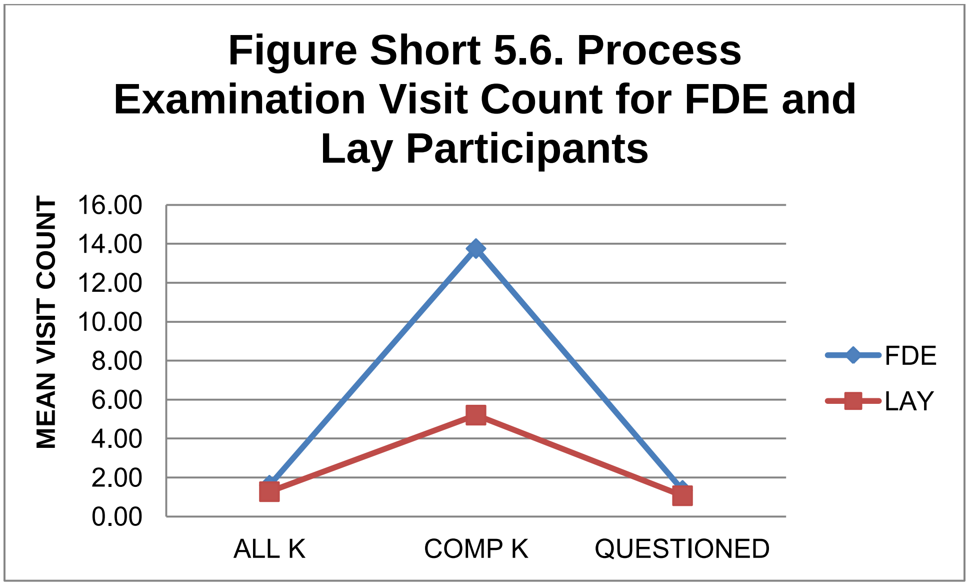
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	9.98	10.35	11.76	11.71	23.59	18.19
Lay	5.47	4.72	3.88	5.04	8.95	10.96

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .217, $F(3, 85) = 7.86$, $p < .001$, multivariate $\eta^2 = .217$. Figure Short 5.6 presents the mean visit durations by AOI.

Figure Short 5.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in one of the three of the areas of interest. Total visit count for the known signature comparison stimulus (COMP K) was significantly greater for FDEs than for Lay participants, $F(1, 87) = 19.86$, $p < .001$, partial $\eta^2 = .186$).

Visit count in the questioned signature and the known signature stimulus (ALL K) were not statistically significant ($p = .128$, *ns*; $p = 158$, *ns*). Table Short 5.3 presents the means and standard deviations for areas of interest by participant type.

Table Short 5.3

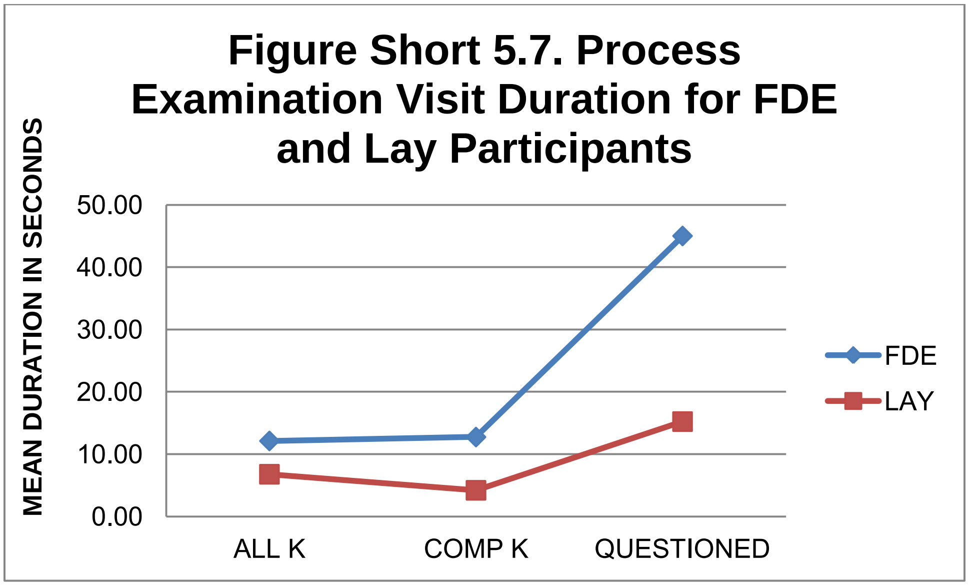
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.61	1.37	13.76	10.91	1.35	1.12
Lay	1.28	0.67	5.21	6.48	1.07	0.40

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .244, $F(3, 85) = 9.16$, $p < .001$, multivariate $\eta^2 = .244$. Figure Short 5.7 presents the mean visit durations by AOI.

Figure Short 5.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit duration in all three of the areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus (COMP K) was significantly greater for FDEs than for Lay participants, $F(1, 87) = 25.07$, $p > .001$, partial $\eta^2 = .224$, $F(1, 87) = 16.95$, $p < .001$, partial $\eta^2 = .163$).

Visit duration in the known signature stimulus (ALL K) was also statistically significant, $F(1, 87) = 7.16$, $p = .009$, partial $\eta^2 = .076$. Table Short 5.4 presents the means and standard deviations for areas of interest by participant type.

Table Short 5.4

Process Analysis Visit Duration for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	12.13	11.82	12.76	12.46	45.02	34.96
Lay	6.79	5.81	4.21	5.65	15.24	17.87

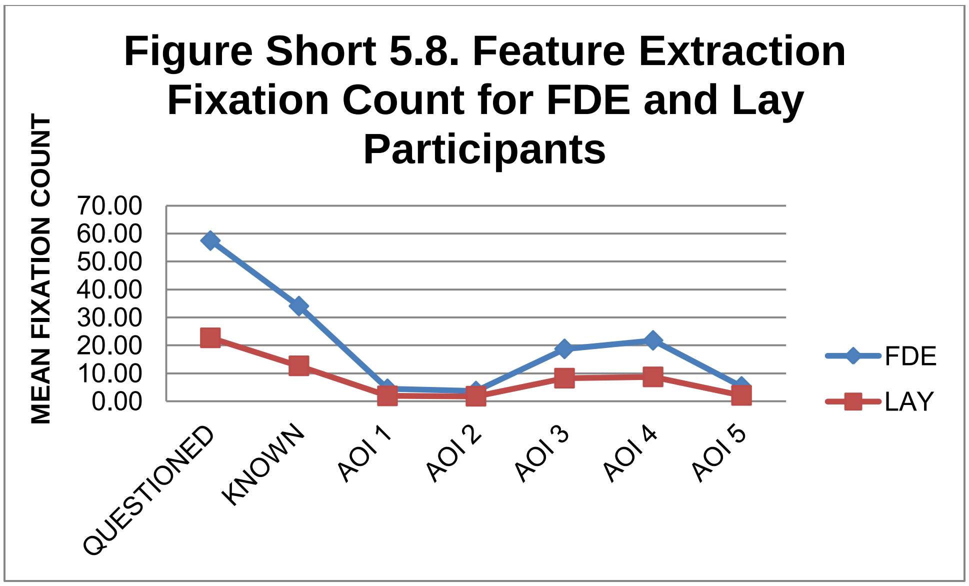
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .186, $F(7, 81) = 2.64$, $p = .017$, multivariate $\eta^2 = .186$. Figure Short 5.8 presents the mean fixation counts by AOI.

Figure Short 5.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all but one areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 87) = 18.64$, $p < .001$, partial $\eta^2 = .176$, and $F(1, 87) = 14.29$, $p = .001$, partial $\eta^2 = .141$.

Fixation count in all AOIs was significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 11.56$, $p = .001$, partial $\eta^2 = .117$; AOI 2, $F(1, 87) = 7.56$, $p = .007$, partial $\eta^2 = .080$; AOI 3, $F(1, 87) = 12.36$, $p = .001$, partial $\eta^2 = .124$; AOI 4, $F(1, 87) = 14.79$, $p < .001$, partial $\eta^2 = .145$; AOI 6, $F(1, 87) = 14.52$, $p < .001$, partial $\eta^2 = .143$). Table Short 5.5 presents the means and standard deviations for areas of interest by participant type.

Table Short 5.5

Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

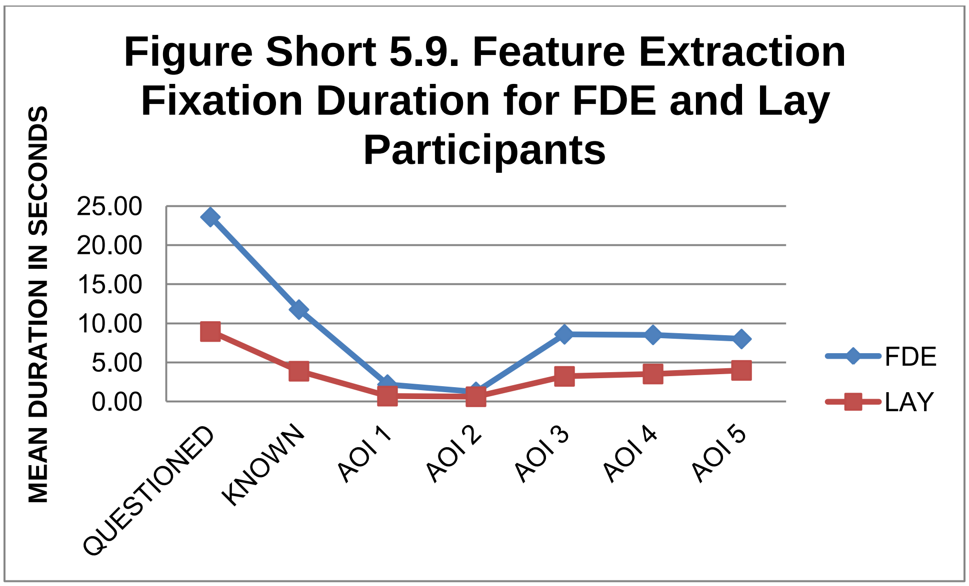
	QUESTIONED	KNOWN	AOI 1	AOI 2

Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	57.46	46.69	34.02	32.01	4.43	4.31	3.63	3.90
Lay	22.67	25.54	12.65	19.33	1.91	2.36	1.79	2.08
	AOI 3		**AOI 4**		**AOI 5**			
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*		
FDE	18.72	17.20	21.76	20.38	5.28	4.88		
Lay	8.23	9.62	8.70	9.28	2.07	2.68		

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .212, $F(6, 82) = 3.69$, $p = .003$, multivariate $\eta^2 = .212$. Figure Short 5.9 presents the mean fixation duration by AOI.

Figure Short 5.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all but one areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 87) = 20.79$, $p < .001$, partial $\eta^2 = .193$, and $F(1, 87) = 16.59$, $p < .001$, partial $\eta^2 = .160$.

Fixation duration in all AOIs was significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 16.02$, $p < .001$, partial $\eta^2 = .155$; AOI 2, $F(1, 87) = 7.23$, $p = .009$, partial $\eta^2 = .077$; AOI 3, $F(1, 87) = 16.90$, $p < .001$, partial $\eta^2 = .163$); AOI 4, $F(1, 87) = 14.15$, $p < .001$, partial $\eta^2 = .140$). Table Short 5.6 presents the means and standard deviations for areas of interest by participant type.

Table Short 5.6

Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

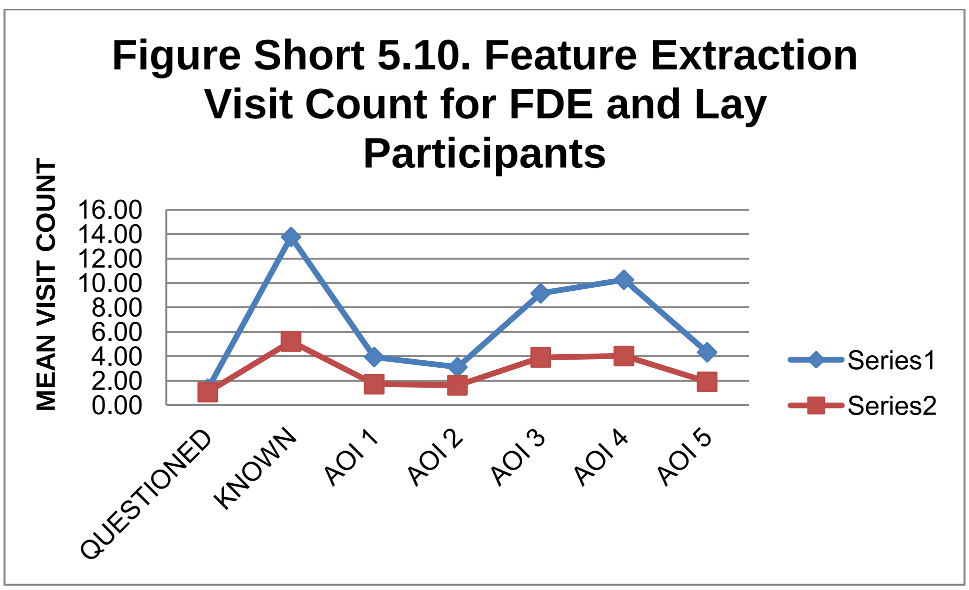
	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	23.59	18.19	11.76	11.71	2.17	2.27	1.24	1.34
Lay	8.95	10.96	3.88	5.04	0.69	0.85	0.62	0.74

	AOI 3		AOI 4		AOI 5	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	8.60	7.66	8.52	7.81	8.00	7.50
Lay	3.22	3.98	3.52	4.00	3.98	3.52

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .206, $F(7, 81) = 3.00$, $p = .007$, multivariate $\eta^2 = .206$. Figure Short 5.10 presents the mean visit counts by AOI.

Figure Short 5.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in all but one areas of interest. Total visit count for the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 87) = 19.86$ $p < .001$, partial $\eta^2 = .186$. No significant difference was found in visit count for the questioned signature, $p = .128$, *ns*.

Visit count in all AOIs was significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 13.25$, $p < .001$, partial $\eta^2 = .132$; AOI 2, $F(1, 87) = 7.65$, $p = .007$, partial $\eta^2 = .081$; AOI 3, $F(1, 87) = 17.01$, $p < .001$, partial $\eta^2 = .164$; AOI 4 ($F(1, 87) = 18.97$, $p < .001$, partial $\eta^2 = .179$; AOI 5, $F(1, 87) = 13.13$, $p < .001$, partial $\eta^2 = .131$). Table Short 5.7 presents the means and standard deviations for areas of interest by participant type.

Table Short 5.7

Feature Extraction Analysis Visit Count for FDE and Lay Participants

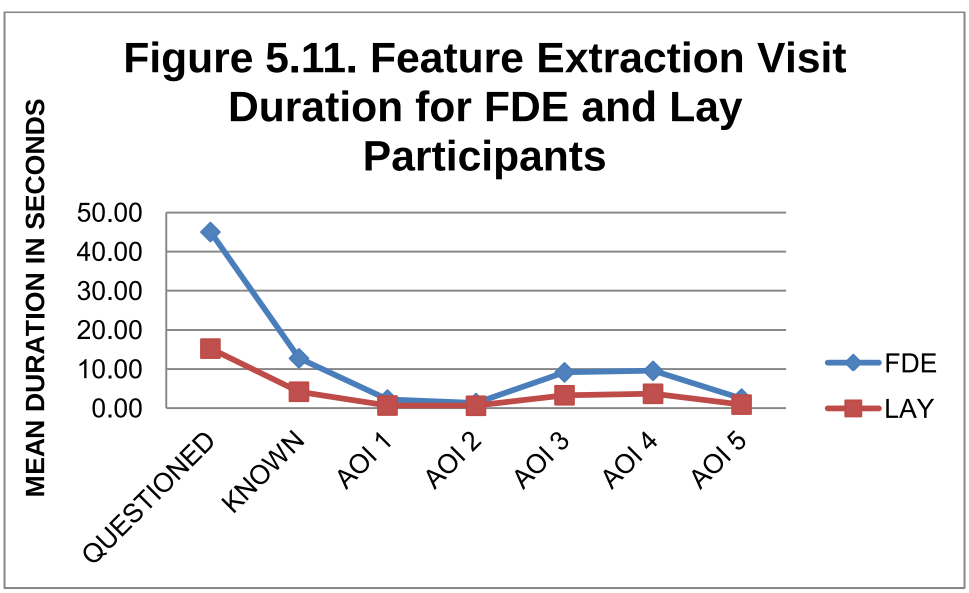
	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.35	1.12	13.76	10.91	3.93	3.57	3.11	3.09
Lay	1.07	0.40	5.21	6.48	1.72	1.83	1.63	1.72

	AOI 3		AOI 4		AOI 5	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	9.15	6.98	10.26	8.31	4.33	3.71
Lay	3.91	4.71	4.02	4.51	1.91	2.40

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .242, $F(7, 81) = 3.69$, $p = .002$, multivariate $\eta^2 = .242$. Figure Short 5.11 presents the mean visit durations by AOI.

Figure Short 5.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 87) = 25.07$, $p < .001$, partial $\eta^2 = .224$, and $F(1, 87) = 16.95$, $p < .001$, partial $\eta^2 = .163$.

Visit duration was statistically significant in all AOIs (AOI 1, $F(1, 87) = 16.03$, $p < .001$, partial $\eta^2 = .156$; AOI 2, $F(1, 87) = 7.76$, $p < .001$, partial $\eta^2 = .082$; AOI 3, $F(1, 87) = 17.91$, $p < .001$, partial $\eta^2 = .171$); AOI 4, $F(1, 87) = 15.82$, $p < .001$, partial $\eta^2 = .154$; AOI 5, $F(1, 87) = 12.84$, $p = .001$, partial $\eta^2 = .129$). Table Short 5.8 presents the means and standard deviations for areas of interest by participant type.

Table Short 5.8
Feature Extraction Analysis Visit Duration for FDE and Lay Participants

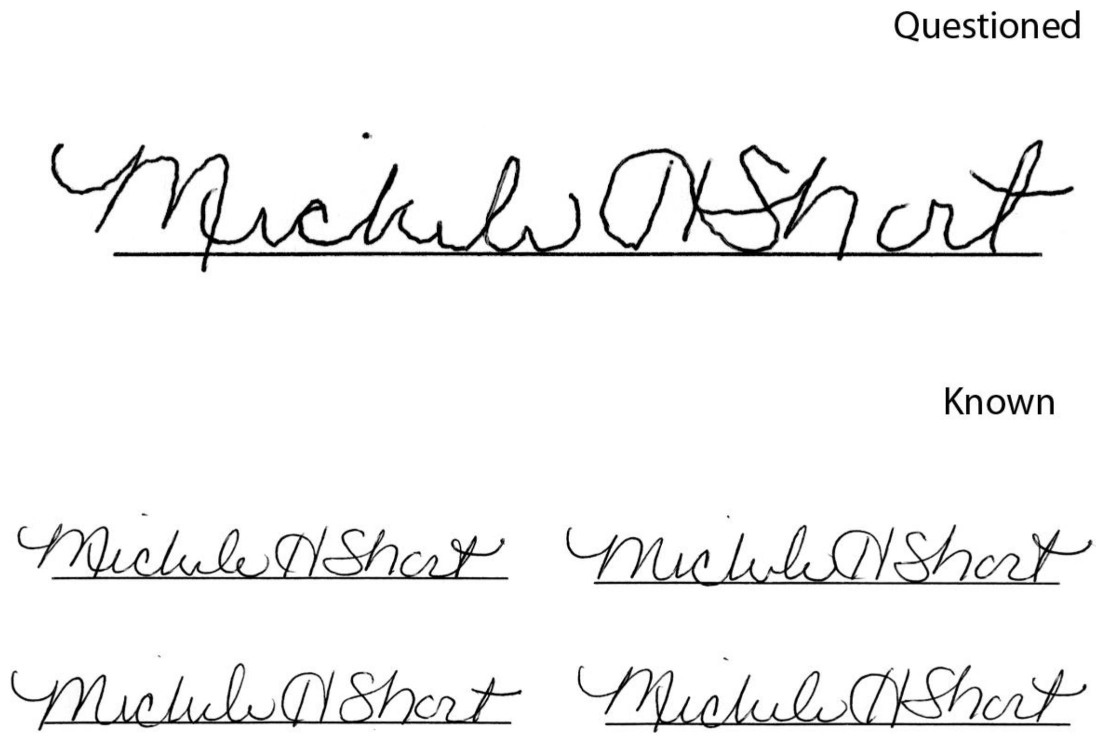
	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	45.02	34.96	12.76	12.46	2.22	2.35	1.33	1.45
Lay	15.24	17.87	4.21	5.65	0.70	0.85	0.63	0.77

	AOI 3		**AOI 4**		**AOI 5**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	9.17	8.18	9.55	8.80	2.46	2.53
Lay	3.32	4.06	3.69	4.14	0.93	1.25

Short Signature 6: Traced (Non-Genuine)

Of the 49 FDE participants, 48 responded correctly that the signature was non-genuine, while 1 responded that the signature was genuine. Of the 43 Lay participants, 41 responded correctly that the signature was non-genuine, while 1 responded that the signature was genuine. This difference was not statistically significant, p = .482, *n*s. Figure Short 6.1 presents the comparison view of this signature.

Figure Short 6.1. Questioned-Known Comparison Stimulus for Signature Short 6.

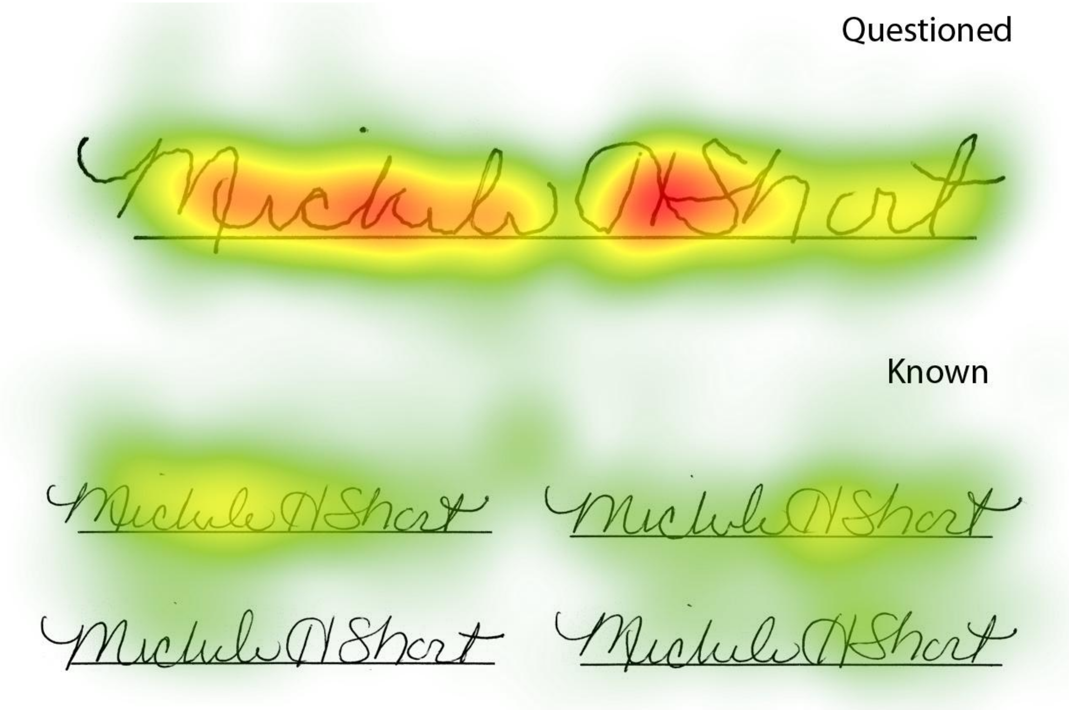


Selection of Areas of Interest (AOIs)

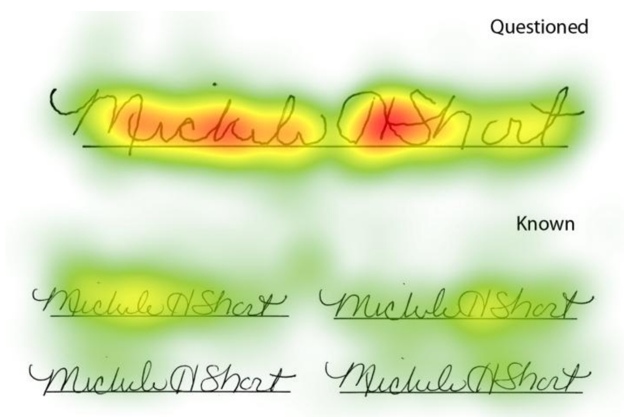
Figure Short 6.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were four locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of four AOIs for this stimulus. AOIs were created for these specific hot spots. Larger, secondary AOIs incorporating the smaller hot spots were created to include the orange "warm spots", creating a total of four AOIs for this stimulus. Figure Short 6.3 presents the location of the AOIs identified in the heat map.

Figure Short 6.2. Heat map for Short signature 6, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

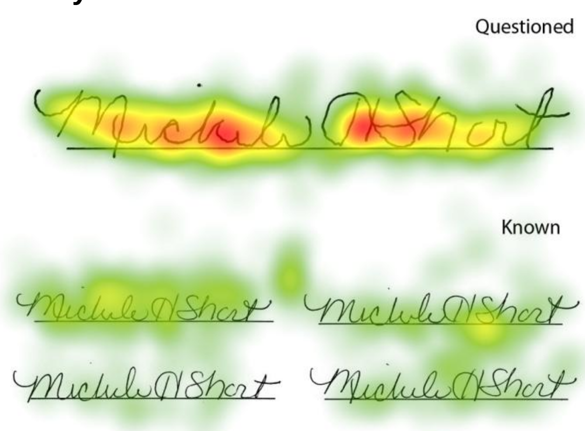
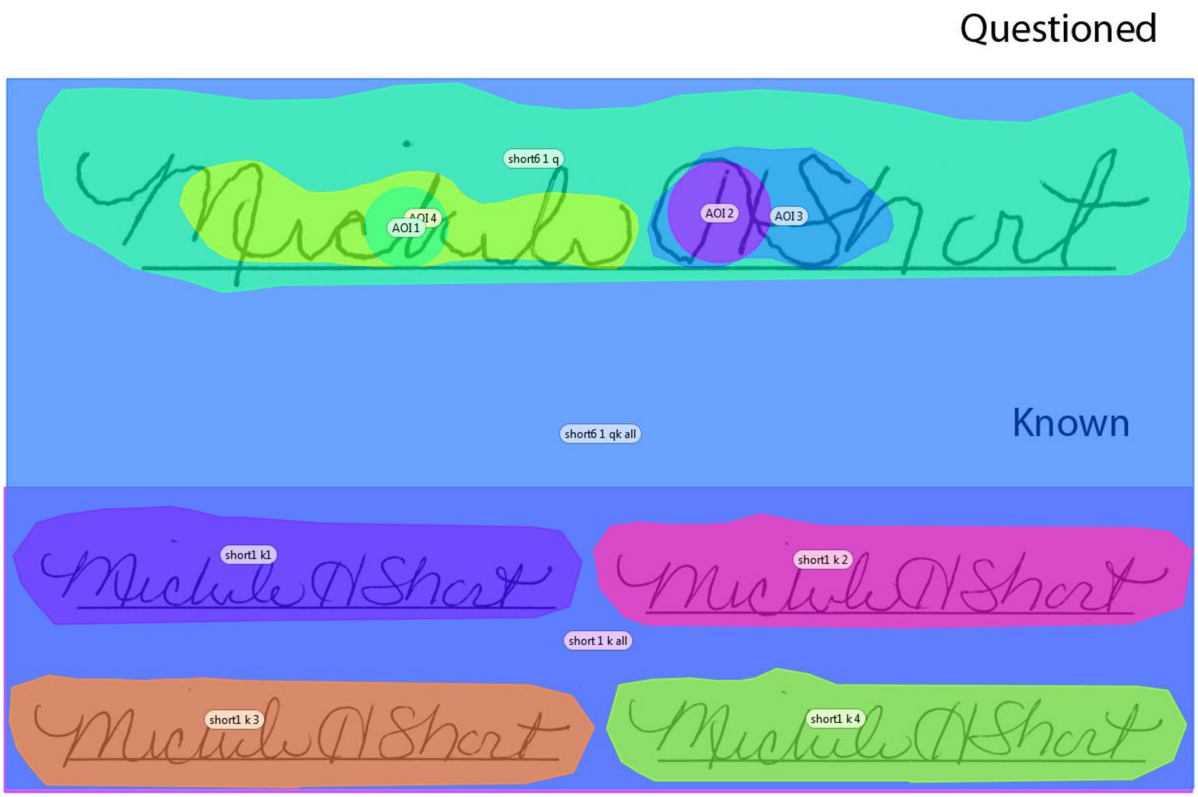


Figure Short 6.3. Areas of Interest (AOIs) for Short Signature 6.



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

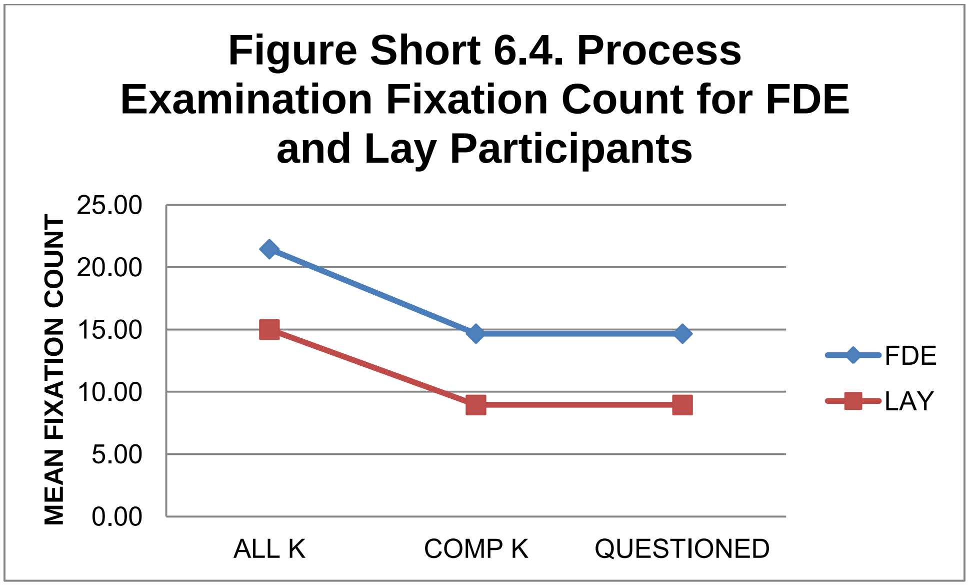
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Short known signature stimulus (Knowns, not pictured here), Short 1 K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Short 6Q (the Short questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 4) are included in subsequent analyses.

<u>*Total Fixation Count*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .260, $F(3, 81) = 9.50$, $p < .001$, multivariate $\eta^2 = .260$. Figure Short 6.4 presents the mean fixation counts by AOI.

Figure Short 6.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in two of the three areas of interest. Total fixation count for the questioned signature was significantly greater for FDEs than for the Lay participants, ($F(1, 83) = 15.06$, $p < .001$, partial $\eta^2 = .154$) and the known signature comparison stimulus (ALL K), ($F(1, 83) = 4.07$, $p = 047$, partial $\eta^2 = .047$).

Fixation count in the known comparison signature stimulus (COMP K) was not significantly different, $p = .323$, *ns*. Table Short 6.1 presents the means and standard deviations for areas of interest by participant type.

Table Short 6.1

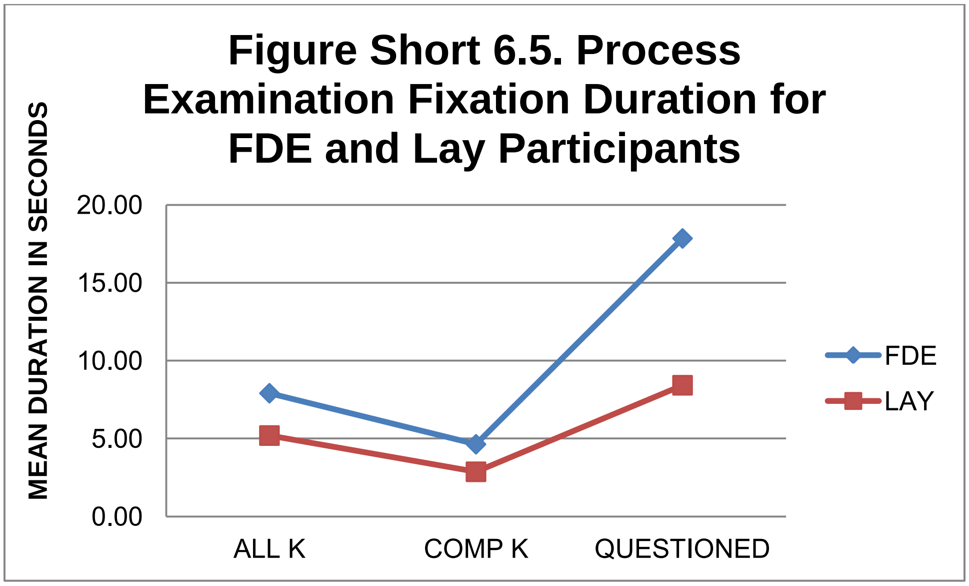
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	21.47	19.04	14.67	34.07	14.67	34.07
Lay	15.00	7.40	8.95	13.50	8.95	13.50

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .201, $F(3, 82) = 6.87$, $p < .001$, multivariate $\eta^2 = .201$. Figure Short 6.5 presents the mean fixation duration by AOI.

Figure Short 6.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in only one area of interest. Total fixation duration for the questioned signature was significantly greater for the FDEs than for Lay participants (questioned signature, $F(1, 84) = 11.47$, $p = .001$, partial $\eta^2 = .120$).

No significant difference was found for the known signature comparison stimulus (COMP K) or the known signature stimulus (ALL K) ($p = .380$, *ns*; $p = .062$, *ns*) . Table Short 6.2 presents the means and standard deviations for areas of interest by participant type.

Table Short 6.3

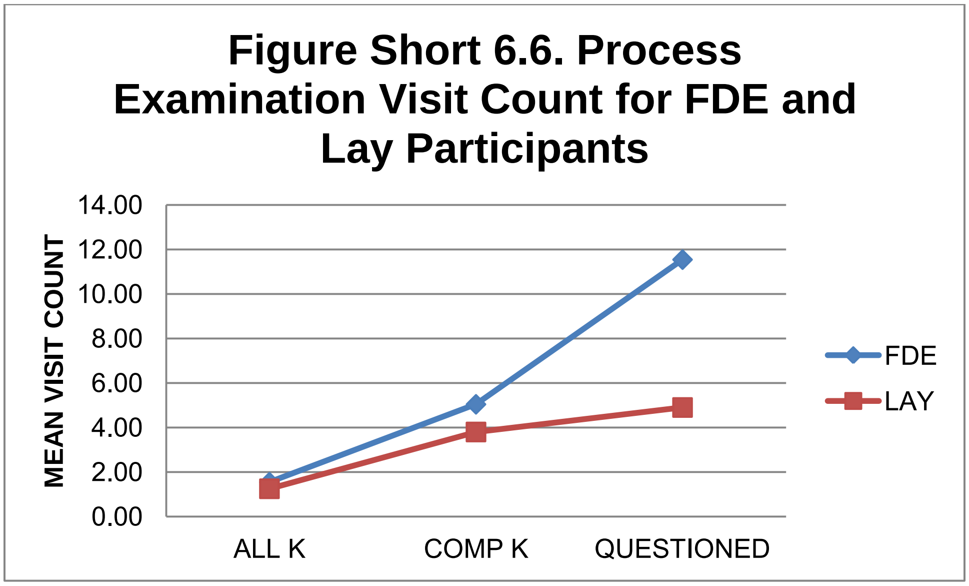
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	7.92	8.36	4.64	11.94	17.85	16.21
Lay	5.20	3.81	2.87	4.46	8.43	7.30

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .377, $F(3, 82) = 16.53$, $p < .001$, multivariate $\eta^2 = .377$. Figure Short 6.6 presents the mean fixation durations by AOI.

Figure Short 6.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in one of the three of the areas of interest. Total visit count for the questioned signature was significantly greater for the FDEs than for Lay participants (questioned signature, $F(1, 84) = 13.77$, $p < .001$, partial $\eta^2 = .141$).

No significant difference was found for the known signature comparison stimulus (COMP K) or the known signature stimulus (ALL K) ($p = .525$, *ns*; $p = .219$, *ns*) . Table Short 6.3 presents the means and standard deviations for areas of interest by participant type.

Table Short 6.3

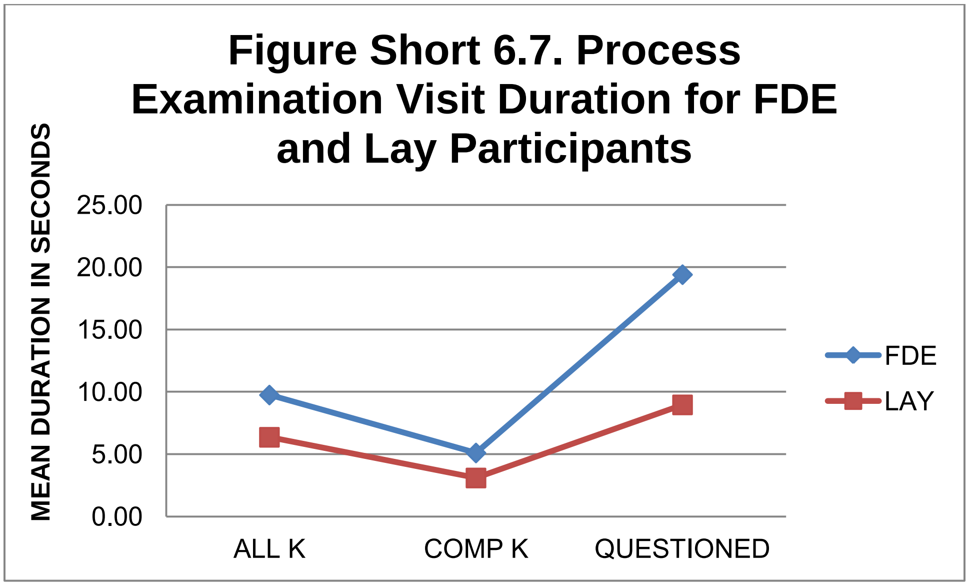
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.54	1.39	5.04	11.20	11.54	10.40
Lay	1.25	0.59	3.80	5.46	4.90	4.79

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .220, $F(3, 82) = 7.70$, $p < .001$, multivariate $\eta^2 = .220$. Figure Short 6.7 presents the mean visit duration by AOI.

Figure Short 6.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit duration in two of the three areas of interest. Total visit duration for the questioned signature was significantly greater for FDEs than for Lay participants, $F(1, 84) = 12.51$, $p = .001$, partial $\eta^2 = .130$). Visit duration in the known signature stimulus (ALL K) was also statistically significant, $F(1, 84) = 4.10$, $p = .046$, partial $\eta^2 = .047$. No significant difference was found for the known signature comparison stimulus (COMP K), $p = .355$, *ns*). Table Short 6.4 presents the means and standard deviations for areas of interest by participant type.

Table Short 6.4

Process Analysis Visit Duration for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	9.75	9.85	5.10	12.87	19.41	17.16
Lay	6.36	4.11	3.09	4.77	8.96	7.91

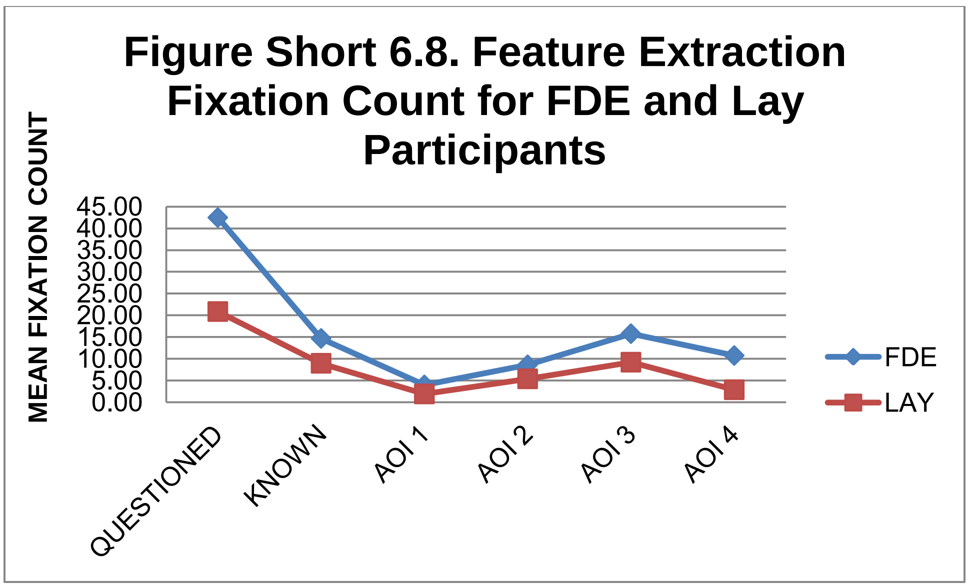
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .325, $F(6, 78) = 6.25$, $p < .001$, multivariate $\eta^2 = .325$. Figure Short 6.8 presents the mean fixation count by AOI.

Figure Short 6.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all but two areas of interest. Total fixation count for the questioned signature stimulus was significantly greater for FDEs than for Lay participants, $F(1, 83) = 15.06$, $p < .001$, partial $\eta^2 = .154$. No significant difference was found in the known signature comparison, $F(1, 83) = .99$, $p = .323$, partial $\eta^2 = .012$, *ns*.

Fixation count was significantly greater for FDEs than for Lay participants in all but one instance (AOI 1, $F(1, 83) = 9.16$, $p = .003$, partial $\eta^2 = .099$; AOI 3, $F(1, 83) = 5.91$, $p = .017$, partial $\eta^2 = .066$; AOI 4, $F(1, 83) = 30.34$, $p < .001$, partial $\eta^2 = .268$). No significant difference was found in AOI2, $p = .059$, *ns*. Table Short 6.5 presents the means and standard deviations for areas of interest by participant type.

Table Short 6.5

Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

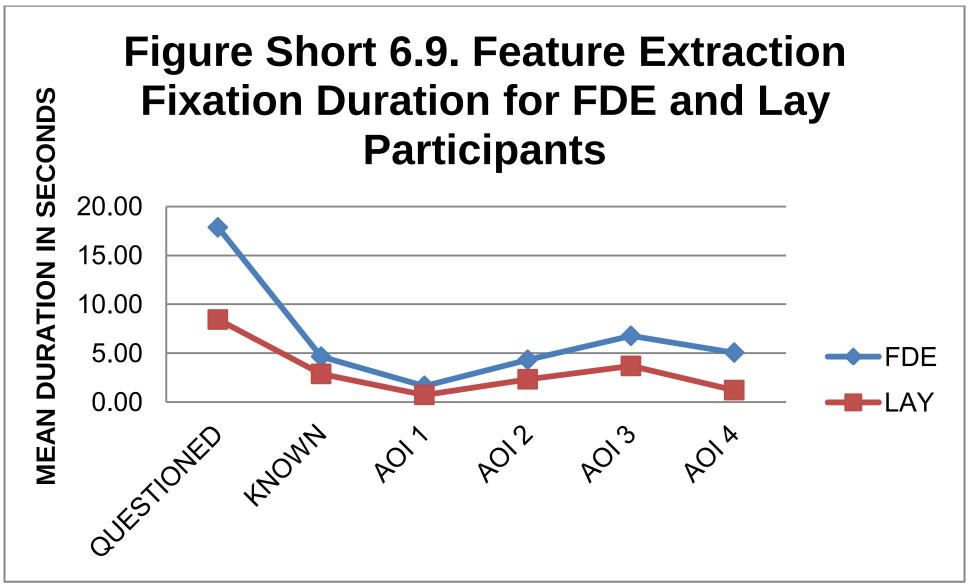
	QUESTIONED	KNOWN	AOI 1	AOI 2	AOI 3	AOI 4

Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	42.47	31.37	14.67	34.07	3.98	3.75	8.60	9.64	15.76	15.26	10.73	8.71
Lay	20.85	16.98	8.95	13.50	1.90	2.32	5.38	4.74	9.20	8.08	2.88	2.49

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .271, $F(6, 79) = 4.89$, $p < .001$, multivariate $\eta^2 = .271$. Figure Short 6.9 presents the mean fixation duration by AOI.

Figure Short 6.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all but one area of interest. Total fixation duration for the questioned signature stimulus was significantly greater for FDEs than for Lay participants, $F(1, 84) = 11.47$, $p = .001$, partial $\eta^2 = .120$. No significant difference was found in the known signature comparison, $p = .380$, *ns*.

Fixation duration in all AOIs was significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 84) = 8.64$, $p = .004$, partial $\eta^2 = .093$; AOI 2, $F(1, 84) = 4.47$, $p = .037$, partial $\eta^2 = .051$; AOI 3, $F(1, 84) = 5.43$, $p = .022$, partial $\eta^2 = .061$); AOI 4, $F(1, 84) = 24.31$, $p < .001$, partial $\eta^2 = .224$). Table Short 6.6 presents the means and standard deviations for areas of interest by participant type.

Table Short 6.6

Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

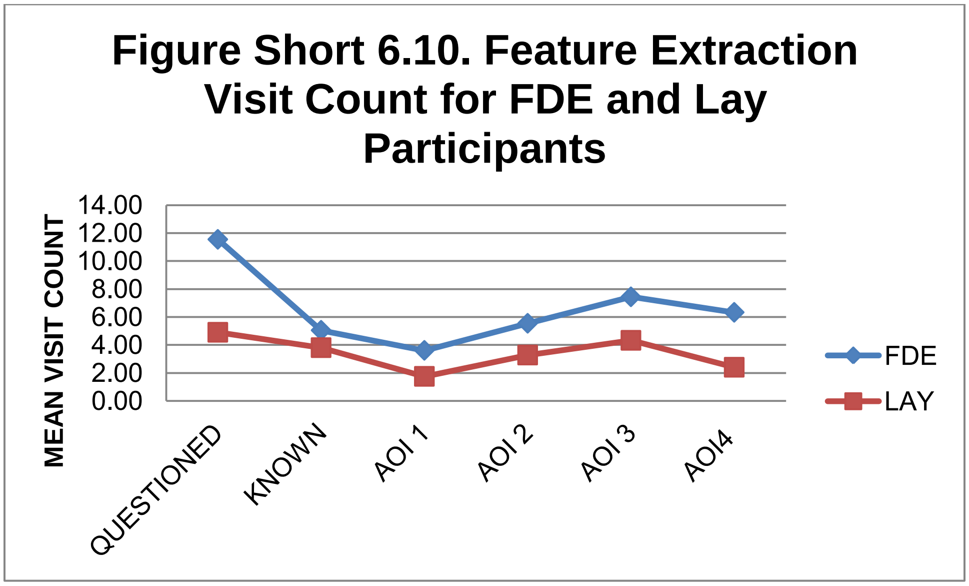
	QUESTIONED	KNOWN	AOI 1	AOI 2	AOI 3	AOI 4

Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	17.85	16.21	4.64	11.94	1.65	1.78	4.32	5.62	6.77	7.65	5.05	4.81
Lay	8.43	7.30	2.87	4.46	0.73	0.95	2.33	2.13	3.69	3.58	1.22	1.10

<u>*Total Visit Count*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .383, $F(6, 79) = 3.00$, $p < .001$, multivariate $\eta^2 = .383$. Figure Short 6.10 presents the mean visit count by AOI.

Figure Short 6.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in all but one areas of interest. Total visit count for the questioned signature stimulus was significantly greater for FDEs than for Lay participants, $F(1, 84) = 13.77$, $p < .001$, partial $\eta^2 = .141$. No significant difference was found in the known signature comparison, $p = .525$, *ns*.

Visit count in all AOIs was significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 84) = 9.32$, $p = .003$, partial $\eta^2 = .100$; AOI 2, $F(1, 84) = 6.12$, $p = .015$, partial $\eta^2 = .068$; AOI 3, $F(1, 84) = 6.36$, $p = .014$, partial $\eta^2 = .070$); AOI 4, $F(1, 84) = 25.24$, $p < .001$, partial $\eta^2 = .231$). Table Short 6.7 presents the means and standard deviations for areas of interest by participant type.

Table Short 6.7

Feature Extraction Analysis Visit Count for FDE and Lay Participants

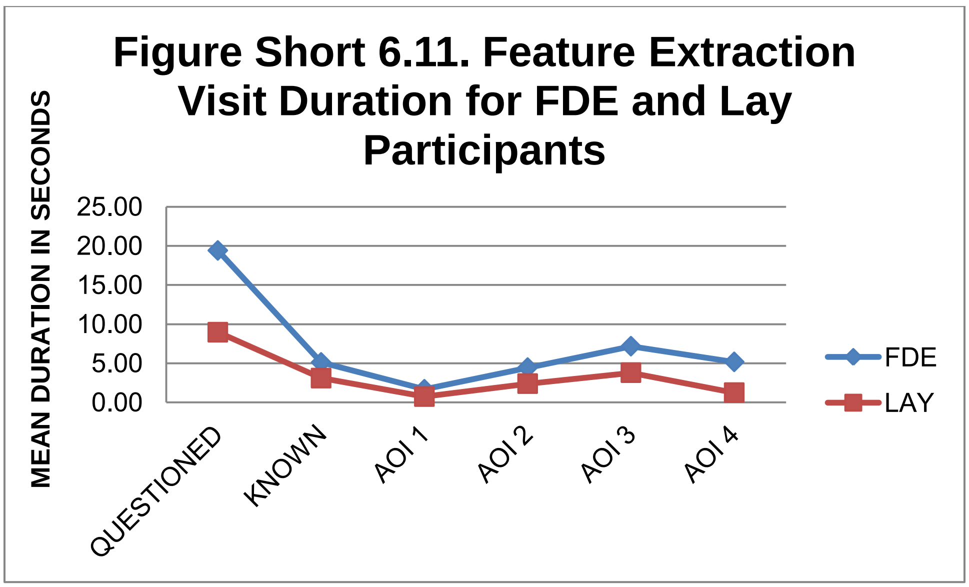
	QUESTIONED	KNOWN	AOI 1	AOI 2	AOI 3	AOI 4

Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	11.54	10.40	5.04	11.20	3.61	3.37	5.54	5.31	7.43	7.02	6.33	4.62
Lay	4.90	4.79	3.80	5.46	1.75	2.00	3.28	2.50	4.33	3.65	2.40	1.86

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .284, $F(6, 79) = 5.23$, $p < .001$, multivariate $\eta^2 = .284$. Figure Short 6.11 presents the mean visit durations by AOI.

Figure Short 6.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Visit duration for the questioned signature stimulus was significantly greater for FDEs than for Lay participants, $F(1, 84) = 12.51$, $p = .001$, partial $\eta^2 = .130$. No significant difference was found in the known signature comparison, $p = .355$, *ns*.

Visit duration in all AOIs was significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 84) = 8.72$, $p = .004$, partial $\eta^2 = .094$; AOI 2, $F(1, 84) = 4.43$, $p = .038$, partial $\eta^2 = .050$; AOI 3, $F(1, 84) = 5.91$, $p = .017$, partial $\eta^2 = .066$); AOI 4, $F(1, 84) = 24.32$, $p < .001$, partial $\eta^2 = .225$). Table Short 6.8 presents the means and standard deviations for areas of interest by participant type.

Table Short 6.8

Feature Extraction Analysis Visit Duration for FDE and Lay Participants

	QUESTIONED	KNOWN	AOI 1	AOI 2	AOI 3	AOI 4

Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	19.41	17.16	5.10	12.87	1.67	1.79	4.44	5.80	7.17	8.11	5.17	4.93
Lay	8.96	7.91	3.09	4.77	0.74	0.95	2.39	2.19	3.79	3.66	1.24	1.12

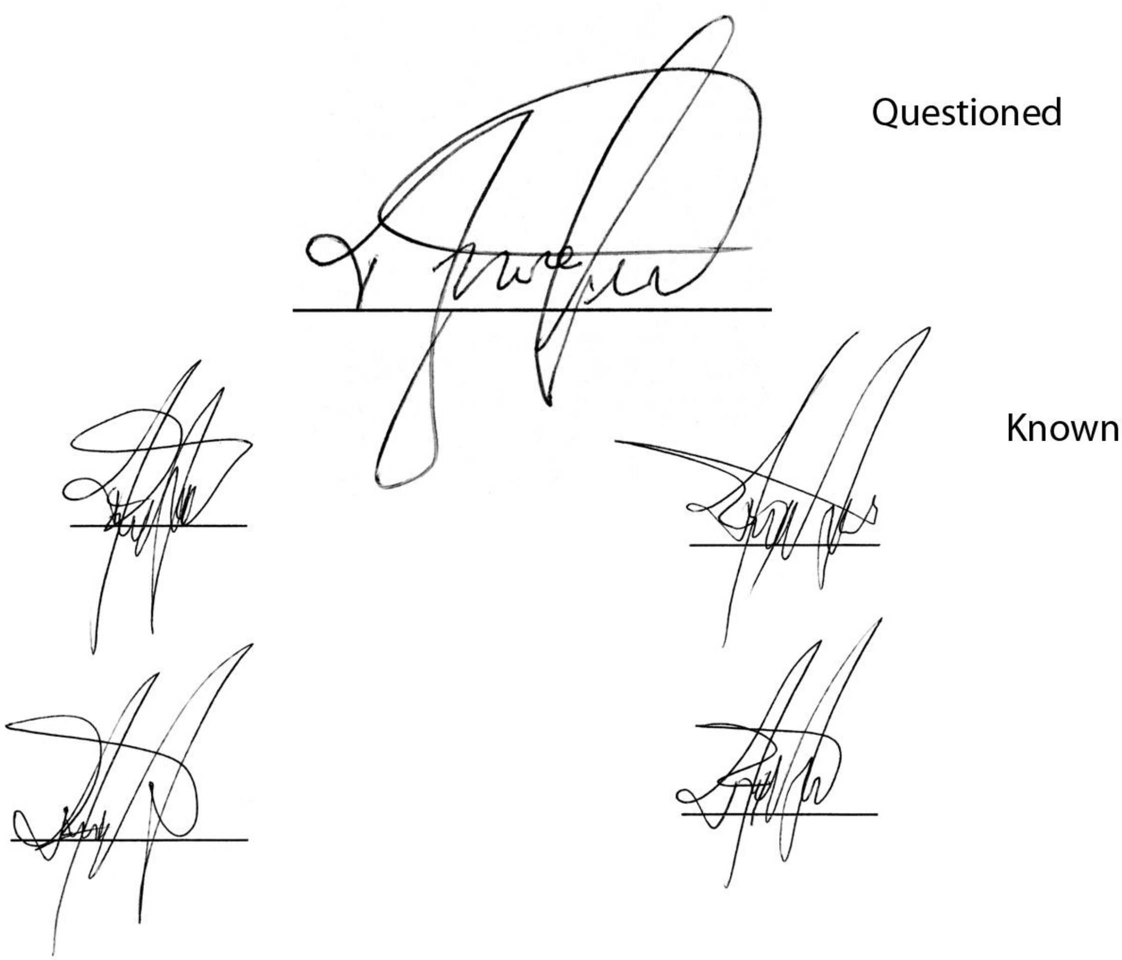
SIGNATURE 9: Vilcise Tima

The signature of Vilcise Tima is characterized as a high-complexity stylized-type signature. The set of Tima signature specimens included three genuine signatures. Of the non-genuine signatures, one was a freehand simulation, and two were disguised signatures. No traced signatures were included.

Tima Signature 1: Freehand Simulation (Non-Genuine)

Of the 49 FDE participants, 46 responded correctly that the signature was non-genuine, and 2 responded that it was genuine. One FDE declined to respond. Of the 43 Lay participants, 38 responded correctly that the signature was non-genuine, and 5 responded that the signature was non-genuine. This difference was not statistically significant, $p = .263$, *ns.* Figure Tima 1.1 presents the comparison view of this signature.

FigureTima 1.1. Questioned-Known Comparison Stimulus for Tima Signature 1.

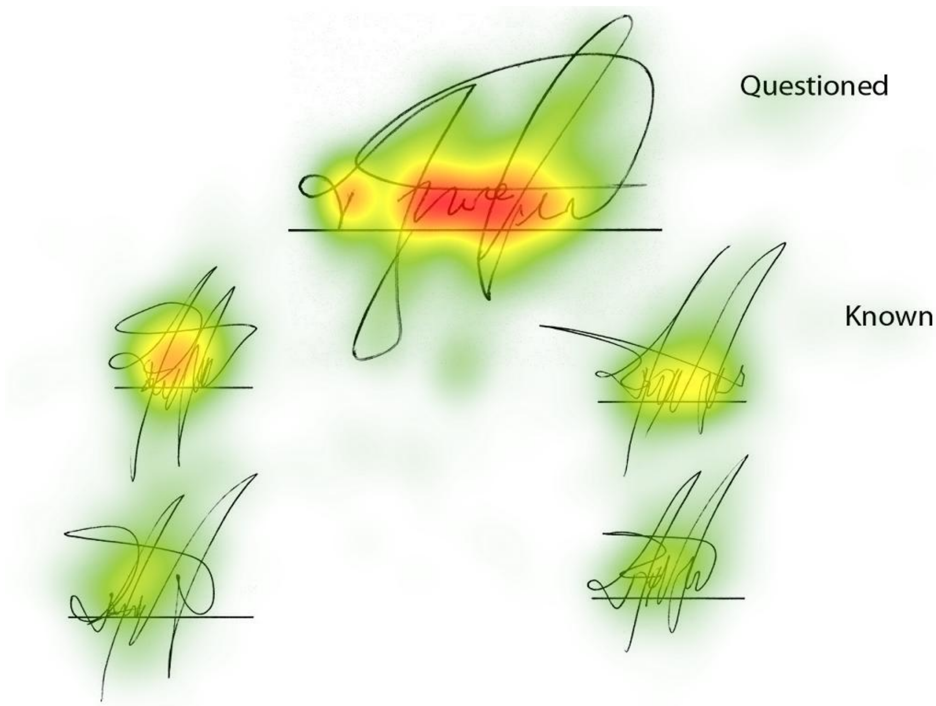


Selection of Areas of Interest (AOIs)

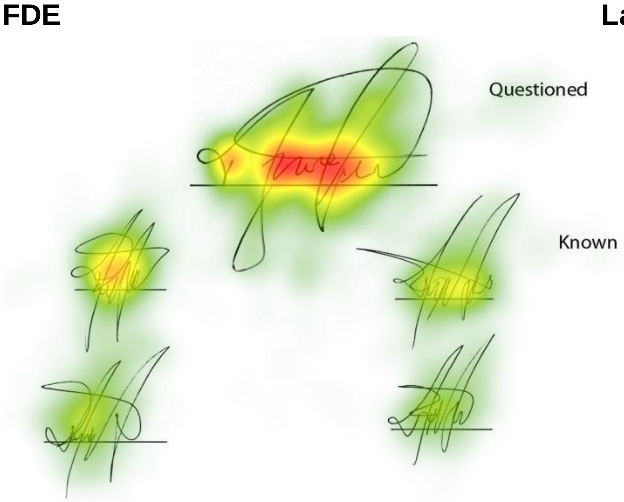
Figure Tima 1.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were three locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of three AOIs for this stimulus. Figure Tima 1.3 presents the location of the AOIs identified in the heat map.

Figure Tima 1.2. Heat map for Tima signature 1, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

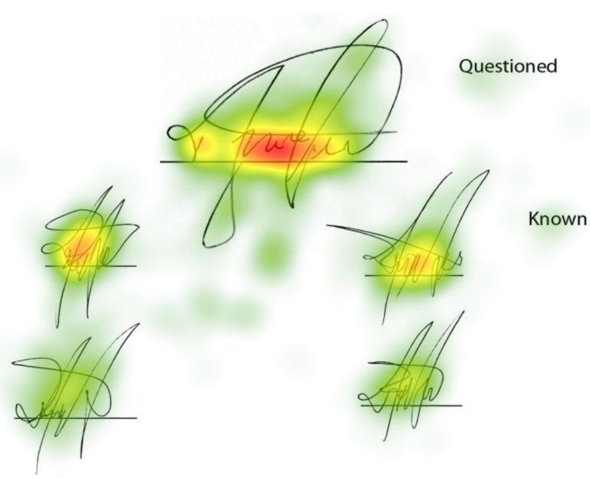
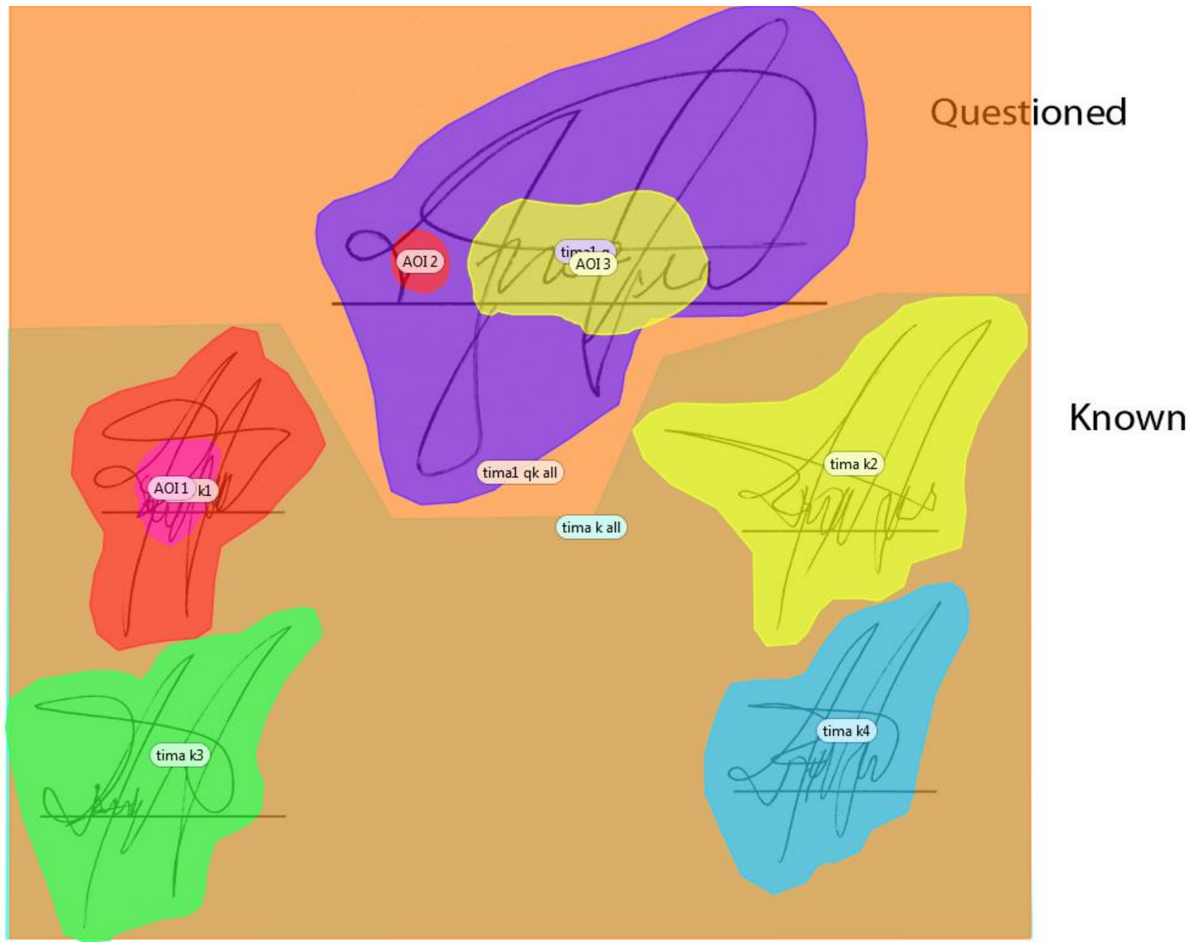


Figure Tima 1.3. Areas of Interest (AOIs) for Tima Signature 1.



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

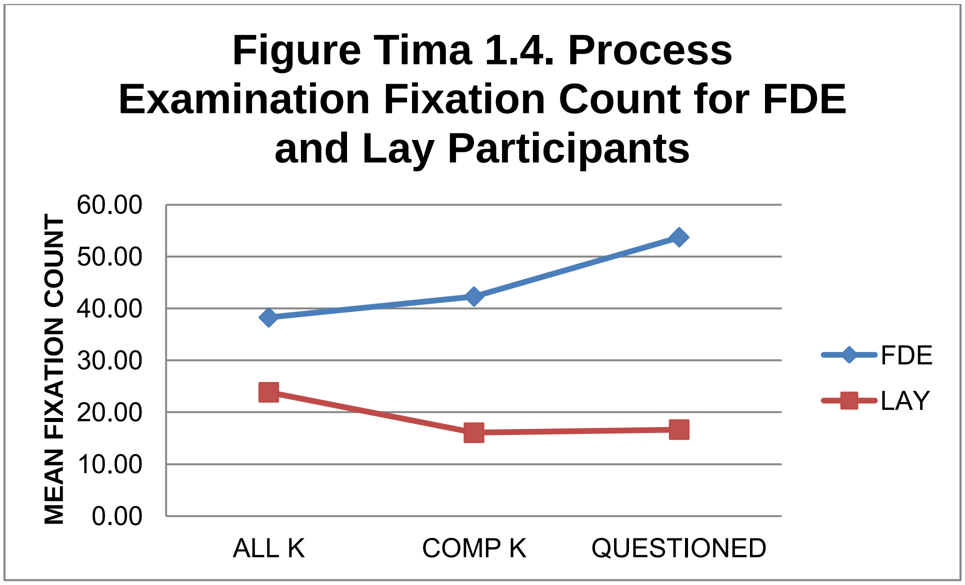
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Tima known signature stimulus (Knowns, not pictured here), Tima 1 K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Tima 1Q (the Tima questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 3) are included in subsequent analyses.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .371, $F(3, 85) = 16.68$, $p < .001$, multivariate $\eta^2 = .371$. Figure Tima 1.4 presents the mean fixation counts by AOI.

Figure Tima 1.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants $F(1, 87) = 49.28$, $p > .001$, partial $\eta^2 = .362$); $F(1, 87) = 22.13$, $p < .001$, partial $\eta^2 = .203$).

Fixation count in the known signature stimulus (ALL K) was also statistically significant, $F(1, 87) = 4.81$, $p = .031$, partial $\eta^2 = .052$. Table Tima 1.1 presents the means and standard deviations for areas of interest by participant type.

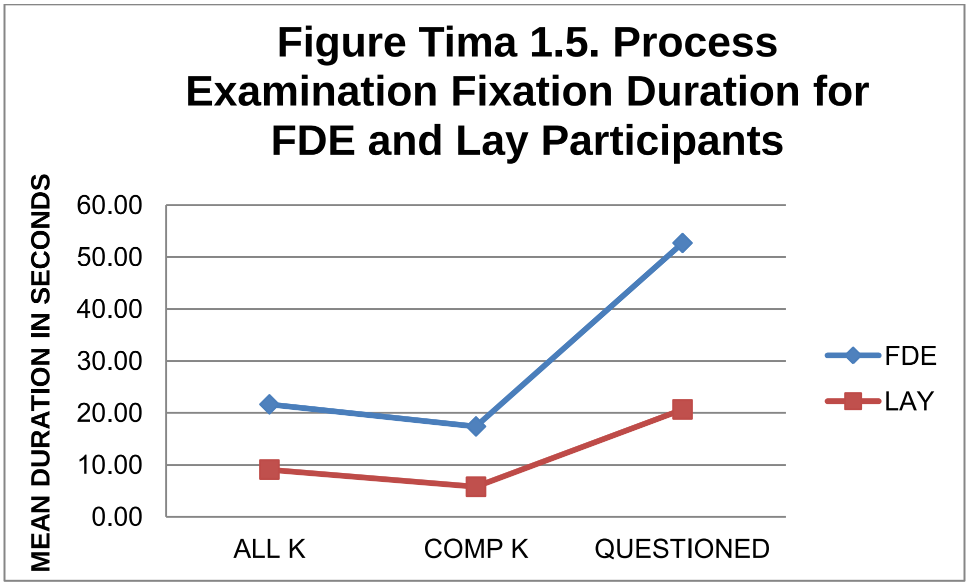
Table Tima 1.1
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	38.26	33.12	42.28	33.85	53.72	32.65
Lay	23.84	28.54	16.05	14.28	16.65	11.90

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .423, $F(3, 85) = 20.76$, $p < .001$, multivariate $\eta^2 = .423$. Figure Tima 1.5 presents the mean fixation duration by AOI.

Figure Tima 1.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, $F(1, 87) = 56.65$, $p > .001$, partial $\eta^2 = .394$); $F(1, 87) = 18.17$, $p < .001$, partial $\eta^2 = .173$).

Fixation duration in the known signature stimulus (ALL K) was also statistically significant, $F(1, 87) = 8.77$, $p = .004$, partial $\eta^2 = .092$. Table Tima 1.2 presents the means and standard deviations for areas of interest by participant type.

Table Tima 1.2

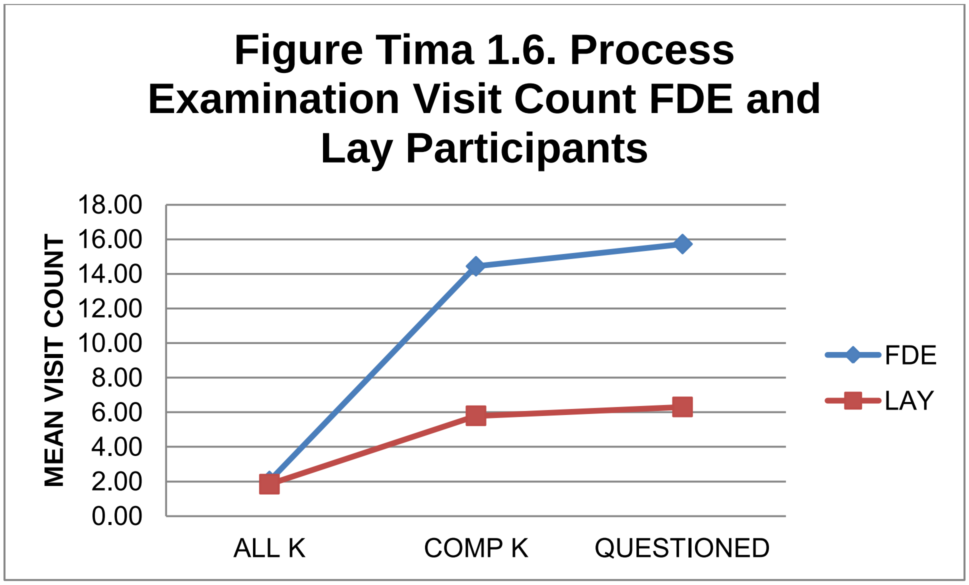
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	21.62	25.99	17.37	17.20	52.70	36.75
Lay	9.07	10.16	5.76	4.95	20.65	24.04

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .329, $F(3, 85) = 13.89$, $p < .001$, multivariate $\eta^2 = .329$. Figure Tima 1.6 presents the mean visit counts by AOI.

Figure Tima 1.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in two of the three areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, $F(1, 87) = 35.59$, $p > .001$, partial $\eta^2 = .290$); $F(1, 87) = 29.17$, $p < .001$, partial $\eta^2 = .251$).

Visit count in the known signature stimulus (ALL K) was not statistically significant, $p = .629$, *ns*. Table Tima 1.3 presents the means and standard deviations for areas of interest by participant type.

Table Tima 1.3

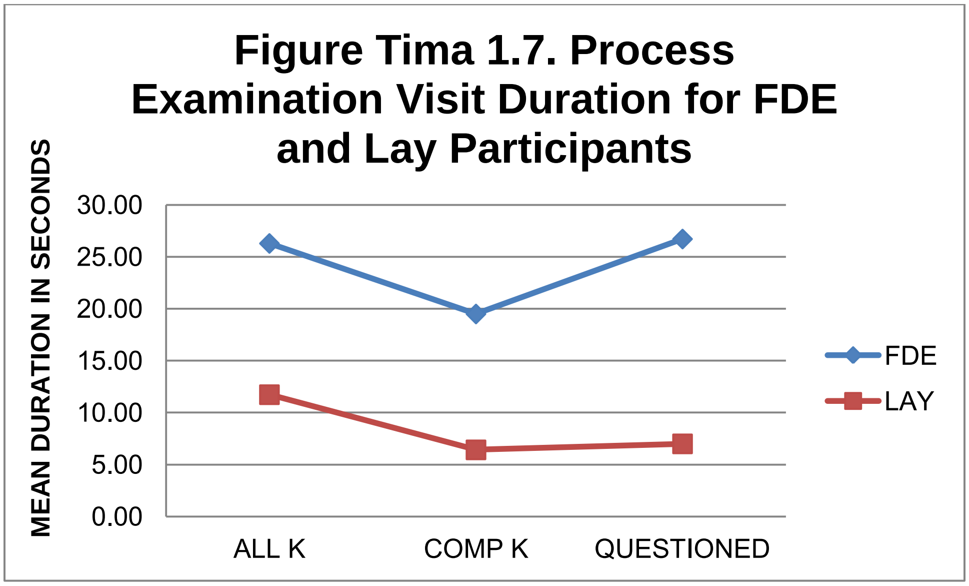
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.02	2.19	14.43	9.51	15.72	9.30
Lay	1.84	1.25	5.79	4.59	6.30	4.69

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .433, $F(3, 85) = 21.63$, $p < .001$, multivariate $\eta^2 = .433$. Figure Tima 1.7 presents the mean visit durations by AOI.

Figure Tima 1.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all of the three areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, $F(1, 87) = 62.89$, $p > .001$, partial $\eta^2 = .420$; $F(1, 87) = 20.09$, $p < .001$, partial $\eta^2 = .188$).

Visit duration in the known signature stimulus (ALL K) was also statistically significant, $F(1, 87) = 9.94$, $p = .002$, partial $\eta^2 = .014$. Table Tima 1.4 presents the means and standard deviations for areas of interest by participant type.

Table Tima 1.4

Process Analysis Visit Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	26.29	27.61	19.50	18.30	26.72	15.49
Lay	11.73	12.85	6.42	5.79	7.00	5.26

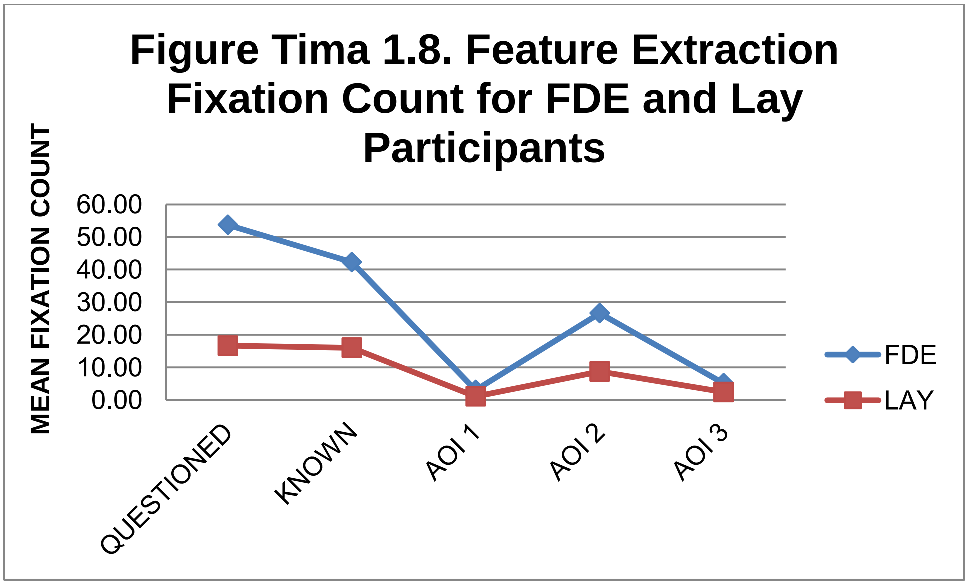
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .385, $F(5, 83) = 10.40$, $p < .001$, multivariate $\eta^2 = .385$. Figure Tima 1.8 presents the mean fixation counts by AOI.

Figure Tima 1.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 87) = 49.28$, $p < .001$, partial $\eta^2 = .362$, and $F(1, 87) = 22.13$, $p < .001$, partial $\eta^2 = .203$.

Fixations count in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 12.37$, $p = .001$, partial $\eta^2 = .124$; AOI 2, $F(1, 87) = 50.58$, $p < .001$, partial $\eta^2 = .368$ AOI 3, $F(1, 87) = 12.50$, $p = .001$, partial $\eta^2 = .126$). Table Tima 1.5 presents the means and standard deviations for areas of interest by participant type.

Table Tima 1.5

Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

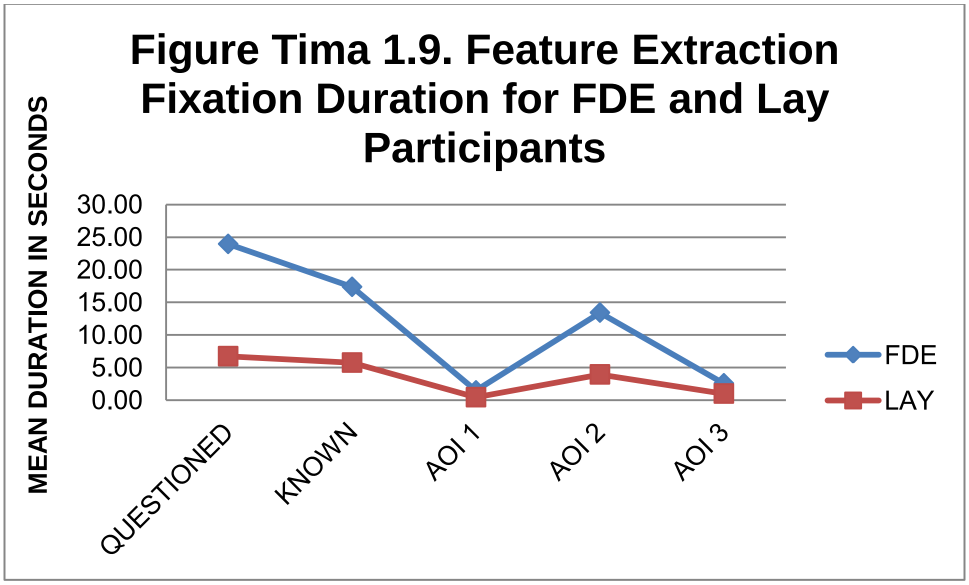
	QUESTIONED		KNOWN		AOI 1		AOI 2		AOI 3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***

FDE	53.72	32.65	42.28	33.85	3.09	3.42	26.65	15.55	5.15	4.35
Lay	16.65	11.90	16.05	14.28	1.14	1.25	8.74	5.74	2.44	2.61

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .429, $F(5, 83) = 12.49$, $p < .001$, multivariate $\eta^2 = .429$. Figure Tima 1.9 presents the mean fixation durations by AOI.

Figure Tima 1.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 87) = 56.65$, $p < .001$, partial $\eta^2 = .394$, and $F(1, 87) =18.17$, p < .001, partial $\eta^2 = .173$.

Fixation durations in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 14.78$, $p < .001$, partial $\eta^2 = .145$; AOI 2, $F(1, 87) = 53.35$, $p < .001$, partial $\eta^2 = .380$; AOI 3, $F(1, 87) = 18.68$, $p < .001$, partial $\eta^2 = .177$). Table Tima 1.6 presents the means and standard deviations for areas of interest by participant type.

Table Tima 1.6

Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

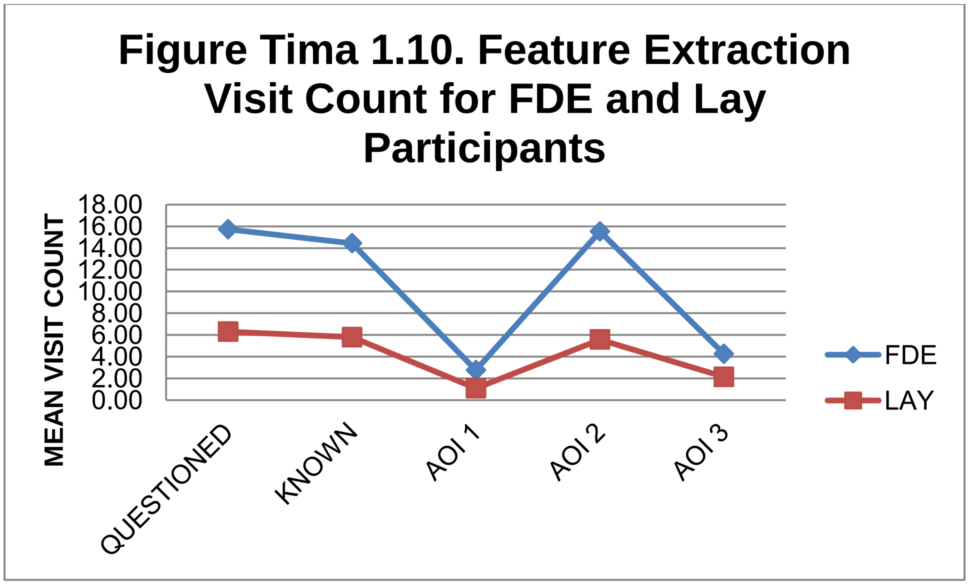
	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**		**AOI 3**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***

FDE	23.95	14.14	17.37	17.20	1.49	1.69	13.42	8.03	2.58	2.17
Lay	6.74	5.15	5.76	4.95	0.45	0.56	3.94	2.91	1.01	1.04

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .381, $F(5, 83) = 10.22$, $p < .001$, multivariate $\eta^2 = .381$. Figure Tima 1.10 presents the mean visit counts by AOI.

Figure Tima 1.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 87) = 194.65$, $p < .001$, partial $\eta^2 = .691$, and $F(1, 87) = 159.71$, $p < .001$, partial $\eta^2 = .647$.

Visit counts in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 68.38$, $p < .001$, partial $\eta^2 = .440$; AOI 2, $F(1, 87) = 219.56$, $p < .001$, partial $\eta^2 = .716$; AOI 3, $F(1, 87) = 109.70$, $p < .001$, partial $\eta^2 = .558$). Table Tima 1.7 presents the means and standard deviations for areas of interest by participant type.

Table Tima 1.7

Feature Extraction Analysis Visit Count for FDE and Lay Participants

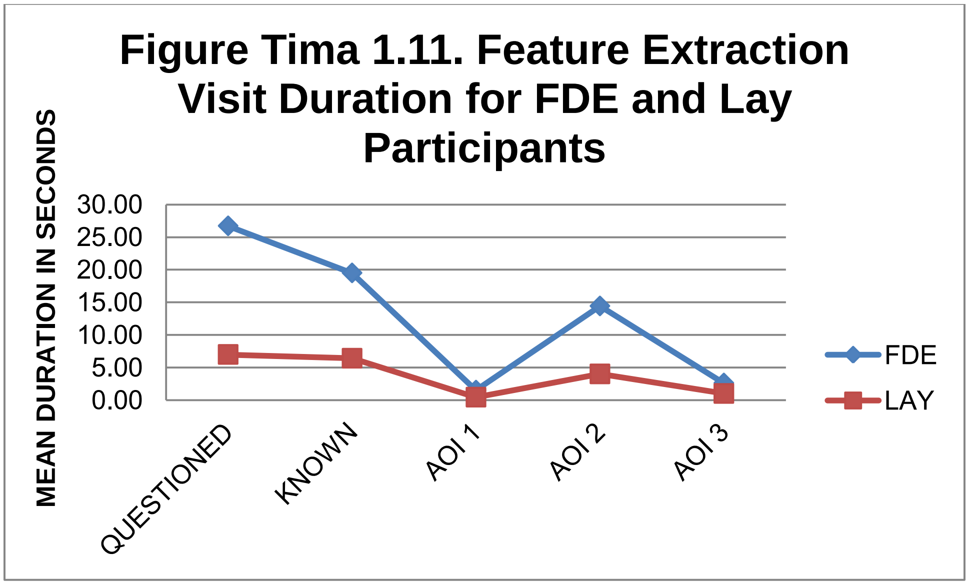
	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**		**AOI 3**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***

FDE	15.72	9.30	14.43	9.51	2.76	2.82	15.52	8.64	4.26	3.42
Lay	6.30	4.69	5.79	4.59	1.09	1.21	5.58	3.67	2.14	2.16

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .451, $F(5, 83) = 13.63$, $p < .001$, multivariate $\eta^2 = .451$. Figure Tima 1.11 presents the mean visit durations by AOI.

Figure Tima 1.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 87) = 62.89$, $p < .001$, partial $\eta^2 = .420$, and $F(1, 87) = 20.09$, $p < .001$, partial $\eta^2 = .188$.

Visit durations in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 14.40$, $p < .001$, partial $\eta^2 = .142$; AOI 2, $F(1, 87) = 56.48$, $p < .001$, partial $\eta^2 = .394$; AOI 3, $F(1, 87) = 18.78$, $p < .001$, partial $\eta^2 = .178$). Table Tima 1.8 presents the means and standard deviations for areas of interest by participant type.

Table Tima 1.8

Feature Extraction Analysis Visit Duration for FDE and Lay Participants

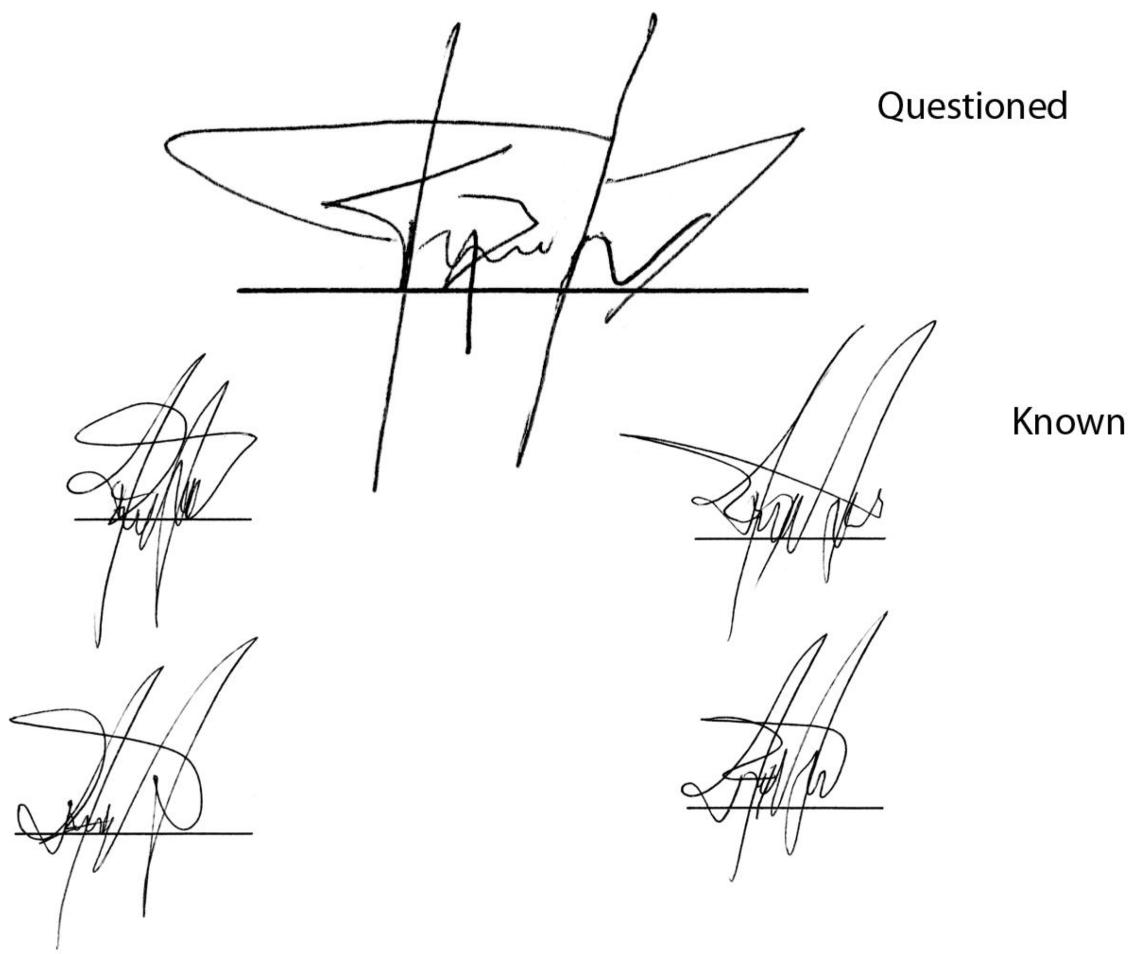
	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**		**AOI 3**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***

FDE	26.72	15.49	19.50	18.30	1.53	1.79	14.43	8.63	2.63	2.21
Lay	7.00	5.26	6.42	5.79	0.45	0.56	4.02	2.94	1.01	1.05

Tima Signature 2: Disguised (Non-Genuine)

Of the 49 FDE participants, 47 responded correctly that the signature was genuine, and 1 responded that it was non-genuine. One FDE declined to respond. Of the 43 Lay participants, 41 responded correctly that the signature was genuine, and 2 responded that the signature was non-genuine. This difference was statistically significant, χ^2 (2, N = 92) = 1.36, p = .507. Figure Tima 2.1 presents the comparison view of this signature.

Figure Tima 2.1. Questioned-Known Comparison Stimulus for Tima Signature 2.

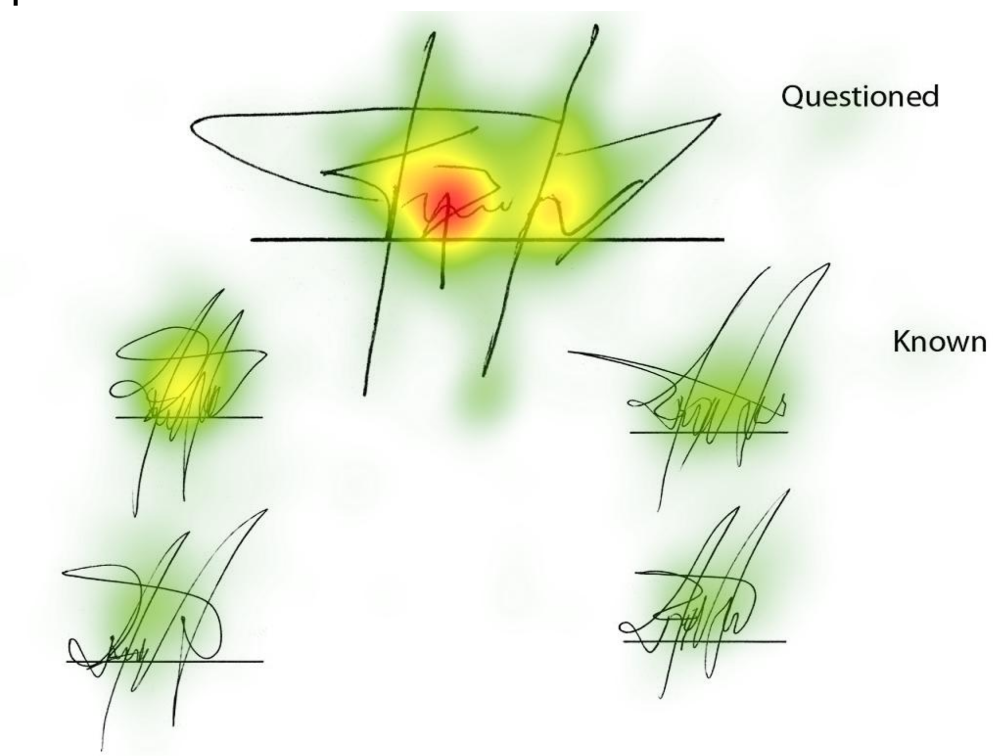


Selection of Areas of Interest (AOIs)

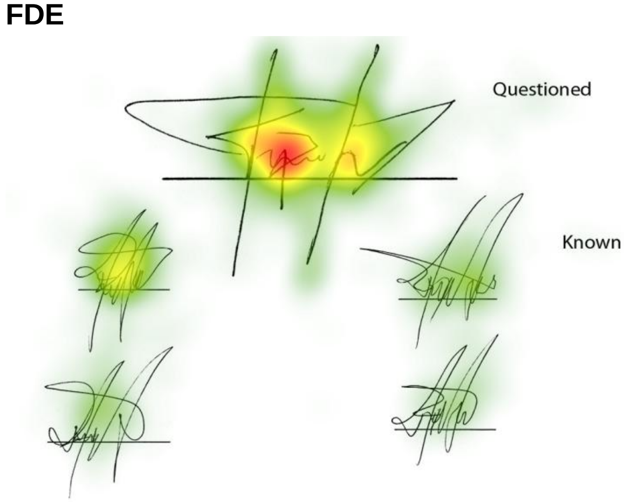
Figure Tima 2.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were four locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of four AOIs for this stimulus. Figure Tima 2.3 presents the location of the AOIs identified in the heat map.

Figure Tima 2.2. Heat map for Tima Signature 2, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

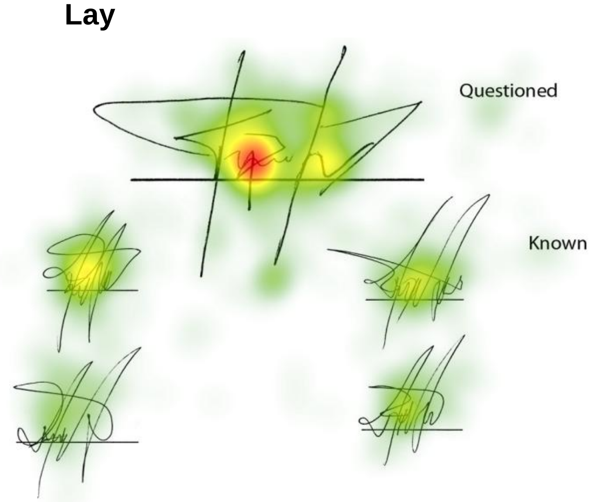
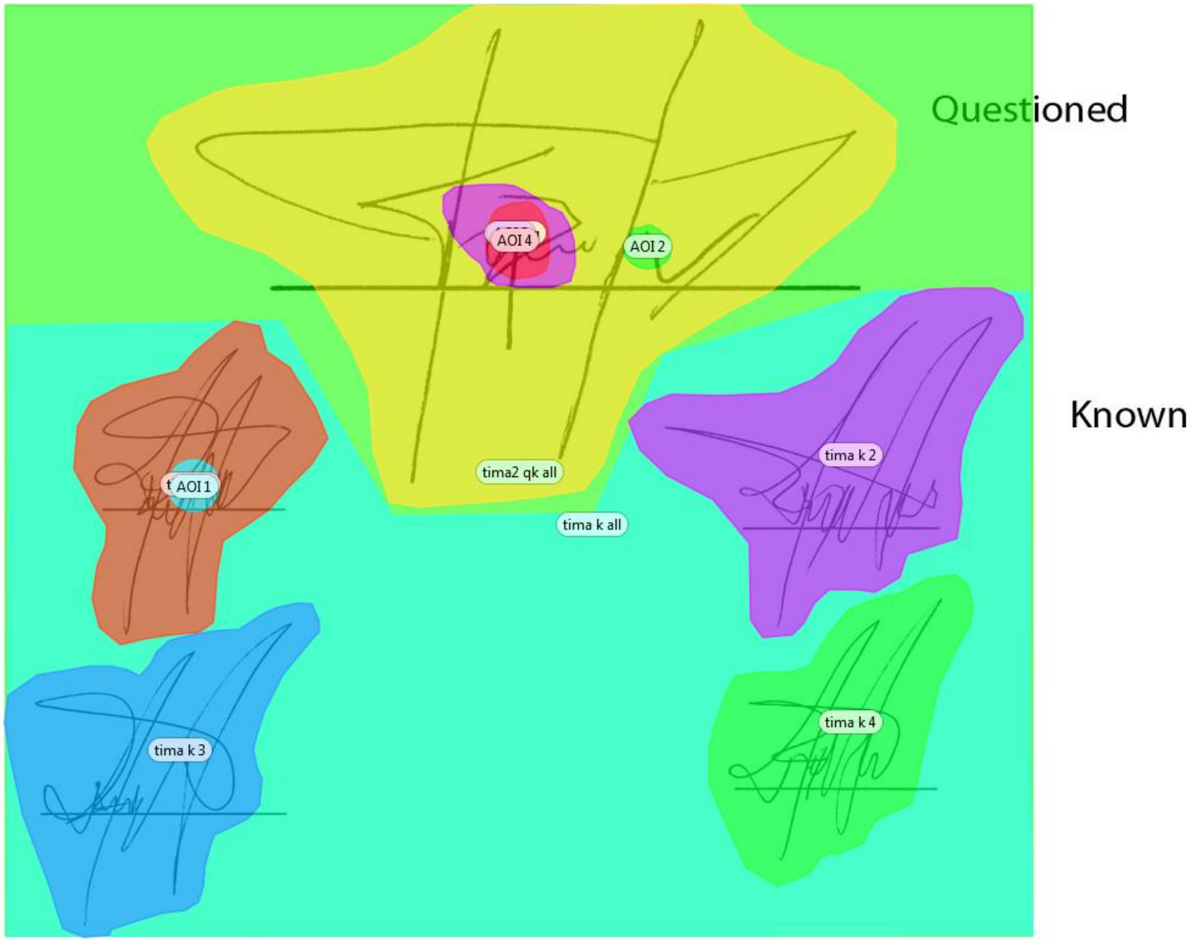


Figure Tima 2.3. Areas of Interest (AOIs) for Tima Signature 2.



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

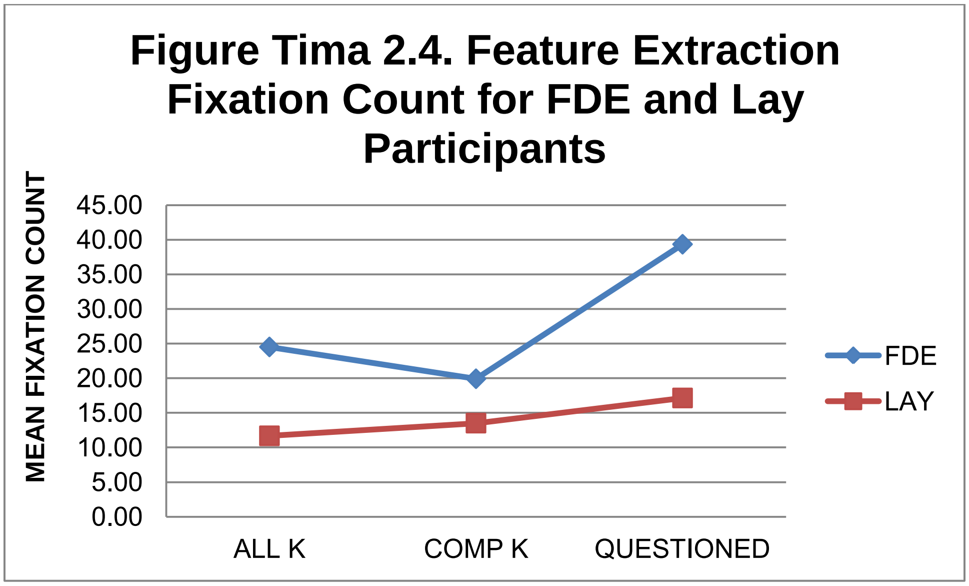
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Tima known signature stimulus (Knowns, not pictured here), Tima 1 K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Tima 2Q (the Tima questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 4) are included in subsequent analyses.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .322, $F(3, 86) = 13.62$, $p < .001$, multivariate $\eta^2 = .322$. Figure Tima 2.4 presents the mean fixation counts by AOI.

Figure Tima 2.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count (COMP K) in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 88) = 28.24$, $p > .001$, partial $\eta^2 = .243$; $F(1, 88) = 4.11$, $p = .046$, partial $\eta^2 = .045$).

Fixation count in the known signature stimulus (ALL K) was also statistically significant, $F(1, 88) = 5.78$, $p = .018$, partial $\eta^2 = .062$. Table Tima 2.1 presents the means and standard deviations for areas of interest by participant type.

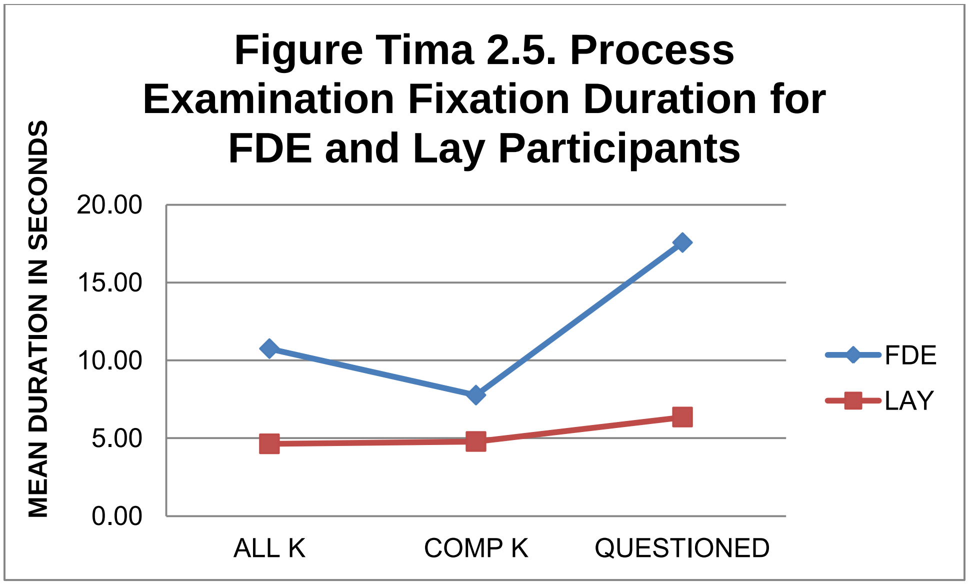
Table Tima 2.1
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	24.51	33.62	19.91	16.49	39.34	24.32
Lay	11.67	10.20	13.51	13.10	17.14	13.16

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .393, $F(3, 86) = 20.76$, $p < .001$, multivariate $\eta^2 = .393$. Figure Tima 2.5 presents the mean fixation duration by AOI.

Figure Tima 2.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, $F(1, 88) = 34.60$, $p > .001$, partial $\eta^2 = .282$); $F(1, 88) = 5.14$, $p = .026$, partial $\eta^2 = .055$).

Fixation duration in the known signature stimulus (ALL K) was also statistically significant, $F(1, 88) = 6.52$, $p = .012$, partial $\eta^2 = .069$. Table Tima 2.2 presents the means and standard deviations for areas of interest by participant type.

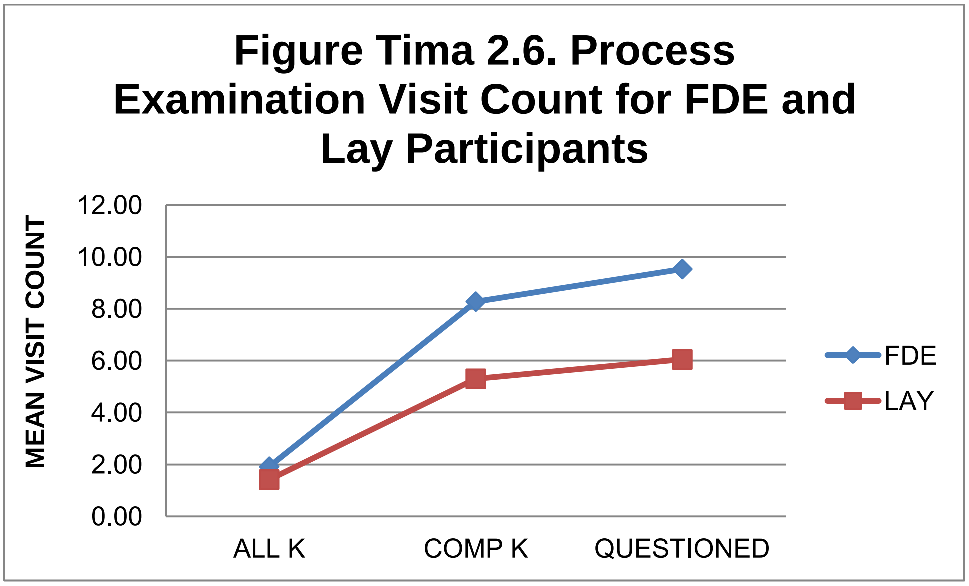
Table Tima 2.2
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	10.75	15.01	7.76	7.43	17.56	11.34
Lay	4.63	4.78	4.78	4.55	6.35	5.48

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .112, $F(3, 86) = 13.89$, $p = .016$, multivariate $\eta^2 = .112$. Figure Tima 2.6 presents the mean visit counts by AOI.

Figure Tima 2.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in two of the three areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 88) = 8.47$, $p = .005$, partial $\eta^2 = .088$); known signature comparison stimulus, $F(1, 88) = 6.67$, $p = .011$, partial $\eta^2 = .070$).

Visit count in the known signature stimulus (ALL K) was not statistically significant, $p = .104$, *ns*. Table Tima 2.3 presents the means and standard deviations for areas of interest by participant type.

Table Tima 2.3

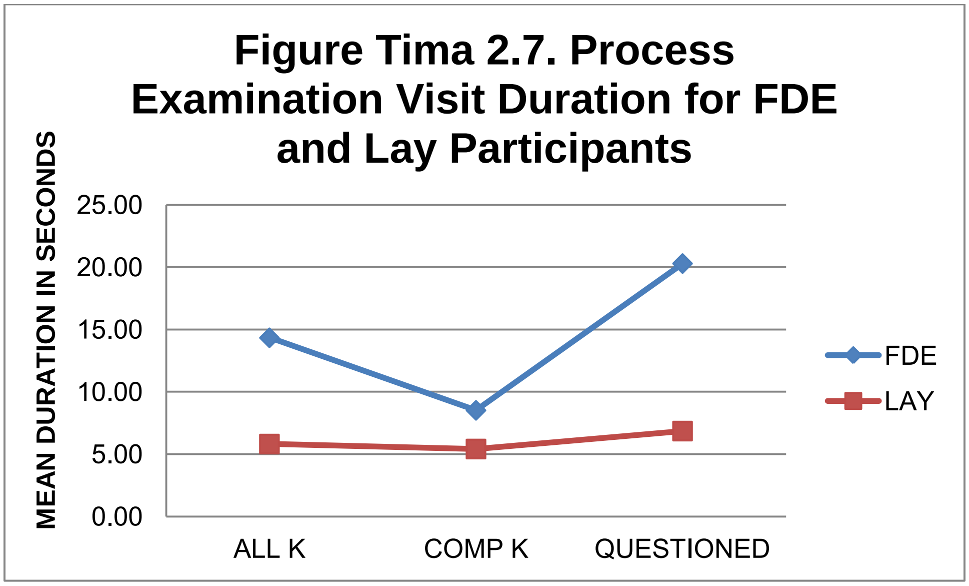
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.91	1.74	8.28	6.31	9.53	6.61
Lay	1.42	0.98	5.30	4.34	6.05	4.43

<u>*Total Visit Duration*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .375, $F(3, 86) = 17.23$, $p < .001$, multivariate $\eta^2 = .375$. Figure Tima 2.7 presents the mean visit durations by AOI.

Figure Tima 2.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all of the three areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, $F(1, 88) = 38.82$, $p > .001$, partial $\eta^2 = .306$); $F(1, 88) = 4.67$, $p = .033$, partial $\eta^2 = .050$).

Visit duration in the known signature stimulus (ALL K) was also statistically significant, $F(1, 88) = 7.39$, $p = .008$, partial $\eta^2 = .077$. Table Tima 2.4 presents the means and standard deviations for areas of interest by participant type.

Table Tima 2.4

Process Analysis Visit Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	14.34	19.89	8.52	7.93	20.30	13.08
Lay	5.81	5.44	5.42	5.29	6.86	5.60

Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .369, $F(6, 83) = 9.62$, $p < .001$, multivariate $\eta^2 = .369$. Figure Tima 2.8 presents the mean fixation counts by AOI.

Figure Tima 2.8

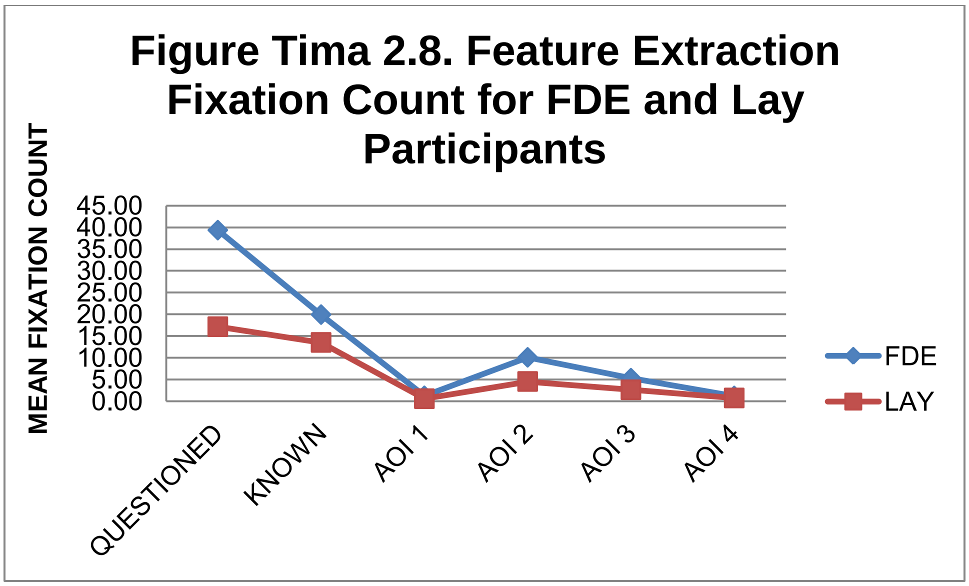


Figure Tima 2.8. Feature Extraction Fixation Count for FDE and Lay Participants

Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all but one area of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 88) = 28.24$, $p < .001$, partial $\eta^2 = .243$, and $F(1, 88) = 4.11$, $p = .046$, partial $\eta^2 = .045$.

Fixation count in three of the four AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 7.87$, $p = .006$, partial $\eta^2 = .082$; AOI 2, $F(1, 88) = 19.72$, $p < .001$, partial $\eta^2 = .183$; AOI 3, $F(1, 88) = 12.00$, $p = .001$, partial $\eta^2 = .120$).

No significant difference was found for AOI 4, $p = .138$, *ns*. Table Tima 2.5 presents the means and standard deviations for areas of interest by participant type.

Table Tima 2.5

Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

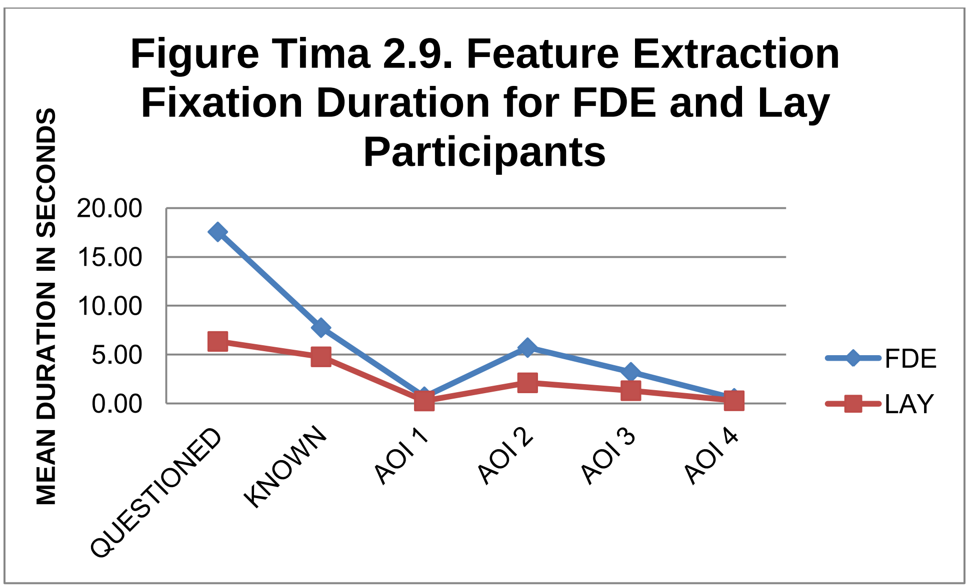
	QUESTIONED	**KNOWN**	**AOI 1**

Participant	M	SD	M	SD	M	SD
FDE	17.56	11.34	7.76	7.43	0.70	0.89
Lay	6.35	5.48	4.78	4.55	0.27	0.43
	AOI 2		AOI 3		AOI 4	
Participant	M	SD	M	SD	M	SD
FDE	5.72	4.60	3.20	2.89	0.54	0.81
Lay	2.12	2.37	1.32	1.38	0.29	0.51

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .410, $F(6, 83) = 9.62$, $p < .001$, multivariate $\eta^2 = .410$. Figure Tima 2.9 presents the mean fixation durations by AOI.

Figure Tima 2.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all but one area of interest. Fixation duration for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 88) = 36.40$, $p < .001$, partial $\eta^2 = .282$, and $F(1, 88) = 5.14$, $p = .026$, partial $\eta^2 = .055$.

Fixation duration in three of the four AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 8.35$, $p = .005$, partial $\eta^2 = .087$; AOI 2, $F(1, 88) = 21.18$, $p < .001$, partial $\eta^2 = .194$; AOI 3, $F(1, 88) = 15.18$, $p < .001$, partial $\eta^2 = .147$).

No significant difference was found for AOI 4, $p = .087$, *ns*. Table Tima 2.6 presents the means and standard deviations for areas of interest by participant type.

Table Tima 2.6

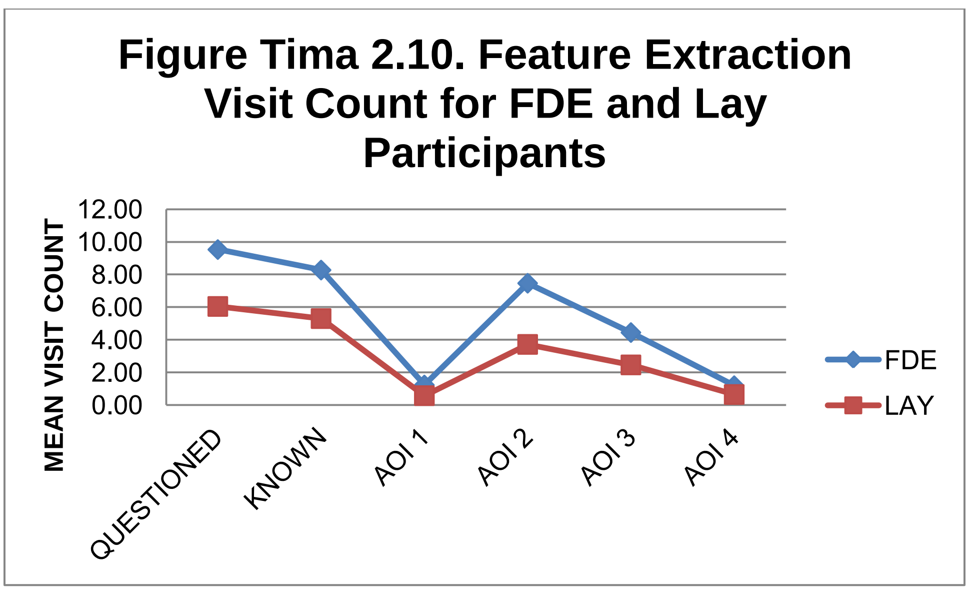
Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	39.34	24.32	19.91	16.49	1.23	1.27
Lay	17.14	13.16	13.51	13.10	0.58	0.88
	AOI 2		**AOI 3**		**AOI 4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	10.09	7.28	5.30	4.54	1.21	1.73
Lay	4.53	3.92	2.63	2.32	0.74	1.16

<u>*Total Visit Count*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .244, $F(6, 83) = 4.48$, $p < .001$, multivariate $\eta^2 = .244$. Figure Tima 2.10 presents the mean visit counts by AOI.

Figure Tima 2.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 88) = 8.47$, $p = .005$, partial $\eta^2 = .088$, and $F(1, 88) = 6.67$, $p = .011$, partial $\eta^2 = .070$.

Visit counts in all but one AOI were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 7.87$, $p = .006$, partial $\eta^2 = .082$; AOI 2, $F(1, 88) = 18.20$, $p < .001$, partial $\eta^2 = .171$; AOI 3, $F(1, 88) = 10.71$, $p = .002$, partial $\eta^2 = .109$).

Visit count in AOI 4 was not significantly different, $p = .065$, *ns*. Table Tima 2.7 presents the means and standard deviations for areas of interest by participant type.

Table Tima 2.7

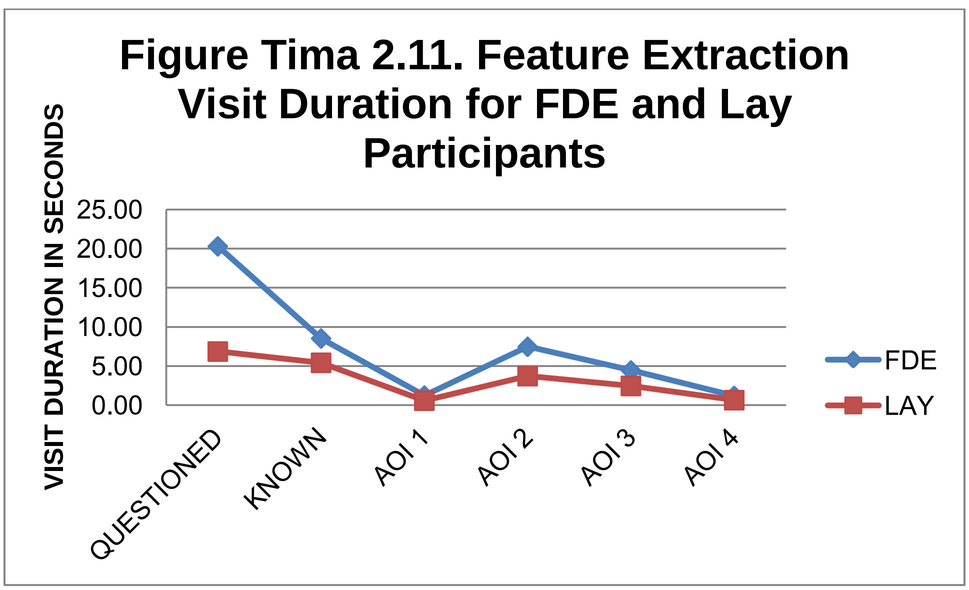
Feature Extraction Analysis Visit Count for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	9.53	6.61	8.28	6.31	1.23	1.27
Lay	6.05	4.43	5.30	4.34	0.58	0.88
	AOI 2		**AOI 3**		**AOI 4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	7.47	5.12	4.45	3.48	1.19	1.62
Lay	3.72	2.75	2.47	1.99	0.65	1.02

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .410, $F(6, 83) = 9.63$, $p < .001$, multivariate $\eta^2 = .410$. Figure Tima 2.11 presents the mean visit durations by AOI.

Figure Tima 2.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 88) = 38.82$, $p < .001$, partial $\eta^2 = .306$, and $F(1, 88) = 4.67$, $p = .033$, partial $\eta^2 = .050$.

Visit durations in all but one AOI were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 7.87$, $p = .006$, partial $\eta^2 = .082$; AOI 2, $F(1, 88) = 18.20$, $p < .001$, partial $\eta^2 = .171$; AOI 3, $F(1, 88) = 10.71$, $p = .002$, partial $\eta^2 = .109$).

No significant difference was found for AOI 4, $p = .065$, *ns*. Table Tima 2.8 presents the means and standard deviations for areas of interest by participant type.

Table Tima 2.8

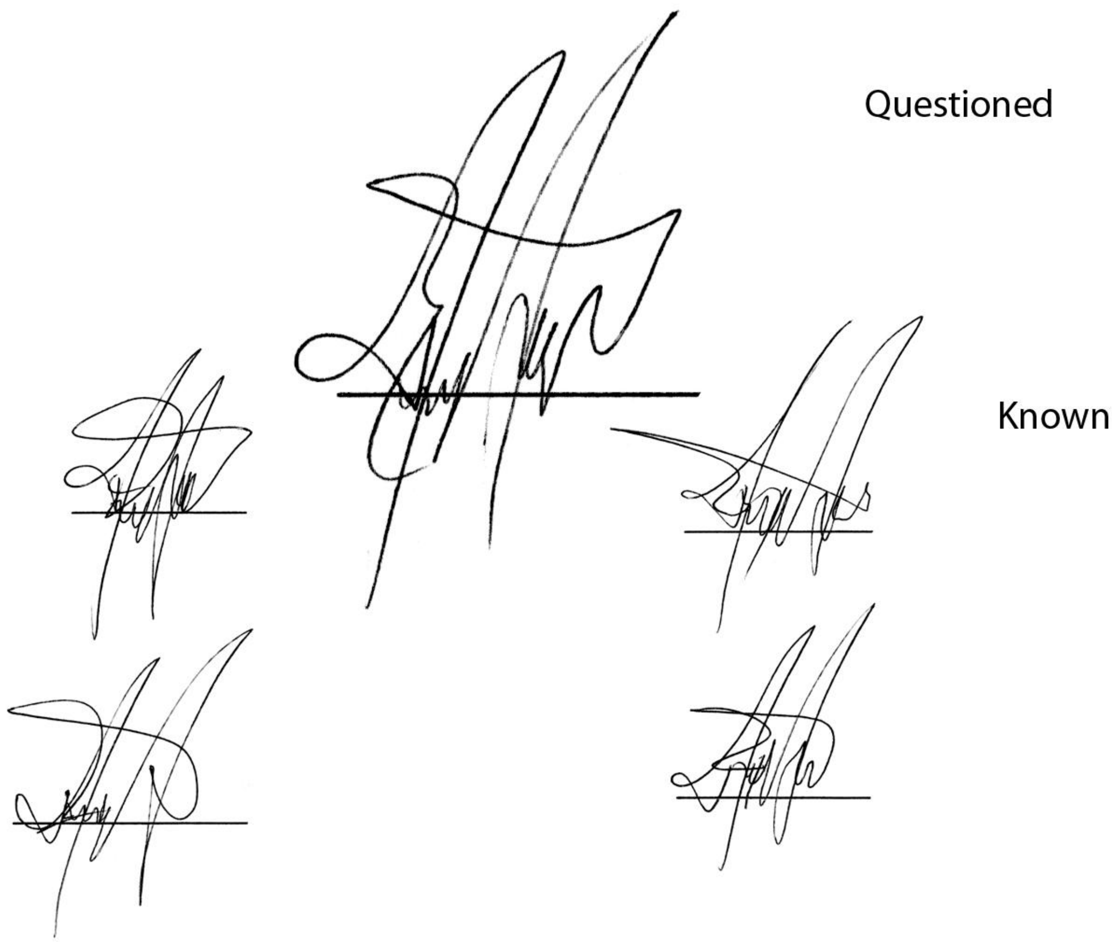
Feature Extraction Analysis Visit Duration for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	20.30	13.08	8.52	7.93	1.23	1.27
Lay	6.86	5.60	5.42	5.29	0.58	0.88
	AOI 2		**AOI 3**		**AOI 4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	7.47	5.12	4.45	3.48	1.19	1.62
Lay	3.72	2.75	2.47	1.99	0.65	1.02

Tima Signature 3: Genuine

Of the 49 FDE participants, 38 responded correctly that the signature was genuine, and 10 responded that it was non-genuine. One FDE declined to respond. Of the 43 Lay participants, 42 responded correctly that the signature was genuine, and 1 responded that the signature was non-genuine. This difference was statistically significant, χ^2 (2, N = 92) = 8.21, p = .017. Figure Tima 3.1 presents the comparison view of this signature.

Figure Tima 3.1. Questioned-Known Comparison Stimulus for Tima Signature 3.

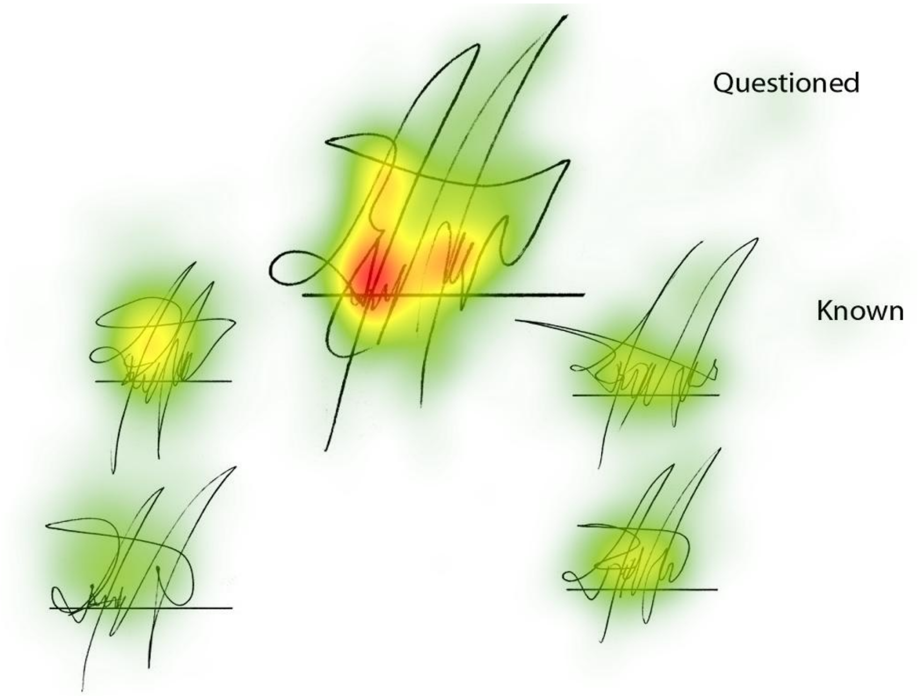


Selection of Areas of Interest (AOIs)

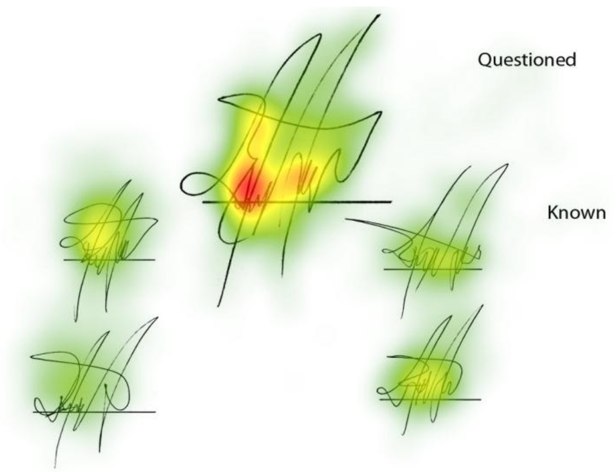
Figure Tima 3.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were three locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of three AOIs for this stimulus. Figure Tima 3.3 presents the location of the AOIs identified in the heat map.

Figure Tima 3.2. Heat map for Tima signature 3, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

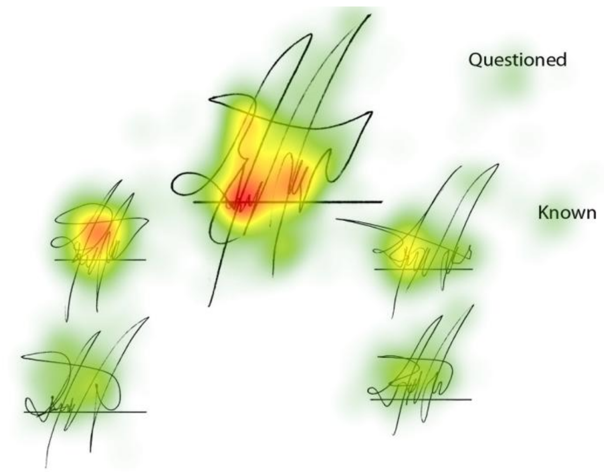
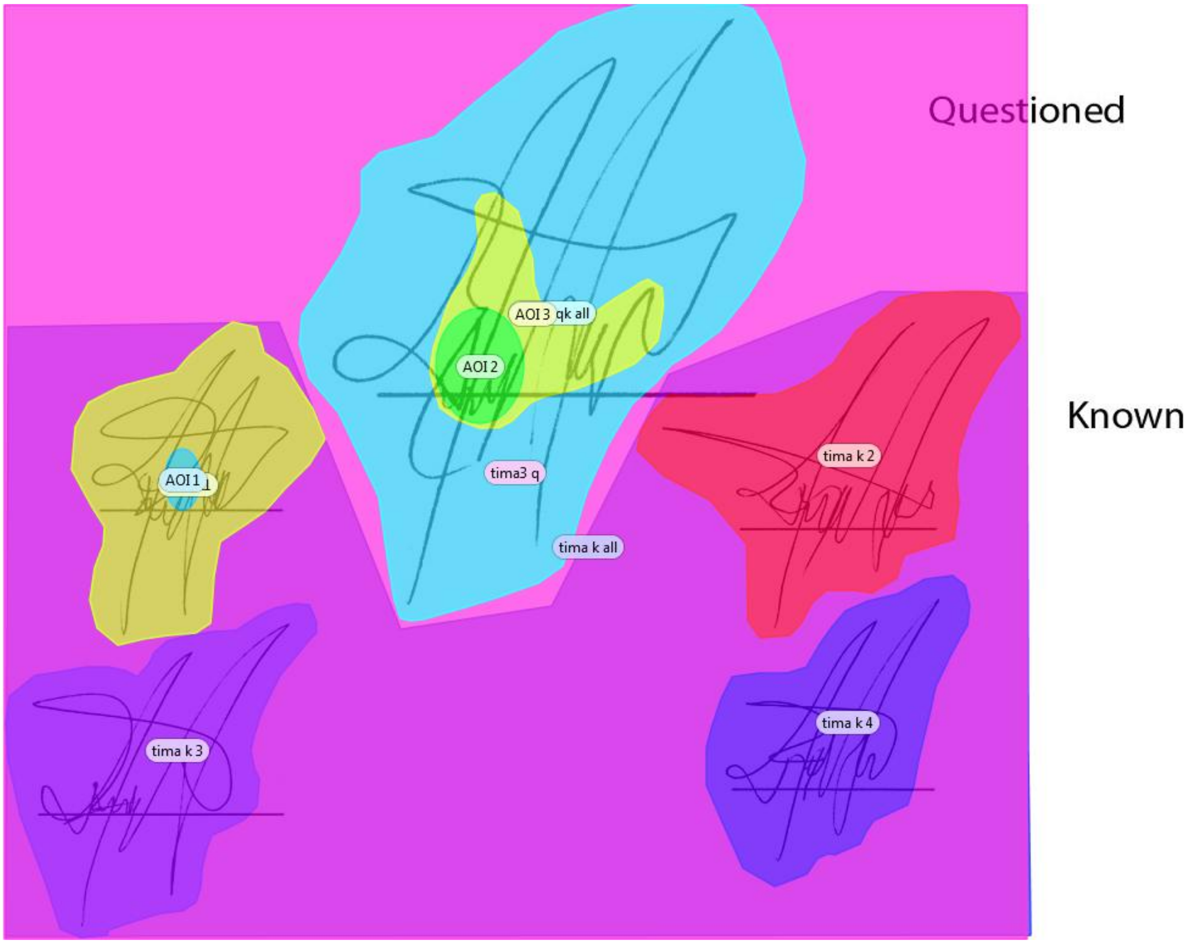


Figure Tima 3.3. Areas of Interest (AOIs) for Tima Signature 3.



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

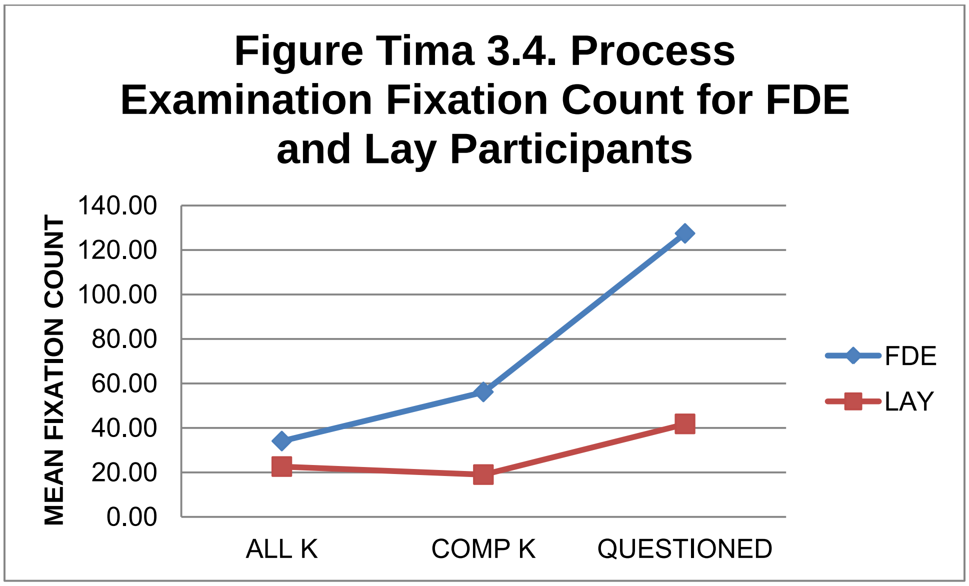
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Tima known signature stimulus (Knowns, not pictured here), Tima 1 K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Tima 3Q (the Tima questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 3) are included in subsequent analyses.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .316, $F(3, 86) = 13.62$, $p < .001$, multivariate $\eta^2 = .316$. Figure Tima 3.4 presents the mean fixation counts by AOI.

Figure Tima 3.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in two of the three areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, $F(1, 88) = 36.99$, $p > .001$, partial $\eta^2 = .296$; $F(1, 88) = 26.20$, $p < .001$, partial $\eta^2 = .229$).

Fixation count in the known signature stimulus (ALL K) was not statistically significant, $p = .105$, *ns*. Table Tima 3.1 presents the means and standard deviations for areas of interest by participant type.

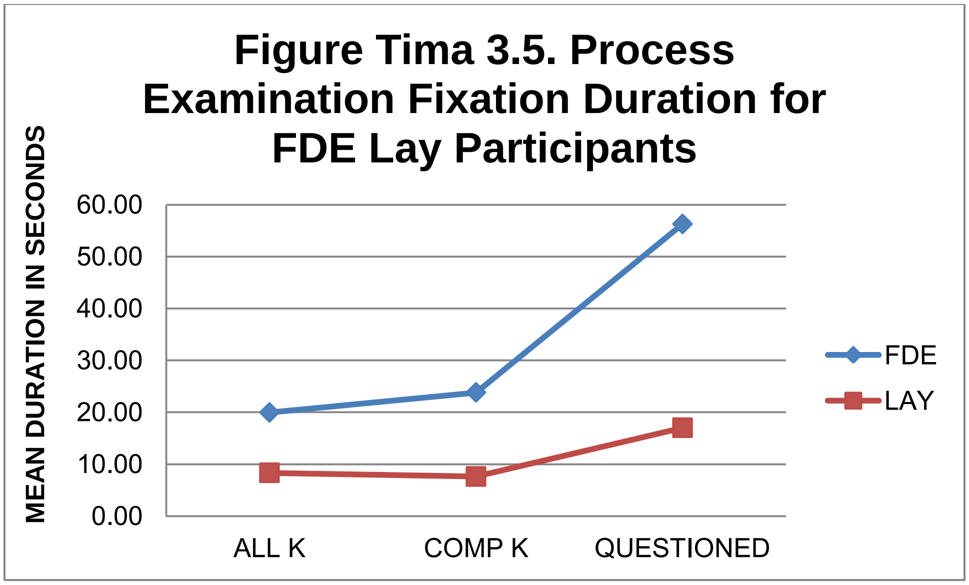
Table Tima 3.1
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	34.02	42.86	56.11	45.17	127.40	88.22
Lay	22.56	17.26	18.95	15.62	41.74	28.46

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .369, $F(3, 86) = 16.74$, $p < .001$, multivariate $\eta^2 = .369$. Figure Tima 3.5 presents the mean fixation duration by AOI.

Figure Tima 3.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation durations for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, $F(1, 88) = 41.30$, $p > .001$, partial $\eta^2 = .319$); $F(1, 88) = 29.89$, $p < .001$, partial $\eta^2 = .254$).

Fixation duration in the known signature stimulus (ALL K) was also statistically significant, $F(1, 88) = 4.76$, $p = .032$, partial $\eta^2 = .051$. Table Tima 3.2 presents the means and standard deviations for areas of interest by participant type.

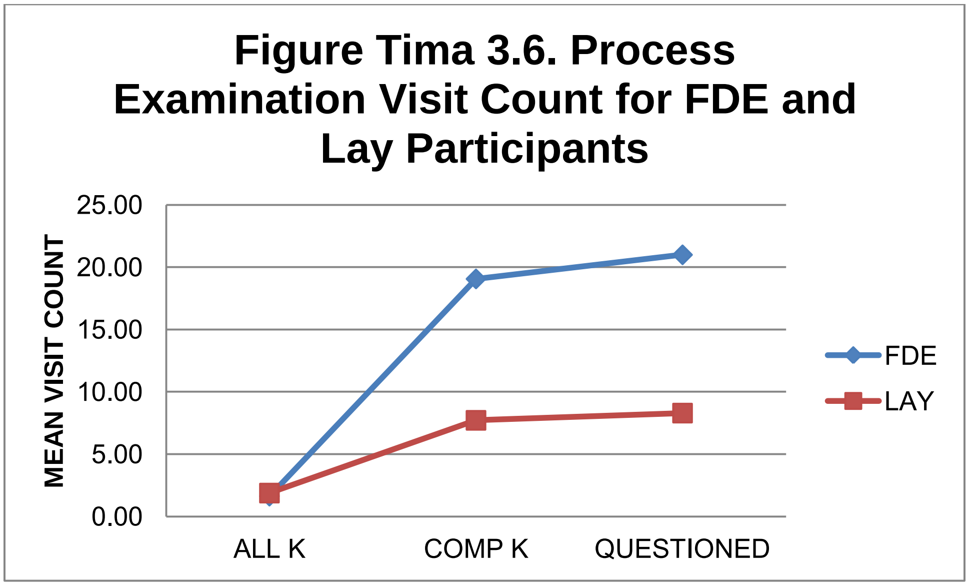
Table Tima 3.2
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	19.95	34.48	23.81	18.28	56.27	37.65
Lay	8.32	5.77	7.61	6.89	17.00	14.30

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .339, $F(3, 86) = 13.89$, $p < .001$, multivariate $\eta^2 = .339$. Figure Tima 3.6 presents the mean visit counts by AOI.

Figure Tima 3.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in two of the three areas of interest. Total visit counts for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, $F(1, 88) = 38.74$, $p < .001$, partial $\eta^2 = .306$); $F(1, 88) = 33.91$, $p < .001$, partial $\eta^2 = .278$).

Visit count in the known signature stimulus (ALL K) was not statistically significant, $p = .281$, *ns*. Table Tima 3.3 presents the means and standard deviations for areas of interest by participant type.

Table Tima 3.3

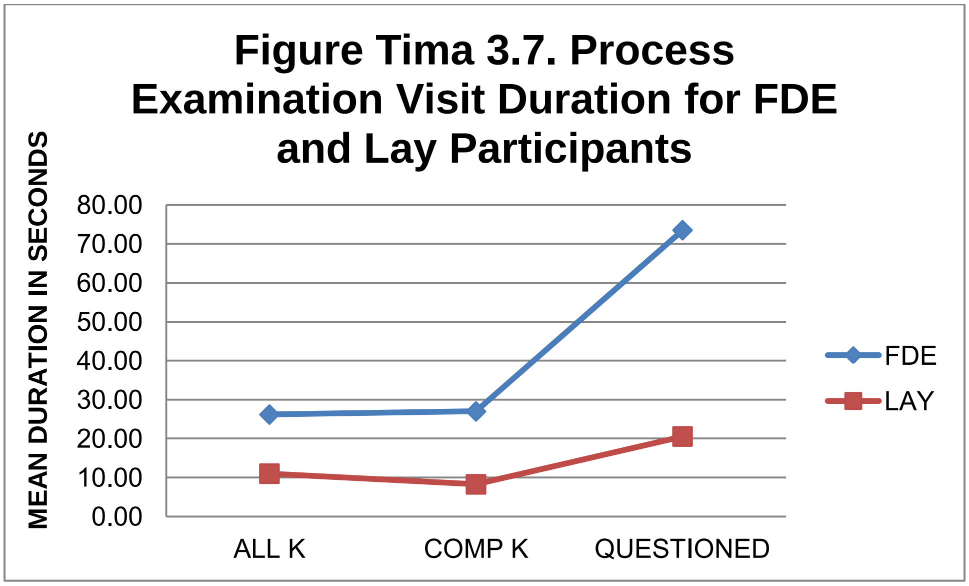
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.64	0.97	19.06	11.78	21.00	12.32
Lay	1.88	1.18	7.72	5.15	8.30	5.44

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .342, $F(3, 86) = 14.88$, $p < .001$, multivariate $\eta^2 = .342$. Figure Tima 3.7 presents the mean visit durations by AOI.

Figure Tima 3.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all of the three areas of interest. Total visit durations for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, $F(1, 88) = 45.34$, $p > .001$, partial $\eta^2 = .340$); $F(1, 88) = 33.11$, $p < .001$, partial $\eta^2 = .273$).

Visit duration in the known signature stimulus (ALL K) was also statistically significant, $F(1, 88) = 5.25$, $p = .024$, partial $\eta^2 = .056$. Table Tima 3.4 presents the means and standard deviations for areas of interest by participant type.

Table Tima 3.4

Process Analysis Visit Duration for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	26.18	42.60	26.99	20.19	73.51	49.53
Lay	11.01	8.40	8.28	7.12	20.56	14.94

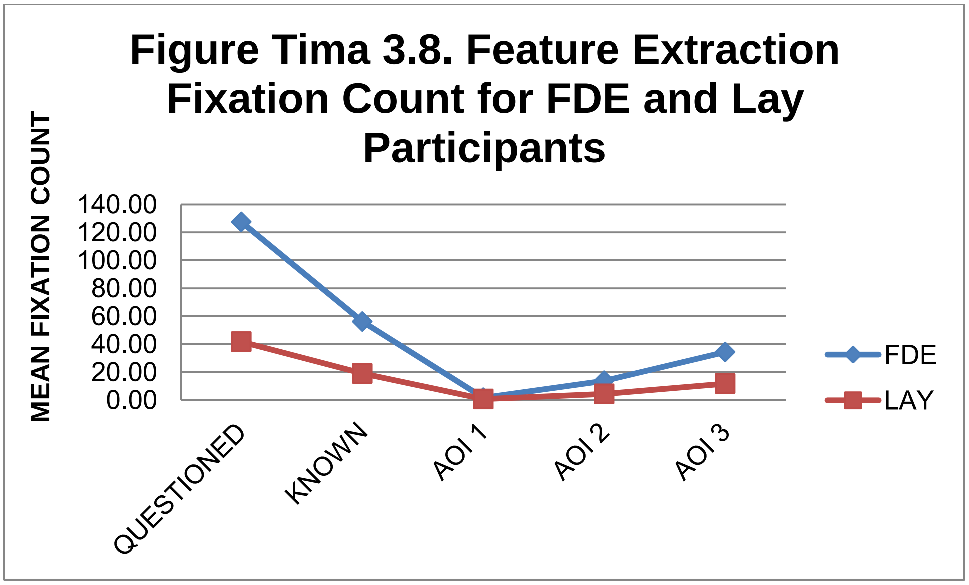
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .325, $F(5, 84) = 8.10$, $p < .001$, multivariate $\eta^2 = .325$. Figure Tima 3.8 presents the mean fixation counts by AOI.

Figure Tima 3.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all but one area of interest. Total fixation count for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 88) = 36.99$, $p < .001$, partial $\eta^2 = .296$, and $F(1, 88) = 26.20$, $p < .001$, partial $\eta^2 = .229$.

Fixation counts in three of the four AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 9.06$, $p = .003$, partial $\eta^2 = .094$; AOI 2, $F(1, 88) = 29.10$, $p < .001$, partial $\eta^2 = .248$; AOI 3, $F(1, 88) = 31.83$, $p < .001$, partial $\eta^2 = .266$). Table Tima 3.5 presents the means and standard deviations for areas of interest by participant type.

Table Tima 3.5
Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

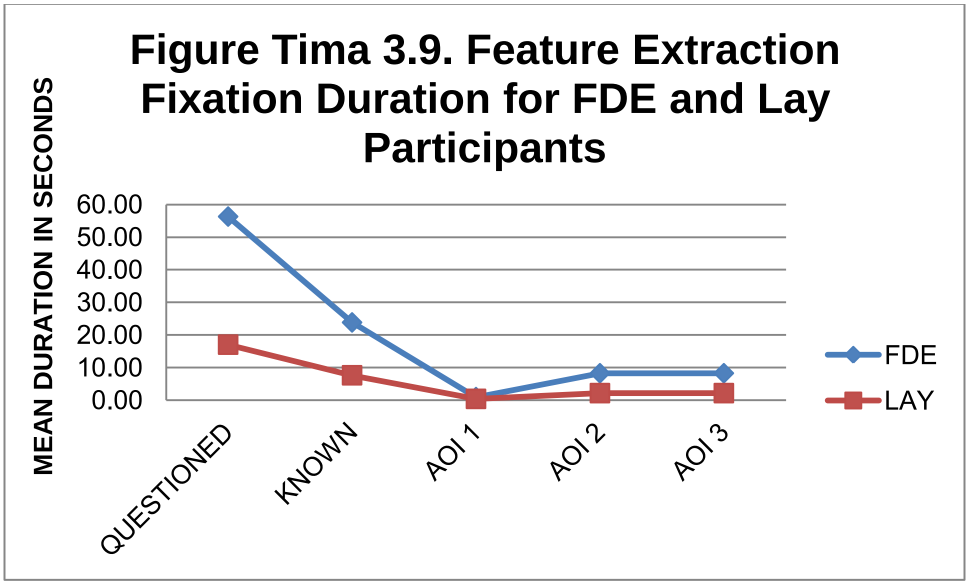
	QUESTIONED		KNOWN		AOI 1		AOI 2		AOI 3	
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*

FDE	127.40	88.22	56.11	45.17	1.64	1.81	13.79	10.81	34.34	24.97
Lay	41.74	28.46	18.95	15.62	0.72	0.85	4.37	3.92	11.77	8.38

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .375, $F(5, 84) = 9.62$, $p < .001$, multivariate $\eta^2 = .375$. Figure Tima 3.9 presents the mean fixation durations by AOI.

Figure Tima 3.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all but one area of interest. Fixation duration for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 88) = 41.30$, $p < .001$, partial $\eta^2 = .319$, and $F(1, 88) = 29.89$, $p < .001$, partial $\eta^2 = .254$.

Fixation durations in three of the four AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 8.18$, $p = .005$, partial $\eta^2 = .085$; AOI 2, $F(1, 88) = 28.69$, $p < .001$, partial $\eta^2 = .246$; AOI 3, $F(1, 88) = 36.94$, $p < .001$, partial $\eta^2 = .296$). Table Tima 3.6 presents the means and standard deviations for areas of interest by participant type.

Table Tima 3.6

Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

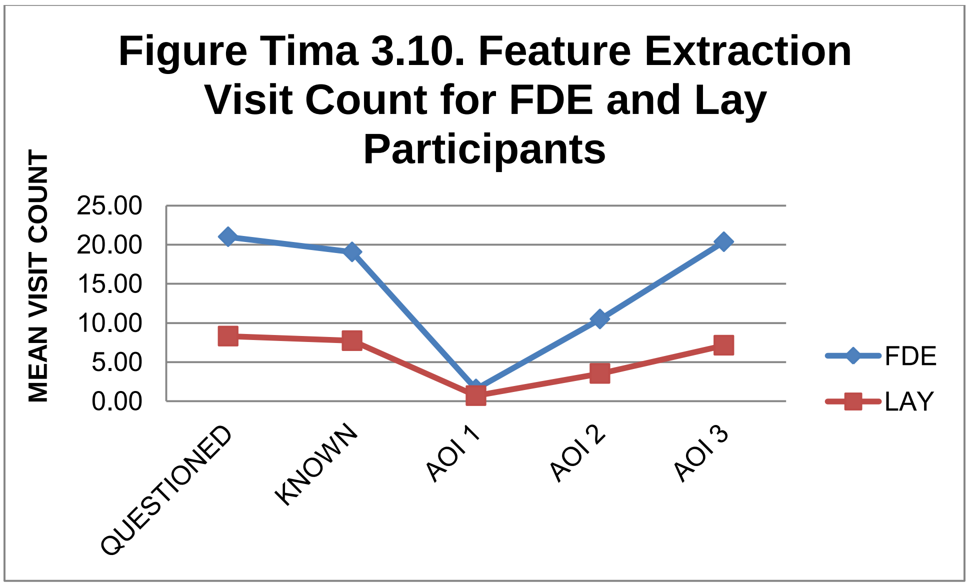
	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**		**AOI 3**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***

FDE	56.27	37.65	23.81	18.28	0.93	1.19	8.24	7.00	8.24	7.00
Lay	17.00	14.30	7.61	6.89	0.37	0.47	2.13	2.73	2.13	2.73

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .336, $F(5, 84) = 8.51$, $p < .001$, multivariate $\eta^2 = .336$. Figure Tima 3.10 presents the mean visit counts by AOI.

Figure Tima 3.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit counts for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 88) = 38.74$, $p < .001$, partial $\eta^2 = .278$, and $F(1, 88) = 33.91$, $p < .001$, partial $\eta^2 = .278$.

Visit counts in all but one AOI were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 8.89$, $p = .004$, partial $\eta^2 = .092$; AOI 2, $F(1, 88) = 30.43$, $p < .001$, partial $\eta^2 = .257$; AOI 3, $F(1, 88) = 36.82$, $p < .001$, partial $\eta^2 = .295$). Table Tima 3.7 presents the means and standard deviations for areas of interest by participant type.

Table Tima 3.7

Feature Extraction Analysis Visit Count for FDE and Lay Participants

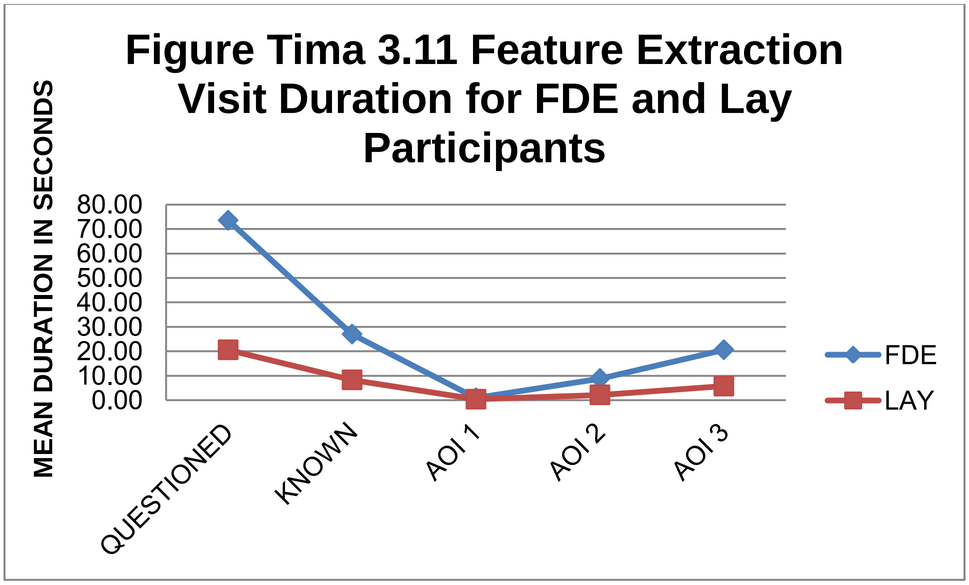
	QUESTIONED		KNOWN		AOI 1		AOI 2		AOI 3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***

FDE	21.00	12.32	19.06	11.78	1.55	1.72	10.49	7.79	20.36	13.50
Lay	8.30	5.44	7.72	5.15	0.70	0.80	3.53	2.89	7.14	4.89

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .372, $F(5, 84) = 9.96$, $p < .001$, multivariate $\eta^2 = .372$. Figure Tima 3.11 presents the mean visit durations by AOI.

Figure Tima 3.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit durations for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 88) = 45.34$, $p < .001$, partial $\eta^2 = .340$, and $F(1, 88) = 33.11$, $p < .001$, partial $\eta^2 = .273$.

Visit durations in all AOI were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 8.11$, $p = .005$, partial $\eta^2 = .084$; AOI 2, $F(1, 88) = 29.88$, $p < .001$, partial $\eta^2 = .253$; AOI 3, $F(1, 88) = 40.40$, $p < .002$, partial $\eta^2 = .315$). Table Tima 3.8 presents the means and standard deviations for areas of interest by participant type.

Table Tima 3.8

Feature Extraction Analysis Visit Duration for FDE and Lay Participants

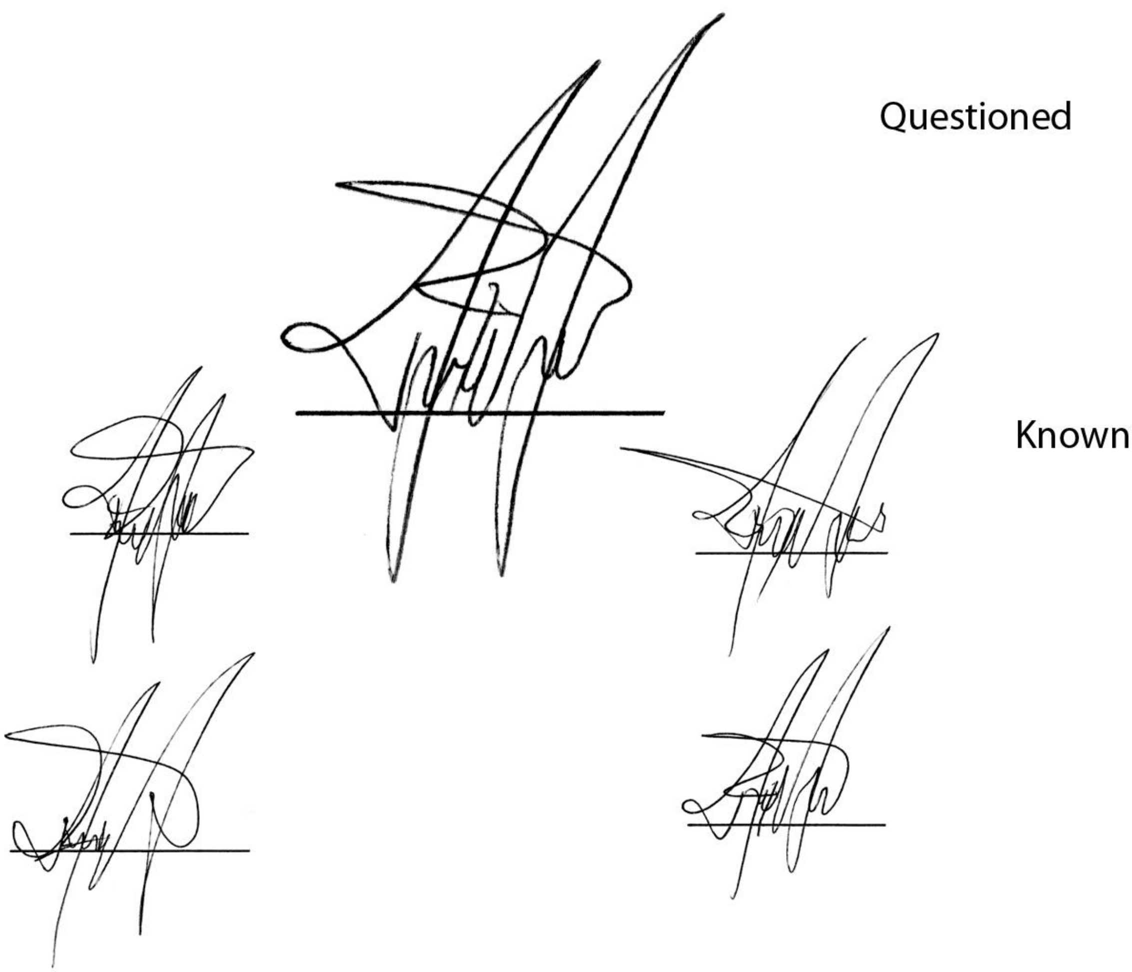
	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**		**AOI 3**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***

FDE	73.51	49.53	26.99	20.19	0.94	1.21	8.84	7.58	20.60	14.38
Lay	20.56	14.94	8.28	7.12	0.38	0.48	2.15	2.74	5.71	5.61

Tima Signature 4: Genuine

Of the 49 FDE participants, 39 responded correctly that the signature was genuine, and 9 responded that it was non-genuine. One FDE declined to respond. Of the 43 Lay participants, 42 responded correctly that the signature was genuine, and 1 responded that the signature was non-genuine. This difference was statistically significant, χ^2 (2, N = 92) = 7.15, *p* = .028. Figure Tima 4.1 presents the comparison view of this signature.

Figure Tima 4. Questioned-Known Comparison Stimulus for Tima Signature 4.

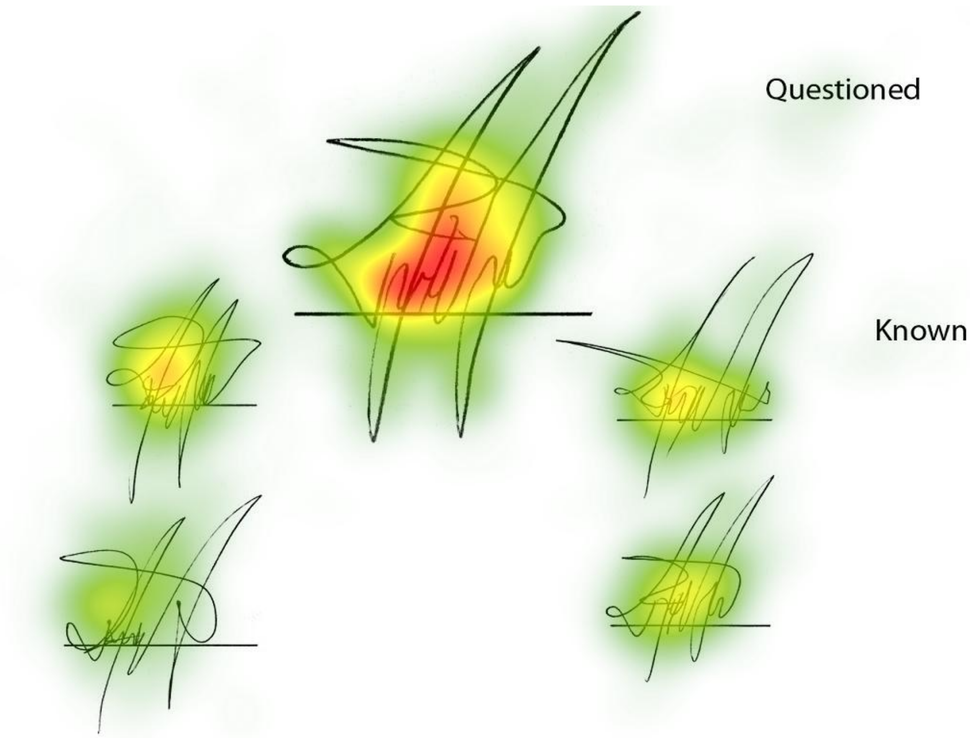


Selection of Areas of Interest (AOIs)

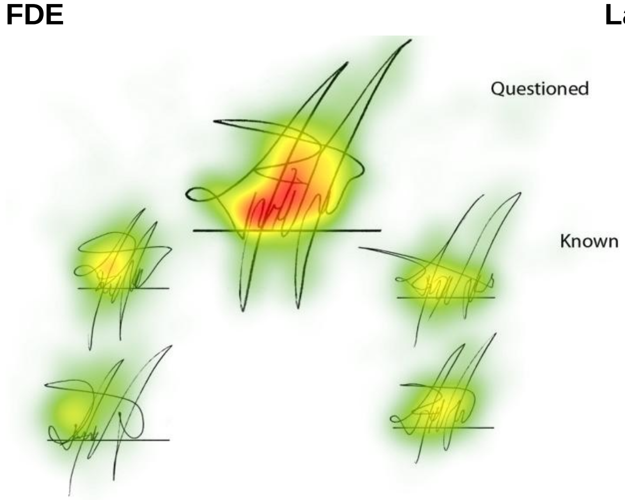
Figure Tima 4.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were four locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of four AOIs for this stimulus. Figure Tima 4.3 presents the location of the AOIs identified in the heat map.

Figure Tima 4.2. Heat map for Tima signature 4, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

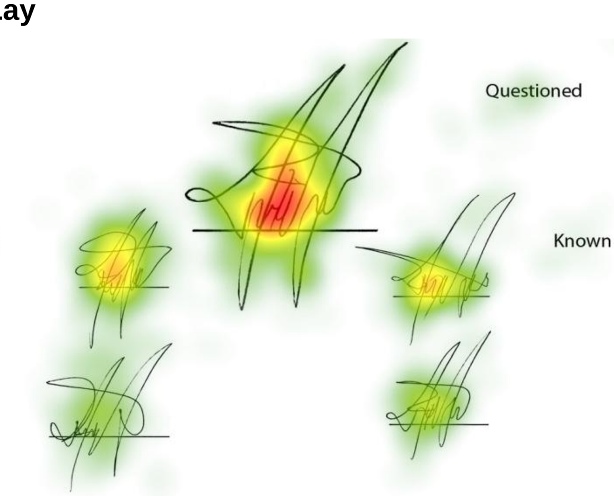
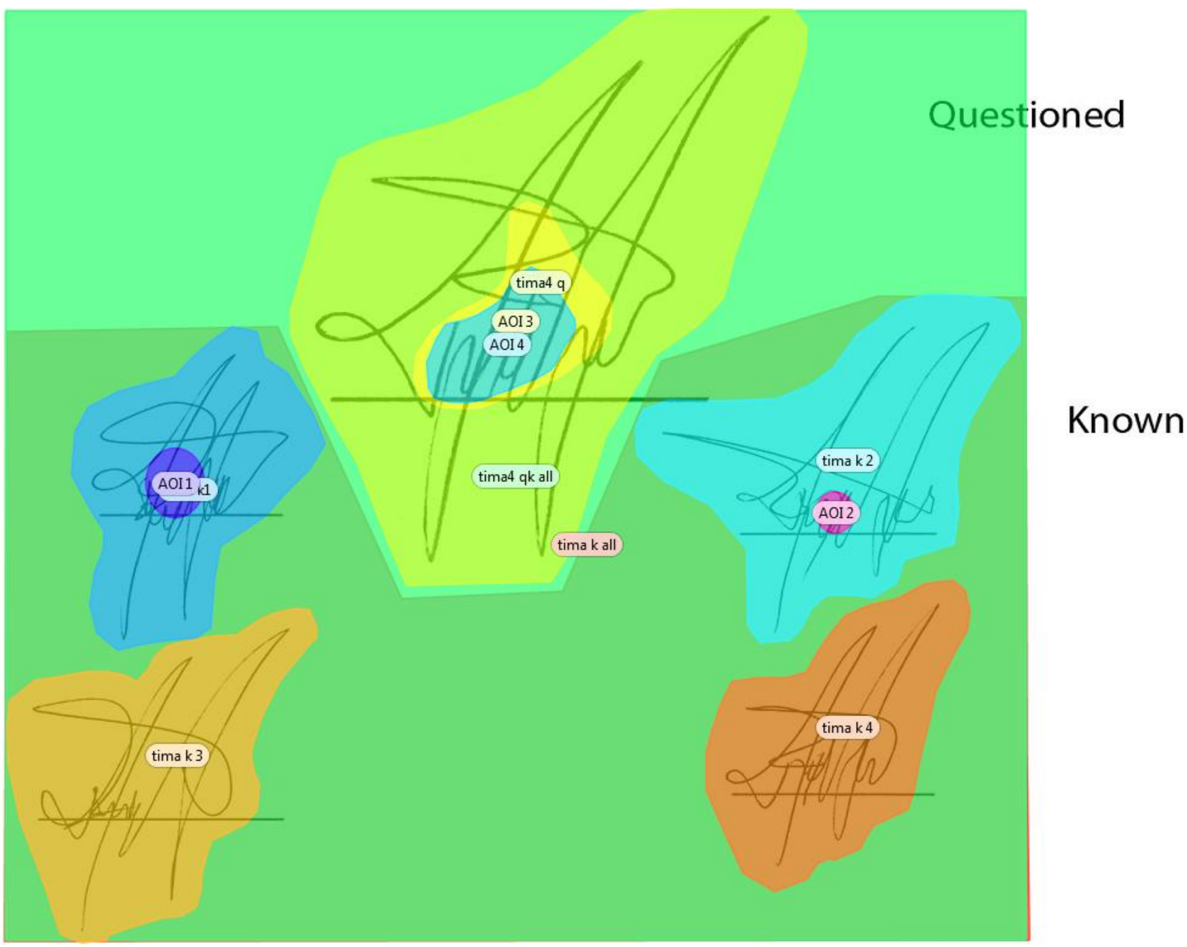


Figure Tima 4.3. Areas of Interest (AOIs) for Tima Signature 4.



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

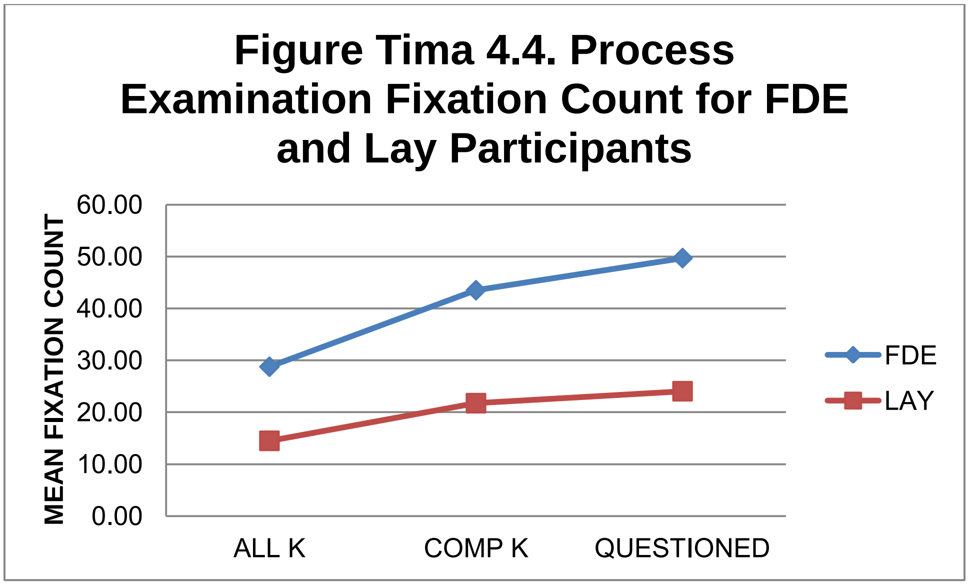
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Tima known signature stimulus (Knowns, not pictured here), Tima 1 K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Tima 4Q (the Tima questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 3) are included in subsequent analyses.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .188, $F(3, 86) = 6.62$, $p < .001$, multivariate $\eta^2 = .188$. Figure Tima 4.4 presents the mean fixation counts by AOI.

Figure Tima 4.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in two of the three areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, $F(1, 88) = 14.19$, $p > .001$, partial $\eta^2 = .139$; $F(1, 88) = 8.16$, $p = .005$, partial $\eta^2 = .085$).

Fixation count in the known signature stimulus (ALL K) was not statistically significant, $p = .008$, *ns*. Table Tima 4.1 presents the means and standard deviations for areas of interest by participant type.

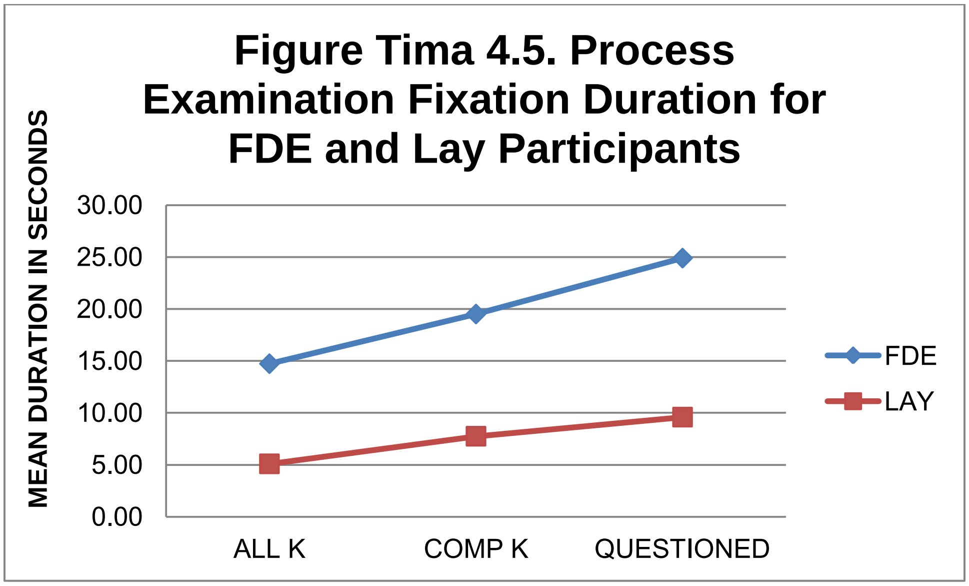
Table Tima 4.1
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	28.77	32.37	43.51	37.52	49.70	31.67
Lay	14.49	13.11	21.74	34.49	24.05	32.92

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .245, $F(3, 86) = 9.32$, $p < .001$, multivariate $\eta^2 = .245$. Figure Tima 4.5 presents the mean fixation duration by AOI.

Figure Tima 4.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, $F(1, 88) = 22.60$, $p > .001$, partial $\eta^2 = .204$); $F(1, 88) = 13.77$, $p < .001$, partial $\eta^2 = .135$).

Fixation duration in the known signature stimulus (ALL K) was also statistically significant, $F(1, 88) = 8.97$, $p = .004$, partial $\eta^2 = .092$. Table Tima 4.2 presents the means and standard deviations for areas of interest by participant type.

Table Tima 4.2

Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	14.73	20.63	19.50	17.53	24.89	17.40
Lay	5.08	4.64	7.74	11.66	9.58	12.48

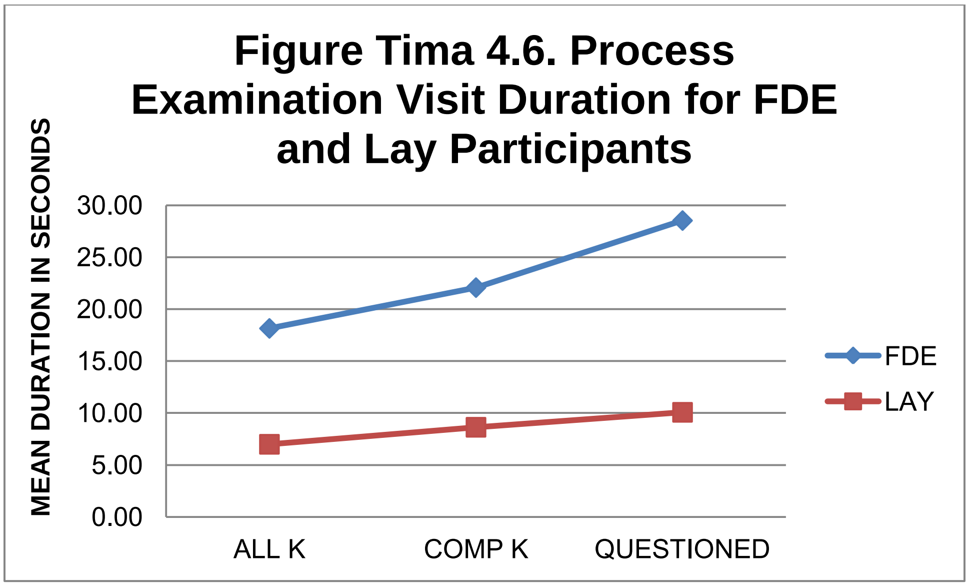
Total Visit Count

MANOVA results revealed no significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .074, $F(3, 86) = 2.28$, $p = .085$, multivariate $\eta^2 = .074$, *ns*. No subsequent analyses were conducted for visit count because the overall model was not statistically significant.

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .304, $F(3, 86) = 12.52$, $p < .001$, multivariate $\eta^2 = .304$. Figure Tima 4.6 presents the mean visit durations by AOI.

Figure Tima 4.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit duration in all areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, $F(1, 88) = 32.94$, $p > .001$, partial $\eta^2 = .272$); $F(1, 88) = 15.44$, $p < .001$, partial $\eta^2 = .149$.

Visit duration in the known signature stimulus (ALL K) was also statistically significant, $F(1, 88) = 8.03$, $p = .006$, partial $\eta^2 = .082$. Table Tima 4.3 presents the means and standard deviations for areas of interest by participant type.

Table Tima 4.3

Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns	Comp Knowns	Questioned

Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	18.14	24.84	22.07	18.48	28.53	16.95
Lay	6.99	7.32	8.63	13.30	10.07	13.12

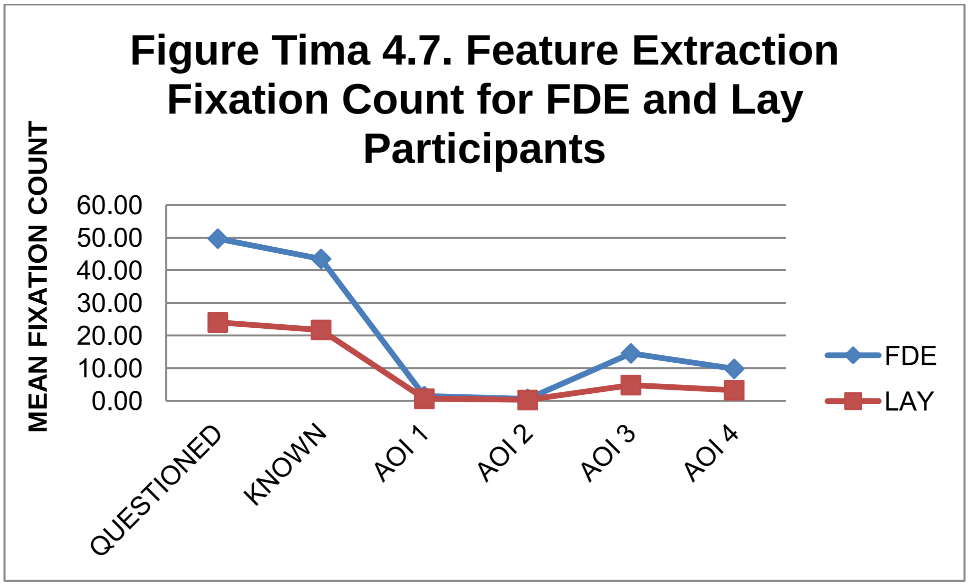
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .236, *F*(6, 83) = 4.27, p = .001, multivariate η^2 = .236. Figure Tima 4.7 presents the mean fixation counts by AOI.

Figure Tima 4.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all but one area of interest. Total fixation count for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, *F*(1, 88) = 4.19, p < .001, partial η^2 = .39, and F(1, 88) = 8.16, p < .005, partial η^2 = .085.

Fixation count in three of the four AOIs were significantly greater for FDEs than for Lay participants (AOI 1, *F*(1, 88) = 5.28, p = .024, partial η^2 = .057; AOI 3, *F*(1, 88) = 24.18, p < .001, partial η^2 = .216; AOI 4, *F*(1, 88) = 20.59, p < .001, partial η^2 = .190).

No significant difference was found in AOI 2, $p = .135$, *ns*. Table Tima 4.4 presents the means and standard deviations for areas of interest by participant type.

Table Tima 4.4

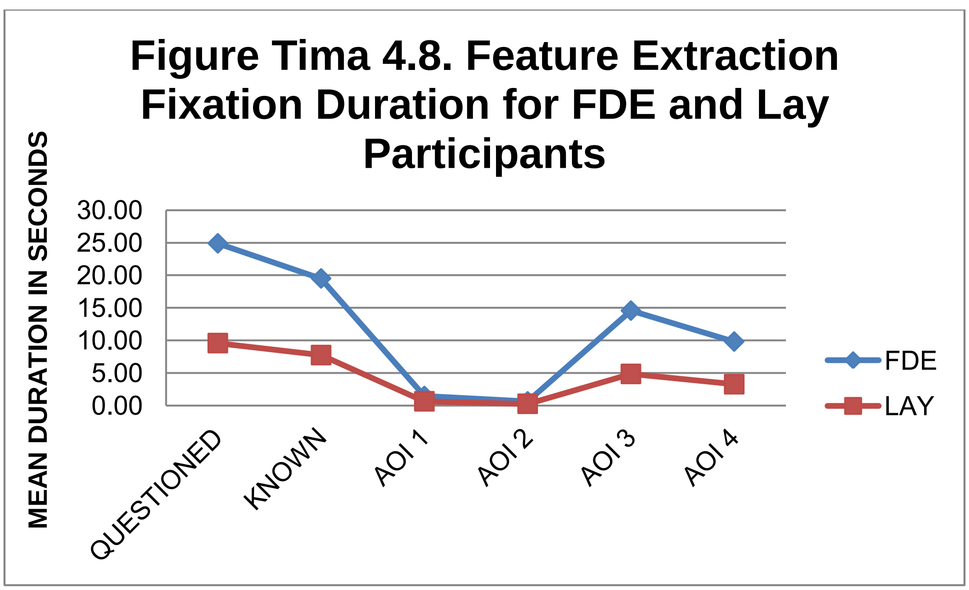
Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	49.70	31.67	43.51	37.52	1.47	2.00
Lay	24.05	32.92	21.74	34.49	0.66	1.25
	AOI 2		**AOI 3**		**AOI 4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	0.64	1.41	14.57	12.03	9.82	8.81
Lay	0.27	0.72	4.85	5.02	3.28	3.60

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .238, $F(6, 83) = 4.33$, $p < .001$, multivariate $\eta^2 = .238$. Figure Tima 4.8 presents the mean fixation durations by AOI.

Figure Tima 4.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all but one area of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 88) = 22.60$, $p < .001$, partial $\eta^2 = .204$, and $F(1, 88) = 13.77$, $p < .001$, partial $\eta^2 = .135$.

Fixation duration in three of the four AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 5.28$, $p = .024$, partial $\eta^2 = .057$; AOI 3, $F(1, 88) = 24.18$, $p < .001$, partial $\eta^2 = .216$; AOI 4, $F(1, 88) = 20.59$, $p < .001$, partial $\eta^2 = .190$).

No significant difference was found in AOI 2, $p = .135$, *ns*. Table Tima 4.5 presents the means and standard deviations for areas of interest by participant type.

Table Tima 4.5

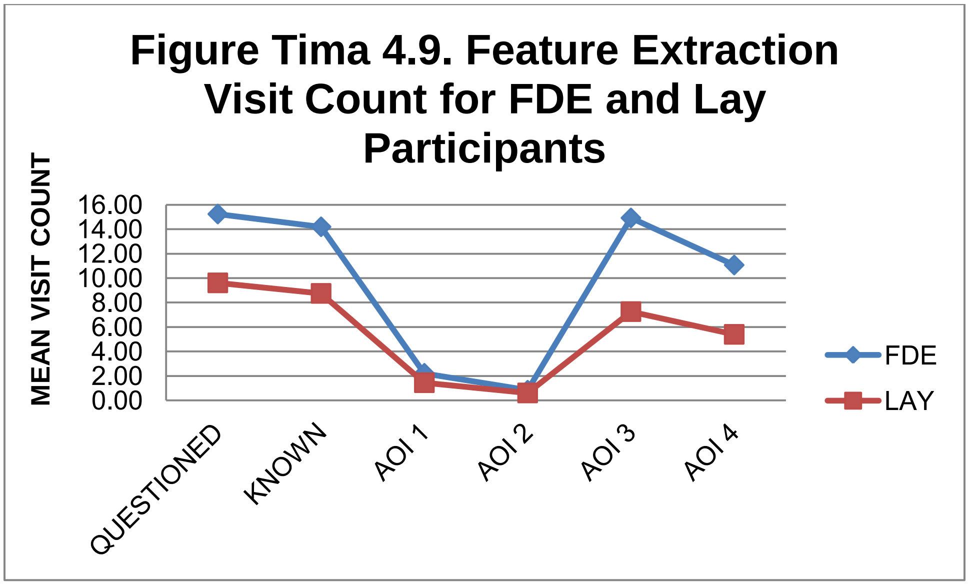
Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	24.89	17.40	19.50	17.53	1.47	2.00
Lay	9.58	12.48	7.74	11.66	0.66	1.25
	AOI 2		**AOI 3**		**AOI 4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	0.64	1.41	14.57	12.03	9.82	8.81
Lay	0.27	0.72	4.85	5.02	3.28	3.60

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .221, $F(6, 83) = 3.93$, $p = .002$, multivariate $\eta^2 = .221$. Figure Tima 4.9 presents the mean fixation counts by AOI.

Figure Tima 4.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all but two areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 88) = 6.72$, $p = .011$, partial $\eta^2 = .071$, and $F(1, 88) = 6.63$, $p = .012$, partial $\eta^2 = .070$.

Visit counts in all but two AOI were significantly greater for FDEs than for Lay participants (AOI 3, $F(1, 88) = 15.69$, $p < .001$, partial $\eta^2 = .151$; AOI 3, $F(1, 88) = 12.97$, $p = .001$, partial $\eta^2 = .128$).

No significant differences were found in AOI 1 ($p = .098$, *ns*) or AOI 2 ($p = .451$, *ns*). Table Tima 4.6 presents the means and standard deviations for areas of interest by participant type.

Table Tima 4.6

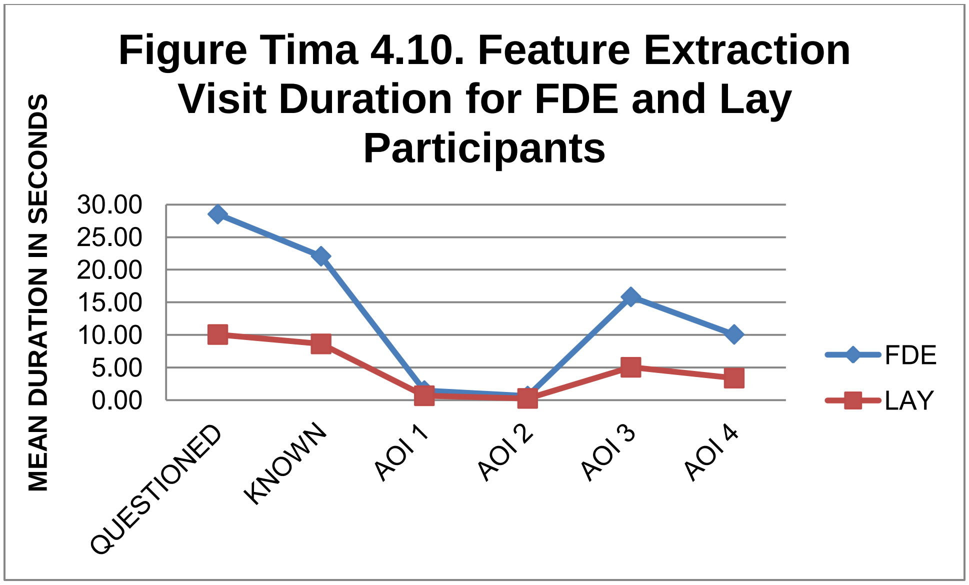
Feature Extraction Analysis Visit Count for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	15.23	8.98	14.19	8.64	2.21	2.52
Lay	9.60	11.56	8.74	11.35	1.44	1.75
	AOI 2		**AOI 3**		**AOI 4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	0.83	1.46	14.91	10.37	11.06	8.15
Lay	0.60	1.35	7.26	7.63	5.40	6.61

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .221, $F(6, 83) = 3.93$, $p = .002$, multivariate $\eta^2 = .221$. Figure Tima 4.10 presents the mean visit durations by AOI.

Figure Tima 4.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit duration in all but two areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 88) = 32.94$, $p < .001$, partial $\eta^2 = .272$, and $F(1, 88) = 15.44$, $p < .001$, partial $\eta^2 = .149$.

Visit duration in all but one AOI was significantly greater for FDEs than for Lay participants (AOI 1 ($F(1, 88) = 4.78$, $p = .031$, partial $\eta^2 = .052$; AOI 3, $F(1, 88) = 28.36$, $p < .001$, partial $\eta^2 = .244$; AOI 4, $F(1, 88) = 20.92$, $p < .001$, partial $\eta^2 = .192$).

No significant differences were found in AOI 2 ($p = .135$, *ns*). Table Tima 4.7 presents the means and standard deviations for areas of interest by participant type.

Table Tima 4.7

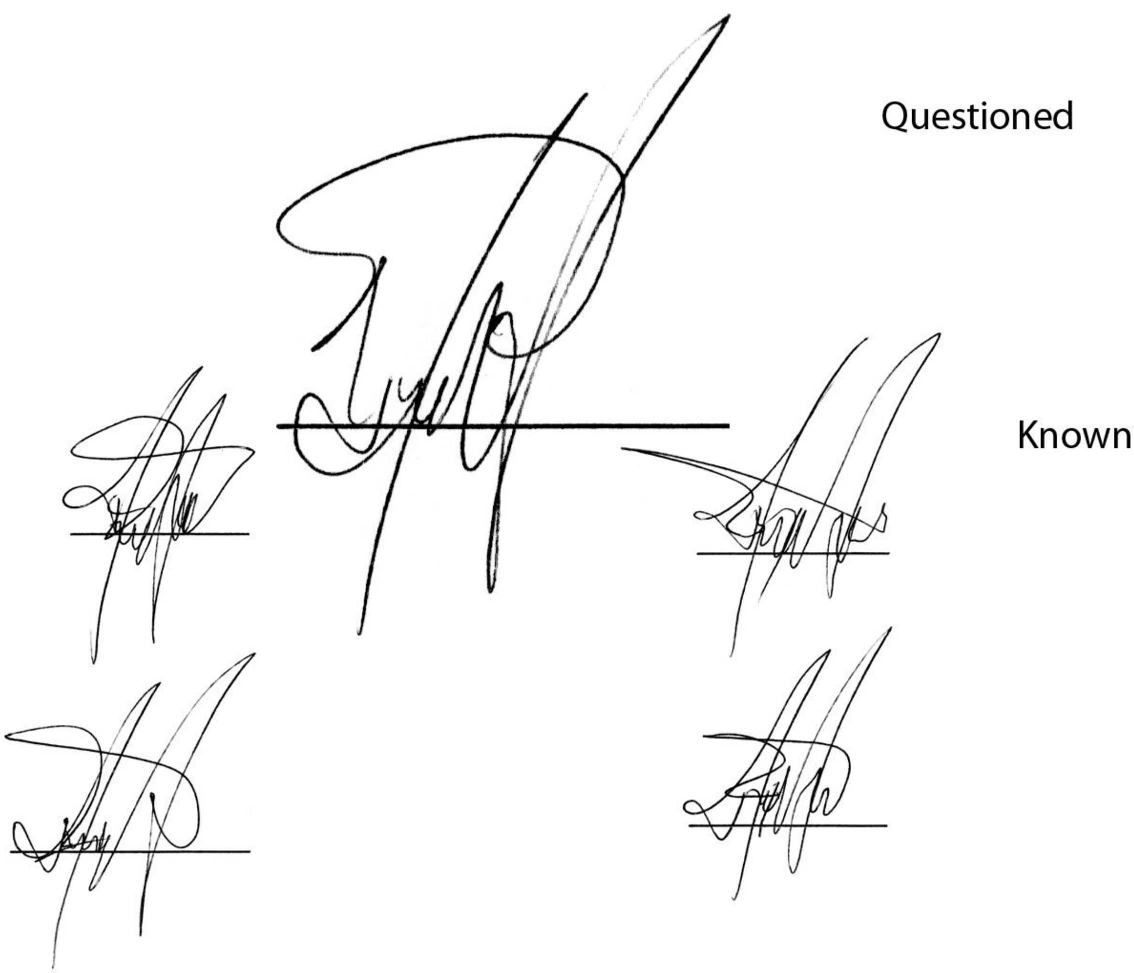
Feature Extraction Analysis Visit Duration for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	28.53	16.95	22.07	18.48	1.48	2.01
Lay	10.07	13.12	8.63	13.30	0.68	1.35
	AOI 2		**AOI 3**		**AOI 4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	0.64	1.41	15.84	12.28	10.08	8.91
Lay	0.27	0.72	5.05	5.32	3.38	3.75

Tima Signature 5: Genuine

Of the 49 FDE participants, 13 responded correctly that the signature was genuine, and 35 responded that it was non-genuine. One FDE declined to respond. Of the 43 Lay participants, 41 responded correctly that the signature was genuine, and 2 responded that the signature was non-genuine. This difference was statistically significant, χ^2 (2, N = 92) = 44.75, p < .001. Figure Tima 5.1 presents the comparison view of this signature.

Figure Tima 5.1. Questioned-Known Comparison Stimulus for Tima Signature 5.

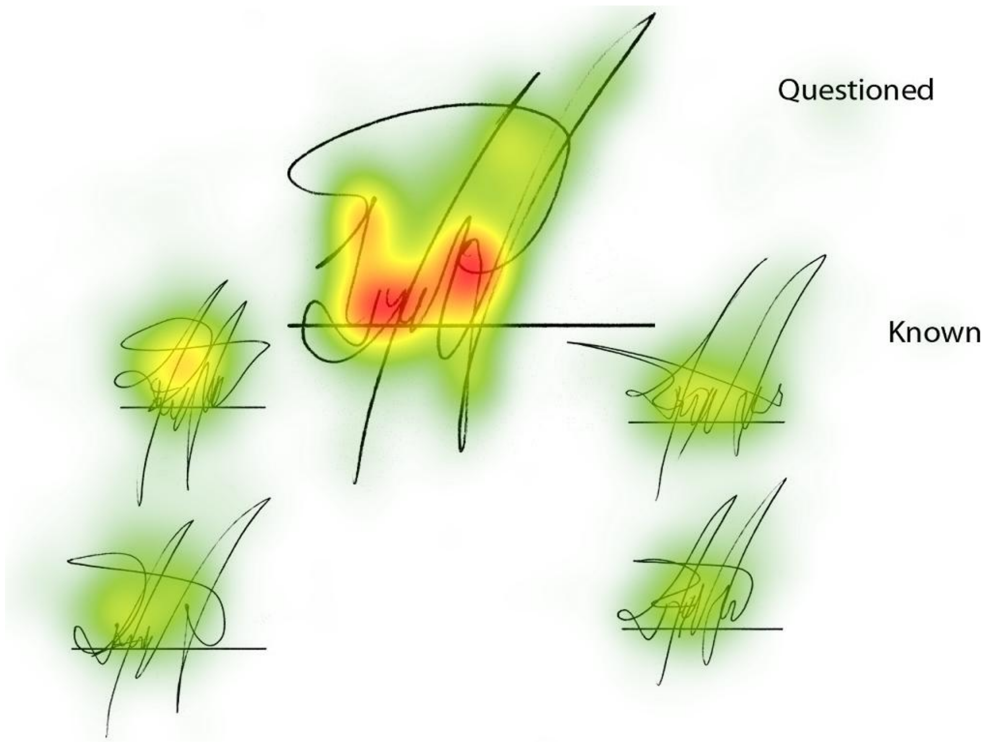


Selection of Areas of Interest (AOIs)

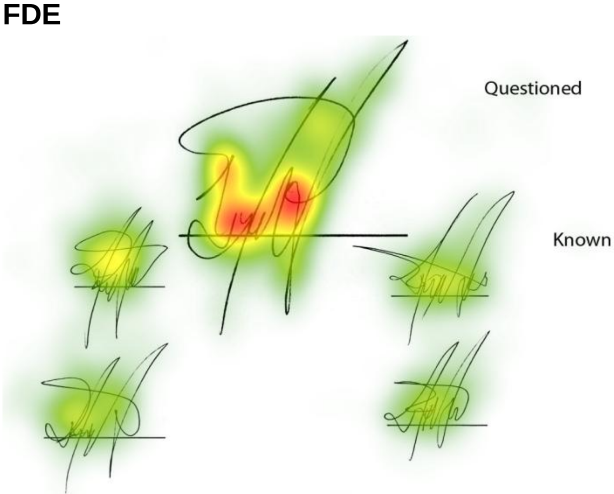
Figure Tima 5.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were four locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of four AOIs for this stimulus. Figure Tima 5.3 presents the location of the AOIs identified in the heat map.

Figure Tima 5.2. Heat map for Tima signature 5, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

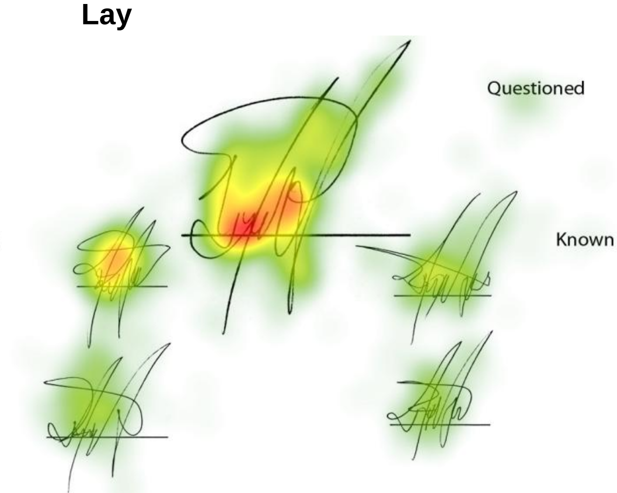
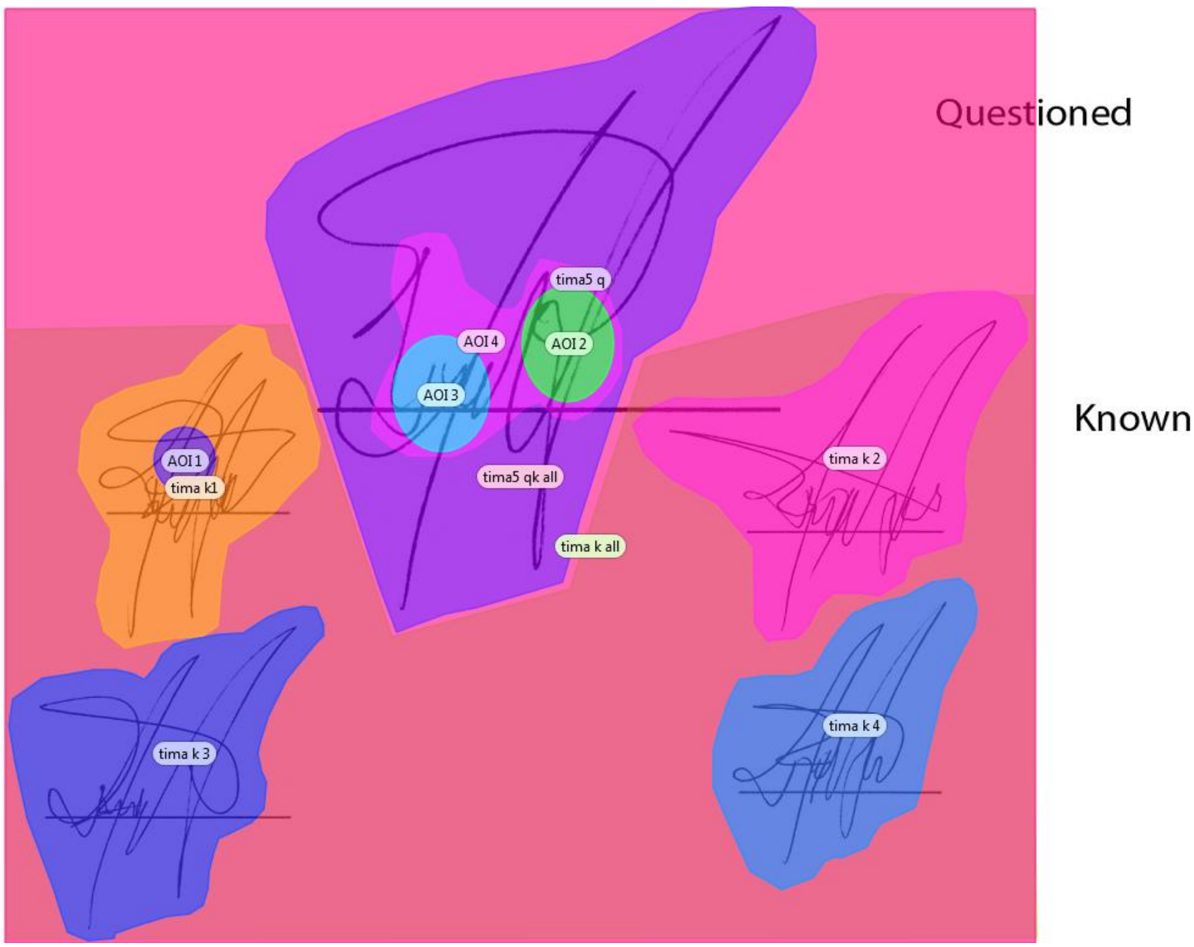


Figure Tima 5.3. Areas of Interest (AOIs) for Tima Signature 5.



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

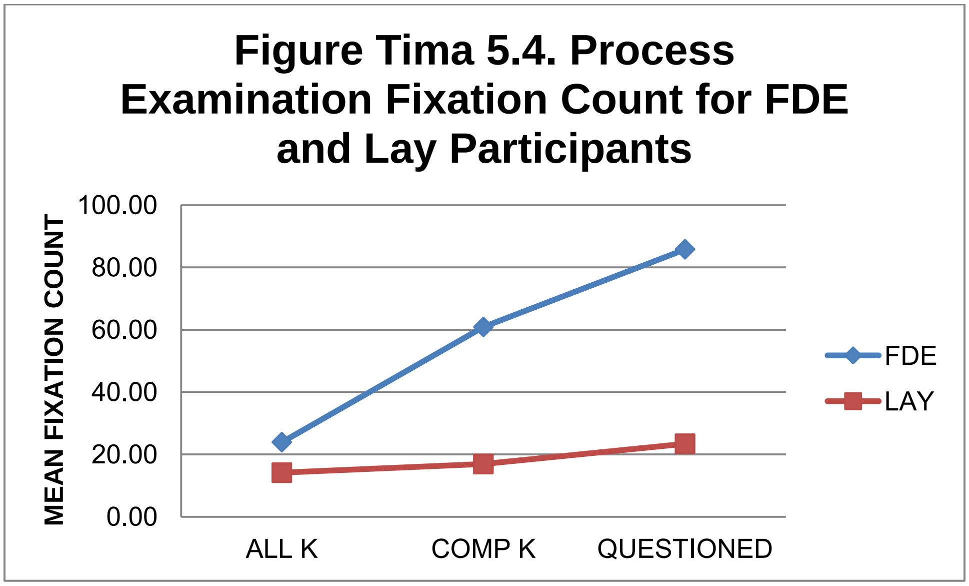
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Tima known signature stimulus (Knowns, not pictured here), Tima 1 K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Tima 5Q (the Tima questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 4) are included in subsequent analyses.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .386, $F(3, 85) = 17.81$, $p < .001$, multivariate $\eta^2 = .386$. Figure Tima 5.4 presents the mean fixation counts by AOI.

Figure Tima 5.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all of the three areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, $F(1, 87) = 49.40$, $p > .001$, partial $\eta^2 = .362$; $F(1, 87) = 43.72$, $p > .001$, partial $\eta^2 = .334$).

Fixation count in the known signature stimulus (ALL K) was also statistically significant, $F(1, 87) = 4.79$, $p = .031$, partial $\eta^2 = .052$. Table Tima 5.1 presents the means and standard deviations for areas of interest by participant type.

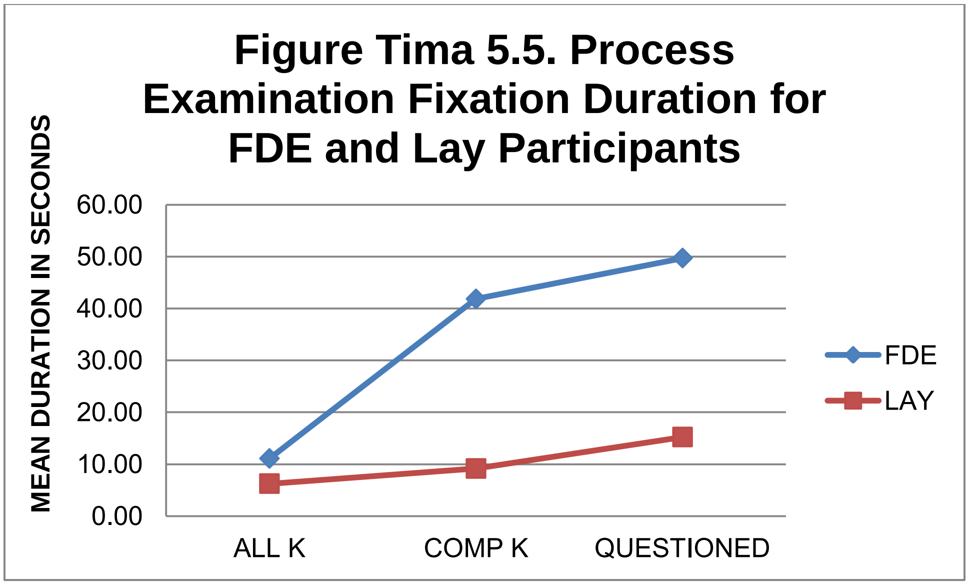
Table Tima 5.1
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	23.91	27.16	60.87	41.42	85.80	54.44
Lay	14.12	11.52	16.88	14.09	23.40	21.32

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .400, $F(3, 85) = 19.89$, $p < .001$, multivariate $\eta^2 = .400$. Figure Tima 5.5 presents the mean fixation duration by AOI.

Figure Tima 5.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, $F(1, 87) = 49.29$, $p > .001$, partial $\eta^2 = .362$); $F(1, 87) = 52.17$, $p < .001$, partial $\eta^2 = .375$).

Fixation duration in the known signature stimulus (ALL K) was also statistically significant, $F(1, 87) = 4.96$, $p = .029$, partial $\eta^2 = .054$. Table Tima 5.2 presents the means and standard deviations for areas of interest by participant type.

Table Tima 5.2

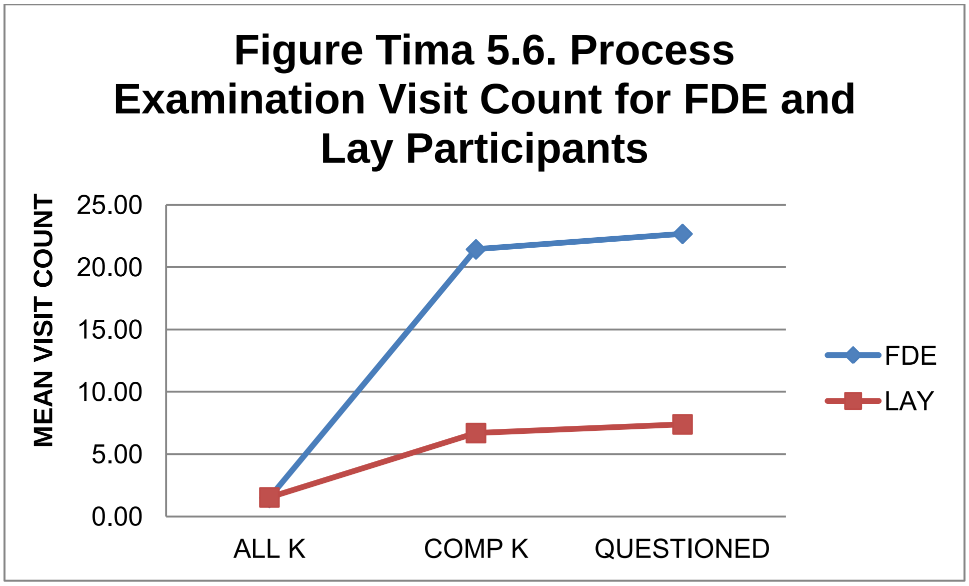
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	11.08	12.89	41.83	28.60	68.79	48.67
Lay	6.24	6.33	9.15	8.12	15.21	11.96

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .350, $F(3, 85) = 15.25$, $p < .001$, multivariate $\eta^2 = .350$. Figure Tima 5.6 presents the mean visit durations by AOI.

Figure Tima 5.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in two of the three of the areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, $F(1, 87) = 45.24$, $p > .001$, partial $\eta^2 = .342$ $F(1, 87) = 42.93$, $p < .001$, partial $\eta^2 = .330$).

Visit count in the known signature stimulus (ALL K) was not statistically significant. $p = .861$, *ns*. Table Tima 5.6 presents the means and standard deviations for areas of interest by participant type.

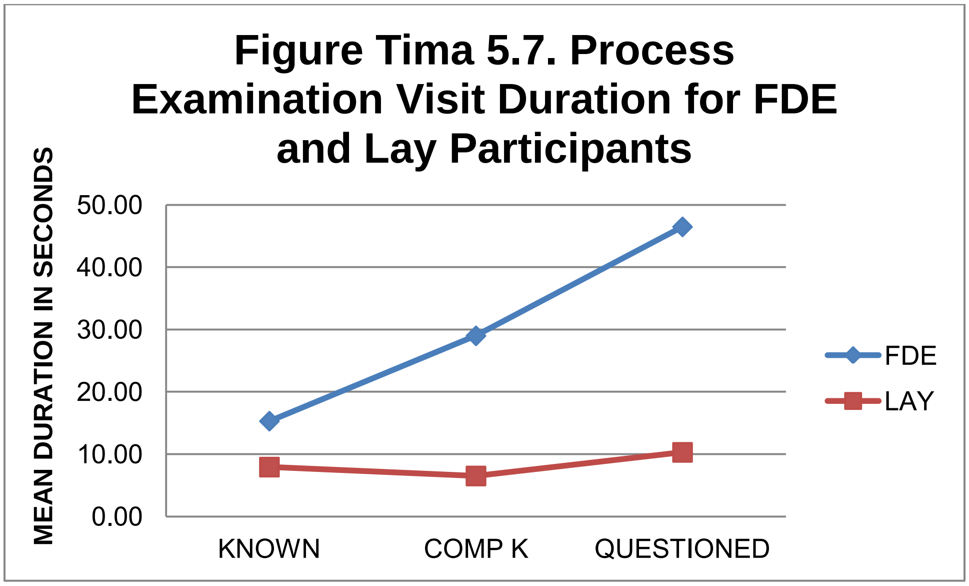
Table Tima 5.3
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.50	0.86	21.43	13.89	22.67	13.99
Lay	1.53	1.01	6.70	5.12	7.40	5.27

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .304, $F(3, 86) = 14.88$, $p < .001$, multivariate $\eta^2 = .304$. Figure Tima 5.7 presents the mean visit durations by AOI.

Figure Tima 5.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all of the three areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, $F(1, 88) = 32.94$, $p > .001$, partial $\eta^2 = .272$); $F(1, 88) = 15.44$, $p < .001$, partial $\eta^2 = .149$).

Visit duration in the known signature stimulus (ALL K) was also statistically significant, $F(1, 88) = 8.03$, $p = .006$, partial $\eta^2 = .084$. Table Tima 5.4 presents the means and standard deviations for areas of interest by participant type.

Table Tima 5.4

Process Analysis Visit Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	15.30	17.65	28.99	22.33	46.48	31.76
Lay	7.94	7.77	6.51	5.02	10.30	8.51

Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

<u>*Total Fixation Count*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .411, $F(6, 82) = 9.54$, $p < .001$, multivariate $\eta^2 = .411$. Figure Tima 5.8 presents the mean fixation counts by AOI.

Figure Tima 5.8

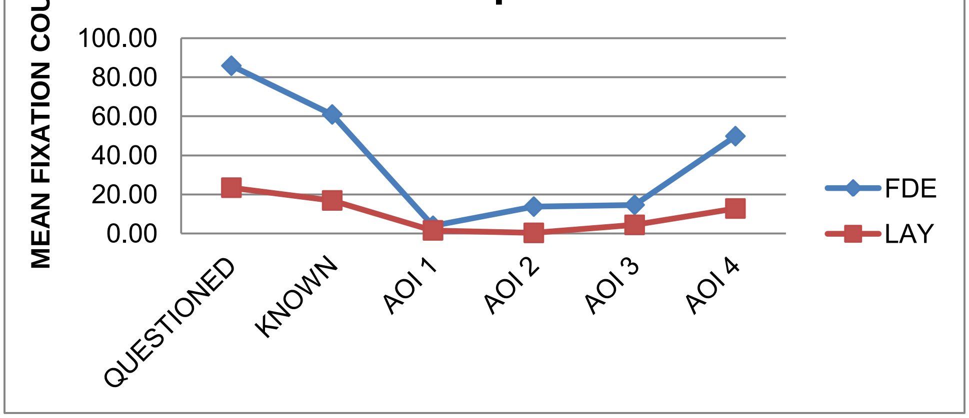


Figure Tima 5.8. Feature Extraction Fixation Count for FDE and Lay Participants

Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all but one area of interest. Total fixation count for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 87) = 49.40$, $p < .001$, partial $\eta^2 = .362$, and $F(1, 87) = 43.72$, $p < .001$, partial $\eta^2 = .334$.

Fixation count in all of the four AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 12.61$, $p = .001$, partial $\eta^2 = .127$; AOI 2, $F(1, 87) = 44.29$, $p < .001$, partial $\eta^2 = .337$; AOI 3, $F(1, 87) = 33.61$, $p < .001$, partial $\eta^2 = .279$; AOI 4, $F(1, 87) = 47.53$, $p < .001$, partial $\eta^2 = .353$). Table Tima 5.5 presents the means and standard deviations for areas of interest by participant type.

Table Tima 5.5

Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

	QUESTIONED	KNOWN	AOI 1

Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	85.80	54.44	60.87	41.42	3.91	4.12
Lay	23.40	21.32	16.88	14.09	1.56	1.44
	AOI 2		**AOI 3**		**AOI 4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	13.72	10.59	14.59	10.96	49.76	33.52
Lay	2.60	2.88	4.37	3.78	12.74	11.08

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .423, $F(6, 82) = 10.04$, $p < .001$, multivariate $\eta^2 = .423$. Figure Tima 5.9 presents the mean fixation durations by AOI.

Figure Tima 5.9

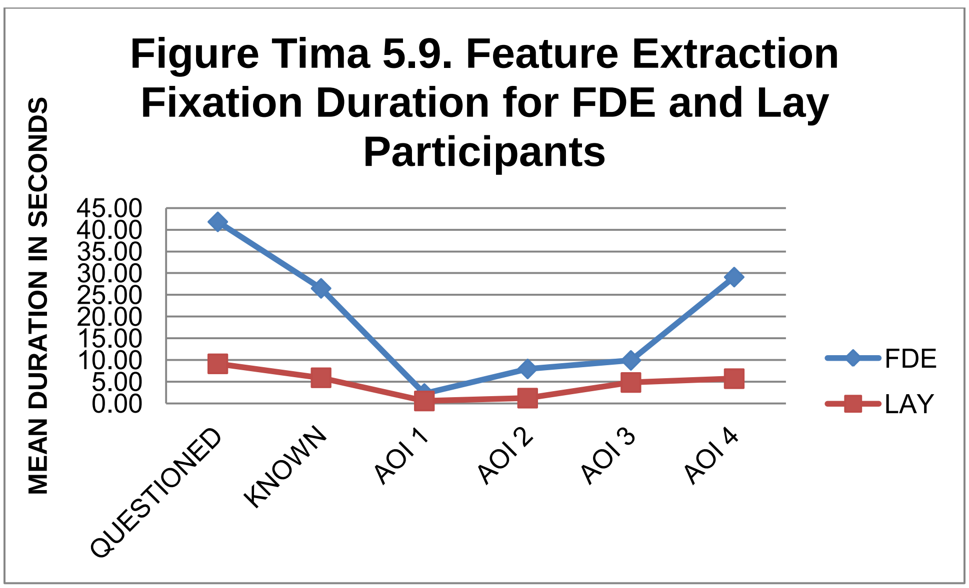


Figure Tima 5.9. Feature Extraction Fixation Duration for FDE and Lay Participants

Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all but one area of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 87) = 52.17$, $p < .001$, partial $\eta^2 = .375$, and $F(1, 87) = 38.59$, $p < .001$, partial $\eta^2 = .307$.

Fixation duration in all four AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 9.85$, $p = .002$, partial $\eta^2 = .102$; AOI 2, $F(1, 87) = 37.44$, $p < .001$, partial $\eta^2 = .301$; AOI 3, $F(1, 87) = 33.05$, $p < .001$, partial $\eta^2 = .275$; AOI 4, $F(1, 87) = 47.56$, $p < .001$, partial $\eta^2 = .353$). Table Tima 5.6 presents the means and standard deviations for areas of interest by participant type.

Table Tima 5.6

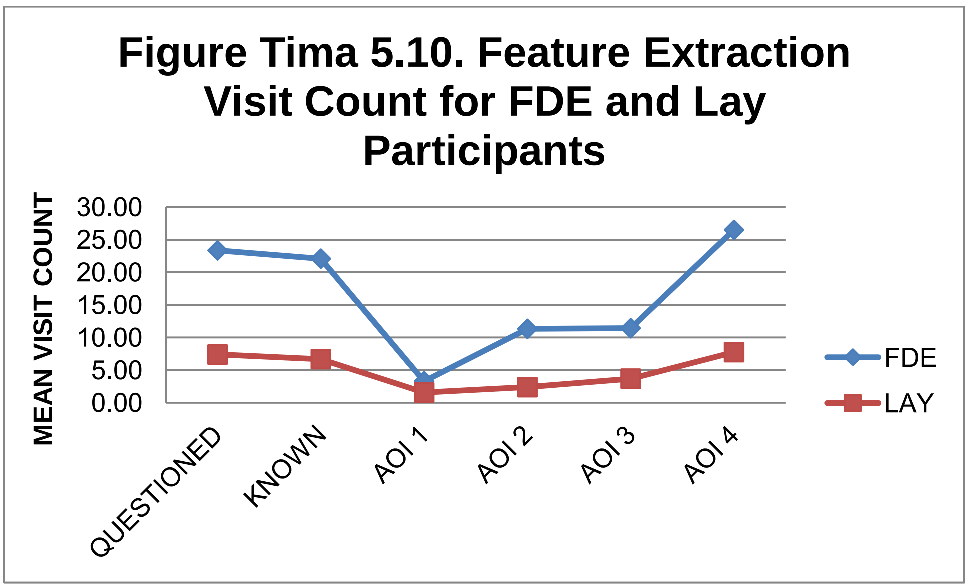
Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	41.83	28.60	26.51	21.27	2.32	3.54
Lay	9.15	8.12	5.93	4.50	0.60	0.63
	AOI 2		**AOI 3**		**AOI 4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	7.98	7.08	9.94	8.57	29.11	21.67
Lay	1.25	1.38	2.19	2.23	5.73	5.09

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .654, $F(6, 78) = 24.57$, $p < .001$, multivariate $\eta^2 = .654$. Figure Tima 5.10 presents the mean visit counts by AOI.

Figure Tima 5.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 83) = 9.99$, $p = .002$, partial $\eta^2 = .107$, and $F(1, 83) = 46.50$, $p = .012$, partial $\eta^2 = .070$.

Visit counts in all AOI were significantly greater for FDEs than for Lay participants (AOI 1 (F(1, 83) = 2.79, p = .098, partial η^2 = .031; AOI 2 (F(1, 83) = .57, p < .001, partial η^2 = .359; AOI 3, F(1, 83) = 30.70, p < .001, partial η^2 = .270; AOI 4, F(1, 83) = 45.18, p < .001, partial η^2 = .352). Table Tima 5.7 presents the means and standard deviations for areas of interest by participant type.

Table Tima 5.7

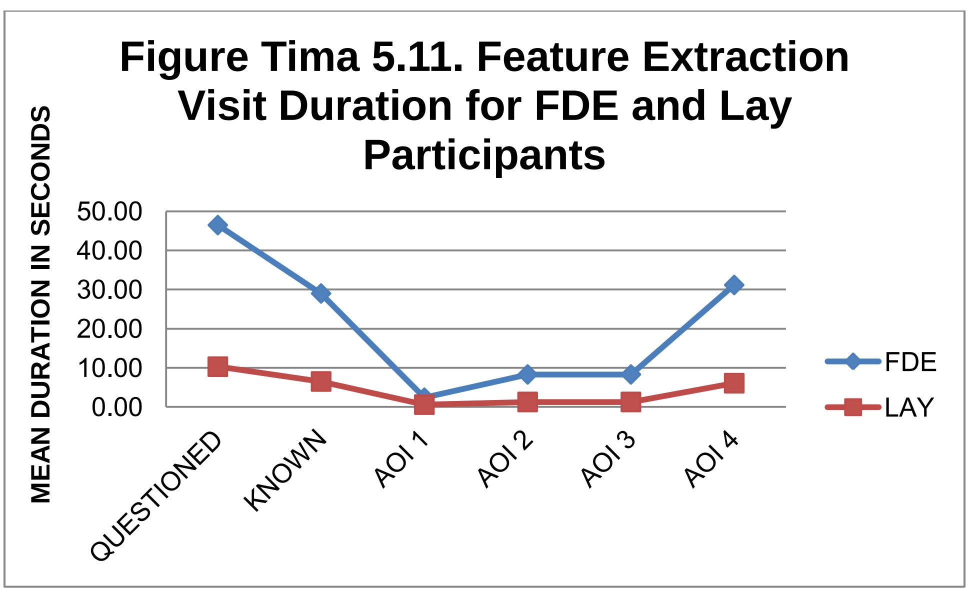
Feature Extraction Analysis Visit Count for FDE and Lay Participants

	QUESTIONED		**KNOWN**		**AOI 1**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	23.36	13.69	22.10	13.59	3.31	3.25
Lay	7.40	5.27	6.70	5.12	1.58	1.50
	AOI 2		**AOI 3**		**AOI 4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	11.33	8.23	11.43	8.73	26.50	17.44
Lay	2.40	2.45	3.70	2.71	7.77	5.41

<u>*Total Visit Duration*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .426, F(6, 82) = 10.14, p < .001, multivariate η^2 = .426. Figure Tima 5.11 presents the mean visit counts by AOI.

Figure Tima 5.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit duration in all areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 87) = 52.26$, $p < .001$, partial $\eta^2 = .375$, and $F(1, 87) = 41.59$, $p < .001$, partial $\eta^2 = .323$.

Visit duration in all AOI was significantly greater for FDEs than for Lay participants (AOI 1 ($F(1, 87) = 9.87$, $p = .002$, partial $\eta^2 = .102$; AOI 2 ($F(1, 87) = 37.74$, $p < .001$, partial $\eta^2 = .303$; AOI 3, $F(1, 87) = 34.06$, $p < .001$, partial $\eta^2 = .281$; AOI 4, $F(1, 87) = 48.86$, $p < .001$, partial $\eta^2 = .350$). Table Tima 5.8 presents the means and standard deviations for areas of interest by participant type.

Table Tima 5.8

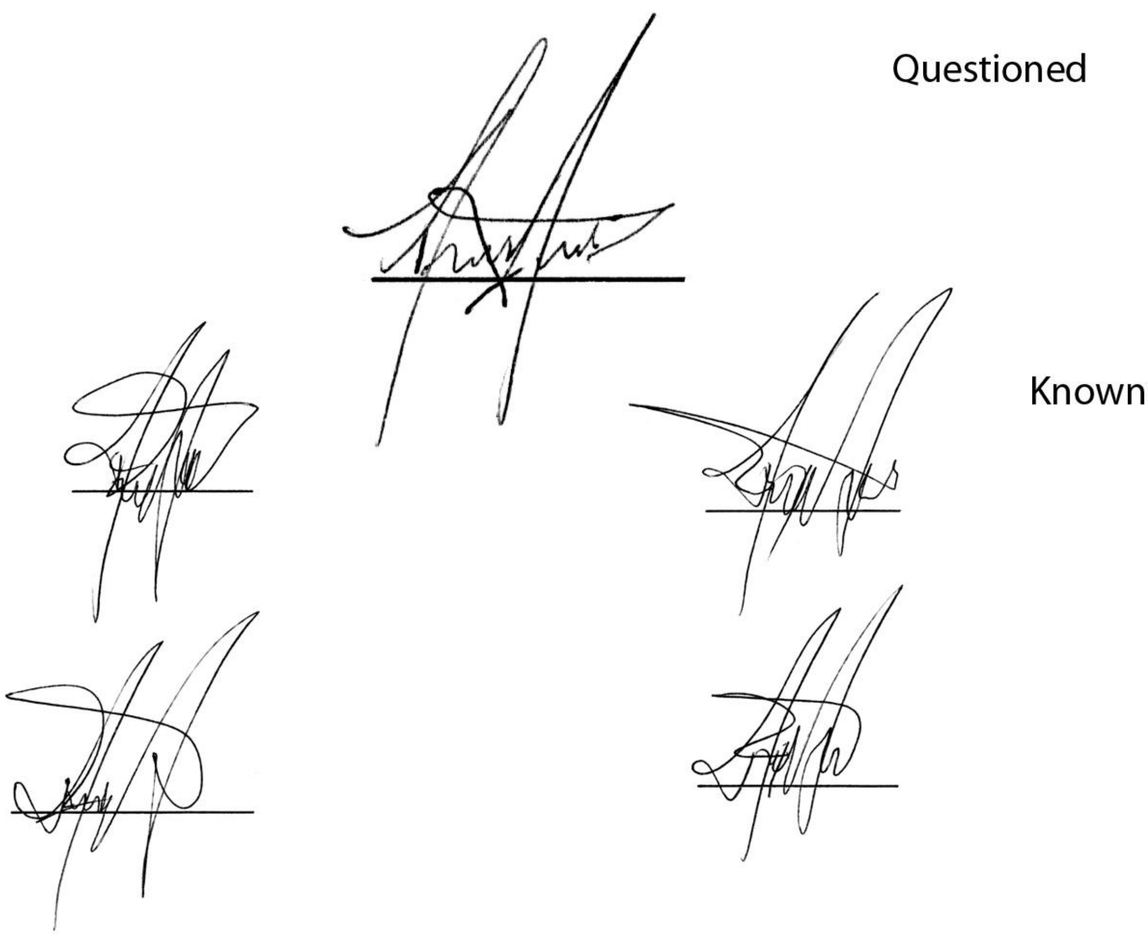
Feature Extraction Analysis Visit Duration for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	46.48	31.76	28.99	22.33	2.37	3.64
Lay	10.30	8.51	6.51	5.02	0.60	0.63
	AOI 2		**AOI 3**		**AOI 4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	8.31	7.38	8.31	7.38	31.17	23.49
Lay	1.27	1.44	1.27	1.44	6.07	5.25

Tima Signature 6: Disguised (Non-Genuine)

Of the 49 FDE participants, 48 responded correctly that the signature was non-genuine, and none responded that it was genuine. One FDE declined to respond. Of the 43 Lay participants, 41 responded correctly that the signature was non-genuine, and 2 responded that the signature was genuine. This difference was not statistically significant, χ^2 (2, N = 92) = 3.17, p = .205. Figure Tima 6.1 presents the comparison view of this signature.

Figure Tima 6.1. Questioned-Known Comparison Stimulus for Signature Tima 6.

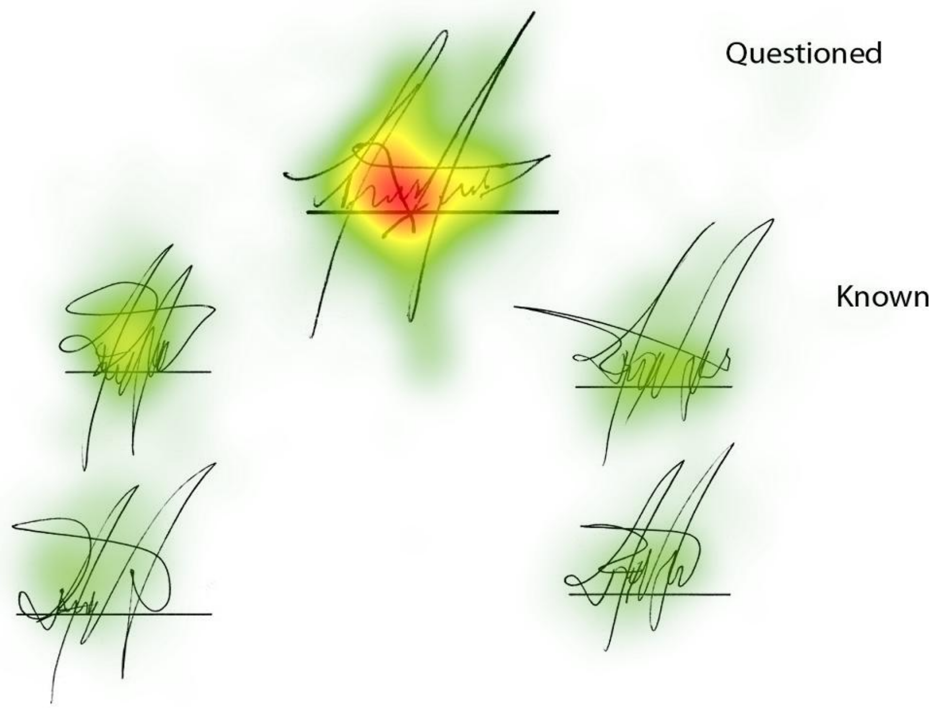


Selection of Areas of Interest (AOIs)

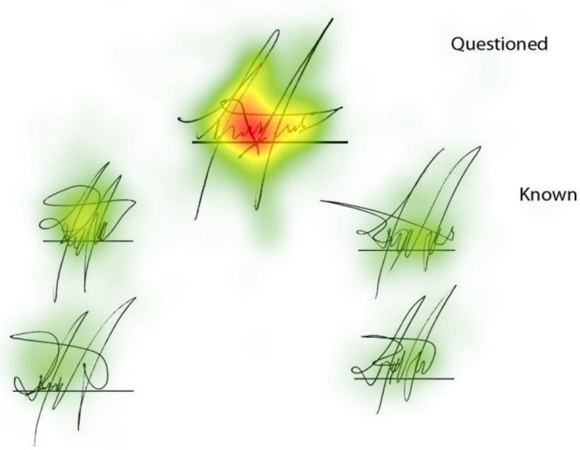
Figure Tima 6.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were two locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of two AOIs for this stimulus. Figure Tima 6.3 presents the location of the AOIs identified in the heat map.

Figure Tima 6.2. Heat map for Tima signature 6, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

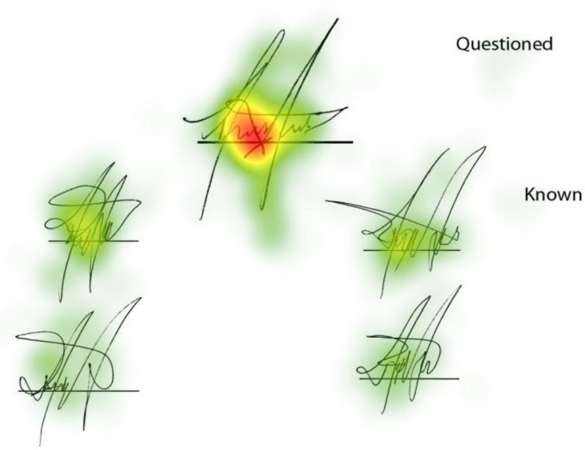
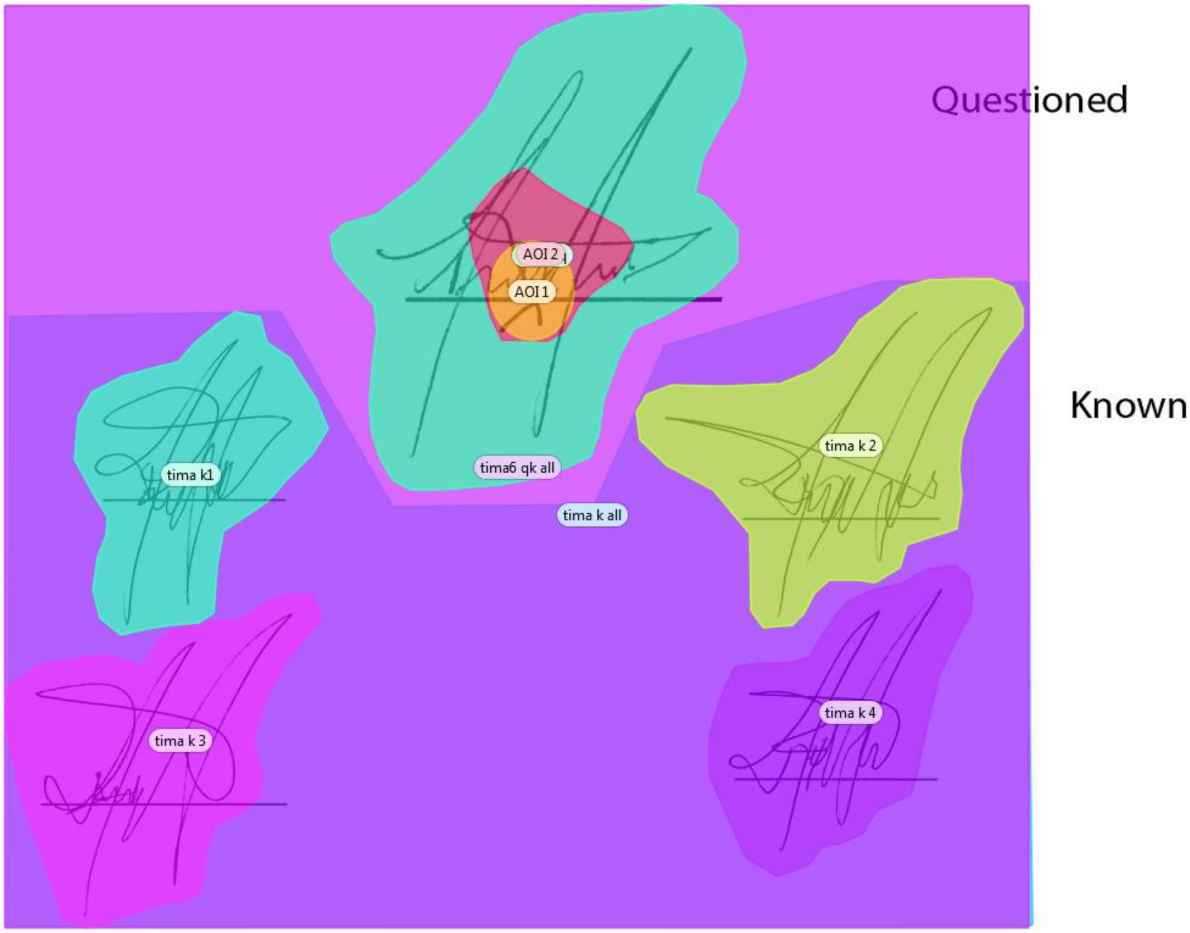


Figure Tima 6.3. Areas of Interest (AOIs) for Tima Signature 6.



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

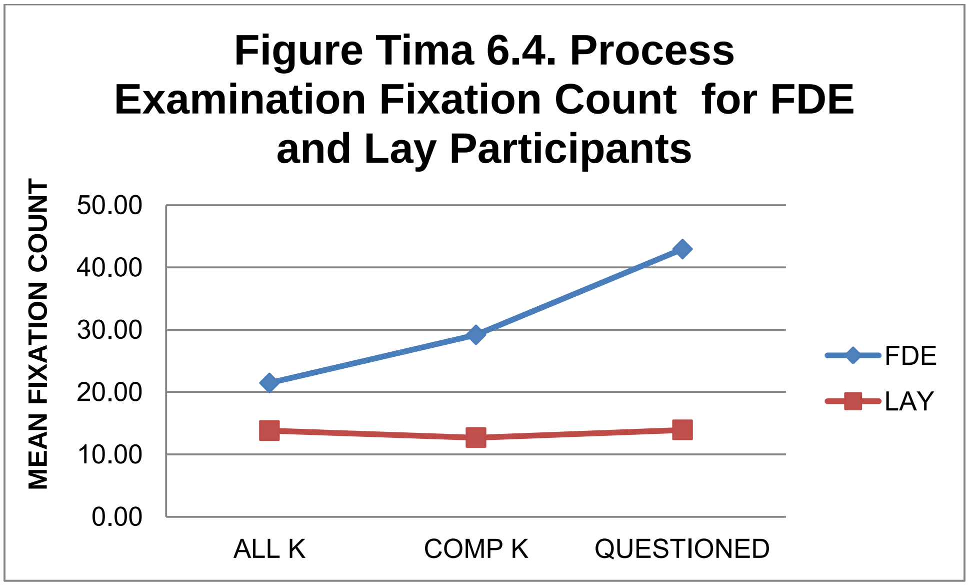
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Tima known signature stimulus (Knowns, not pictured here), Tima 1 K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Tima 6Q (the Tima questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 2) are included in subsequent analyses.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .342, $F(3, 85) = 14.72$, $p < .001$, multivariate $\eta^2 = .342$. Figure Tima 6.4 presents the mean fixation counts by AOI.

Figure Tima 6.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all of the areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, $F(1, 87) = 41.02$, $p > .001$, partial $\eta^2 = .320$, and $F(1, 87) = 18.23$, $p > .001$, partial $\eta^2 = .173$).

Fixation count in the known signature stimulus (ALL K) was also statistically significant, $F(1, 87) = 5.05$, $p = .027$, partial $\eta^2 = .055$. Table Tima 6.1 presents the means and standard deviations for areas of interest by participant type.

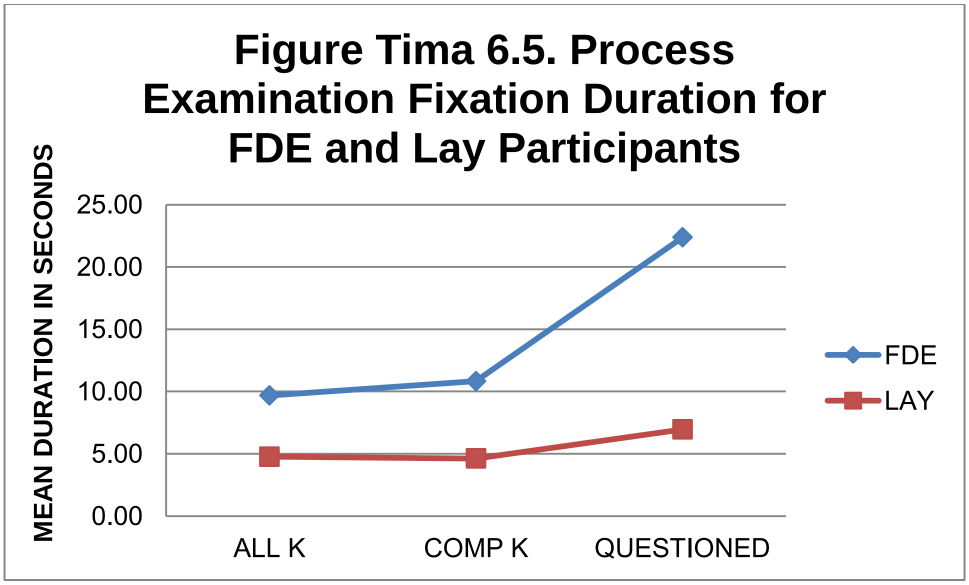
Table Tima 6.1
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	21.46	19.15	29.17	22.76	42.93	27.44
Lay	13.81	11.80	12.70	11.43	13.93	11.72

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .420, $F(3, 85) = 20.52$, $p < .001$, multivariate $\eta^2 = .420$. Figure Tima 6.5 presents the mean fixation duration by AOI.

Figure Tima 6.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants $F(1, 87) = 41.85$, $p > .001$, partial $\eta^2 = .325$); $F(1, 87) = 12.47$, $p = .001$, partial $\eta^2 = .125$).

Fixation duration in the known signature stimulus (ALL K) was also statistically significant, $F(1, 87) = 8.85$, $p = .004$, partial $\eta^2 = .092$. Table Tima 6.3 presents the means and standard deviations for areas of interest by participant type.

Table Tima 6.2

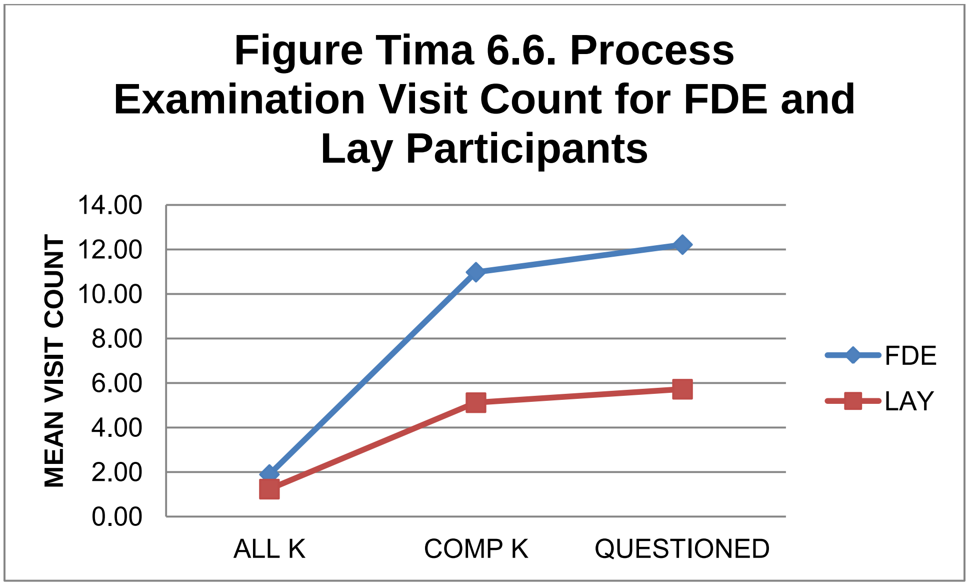
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	9.68	10.04	10.82	10.37	22.38	14.64
Lay	4.76	4.24	4.62	5.17	6.96	5.66

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .216, $F(3, 85) = 7.80$, $p < .001$, multivariate $\eta^2 = .216$. Figure Tima 6.6 presents the mean visit counts by AOI.

Figure Tima 6.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in two of the three of the areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for Lay participants, $F(1, 87) = 21.04$, $p > .001$, partial $\eta^2 = .195$); $F(1, 87) = 17.17$, $p < .001$, partial $\eta^2 = .165$).

Visit count in the known signature stimulus (ALL K) was not statistically significant, $p = .143$, *ns*. Table Tima 6.4 presents the means and standard deviations for areas of interest by participant type.

Table Tima 6.3

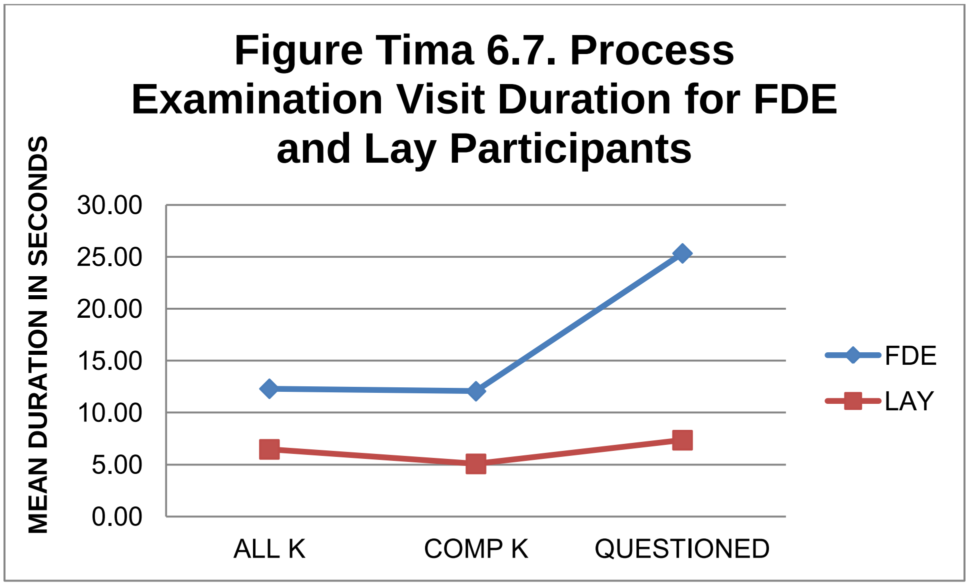
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.89	2.85	10.98	8.16	12.22	8.10
Lay	1.23	0.68	5.12	4.57	5.72	4.70

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .459, $F(3, 85) = 24.00$, $p < .001$, multivariate $\eta^2 = .459$. Figure Tima 6.7 presents the mean visit durations by AOI.

Figure Tima 6.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit duration in all three of the areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus (COMP K) was significantly greater for FDEs than for Lay participants, $F(1, 87) = 49.33$, $p > .001$, partial $\eta^2 = .362$); $F(1, 87) = 13.55$, $p < .001$, partial $\eta^2 = .135$).

Visit duration in the known signature stimulus (ALL K) was also statistically significant, $F(1, 87) = 7.65$, $p = .007$, partial $\eta^2 = .081$. Table Tima 6.4 presents the means and standard deviations for areas of interest by participant type.

Table Tima 6.4

Process Analysis Visit Duration for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	12.30	12.66	12.06	11.32	25.34	15.81
Lay	6.47	5.74	5.07	5.38	7.35	5.85

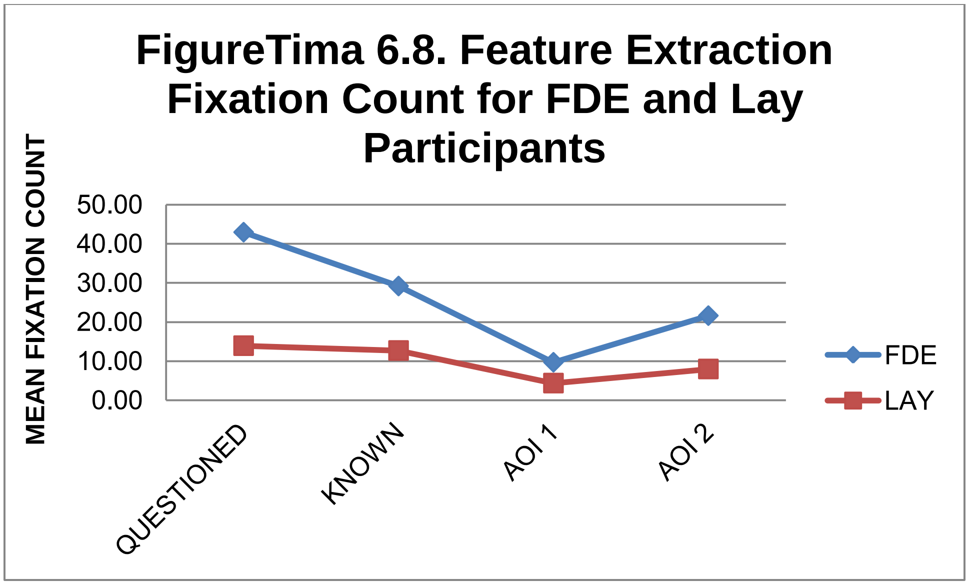
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .333, $F(4, 84) = 10.50$, $p < .001$, multivariate $\eta^2 = .333$. Figure Tima 6.8 presents the mean fixation counts by AOI.

Figure Tima 6.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus (COMP K) was significantly greater for FDEs than for Lay participants, $F(1, 87) = 41.02$, $p < .001$, partial $\eta^2 = .320$, and $F(1, 87) = 18.23$, $p < .001$, partial $\eta^2 = .173$.

Fixation count in both AOIs was significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 22.66$, $p = .001$, partial $\eta^2 = .207$; AOI 2, $F(1, 87) = 32.24$, $p < .001$, partial $\eta^2 = .270$). Table Tima 6.5 presents the means and standard deviations for areas of interest by participant type.

Table Tima 6.5
Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

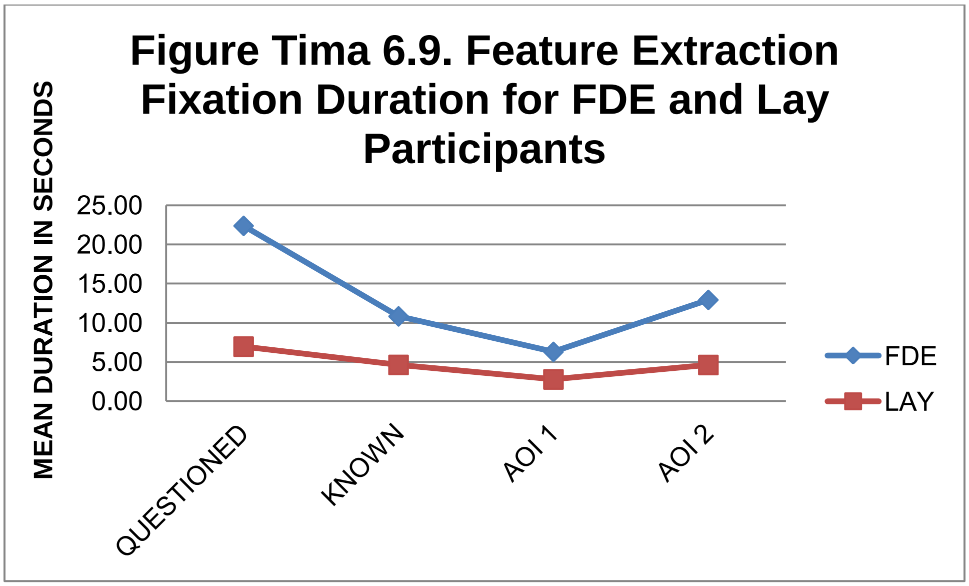
	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	42.93	27.44	29.17	22.76	9.70	6.62	21.61	14.38

Lay	13.93	11.72	12.70	11.43	4.37	3.26	7.98	6.61

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .444, $F(4, 84) = 16.79$, $p < .001$, multivariate $\eta^2 = .444$. Figure Tima 6.9 presents the mean fixation durations by AOI.

Figure Tima 6.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 87) = 41.85$, $p < .001$, partial $\eta^2 = .325$, and $F(1, 87) = 12.47$, $p < .001$, partial $\eta^2 = .125$.

Fixation duration in both AOIs was significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 20.50$, $p = .001$, partial $\eta^2 = .191$; AOI 2, $F(1, 87) = 27.18$, $p < .001$, partial $\eta^2 = .238$). Table Tima 6.6 presents the means and standard deviations for areas of interest by participant type.

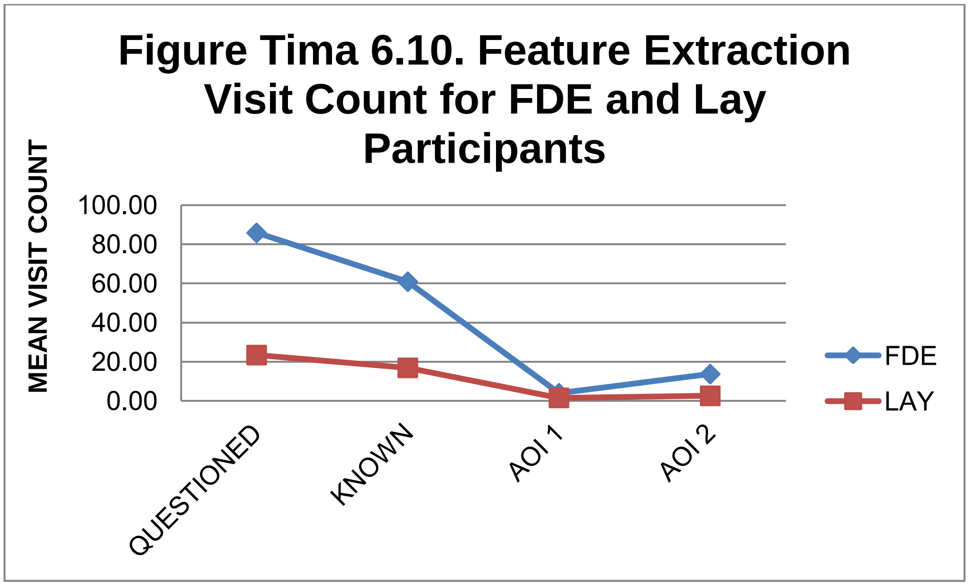
Table Tima 6.6
Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	22.38	14.64	10.82	10.37	6.29	4.55	12.93	9.78
Lay	6.96	5.66	4.62	5.17	2.77	2.36	4.62	3.79

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .303, $F(4, 84) = 9.12$, $p < .001$, multivariate $\eta^2 = .303$. Figure Tima 6.10 presents the mean visit counts by AOI.

Figure Tima 6.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, $F(1, 87) = 21.04$, $p < .001$, partial $\eta^2 = .195$, and F(1, 87) = 17.17, $p < .001$, partial $\eta^2 = .165$.

Visit counts in all AOI were significantly greater for FDEs than for Lay participants (AOI 1 ($F(1, 87) = 25.12$, $p < .001$, partial $\eta^2 = .224$; AOI 2 ($F(1, 87) = .25.12$, $p < .001$, partial $\eta^2 = .268$). Table Tima 6.7 presents the means and standard deviations for areas of interest by participant type.

Table Tima 6.7

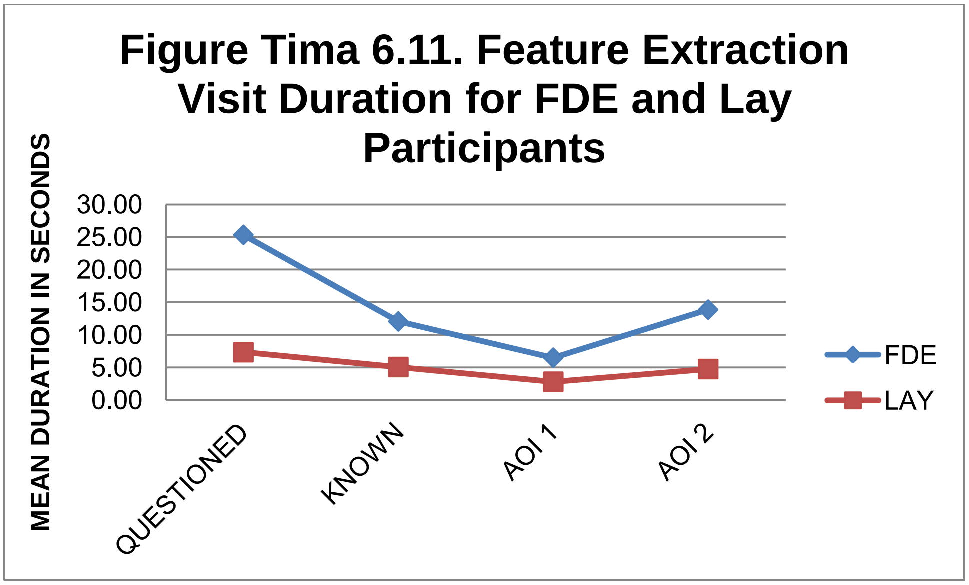
Feature Extraction Analysis Visit Count for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	85.80	54.44	60.87	41.42	3.91	4.12	13.72	10.59
Lay	23.40	21.32	16.88	14.09	1.56	1.44	2.60	2.88

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .463, $F(4, 84) = 18.14$, $p < .001$, multivariate $\eta^2 = .463$. Figure Tima 6.11 presents the mean visit durations by AOI.

Figure Tima 6.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit duration in all areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 87) = 49.33$, $p < .001$, partial $\eta^2 = .362$, and $F(1, 87) = 13.55$, $p < .001$, partial $\eta^2 = .135$.

Visit duration in both AOIs was significantly greater for FDEs than for Lay participants (AOI 1 ($F(1, 87) = 21.50$, $p < .001$, partial $\eta^2 = .198$; AOI 2 ($F(1, 87) = 30.24$, $p < .001$, partial $\eta^2 = .258$). Table Tima 6.8 presents the means and standard deviations for areas of interest by participant type.

Table Tima 6.8
Feature Extraction Analysis Visit Duration for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	25.34	15.81	12.06	11.32	6.51	4.67	13.87	10.19
Lay	7.35	5.85	5.07	5.38	2.82	2.41	4.76	3.89

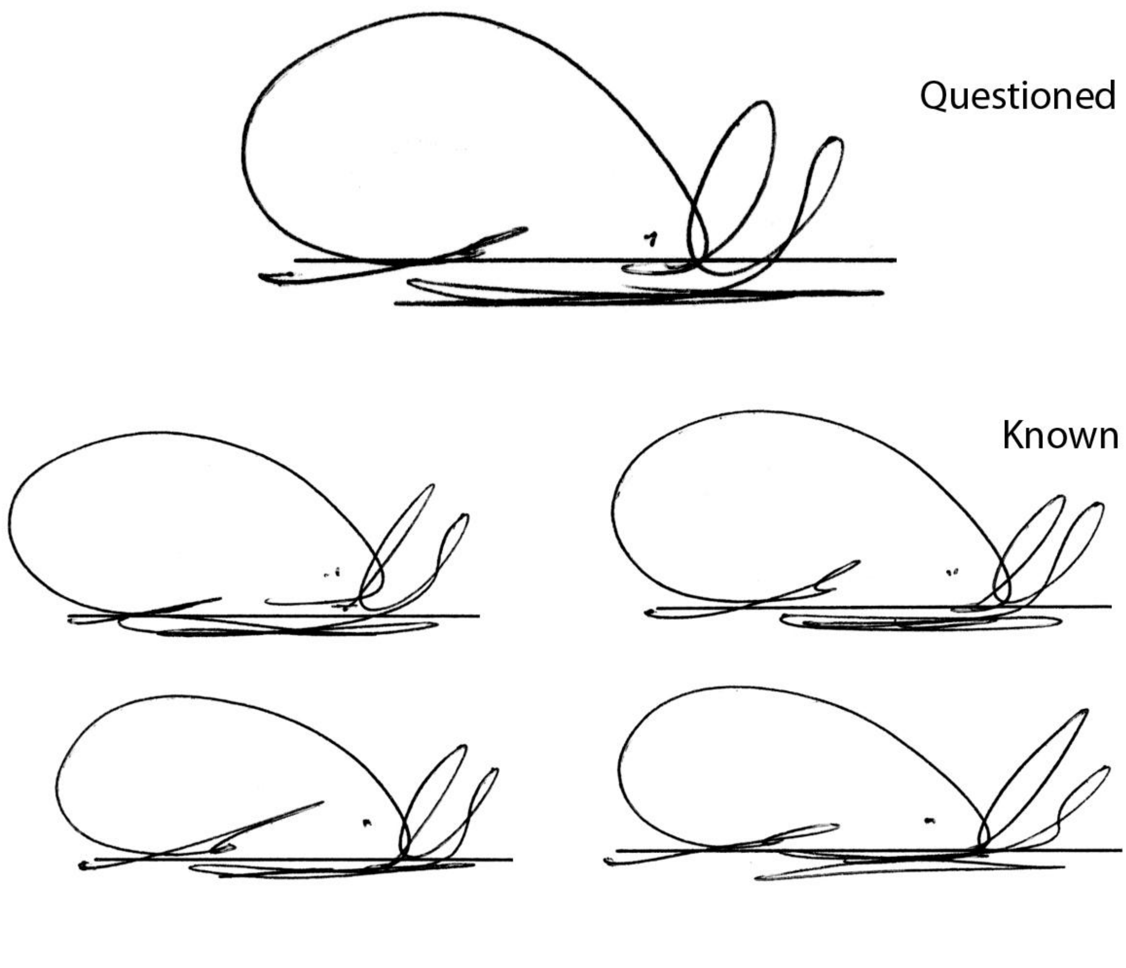
SIGNATURE 10: Ricardo Vega

The signature of Ricardo Vega is characterized as a low-complexity stylized-type signature. The set of Vega signature specimens included two genuine signatures. Of the non-genuine signatures, one was a freehand simulation, and two were traced signatures, and one was a traced signature.

Vega Signature 1: Genuine

Of the 49 FDE participants, 44 responded correctly that the signature was genuine, and 5 responded that it was non-genuine. All 43 Lay participants responded correctly that the signature was genuine. This difference was statistically significant, χ^2 (2, N = 92) = 4.64, p = .031. Figure Vega 1.1 presents the comparison view of this signature.

Figure Vega 1.1 Questioned-Known Comparison Stimulus for Vega Signature 1.

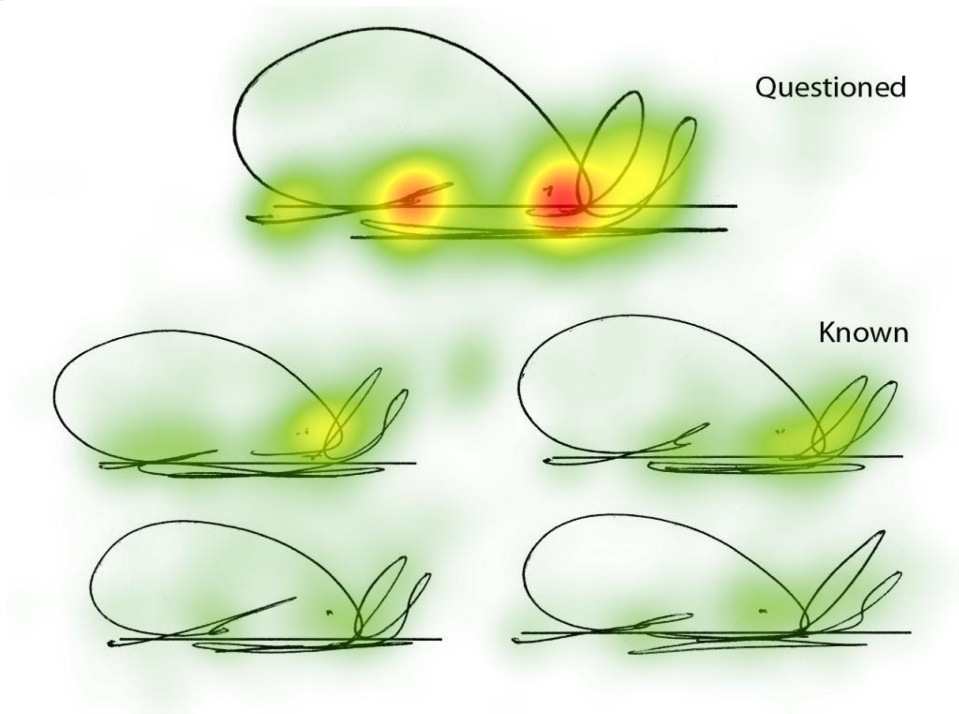


Selection of Areas of Interest (AOIs)

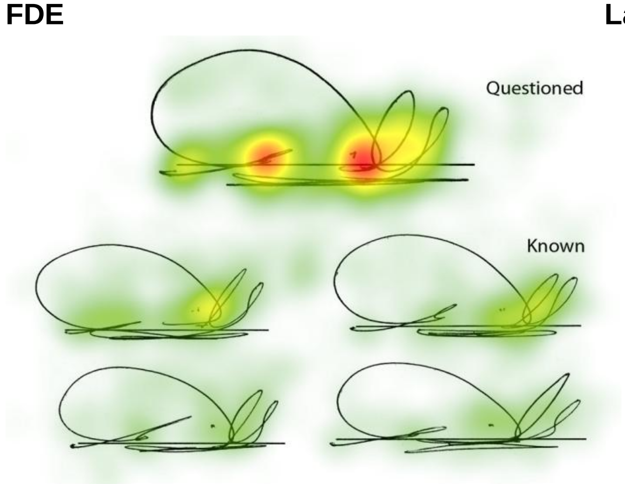
Figure Vega 1.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were two locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of two AOIs for this stimulus. Figure Vega 1.3 presents the location of the AOIs identified in the heat map.

Figure Vega 1.2. Heat map for Vega signature 1, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

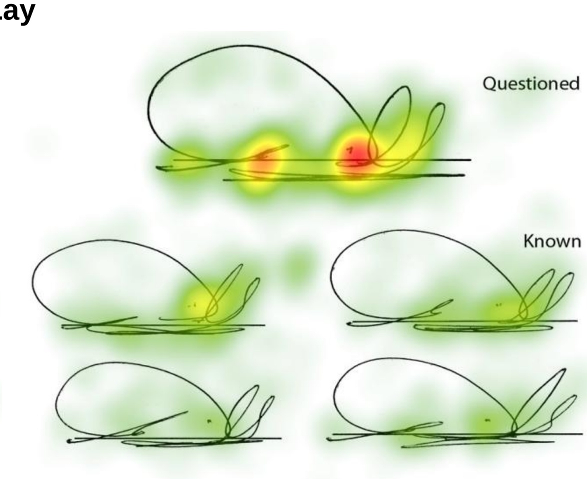
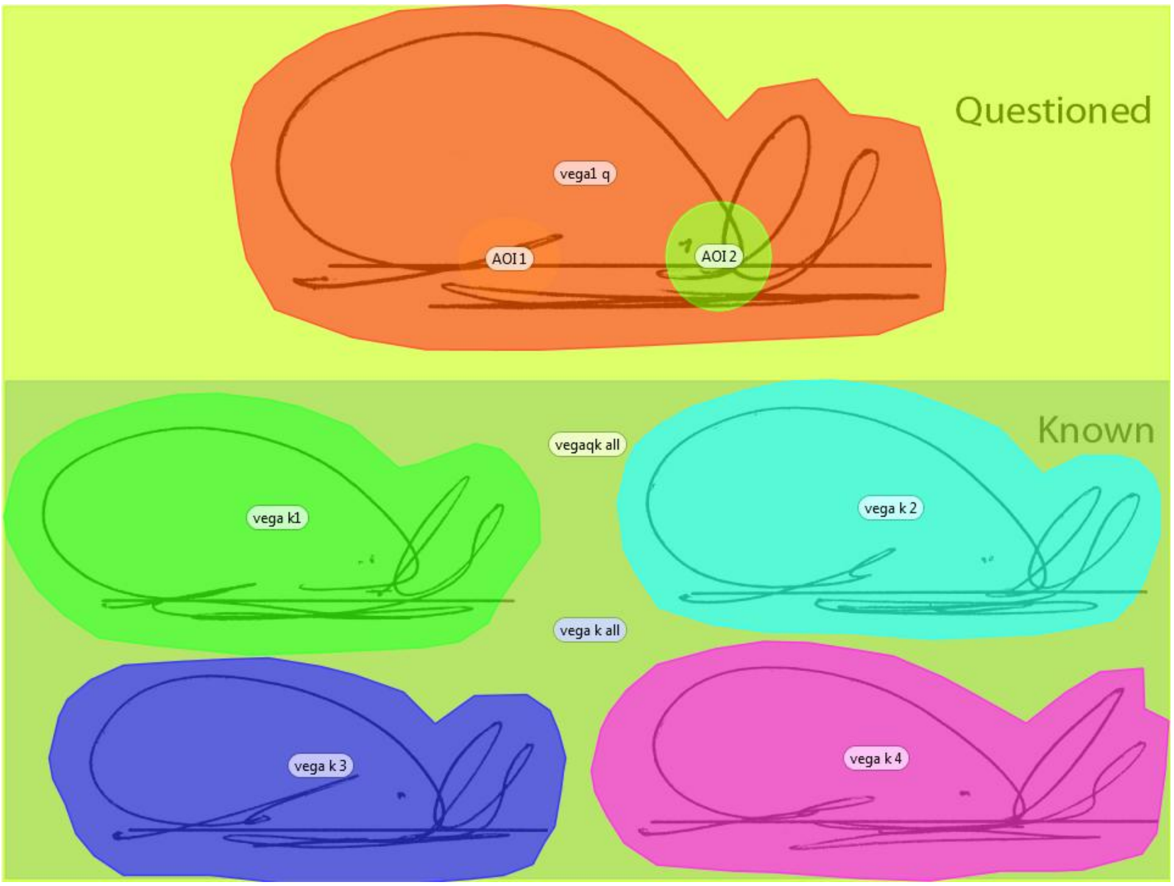


Figure Vega 1.3. Areas of Interest (AOIs) for Vega Signature 1.



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

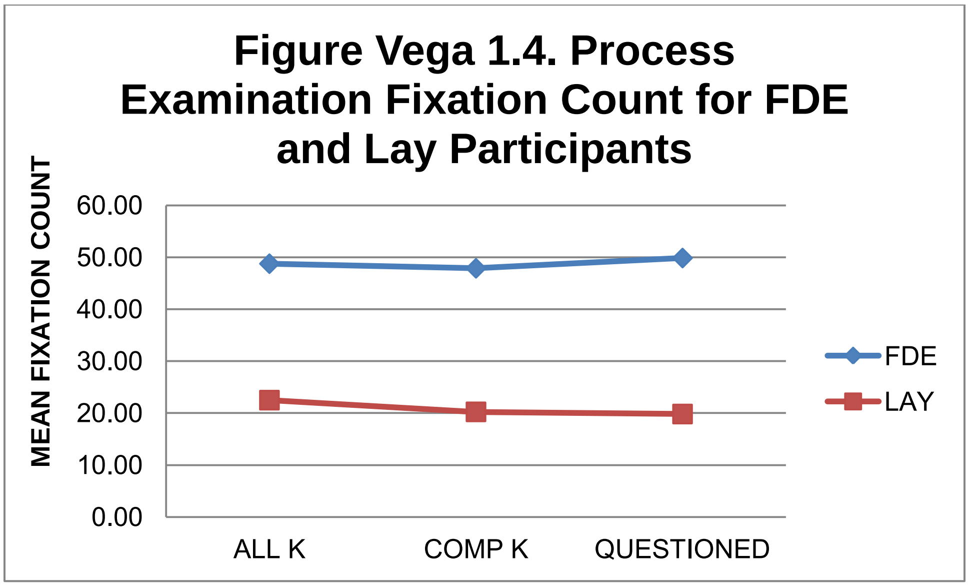
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Vega known signature stimulus (Knowns, not pictured here), Vega 1 K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Vega 1Q (the Vega questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 2) are included in subsequent analyses.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .208, $F(3, 85) = 7.44$, $p < .001$, multivariate $\eta^2 = .208$. Figure Vega 1.4 presents the mean fixation counts by AOI.

Figure Vega 1.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all of the areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for lay participants, $F(1, 87) = 17.57$, $p < .001$, partial $\eta^2 = .168$; $F(1, 87) = 16.54$, $p > .001$, partial $\eta^2 = .160$).

Fixation count in the known signature stimulus (ALL K) was also statistically significant, $F(1, 87) = 11.93$, $p = .001$, partial $\eta^2 = .121$. Table Vega 1.1 presents the means and standard deviations for areas of interest by participant type.

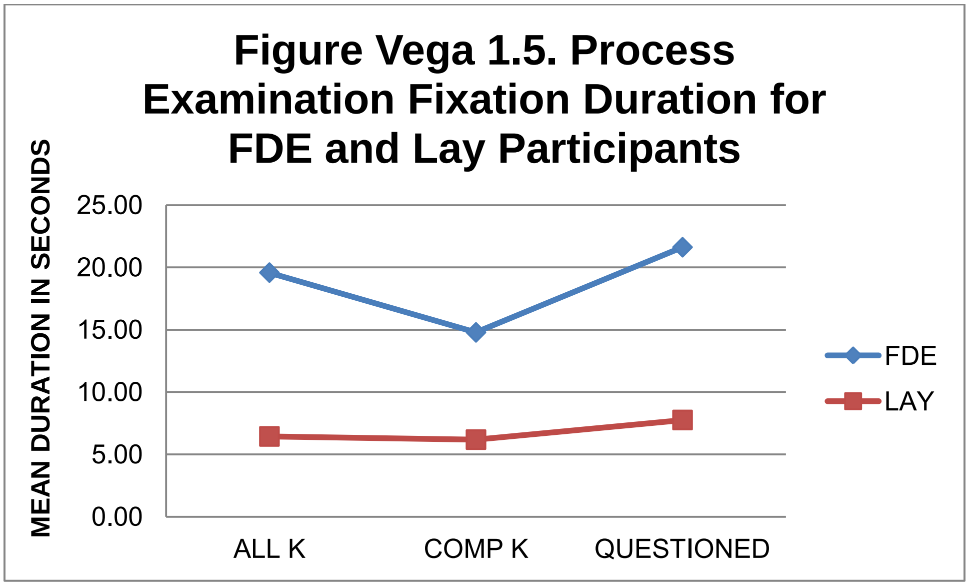
Table Vega 1.1
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	48.76	42.84	47.87	41.35	49.85	44.27
Lay	22.49	26.38	20.23	17.16	19.81	16.24

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .229, $F(3, 85) = 8.40$, $p < .001$, multivariate $\eta^2 = .229$. Figure Vega 1.5 presents the mean fixation duration by AOI.

Figure Vega 1.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for lay participants, $F(1, 87) = 20.97$, $p > .001$, partial $\eta^2 = .194$; known signature comparison stimulus, $F(1, 87) = 16.99$, $p < .001$, partial $\eta^2 = .163$.

Fixation duration in the known signature stimulus (ALL K) was also statistically significant, $F(1, 87) = 13.41$, $p < .001$, partial $\eta^2 = .134$. Table Vega 1.2 presents the means and standard deviations for areas of interest by participant type.

Table Vega 1.2

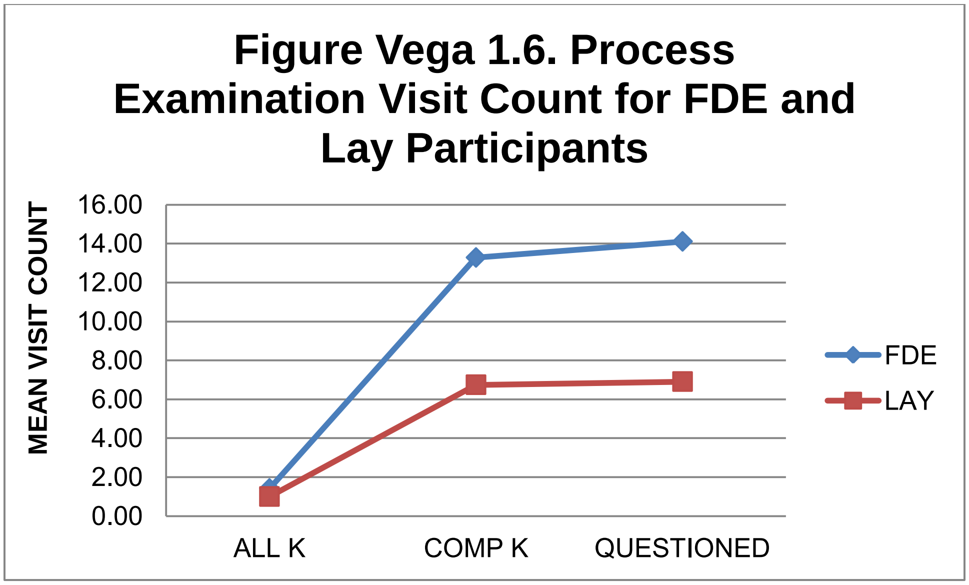
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	19.58	22.53	14.78	12.67	21.62	18.75
Lay	6.44	7.00	6.18	5.34	7.76	6.72

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .223, $F(3, 85) = 8.12$, $p < .001$, multivariate $\eta^2 = .223$. Figure Vega 1.6 presents the mean visit counts by AOI.

Figure Vega 1.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in two of the three of the areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for lay participants, $F(1, 87) = 17.93$, $p > .001$, partial $\eta^2 = .171$; known signature comparison stimulus, $F(1, 87) = 18.00$, $p < .001$, partial $\eta^2 = .171$.

Visit count in the known signature stimulus (ALL K) was also statistically significant, $F(1, 87) = 6.45$, $p = .013$, partial $\eta^2 = .069$. Table Vega 1.3 presents the means and standard deviations for areas of interest by participant type.

Table Vega 1.3

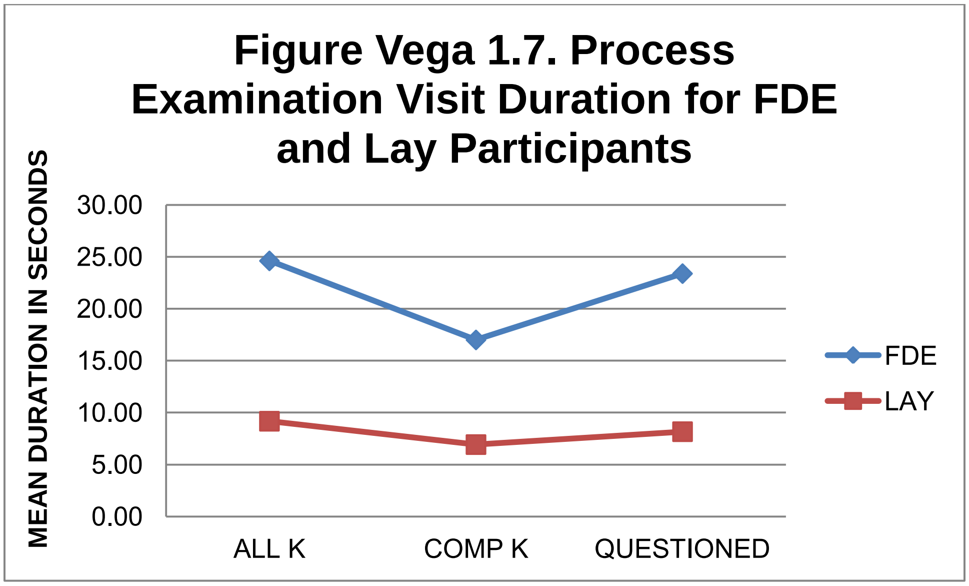
Process Analysis Visit Counts for FDE and Lay Participants

	Knows		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.41	1.00	13.28	8.95	14.11	9.92
Lay	1.00	0.38	6.74	4.86	6.91	5.26

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .239, $F(3, 85) = 8.90$, $p < .001$, multivariate $\eta^2 = .239$. Figure Vega 1.7 presents the mean visit durations by AOI.

Figure Vega 1.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit duration in two of the three of the areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus (COMP K) was significantly greater for FDEs than for lay participants, $F(1, 87) = 21.92$, $p > .001$, partial $\eta^2 = .201$; known signature comparison stimulus, $F(1, 87) = 17.45$, $p < .001$, partial $\eta^2 = .167$.

Visit duration in the known signature stimulus (ALL K) was also statistically significant, $F(1, 87) = 14.05$, $p < .001$, partial $\eta^2 = .139$. Table Vega 1.4 presents the means and standard deviations for areas of interest by participant type.

Table Vega 1.4

Process Analysis Visit Durations for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	24.62	25.15	17.00	14.75	23.39	20.21
Lay	9.18	10.15	6.93	5.89	8.17	6.99

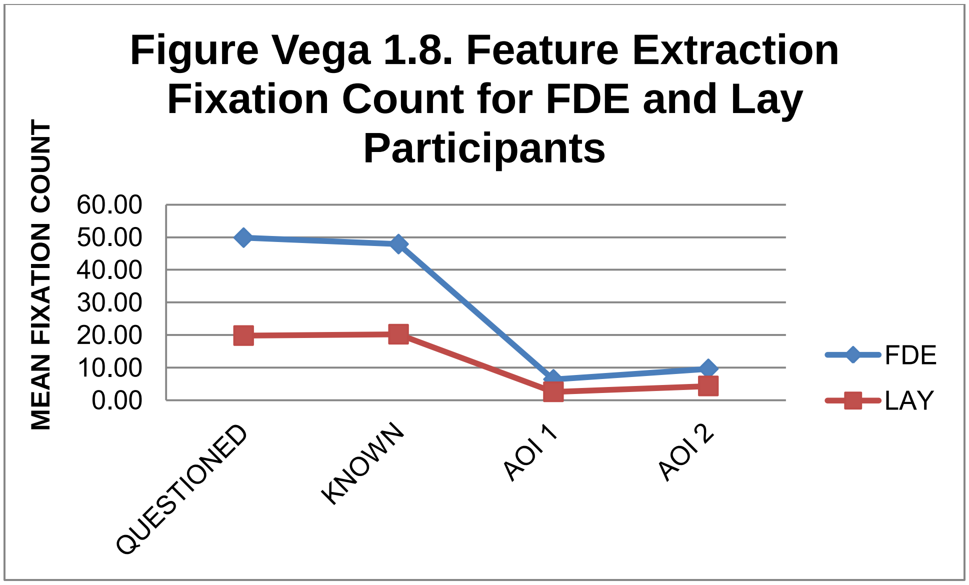
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .193, $F(4, 84) = 5.01$, $p = .001$, multivariate $\eta^2 = .193$. Figure Vega 1.8 presents the mean fixation counts by AOI.

Figure Vega 1.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all but one area of interest. Total fixation count for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for lay participants, $F(1, 87) = 17.57$, $p < .001$, partial $\eta^2 = .168$, and $F(1, 87) = 16.54$, $p < .001$, partial $\eta^2 = .160$.

Fixation count in both AOIs was significantly greater for FDEs than for lay participants (AOI 1, $F(1, 87) = 18.64$, $p < .001$, partial $\eta^2 = .176$; AOI 2, $F(1, 87) = 16.13$, $p < .001$, partial $\eta^2 = .156$). Table Vega 1.5 presents the means and standard deviations for areas of interest by participant type.

Table Vega 1.5
Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

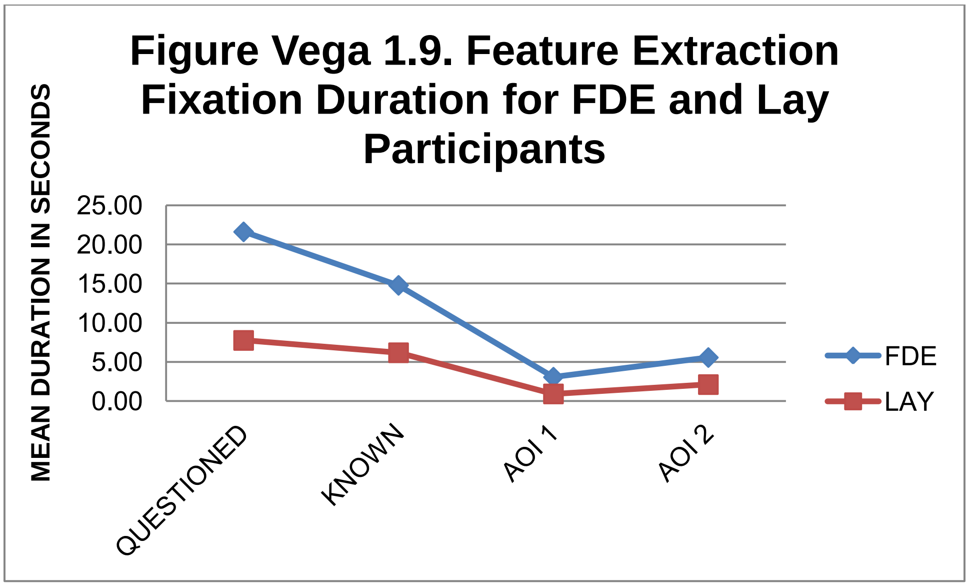
	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	49.85	44.27	47.87	41.35	6.39	5.25	9.61	7.88

Lay	19.81	16.24	20.23	17.16	2.58	2.52	4.37	3.42

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .198, $F(4, 84) = 5.19$, $p = .001$, multivariate $\eta^2 = .198$. Figure Vega 1.9 presents the mean fixation counts by AOI.

Figure Vega 1.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for lay participants, $F(1, 87) = 20.97$, $p < .001$, partial $\eta^2 = .194$, and F(1, 87) = 16.99, $p < .001$, partial $\eta^2 = .163$.

Fixation duration in both AOIs was significantly greater for FDEs than for lay participants (AOI 1, $F(1, 87) = 17.47$, $p < .001$, partial $\eta^2 = .167$; AOI 2, $F(1, 87) = 17.66$, $p < .001$, partial $\eta^2 = .169$). Table Vega 1.6 presents the means and standard deviations for areas of interest by participant type.

Table Vega 1.6

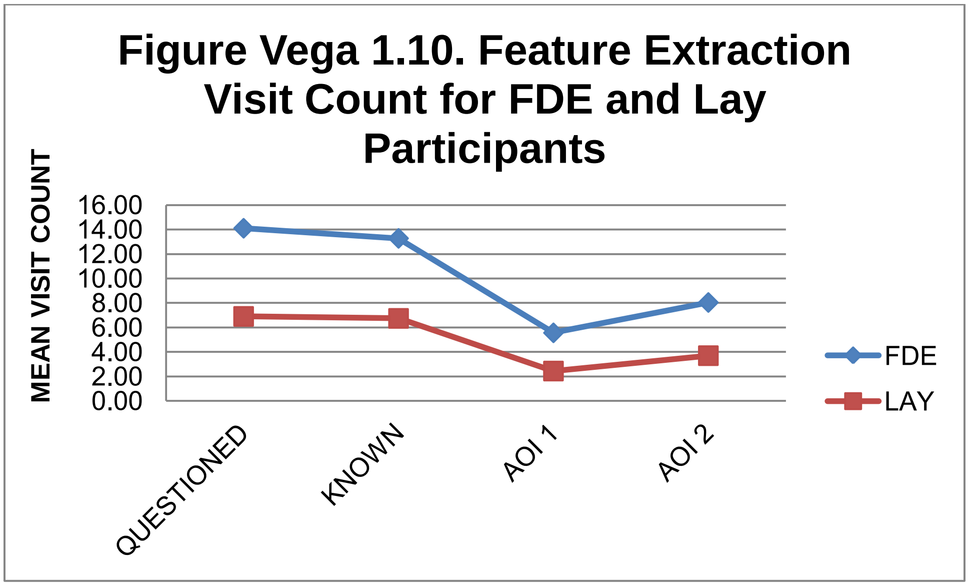
Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	21.62	18.75	14.78	12.67	3.06	3.21	5.57	5.09
Lay	7.76	6.72	6.18	5.34	0.92	1.01	2.11	1.83

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .191, $F(4, 84) = 9.12$, $p = .001$, multivariate $\eta^2 = .191$. Figure Vega 1.10 presents the mean visit counts by AOI.

Figure Vega 1.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for lay participants, $F(1, 87) = 17.93$, $p < .001$, partial $\eta^2 = .171$, and F(1, 87) = 18.00, $p < .001$, partial $\eta^2 = .171$.

Visit counts in all AOI were significantly greater for FDEs than for lay participants (AOI 1 ($F(1, 87) = 16.26$, $p < .001$, partial $\eta^2 = .157$; AOI 2 ($F(1, 87) = 18.29$, $p < .001$, partial $\eta^2 = .174$). Table Vega 1.7 presents the means and standard deviations for areas of interest by participant type.

Table Vega 1.7

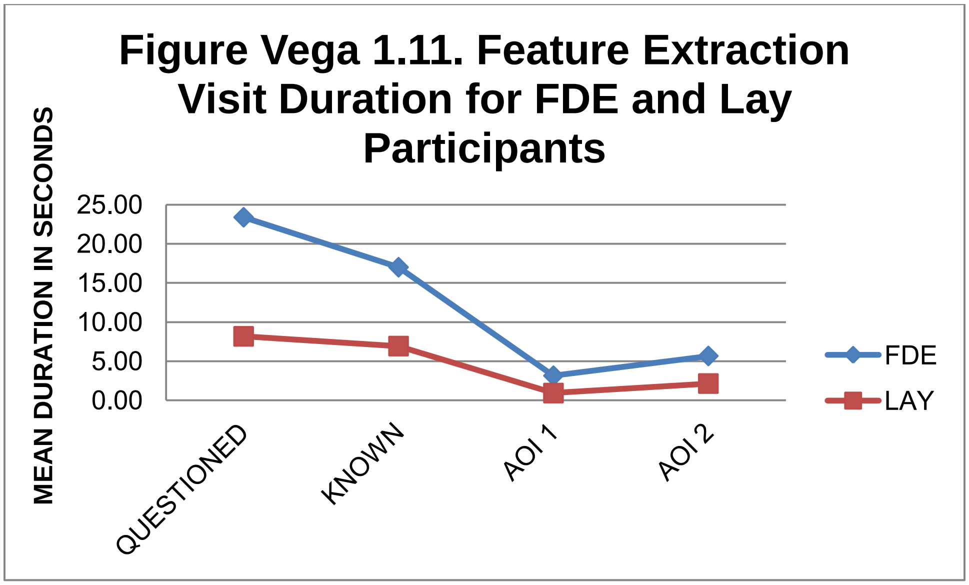
Feature Extraction Analysis Visit Count for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	14.11	9.92	13.28	8.95	5.57	4.51	8.04	6.18
Lay	6.91	5.26	6.74	4.86	2.44	2.40	3.70	2.57

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .208, $F(4, 84) = 18.14$, $p = .001$, multivariate $\eta^2 = .208$. Figure Vega 1.11 presents the mean visit counts by AOI.

Figure Vega 1.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit duration in all areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for lay participants, $F(1, 87) = 21.92$, $p < .001$, partial $\eta^2 = .201$, and $F(1, 87) = 17.45$, $p < .001$, partial $\eta^2 = .167$.

Visit duration in both AOIs was significantly greater for FDEs than for lay participants (AOI 1 ($F(1, 87) = 18.22$, $p < .001$, partial $\eta^2 = .173$; AOI 2 ($F(1, 87) = 17.88$, $p < .001$, partial $\eta^2 = .170$). Table Vega 1.8 presents the means and standard deviations for areas of interest by participant type.

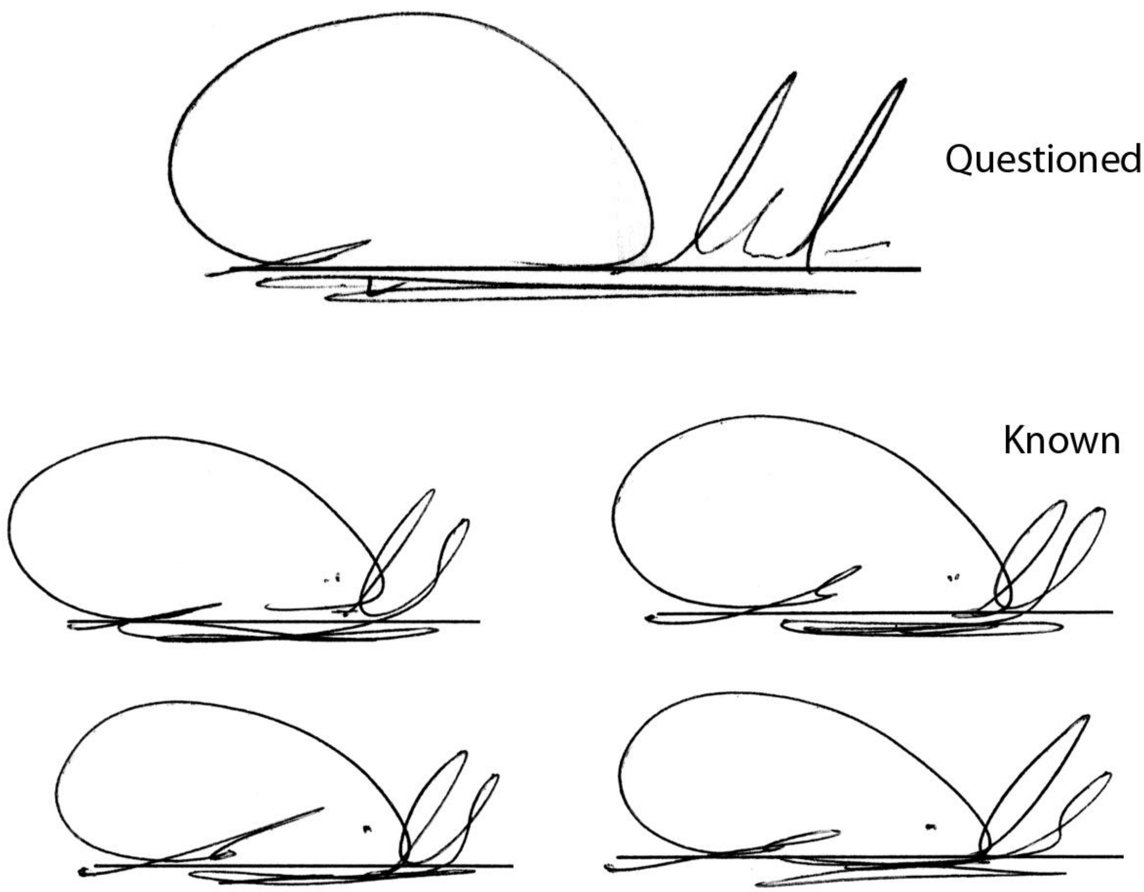
Table Vega 1.8
Feature Extraction Analysis Visit Count for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	23.39	20.21	17.00	14.75	3.15	3.27	5.67	5.17
Lay	8.17	6.99	6.93	5.89	0.93	1.01	2.14	1.83

Vega Signature 2: Disguised (Non-Genuine)

This signature is a disguised specimen of the signature of Ricardo Vega, which is characterized as a low-complexity, stylized-type signature. Of the 49 FDE participants, 42 responded correctly that the signature was non-genuine, and 7 responded that it was genuine. Of the 43 Lay participants, 42 responded correctly that the signature was non-genuine, and 1 responded that it was genuine. This difference was statistically significant, χ^2 (2, N = 92) = 4.12, p = .042. Figure Vega 2.1 presents the comparison view of this signature.

Figure Vega 2.1 Questioned-Known Comparison Stimulus for Vega Signature 2.

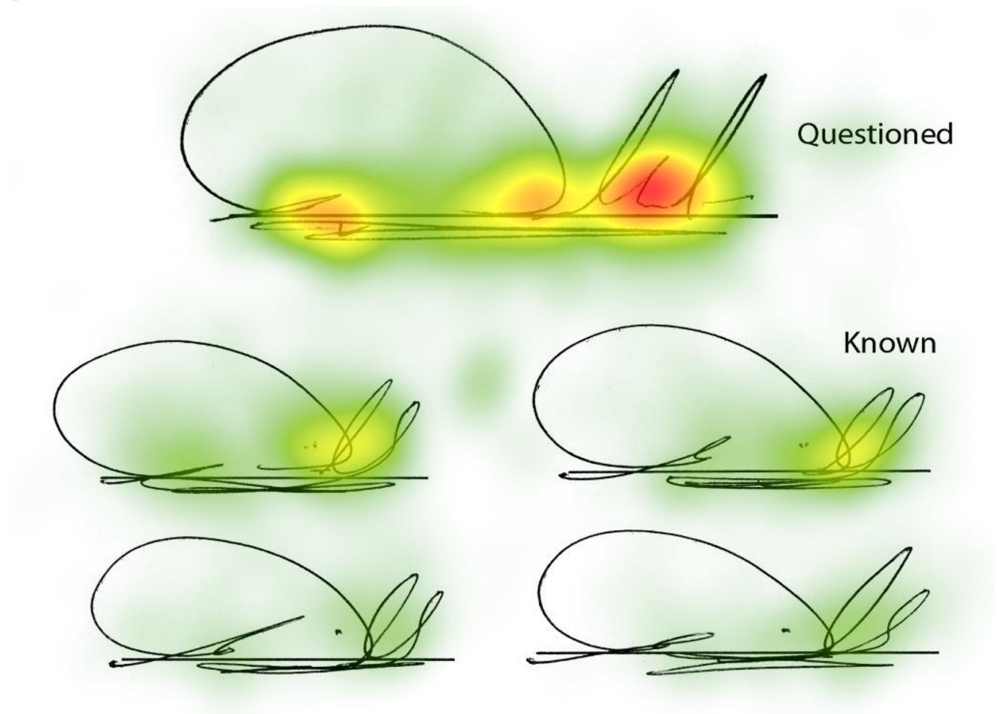


Selection of Areas of Interest (AOIs)

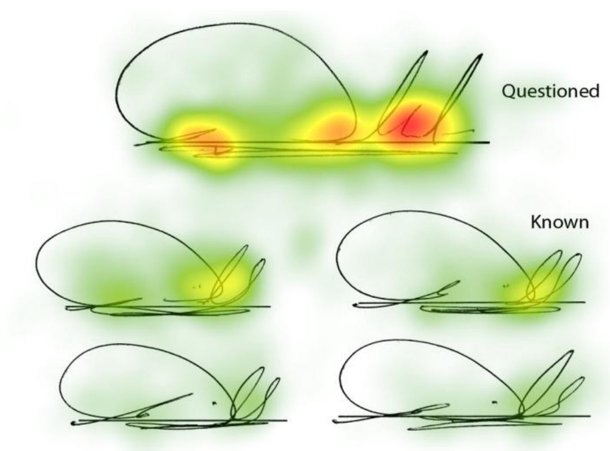
Figure Vega 2.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were two locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of two AOIs for this stimulus. Figure Vega 2.3 presents the location of the AOIs identified in the heat map.

Figure Vega 2.2. Heat map for Vega Signature 2, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

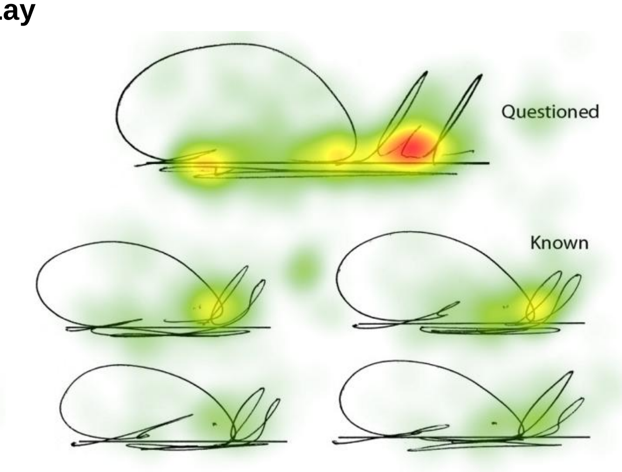
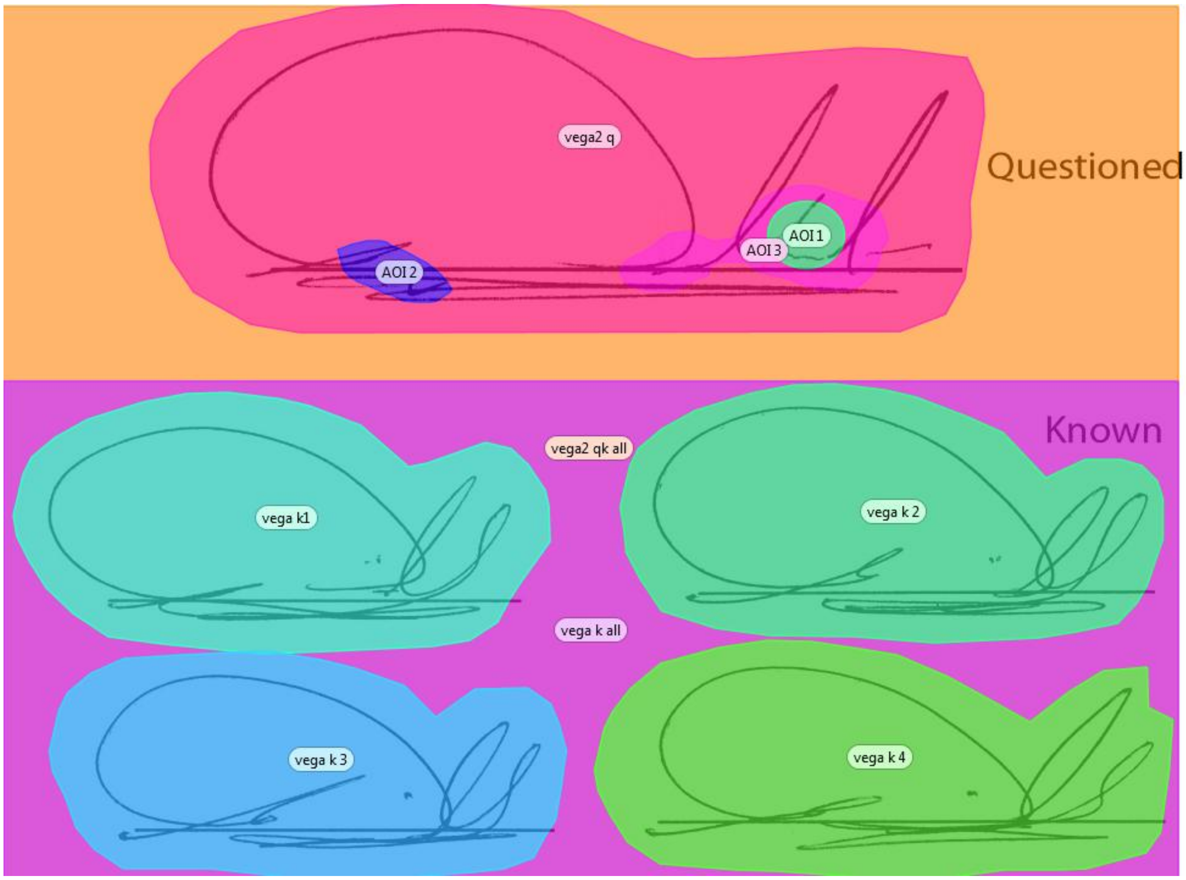


Figure Vega 2.3. Areas of Interest (AOIs) for Vega Signature 2.



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

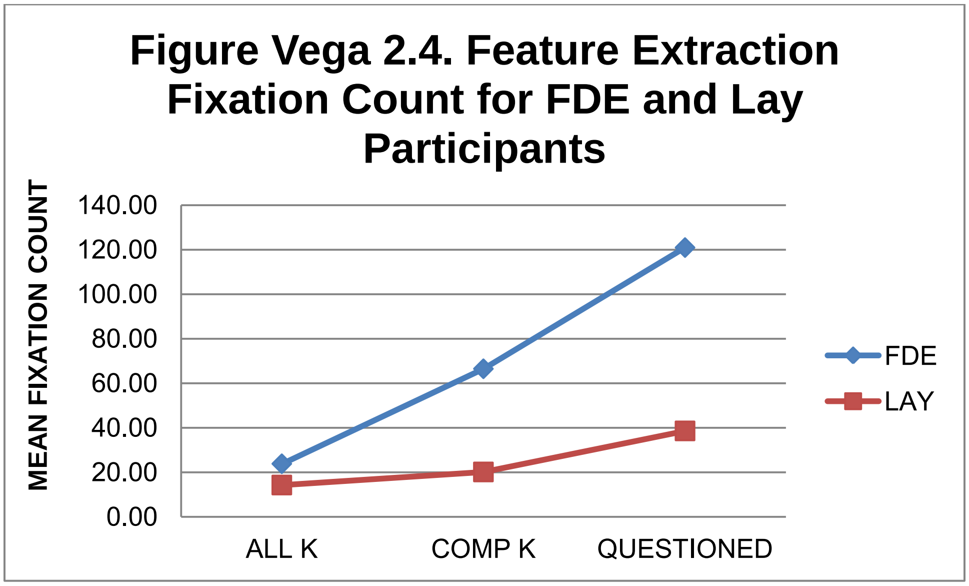
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Vega known signature stimulus (Knowns, not pictured here), Vega 1 K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Vega 2Q (the Vega questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 2) are included in subsequent analyses.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .328, $F(3, 86) = 13.98$, $p < .001$, multivariate $\eta^2 = .328$. Figure Vega 2.4 presents the mean fixation counts by AOI.

Figure Vega 2.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all of the areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for lay participants, $F(1, 88) = 33.50$, $p < .001$, partial $\eta^2 = .276$; $F(1, 88) = 40.83$, $p > .001$, partial $\eta^2 = .317$.

Fixation count in the known signature stimulus (ALL K) was also statistically significant, $F(1, 88) = 4.93$, $p = .029$, partial $\eta^2 = .053$. Table Vega 2.1 resents the means and standard deviations for areas of interest by participant type.

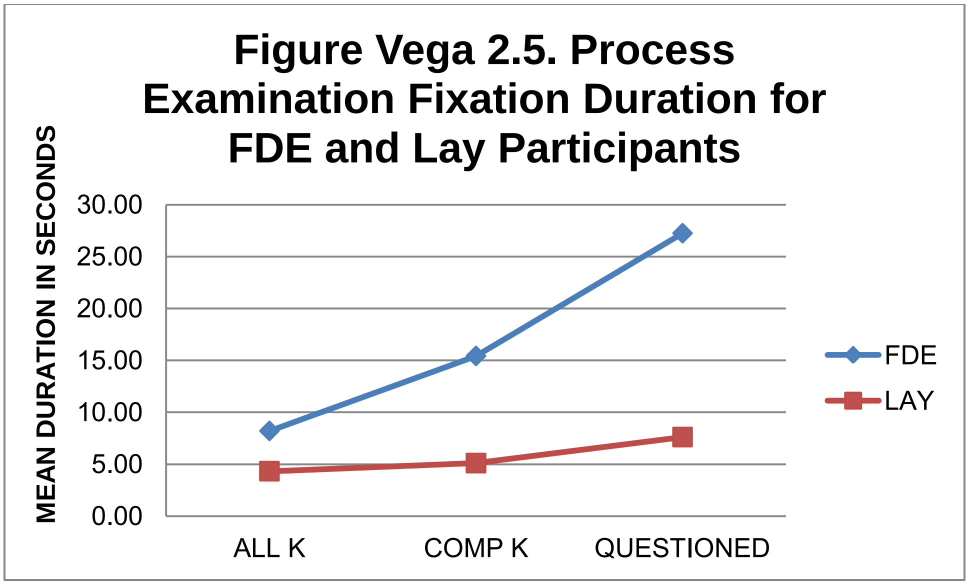
Table Vega 2.1
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	23.77	26.86	66.45	42.99	120.89	85.06
Lay	14.21	9.06	20.09	21.27	38.53	40.02

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .330, $F(3, 86) = 14.10$, $p < .001$, multivariate $\eta^2 = .330$. Figure Vega 2.5 presents the mean fixation duration by AOI.

Figure Vega 2.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for lay participants, $F(1, 88) = 39.05$, $p > .001$, partial $\eta^2 = .307$; $F(1, 88) = 19.30$, $p < .001$, partial $\eta^2 = .180$.

Fixation duration in the known signature stimulus (ALL K) was also statistically significant, $F(1, 88) = 4.91$, $p = .029$, partial $\eta^2 = .053$. Table Vega 2.2 presents the means and standard deviations for areas of interest by participant type.

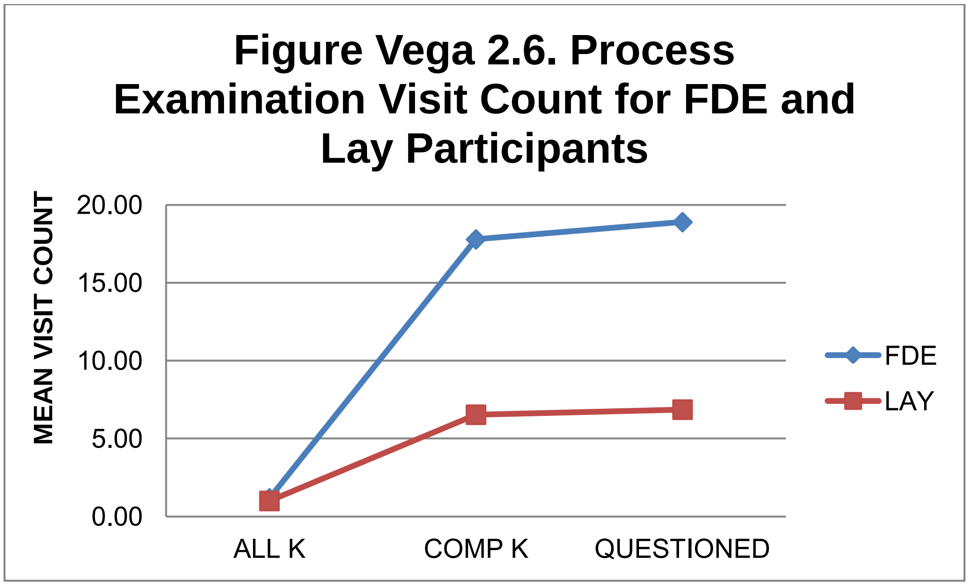
Table Vega 2.2
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	8.19	11.10	15.42	14.33	27.24	19.06
Lay	4.32	2.99	5.09	5.90	7.60	8.17

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .241, $F(3, 86) = 9.12$, $p < .001$, multivariate $\eta^2 = .241$. Figure Vega 2.6 presents the mean visit durations by AOI.

Figure Vega 2.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in two of the three of the areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for lay participants, $F(1, 88) = 26.68$, $p > .001$, partial $\eta^2 = .233$; known signature comparison stimulus, $F(1, 88) = 25.43$, $p < .001$, partial $\eta^2 = .224$.

Visit count in the known signature stimulus (ALL K) was not statistically significant, $p = .051$, *ns*. Table Vega 2.3 presents the means and standard deviations for areas of interest by participant type.

Table Vega 2.3

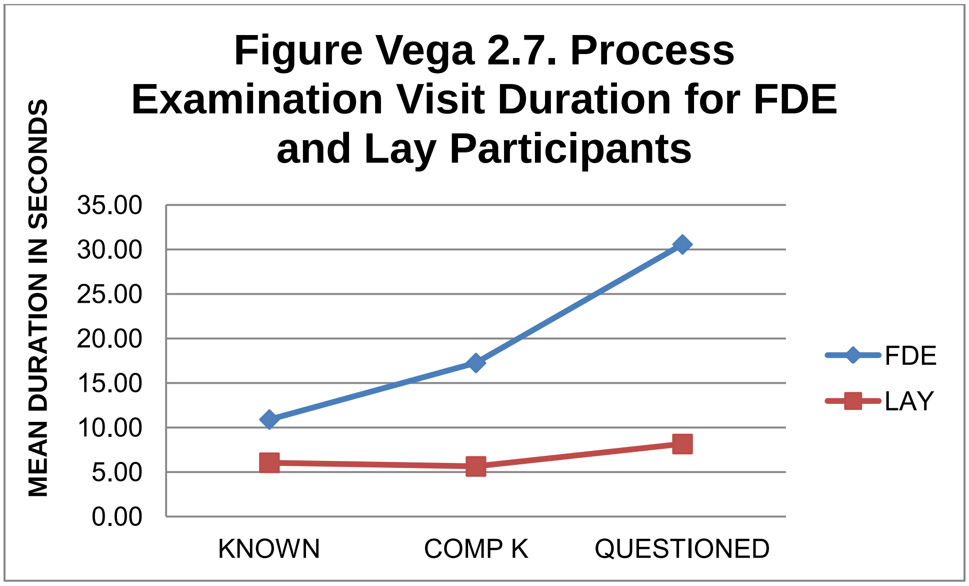
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.17	0.48	17.79	13.02	18.89	13.61
Lay	1.00	0.31	6.53	6.97	6.86	7.25

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .363, $F(3, 86) = 16.35$, $p < .001$, multivariate $\eta^2 = .363$. Figure Vega 2.7 presents the mean visit durations by AOI.

Figure Vega 2.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit duration in two of the three of the areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for lay participants, $F(1, 88) = 45.49$, $p > .001$, partial $\eta^2 = .341$; $F(1, 88) = 19.55$, $p < .001$, partial $\eta^2 = .182$.

Visit duration in the known signature stimulus was also statistically significant, $F(1, 88) = 5.28$, $p < .024$, partial $\eta^2 = .057$. Table Vega 2.4 presents the means and standard deviations for areas of interest by participant type.

Table Vega 2.4

Process Analysis Visit Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	10.90	13.16	17.25	16.17	30.56	20.22
Lay	6.04	4.48	5.63	6.22	8.15	8.48

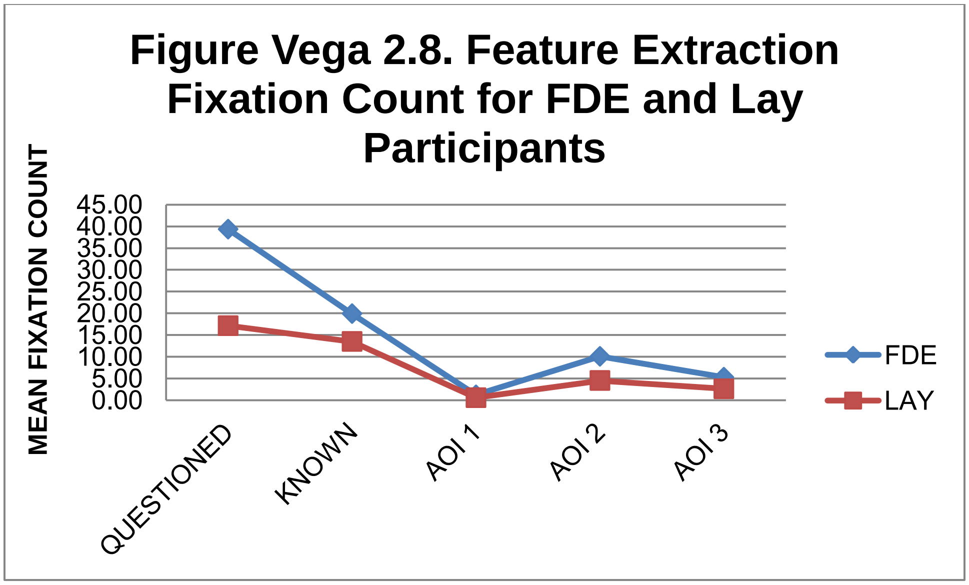
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .369, *F*(5, 84) = 9.81, $p < .001$, multivariate $\eta^2 = .369$. Figure Vega 2.8 presents the mean fixation counts by AOI.

Figure Vega 2.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for lay participants, *F*(1, 88) = 28.24, $p < .001$, partial $\eta^2 = .243$, and F(1, 88) = 4.11, $p = .046$, partial $\eta^2 = .045$.

Fixation count in all AOIs was significantly greater for FDEs than for lay participants (AOI 1, *F*(1, 88) = 7.87, $p = .006$, partial $\eta^2 = .082$; AOI 2, *F*(1, 88) = 19.72, $p < .001$, partial $\eta^2 = .183$; AOI 3, *F*(1, 88) = 12.00, $p = .001$, partial $\eta^2 = .120$). Table Vega 2.5 presents the means and standard deviations for areas of interest by participant type.

Table Vega 2.5
Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

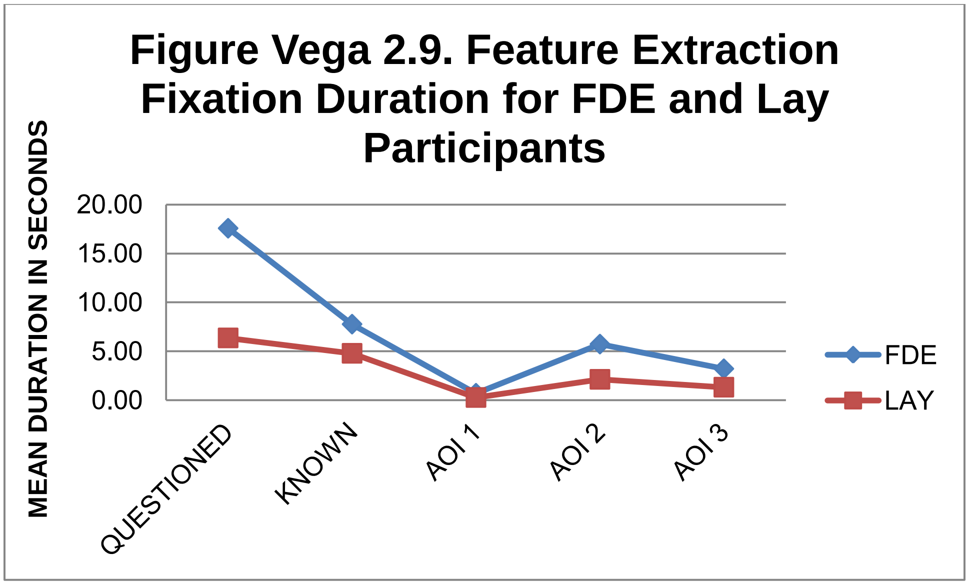
	QUESTIONED		KNOWN		AOI 1		AOI 2		AOI 3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***

FDE	39.34	24.32	19.91	16.49	1.23	1.27	10.09	7.28	5.30	4.54
Lay	17.14	13.16	13.51	13.10	0.58	0.88	4.53	3.92	2.63	2.32

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .409, $F(5, 84) = 11.63$, $p < .001$, multivariate $\eta^2 = .409$. Figure Vega 2.9 presents the mean fixation durations by AOI.

Figure Vega 2.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for lay participants, $F(1, 88) = 34.60$, $p < .001$, partial $\eta^2 = .282$, and $F(1, 88) = 5.14$, $p = .026$, partial $\eta^2 = .055$.

Fixation duration in all AOIs was significantly greater for FDEs than for lay participants (AOI 1, $F(1, 88) = 8.35$, $p = .005$, partial $\eta^2 = .087$; AOI 2, $F(1, 88) = 21.18$, $p < .001$, partial $\eta^2 = .194$; AOI 3, $F(1, 88) = 15.18$, $p < .001$, partial $\eta^2 = .147$). Table Vega 2.6 presents the means and standard deviations for areas of interest by participant type.

Table Vega 2.6

Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

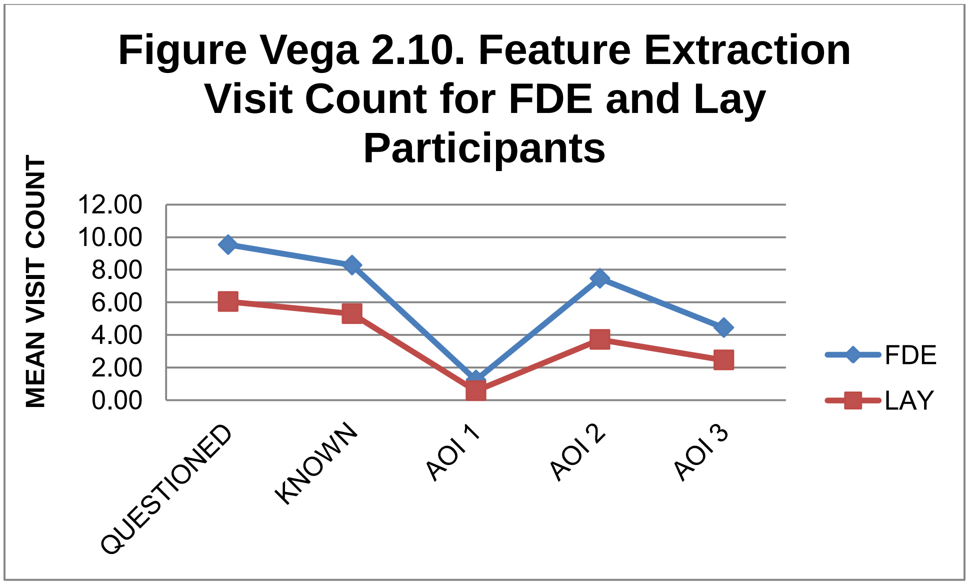
	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**		**AOI 3**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***

FDE	17.56	11.34	7.76	7.43	0.70	0.89	5.72	4.60	3.20	2.89
Lay	6.35	5.48	4.78	4.55	0.27	0.43	2.12	2.37	1.32	1.38

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .243, *F*(5, 84) = 5.39, *p* = .001, multivariate η^2 = .243. Figure Vega 2.10 presents the mean visit counts by AOI.

Figure Vega 2.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for lay participants, *F*(1, 88) = 8.47, *p* = .005, partial η^2 = .088, and F(1, 88) = 6.67, *p* = .011, partial η^2 = .070.

Visit counts in all AOI were significantly greater for FDEs than for lay participants (AOI 1 (*F*(1, 88) = 7.87, *p* = .001, partial η^2 = .082; AOI 2 (*F*(1, 88) = 18.20, *p* < .001, partial η^2 = .171; AOI 3 (*F*(1, 88) = 10.71, *p* = .002, partial η^2 = .109). Table Vega 2.7 presents the means and standard deviations for areas of interest by participant type.

Table Vega 2.7

Feature Extraction Analysis Visit Count for FDE and Lay Participants

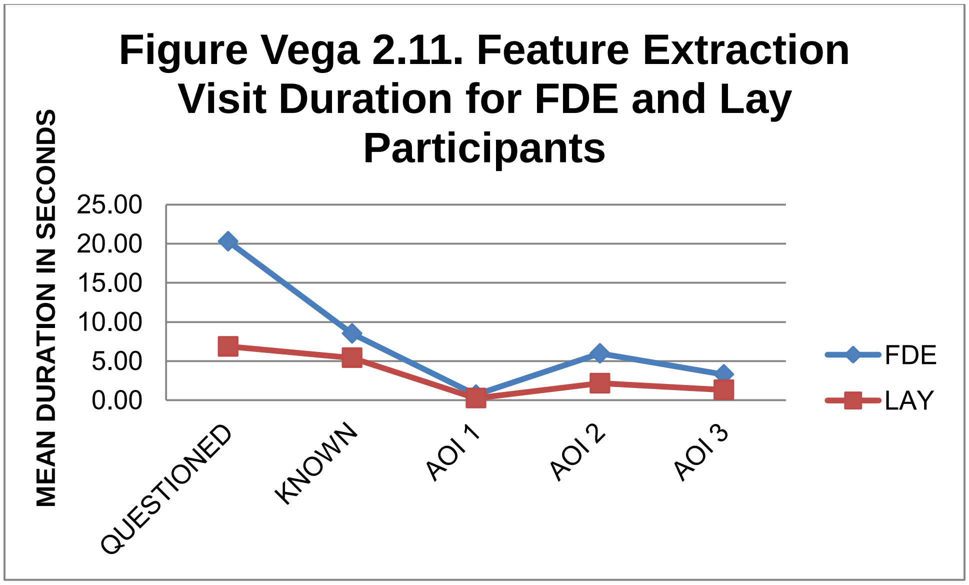
	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**		**AOI 3**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***

FDE	9.53	6.61	8.28	6.31	1.23	1.27	7.47	5.12	4.45	3.48
Lay	6.05	4.43	5.30	4.34	0.58	0.88	3.72	2.75	2.47	1.99

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .393, $F(5, 84) = 10.87$, $p < .001$, multivariate $\eta^2 = .393$. Figure Vega 2.11 presents the mean visit durations by AOI.

Figure Vega 2.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit duration in all areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for lay participants, $F(1, 88) = 38.82$, $p < .001$, partial $\eta^2 = .306$, and F(1, 88) = 4.67, $p = .033$, partial $\eta^2 = .050$.

Visit duration in all AOIs was significantly greater for FDEs than for lay participants (AOI 1 ($F(1, 88) = 8.35$, $p = .005$, partial $\eta^2 = .087$; AOI 2 ($F(1, 88) = 21.78$, $p < .001$, partial $\eta^2 = .198$; AOI 3 ($F(1, 88) = 15.21$, $p < .001$, partial $\eta^2 = .147$). Table Vega 2.8 presents the means and standard deviations for areas of interest by participant type.

Table Vega 2.8

Feature Extraction Analysis Visit Duration for FDE and Lay Participants

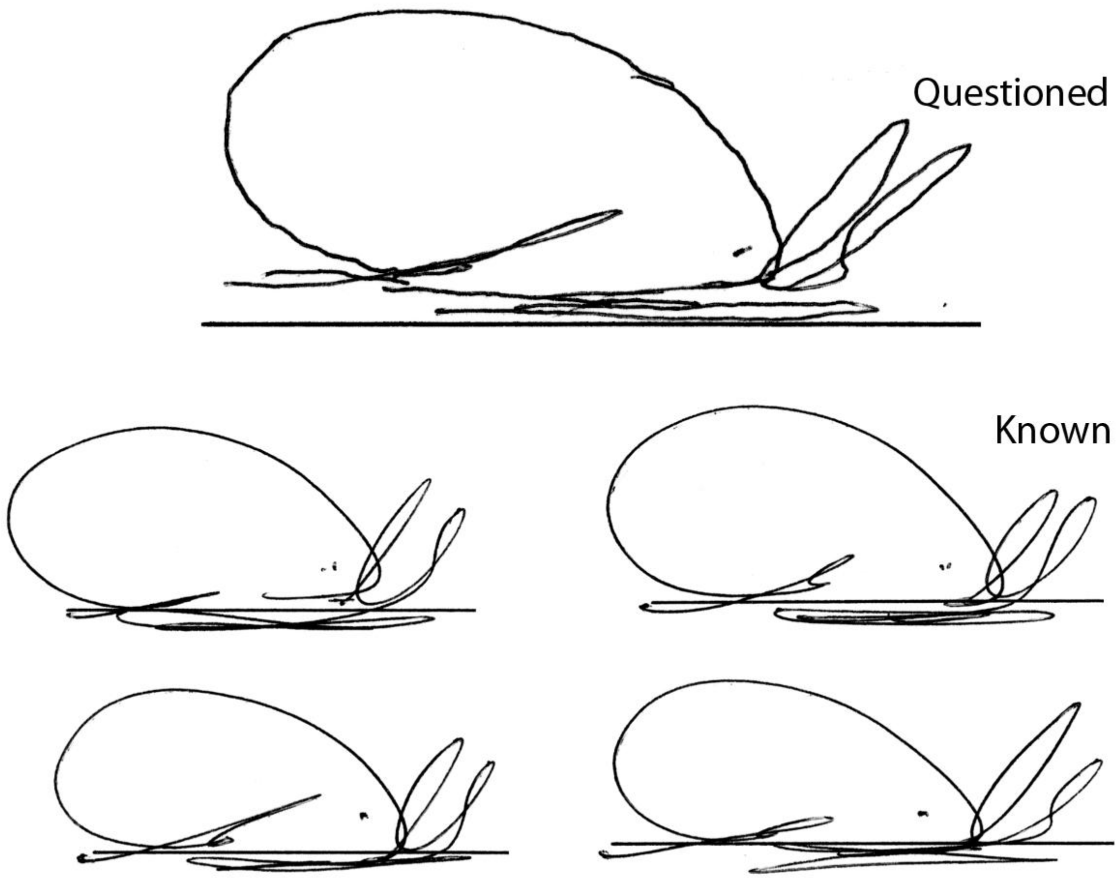
	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**		**AOI 3**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***

FDE	20.30	13.08	8.52	7.93	0.70	0.89	5.97	4.81	3.29	3.02
Lay	6.86	5.60	5.42	5.29	0.27	0.43	2.16	2.47	1.33	1.42

Vega Signature 3: Traced (Non-Genuine)

Of the 49 FDE participants, 48 responded correctly that the signature was non-genuine, and 1 responded that it was genuine. Of the 43 Lay participants, 39 responded correctly that the signature was non-genuine, and 1 responded that it was genuine. This difference was not statistically significant, χ^2 (2, N = 92) = 2.35, *p* = .125. Figure Vega 3.1 presents the comparison view of this signature.

Figure Vega 3.1. Questioned-Known Comparison Stimulus for Vega Signature 3.

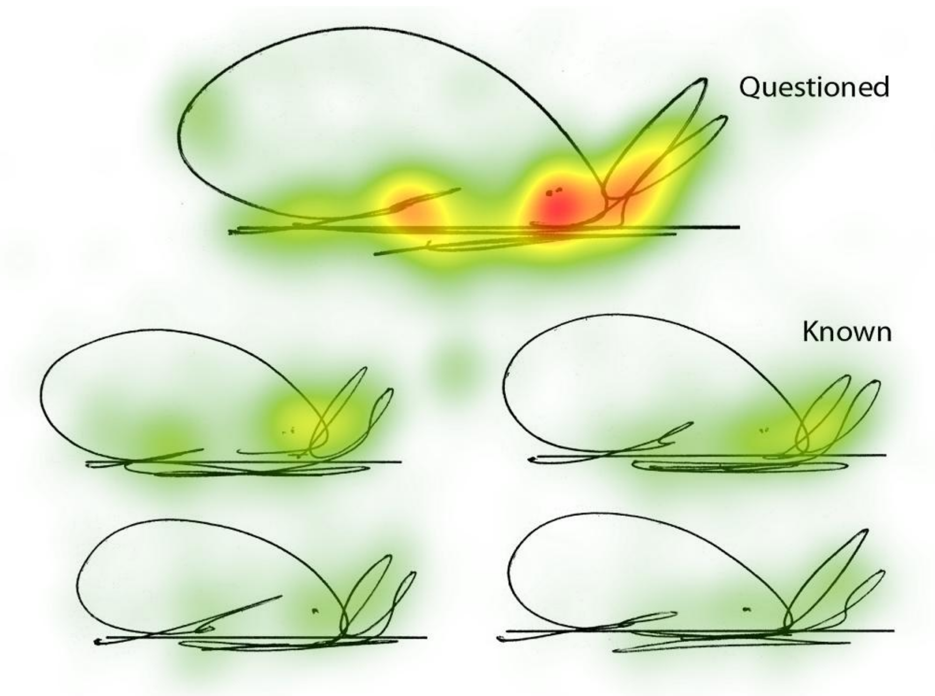


Selection of Areas of Interest (AOIs)

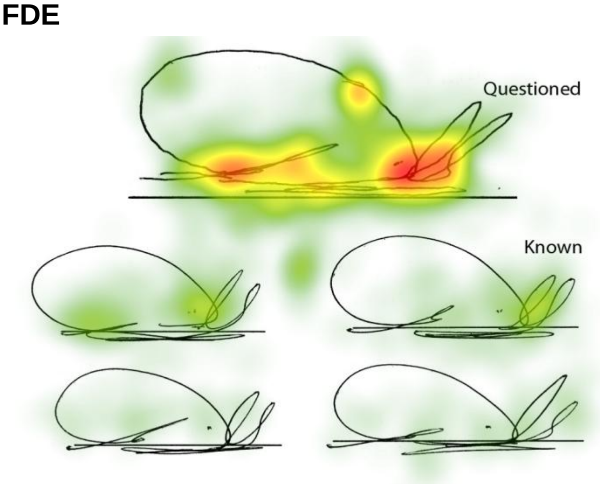
Figure Vega 3.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were four locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of four AOIs for this stimulus. Figure Vega 3.3 presents the location of the AOIs identified in the heat map.

Figure Vega 3.2. Heat map for Vega signature 3, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

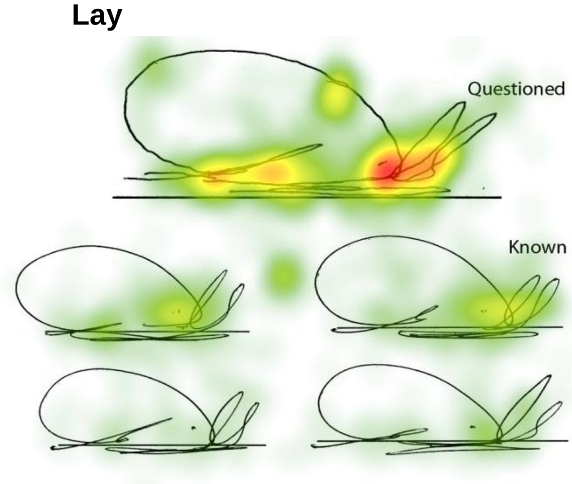
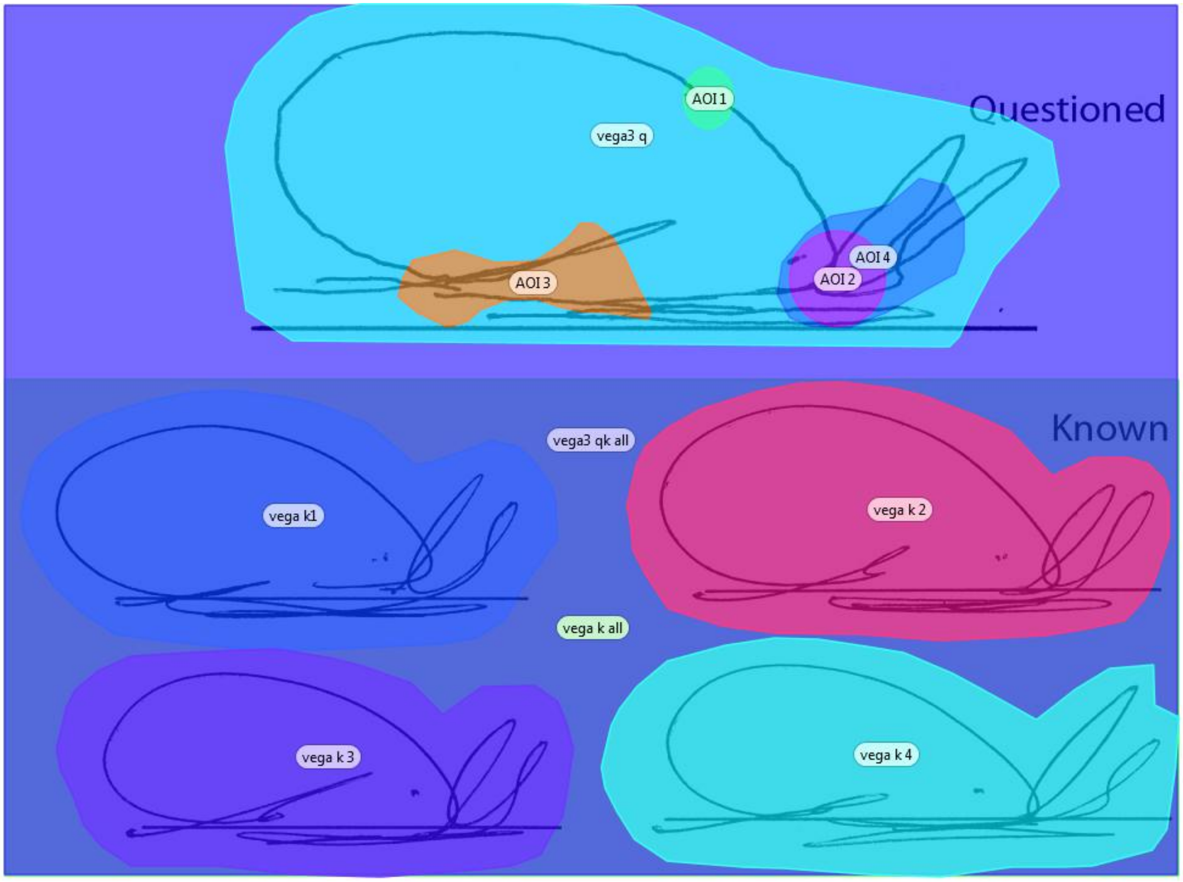


Figure Vega 3.3. Areas of Interest (AOIs) for Vega Signature 3.



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

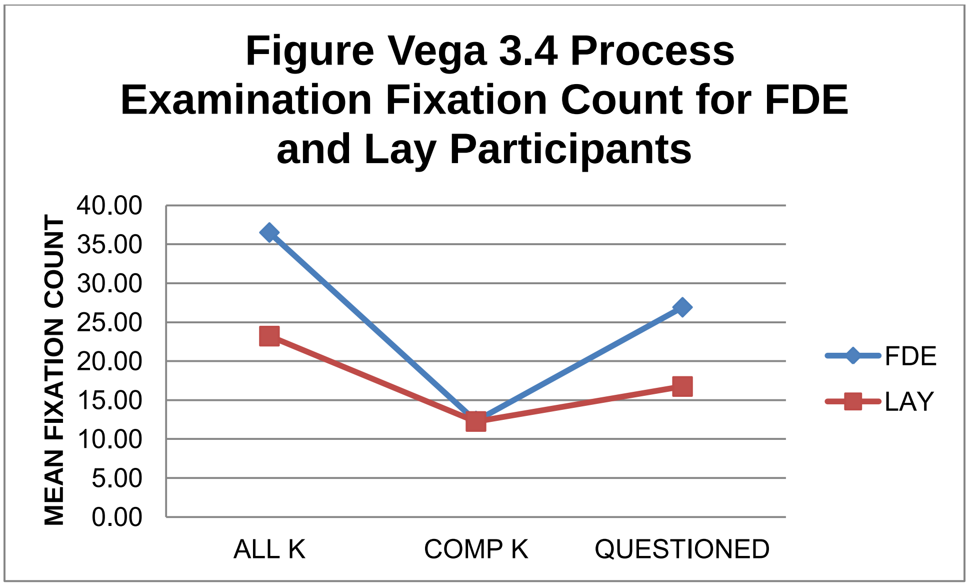
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Vega known signature stimulus (Knowns, not pictured here), Vega K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Vega 3Q (the Vega questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 4) are included in subsequent analyses.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .247, $F(3, 86) = 9.39$, $p < .001$, multivariate $\eta^2 = .247$. Figure Vega 3.4 presents the mean fixation counts by AOI.

Figure Vega 3.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in one of the three areas of interest. Total fixation count for the questioned signature was significantly greater for FDEs than for lay participants, $F(1, 88) = 8.04$, $p = .006$, partial $\eta^2 = .084$.

Fixation count in the known signature comparison stimulus (COMP K) and the known signature stimulus (ALL K) were not statistically significant, $p = .981$, *ns*; $p = .126$, *ns*. Table Vega 3.1 presents the means and standard deviations for areas of interest by participant type.

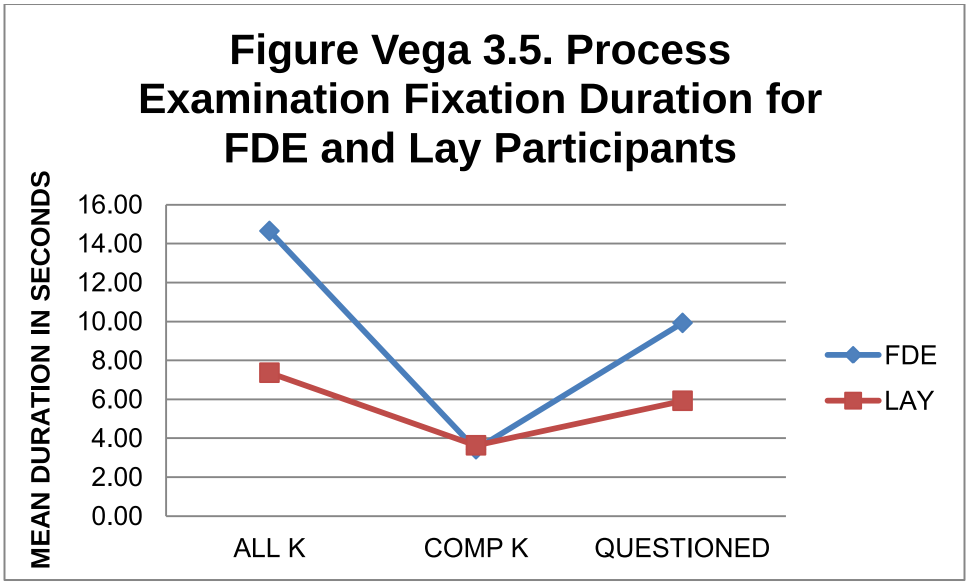
Table Vega 3.1
Process Analysis Fixation Counts for FDE and Lay Participants

	Knows		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	36.51	52.85	12.32	14.31	26.91	20.01
Lay	23.21	20.53	12.26	10.90	16.74	12.92

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .230, $F(3, 86) = 8.56$, $p < .001$, multivariate $\eta^2 = .230$. Figure Vega 3.5 presents the mean fixation duration by AOI.

Figure Vega 3.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in one of the three areas of interest. Total fixation duration for the questioned signature was significantly greater for FDEs than for lay participants, (questioned signature, $F(1, 88) = 8.91$, $p = .004$, partial $\eta^2 = .092$).

Fixation duration in the known signature comparison stimulus (COMP K) and the known signature stimulus (KNOWN K) was not statistically significant, $p = .812$, *ns*; $p = .066$, *ns*. Table Vega 3.2 presents the means and standard deviations for areas of interest by participant type.

Table Vega 3.2

Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	14.65	24.65	3.43	4.19	9.92	7.49
Lay	7.36	7.28	3.63	3.85	5.92	4.81

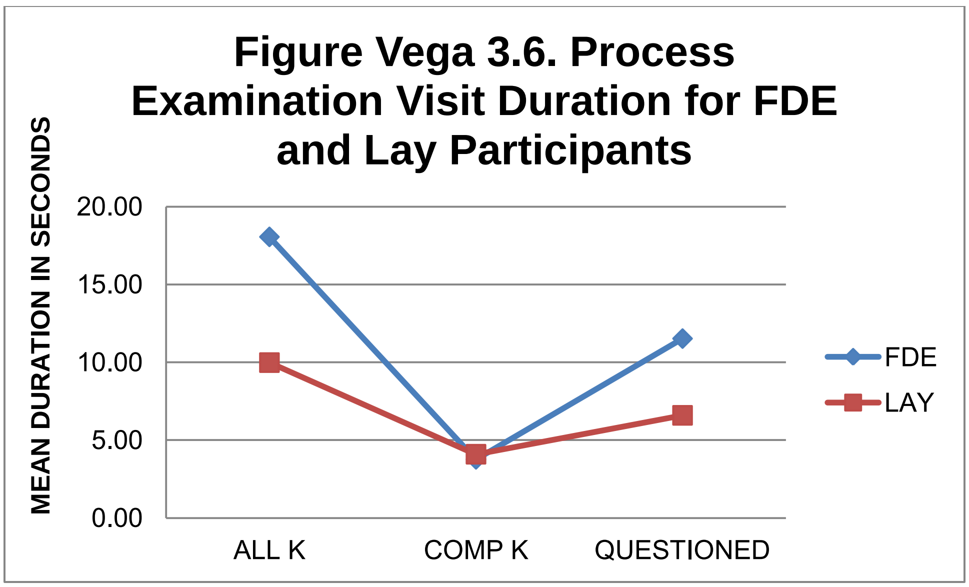
Total Visit Count

MANOVA results revealed no significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .034, p < .001, *ns*. No subsequent analyses were conducted because the full model was not statistically significant.

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .272, $F(3, 86) = 1.02$, $p < .001$, multivariate $\eta^2 = .272$. Figure Vega 3.6 presents the mean visit durations by AOI.

Figure Vega 3.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit duration in one of the three of the areas of interest. Total visit duration for the questioned signature was significantly greater for FDEs than for lay participants, $F(1, 88) = 11.86$, $p = .001$, partial $\eta^2 = .119$.

Visit duration in the known signature comparison stimulus (COMP K) and the known signature stimulus (ALL K) were not statistically significant, $p = .726$, *ns*; $p = .082$, *ns*. Table Vega 3.3 presents the means and standard deviations for areas of interest by participant type.

Table Vega 3.3

Process Analysis Visit Duration for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	18.05	28.66	3.76	4.63	11.52	8.04
Lay	9.97	9.52	4.09	4.19	6.59	5.08

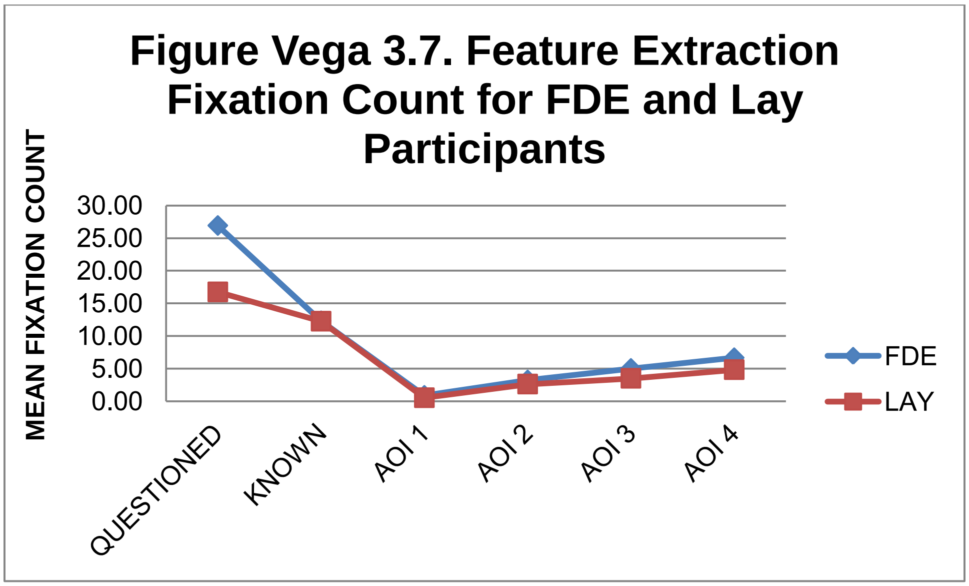
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

<u>*Total Fixation Count*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .311, $F(6, 83) = 6.24$, $p < .001$, multivariate $\eta^2 = .311$. Figure Vega 3.7 presents the mean fixation counts by AOI.

Figure Vega 3.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in one area of interest. Total fixation count for the questioned signature was significantly greater for FDEs than for lay participants, $F(1, 88) = 8.04$, $p = .006$, partial $\eta^2 = .084$. Fixation count in the known signature comparison stimulus was not significantly different, $p = .981$, *ns*.

None of the AOIs was significantly greater for FDEs than for lay participants (AOI 1, $p = .073$, *ns*; AOI 2, $p = .355$, *ns*; AOI 3, $p = .087$, *ns*; AOI 4, $p = .127$, *ns*). Table Vega 3.4 presents the means and standard deviations for areas of interest by participant type.

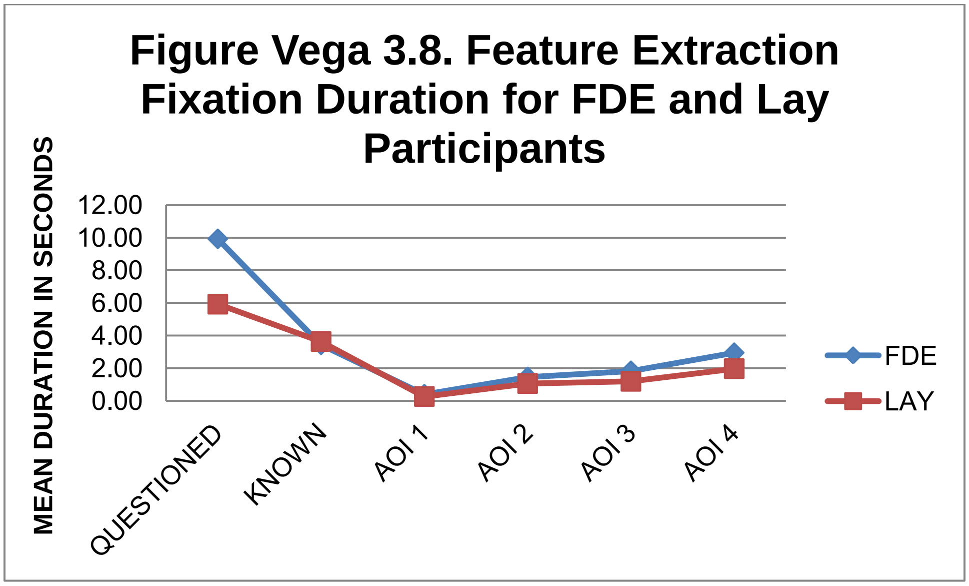
Table Vega 3.4
Process Analysis Fixation Counts for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	26.91	20.01	12.32	14.31	0.89	1.07
Lay	16.74	12.92	12.26	10.90	0.53	0.77
	AOI 2		**AOI 3**		**AOI 4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	3.26	3.66	5.02	4.45	6.66	6.08
Lay	2.63	2.59	3.51	3.74	4.84	5.01

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .246, $F(6, 83) = 4.52$, $p = .001$, multivariate $\eta^2 = .246$. Figure Vega 3.8 presents the mean fixation counts by AOI.

Figure Vega 3.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in one area of interest. Total fixation duration for the questioned signature was significantly greater for FDEs than for lay participants, $F(1, 88) = 8.91$, $p = .004$, partial $\eta^2 = .092$. Fixation duration in the known signature comparison stimulus was not significantly different, $F(1, 88) = .06$, $p = .812$, partial $\eta^2 = .001$, *ns*.

None of the AOIs was significantly greater for FDEs than for lay participants (AOI 1, $p = .178$, *ns*; AOI 2, $p = .193$, *ns*; AOI 3, $p = .050$, *ns*; AOI 4, $p = .060$, *ns*). Table Vega 3.5 presents the means and standard deviations for areas of interest by participant type.

Table Vega 3.5

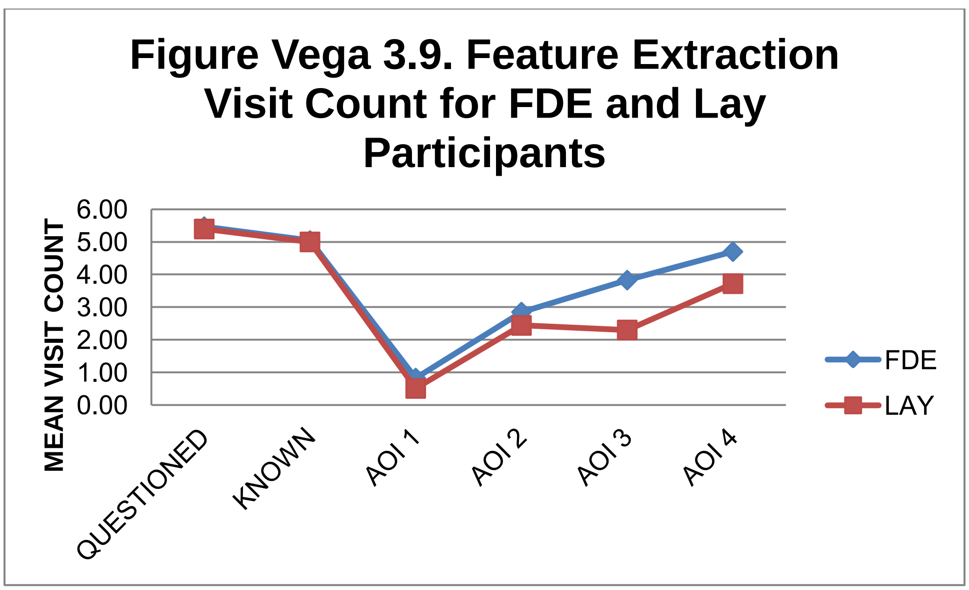
Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	9.92	7.49	3.43	4.19	0.40	0.50
Lay	5.92	4.81	3.63	3.85	0.26	0.47
	AOI 2		**AOI 3**		**AOI 4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.46	1.67	1.84	1.69	2.95	2.69
Lay	1.06	1.15	1.19	1.37	1.97	2.11

<u>*Total Visit Count*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .143, $F(6, 83) = 2.31$, $p = .041$, multivariate $\eta^2 = .143$. Figure Vega 3.9 presents the mean visit counts by AOI.

Figure Vega 3.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significantly different in only one AOI. Total visit count for the questioned signature and the known signature comparison stimulus were not significantly greater for FDEs than for lay participants, $F(1, 88) = .010$, $p = .934$, partial $\eta^2 = .000$, *ns*, and $F(1, 88) = .000$, $p = .964$, partial $\eta^2 = .000$, *ns*.

Visit counts in AOI 3 were significantly greater for FDEs than for lay participants, $F(1, 88) = 6.78$, $p = .011$, partial $\eta^2 = .072$.

No other significant differences were found among the AOIs (AOI 1, $p = .084$, *ns*; AOI 2, $p < .474$, *ns*; AOI 4, $p = .195$, *ns*). Table Vega 3.6 presents the means and standard deviations for areas of interest by participant type.

Table Vega 3.6

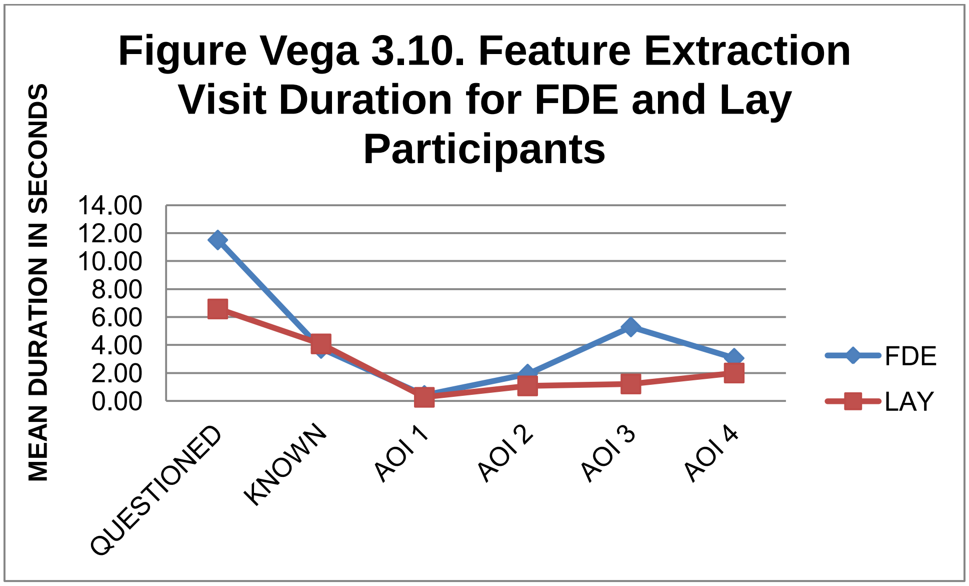
Feature Extraction Analysis Visit Count for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	5.47	4.39	5.04	4.64	0.83	0.96
Lay	5.40	3.90	5.00	4.13	0.51	0.74
	AOI 2		**AOI 3**		**AOI 4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	2.85	2.96	3.83	3.13	4.70	3.63
Lay	2.44	2.38	2.30	2.34	3.72	3.49

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .301, $F(6, 83) = 5.95$, $p < .001$, multivariate $\eta^2 = .301$. Figure Vega 3.10 presents the mean visit durations by AOI.

Figure Vega 3.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit duration in all areas of interest. Total visit duration for the questioned signature was significantly greater for FDEs than for lay participants, $F(1, 88) = 11.86$, $p = .001$, partial $\eta^2 = .119$. Visit duration for the known signature comparison stimulus was not significantly different, $F(1, 88) = .120$, $p = .726$, partial $\eta^2 = .001$, *ns*.

Visit duration in AOI 3 was significantly greater for FDEs than for lay participants, $F(1, 88) = 11.27$, $p = .044$, partial $\eta^2 = .045$.

Visit duration was not statistically significantly different in any of the remaining AOIs (AOI 1, $p = .187$, *n*s; AOI 2, $p = .200$, *ns*; AOI 4, $p < .051$, *ns*). Table Vega 3.7 presents the means and standard deviations for areas of interest by participant type.

Table Vega 3.7

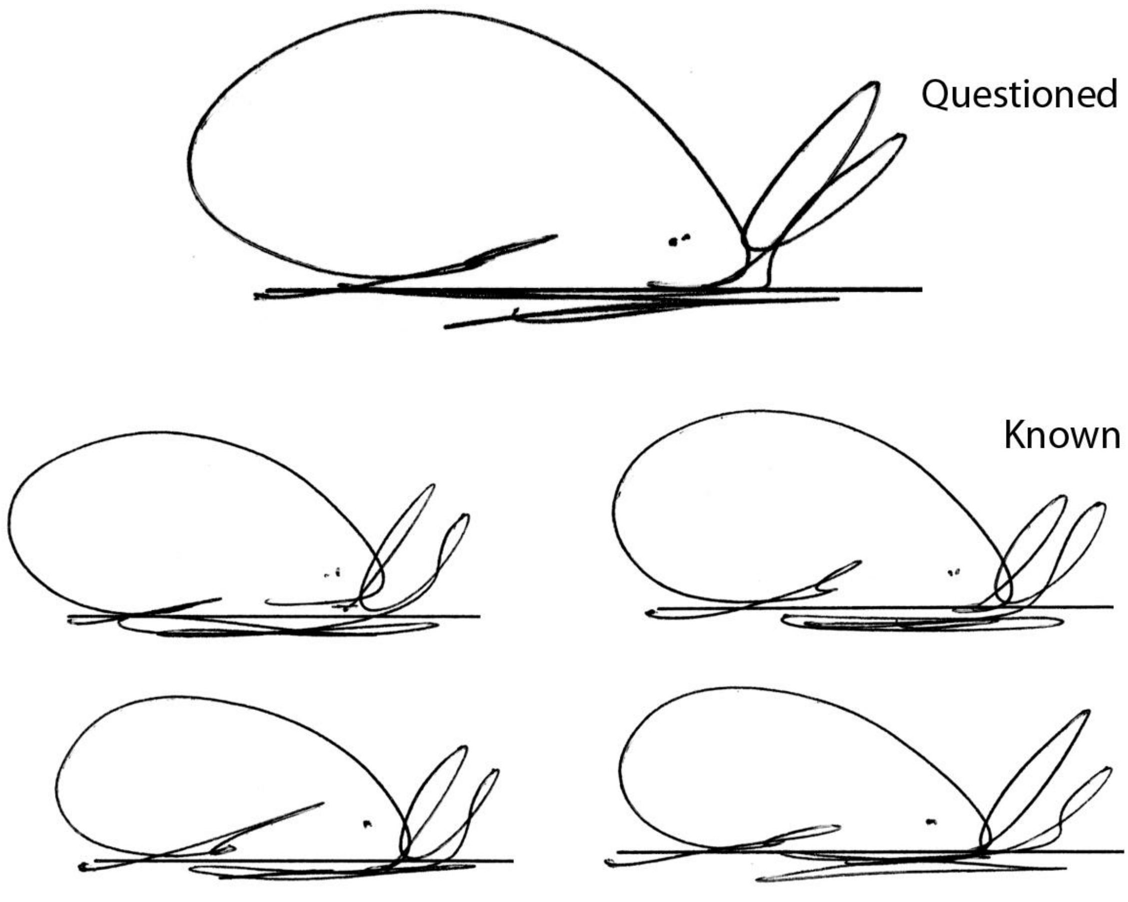
Feature Extraction Analysis Visit Duration for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	11.52	8.04	3.76	4.63	0.41	0.51
Lay	6.59	5.08	4.09	4.19	0.27	0.48
	AOI 2		**AOI 3**		**AOI 4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.49	1.72	1.93	1.82	3.06	2.82
Lay	1.08	1.17	1.22	1.44	2.01	2.18

Vega Signature 4: Genuine REPLACE ALL AOI METRIC DATA

Of the 49 FDE participants, 38 responded correctly that the signature was genuine, and 11 responded that it was non-genuine. Of the 43 Lay participants, 42 responded correctly that the signature was genuine, and 1 responded that it was non-genuine. This difference was not statistically significant, $p = .004$. Figure Vega 4.1 presents the comparison view of this signature.

Figure Vega 4.1 Questioned-Known Stimulus for Vega Signature 4.

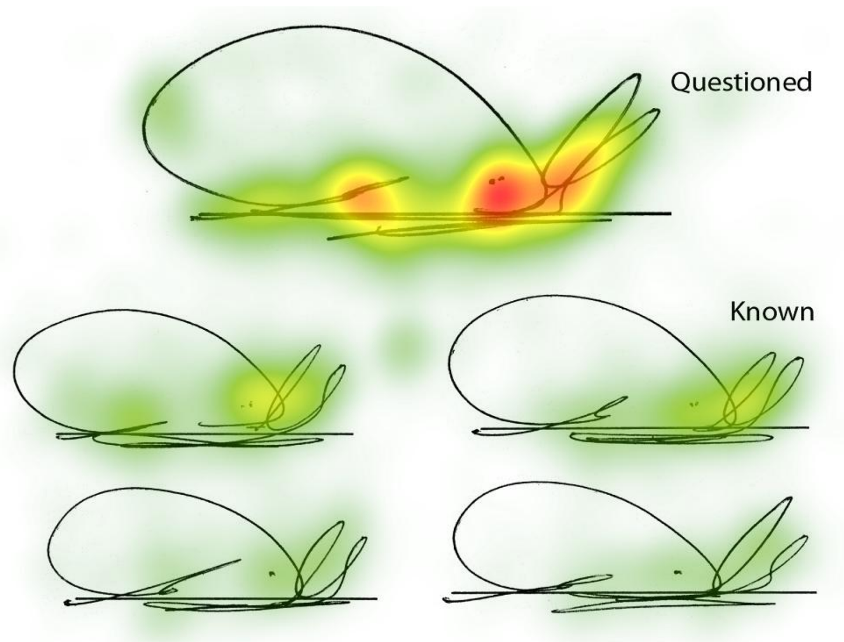


Selection of Areas of Interest (AOIs)

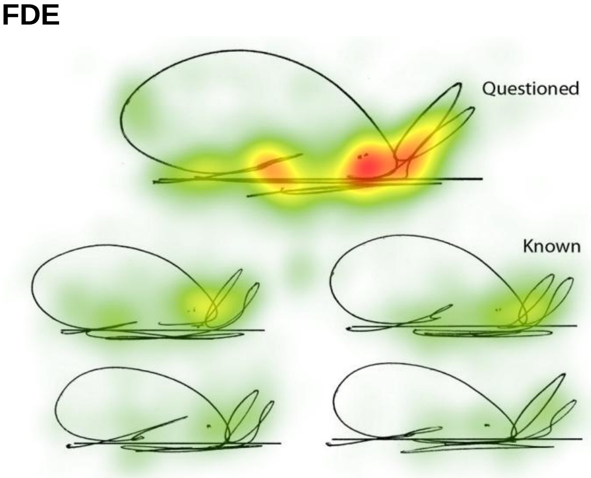
Figure Vega 4.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were four locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of four AOIs for this stimulus. Figure Vega 4.3 presents the location of the AOIs identified in the heat map.

Figure Vega 4.2 Heat map for Vega signature 4, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

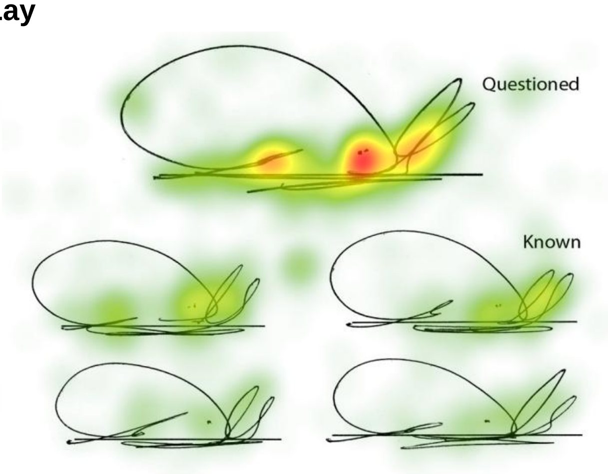
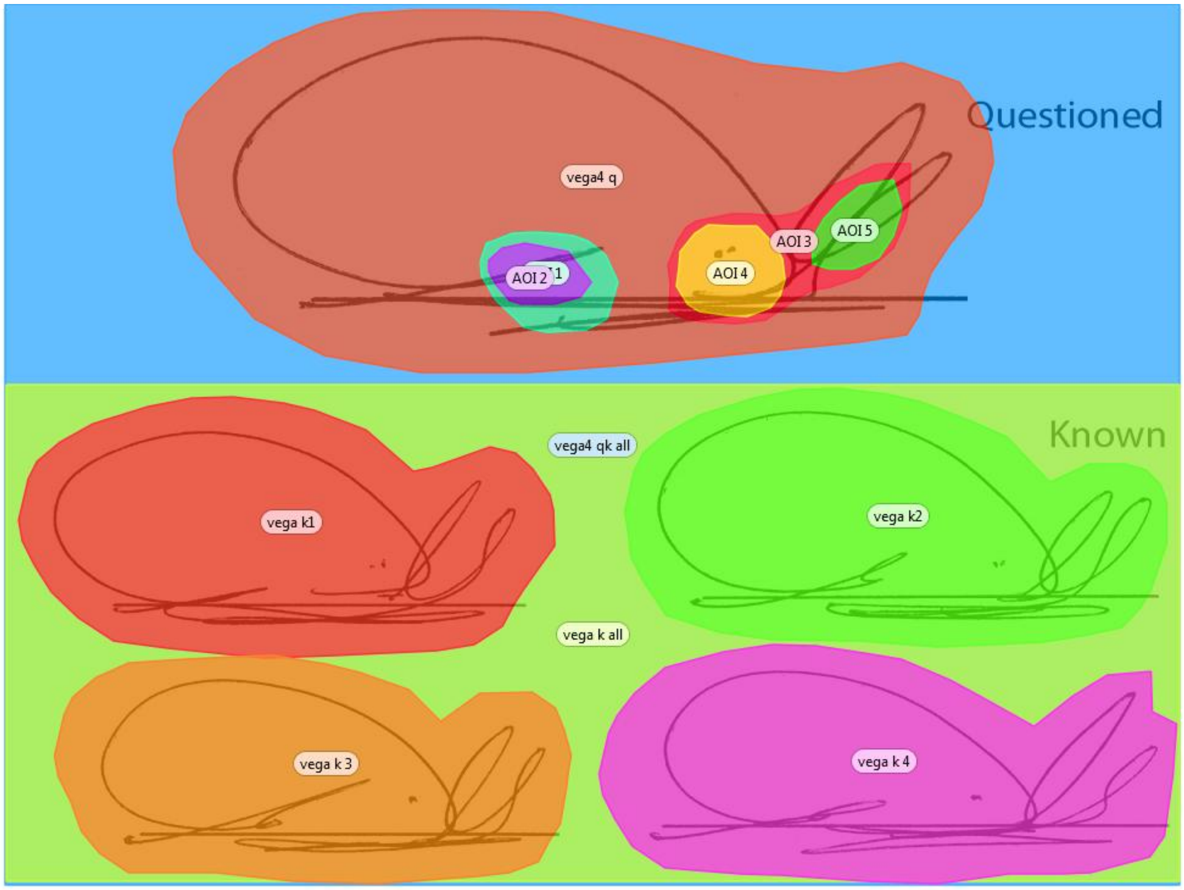


Figure Vega 4.3 Areas of Interest (AOIs) for Vega Signature 4. REPLACE



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

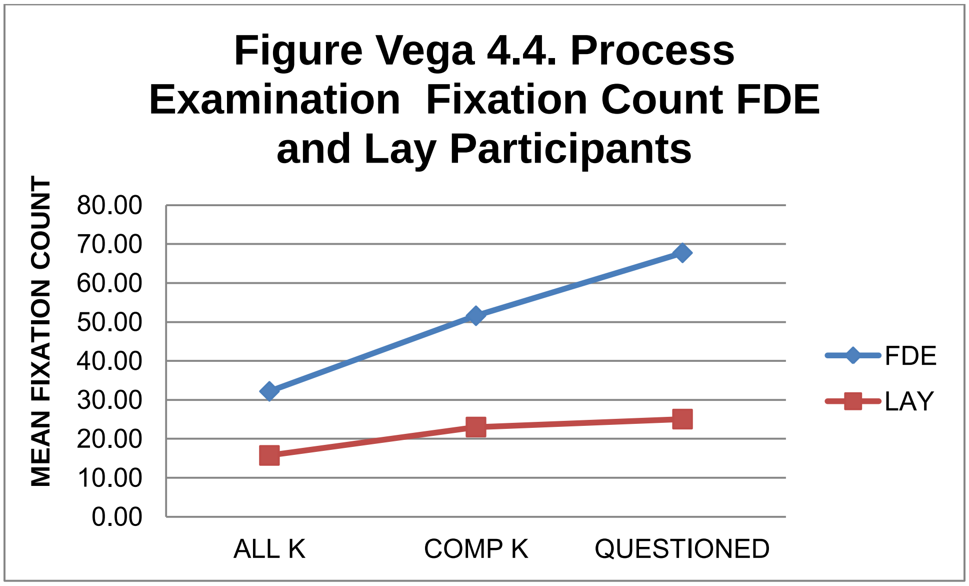
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Vega known signature stimulus (Knowns, not pictured here), Vega K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Vega 4Q (the Vega questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 4) are included in subsequent analyses.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .221, $F(3, 86) = 8.12$, $p < .001$, multivariate $\eta^2 = .221$. Figure Vega 4.4 presents the mean fixation counts by AOI.

Figure Vega 4.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all three areas of interest. Total fixation count for the questioned signature was significantly greater for FDEs than for lay participants, $F(1, 88) = 21.99$, $p < .001$, partial $\eta^2 = .198$.

Fixation count in the known signature comparison stimulus (COMP K) and the known signature stimulus (ALL K) were also statistically significant, $F(1, 88) = 12.81$, $p = .001$, partial $\eta^2 = .127$; $F(1, 88) = 11.99$, $p = .001$, partial $\eta^2 = .120$. Table Vega 4.1 presents the means and standard deviations for areas of interest by participant type.

Table Vega 4.1

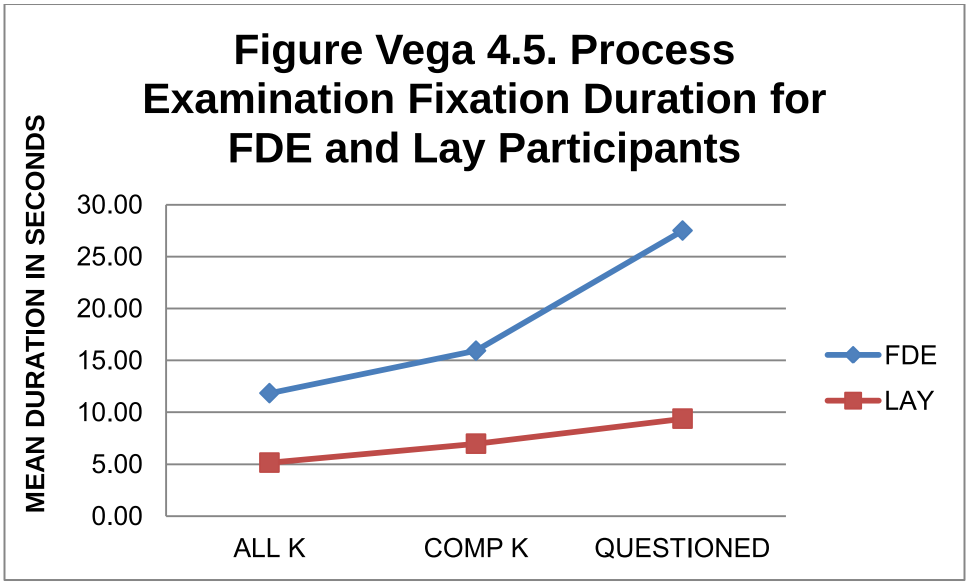
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	32.17	29.39	51.57	46.04	67.72	54.51
Lay	15.72	10.75	23.00	26.00	25.05	26.12

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .298, $F(3, 86) = 12.19$, $p < .001$, multivariate $\eta^2 = .298$. Figure Vega 4.5 presents the mean fixation duration by AOI.

Figure Vega 4.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in one of the three areas of interest. Total fixation duration for the questioned signature was significantly greater for FDEs than for lay participants, (questioned signature, $F(1, 88) = 29.14$, $p < .001$, partial $\eta^2 = .249$).

Fixation duration in the known signature comparison stimulus (COMP K) and the known signature stimulus (KNOWN K) was also statistically significant, $F(1, 88) = 13.63$, $p < .001$, partial $\eta^2 = .134$; $F(1, 88) = 11.49$, $p = .001$, partial $\eta^2 = .115$. Table Vega 4.2 presents the means and standard deviations for areas of interest by participant type.

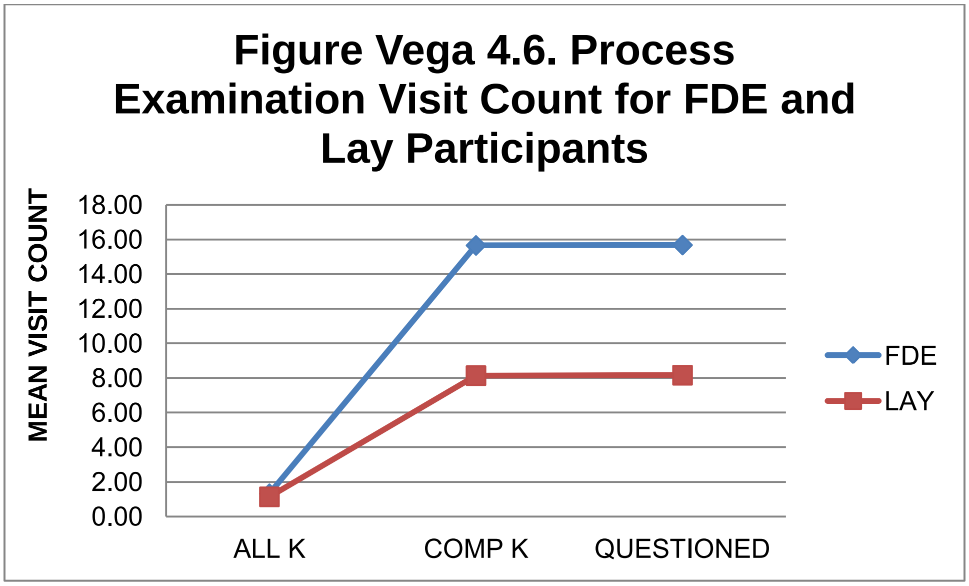
Table Vega 4.2
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	11.83	12.35	15.92	13.86	27.50	20.02
Lay	5.14	4.04	6.97	8.16	9.38	9.54

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .137, $F(3, 86) = 4.56$, $p = .005$, multivariate $\eta^2 = .137$. Figure Vega 4.6 presents the mean fixation counts by AOI.

Figure Vega 4.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in one of the three areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus (COMP K) was significantly greater for FDEs than for lay participants, $F(1, 88) = 11.48$, $p = .001$, partial $\eta^2 = .115$; $F(1, 88) = 12.24$, $p = .001$, partial $\eta^2 = .115$.

Fixation count in the known signature stimulus (ALL K) was not statistically significant, $p = .207$, *ns*. Table Vega 4.1 presents the means and standard deviations for areas of interest by participant type.

Table Vega 4.3

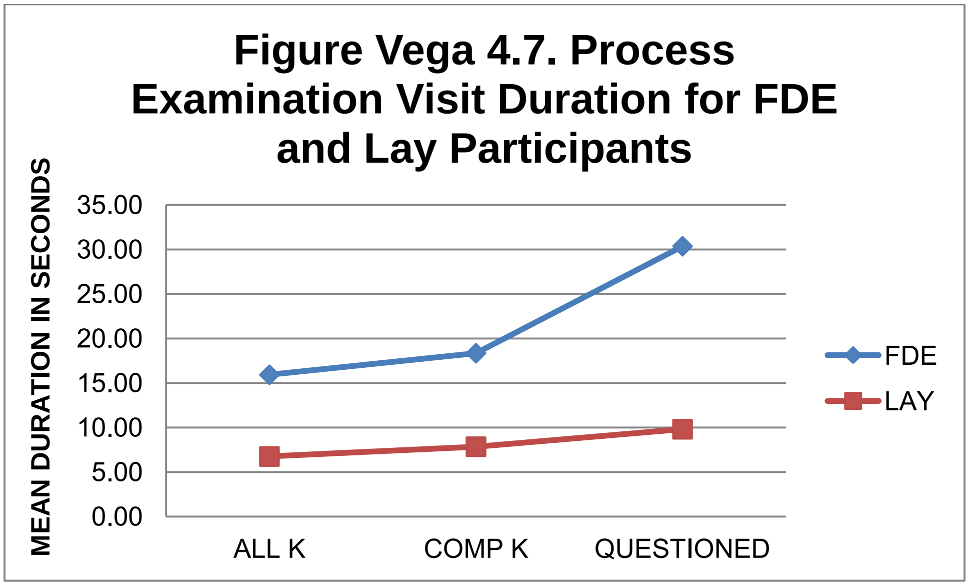
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.32	0.66	15.66	11.94	15.68	12.39
Lay	1.14	0.68	8.14	7.83	8.16	7.97

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .285, $F(3, 86) = 11.45$, $p < .001$, multivariate $\eta^2 = .285$. Figure Vega 4.7 presents the mean visit durations by AOI.

Figure Vega 4.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit duration in one of the three of the areas of interest. Total visit duration for the questioned signature was significantly greater for FDEs than for lay participants, $F(1, 88) = 30.51$, $p < .001$, partial $\eta^2 = .257$.

Visit duration in the known signature comparison stimulus (COMP K) and the known signature stimulus (ALL K) were also statistically significant, $F(1, 88) = 3.10$, $p = .082$, partial $\eta^2 = .034$, and $F(1, 88) = 9.23$, $p = .003$, partial $\eta^2 = .095$. Table Vega 4.3 presents the means and standard deviations for areas of interest by participant type.

Table Vega 4.4

Process Analysis Visit Duration for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	15.92	19.12	18.35	16.79	30.36	22.45
Lay	6.75	5.33	7.84	8.99	9.81	9.96

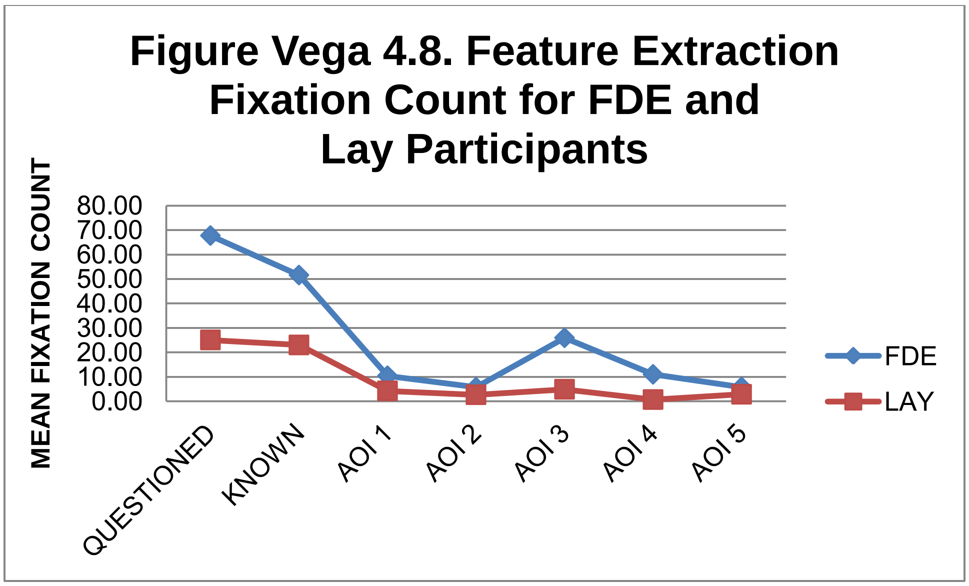
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .562, $F(7, 82) = 15.01$, $p < .001$, multivariate $\eta^2 = .562$. Figure Vega 4.8 presents the mean fixation counts by AOI.

Figure Vega 4.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in one area of interest. Fixation count for the questioned signature was significantly greater for FDEs than for lay participants, $F(1, 88) = 21.77$, $p < .001$, partial $\eta^2 = .198$. Fixation count in the known signature comparison stimulus was also significantly greater, $F(1, 88) = 12.81$, $p = .001$, partial $\eta^2 = .127$.

Fixation counts in all AOIs were significantly greater for FDEs than for lay participants (AOI1, $F(1, 88) = 13.72$, $p < .001$, partial $\eta^2 = .135$; AOI2, $F(1, 88) = 8.13$, $p = .005$, partial $\eta^2 = .085$; AOI3, $F(1, 88) = 13.74$, $p < .001$, partial $\eta^2 = .135$; AOI4, $F(1, 88) = 11.92$, $p = .001$, partial $\eta^2 = .119$; and AOI5, $F(1, 88) = 7.46$, $p = .008$, partial $\eta^2 = .078$). Table Vega 4.5 presents the means and standard deviations for areas of interest by participant type.

Table Vega 4.5

Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

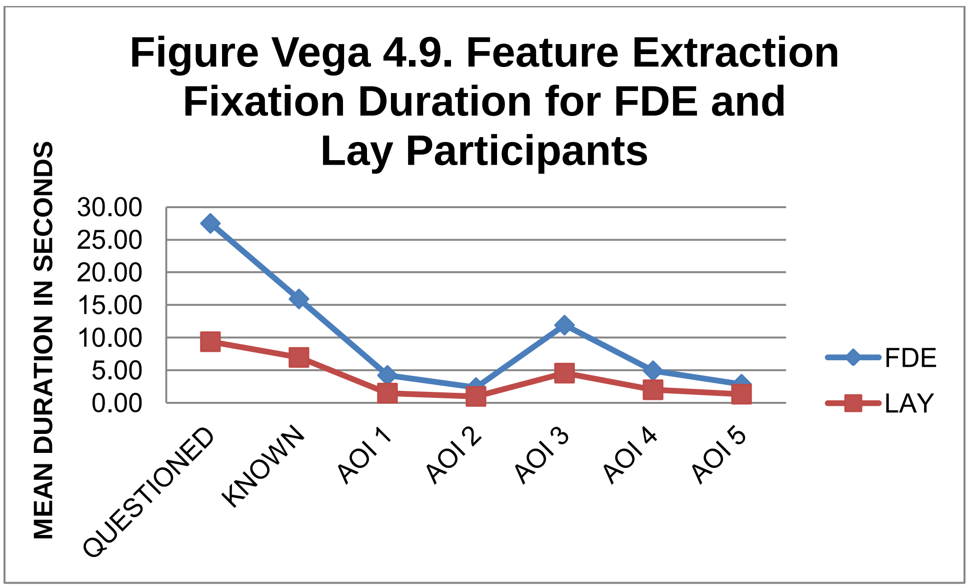
	QUESTIONED	KNOWN	AOI 1	AOI 2

Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	67.72	54.51	51.57	46.04	10.40	9.67	5.72	5.98
Lay	25.05	26.12	23.00	26.00	4.23	5.31	2.65	3.94
	AOI 3		**AOI 4**		**AOI 5**			
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*		
FDE	25.94	25.02	10.98	10.75	5.83	6.18		
Lay	10.65	10.69	4.88	4.49	2.84	3.83		

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .590, $F(7, 82) = 16.87$, $p < .001$, multivariate $\eta^2 = .590$. Figure Vega 4.9 presents the mean fixation counts by AOI.

Figure Vega 4.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in one area of interest. Fixation duration for the questioned signature was significantly greater for FDEs than for lay participants, $F(1, 88) = 29.14$, $p < .001$, partial $\eta^2 = .249$. Fixation duration in the known signature comparison stimulus was also significantly greater, $F(1, 88) = 13.63$, $p < .001$, partial $\eta^2 = .134$.

Fixation durations in all AOIs were significantly greater for FDEs than for lay participants (AOI1, $F(1, 88) = 20.58$, $p < .001$, partial $\eta^2 = .190$; AOI2, $F(1, 88) = 10.44$, $p = .002$, partial $\eta^2 = .106$; AOI3, $F(1, 88) = 18.48$, $p < .001$, partial $\eta^2 = .174$; AOI4, $F(1, 88) = 15.91$, $p < .001$, partial $\eta^2 = .153$; and AOI5, $F(1, 88) = 8.55$, $p = .004$, partial $\eta^2 = .089$). Table Vega 4.6 presents the means and standard deviations for areas of interest by participant type.

Table Vega 4.6

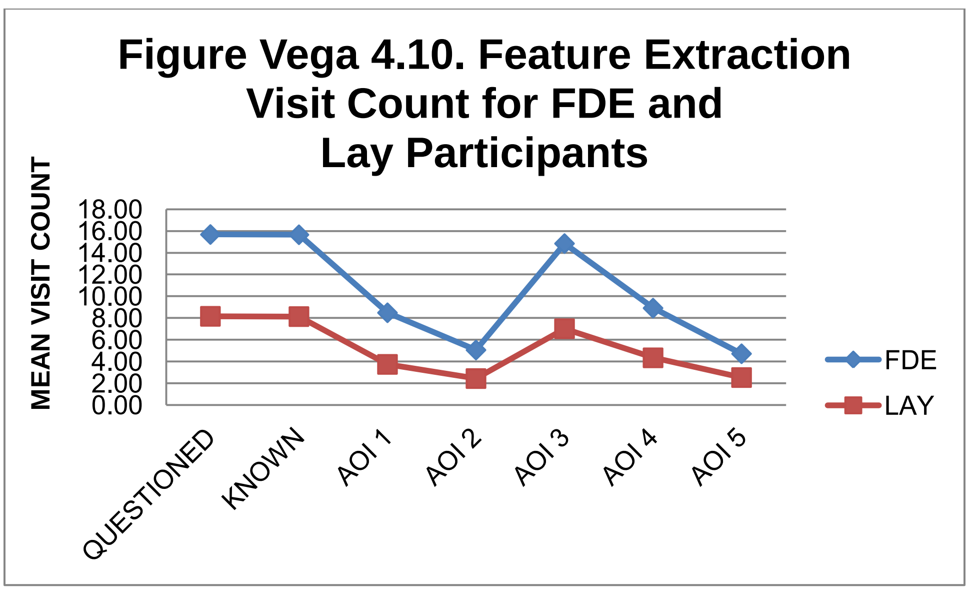
Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	27.50	20.02	15.92	13.86	4.22	3.47	2.35	2.31
Lay	9.38	9.54	6.97	8.16	1.50	1.93	1.00	1.55
	AOI 3		**AOI 4**		**AOI 5**			
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***		
FDE	11.91	10.36	4.93	4.47	2.86	2.81		
Lay	4.56	4.49	2.02	1.78	1.34	2.05		

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .643, $F(7,82) = 21.13$, $p < .001$, multivariate $\eta^2 = .643$. Figure Vega 4.10 presents the mean visit counts by AOI.

Figure Vega 4.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for visit count in one area of interest. Mean visit count for the questioned signature was significantly greater for FDEs than for lay participants, $F(1, 88) = 11.48$, $p = .001$, partial $\eta^2 = .115$. Visit count in the known signature comparison stimulus was also significantly greater, $F(1, 88) = 12.24$, $p = .001$, partial $\eta^2 = .122$.

Visit counts in all AOIs were significantly greater for FDEs than for lay participants (AOI1, $F(1, 88) = 14.84$, $p < .001$, partial $\eta^2 = .144$; AOI2, $F(1, 88) = 8.33$, $p = .005$, partial $\eta^2 = .086$; AOI3, $F(1, 88) = 16.08$, $p < .001$, partial $\eta^2 = .154$; AOI4, $F(1, 88) = 13.74$, $p < .001$, partial $\eta^2 = .135$; and AOI5, $F(1, 88) = 7.07$, $p = .009$, partial $\eta^2 = .074$). Table Vega 4.7 presents the means and standard deviations for areas of interest by participant type.

Table Vega 4.7

Feature Extraction Analysis Visit Count for FDE and Lay Participants

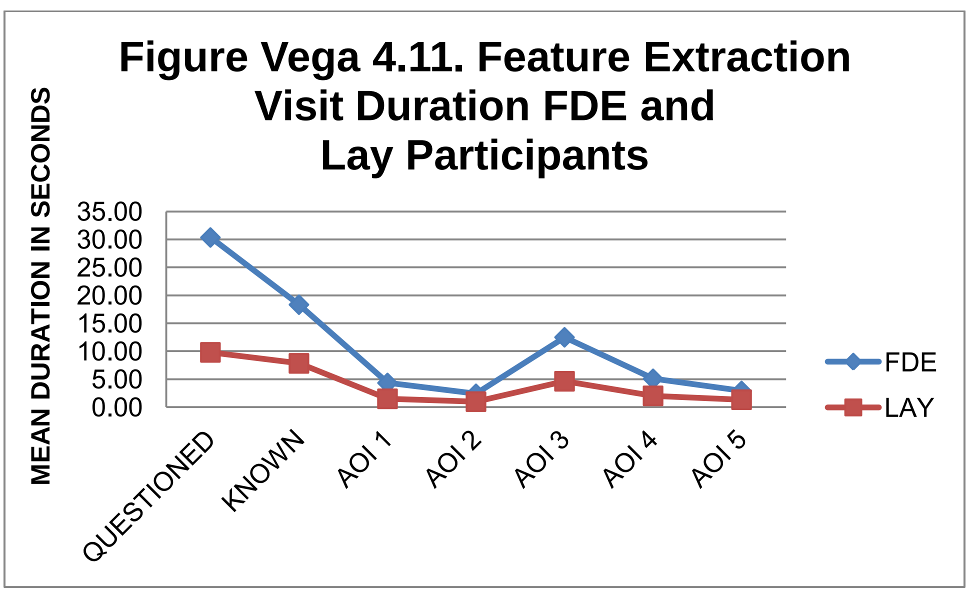
	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	15.68	12.39	15.66	11.94	8.49	6.99	5.06	5.07
Lay	8.16	7.97	8.14	7.83	3.74	4.22	2.44	3.28

	AOI 3		AOI 4		AOI 5	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	14.85	11.35	8.91	7.26	4.72	4.45
Lay	7.02	6.19	4.35	3.69	2.53	3.19

<u>*Total Visit Duration*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .586, $F(7, 82) = 16.56$, $p < .001$, multivariate $\eta^2 = .586$. Figure Vega 4.11 presents the mean visit durations by AOI.

Figure Vega 4.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for visit count in one area of interest. Mean visit duration for the questioned signature was significantly greater for FDEs than for lay participants, $F(1, 88) = 30.51$, $p < .001$, partial $\eta^2 = .257$. Visit duration in the known signature comparison stimulus was also significantly greater, $F(1, 88) = 13.32$, $p < .001$, partial $\eta^2 = .131$.

Visit durations in all AOIs were significantly greater for FDEs than for lay participants (AOI1, $F(1, 88) = 21.56$, $p < .001$, partial $\eta^2 = .197$; AOI2, $F(1, 88) = 10.98$, $p = .001$, partial $\eta^2 = .111$; AOI3, $F(1, 88) = 18.72$, $p < .001$, partial $\eta^2 = .175$; AOI4, $F(1, 88) = 16.55$, $p < .001$, partial $\eta^2 = .158$; and AOI5, $F(1, 88) = 8.66$, $p = .004$, partial $\eta^2 = .090$). Table Vega 4.7 presents the means and standard deviations for areas of interest by participant type.

Table Vega 4.8

Feature Extraction Analysis Visit Duration for FDE and Lay Participants

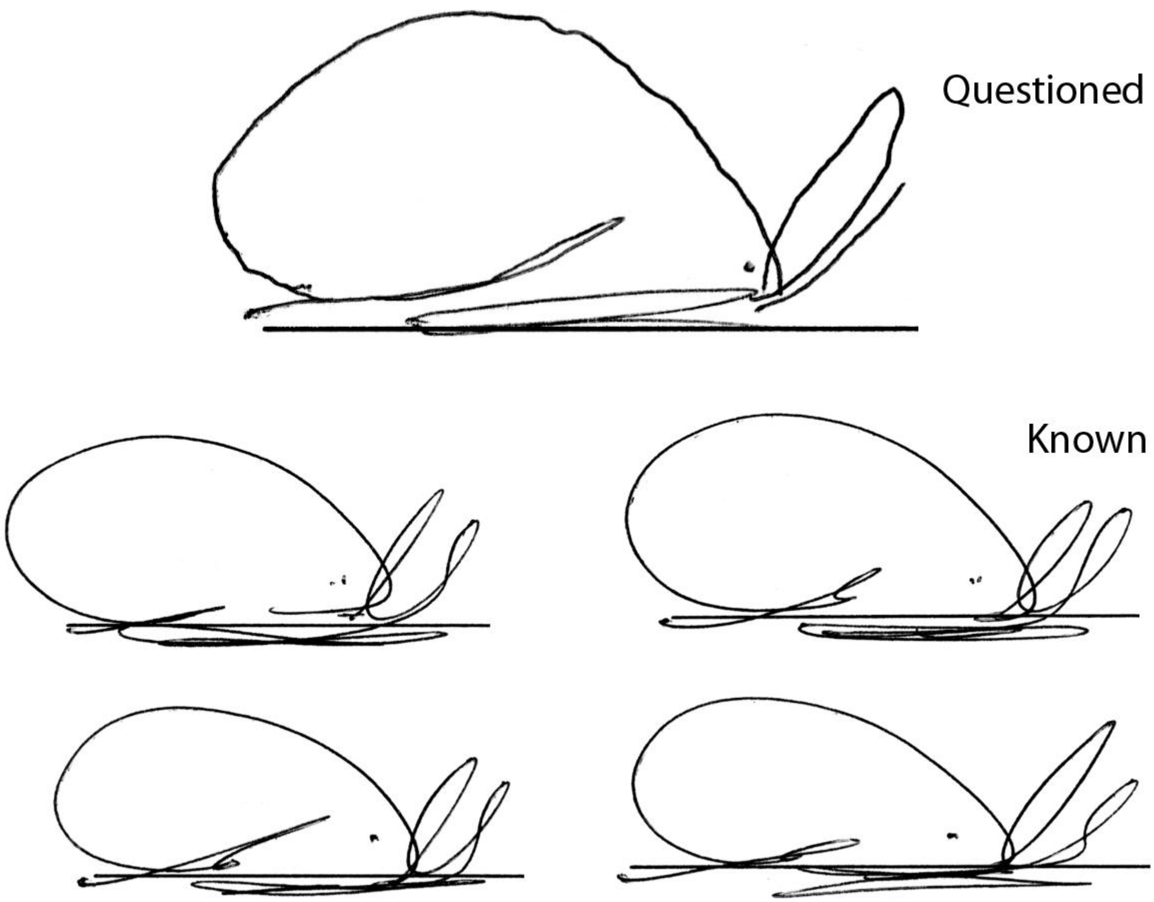
	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	30.36	22.45	18.35	16.79	4.35	3.54	2.41	2.34
Lay	9.81	9.96	7.84	8.99	1.51	1.94	1.00	1.57

	AOI 3		**AOI 4**		**AOI 5**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	12.51	11.09	5.09	4.62	2.91	2.87
Lay	4.65	4.56	2.03	1.78	1.35	2.08

Vega Signature 5: Traced (Non-Genuine)

Of the 49 FDE participants, 48 responded correctly that the signature was non-genuine, and 1 responded that it was genuine. Of the 43 Lay participants, 41 responded correctly that the signature was non-genuine, and 2 responded that it was genuine. This difference was not statistically significant, χ^2 (2, N = 92) = 495, p = .482. Figure Vega 5.1 presents the comparison view of this signature.

Figure Vega 5.1

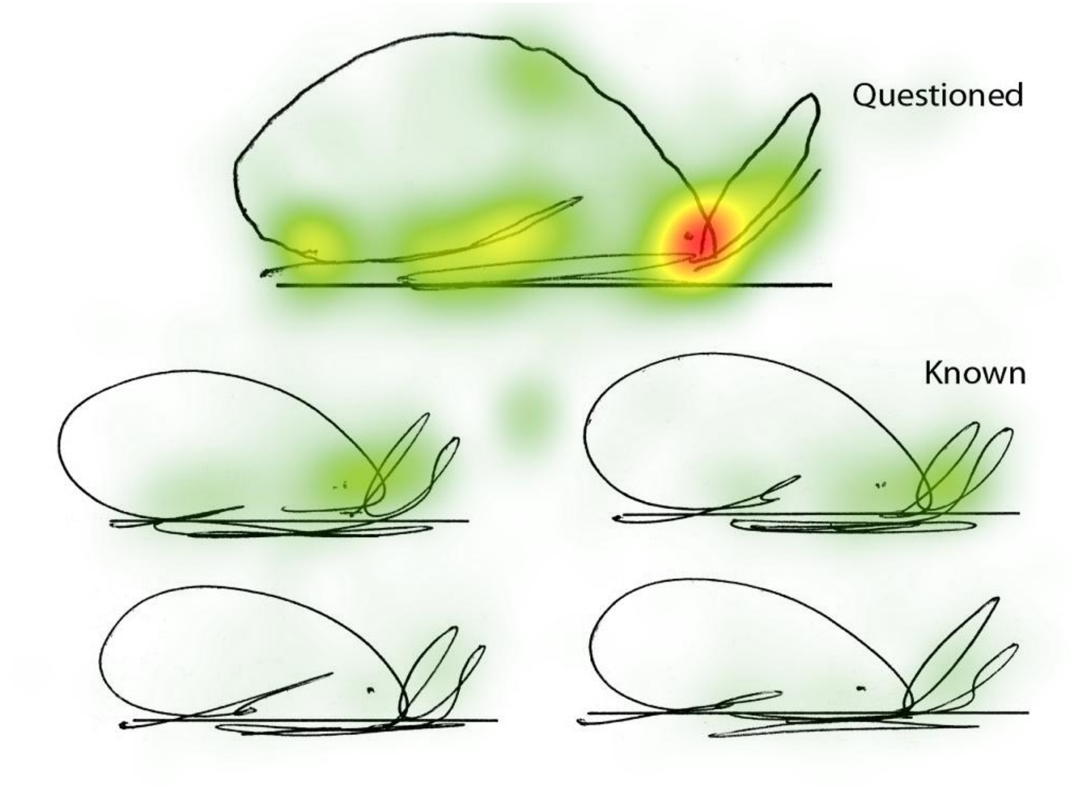


Selection of Areas of Interest (AOIs)

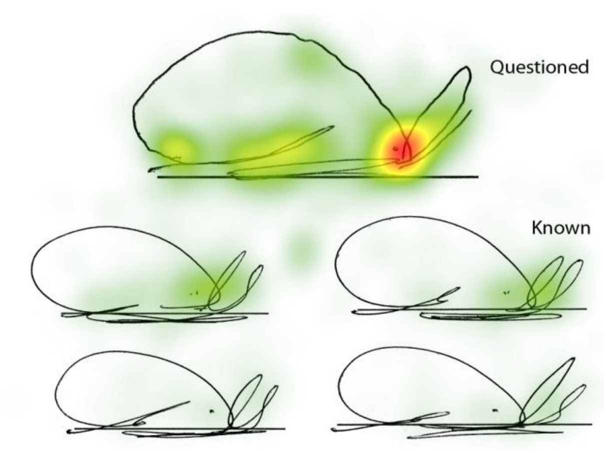
Figure Vega 5.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were four locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of four AOIs for this stimulus. Figure Vega 5.3 presents the location of the AOIs identified in the heat map.

Figure Vega 5.2

All Participants



FDE



Lay

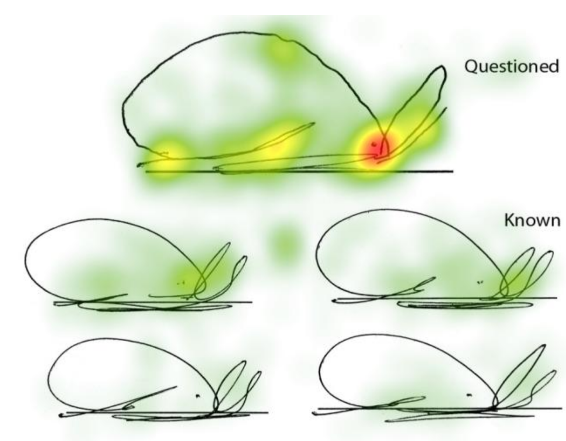
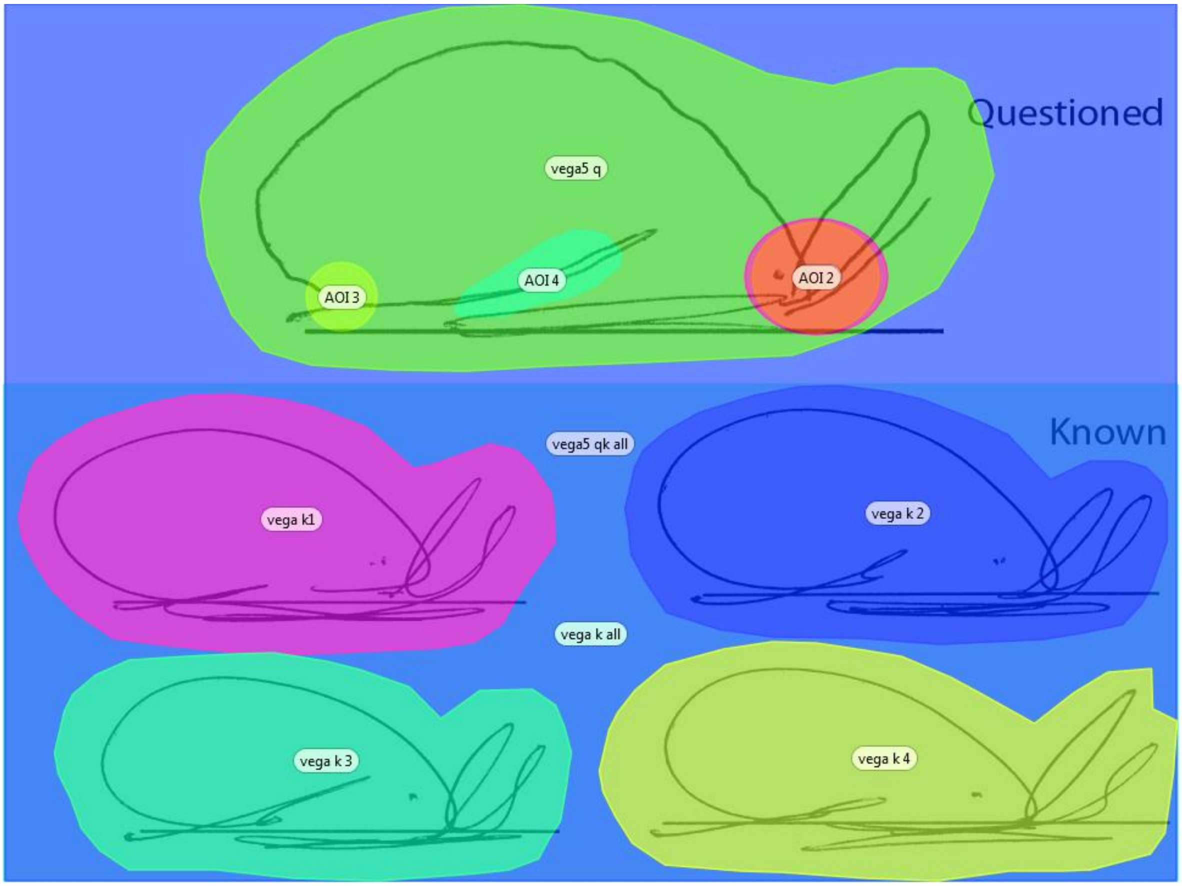


Figure Vega 5.3



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

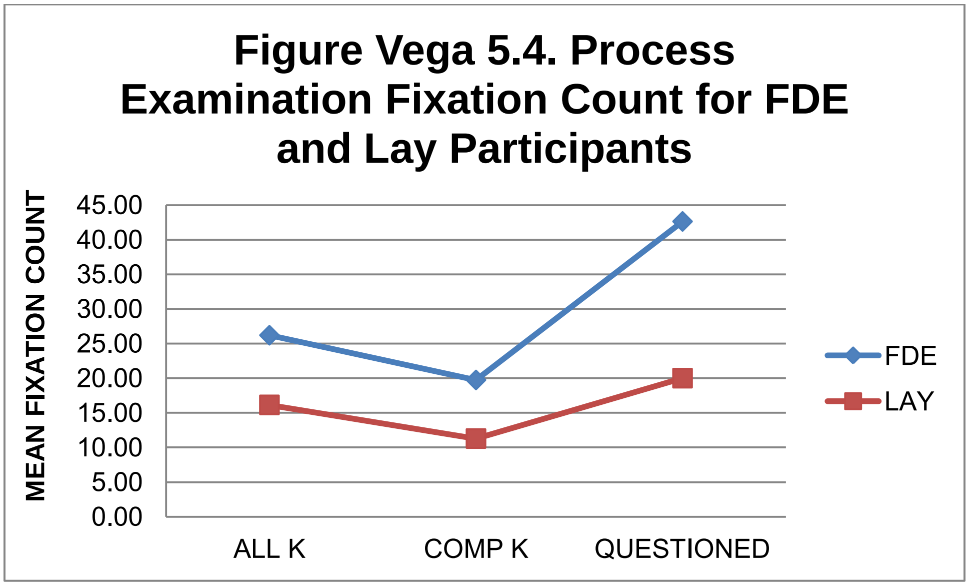
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Vega known signature stimulus (Knowns, not pictured here), Vega K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Vega 5Q (the Vega questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 4) are included in subsequent analyses.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .169, $F(3, 85) = 5.77$, $p = .001$, multivariate $\eta^2 = .169$. Figure Vega 5.4 presents the mean fixation counts by AOI.

Figure Vega 5.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all of the areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for lay participants, $F(1, 87) = 17.30$, $p < .001$, partial $\eta^2 = .166$; $F(1, 87) = 8.97$, $p = .004$, partial $\eta^2 = .094$).

Fixation count in the known signature stimulus (ALL K) was also statistically significant, $F(1, 87) = 4.64$, $p = .034$, partial $\eta^2 = .051$. Table Vega 5.1 presents the means and standard deviations for areas of interest by participant type.

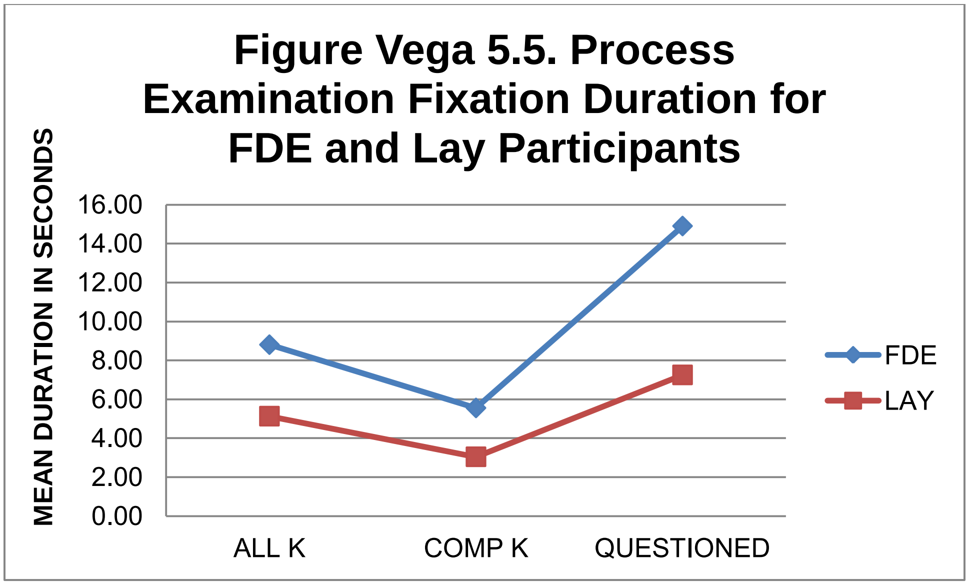
Table Vega 5.1
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	26.20	28.05	19.74	15.43	42.63	31.90
Lay	16.14	12.66	11.28	10.58	20.00	16.51

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .175, $F(3, 85) = 5.99$, $p = .001$, multivariate $\eta^2 = .175$. Figure Vega 5.5 presents the mean fixation duration by AOI.

Figure Vega 5.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for lay participants, (questioned signature, $F(1, 87) = 17.50$, $p > .001$, partial $\eta^2 = .167$); known signature comparison stimulus, $F(1, 87) = 9.31$, $p = .003$, partial $\eta^2 = .097$).

Fixation duration in the known signature stimulus (ALL K) was also statistically significant, $F(1, 87) = 4.76$, $p = .032$, partial $\eta^2 = .052$. Table Vega 5.2 presents the means and standard deviations for areas of interest by participant type.

Table Vega 5.2

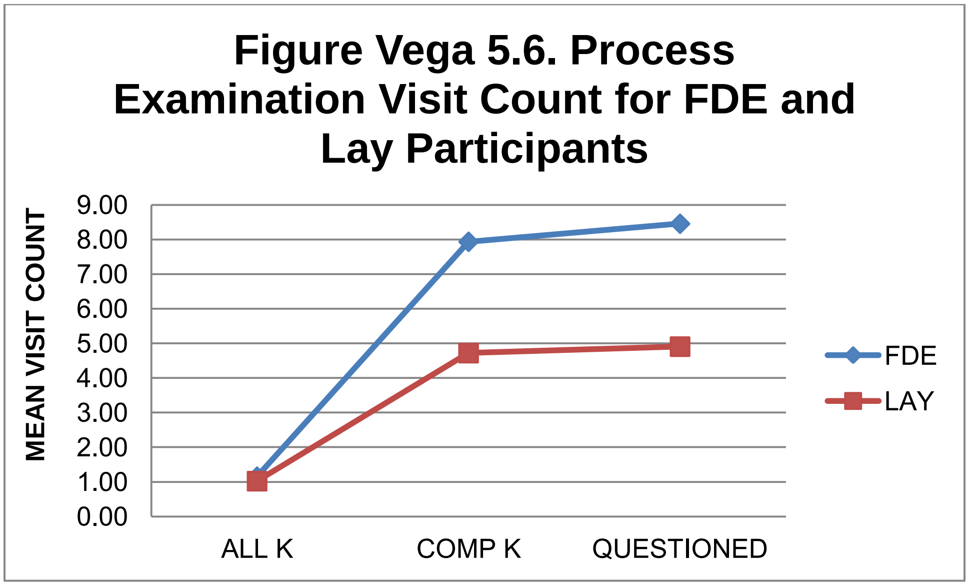
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	8.80	10.11	5.55	4.75	14.90	10.48
Lay	5.13	4.60	3.04	2.64	7.25	6.03

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .120, $F(3, 85) = 3.86$, $p = .012$, multivariate $\eta^2 = .120$. Figure Vega 5.6 presents the mean visit durations by AOI.

Figure Vega 5.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in two of the three of the areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for lay participants, $F(1, 87) = 10.81$, $p = .001$, partial $\eta^2 = .111$; $F(1, 87) = 9.85$, $p = .002$, partial $\eta^2 = .02$).

Visit count in the known signature stimulus (ALL K) was not statistically significant, $p = .172$, *ns*. Table Vega 5.3 presents the means and standard deviations for areas of interest by participant type.

Table Vega 5.3

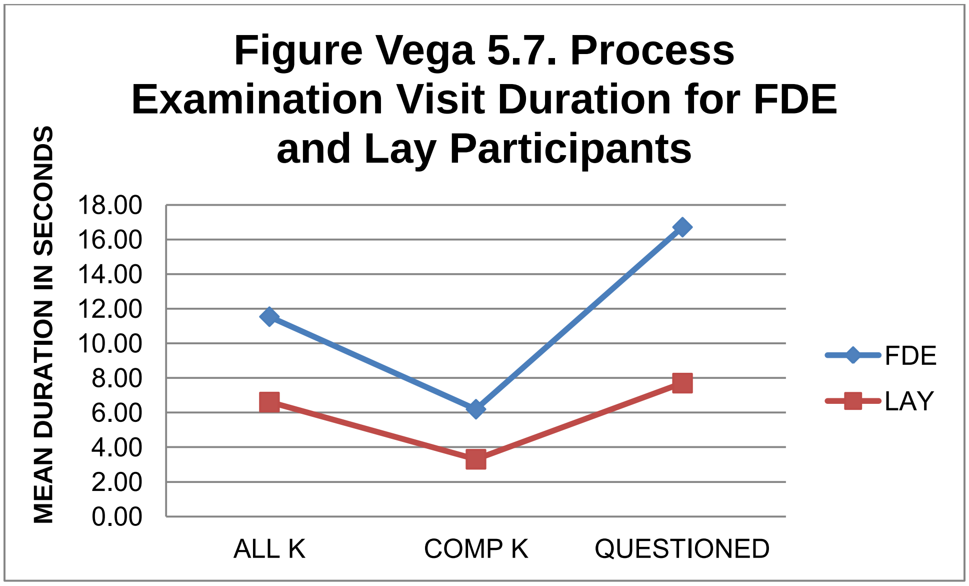
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.15	0.51	7.93	5.47	8.46	5.69
Lay	1.02	0.34	4.72	4.02	4.91	4.36

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .190, $F(3, 85) = 6.64$, $p < .001$, multivariate $\eta^2 = .190$. Figure Vega 5.7 presents the mean visit durations by AOI.

Figure Vega 5.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit duration in all three of the areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus (COMP K) was significantly greater for FDEs than for lay participants, $F(1, 87) = 19.08$, $p > .001$, partial $\eta^2 = .180$; $F(1, 87) = 10.31$, $p = .002$, partial $\eta^2 = .106$).

Visit duration in the known signature stimulus (ALL K) was also statistically significant, $F(1, 87) = 5.17$, $p = .025$, partial $\eta^2 = .056$. Table Vega 5.4 presents the means and standard deviations for areas of interest by participant type.

Table Vega 5.4
Process Analysis Visit Duration for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	11.55	12.88	6.20	5.17	16.72	12.01
Lay	6.61	6.24	3.31	2.95	7.71	6.43

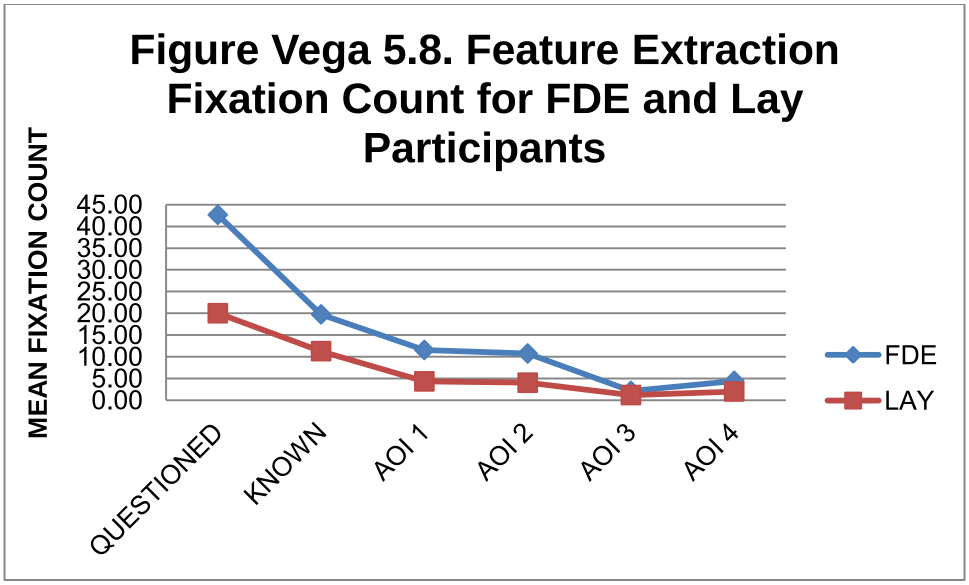
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .203, $F(6, 82) = 203$, $p = .004$, multivariate $\eta^2 = .203$. Figure Vega 5.8 presents the mean fixation counts by AOI.

Figure Vega 5.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all but one areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for lay participants, $F(1, 87) = 17.30$, $p < .001$, partial $\eta^2 = .166$, and $F(1, 87) = 8.97$, $p = .004$, partial $\eta^2 = .094$.

Fixation count in three AOIs was significantly greater for FDEs than for lay participants (AOI 1, $F(1, 87) = 18.46$, $p < .001$, partial $\eta^2 = .175$; AOI 2, $F(1, 87) = 18.04$, $p < .001$, partial $\eta^2 = .172$; AOI 4, $F(1, 87) = 8.17$, $p = .005$, partial $\eta^2 = .086$).

No significant difference was found in AOI 3, $p = .071$, *ns*). Table Vega 5.5 presents the means and standard deviations for areas of interest by participant type.

Table Vega 5.5

Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

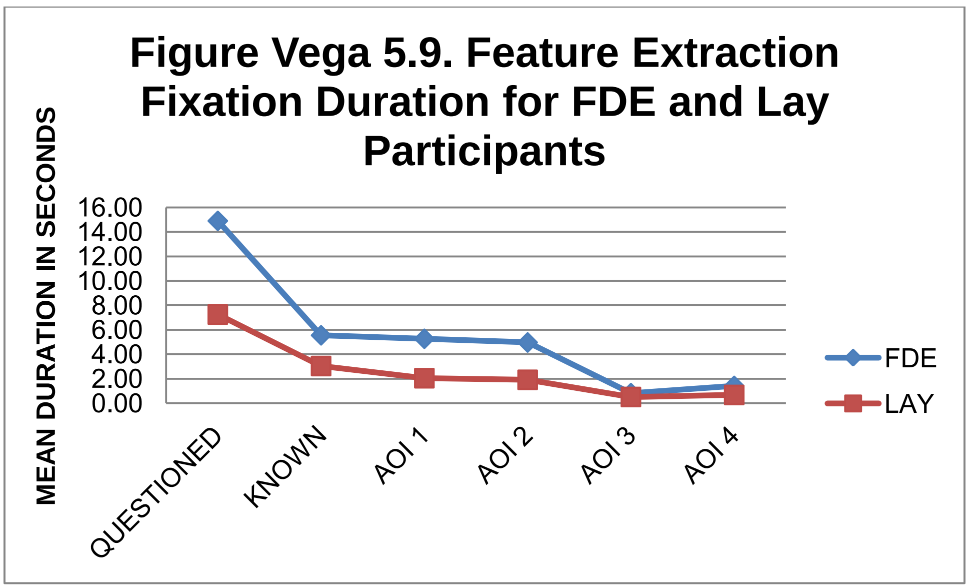
	QUESTIONED	KNOWN	AOI 1

Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	42.63	31.90	19.74	15.43	11.54	10.21
Lay	20.00	16.51	11.28	10.58	4.33	4.26
	AOI 2		AOI 3		AOI 4	
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	10.74	9.57	2.15	2.95	4.46	5.10
Lay	4.02	4.12	1.19	1.88	2.00	2.47

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .253, *F*(6, 82) = 4.63, $p < .001$, multivariate $\eta^2 = .253$. Figure Vega 5.9 presents the mean fixation counts by AOI.

Figure Vega 5.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all but one areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for lay participants, *F*(1, 87) = 17.50, $p < .001$, partial $\eta^2 = .167$, and F(1, 87) = 9.31, $p = .003$, partial $\eta^2 = .097$.

Fixation duration in three AOIs was significantly greater for FDEs than for lay participants (AOI 1, *F*(1, 87) = 20.85, $p < .001$, partial $\eta^2 = .193$; AOI 2, *F*(1, 87) = 19.64, $p < .001$, partial $\eta^2 = .184$; AOI 4, *F*(1, 87) = 6.70, $p = .011$, partial $\eta^2 = .071$). No significant difference was found in AOI 3, $p = .175$, *ns*). Table Vega 5.6 presents the means and standard deviations for areas of interest by participant type.

Table Vega 5.6

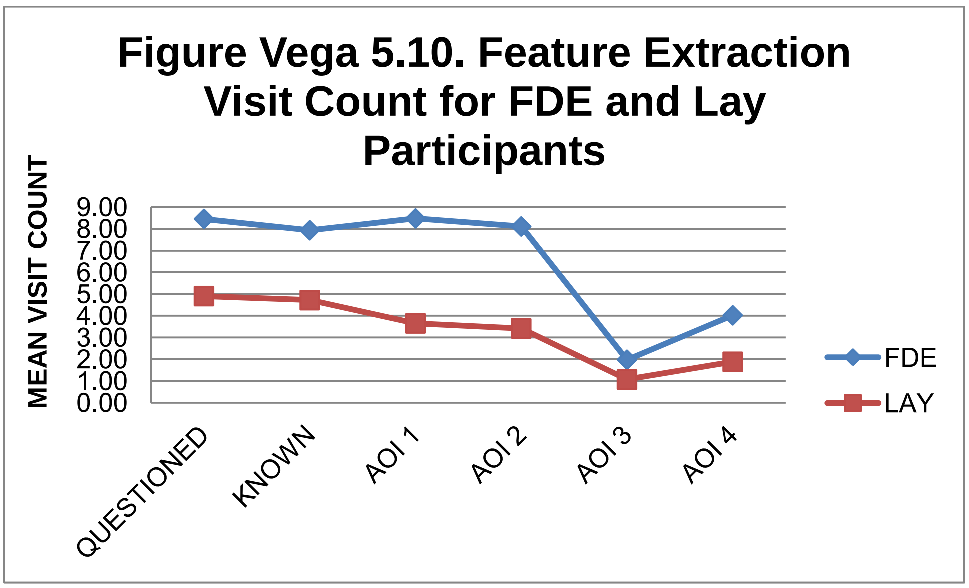
Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	14.90	10.48	5.55	4.75	5.27	4.20
Lay	7.25	6.03	3.04	2.64	2.04	2.00
	AOI 2		**AOI 3**		**AOI 4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	4.97	4.09	0.83	1.10	1.42	1.66
Lay	1.91	1.97	0.51	1.08	0.68	0.89

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .179, $F(6, 82) = 2.98$, $p = .011$, multivariate $\eta^2 = .179$. Figure Vega 5.10 presents the mean visit counts by AOI.

Figure Vega 5.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all but one areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for lay participants, $F(1, 87) = 10.81$, $p = .001$, partial $\eta^2 = .111$, and $F(1, 87) = 9.85$, $p = .002$, partial $\eta^2 = .102$.

Visit count in three AOIs was significantly greater for FDEs than for lay participants (AOI 1, $F(1, 87) = 16.39$, $p < .001$, partial $\eta^2 = .159$; AOI 2, $F(1, 87) = 16.04$, $p < .001$, partial $\eta^2 = .159$; AOI 4, $F(1, 87) = 8.11$, $p = .005$, partial $\eta^2 = .085$).

No significant difference was found in AOI 3, $p = .059$, *ns*). Table Vega 5.7 presents the means and standard deviations for areas of interest by participant type.

Table Vega 5.7

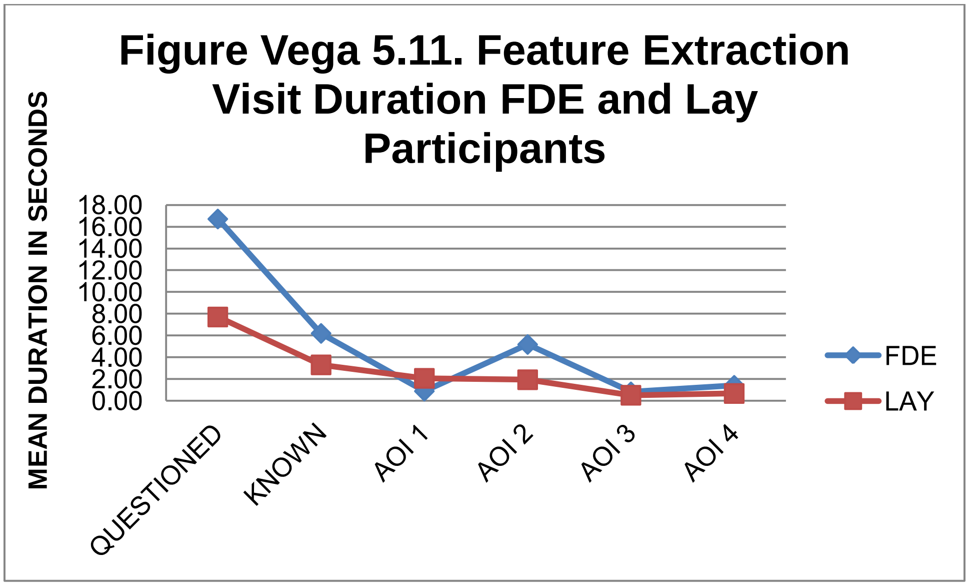
Feature Extraction Analysis Visit Count for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	8.46	5.69	7.93	5.47	8.48	7.11
Lay	4.91	4.36	4.72	4.02	3.65	3.37
	AOI 2		**AOI 3**		**AOI 4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	8.11	6.99	1.98	2.76	4.02	4.38
Lay	3.42	3.27	1.07	1.49	1.88	2.32

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .250, $F(6, 82) = 4.54$, $p = .001$, multivariate $\eta^2 = .250$. Figure Vega 5.11 presents the mean visit durations by AOI.

Figure Vega 5.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all but one areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for lay participants, $F(1, 87) = 19.08$, $p < .001$, partial $\eta^2 = .180$, and $F(1, 87) = 10.31$, $p = .002$, partial $\eta^2 = .106$.

Visit duration in three AOIs was significantly greater for FDEs than for lay participants (AOI 1, $F(1, 87) = 21.58$, $p < .001$, partial $\eta^2 = .199$; AOI 2, $F(1, 87) = 20.69$, $p < .001$, partial $\eta^2 = .190$; AOI 4, $F(1, 87) = 6.70$, $p = .011$, partial $\eta^2 = .071$).

No significant difference was found in AOI 3, $p = .188$, *ns*). Table Vega 5.8 presents the means and standard deviations for areas of interest by participant type.

Table Vega 5.8

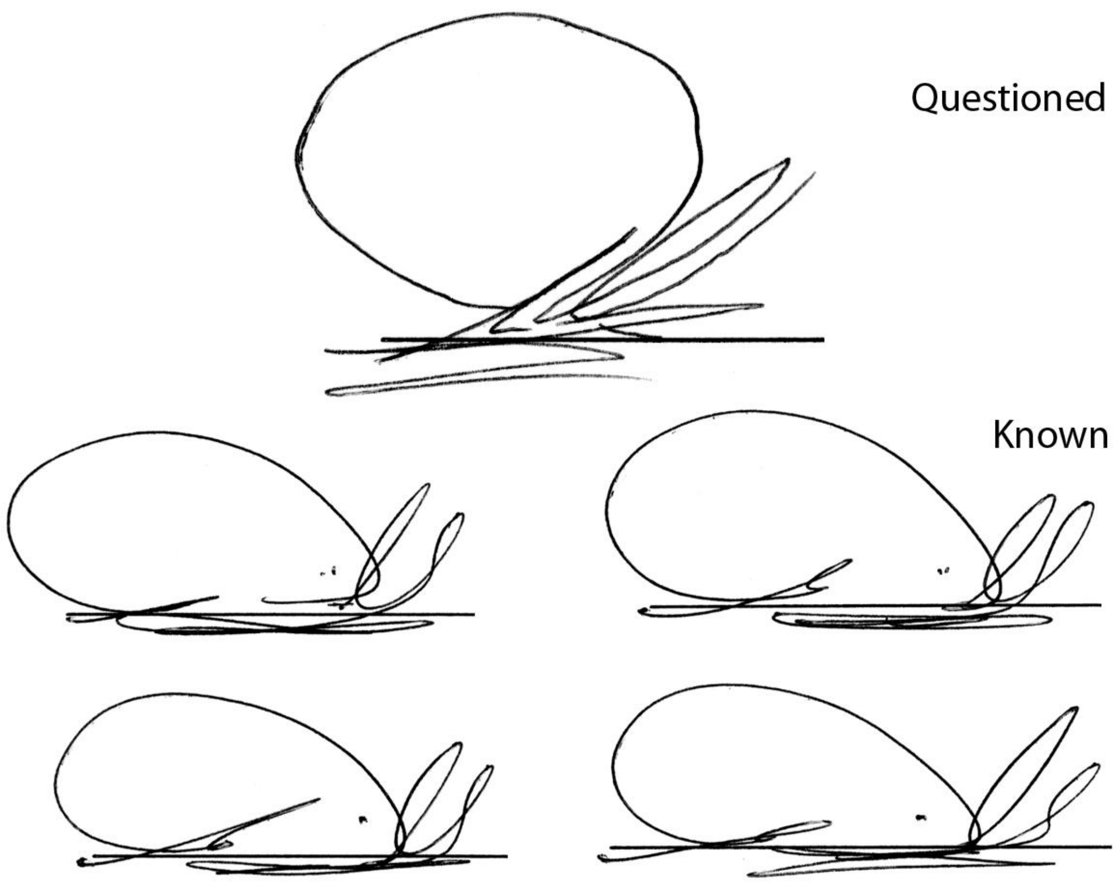
Feature Extraction Analysis Visit Duration for FDE and Lay Participants

	QUESTIONED		**KNOWN**		**AOI 1**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	16.72	12.01	6.20	5.17	5.51	4.42
Lay	7.71	6.43	3.31	2.95	2.07	2.05
	AOI 2		**AOI 3**		**AOI 4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	5.18	4.28	0.83	1.10	1.43	1.70
Lay	1.94	2.02	0.52	1.12	0.68	0.89

Vega Signature 6: Freehand Simulation (Non-Genuine)

Of the 49 FDE participants, 47 responded correctly that the signature was non-genuine. Two FDEs declined to respond. Of the 43 Lay participants, all 43 responded correctly that the signature was non-genuine. This difference was not statistically significant, χ^2 (2, N = 92) = 1.79, p = .180. Figure Vega 6.1 presents the comparison view of this signature.

Figure Vega 6.1

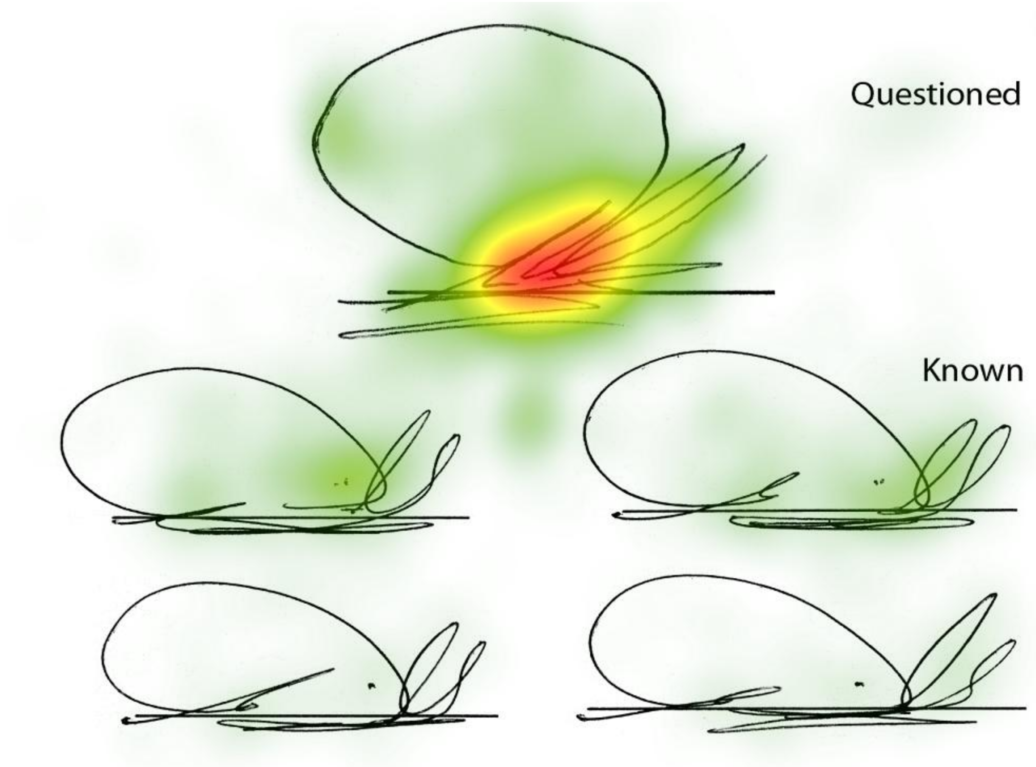


Selection of Areas of Interest (AOIs)

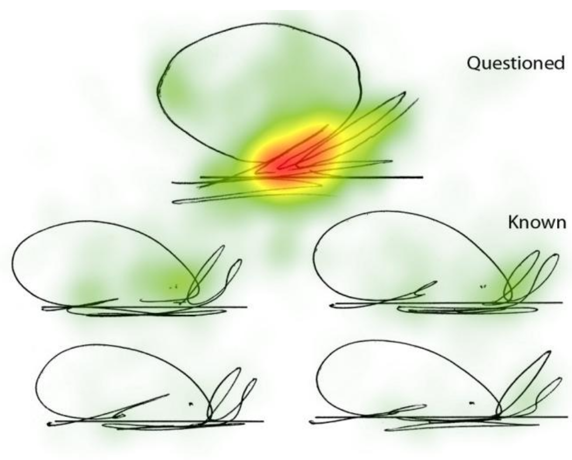
Figure Vega 6.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were two locations indicated by red hot spots and orange warm spots within the signature that elicited significant attention from the participants. AOIs were created for these areas, resulting in a total of two AOIs for this stimulus. Figure Vega 6.3 presents the location of the AOIs identified in the heat map.

Figure Vega 6.2

All Participants



FDE



Lay

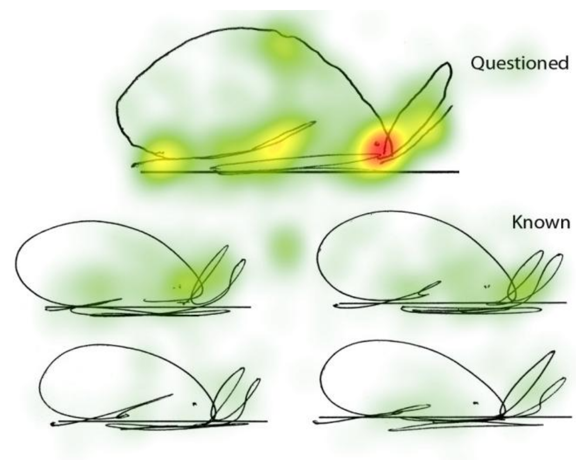
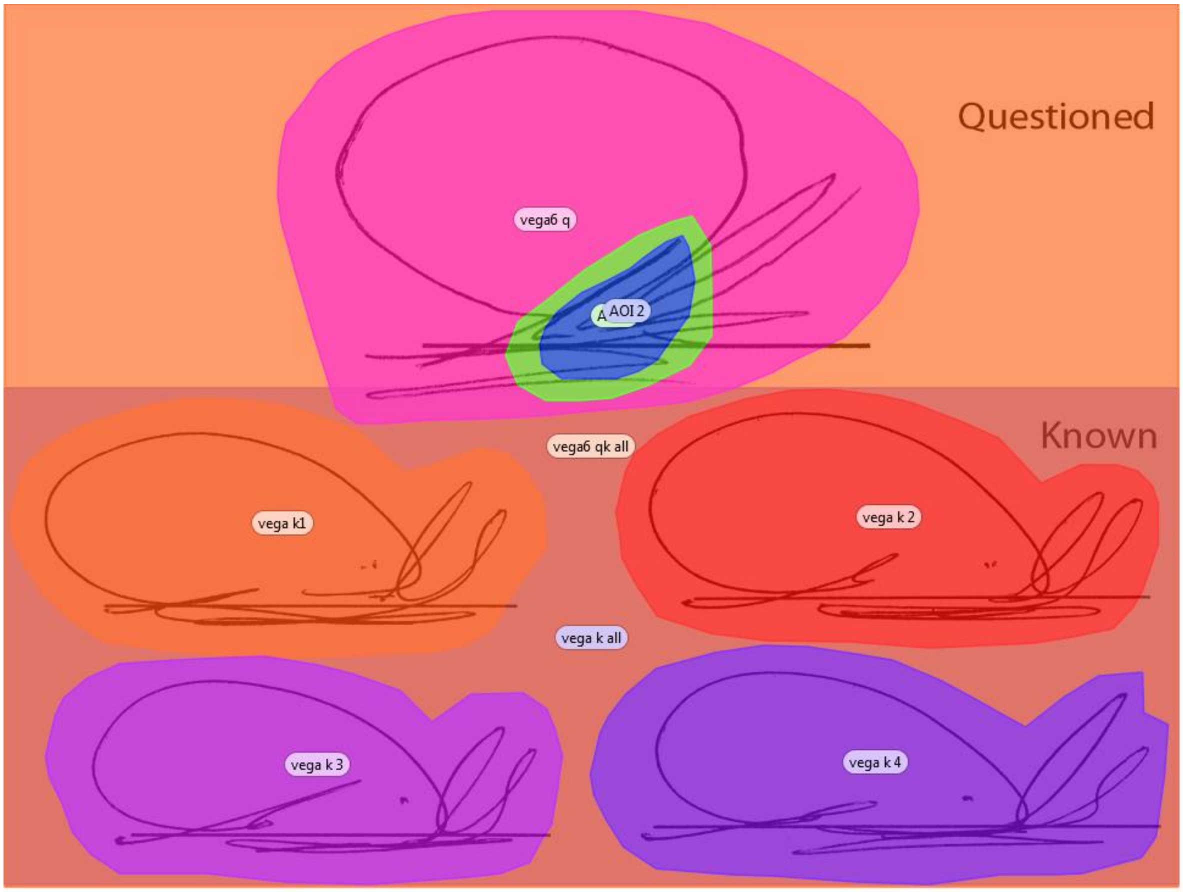


Figure Vega 6.3



Eye-Tracking Metrics Analyses

A series of multivariate analysis of variance tests (MANOVAs) were conducted to investigate whether there was a significant difference in the mean fixation duration, mean fixation count, mean visit duration, and mean visit count for FDEs vs. Lay participants during both the examination process and the use of signature features in reaching a process decision.

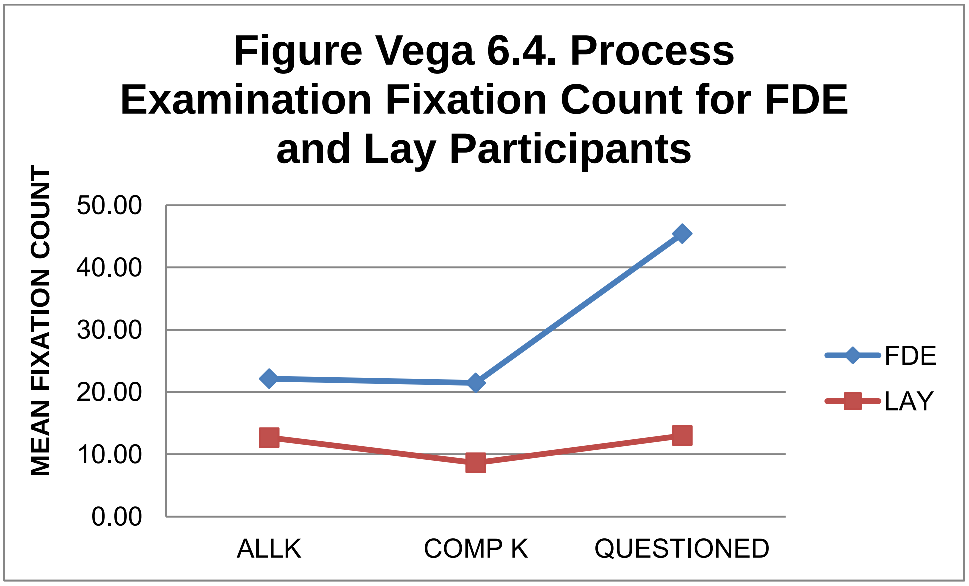
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. The examination process analyses are based on AOIs in the Vega known signature stimulus (Knowns, not pictured here), Vega K all (encompassing all the known signatures on the questioned/known comparison stimulus), and Vega 6Q (the Vega questioned signature on the questioned/known comparison stimulus). Additional AOIs (labeled AOI 1-AOI 4) are included in subsequent analyses.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .288, $F(3, 85) = 11.48$, $p < .001$, multivariate $\eta^2 = .288$. Figure Vega 6.4 presents the mean fixation counts by AOI.

Figure Vega 6.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all of the areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for lay participants, $F(1, 87) = 30.08$, $p < .001$, partial $\eta^2 = .257$ $F(1, 87) = 20.14$, $p < .001$, partial $\eta^2 = .188$).

Fixation count in the known signature stimulus (ALL K) was also statistically significant, $F(1, 87) = 7.91$, $p = .006$, partial $\eta^2 = .083$. Table Vega 6.1 presents the means and standard deviations for areas of interest by participant type.

Table Vega 6.1

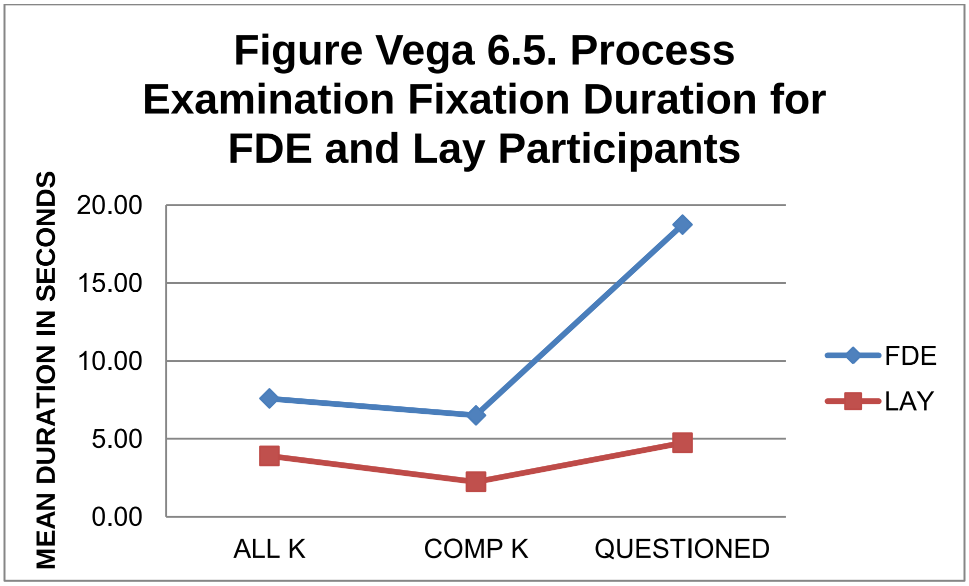
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Quesitoned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	22.13	20.29	21.46	17.26	45.41	37.43
Lay	12.65	9.06	8.63	7.56	13.00	10.33

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .305, $F(3, 85) = 12.42$, $p = .001$, multivariate $\eta^2 = .305$. Figure Vega 6.5 presents the mean fixation duration by AOI.

Figure Vega 6.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for lay participants, $F(1, 87) = 32.57$, $p > .001$, partial $\eta^2 = .272$; $F(1, 87) = 16.90$, $p < .001$, partial $\eta^2 = .163$.

Fixation duration in the known signature stimulus was also statistically significant, $F(1, 87) = 9.07$, $p = .003$, partial $\eta^2 = .094$. Table Vega 6.2 presents the means and standard deviations for areas of interest by participant type.

Table Vega 6.2

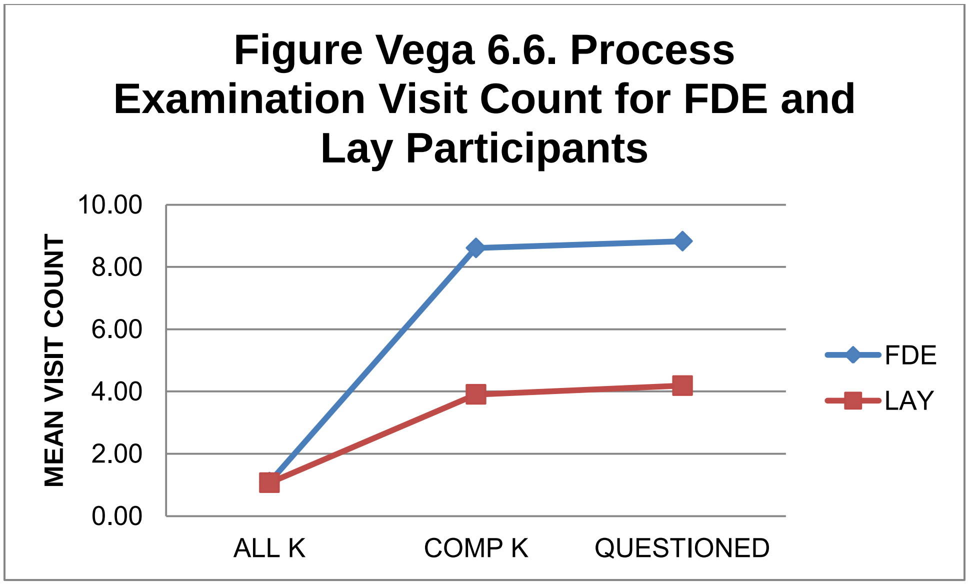
Process Analysis Fixation Durations for FDE and Lay Participants

	ALL K		COMP K		QUESTIONED	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	7.59	7.57	6.50	6.43	18.74	15.59
Lay	3.90	2.78	2.24	2.26	4.74	4.08

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .209, $F(3, 85) = 7.50$, $p < .001$, multivariate $\eta^2 = .209$. Figure Vega 6.6 presents the mean visit durations by AOI.

Figure Vega 6.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in two of the three of the areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus (COMP K) were significantly greater for FDEs than for lay participants, $F(1, 87) = 22.73$, $p < .001$, partial $\eta^2 = .207$; $F(1, 87) = 22.70$, $p < .001$, partial $\eta^2 = .207$).

Visit count in the known signature stimulus (ALL K) was not statistically significant, $p = .874$, *ns*. Table Vega 6.3 presents the means and standard deviations for areas of interest by participant type.

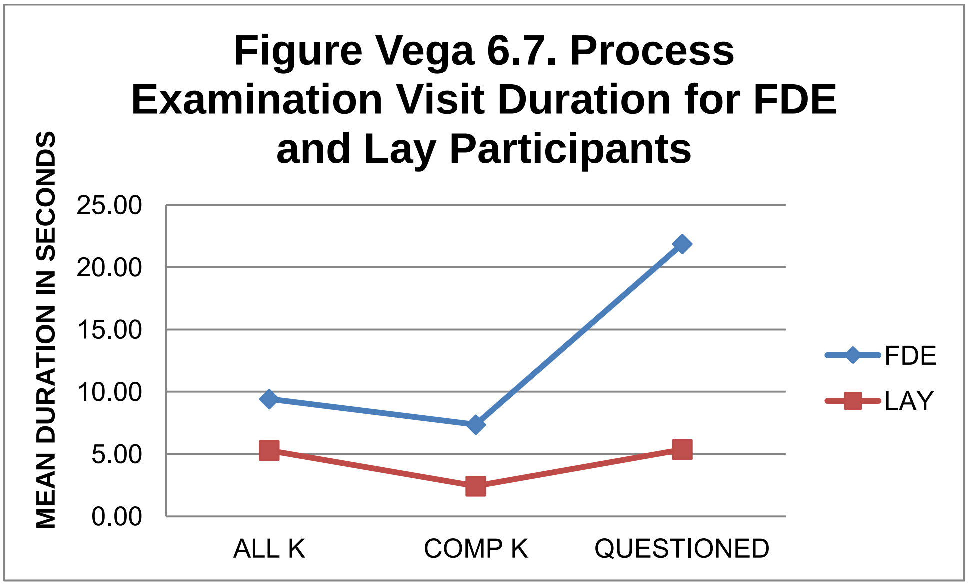
Table Vega 6.3
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.09	0.46	8.61	5.70	8.83	5.59
Lay	1.07	0.55	3.91	3.16	4.19	3.17

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .305, $F(3, 85) = 6.64$, $p < .001$, multivariate $\eta^2 = .305$. Figure Vega 6.7 presents the mean visit durations by AOI.

Figure Vega 6.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit duration in all three of the areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus (COMP K) was significantly greater for FDEs than for lay participants, $F(1, 87) = 34.13$, $p > .001$, partial $\eta^2 = .282$; $F(1, 87) = 18.92$, $p > .001$, partial $\eta^2 = .179$).

Visit duration in the known signature stimulus (ALL K) was also statistically significant, $F(1, 87) = 7.35$, $p = .008$, partial $\eta^2 = .078$. Table Vega 6.4 presents the means and standard deviations for areas of interest by participant type.

Table Vega 6.4

Process Analysis Visit Duration for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	9.41	9.35	7.35	7.07	21.87	18.03
Lay	5.29	3.59	2.42	2.38	5.37	4.35

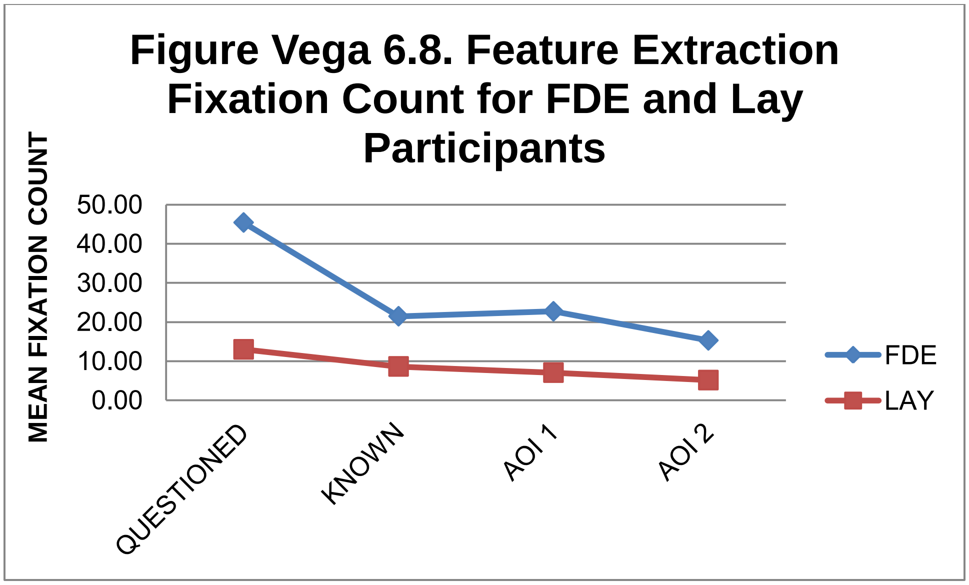
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .259, $F(4, 84) = .259$, $p < .001$, multivariate $\eta^2 = .259$. Figure Vega 6.8 presents the mean fixation counts by AOI.

Figure Vega 6.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all but one areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for lay participants, $F(1, 87) = 30.08$, $p < .001$, partial $\eta^2 = .257$, and $F(1, 87) = 20.14$, $p < .001$, partial $\eta^2 = .188$.

Fixation count in both AOIs was significantly greater for FDEs than for lay participants (AOI 1, $F(1, 87) = 26.11$, $p < .001$, partial $\eta^2 = .231$; AOI 2, $F(1, 87) = 23.90$, $p < .001$, partial $\eta^2 = .216$). Table Vega 6.5 presents the means and standard deviations for areas of interest by participant type.

Table Vega 6.5
Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

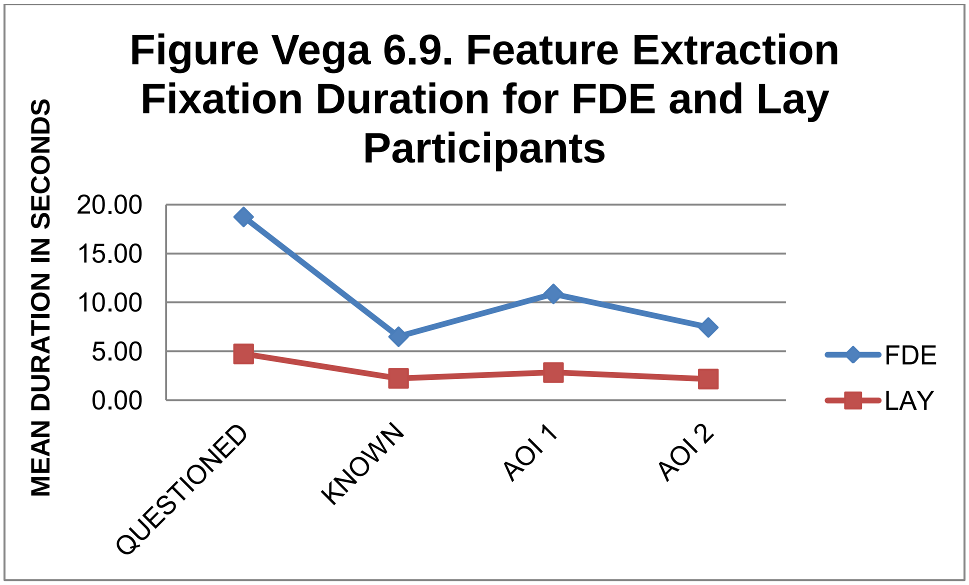
	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	45.41	37.43	21.46	17.26	22.72	19.42	15.28	12.99

Lay	13.00	10.33	8.63	7.56	7.05	5.38	5.14	4.16

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .276, $F(4, 84) = 8.02$, $p < .001$, multivariate $\eta^2 = .276$. Figure Vega 6.9 presents the mean fixation durations by AOI.

Figure Vega 6.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all but one areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for lay participants, $F(1, 87) = 32.57$, $p < .001$, partial $\eta^2 = .272$, and $F(1, 87) = 16.90$, $p < .001$, partial $\eta^2 = .163$.

Fixation duration in both AOIs was significantly greater for FDEs than for lay participants (AOI 1, $F(1, 87) = 28.81$, $p < .001$, partial $\eta^2 = .249$; AOI 2, $F(1, 87) = 26.74$, $p < .001$, partial $\eta^2 = .235$). Table Vega 6.6 presents the means and standard deviations for areas of interest by participant type.

Table Vega 6.6

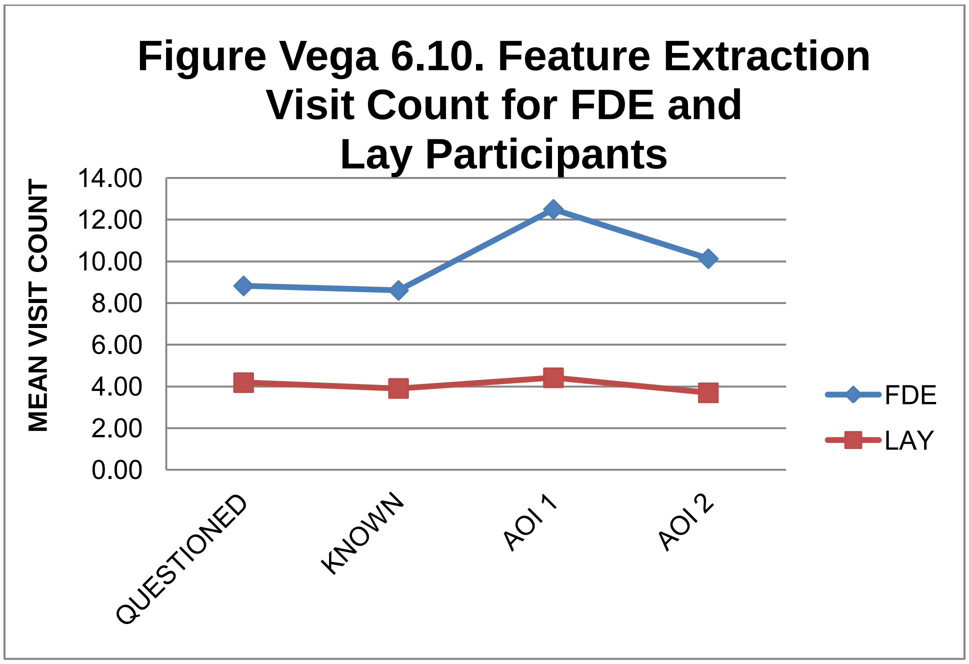
Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
FDE	18.74	15.59	6.50	6.43	10.88	9.56	7.45	6.44
Lay	4.74	4.08	2.24	2.26	2.84	2.30	2.18	1.85

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .250, $F(4, 84) = 6.99$, $p < .001$, multivariate $\eta^2 = .250$. Figure Vega 6.10 presents the mean visit counts by AOI.

Figure Vega 6.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all but one areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for lay participants, $F(1, 87) = 22.73$, $p < .001$, partial $\eta^2 = .207$, and F(1, 87) = 22.70, $p < .001$, partial $\eta^2 = .207$.

Visit count in both AOIs was significantly greater for FDEs than for lay participants (AOI 1, $F(1, 87) = 27.54$, $p < .001$, partial $\eta^2 = .240$; AOI 2, $F(1, 87) = 26.81$, $p < .001$, partial $\eta^2 = .236$). Table Vega 6.7 presents the means and standard deviations for areas of interest by participant type.

Table Vega 6.7
Feature Extraction Analysis Visit Count for FDE and Lay Participants

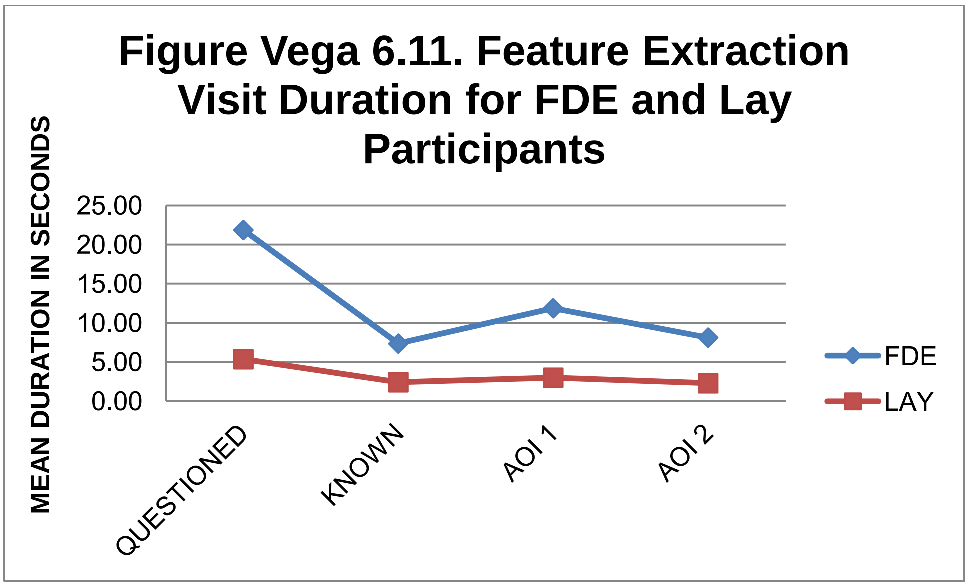
	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	8.83	5.59	8.61	5.70	12.50	9.62	10.13	7.81

Lay	4.19	3.17	3.91	3.16	4.42	3.16	3.70	2.39

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .284, $F(4, 84) = 8.34$, $p < .001$, multivariate $\eta^2 = .284$. Figure Vega 6.11 presents the mean visit durations by AOI.

Figure Vega 6.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit duration in all areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for lay participants, $F(1, 87) = 34.13$, $p < .001$, partial $\eta^2 = .282$, and $F(1, 87) = 18.92$, $p < .001$, partial $\eta^2 = .179$.

Visit duration in both AOIs was significantly greater for FDEs than for lay participants (AOI 1, $F(1, 87) = 30.61$, $p < .001$, partial $\eta^2 = .260$; AOI 2, $F(1, 87) = 28.60$, $p < .001$, partial $\eta^2 = .247$). Table Vega 6.8 presents the means and standard deviations for areas of interest by participant type.

Table Vega 6.8

Feature Extraction Analysis Visit Duration for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	21.87	18.03	7.35	7.07	11.87	10.25	8.12	6.87
Lay	5.37	4.35	2.42	2.38	2.99	2.48	2.30	2.01

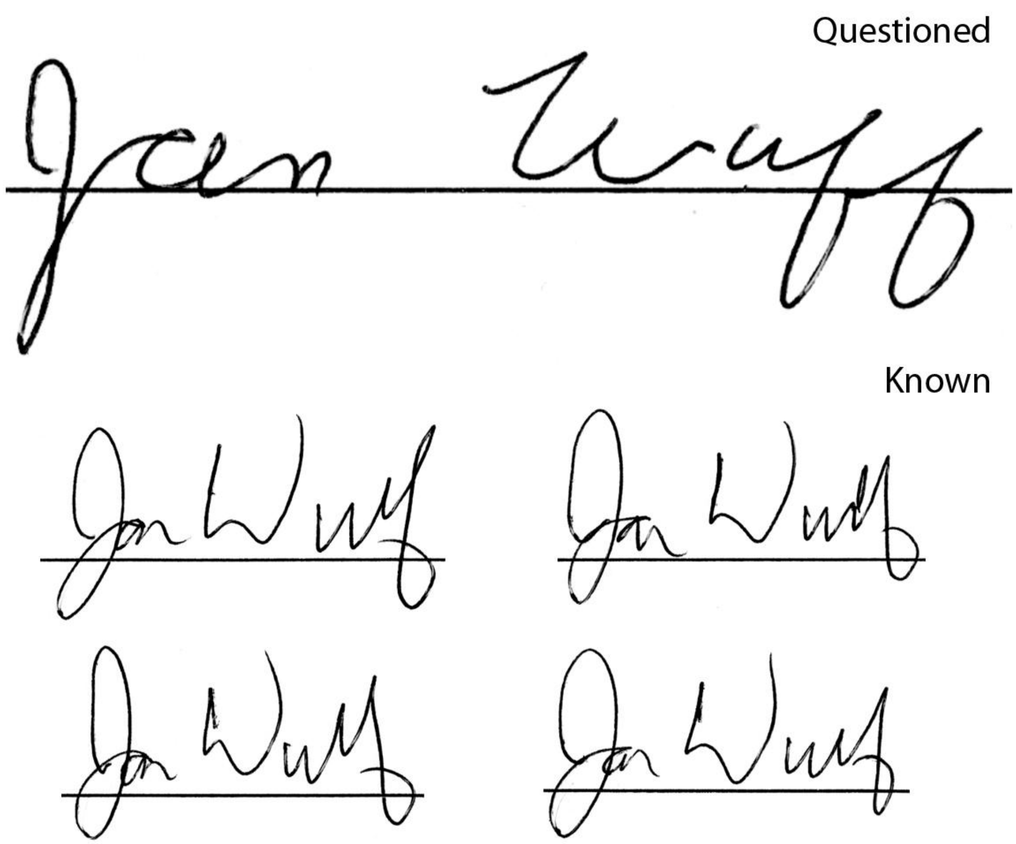
<u>SIGNATURE 11: John Wulf</u>

The signature of John Wulf is characterized as a low-complexity text-based signature.

Wulf Signature 1: Freehand Simulation

Of the 49 FDE participants, 48 responded correctly that the signature was non-genuine, and none responded that it was genuine. One FDE declined to respond. Of the 43 Lay participants, 41responded correctly that the signature was non-genuine, and 1 responded that the signature was genuine. This difference was not statistically significant, p = .205, *ns.* Figure Wulf 1.1 presents the comparison view of this signature.

Figure Wulf 1.1. Questioned-Known Comparison Stimulus for Wulf Signature 1.

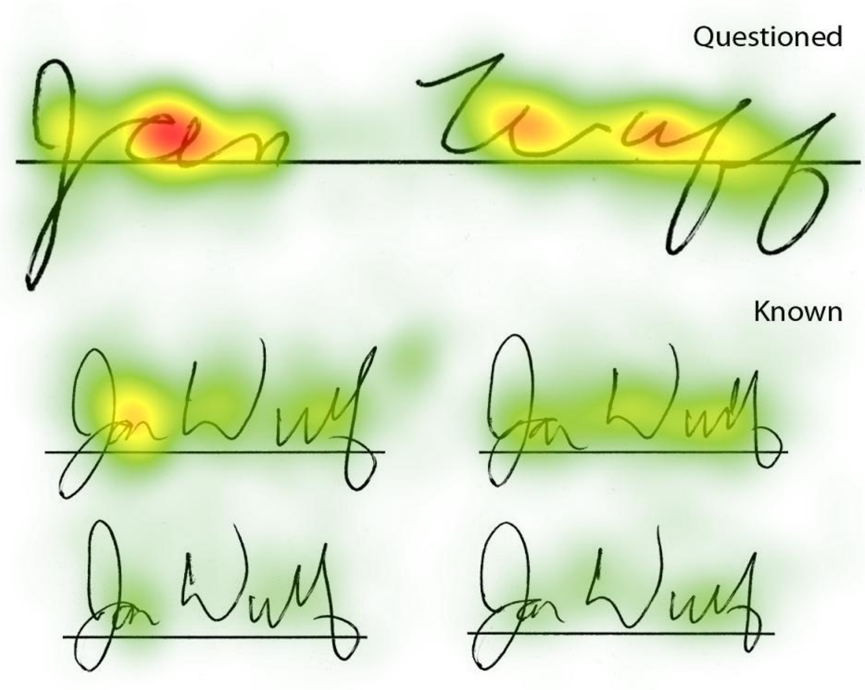


Selection of Areas of Interest (AOIs)

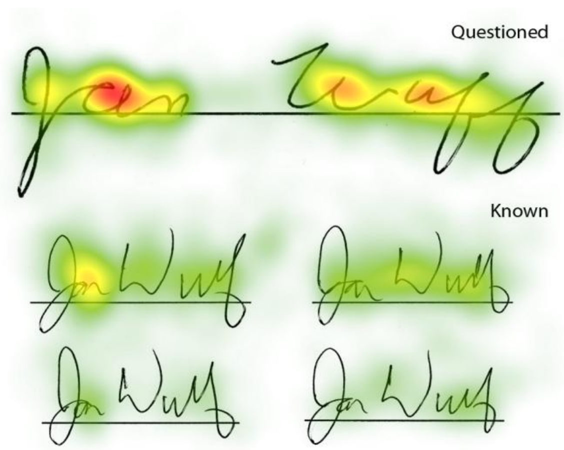
Figure Wulf 1.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there is one location indicated by a red hot spot, and three areas within the signature that are indicated by orange warm spots. AOIs for the following analyses include the AOI encompassing the questioned signature, the AOI encompassing the four known signatures, and the four additional AOIs encompassing the hot and warm spots indicated on the heat map. Figure Wulf 1.3 presents the location of the AOIs identified in the heat map.

Figure Wulf 1.2. Heat map for Wulf signature 1, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

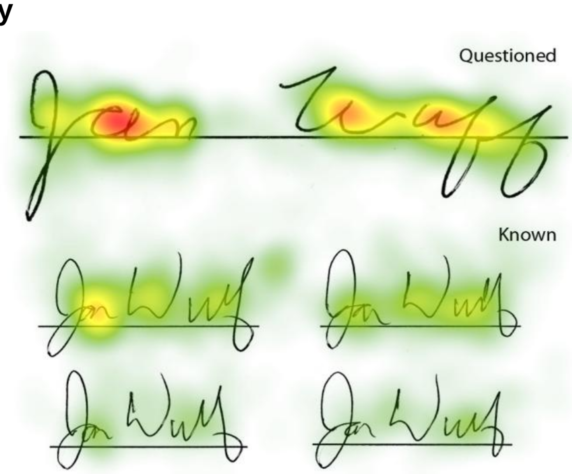
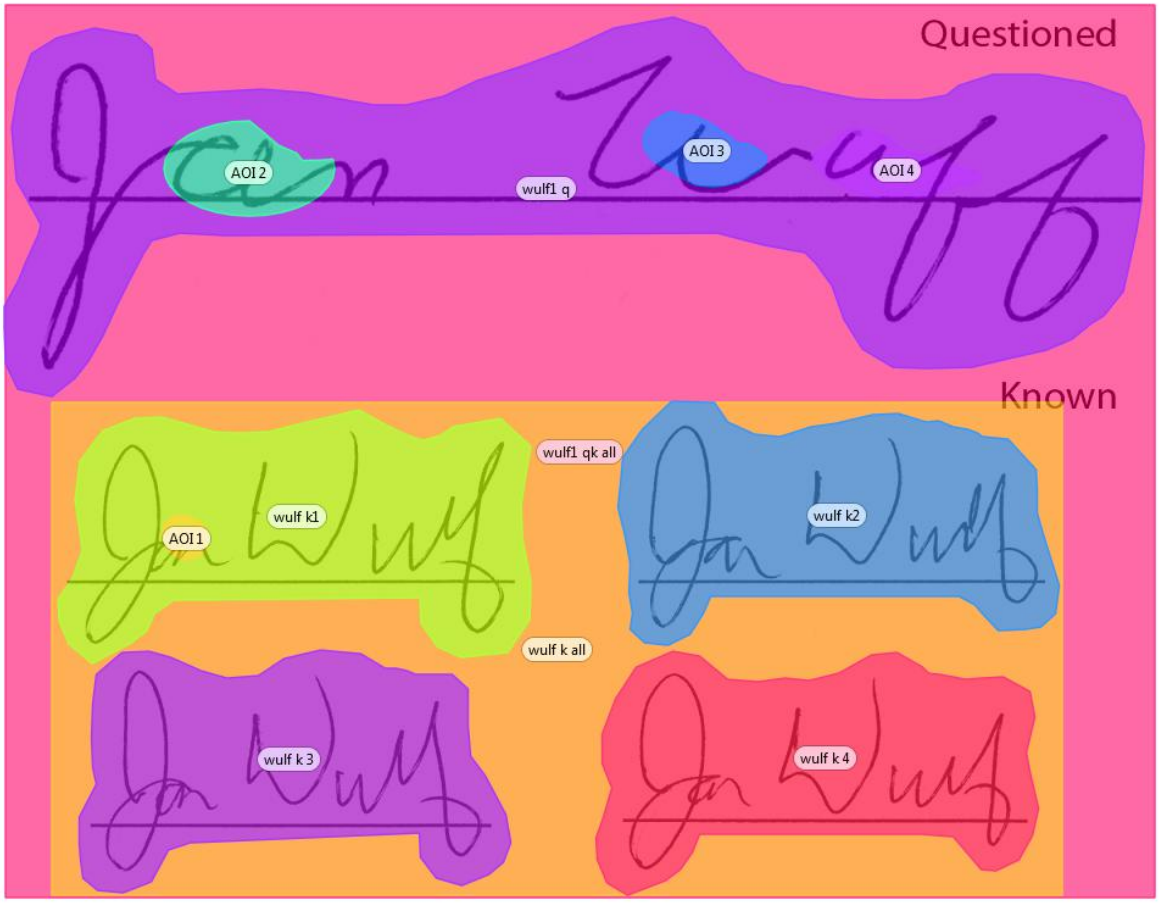


Figure Wulf 1.3. Areas of Interest (AOIs) for Wulf Signature 1.



Eye-Tracking Metrics Analyses

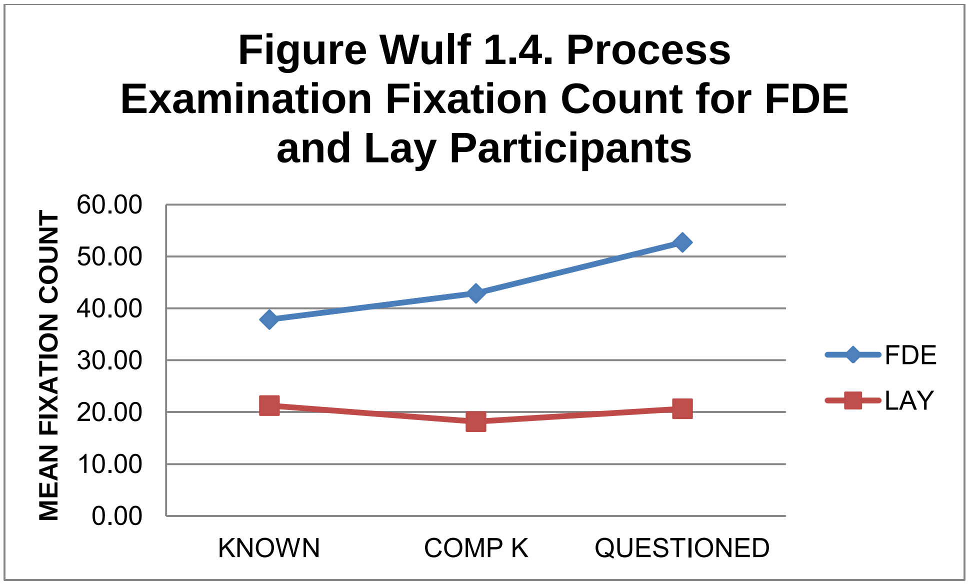
Examination Process Analyses

These analyses are based on AOIs Wulf1Q, Wulf K All, and Wulf K All on the known signature stimulus (not pictured).

<u>Total Fixation Count</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .216, $F(3, 85) = 7.79$, $p < .001$, multivariate $\eta^2 = .216$. Figure Wulf 1.4 presents the mean fixation counts by AOI.

Figure Wulf 1.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 87) = 23.35$, $p < .001$, partial $\eta^2 = .212$); known signature comparison stimulus, $F(1, 87) = 16.42$, $p < .001$, partial $\eta^2 = .159$). Fixation count in the known signature stimulus was also statistically significant, $F(1, 87) = 6.42$, $p = .013$, partial $\eta^2 = .069$. Table Wulf 1.1 presents the means and standard deviations for areas of interest by participant type.

Table Wulf 1.1

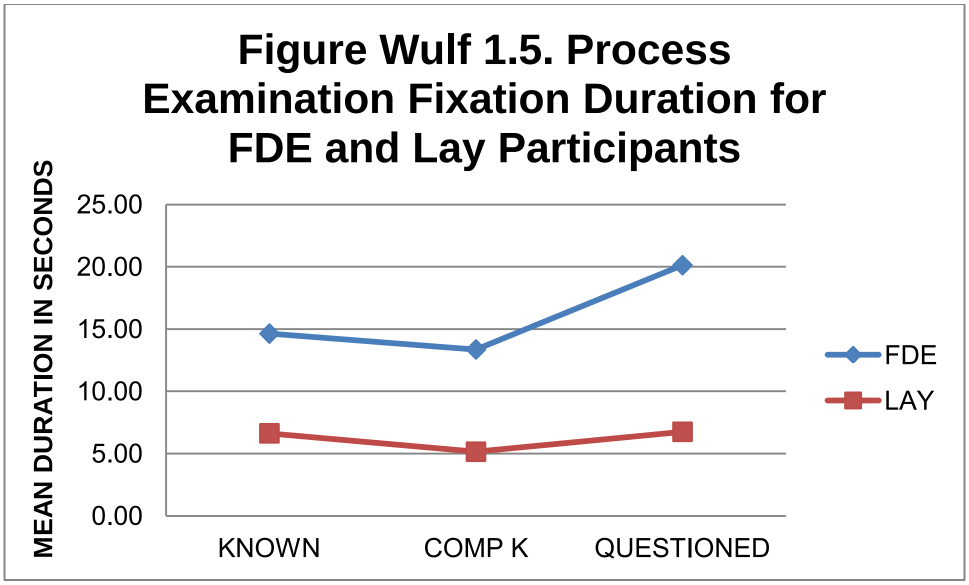
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	37.83	39.13	42.87	34.92	52.70	36.75
Lay	21.26	18.16	18.16	20.11	20.65	24.04

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .252, $F(3, 85) = 9.54$, $p < .001$, multivariate $\eta^2 = .252$. Figure Wulf 1.5 presents the mean fixation duration by AOI.

Figure Wulf 1.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 87) = 26.37$, $p < .001$, partial $\eta^2 = .233$); known signature comparison stimulus, $F(1, 87) = 16.01$, $p < .001$, partial $\eta^2 = .155$). Fixation duration in the known signature stimulus was also statistically significant, $F(1, 87) = 11.14$, $p = .001$, partial $\eta^2 = .114$. Table Wulf 1.2 presents the means and standard deviations for areas of interest by participant type.

Table Wulf 1.2

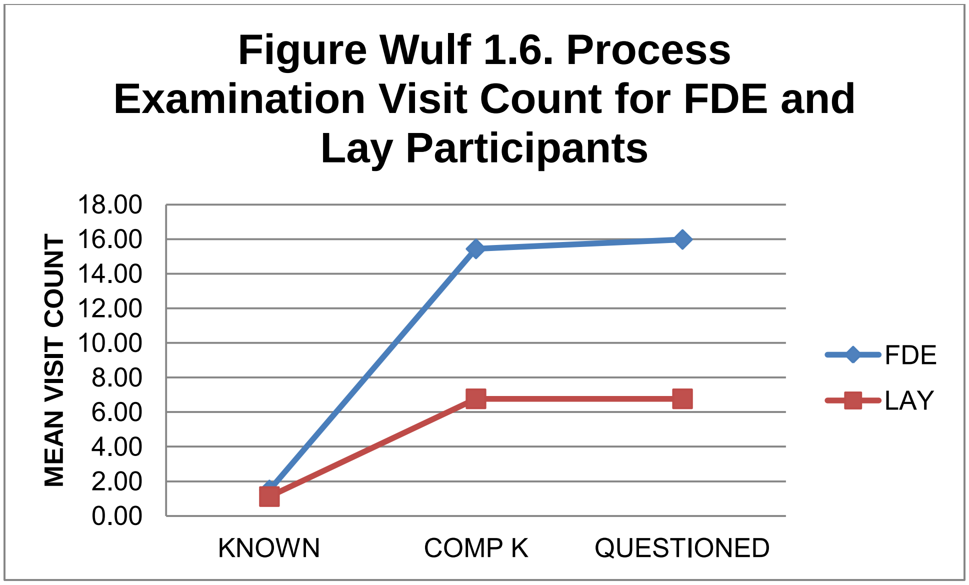
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	14.64	14.54	13.36	12.62	20.12	15.59
Lay	6.63	6.18	5.15	4.81	6.75	7.20

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .167, $F(3, 85) = 5.69$, $p = .001$, multivariate $\eta^2 = .167$. Figure Wulf 1. 6 presents the mean visit counts by AOI.

Figure Wulf 1.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in two of the three areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 87) = 15.78$, $p < .001$, partial $\eta^2 = .154$); known signature comparison stimulus, $F(1, 87) = 15.32$, $p < .001$, partial $\eta^2 = .150$). Visit count in the known signature stimulus was not statistically significant, $p = .127$, *ns*. Table Wulf 1.3 presents the means and standard deviations for areas of interest by participant type.

Table Wulf 1.3

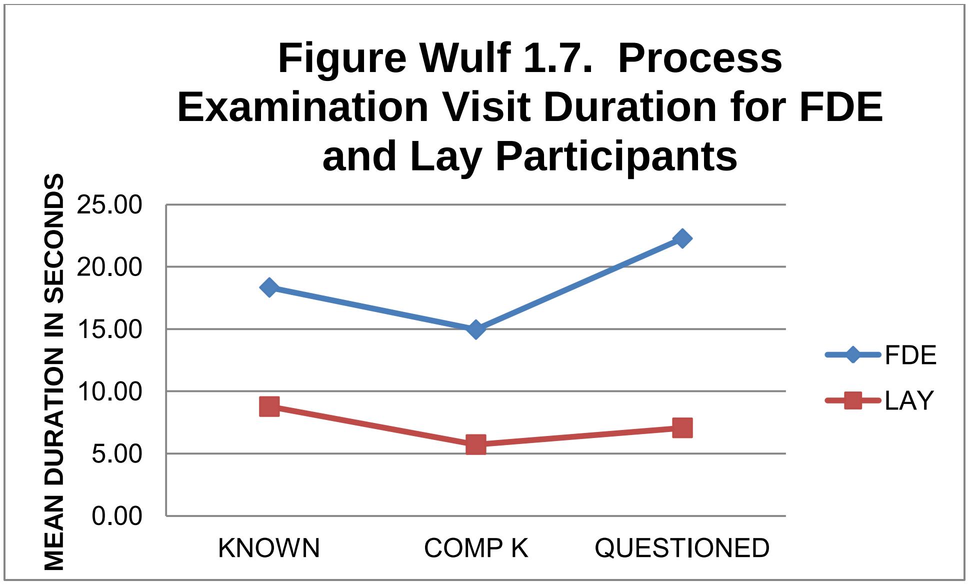
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.50	1.59	15.43	12.34	15.98	12.97
Lay	1.12	0.39	6.77	7.91	6.77	8.20

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .275, $F(3, 85) = 10.77$, $p < .001$, multivariate $\eta^2 = .275$. Figure Wulf 1.7 presents the mean visit durations by AOI.

Figure Wulf 1.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in two of the three areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 87) = 29.98$, $p > .001$, partial $\eta^2 = .256$); known signature comparison stimulus, $F(1, 87) = 17.39$, $p < .001$, partial $\eta^2 = .167$). Visit duration in the known signature stimulus was also statistically significant, $F(1, 87) = 11.44$, $p = .001$, partial $\eta^2 = .116$. Table Wulf 1.4 presents the means and standard deviations for areas of interest by participant type.

Table Wulf 1.4

Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	18.34	17.04	14.96	13.50	22.28	16.71
Lay	8.78	7.52	5.73	5.50	7.07	7.48

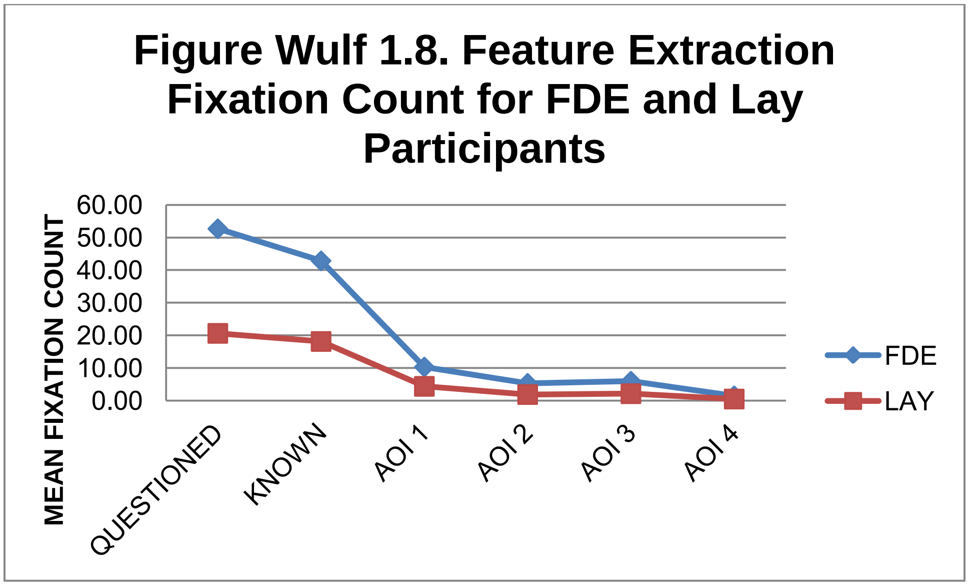
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .226, $F(6, 82) = 3.98$, $p < .001$, multivariate $\eta^2 = .226$. Figure Wulf 1.8 presents the mean fixation counts by AOI.

Figure Wulf 1.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 87) = 23.35$, $p < .001$, partial $\eta^2 = .212$, and $F(1, 87) = 16.42$, $p < .001$, partial $\eta^2 = .159$.

Fixation count in all AOIs was significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 21.12$, $p < .001$, partial $\eta^2 = .195$; AOI 2, $F(1, 87) = 21.12$, $p < .001$, partial $\eta^2 = .195$; AOI 3, $F(1, 87) = 19.75$, $p < .001$, partial $\eta^2 = .185$; AOI 4, $F(1, 87) = 4.57$, $p = .035$, partial $\eta^2 = .050$). Table Wulf 1.5 presents the means and standard deviations for areas of interest by participant type.

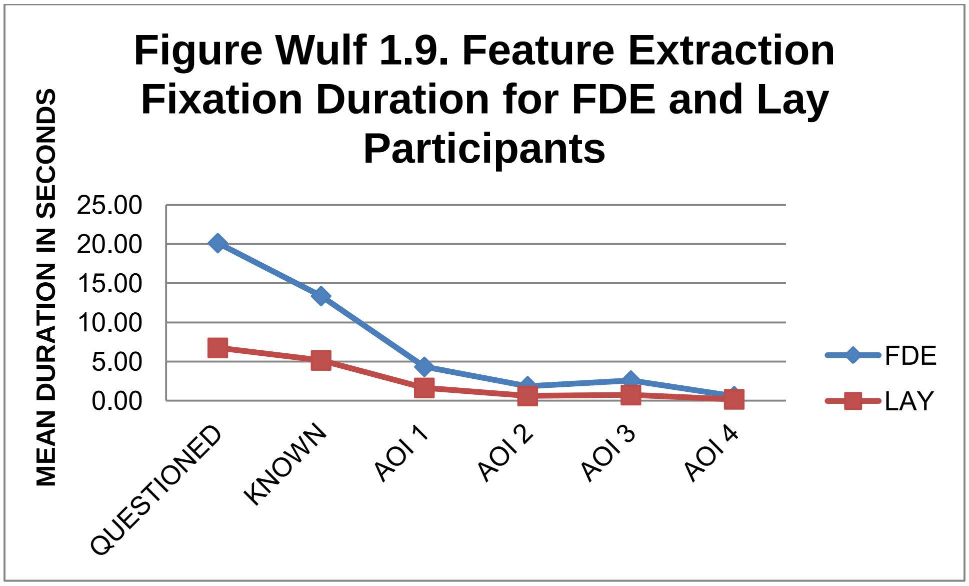
Table Wulf 1.5
Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2		AOI 3		AOI 4	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	52.70	36.75	42.87	34.92	10.35	7.15	5.35	4.17	6.00	5.36	1.52	2.87
Lay	20.65	24.04	18.16	20.11	4.42	4.68	1.91	2.68	2.16	1.88	0.53	1.01

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .274, $F(6, 82) = 5.15$, $p < .001$, multivariate $\eta^2 = .274$. Figure Wulf 1.9 presents the mean fixation durations by AOI.

Figure Wulf 1.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 87) = 26.37$, $p < .001$, partial $\eta^2 = .233$, and $F(1, 87) = 16.01$, $p < .001$, partial $\eta^2 = .155$.

Fixation durations in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 27.74$, $p < .001$, partial $\eta^2 = .242$; AOI 2, $F(1, 87) = 23.41$, $p < .001$, partial $\eta^2 = .212$; AOI 3, $F(1, 87) = 17.59$, $p < .001$, partial $\eta^2 = .168$; AOI 4, $F(1, 87) = 7.74$, $p = .007$, partial $\eta^2 = .082$). Table Wulf 1.6 presents the means and standard deviations for areas of interest by participant type.

Table Wulf 1.6

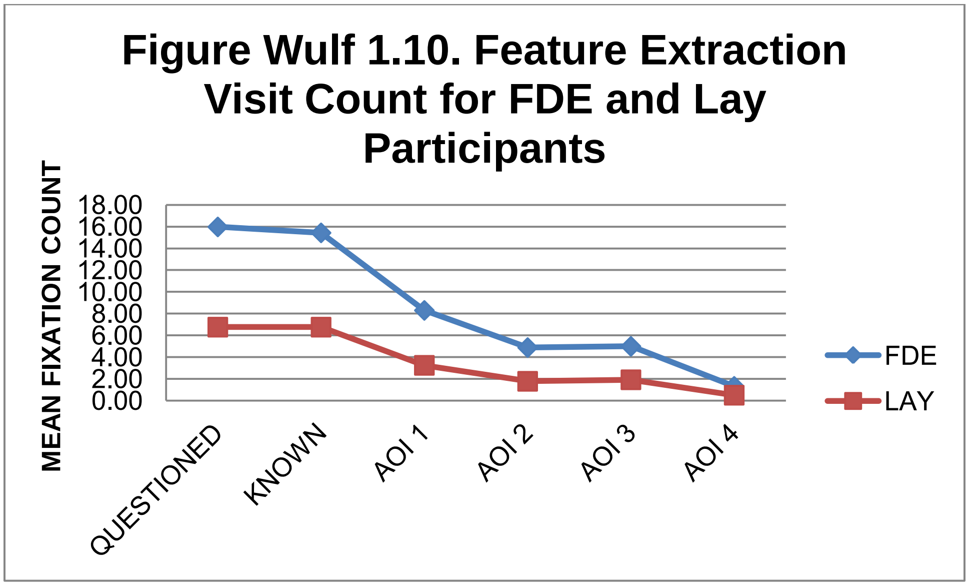
Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2		AOI 3		AOI 4	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	20.12	15.59	13.36	12.62	4.33	3.05	1.86	1.48	2.58	2.84	0.59	0.91
Lay	6.75	7.20	5.15	4.81	1.64	1.43	0.61	0.86	0.73	0.63	0.18	0.27

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .260, $F(6, 82) = 4.80$, $p < .001$, multivariate $\eta^2 = .260$. Figure Wulf 1.10 presents the mean fixation durations by AOI.

Figure Wulf 1.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 87) = 15.78$, $p < .001$, partial $\eta^2 = .154$, and $F(1, 87) = 15.32$, $p < .001$, partial $\eta^2 = .150$.

Visit counts in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 27.88$, $p < .001$, partial $\eta^2 = .243$; AOI 2, $F(1, 87) = 20.26$, $p < .001$, partial $\eta^2 = .189$; AOI 3, $F(1, 87) = 17.64$, $p < .001$, partial $\eta^2 = .169$; AOI 4, $F(1, 87) = 5.03$, $p = .027$, partial $\eta^2 = .055$). Table Wulf 1.7 presents the means and standard deviations for areas of interest by participant type.

Table Wulf 1.7

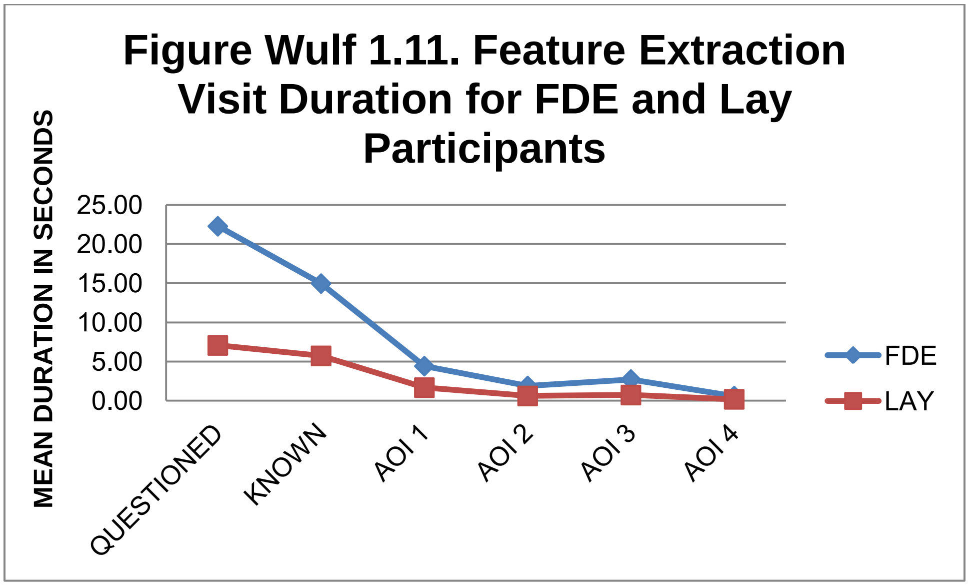
Feature Extraction Analysis Visit Count for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2		AOI 3		AOI 4	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	15.98	12.97	15.43	12.34	8.30	5.64	4.89	3.79	5.00	4.48	1.33	2.22
Lay	6.77	8.20	6.77	7.91	3.26	2.84	1.79	2.54	1.93	1.75	0.51	0.88

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .289, $F(6, 82) = 5.56$, $p < .001$, multivariate $\eta^2 = .289$. Figure Wulf 1.11 presents the mean fixation durations by AOI.

Figure Wulf 1.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 87) = 29.98$, $p < .001$, partial $\eta^2 = .256$, and $F(1, 87) = 17.39$, $p < .001$, partial $\eta^2 = .167$.

Visit durations in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 27.01$, $p < .001$, partial $\eta^2 = .237$; AOI 2, $F(1, 87) = 23.43$, $p < .001$, partial $\eta^2 = .212$; AOI 3, $F(1, 87) = 17.68$, $p < .001$, partial $\eta^2 = .169$; AOI 4, $F(1, 87) = 7.38$, $p = .008$, partial $\eta^2 = .078$). Table Wulf 1.8 presents the means and standard deviations for areas of interest by participant type.

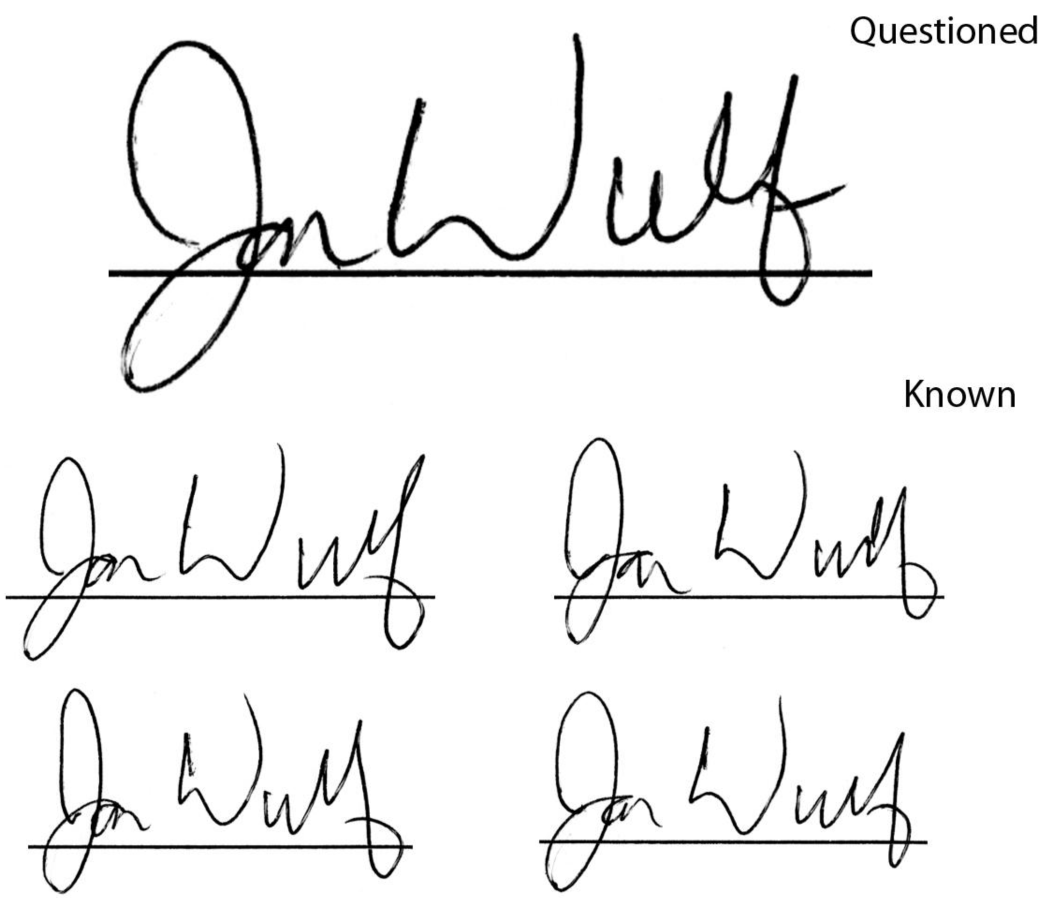
Table Wulf 1.8
Feature Extraction Analysis Visit Count for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2		AOI 3		AOI 4	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	22.28	16.71	14.96	13.50	4.42	3.15	1.89	1.51	2.72	3.04	0.60	0.96
Lay	7.07	7.48	5.73	5.50	1.67	1.49	0.61	0.86	0.73	0.63	0.18	0.27

Wulf Signature 2: Disguised Simulation

Of the 49 FDE participants, 25 responded correctly that the signature was non-genuine, and 23 responded that it was genuine. One FDE declined to respond. Of the 43 Lay participants, 29 responded correctly that the signature was non-genuine, and 14 responded incorrectly that the signature was genuine. This difference was not statistically significant, $p = .211$, *ns*. Figure Wulf 2.1 presents the comparison view of this signature.

Figure Wulf 2.1. Questioned-Known Comparison Stimulus for Wulf Signature 2.

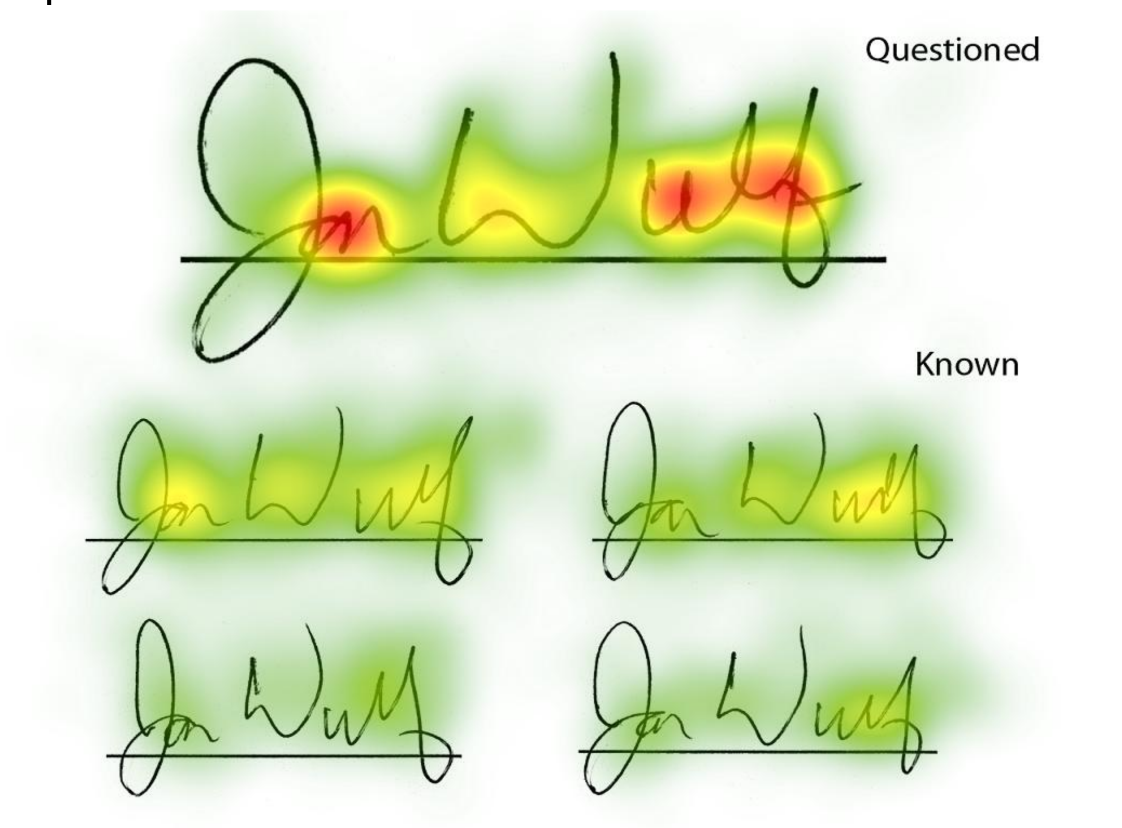


Selection of Areas of Interest (AOIs)

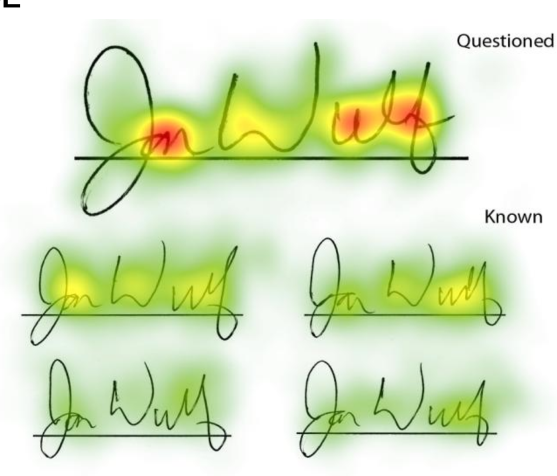
Figure Wulf 2.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there are three locations indicated by a red hot spot, and one area within the signature indicated by an orange warm spot. AOIs for the following analyses include the AOI encompassing the questioned signature, the AOI encompassing the four known signatures, and the four additional AOIs encompassing the hot and warm spots indicated on the heat map. Figure Wulf 2.3 presents the location of the AOIs identified in the heat map.

Figure Wulf 2.2. Heat map for Wulf Signature 2, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

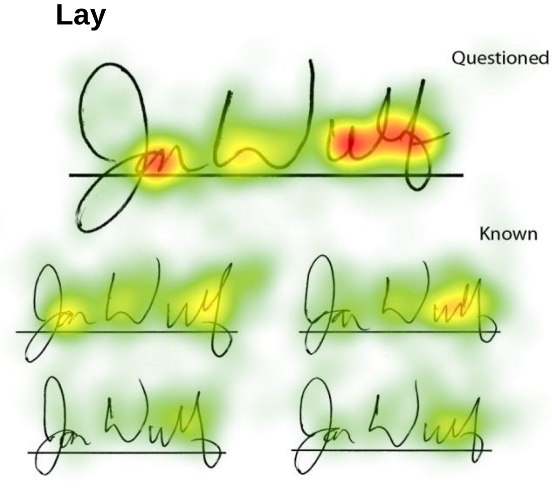
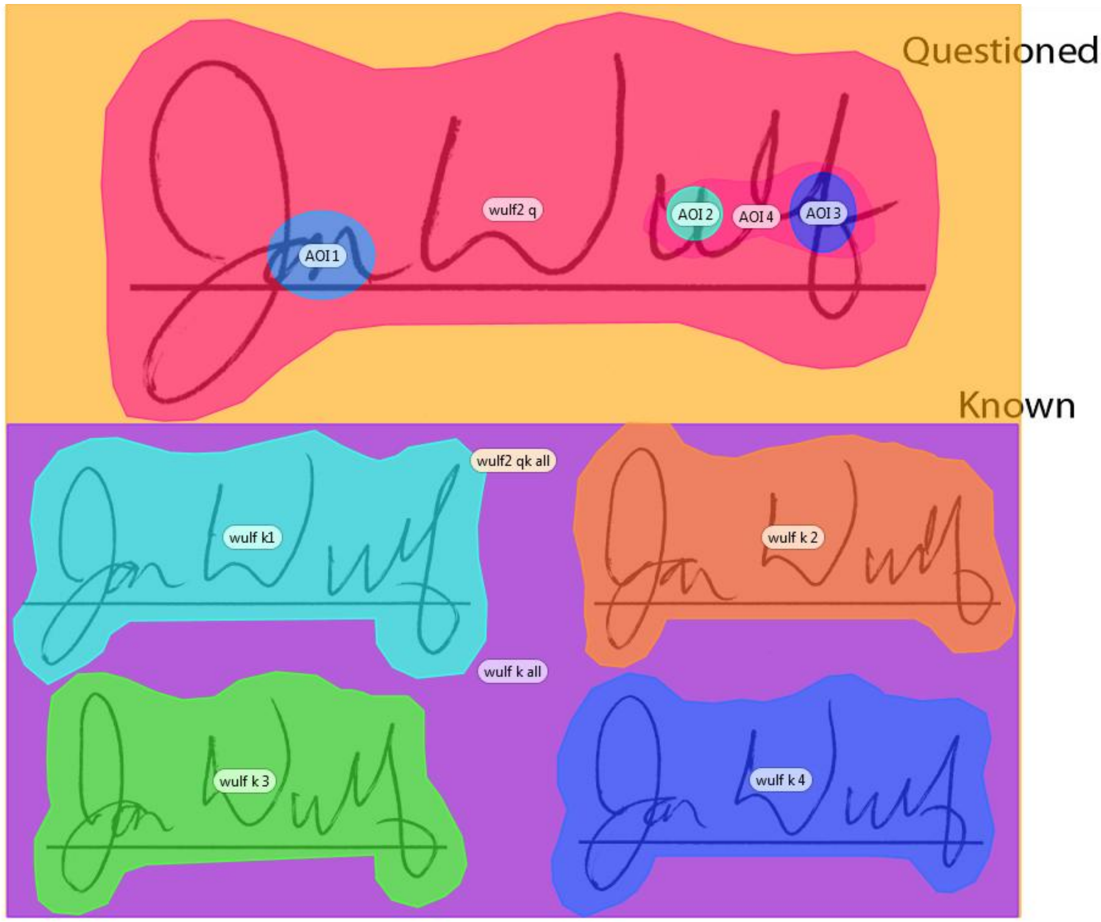


Figure Wulf 2.3. Areas of Interest (AOIs) for Wulf Signature 2.



Eye-Tracking Metrics Analyses

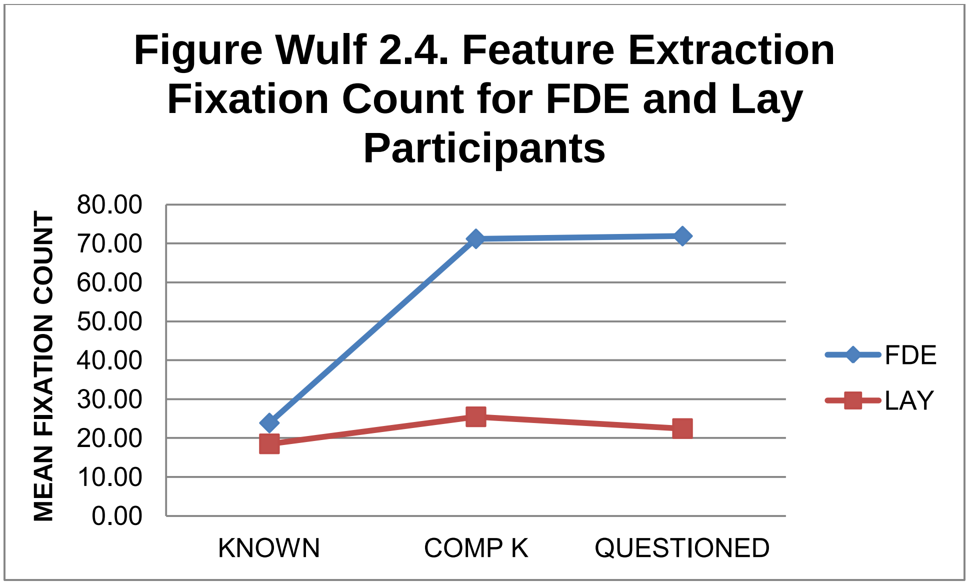
Examination Process Analyses

These analyses are based on AOIs Wulf2Q, Wulf K All, and Wulf K All on the known signature stimulus (not pictured).

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .305, $F(3, 86) = 12.61$, $p < .001$, multivariate $\eta^2 = .305$. Figure Wulf 2.4 presents the mean fixation counts by AOI.

Figure Wulf 2.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 88) = 35.45$, $p < .001$, partial $\eta^2 = .287$); known signature comparison stimulus, $F(1, 88) = 23.47$, $p < .001$, partial $\eta^2 = .211$). Fixation count in the known signature stimulus was also statistically significant, $F(1, 88) = 4.12$, $p = .045$, partial $\eta^2 = .045$. Table Wulf 2.1 presents the means and standard deviations for areas of interest by participant type.

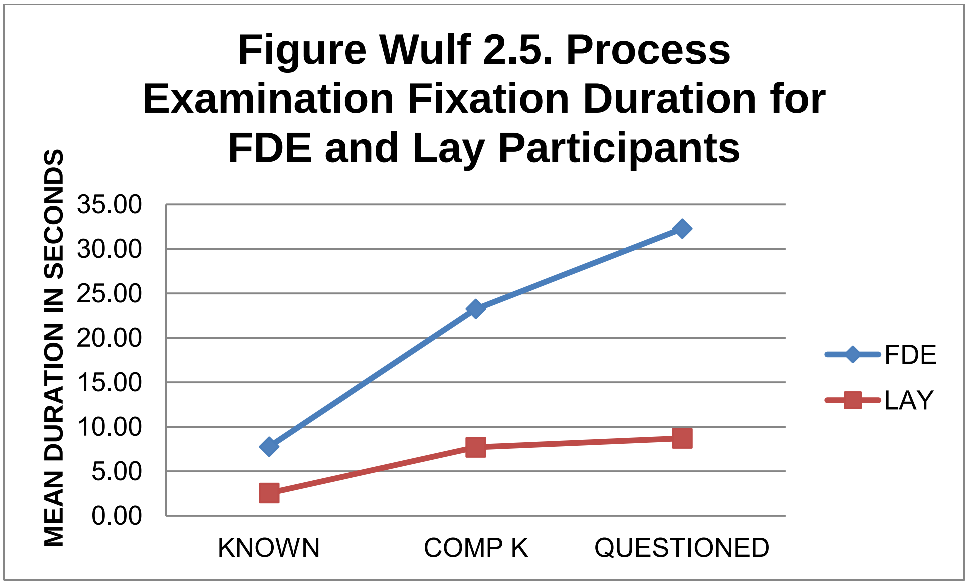
Table Wulf 2.1
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	23.87	19.99	71.19	53.51	71.89	48.39
Lay	18.51	11.62	25.47	32.48	22.44	26.10

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .383, $F(3, 86) = 17.77$, $p < .001$, multivariate $\eta^2 = .383$. Figure Wulf 2.5 presents the mean fixation duration by AOI.

Figure Wulf 2.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 88) = 42.58$, $p < .001$, partial $\eta^2 = .326$); known signature comparison stimulus, $F(1, 88) = 22.46$, $p < .001$, partial $\eta^2 = .203$). Fixation duration in the known signature stimulus was also statistically significant, $F(1, 88) = 25.89$, $p < .001$, partial $\eta^2 = .227$. Table Wulf 2.2 presents the means and standard deviations for areas of interest by participant type.

Table Wulf 2.2

Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	7.74	6.13	23.24	19.93	32.25	21.71
Lay	2.54	2.84	7.68	8.51	8.69	9.86

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .245, $F(3, 86) = 8.02$, $p < .001$, multivariate $\eta^2 = .245$. Figure Wulf 2.6 presents the mean visit counts by AOI.

Figure Wulf 2.6

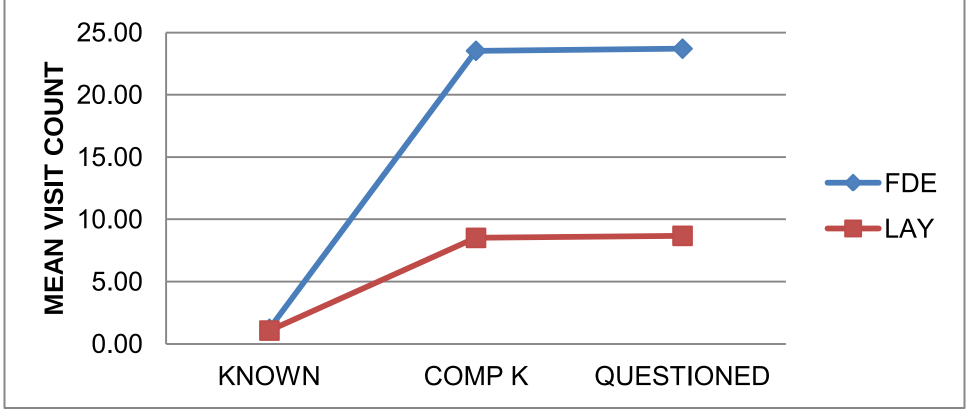


Figure Wulf 2.6. Process Examination Visit Count for FDE and Lay Participants

Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in two of the three areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 88) = 26.90$, $p < .001$, partial $\eta^2 = .234$); known signature comparison stimulus, $F(1, 88) = 27.39$, $p < .001$, partial $\eta^2 = .237$). Visit count in the known signature stimulus was not statistically significant, $p = .344$, *ns*. Table 1 presents the means and standard deviations for areas of interest by participant type. Table Wulf 2.3 presents the means and standard deviations for areas of interest by participant type.

Table Wulf 2.3

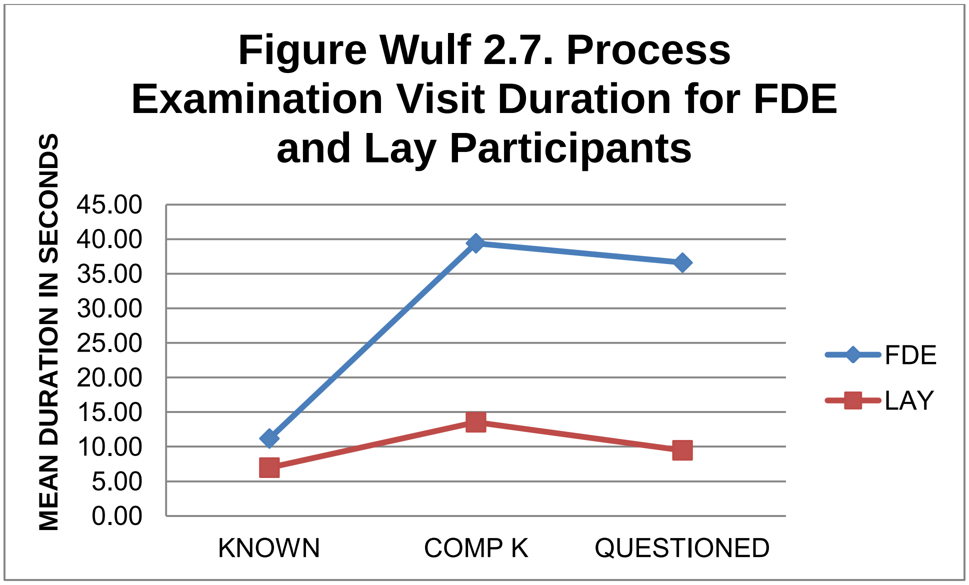
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.21	0.88	23.53	16.18	23.70	16.20
Lay	1.07	0.46	8.51	10.03	8.67	10.37

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .352, $F(3, 86) = 15.55$, $p < .001$, multivariate $\eta^2 = .352$. Figure Wulf 2.7 presents the mean visit durations by AOI.

Figure Wulf 2.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in two of the three areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 88) = 46.34$, $p < .001$, partial $\eta^2 = .345$); known signature comparison stimulus, $F(1, 88) = 22.49$, $p < .001$, partial $\eta^2 = .204$). Visit duration in the known signature stimulus was also statistically significant, $F(1, 88) = 5.30$, $p = .024$, partial $\eta^2 = .057$. Table Wulf 2.4 presents the means and standard deviations for areas of interest by participant type.

Table Wulf 2.4

Process Analysis Visit Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	11.18	11.03	39.40	36.18	36.59	24.26
Lay	6.97	4.87	13.53	12.07	9.48	10.08

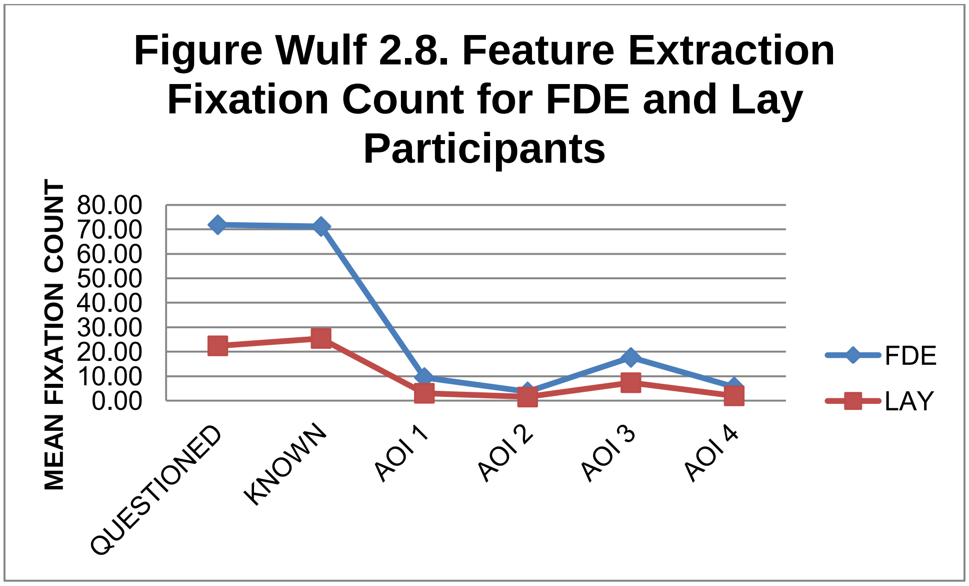
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .377, $F(6, 83) = 8.37$, $p < .001$, multivariate $\eta^2 = .377$. Figure Wulf 2.8 presents the mean fixation counts by AOI.

Figure Wulf 2.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 88) = 35.45$, $p < .001$, partial $\eta^2 = .287$, and $F(1, 88) = 23.47$, $p < .001$, partial $\eta^2 = .211$.

Fixations count in all AOIs was significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 23.38$, $p < .001$, partial $\eta^2 = .210$; AOI 2, $F(1, 88) = 10.91$, $p = .001$, partial $\eta^2 = .110$; AOI 3, $F(1, 88) = 17.71$, $p < .001$, partial $\eta^2 = .168$; AOI 4, $F(1, 88) = 16.48$, $p < .001$, partial $\eta^2 = .158$). Table Wulf 2.5 presents the means and standard deviations for areas of interest by participant type.

Table Wulf 2.5

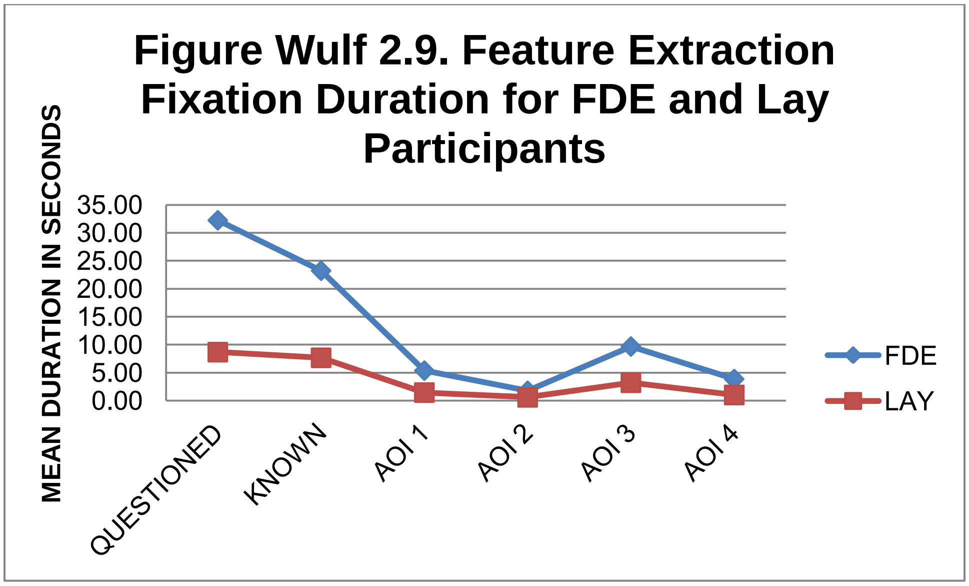
Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2		AOI 3		AOI 4	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	71.89	48.39	71.19	53.51	9.49	7.95	3.64	3.73	17.70	14.19	5.66	5.34
Lay	22.44	26.10	25.47	32.48	3.07	3.69	1.53	1.97	7.37	7.94	2.02	2.55

<u>*Total Fixation Duration*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .408, $F(6, 83) = 9.52$, $p < .001$, multivariate $\eta^2 = .408$. Figure Wulf 2.9 presents the mean fixation durations by AOI.

Figure Wulf 2.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 88) = 42.58$, $p < .001$, partial $\eta^2 = .326$, and $F(1, 88) = 22.46$, p < .001, partial $\eta^2 = .203$.

Fixation durations in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 25.39$, $p < .001$, partial $\eta^2 = .224$; AOI 2, $F(1, 88) = 13.30$, $p < .001$, partial $\eta^2 = .131$; AOI 3, $F(1, 88) = 32.06$, $p < .001$, partial $\eta^2 = .267$; AOI 4, $F(1, 88) = 30.26$, $p < .001$, partial $\eta^2 = .256$). Table Wulf 2.6 presents the means and standard deviations for areas of interest by participant type.

Table Wulf 2.6

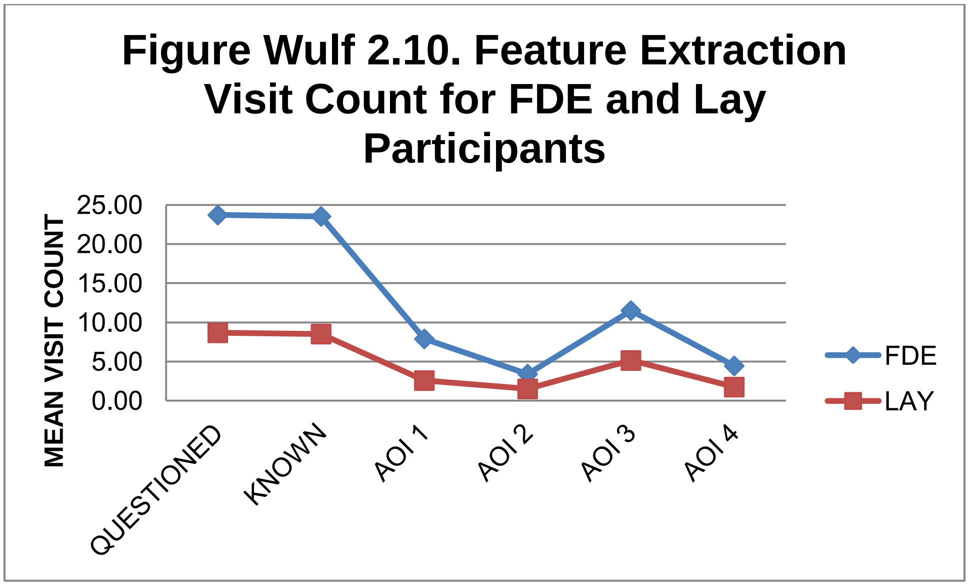
Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2		AOI 3		AOI 4	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	32.25	21.71	23.24	19.93	5.39	4.65	1.79	1.95	9.69	6.74	3.88	3.09
Lay	8.69	9.86	7.68	8.51	1.46	2.21	0.62	0.84	3.22	3.42	1.04	1.45

<u>*Total Visit Count*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .288, $F(6, 83) = 5.59$, $p < .001$, multivariate $\eta^2 = .288$. Figure Wulf 2.10 presents the mean fixation durations by AOI.

Figure Wulf 2.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 88) = 26.90$, $p < .001$, partial $\eta^2 = .234$, and F(1, 88) = 27.39, $p < .001$, partial $\eta^2 = .237$.

Visit counts in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 27.40$, $p < .001$, partial $\eta^2 = .237$; AOI 2, $F(1, 88) = 11.16$, $p = .001$, partial $\eta^2 = .113$; AOI 3, $F(1, 88) = 19.33$, $p < .001$, partial $\eta^2 = .180$; AOI 4, $F(1, 88) = 20.22$, $p < .001$, partial $\eta^2 = .187$). Table Wulf 2.7 presents the means and standard deviations for areas of interest by participant type.

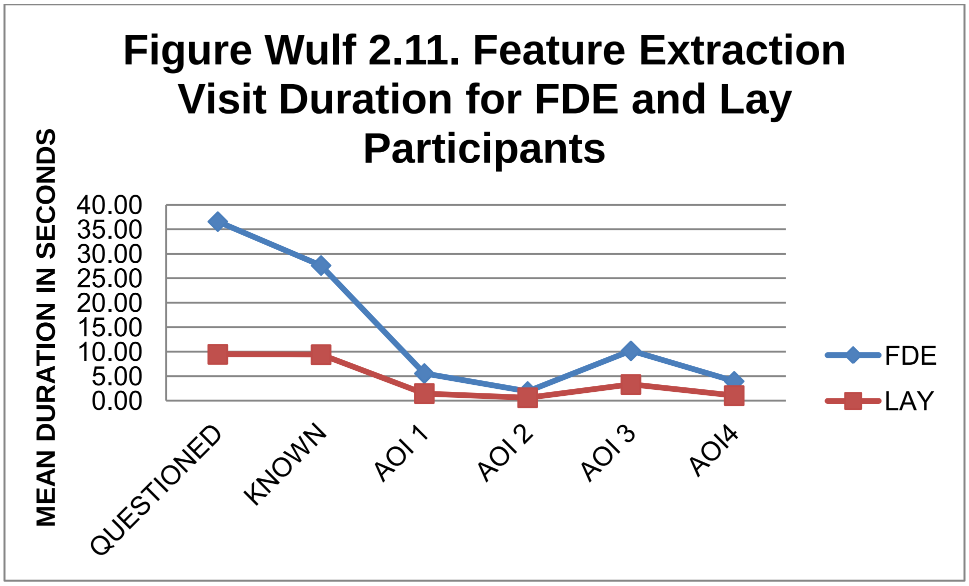
Table Wulf 2.7
Feature Extraction Analysis Visit Count for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2		AOI 3		AOI 4	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	23.70	16.20	23.53	16.18	7.89	6.12	3.40	3.25	11.51	7.89	4.45	3.37
Lay	8.67	10.37	8.51	10.03	2.58	2.74	1.51	1.88	5.14	5.53	1.74	2.13

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .400, $F(6, 83) = 9.22$, $p < .001$, multivariate $\eta^2 = .400$. Figure Wulf 2.11 presents the mean fixation durations by AOI.

Figure Wulf 2.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 88) = 46.34$, $p < .001$, partial $\eta^2 = .345$, and $F(1, 88) = 22.49$, $p < .001$, partial $\eta^2 = .204$.

Visit durations in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 27.03$, $p < .001$, partial $\eta^2 = .235$; AOI 2, $F(1, 88) = 14.94$, $p < .001$, partial $\eta^2 = .145$; AOI 3, $F(1, 88) = 33.39$, $p < .001$, partial $\eta^2 = .275$; AOI 4, $F(1, 88) = 29.71$, $p < .001$, partial $\eta^2 = .252$). Table Wulf 2.8 presents the means and standard deviations for areas of interest by participant type.

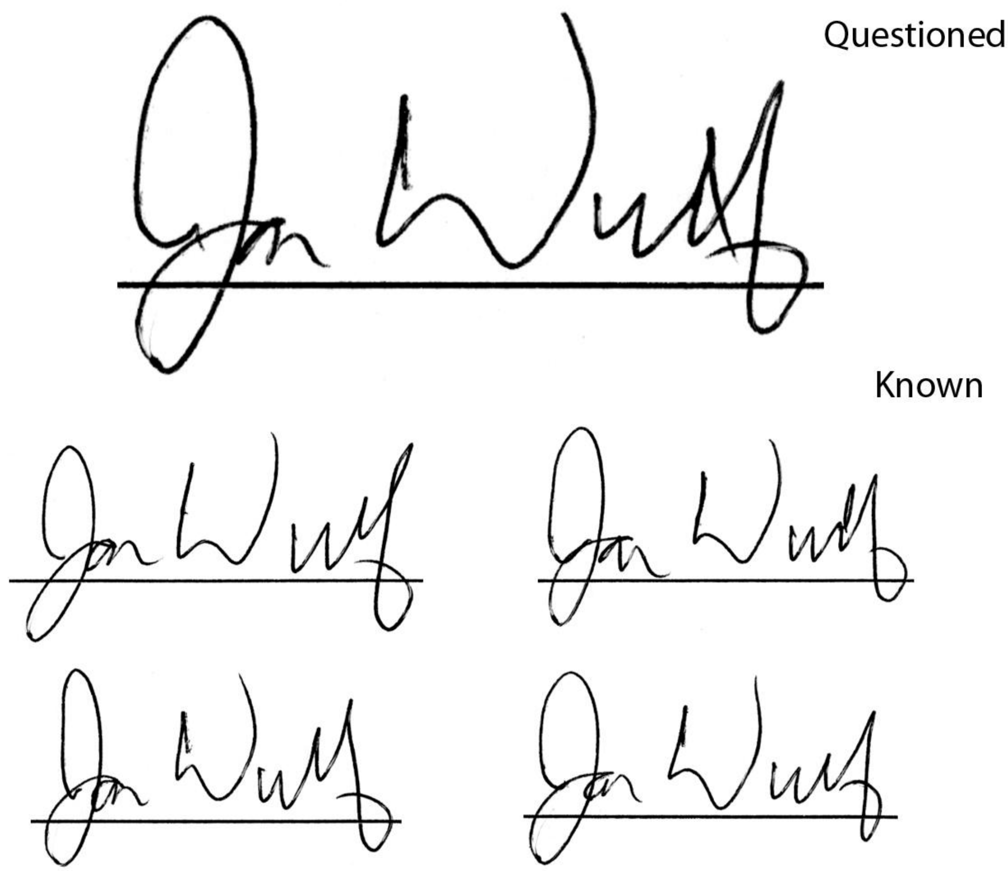
Table Wulf 2.8
Feature Extraction Analysis Visit Duration for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2		AOI 3		AOI 4	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	36.59	24.26	27.63	23.19	5.56	4.70	1.90	2.02	10.19	7.07	3.97	3.22
Lay	9.48	10.08	9.41	10.26	1.47	2.23	0.62	0.84	3.32	3.43	1.05	1.47

Wulf Signature 3: Genuine

Of the 49 FDE participants, 46 responded correctly that the signature was genuine, and 3 responded that it was non-genuine. One FDE declined to respond. Of the 43 Lay participants, 42 responded correctly that the signature was non-genuine, and 1 responded that the signature was non-genuine. This difference was not statistically significant, p = .373, *ns*. Figure Wulf 3.1 presents the comparison view of this signature.

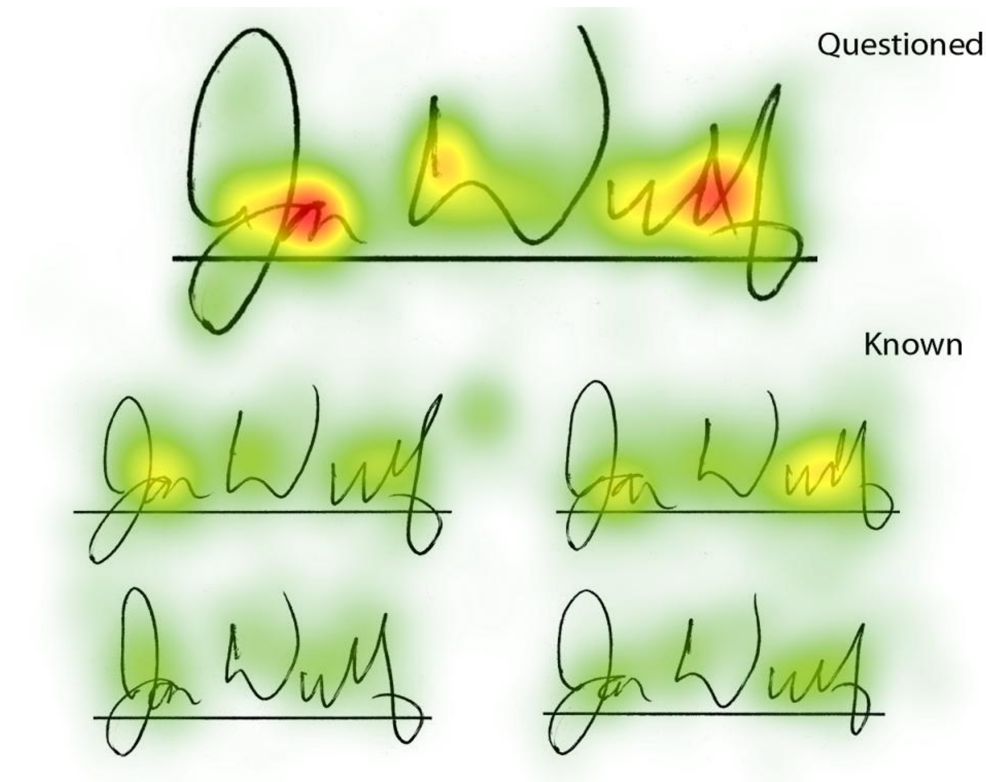
Figure Wulf 3.1. Questioned-Known Comparison Stimulus for Wulf Signature 3.



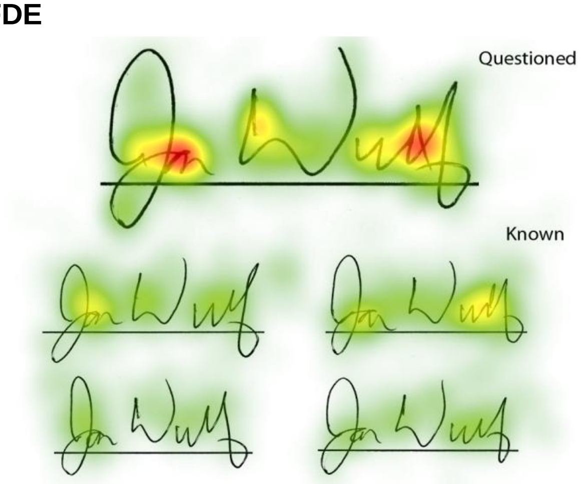
Selection of Areas of Interest (AOIs)

Figure Wulf 3.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were two locations indicated by red “hot spots” within the signature that elicited significant attention from the participants. AOIs were created for these specific hot spots. Secondary AOIs were created to include the orange “warm spots”, creating six AOIs for this stimulus, for a total of eight AOIs for the following analyses (including Wulf K All and Wulf Q). Figure Wulf 3.3 presents the location of the AOIs identified in the heat map.

Figure Wulf 3.2. Heat map for Wulf signature 3, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.



FDE



Lay

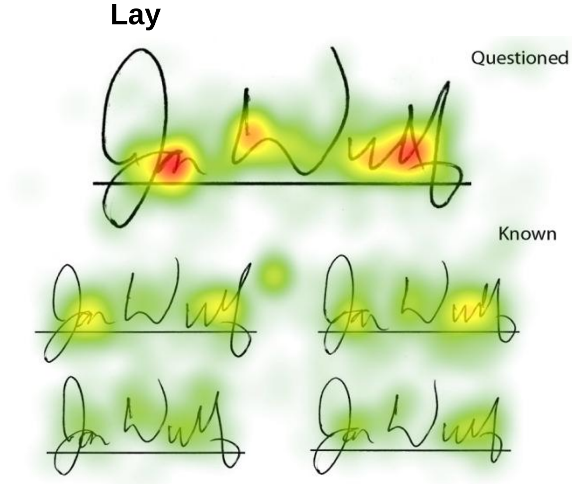
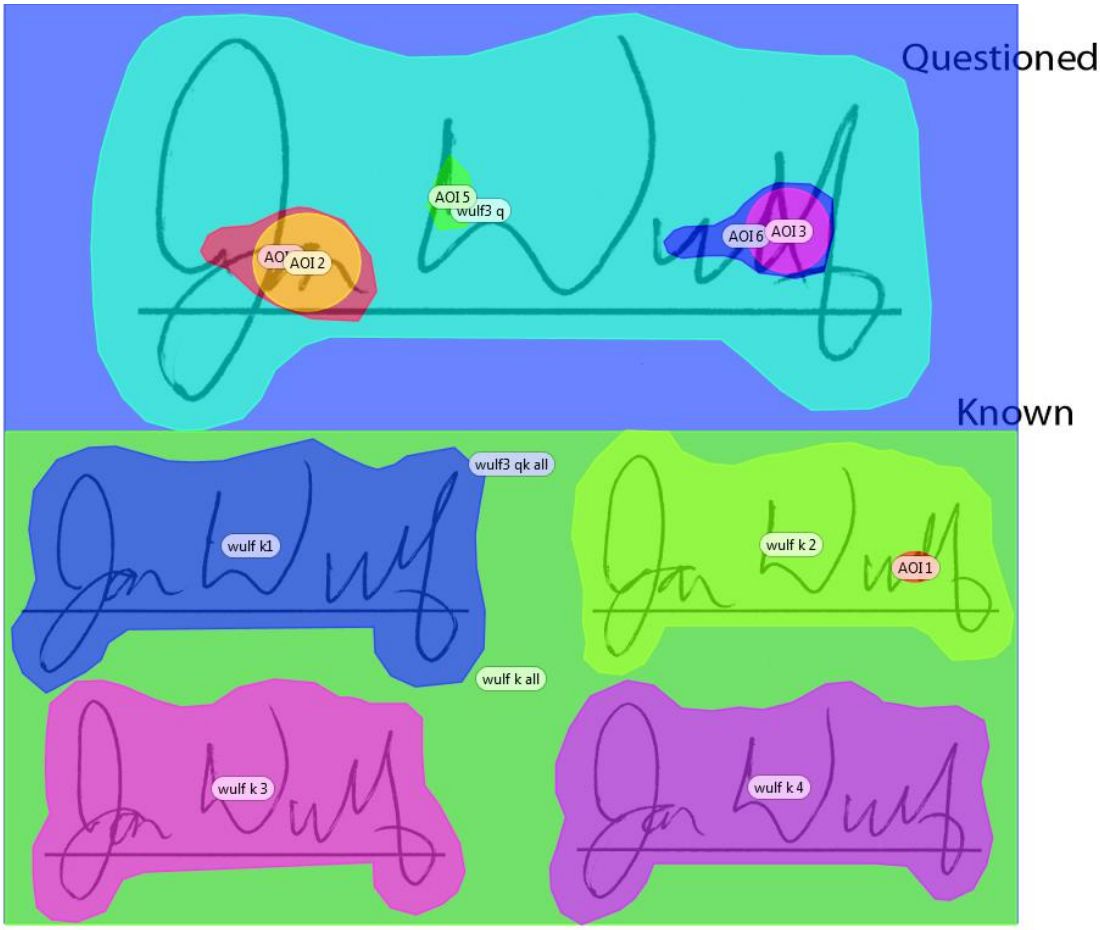


Figure Wulf 3.3. Areas of Interest (AOIs) for Wulf Signature 3.



Eye-Tracking Metrics Analyses

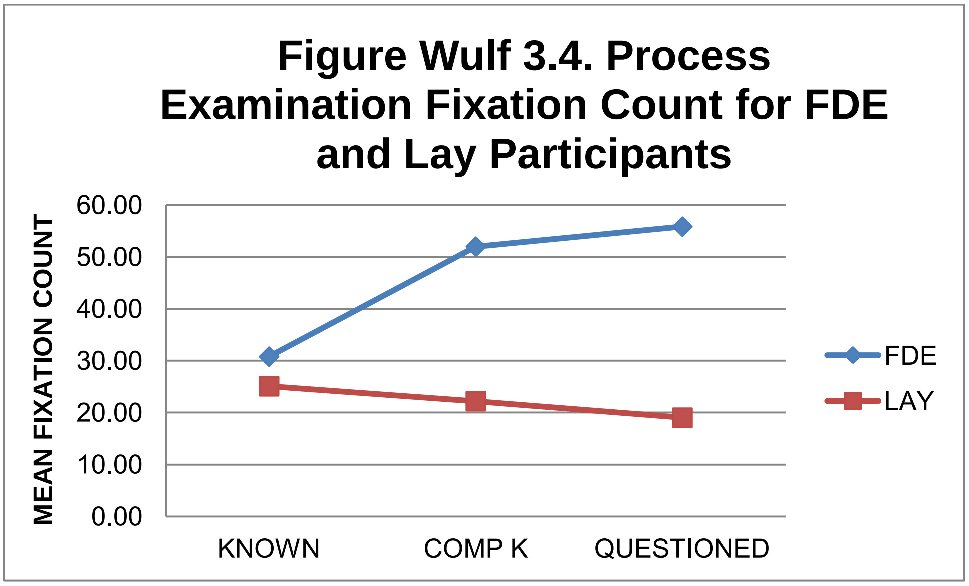
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures. These analyses are based on AOIs Wulf3Q, Wulf K All, and Wulf K All on the known signature stimulus (not pictured).

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .307, $F(3, 86) = 12.68$, $p < .001$, multivariate $\eta^2 = .307$. Figure Wulf 3.4 presents the mean fixation counts by AOI.

Figure Wulf 3.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in two of the three areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 88) = 33.41$, $p < .001$, partial $\eta^2 = .275$); known signature comparison stimulus, $F(1, 88) = 16.97$, $p < .001$, partial $\eta^2 = .162$). Fixation count in the known signature stimulus was not statistically significant, $p = .330$, *ns*. Table Wulf 3.1 presents the means and standard deviations for areas of interest by participant type.

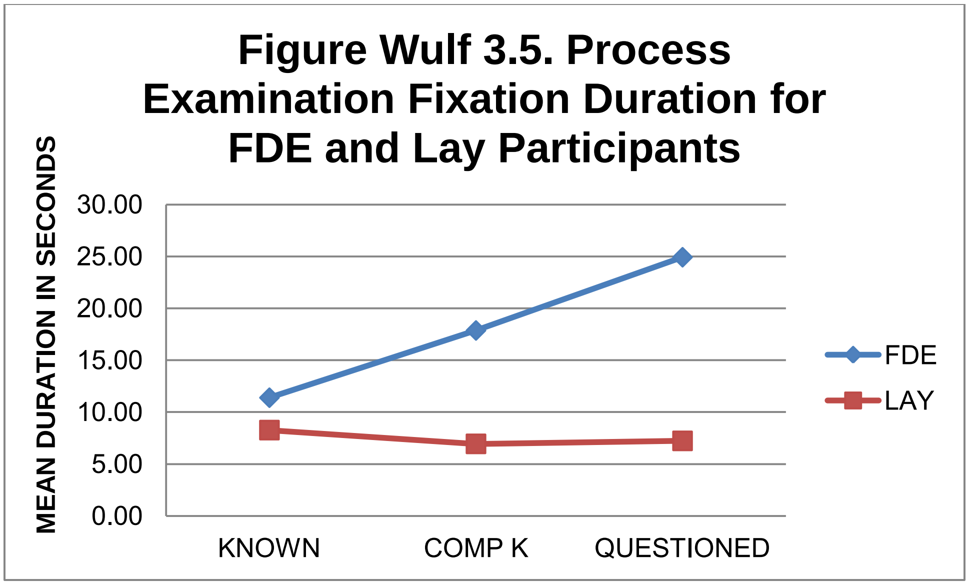
Table Wulf 3.1
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	30.79	33.65	51.98	42.58	55.83	38.94
Lay	25.09	18.75	22.21	21.69	19.02	15.72

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .379, $F(3, 86) = 17.50$, $p < .001$, multivariate $\eta^2 = .379$. Figure Wulf 3.5 presents the mean fixation duration by AOI.

Figure Wulf 3.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all but one area of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 88) = 42.96$, $p < .001$, partial $\eta^2 = .328$); known signature comparison stimulus, $F(1, 88) = 19.05$, $p < .001$, partial $\eta^2 = .178$). Fixation duration in the known signature stimulus was not statistically significant, $p = .185$, *ns*. Table Wulf 3.2 presents the means and standard deviations for areas of interest by participant type.

Table Wulf 3.2

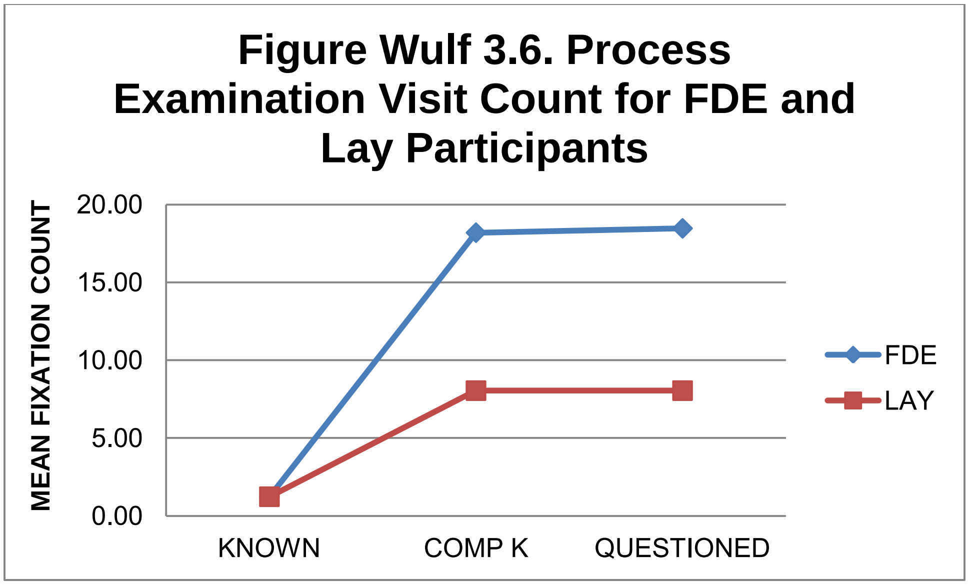
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	11.39	13.58	17.87	14.76	24.92	16.75
Lay	8.27	7.41	6.94	7.49	7.23	5.97

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .219, $F(3, 86) = 8.02$, $p < .001$, multivariate $\eta^2 = .219$. Figure Wulf 3.6 presents the mean visit counts by AOI.

Figure Wulf 3.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in two of the three areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 88) = 23.62$, $p < .001$, partial $\eta^2 = .212$); known signature comparison stimulus, $F(1, 88) = 22.37$, $p < .001$, partial $\eta^2 = .203$). Visit count in the known signature stimulus was not statistically significant, $p = .992$, *ns*. Table Wulf 3.3 presents the means and standard deviations for areas of interest by participant type.

Table Wulf 3.3

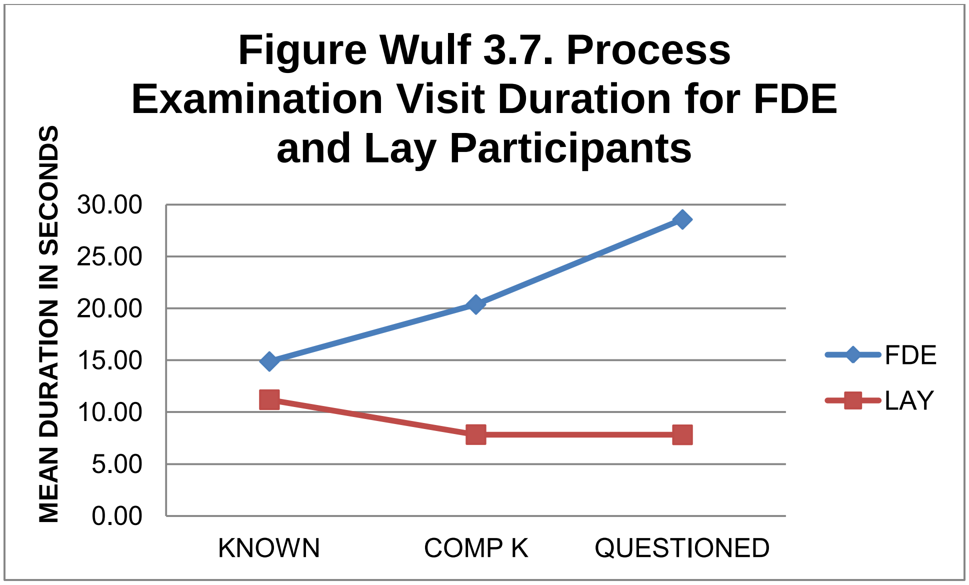
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.23	0.67	18.19	12.07	18.47	11.90
Lay	1.23	0.81	8.05	7.55	8.05	7.83

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .372, $F(3, 86) = 17.00$, $p < .001$, multivariate $\eta^2 = .372$. Figure Wulf 3.7 presents the mean visit durations by AOI.

Figure Wulf 3.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in two of the three areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 88) = 48.84$, $p < .001$, partial $\eta^2 = .357$); known signature comparison stimulus, $F(1, 88) = 19.88$, $p < .001$, partial $\eta^2 = .184$). Visit duration in the known signature stimulus was not statistically significant, $p = .265$, *ns*. Table Wulf 3.4 presents the means and standard deviations for areas of interest by participant type.

Table Wulf 3.4
Process Analysis Visit Duration for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	14.88	19.50	20.36	16.80	28.56	18.58
Lay	11.20	9.47	7.83	7.91	7.81	6.04

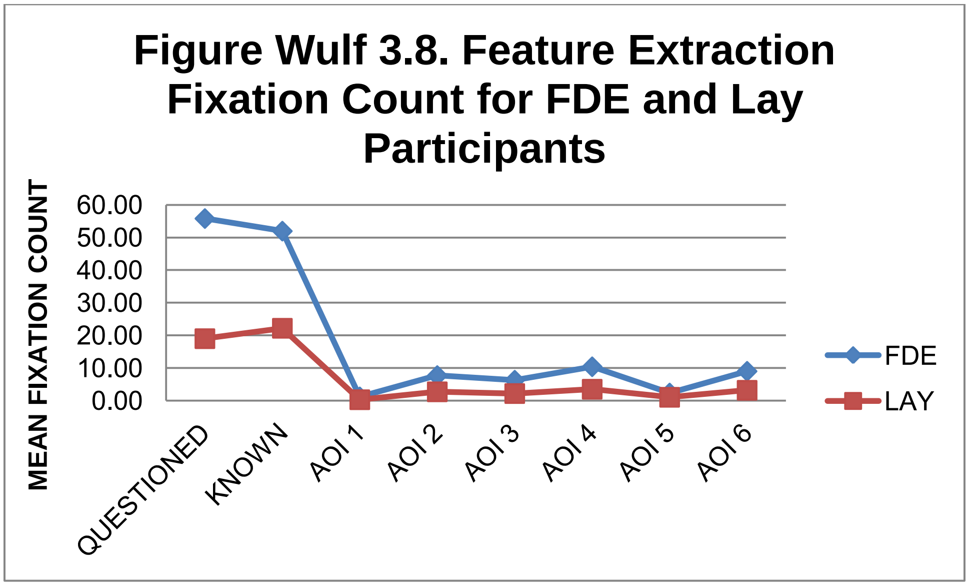
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .369, $F(8, 81) = 5.91$, $p < .001$, multivariate $\eta^2 = .369$. Figure Wulf 3.8 presents the mean fixation counts by AOI.

Figure Wulf 3.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 88) = 33.41$, $p < .001$, partial $\eta^2 = .275$, and F(1, 88) = 16.97, p < .001, partial $\eta^2 = .162$.

Fixation count in all AOIs was significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 13.38$, $p < .001$, partial $\eta^2 = .132$; AOI 2, $F(1, 88) = 20.75$, $p < .001$, partial $\eta^2 = .19$; AOI 3, $F(1, 88) = 18.02$, $p < .001$, partial $\eta^2 = .170$; AOI 4, $F(1, 88) = 21.55$, $p < .001$, partial $\eta^2 = .197$; AOI 5, $F(1, 88) = 14.57$, $p < .001$, partial $\eta^2 = .142$; AOI 6, $F(1, 88) = 17.39$, $p < .001$, partial $\eta^2 = .165$). Table Wulf 3.5 presents the means and standard deviations for areas of interest by participant type.

Table Wulf 3.5

Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	55.83	38.94	51.98	42.58	1.19	1.42	7.72	6.45
Lay	19.02	15.72	22.21	21.69	0.33	0.64	2.74	3.26

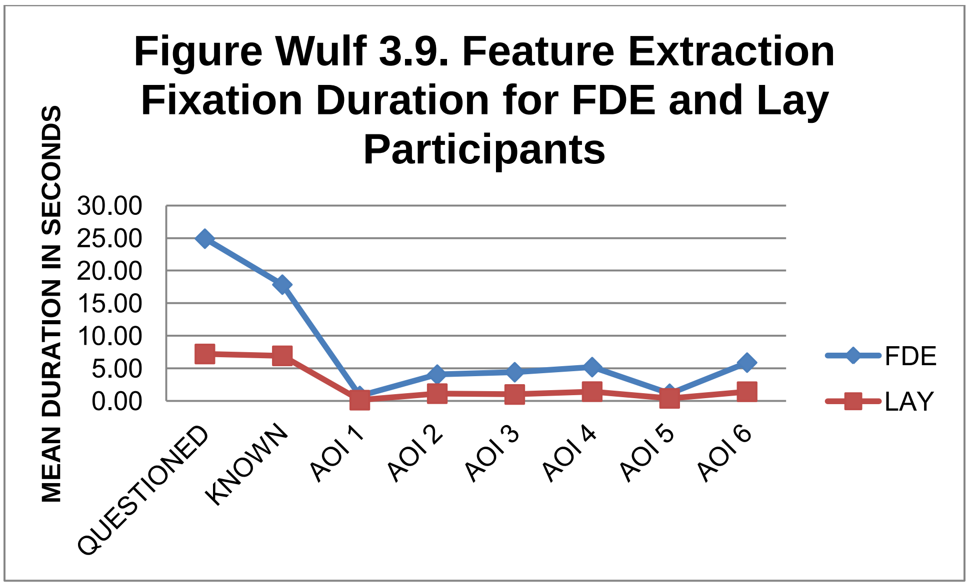
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	6.30	5.90	10.43	9.14	2.38	2.01	9.04	8.64

Lay	2.21	2.36	3.53	3.49	1.07	1.08	3.21	3.20

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .420, $F(8, 81) = 7.34$, $p < .001$, multivariate $\eta^2 = .420$. Figure Wulf 3.9 presents the mean fixation durations by AOI.

Figure Wulf 3.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 88) = 42.96$, $p < .001$, partial $\eta^2 = .328$, and $F(1, 88) = 19.05$, $p < .001$, partial $\eta^2 = .178$.

Fixation durations in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 12.75$, $p = .001$, partial $\eta^2 = .127$; AOI 2, $F(1, 88) = 19.53$, $p < .001$, partial $\eta^2 = .182$; AOI 3, $F(1, 88) = 37.55$, $p < .001$, partial $\eta^2 = .299$; AOI 4, $F(1, 88) = 21.43$, $p < .001$, partial $\eta^2 = .196$; AOI 5, $F(1, 88) = 16.57$, $p < .001$, partial $\eta^2 = .158$; AOI 6, $F(1, 88) = 33.95$, $p < .001$, partial $\eta^2 = .278$). Table Wulf 3.6 presents the means and standard deviations for areas of interest by participant type.

Table Wulf 3.6
Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

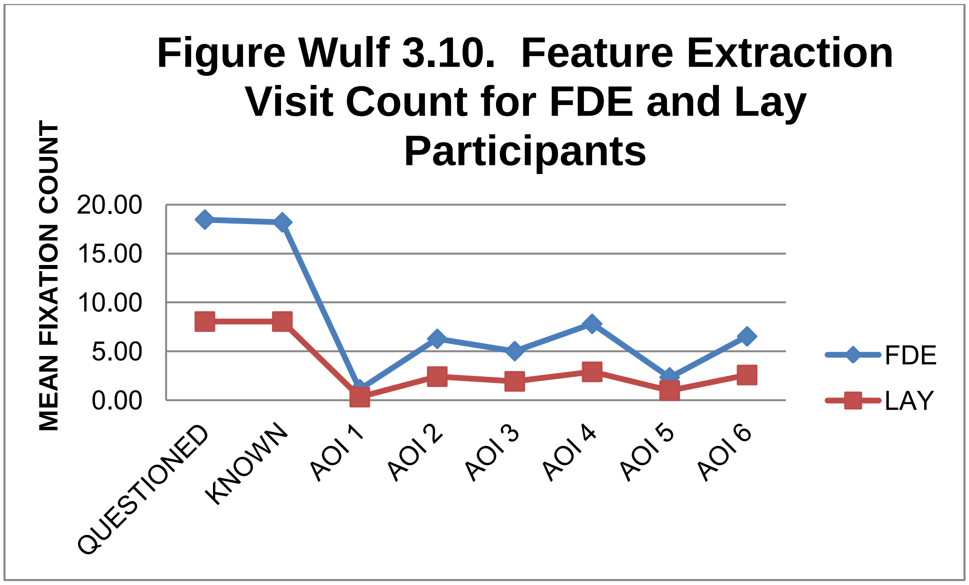
	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*

FDE	24.92	16.75	17.87	14.76	0.79	1.14	4.06	4.11
Lay	7.23	5.97	6.94	7.49	0.14	0.32	1.14	1.43
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	4.43	3.50	5.21	5.15	1.13	1.05	5.91	4.81
Lay	1.02	1.10	1.45	1.45	0.41	0.48	1.44	1.51

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .300, $F(8, 81) = 4.34$, $p < .001$, multivariate $\eta^2 = .300$. Figure Wulf 3.10 presents the mean fixation durations by AOI.

Figure Wulf 3.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 88) = 23.62$, $p < .001$, partial $\eta^2 = .357$, and F(1, 88) = 22.37, p < .001, partial $\eta^2 = .184$.

Visit counts in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 13.15$, $p < .001$, partial $\eta^2 = .126$; AOI 2, $F(1, 88) = 22.70$, $p < .001$, partial $\eta^2 = .198$; AOI 3, $F(1, 88) = 23.61$, $p < .001$, partial $\eta^2 = .288$; AOI 4, $F(1, 88) = 25.73$, $p < .001$, partial $\eta^2 = .209$; AOI 5, $F(1, 88) = 16.10$, $p < .001$, partial $\eta^2 = .157$; AOI 6, $F(1, 88) = 23.08$, $p < .001$, partial $\eta^2 = .277$). Table Wulf 3.7 presents the means and standard deviations for areas of interest by participant type.

Table Wulf 3.7

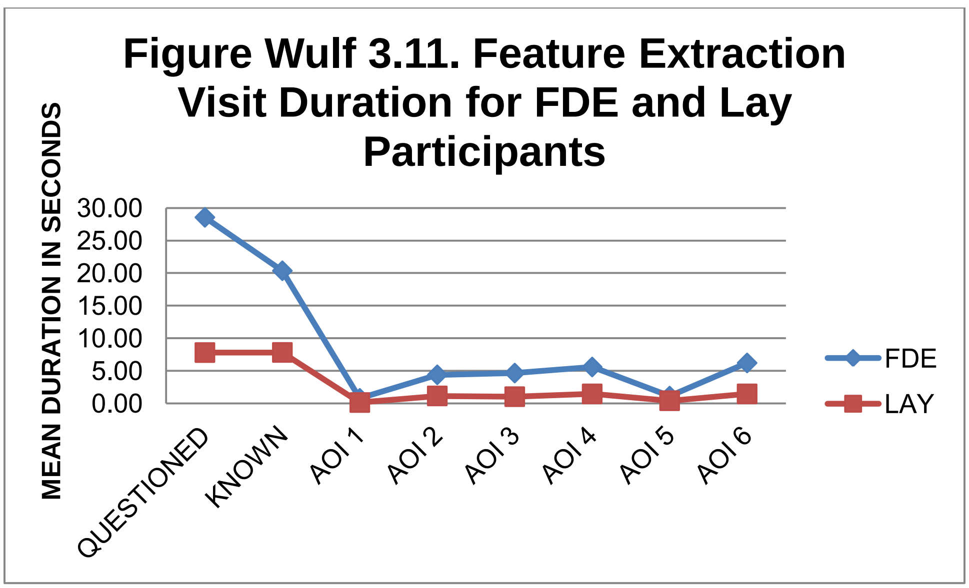
Feature Extraction Analysis Visit Count for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	18.47	11.90	18.19	12.07	1.13	1.31	6.28	4.79
Lay	8.05	7.83	8.05	7.55	0.33	0.64	2.42	2.40
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	5.02	3.77	7.81	5.92	2.34	1.98	6.53	4.90
Lay	1.93	1.86	2.91	2.36	1.00	0.98	2.58	2.34

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .432, $F(8, 81) = 7.69$, $p < .001$, multivariate $\eta^2 = .432$. Figure Wulf 3.11 presents the mean fixation durations by AOI.

Figure Wulf 3.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 88) = 48.84$, $p < .001$, partial $\eta^2 = .357$, and $F(1, 88) = 19.88$, p < .001, partial $\eta^2 = .184$.

Visit durations in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 88) = 12.74$, $p = .001$, partial $\eta^2 = .126$; AOI 2, $F(1, 88) = 21.72$, $p < .001$, partial $\eta^2 = .198$; AOI 3, $F(1, 88) = 35.62$, $p < .001$, partial $\eta^2 = .288$; AOI 4, $F(1, 88) = 23.23$, $p < .001$, partial $\eta^2 = .209$; AOI 5, $F(1, 88) = 16.37$, $p < .001$, partial $\eta^2 = .157$; AOI 6, $F(1, 88) = 33.67$, $p < .001$, partial $\eta^2 = .277$). Table Wulf 3.8 presents the means and standard deviations for areas of interest by participant type.

Table Wulf 3.8

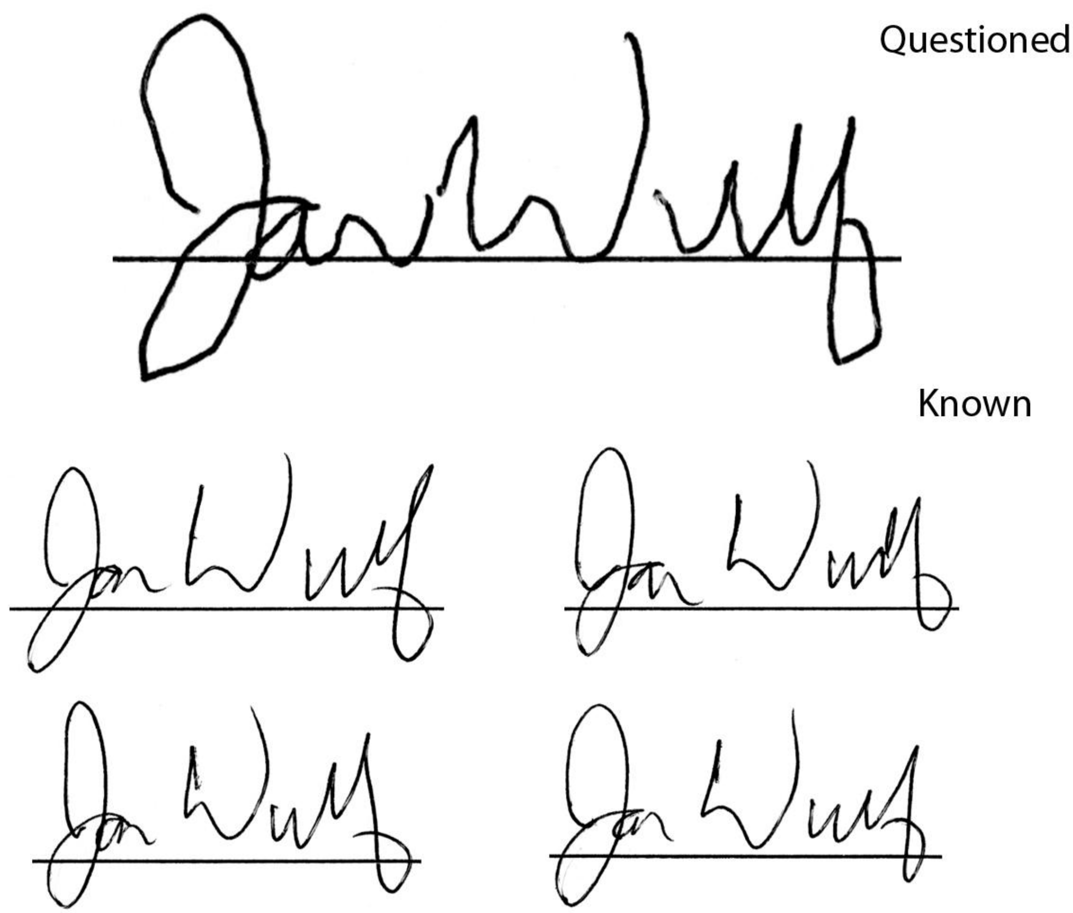
Feature Extraction Analysis Visit Duration for FDE and Lay Participants

	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	28.56	18.58	20.36	16.80	0.79	1.14	4.40	4.33
Lay	7.81	6.04	7.83	7.91	0.14	0.32	1.16	1.48
	AOI 3		**AOI 4**		**AOI 5**		**AOI 6**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	4.66	3.83	5.60	5.42	1.13	1.05	6.22	5.16
Lay	1.04	1.14	1.47	1.49	0.42	0.49	1.47	1.54

Wulf Signature 4: Traced (Non-Genuine)

Of the 49 FDE participants, 48 responded correctly that the signature was non-genuine, and none responded that it was genuine. One FDE declined to respond. Of the 43 Lay participants, 41 responded correctly that the signature was non-genuine, and 2 responded that the signature was genuine. This difference was not statistically significant, p = .205, *ns*.   Figure Wulf 4.1 presents the comparison view of this signature.

Figure Wulf 4.1. Questioned-Known Comparison Stimulus for Wulf Signature 4.

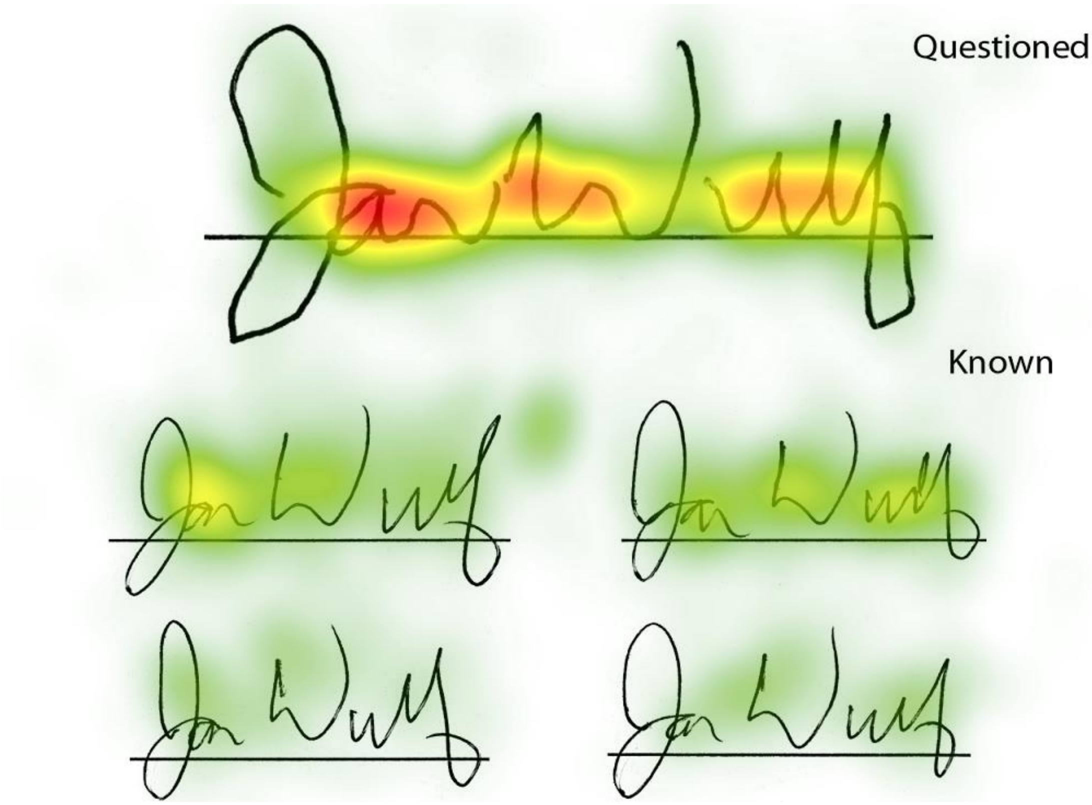


Selection of Areas of Interest (AOIs)

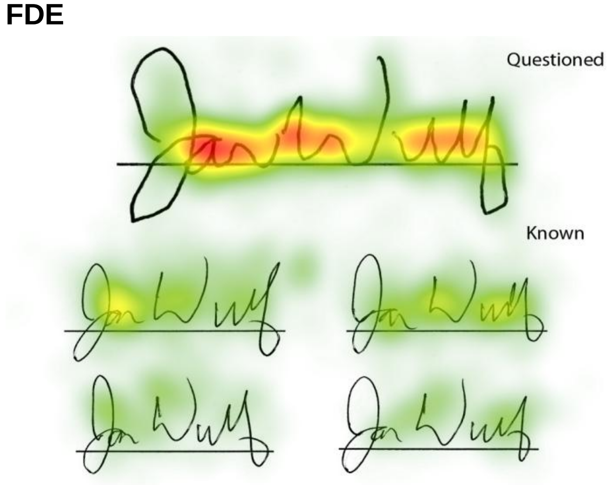
Figure Wulf 4.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were two locations indicated by red “hot spots” within the signature that elicited significant attention from the participants. AOIs were created for these specific hot spots. Larger, secondary AOIs incorporating the smaller hot spots were created to include the orange “warm spots", creating a total of four AOIs for this stimulus. Figure Wulf 4.3 presents the location of the AOIs identified in the heat map.

Figure Wulf 4.2. Heat map for Wulf signature 4, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

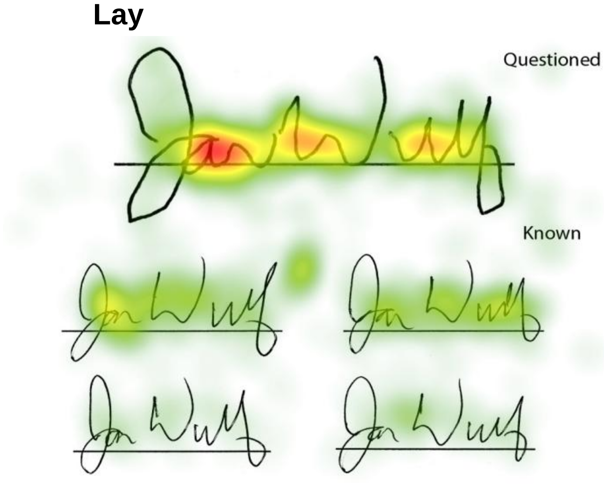
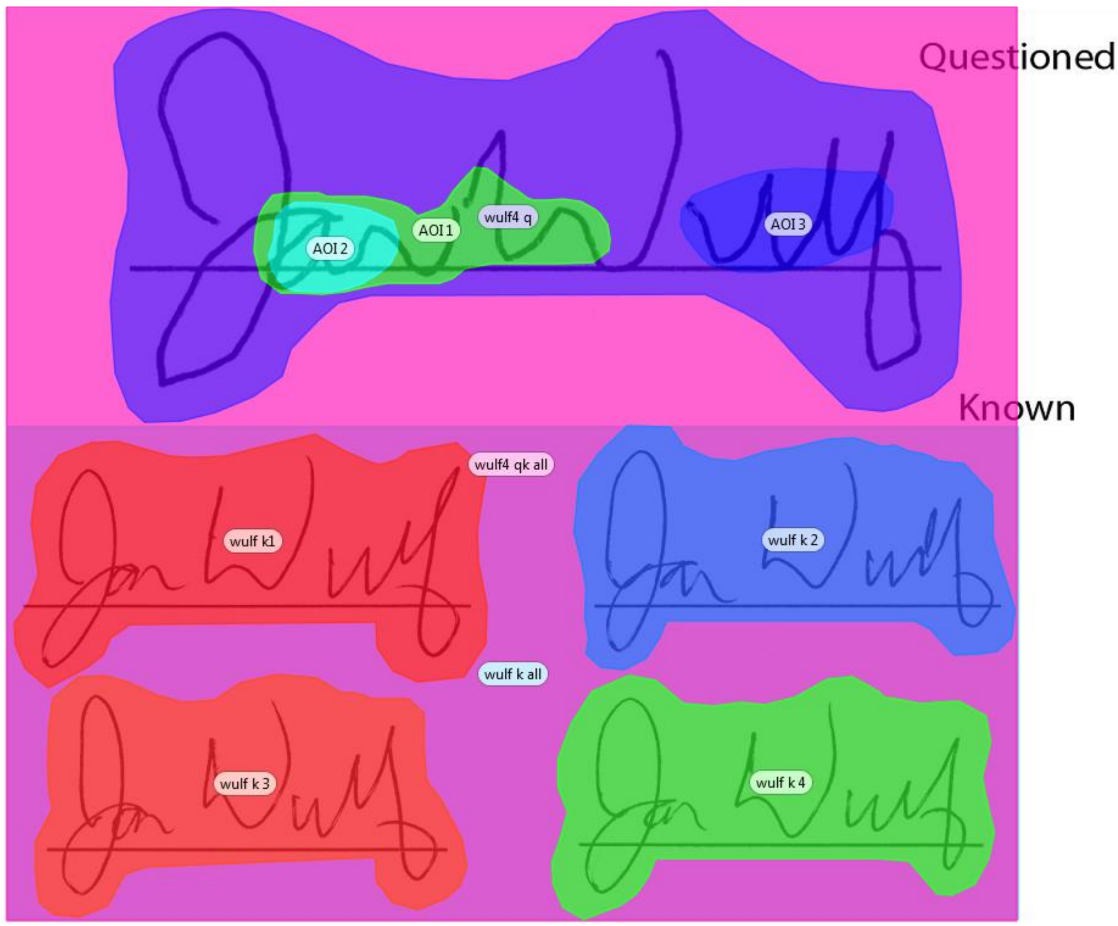


Figure Wulf 4.3. Areas of Interest (AOIs) for Wulf Signature 4.



Eye-Tracking Metrics Analyses

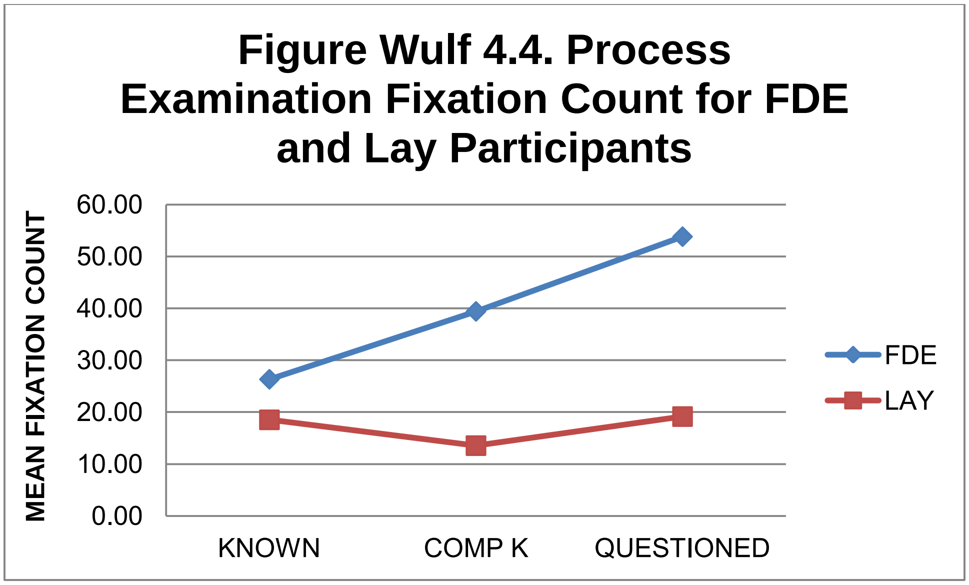
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .219, $F(3, 86) = 8.04$, $p < .001$, multivariate $\eta^2 = .219$. Figure Wulf 4.4 presents the mean fixation counts by AOI.

Figure Wulf 4.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 88) = 19.05$, $p < .001$, partial $\eta^2 = .178$); known signature comparison stimulus, $F(1, 88) = 19.93$, $p < .001$, partial $\eta^2 = .185$). Fixation count in the known signature stimulus was also statistically significant, $F(1, 88) = 4.81$, $p = .031$, partial $\eta^2 = .052$. Table Wulf 4.1 presents the means and standard deviations for areas of interest by participant type.

Table Wulf 4.1

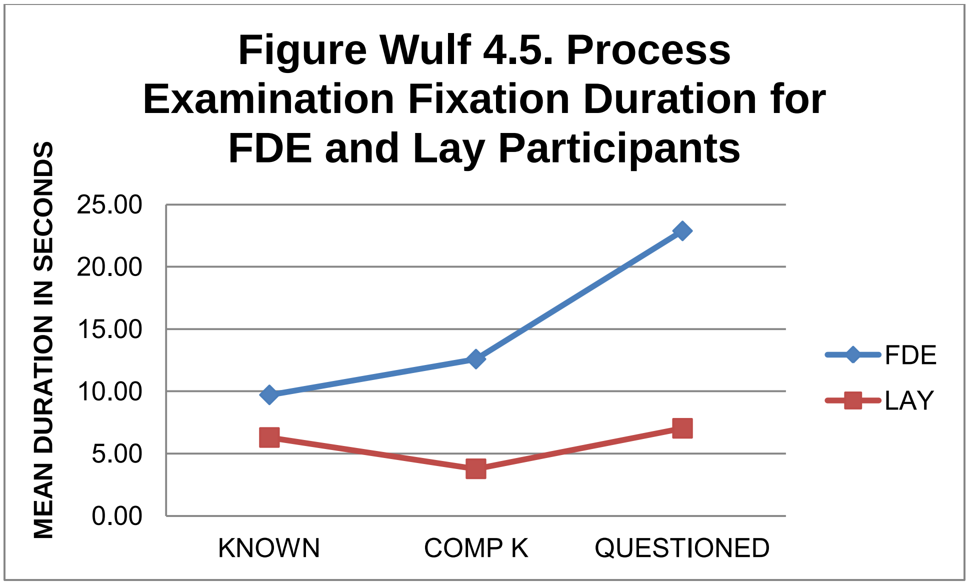
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	26.32	19.91	39.40	36.18	53.81	49.32
Lay	18.51	12.74	13.53	12.07	19.14	17.41

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .208, $F(3, 86) = 7.54$, $p < .001$, multivariate $\eta^2 = .208$. Figure Wulf 4.5 presents the mean fixation duration by AOI.

Figure Wulf 4.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 88) = 21.43$, $p < .001$, partial $\eta^2 = .196$); known signature comparison stimulus, $F(1, 88) = 15.96$, $p < .001$, partial $\eta^2 = .154$). Fixation duration in the known signature stimulus was also statistically significant, $F(1, 88) = .4.86$, $p = .030$, partial $\eta^2 = .052$. Table Wulf 4.2 presents the means and standard deviations for areas of interest by participant type.

Table Wulf 4.2

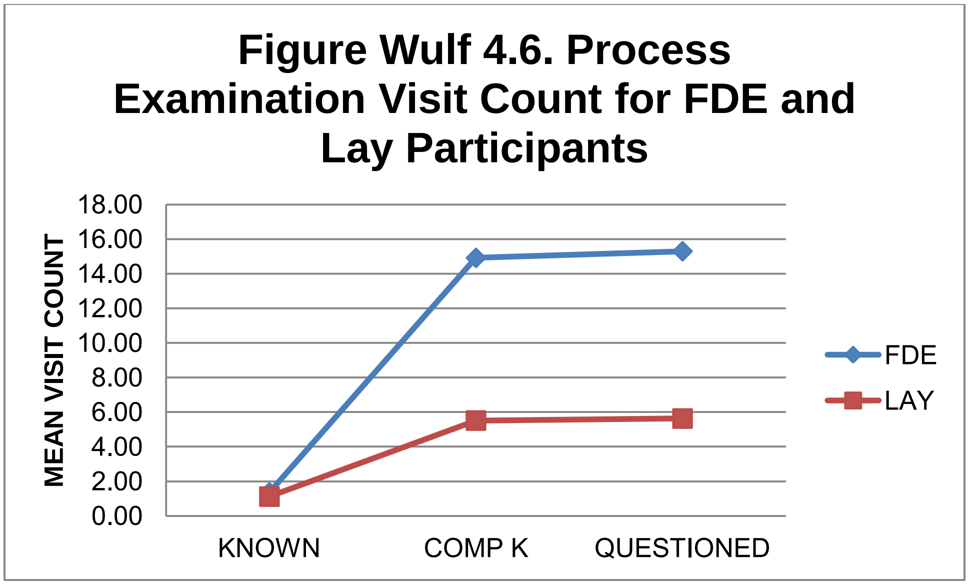
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	9.72	8.83	12.59	14.12	22.88	21.37
Lay	6.30	5.28	3.78	3.19	7.03	7.16

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .202, $F(3, 86) = 7.27$, $p < .001$, multivariate $\eta^2 = .202$. Figure Wulf 4.6 presents the mean visit counts by AOI.

Figure Wulf 4.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in two of the three areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 88) = 19.46$, $p < .001$, partial $\eta^2 = .181$); known signature comparison stimulus, $F(1, 88) = 18.56$, $p < .001$, partial $\eta^2 = .174$). Visit counts in the known signature stimulus were not statistically significant, $p = .218$, *ns*. Table Wulf 4.3 presents the means and standard deviations for areas of interest by participant type.

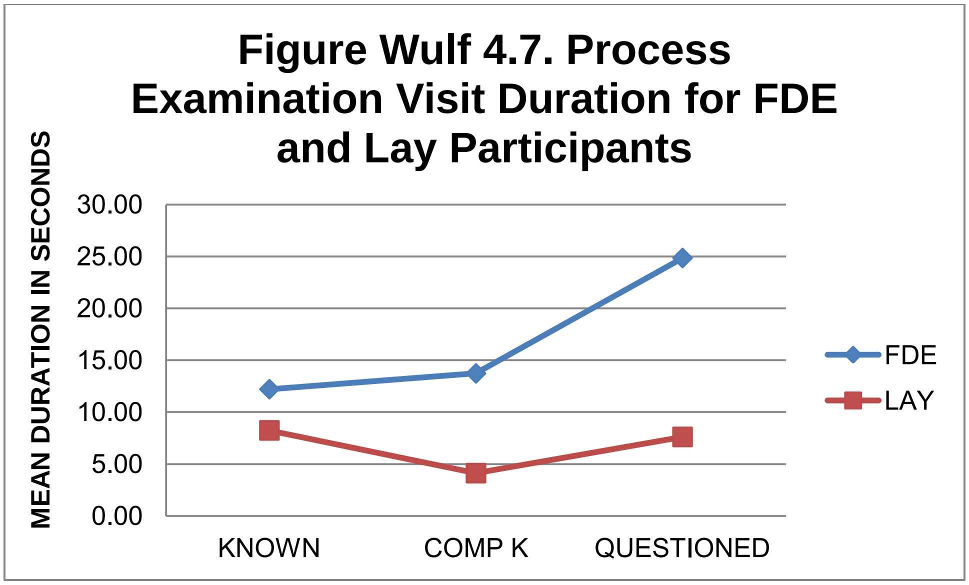
Table Wulf 4.3
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.36	1.15	14.91	13.51	15.30	13.55
Lay	1.12	0.63	5.51	4.92	5.63	5.00

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .205, $F(3, 86) = 7.40$, $p < .001$, multivariate $\eta^2 = .205$. Figure Wulf 4.7 presents the mean visit durations by AOI.

Figure Wulf 4.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 88) = 20.84$, $p < .001$, partial $\eta^2 = .191$); known signature comparison stimulus, $F(1, 88) = 17.19$, $p < .001$, partial $\eta^2 = .163$). Visit durations in the known signature stimulus were also statistically significant, $F(1, 88) = 4.40$, $p = .039$, partial $\eta^2 = .048$. Table Wulf 4.4 presents the means and standard deviations for areas of interest by participant type.

Table Wulf 4.4

Process Analysis Visit Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	12.20	10.58	13.73	14.81	24.85	23.61
Lay	8.24	6.75	4.12	3.52	7.61	7.80

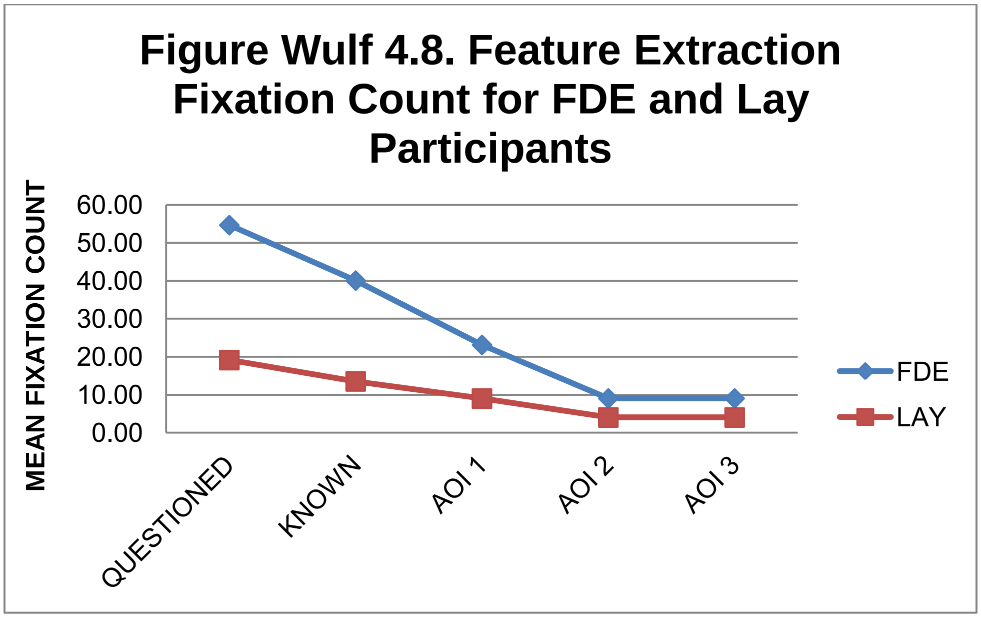
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

<u>*Total Fixation Count*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .283, $F(5, 83) = 6.55$, $p < .001$, multivariate $\eta^2 = .283$. Figure Wulf 4.8 presents the mean fixation counts by AOI.

Figure Wulf 4.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature was significantly greater for FDEs than for Lay participants, $F(1, 87) = 19.85$, $p < .001$, partial $\eta^2 = .186$. A significant difference was also found for the known signature comparison stimulus, $F(1, 87) = 20.81$, $p < .001$, partial $\eta^2 = .193$.

Fixation counts for the AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 16.48$, $p < .001$, partial $\eta^2 = .159$; AOI 2, $F(1, 87) = 12.36$, $p = .001$, partial $\eta^2 = .124$; AOI 3, $F(1, 87) = 11.55$, $p = .001$, partial $\eta^2 = .117$. Table Wulf 4.5 presents the means and standard deviations for areas of interest by participant type.

Table Wulf 4.5

Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

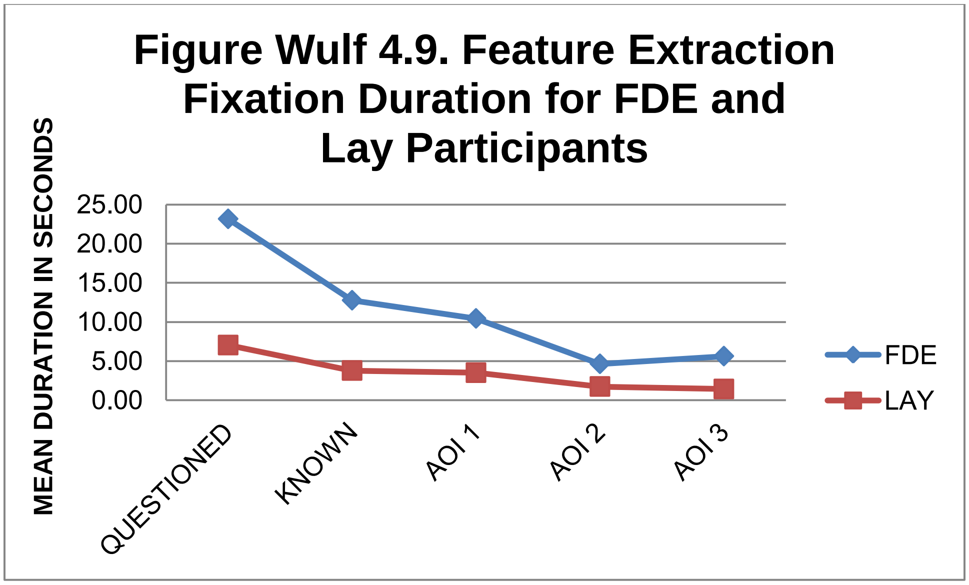
	QUESTIONED		KNOWN		AOI 1	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	54.67	49.51	40.07	36.29	23.13	21.35
LAY	19.14	17.41	13.53	12.07	9.00	8.31
	AOI 2		**AOI 3**			
Participant	***M***	***SD***	***M***	***SD***		

FDE	9.04	8.70	9.04	8.70
LAY	4.02	3.56	4.02	3.56

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .243, $F(5, 83) = 5.33$, $p < .001$, multivariate $\eta^2 = .243$. Figure Wulf 4.9 presents the mean fixation durations by AOI.

Figure Wulf 4.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all but one area of interest. Total fixation duration for the questioned signature was significantly greater for FDEs than for Lay participants, $F(1, 87) = 21.86$, $p < .001$, partial $\eta^2 = .201$. A significant difference was found for the known signature comparison stimulus, $F(1, 87) = 16.34$, $p < .001$, partial $\eta^2 = .158$.

Fixation durations for all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 17.86$, $p < .001$, partial $\eta^2 = .170$; AOI 2, $F(1, 87) = 12.48$, $p = .001$, partial $\eta^2 = .125$; AOI 3, $F(1, 87) = 15.66$, $p < .001$, partial $\eta^2 = .153$. Table Wulf 4.6 presents the means and standard deviations for areas of interest by participant type.

Table Wulf 4.6

Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

	QUESTIONED		**KNOWN**		**AOI 1**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***

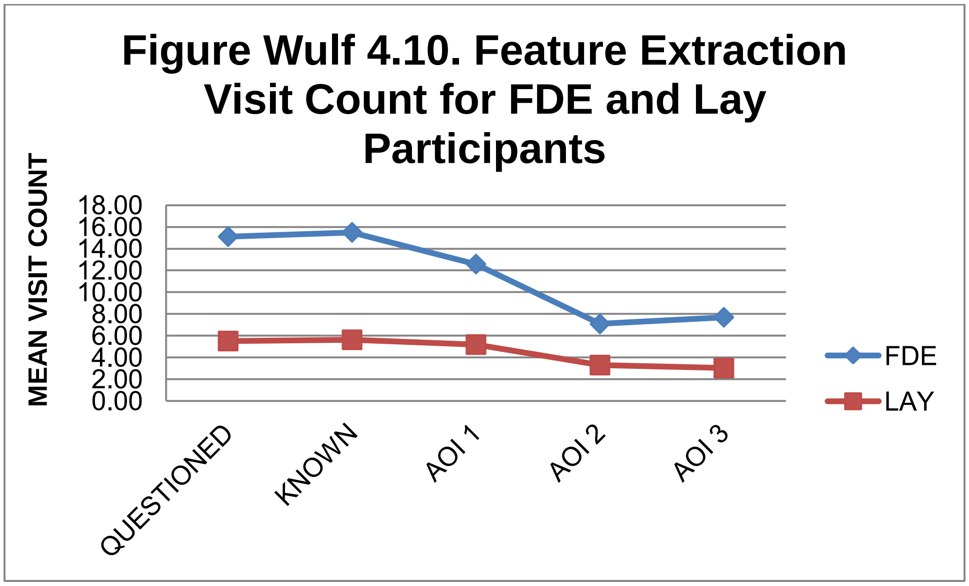
FDE	23.16	21.53	12.76	14.23	10.44	10.23
LAY	7.03	7.16	3.78	3.19	3.50	3.45

	AOI 2		**AOI 3**	
Participant	***M***	***SD***	***M***	***SD***
FDE	4.64	5.14	5.62	6.84
LAY	1.74	1.63	1.42	1.31

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .262, $F(5, 83) = 5.90$, $p < .001$, multivariate $\eta^2 = .262$. Figure Wulf 4.10 presents the mean visit counts by AOI.

Figure Wulf 4.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit count for the questioned signature was significantly greater for FDEs than for Lay participants, $F(1, 87) = 20.03$, $p < .001$, partial $\eta^2 = .187$. A significant difference was found for the known signature comparison stimulus, $F(1, 87) = 19.09$, $p < .001$, partial $\eta^2 = .180$.

Visit counts for all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 21.33$, $p < .001$, partial $\eta^2 = .197$; AOI 2, $F(1, 87) = 15.52$, $p < .001$, partial $\eta^2 = .151$; AOI 3, $F(1, 87) = 11.23$, $p < .001$, partial $\eta^2 = .114$. Table Wulf 4.7 presents the means and standard deviations for areas of interest by participant type.

Table Wulf 4.7

Feature Extraction Analysis Visit Counts for FDE and Lay Participants

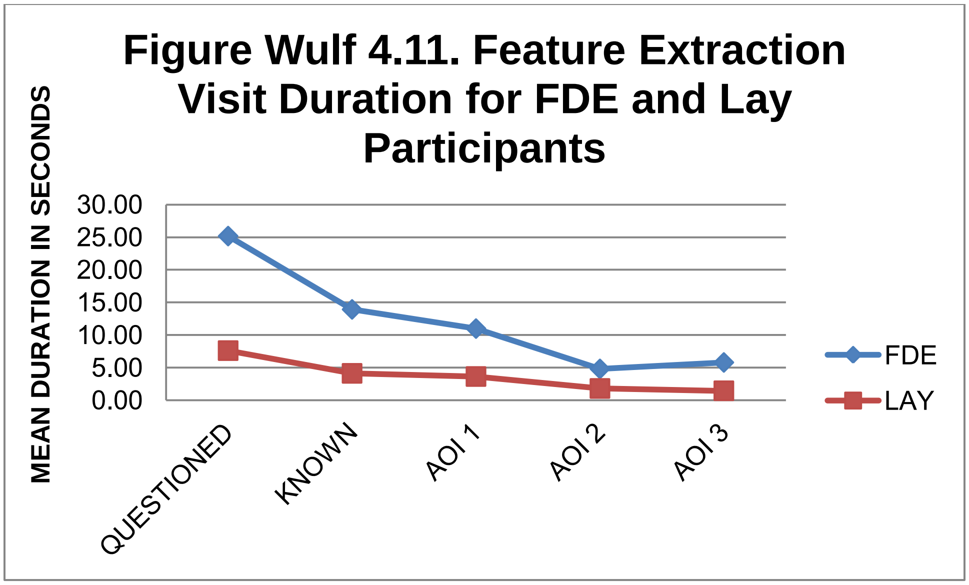
	QUESTIONED		KNOWN		AOI 1	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	15.11	13.59	15.50	13.63	12.59	9.65
LAY	5.51	4.92	5.63	5.00	5.19	4.29

	AOI 2		AOI 3	
Participant	***M***	***SD***	***M***	***SD***
FDE	7.09	5.75	7.70	8.79
LAY	3.30	2.65	3.02	2.59

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependent variables, Pillai's Trace = .231, $F(5, 83) = 4.99$, $p < .001$, multivariate $\eta^2 = .231$. Figure Wulf 4.11 presents the mean visit durations by AOI.

Figure Wulf 4.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit duration in all but one area of interest. Total visit duration for the questioned signature was significantly greater for FDEs than for Lay participants, $F(1, 87) = 21.30$, $p < .001$, partial $\eta^2 = .197$. A significant difference was found for the known signature comparison stimulus, $F(1, 87) = 17.65$, $p < .001$, partial $\eta^2 = .169$.

Visit durations for all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 17.74$, $p < .001$, partial $\eta^2 = .169$; AOI 2, $F(1, 87) = 12.41$, $p = .001$, partial $\eta^2 = .125$; AOI 3,

$F(1, 87) = 15.44$, $p < .001$, partial $\eta^2 = .151$. Table Wulf 4.8 presents the means and standard deviations for areas of interest by participant type.

Table Wulf 4.8

Feature Extraction Analysis Visit Duration for FDE and Lay Participants

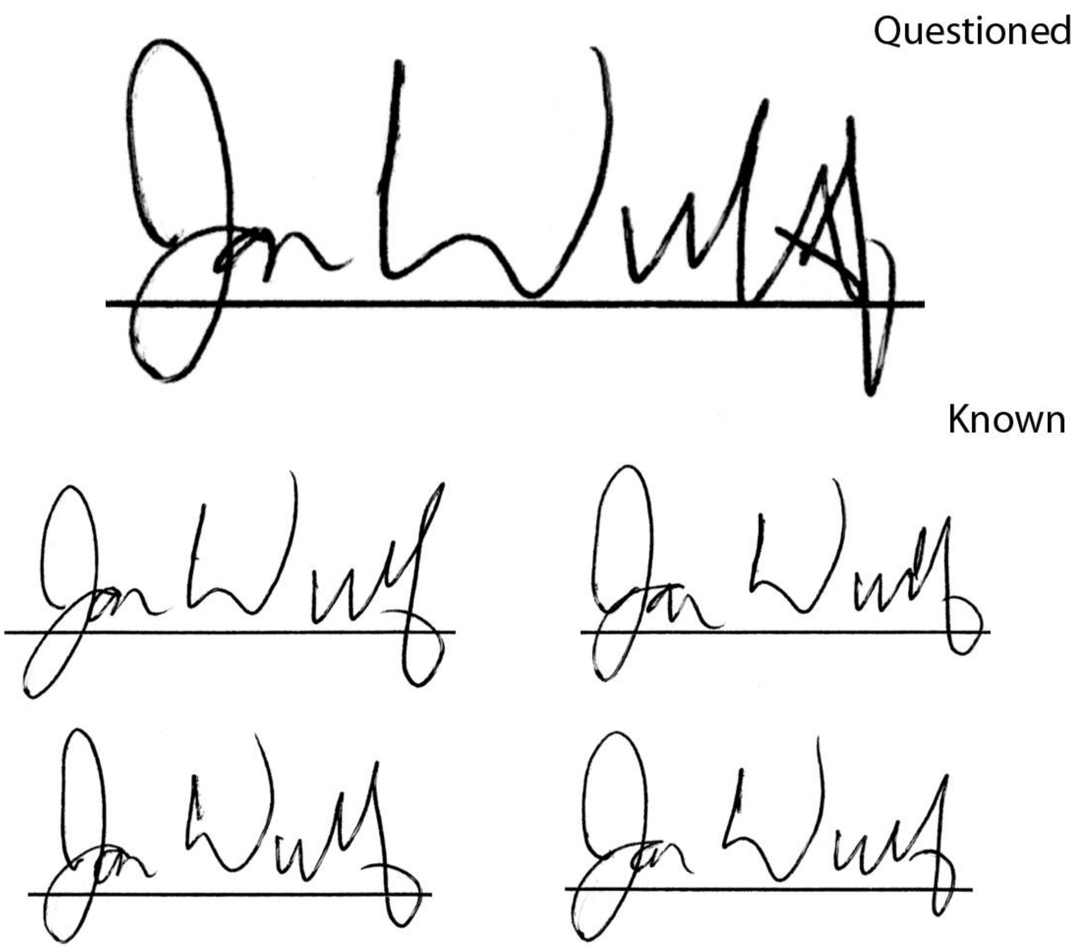
	QUESTIONED		**KNOWN**		**AOI 1**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	25.16	23.77	13.92	14.92	10.98	10.91
LAY	7.61	7.80	4.12	3.52	3.64	3.54

	AOI 2		**AOI 3**	
Participant	***M***	***SD***	***M***	***SD***
FDE	4.80	5.34	5.79	7.13
LAY	1.80	1.67	1.45	1.33

Wulf Signature 5: Genuine

Of the 49 FDE participants, 20 responded correctly that the signature was genuine, and 28 responded that it was non-genuine. One FDE declined to respond. Of the 43 Lay participants, 41 responded correctly that the signature was genuine, and 2 responded incorrectly that the signature was non-genuine. This difference was statistically significant, χ^2 (2, N = 92) = 30.50, $p < .001$. Figure Wulf 5.1 presents the comparison view of this signature.

Figure Wulf 5.1. Questioned-Known Comparison Stimulus for Wulf Signature 5.

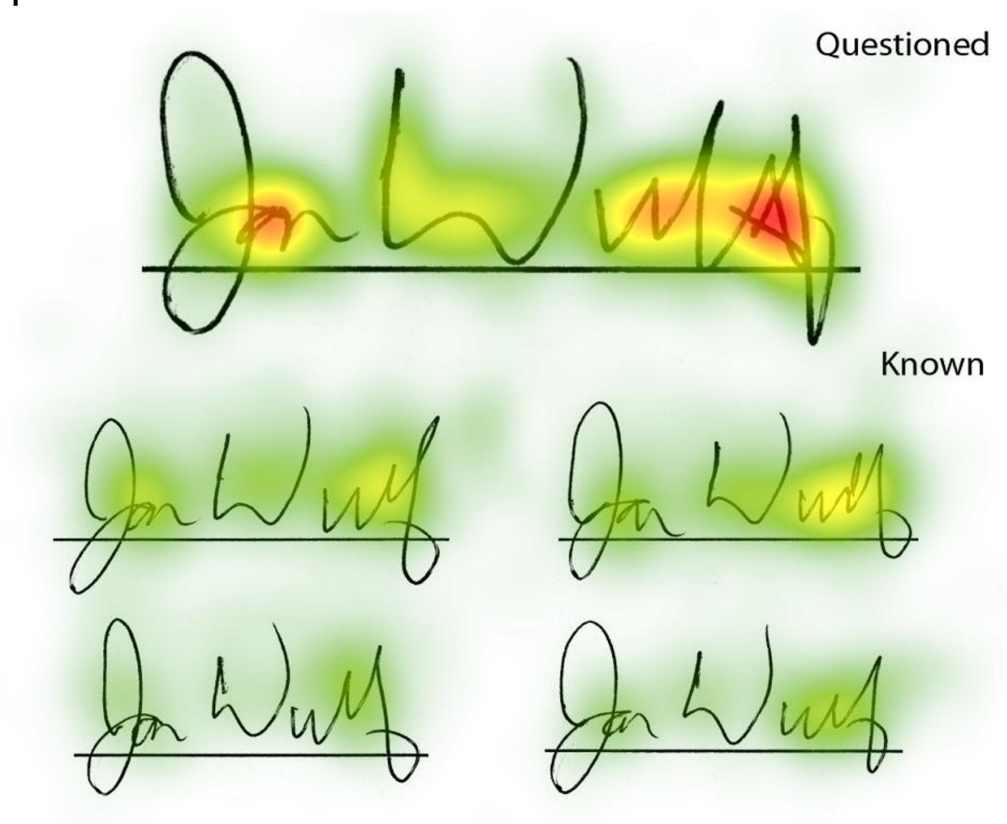


Selection of Areas of Interest (AOIs)

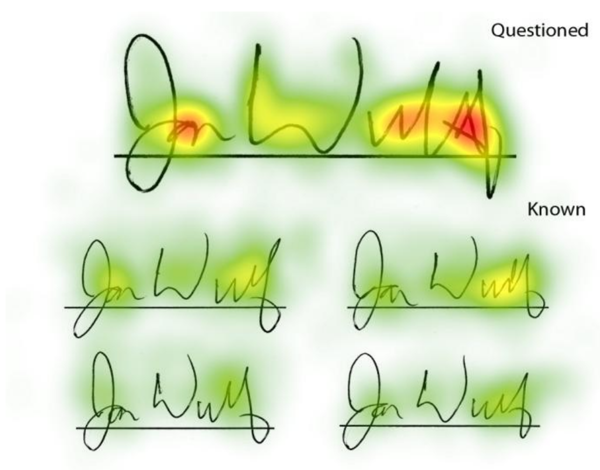
Figure Wulf 5.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were two locations indicated by red "hot spots" within the signature that elicited significant attention from the participants. AOIs were created for these specific hot spots. Larger, secondary AOIs incorporating the smaller hot spots were created to include the orange "warm spots", creating a total of four AOIs for this stimulus. Figure Wulf 5.3 presents the location of the AOIs identified in the heat map.

Figure Wulf 5.2. Heat map for Wulf signature 5, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

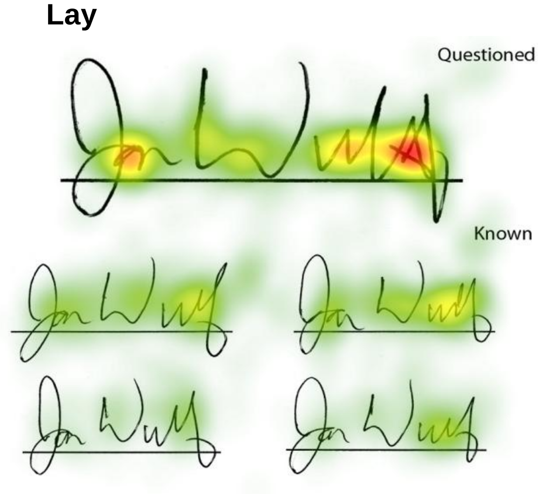
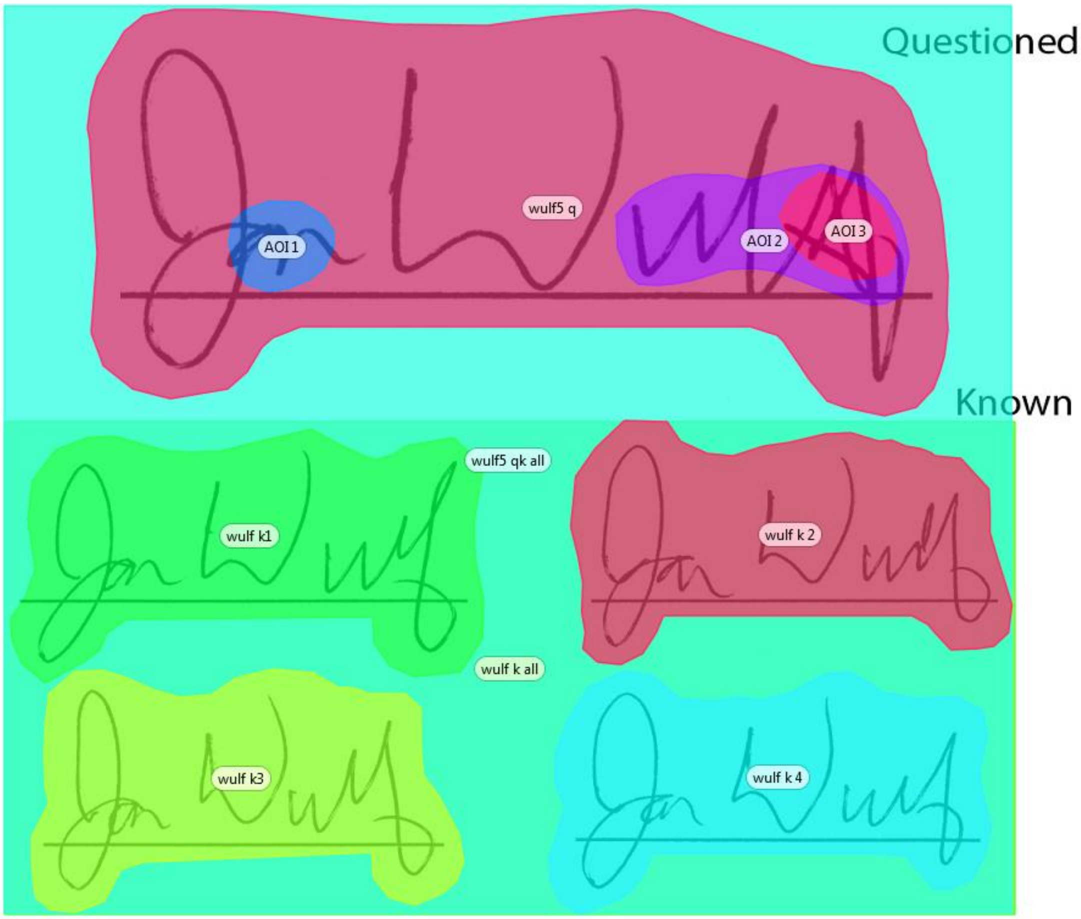


Figure Wulf 5.3. Areas of Interest (AOIs) for Wulf Signature 5.



Eye-Tracking Metrics Analyses

Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .369, $F(3, 85) = 16.56$, $p < .001$, multivariate $\eta^2 = .369$. Figure Wulf 5.4 presents the mean fixation counts by AOI.

Figure Wulf 5.4

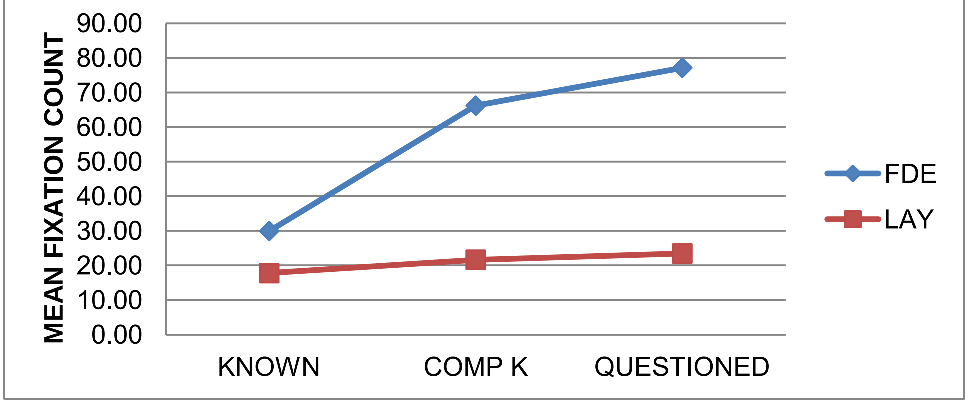


Figure Wulf 5.4. Process Examination Fixation Count for FDE and Lay Participants

Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 87) = 39.54$, $p > .001$, partial $\eta^2 = .312$); known signature comparison stimulus, $F(1, 87) = 19.79$, $p < .001$, partial $\eta^2 = .185$). Fixation count in the known signature stimulus was also statistically significant, $F(1, 87) = 4.26$, $p = .042$, partial $\eta^2 = .047$. Table Wulf 5.1 presents the means and standard deviations for areas of interest by participant type.

Table Wulf 5.1

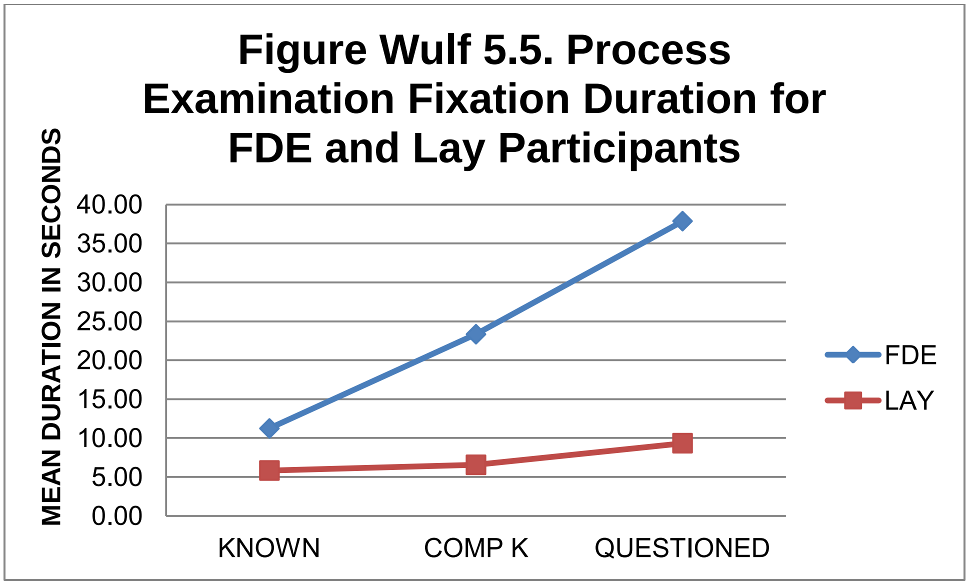
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	29.96	36.80	66.17	61.84	77.13	51.81
Lay	17.79	12.23	21.65	22.66	23.44	21.91

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .342, $F(3, 85) = 14.72$, $p < .001$, multivariate $\eta^2 = .342$. Figure Wulf 5.5 presents the mean fixation duration by AOI.

Figure Wulf 5.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 87) = 39.34$, $p > .001$, partial $\eta^2 = .311$); known signature comparison stimulus, $F(1, 87) = 18.28$, $p < .001$, partial $\eta^2 = .174$). Fixation duration in the known signature stimulus was also statistically significant, $F(1, 87) = 5.81$, $p = .018$, partial $\eta^2 = .063$. Table Wulf 5.2 presents the means and standard deviations for areas of interest by participant type.

Table Wulf 5.2

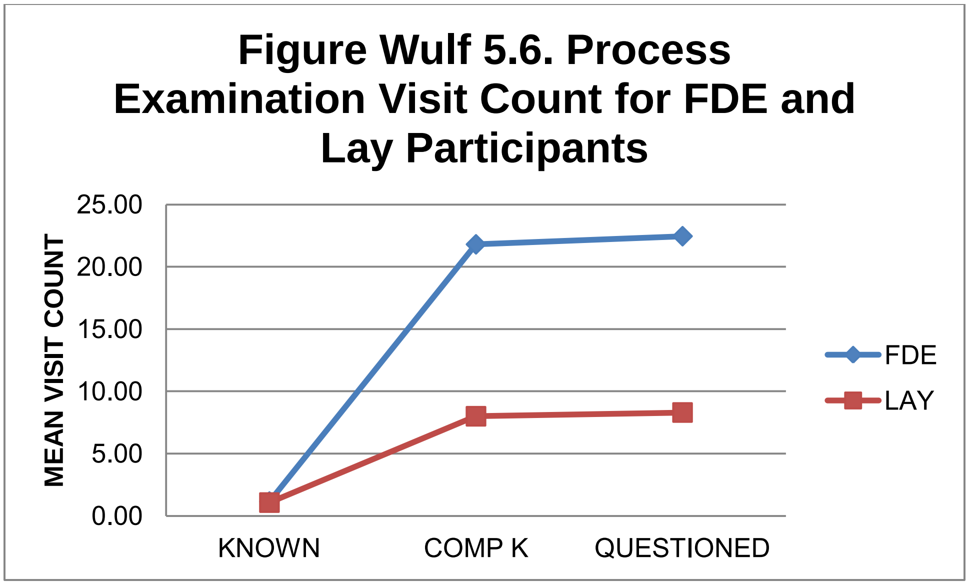
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	11.23	13.90	23.34	24.86	37.86	28.38
Lay	5.83	4.92	6.56	6.82	9.34	9.44

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .238, $F(3, 85) = 8.86$, $p < .001$, multivariate $\eta^2 = .238$. Figure Wulf 5.6 presents the mean visit counts by AOI.

Figure Wulf 5.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit count in two of the three areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 87) = 26.76$, $p < .001$, partial $\eta^2 = .235$); known signature comparison stimulus, $F(1, 87) = 25.98$, $p < .001$, partial $\eta^2 = .230$). Visit counts in the known signature stimulus were not statistically significant, $p = .449$, *ns*. Table Wulf 5.3 presents the means and standard deviations for areas of interest by participant type.

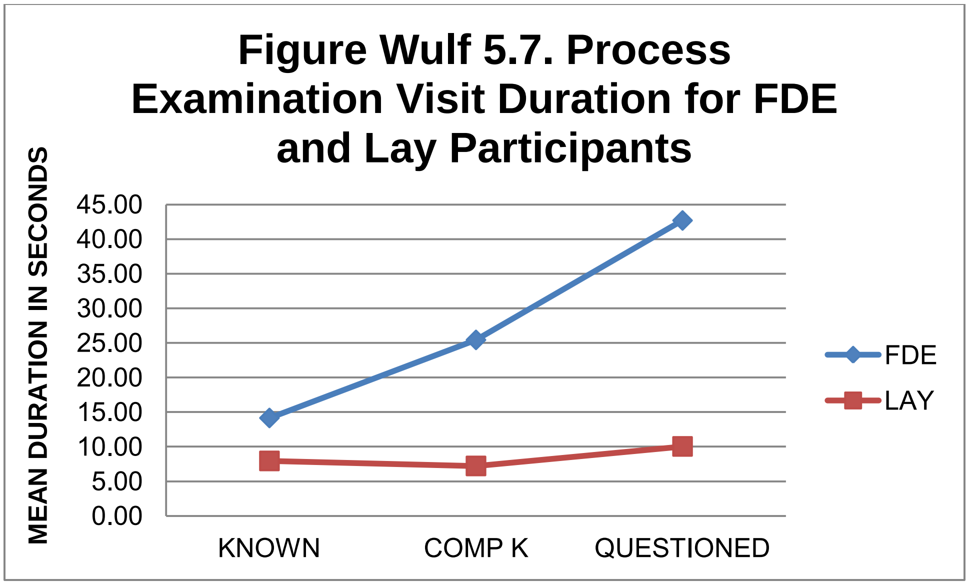
Table Wulf 5.3
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.15	0.47	21.80	16.04	22.46	16.18
Lay	1.07	0.55	8.00	7.87	8.30	8.01

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .374, $F(3, 85) = 16.93$, $p < .001$, multivariate $\eta^2 = .374$. Figure Wulf 5.7 presents the mean visit durations by AOI.

Figure Wulf 5.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 87) = 47.17$, $p < .001$, partial $\eta^2 = .352$); known signature comparison stimulus, $F(1, 87) = 18.34$, $p < .001$, partial $\eta^2 = .174$). Visit durations in the known signature stimulus were also statistically significant, $F(1, 87) = 5.06$, $p = .027$, partial $\eta^2 = .055$. Table Wulf 5.4 presents the means and standard deviations for areas of interest by participant type. Table

Wulf 5.4

Process Analysis Visit Durations for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	14.15	17.11	25.44	26.93	42.70	29.70
Lay	7.95	6.08	7.22	7.51	10.04	9.76

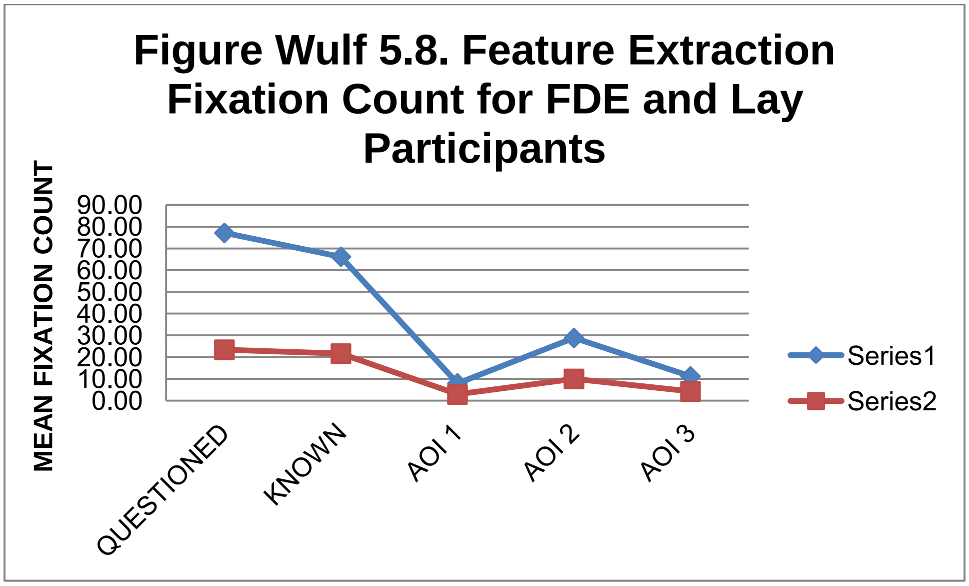
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .377, $F(5, 83) = 10.04$, $p < .001$, multivariate $\eta^2 = .377$. Figure Wulf 5.8 presents the mean fixation counts by AOI.

Figure Wulf 5.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 87) = 39.54$, $p < .001$, partial $\eta^2 = .312$, and $F(1, 87) = 19.79$, $p < .001$, partial $\eta^2 = .185$.

Fixation counts in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 20.81$, $p < .001$, partial $\eta^2 = .193$; AOI 2, $F(1, 87) = 25.72$, $p < .001$, partial $\eta^2 = .228$; AOI 3, $F(1, 87) = 21.52$, $p < .001$, partial $\eta^2 = .198$). Table Wulf 5.5 presents the means and standard deviations for areas of interest by participant type.

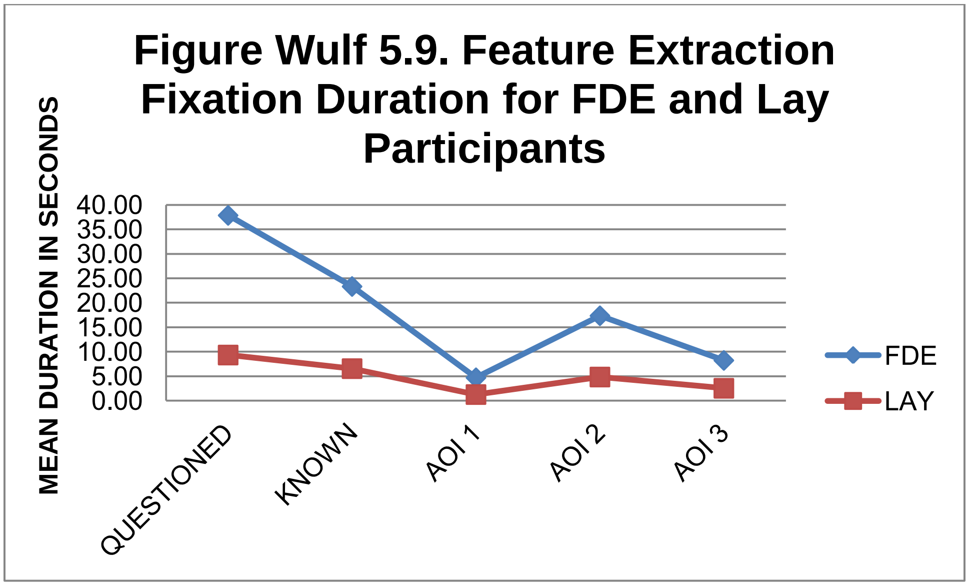
Table Wulf 5.5
Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2		AOI 3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	77.13	51.81	66.17	61.84	8.02	6.76	28.85	22.54	11.20	8.70
Lay	23.44	21.91	21.65	22.66	2.91	2.98	10.02	9.49	4.28	4.60

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .351, $F(5, 83) = 8.96$, $p < .001$, multivariate $\eta^2 = .351$. Figure Wulf 5.9 presents the mean fixation durations by AOI.

Figure Wulf 5.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 87) = 39.34$, $p < .001$, partial $\eta^2 = .311$, and $F(1, 87) = 18.28$, $p < .001$, partial $\eta^2 = .174$.

Fixation durations in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 25.35$, $p < .001$, partial $\eta^2 = .226$; AOI 2, $F(1, 87) = 29.41$, $p < .001$, partial $\eta^2 = .253$; AOI 3, $F(1, 87) = 21.97$, $p < .001$, partial $\eta^2 = .202$). Table Wulf 5.6 presents the means and standard deviations for areas of interest by participant type.

Table Wulf 5.6

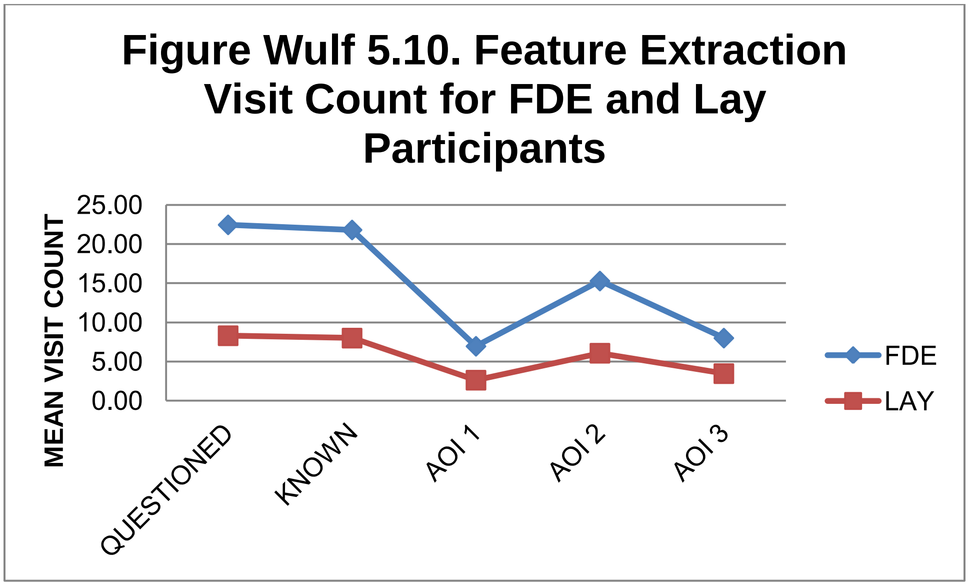
Feature Extraction Analysis Fixation Durations for FDE and Lay Participants

	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**		**AOI 3**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	37.86	28.38	23.34	24.86	4.70	4.30	17.36	14.07	8.24	7.19
Lay	9.34	9.44	6.56	6.82	1.27	1.27	4.85	5.74	2.55	3.54

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .249, $F(5, 83) = 5.52$, $p < .001$, multivariate $\eta^2 = .249$. Figure Wulf 5.10 presents the mean fixation durations by AOI.

Figure Wulf 5.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 87) = 26.76$, $p < .001$, partial $\eta^2 = .235$, and $F(1, 87) = 25.98$, $p < .001$, partial $\eta^2 = .230$.

Visit counts in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 20.49$, $p < .001$, partial $\eta^2 = .191$; AOI 2, $F(1, 87) = 22.47$, $p < .001$, partial $\eta^2 = .205$; AOI 3, $F(1, 87) = 15.37$, $p < .001$, partial $\eta^2 = .153$). Table Wulf 5.7 presents the means and standard deviations for areas of interest by participant type.

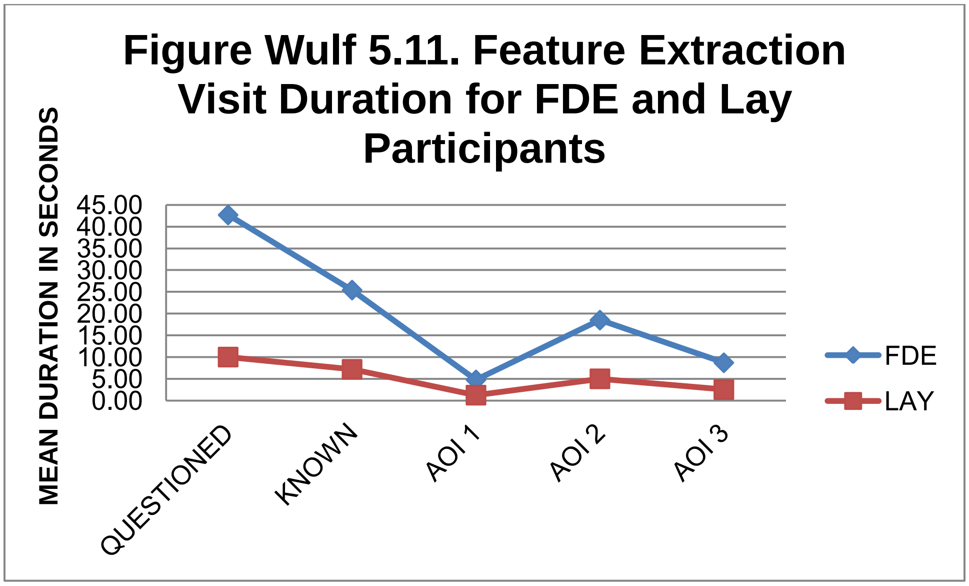
Table Wulf 5.7
Feature Extraction Analysis Visit Counts for FDE and Lay Participants

	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**		**AOI 3**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	22.46	16.18	21.80	16.04	6.96	5.73	15.28	11.67	8.00	6.63
Lay	8.30	8.01	8.00	7.87	2.63	2.63	6.07	5.29	3.47	3.63

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .380, $F(5, 83) = 10.18$, $p < .001$, multivariate $\eta^2 = .380$. Figure Wulf 5.11 presents the mean fixation durations by AOI.

Figure Wulf 5.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 87) = 47.17$, $p < .001$, partial $\eta^2 = .352$, and $F(1, 87) = 18.34$, $p < .001$, partial $\eta^2 = .174$.

Visit durations in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 25.71$, $p < .001$, partial $\eta^2 = .228$; AOI 2, $F(1, 87) = 32.22$, $p < .001$, partial $\eta^2 = .270$; AOI 3, $F(1, 87) = 23.30$, $p < .001$, partial $\eta^2 = .211$). Table Wulf 5.8 presents the means and standard deviations for areas of interest by participant type.

Table Wulf 5.8

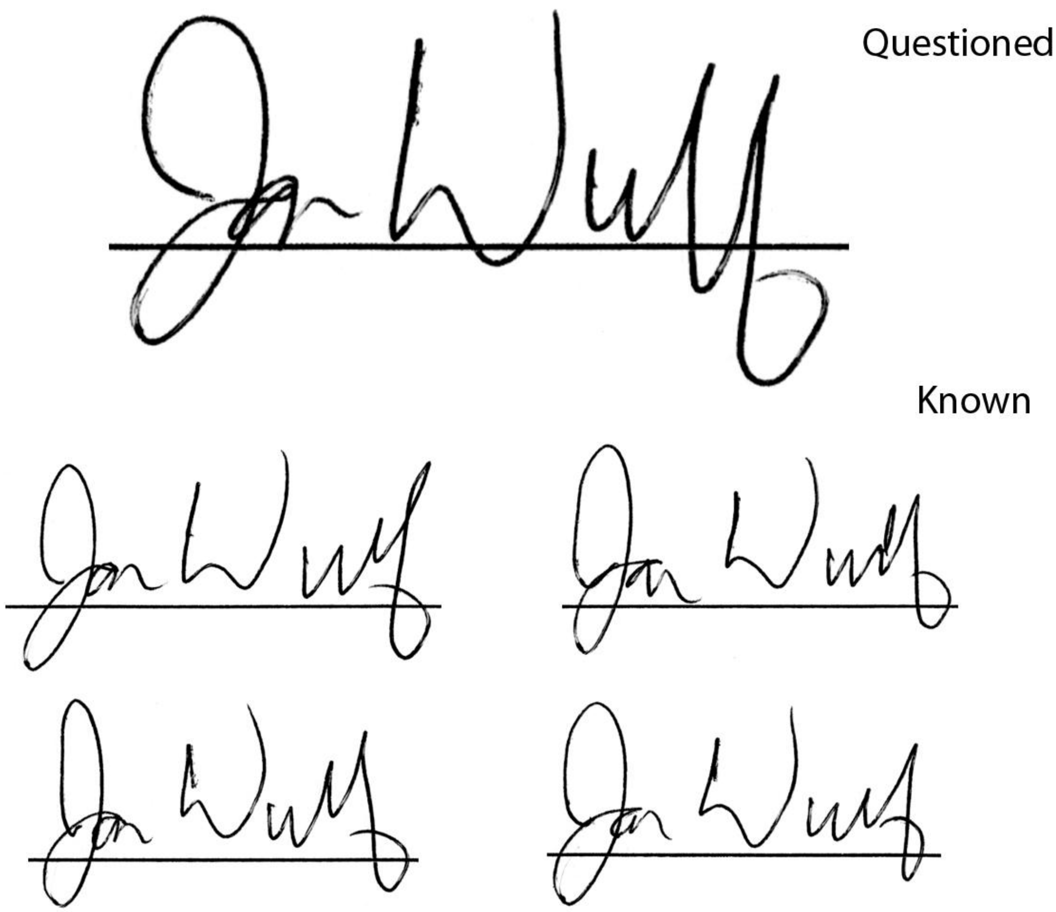
Feature Extraction Analysis Visit Counts for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2		AOI 3	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	42.70	29.70	25.44	26.93	4.80	4.36	18.53	14.51	8.74	7.63
Lay	10.04	9.76	7.22	7.51	1.29	1.29	5.04	5.87	2.58	3.56

Wulf Signature 6: Genuine

Of the 49 FDE participants, 21 responded correctly that the signature was genuine, and 27 responded that it was non-genuine. One FDE declined to respond. Of the 43 Lay participants, 41 responded correctly that the signature was genuine, and 2 responded incorrectly that the signature was non-genuine. This difference was statistically significant, χ^2 (2, N = 92) = 28.73, p < .001. Figure Wulf 6.1 presents the comparison view of this signature.

Figure Wulf 6.1. Questioned-Known Comparison Stimulus for Signature Wulf 6.

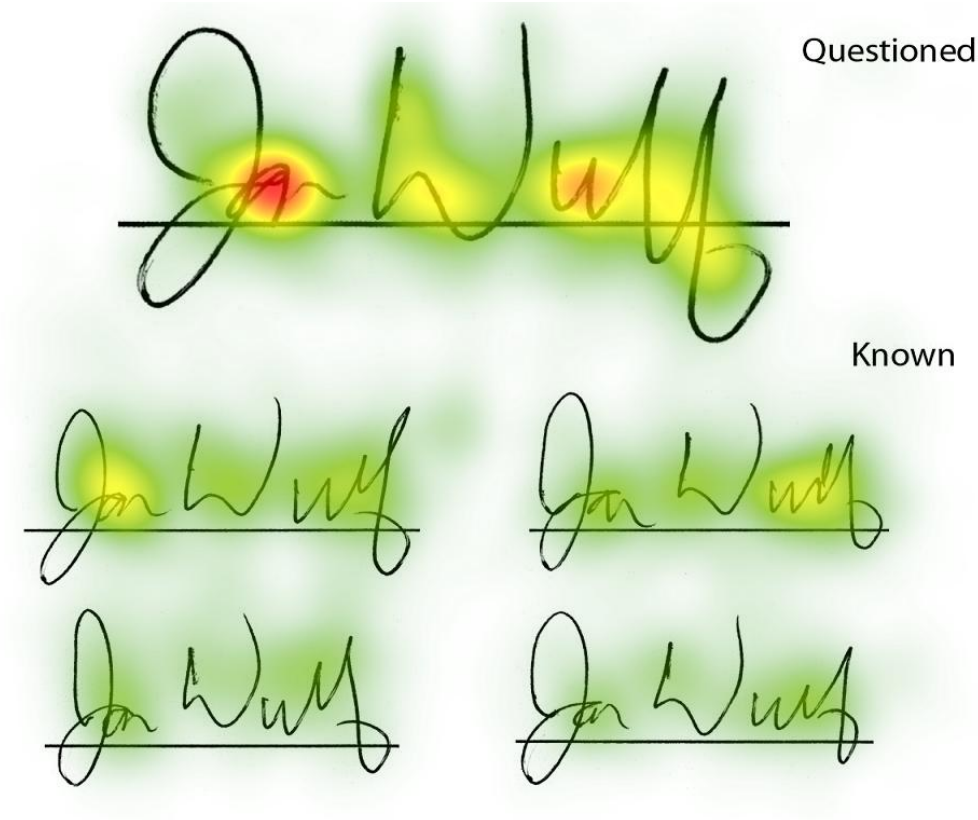


Selection of Areas of Interest (AOIs)

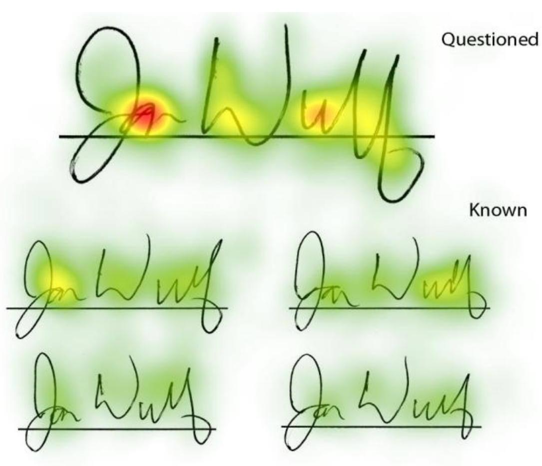
Figure Wulf 6.2 presents the heat map for this comparison slide. Empirical examination of the heat map revealed that there were two locations indicated by red “hot spots” within the signature that elicited significant attention from the participants. AOIs were created for these specific hot spots. Larger, secondary AOIs incorporating the smaller hot spots were created to include the orange “warm spots”, creating a total of four AOIs for this stimulus. Figure Wulf 6.3 presents the location of the AOIs identified in the heat map.

Figure Wulf 6.2. Heat map for Wulf signature 6, demonstrating the areas of gaze concentration (hot and warm spots) used to create AOIs.

All Participants



FDE



Lay

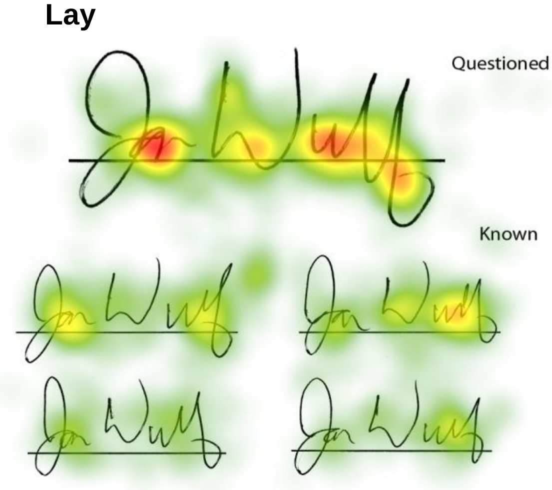
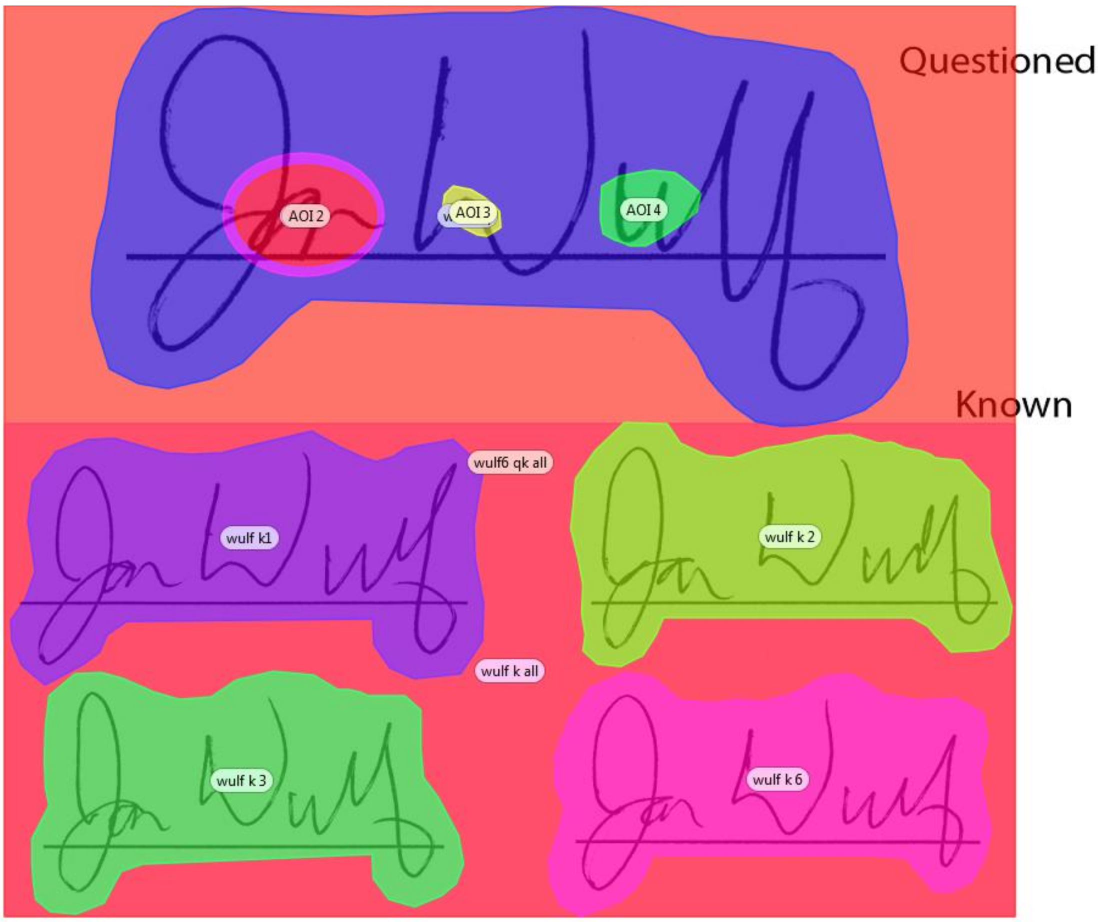


Figure Wulf 6.3. Areas of Interest (AOIs) for Wulf Signature 6.



Eye-Tracking Metrics Analyses

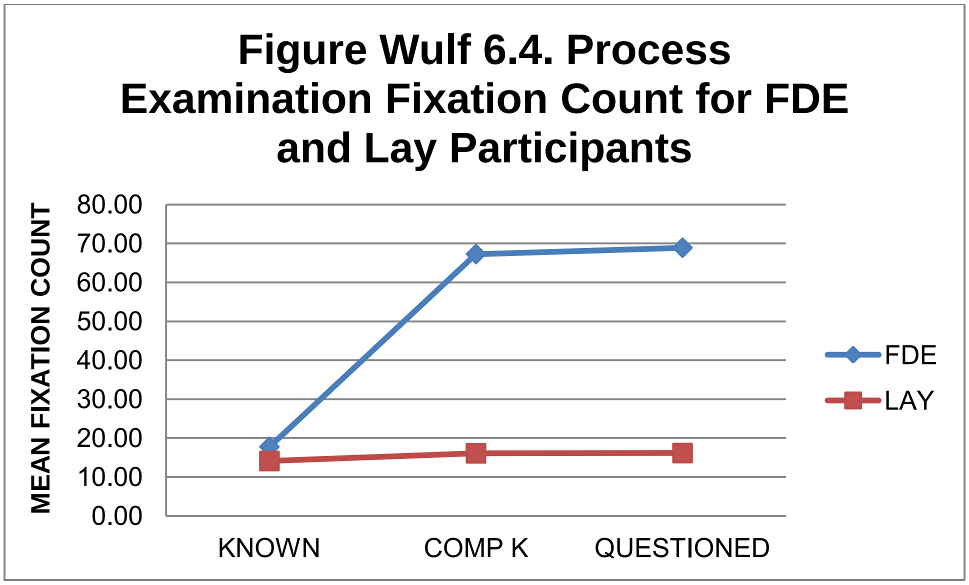
Examination Process Analyses

These analyses investigate the participants' overall utilization of characteristics in the known and questioned signatures.

Total Fixation Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .414, $F(3, 85) = 20.05$, $p < .001$, multivariate $\eta^2 = .414$. Figure Wulf 6.4 presents the mean fixation counts by AOI.

Figure Wulf 6.4



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixations counts in two of the three areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 87) = 58.76$, $p < .001$, partial $\eta^2 = .403$); known signature comparison stimulus, $F(1, 87) = 49.00$, $p < .001$, partial $\eta^2 = .360$). Fixation counts in the known signature stimulus were not statistically significant, $p = .190$, *ns*. Table Wulf 6.1 presents the means and standard deviations for areas of interest by participant type.

Table Wulf 6.1

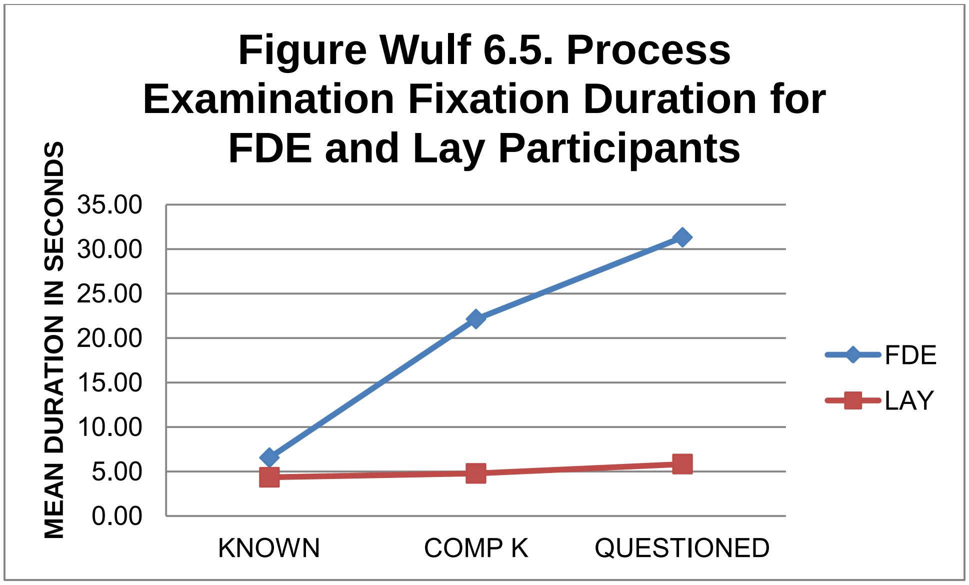
Process Analysis Fixation Counts for FDE and Lay Participants

	Knowns		**Comp Knowns**		**Questioned**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	17.76	16.52	67.26	45.83	68.89	43.12
Lay	14.09	7.91	16.07	14.55	16.14	13.72

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .447, $F(3, 85) = 22.86$, $p < .001$, multivariate $\eta^2 = .447$. Figure Wulf 6.5 presents the mean fixation counts by AOI.

Figure Wulf 6.5



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation durations in two of the three areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 87) = 69.11$, $p < .001$, partial $\eta^2 = .443$); known signature comparison stimulus, $F(1, 87) = 48.35$, $p < .001$, partial $\eta^2 = .357$). Fixation durations in the known signature stimulus were not statistically significant, $F(1, 87) = 3.52$, $p = .064$, partial $\eta^2 = .039$, *ns*. Table Wulf 6.2 presents the means and standard deviations for areas of interest by participant type.

Table Wulf 6.2

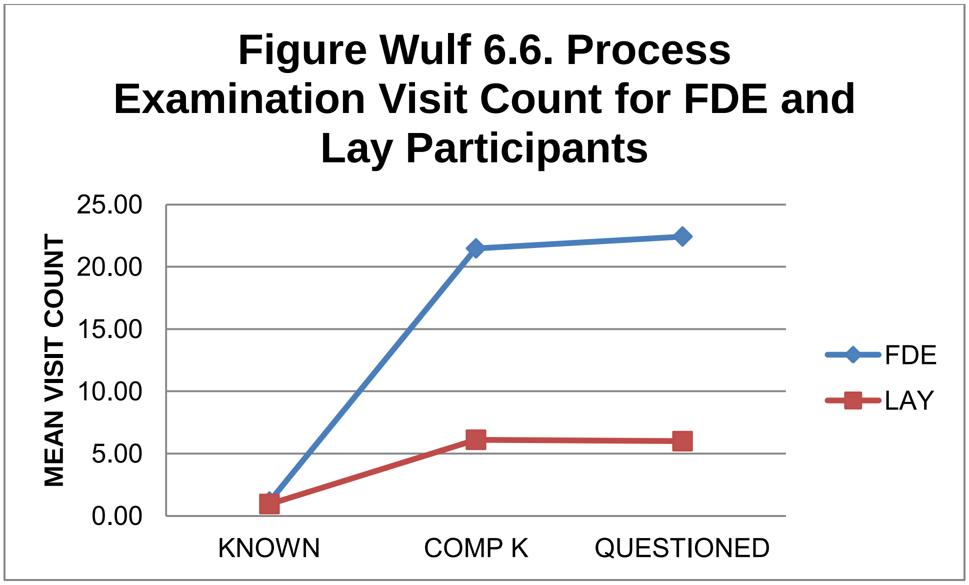
Process Analysis Fixation Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	6.55	7.17	22.13	15.76	31.32	19.56
Lay	4.34	2.91	4.78	4.53	5.83	4.79

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .412, $F(3, 85) = 19.82$, $p < .001$, multivariate $\eta^2 = .412$. Figure Wulf 6.6 presents the mean visit counts by AOI.

Figure Wulf 6.6



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all but one area of interest. Total visit count for the questioned signature and the known signature comparison stimulus was significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 87) = 54.49$, $p < .001$, partial $\eta^2 = .385$); known signature comparison stimulus, $F(1, 87) = 48.32$, $p < .001$, partial $\eta^2 = .357$). Visit count in the known signature stimulus was not statistically significant, $p = .113$, *ns*. Table Wulf 6.3 presents the means and standard deviations for areas of interest by participant type.

Table Wulf 6.3

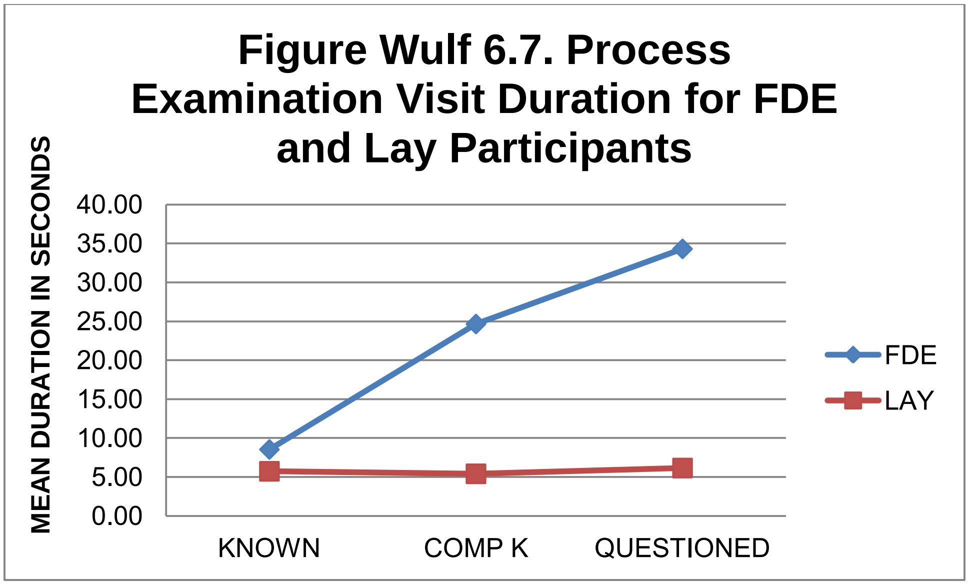
Process Analysis Visit Counts for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	1.15	0.73	21.48	13.49	22.43	13.67
Lay	0.95	0.38	6.12	5.47	6.00	5.30

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .435, $F(3, 85) = .21.78$, $p < .001$, multivariate $\eta^2 = .435$. Figure Wulf 6.7 presents the mean visit durations by AOI.

Figure Wulf 6.7



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, (questioned signature, $F(1, 87) = 66.11$, $p < .001$, partial $\eta^2 = .432$); known signature comparison stimulus, $F(1, 87) = 47.91$, $p < .001$, partial $\eta^2 = .355$). Visit duration in the known signature stimulus was not statistically significant, $p = .061$, *ns*. Table Wulf 6.4 presents the means and standard deviations for areas of interest by participant type.

Table Wulf 6.4

Process Analysis Visit Durations for FDE and Lay Participants

	Knowns		Comp Knowns		Questioned	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	8.53	8.97	24.65	17.60	34.30	22.19
Lay	5.72	3.84	5.40	4.88	6.14	4.95

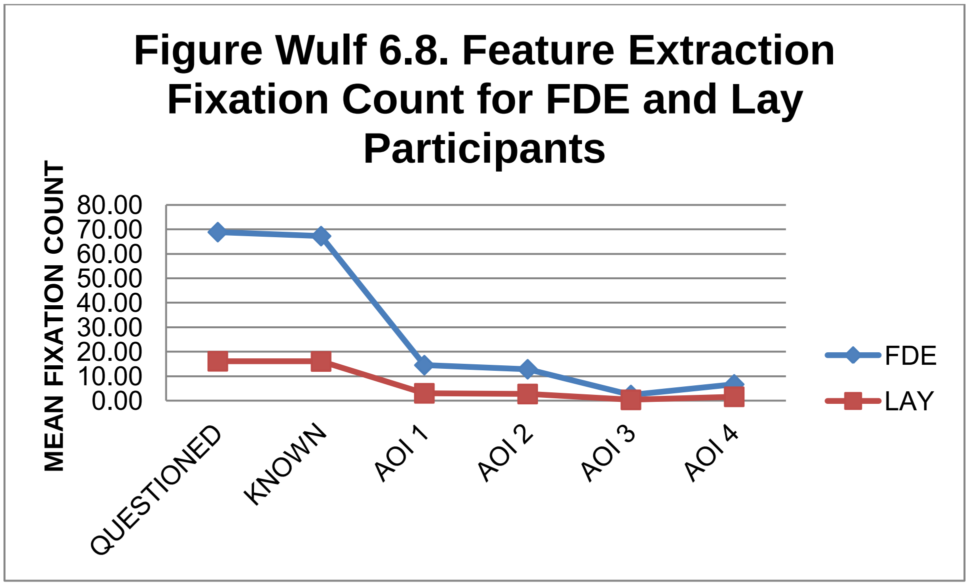
Feature Extraction Analyses

These analyses investigate the participants' deployment of attentional resources to specific characteristics in the known and questioned signatures that the heat map indicated were particularly diagnostic during the examination.

<u>*Total Fixation Count*</u>

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .432, $F(6, 82) = 10.41$, $p < .001$, multivariate $\eta^2 = .432$. Figure Wulf 6.8 presents the mean fixation counts by AOI.

Figure Wulf 6.8



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation count in all areas of interest. Total fixation count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 87) = 58.76$, $p < .001$, partial $\eta^2 = .403$, and $F(1, 87) = 49.00$, $p < .001$, partial $\eta^2 = .360$.

Fixation counts in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 57.65$, $p < .001$, partial $\eta^2 = .399$; AOI 2, $F(1, 87) = 53.38$, $p < .001$, partial $\eta^2 = .380$; AOI 3, $F(1, 87) = 24.99$, $p < .001$, partial $\eta^2 = .223$; AOI 4, $F(1, 87) = 28.44$, $p < .001$, partial $\eta^2 = .246$). Table Wulf 6.5 presents the means and standard deviations for areas of interest by participant type.

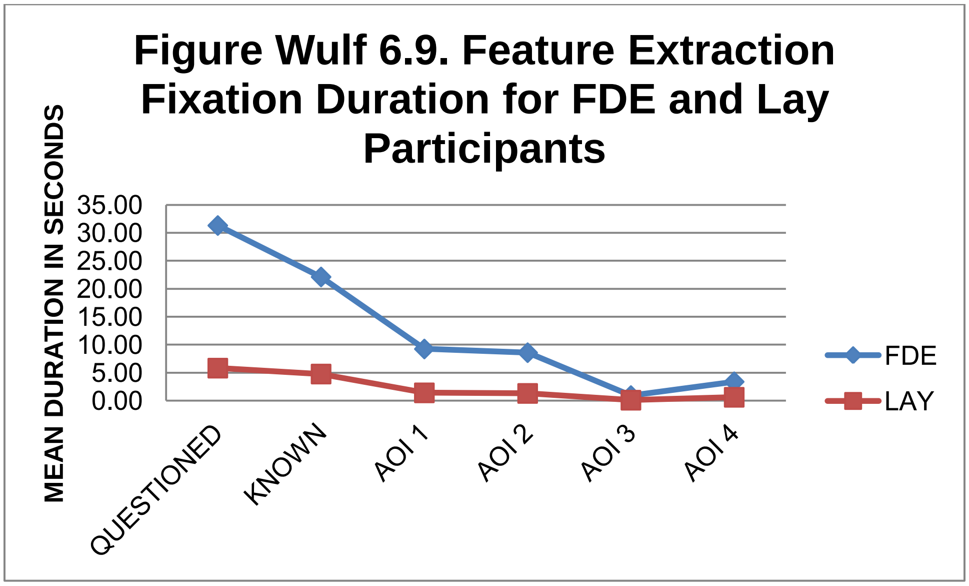
Table Wulf 6.5
Feature Extraction Analysis Fixation Counts for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1		AOI 2		AOI 3		AOI 4	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	68.89	43.12	67.26	45.83	14.54	9.47	12.87	8.65	2.37	2.53	6.70	5.89
Lay	16.14	13.72	16.07	14.55	3.05	3.09	2.77	2.81	0.37	0.69	1.63	2.10

Total Fixation Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .465, $F(6, 82) = 11.89$, $p < .001$, multivariate $\eta^2 = .465$. Figure Wulf 6.9 presents the mean fixation durations by AOI.

Figure Wulf 6.9



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total fixation duration in all areas of interest. Total fixation duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 87) = 69.11$, $p < .001$, partial $\eta^2 = .443$, and $F(1, 87) = 48.35$, $p < .001$, partial $\eta^2 = .357$.

Fixation durations in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 38.78$, $p < .001$, partial $\eta^2 = .308$; AOI 2, $F(1, 87) = 39.94$, $p < .001$, partial $\eta^2 = .315$; AOI 3, $F(1, 87) = 25.14$, $p < .001$, partial $\eta^2 = .224$; AOI 4, $F(1, 87) = 34.67$, $p < .001$, partial $\eta^2 = .285$). Table Wulf 6.6 presents the means and standard deviations for areas of interest by participant type.

Table Wulf 6.6

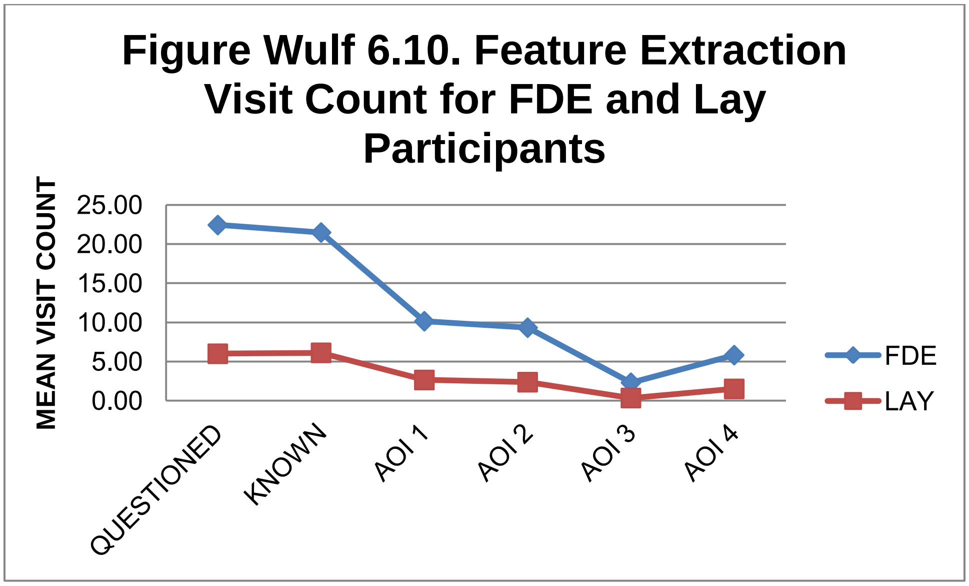
Feature Extraction Analysis Fixation Duration for FDE and Lay Participants

	QUESTIONED		**KNOWN**		**AOI 1**		**AOI 2**		**AOI 3**		**AOI 4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	31.32	19.56	22.13	15.76	9.26	8.15	8.59	7.44	0.93	1.06	3.40	2.98
Lay	5.83	4.79	4.78	4.53	1.41	1.39	1.32	1.31	0.10	0.21	0.62	0.83

Total Visit Count

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .451, $F(6, 82) = 11.25$, $p < .001$, multivariate $\eta^2 = .451$. Figure Wulf 6.10 presents the mean fixation durations by AOI.

Figure Wulf 6.10



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit counts in all areas of interest. Total visit count for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 87) = 54.49$, $p < .001$, partial $\eta^2 = .385$, and $F(1, 87) = 48.32$, $p < .001$, partial $\eta^2 = .357$.

Visit counts in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 50.42$, $p < .001$, partial $\eta^2 = .367$; AOI 2, $F(1, 87) = 50.32$, $p < .001$, partial $\eta^2 = .366$; AOI 3, $F(1, 87) = 26.08$, $p < .001$, partial $\eta^2 = .231$; AOI 4, $F(1, 87) = 31.87$, $p < .001$, partial $\eta^2 = .268$). Table Wulf 6.7 presents the means and standard deviations for areas of interest by participant type.

Table Wulf 6.7

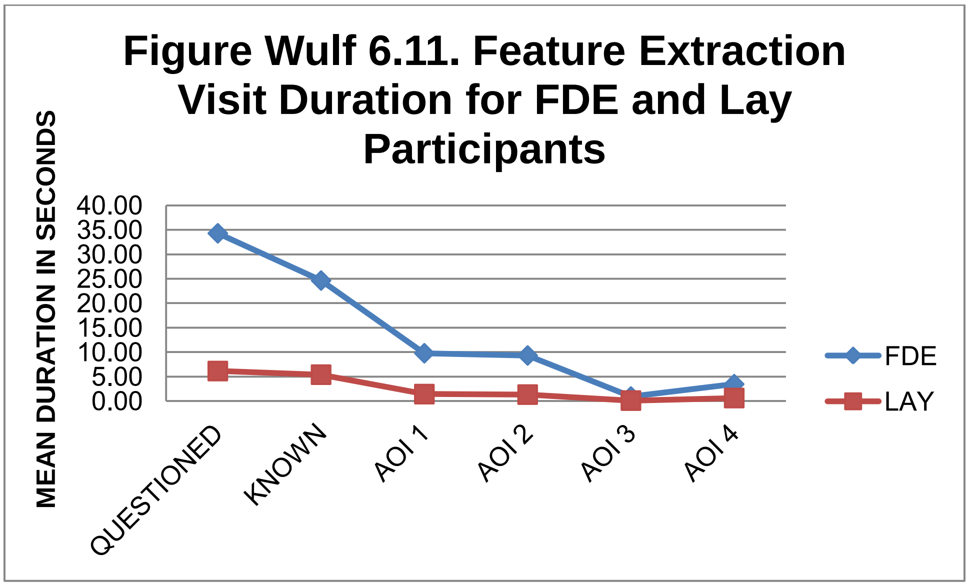
Feature Extraction Analysis Visit Count for FDE and Lay Participants

	QUESTIONED		**KNOWN**		**AOI 1**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	22.43	13.67	21.48	13.49	10.15	6.43
Lay	6.00	5.30	6.12	5.47	2.65	2.66
	AOI 2		**AOI 3**		**AOI 4**	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	9.33	6.00	2.30	2.44	5.83	4.72
Lay	2.37	2.39	0.35	0.61	1.51	1.75

Total Visit Duration

MANOVA results revealed significant differences between FDEs and Lay participants on the dependant variables, Pillai's Trace = .448, $F(6, 82) = 11.11$, $p < .001$, multivariate $\eta^2 = .448$. Figure Wulf 6.11 presents the mean fixation durations by AOI.

Figure Wulf 6.11



Follow-up ANOVAS conducted on each dependent variable revealed that participant type differences were significant for total visit durations in all areas of interest. Total visit duration for the questioned signature and the known signature comparison stimulus were significantly greater for FDEs than for Lay participants, $F(1, 87) = 66.00$, $p < .001$, partial $\eta^2 = .432$, and $F(1, 87) = 47.91$, $p < .001$, partial $\eta^2 = .355$.

Visit durations in all AOIs were significantly greater for FDEs than for Lay participants (AOI 1, $F(1, 87) = 40.02$, $p < .001$, partial $\eta^2 = .315$; AOI 2, $F(1, 87) = 40.54$, $p < .001$, partial $\eta^2 = .318$; AOI 3, $F(1, 87) = 25.28$, $p < .001$, partial $\eta^2 = .225$; AOI 4, $F(1, 87) = 34.65$, $p < .001$, partial $\eta^2 = .285$). Table Wulf 6.8 presents the means and standard deviations for areas of interest by participant type.

Table Wulf 6.8

Feature Extraction Analysis Visit Duration for FDE and Lay Participants

	QUESTIONED		KNOWN		AOI 1	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	34.30	22.19	24.65	17.60	9.78	8.55
Lay	6.14	4.95	5.40	4.88	1.43	1.41

	AOI 2		AOI 3		AOI 4	
Participant	***M***	***SD***	***M***	***SD***	***M***	***SD***
FDE	9.06	7.85	0.94	1.06	3.46	3.05
Lay	1.33	1.33	0.11	0.22	0.63	0.83

CHAPTER 3: RESULTS

SECTION 3.4: TACHISTOSCOPE/EXTENDED VIEW ANALYSES

Tachistotscope/Extended View Protocol

This protocol was originally conceptualized as a distraction task to separate the questioned/known signature protocol from the peer review protocol (in which participants examined previously-viewed signatures). Although we did not propose any formal hypotheses for these data, the tachistoscope/extended view protocol provided an opportunity to further explore some of the characteristics of expertise.

The development of expertise involves extensively greater proceduralization of problem-solving skills, tactics, and strategies. The cognitive advantages of perceiving and storing problems in terms of patterns, as well as the research demonstrating that experts in most domains are able to solve problems more quickly than are non-experts suggested that even when given a short period of time to view a signature, FDEs should in most instances outperform Lay participants when making process decisions. This difference should be even more pronounced when participants were given the opportunity to view the signatures for an extended period of time.

Overall Analyses

Binomial logistic regression was conducted using the enter method to determine which among five independent variables (*participant type, view, signature orientation, signature type,* and *signature complexity*) predicted *call accuracy* (correct vs. incorrect). Regression results indicated that the overall model fit was poor (-2 Log Likelihood = 4432.26), but was moderately statistically reliable in distinguishing call accuracy, χ^2 (6) = 166.14, $p < .001$. The model correctly classified 68.9 % of cases. Regression coefficients are presented in Table 3.4.1.

Table 3.4.1
Regression Coefficients

	B	*Wald*	*df*	*p*	*Odds*
Participant Type	-.337	21.57	1	.000	.71
View	.265	13.28	1	.000	1.30
Signature Orientation	.078	0.82	1	.367	1.08
Signature Type		74.24	2	.000	
Text	1.219	39.02	1	.000	3.38
Mixed	.540	7.22	1	.007	1.72
Signature Complexity	-1.056	106.84	1	.000	.35

Wald statistics indicated *participant type* (FDE vs. Lay), *view* (tachistoscope vs. extended view), *signature type* (text, mixed, or stylized), and *signature complexity* (high vs. low) significantly predicted whether the call was correct or incorrect. *Signature orientation* was not a significant predictor of *call* *accuracy*. Although statistically significant, the odds ratios for *participant type* and *signature complexity* are small, indicating little change in the likelihood of *call accuracy* related to these factors. Table 3.4.2 presents overall call accuracy. Figure 3.4.1 presents the percentage of correct calls by participant type, signature type, and view. Figure 3.4.2 presents the percentage of correct calls by participant type, signature complexity, and view.

Table 3.4.2
Overall Accuracy of Calls by View, Signature Type, and Complexity

TACHISTOSCOPE VIEW						
	Text		Mixed		Stylized	
	High	Low	High	Low	High	Low
Correct	648	38	356	96	**	66
Incorrect	363	54	104	88	**	26
EXTENDED VIEW						
	Text		Mixed		Stylized	
	High	Low	High	Low	High	Low
Correct	707	43	377	112	**	65
Incorrect	43	49	82	72	**	27

*** No high complexity stylized signatures were included in this sample.*

Figure 3.4.1

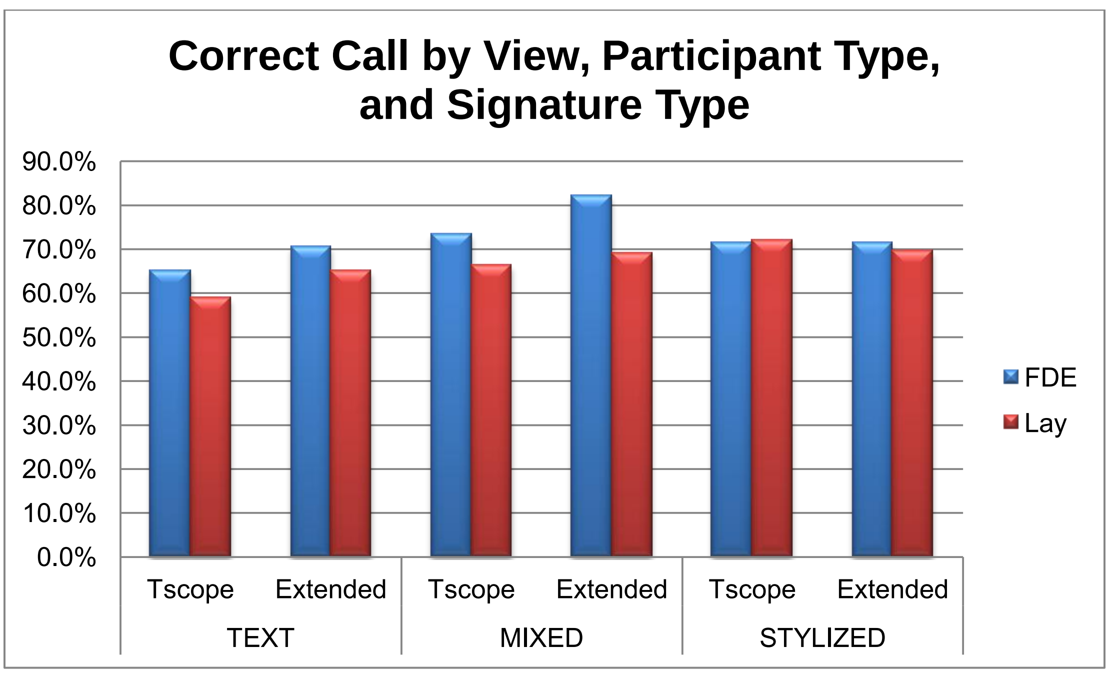


Figure 3.4.2

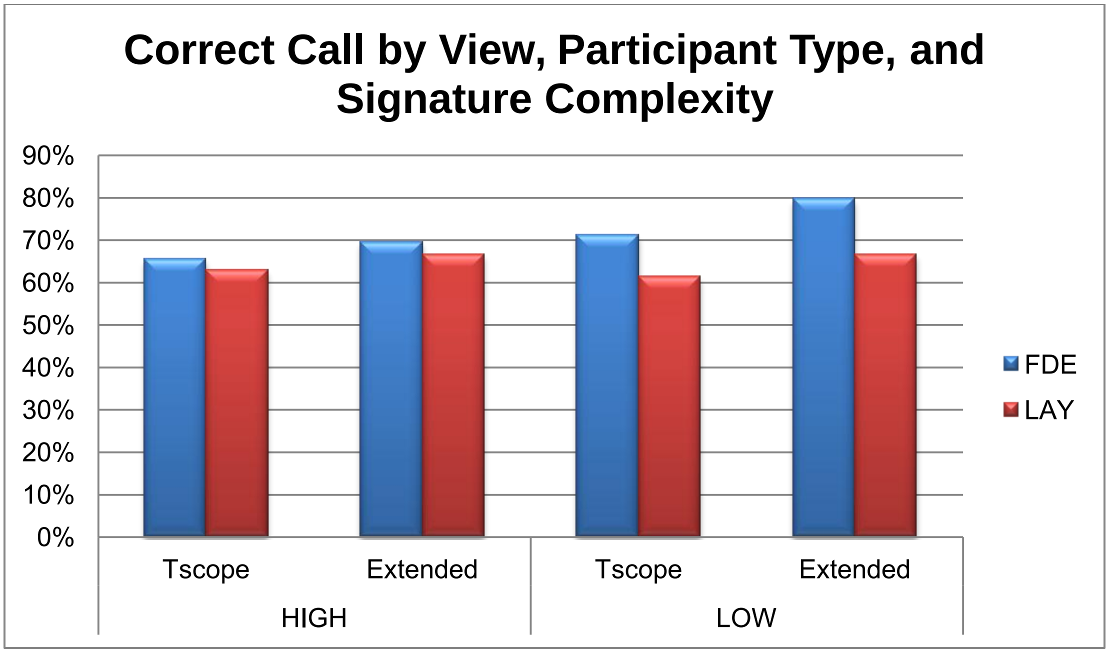
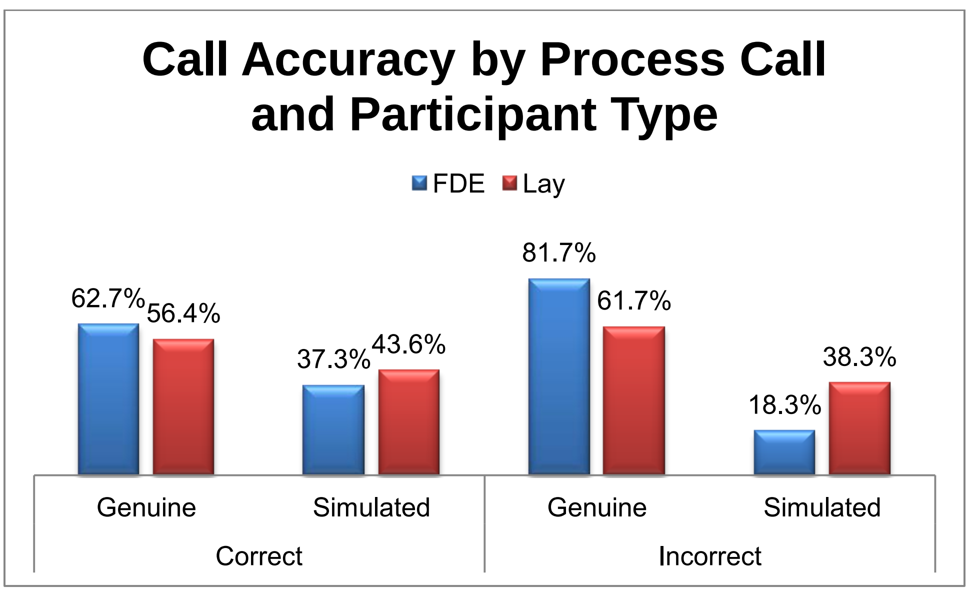


Figure 3.4.3 presents the percentages of correct and incorrect process calls, according to the calls made by FDE and Lay participants.

Figure 3.4.3



This Figure 3.4. demonstrates that FDEs made a greater number of correct calls than did Lay participants when the signatures were genuine (i.e., the signature was genuine and the call was genuine), and Lay participants made a greater number of correct calls than did FDEs when the signatures were simulated (i.e., the signature was simulated and the call was simulated). FDEs made a greater number of incorrect calls than did Lay participants when the call was genuine and the signatures were simulated, and Lay participants made a greater number of incorrect calls when the call was simulated and the signatures were genuine

Overall, FDEs were more accurate than were Lay participants at determining whether these signatures were genuine or simulated. When we examined the signature results individually, we found in some instances that Lay participants outperformed FDEs. Table 3.4.3 presents a signature-by-signature summary Table 3.4. of participant accuracy by view.

Table 3.4.3.
Call Accuracy by Participant Type and View

		Tachistoscope View			Extended View		
Signature	**Participant**	**Correct**	**Incorrect**	**Total**	**Correct**	**Incorrect**	**Total**
Amy Bedford Genuine	FDE	**48****	1	49	**49****	0	49
	Lay	34	9	43	36	7	43
	Total	*82*	*10*	*92*	*85*	*7*	*92*
Cedric Caldwell Simulated	FDE	8	41	49	7	42	49
	Lay	**20****	23	43	**18****	25	43
	Total	*28*	*64*	*92*	*25*	*67*	*92*
Jaina Hawkins Genuine	FDE	**49****	0	49	**48****	1	49
	Lay	33	10	43	31	12	43
	Total	*82*	*10*	*92*	*79*	*13*	92
Janice Ferguson Simulated	FDE	46	3	49	45	3	48
	Lay	34	9	43	41	2	43
	Total	*80*	*12*	*92*	*86*	*5*	*91*
Jermyn Barker Simulated	FDE	26	23	49	**40****	9	49
	Lay	16	27	43	20	23	43
	Total	*42*	*50*	*92*	*60*	*32*	*92*
Jessie Martin Genuine	FDE	30	19	49	35	14	49
	Lay	19	24	43	27	16	43
	Total	*49*	*43*	*92*	*62*	*30*	*92*
Juliet Oliver Simulated	FDE	21	28	49	33	16	49
	Lay	23	20	43	34	9	43
	Total	*44*	*48*	*92*	*67*	*25*	*92*
Karen Crissler Genuine	FDE	37	12	49	**42****	7	49
	Lay	24	19	43	24	19	43
	Total	*61*	*31*	*92*	*66*	*26*	*92*
Kathy Schwarzer Simulated	FDE	25	24	49	28	20	48
	Lay	**33***	10	43	**37****	6	43
	Total	*58*	*34*	*92*	*65*	*26*	*91*
Kevin Backan Genuine	FDE	35	14	49	35	14	49
	Lay	31	12	43	30	13	43
	Total	*66*	*26*	*92*	*65*	*27*	*92*
Lorene Mosby	FDE	2	47	49	0	49	49

Simulated	Lay	7	36	43	**6****	37	43
	Total	*9*	*83*	*92*	*6*	*86*	*92*
Mitch Hawkins Genuine	FDE	**49***	0	49	**49****	0	49
	Lay	38	5	43	35	8	43
	Total	*87*	*5*	*92*	*84*	*8*	*92*
Nancy Korosi Simulated	FDE	21	28	49	24	25	49
	Lay	27	16	43	25	18	43
	Total	*48*	*44*	*92*	*49*	*43*	*92*
Paul Malizia Simulated	FDE	17	32	49	26	23	49
	Lay	18	25	43	20	23	43
	Total	*35*	*57*	*92*	*46*	*46*	*92*
Rhonda Vinson Genuine	FDE	44	5	49	**48****	1	49
	Lay	32	11	43	34	9	43
	Total	*76*	*16*	*92*	*82*	*10*	*92*
Ricki Walls Genuine	FDE	**47****	1	48	**48***	1	49
	Lay	33	10	43	37	6	43
	Total	*80*	*11*	*91*	*85*	*7*	*92*
Tami Groover Genuine	FDE	49	0	49	**49***	0	49
	Lay	42	1	43	38	5	43
	Total	*91*	*1*	*92*	*87*	*5*	*92*
Tiffany Wright Simulated	FDE	**49***	0	49	48	1	49
	Lay	38	5	43	41	2	43
	Total	*87*	*5*	*92*	*89*	*3*	*92*
Tommy Rouse Genuine	FDE	**40****	9	49	**46****	3	49
	Lay	21	22	43	27	16	43
	Total	*61*	*31*	*92*	*73*	*19*	*92*
Wesley Ellis Simulated	FDE	**26***	23	49	**30****	19	49
	Lay	12	31	43	13	30	43
	Total	*38*	*54*	*92*	*43*	*49*	*92*
Total	FDE	**669****	310	979	**730****	248	978
	Lay	535	325	860	574	286	860
	Total	*1204*	*635*	*1839*	*1304*	*534*	*1838*

*Significantly greater at $p < .05$; **Significantly greater at $p < .01$

Call accuracy was statistically significantly different for FDEs and Lay participants in 14 of the 20 signatures. Table 3.4.4 presents these signatures with information about the correct process call, signature type, signature complexity, and the orientation in which the signature was presented (upside down or right side up).

Table 3.4.4.
Signatures with Significantly Different Call Accuracy

Signature	Process	Type	Complexity	Orientation
Barker	Simulated	Mixed	High	Up
Bedford	Genuine	Text	High	Down
Caldwell*	Simulated**	Text	High	Down
Crissler	Genuine	Text	High	Up
Ellis	Simulated	Text	Low	Up
Groover	Genuine	Text	High	Up
J Hawkins	Genuine	Text	High	Up
M Hawkins	Genuine	Mixed	High	Up
Mosby*	Simulated**	Text	High	Up
Rouse	Genuine	Text	High	Down
Schwarzer*	Simulated	Mixed	High	Down
Vinson	Genuine	Text	High	Up
Walls	Genuine	Text	High	Down
Wright	Simulated	Mixed	High	Up

*Lay participants were more accurate than FDEs
**Overall accuracy was low (fewer than half of the participants per group responded correctly)

Lay participants were significantly more accurate than were FDEs in three of the 14 instances; however, in two of these three instances overall call accuracy was low. For example, although Lay participants were more accurate than were FDEs for the Caldwell signature, only 18 of the 43 Lay participants correctly identified the signature as genuine. Similarly, only six of the 43 Lay participants correctly identified the Mosby signature as genuine. Overall call accuracy was higher for the Schwarzer signature, which 37 of the 43 Lay participants correctly identified as genuine. Overall, simulated signatures accounted for 81.7% of incorrect calls by FDEs and 61.7% of incorrect calls by Lay participants. All three of the signatures that Lay participants called more accurately than did FDEs were simulated signatures.

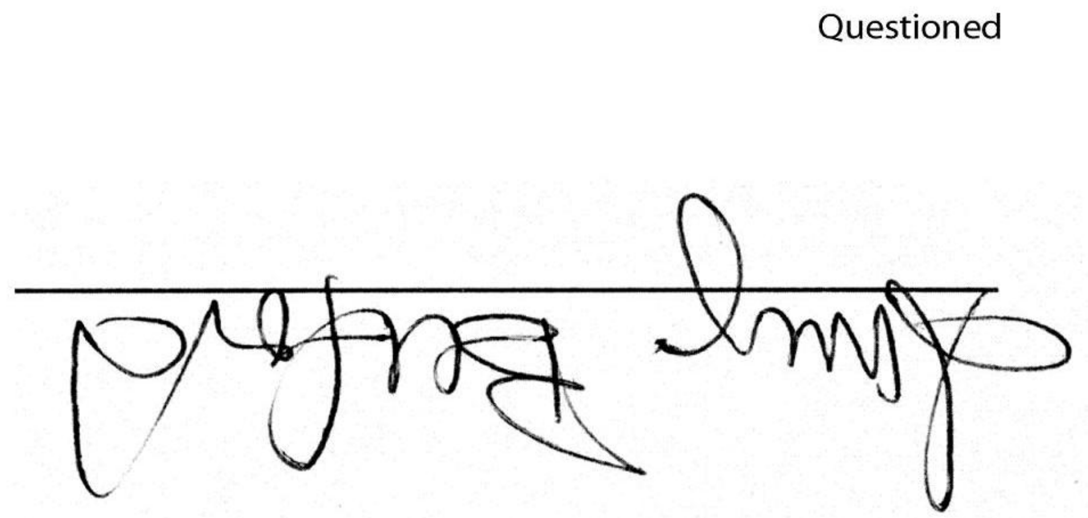
Individual Signature Tachistoscope/Extended View Analyses

These analyses provide signature by signature information about the relationships between *participant type*, *signature view*, and *call accuracy*.

Signature 1: Amy Bedford (Genuine)

Figure 3.4.Bedford.1 presents the signature of Amy Bedford, which is characterized as a high complexity, text based signature. This signature was presented in the upside down orientation, as pictured. Participants viewed the signature for 1s in the tachistoscope view, and were allowed to examine the signature for as long as they chose in the extended view.

Figure 3.4.Bedford.1.



A statistically significant difference in call accuracy was found according to participant type, χ^2 (1) = 16.89, p < .001. Table 3.4.Bedford.1 presents the overall distribution of correct and incorrect responses.

Table 3.4.Bedford.1
Overall Call Accuracy by Participant Type

	Correct	Incorrect	Total
FDE	97	1	98
Lay	70	16	86
Total	167	17	184

Binomial logistic regression was conducted using the enter method to determine which among two independent variables (*participant type* and *view)* predicted *call accuracy* (correct vs. incorrect).

Regression results indicated that the overall model fit was questionable (-2 Log Likelihood = 93.15), but was extremely statistically reliable in distinguishing call accuracy, χ^2 (2) = 20.21, $p < .001$. The model correctly classified 90.8 % of cases. Regression coefficients are presented in Table 3.4.Bedford.2.

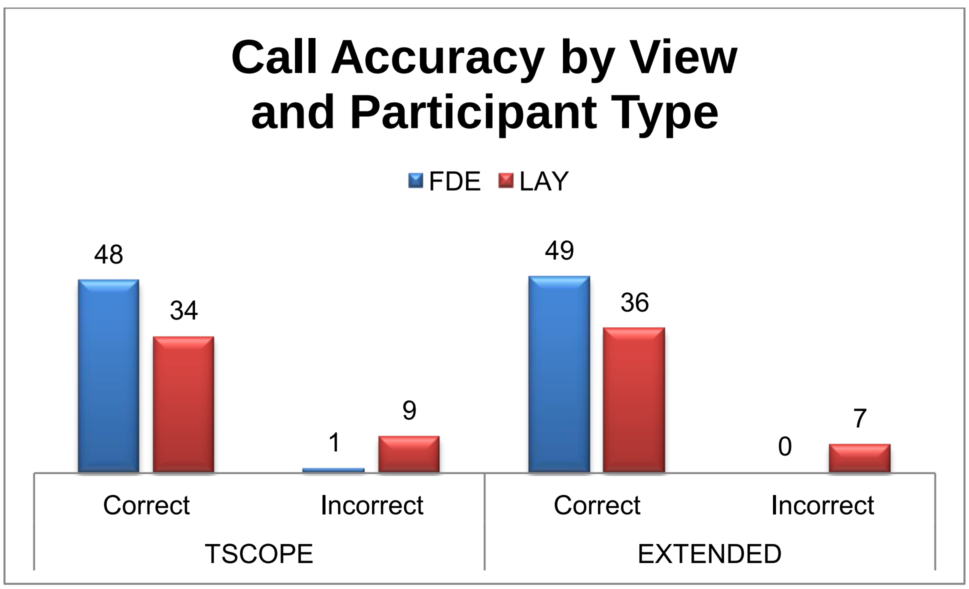
Table 3.4.Bedford.2

Regression Coefficients

	B	***Wald***	***df***	***p***	***Odds***
View	.43	.64	1	.425	1.54
Participant Type	-3.11	8.87	1	.003	0.04

Wald statistics indicated *participant type* (FDE vs. Lay) significantly predicted whether the call was correct or incorrect. *View* (tachistoscope vs. extended) was not a significant predictor of *call accuracy*. Figure 3.4.Bedford.2 demonstrates the accuracy of FDE and Lay participants by tachistoscope and extended view.

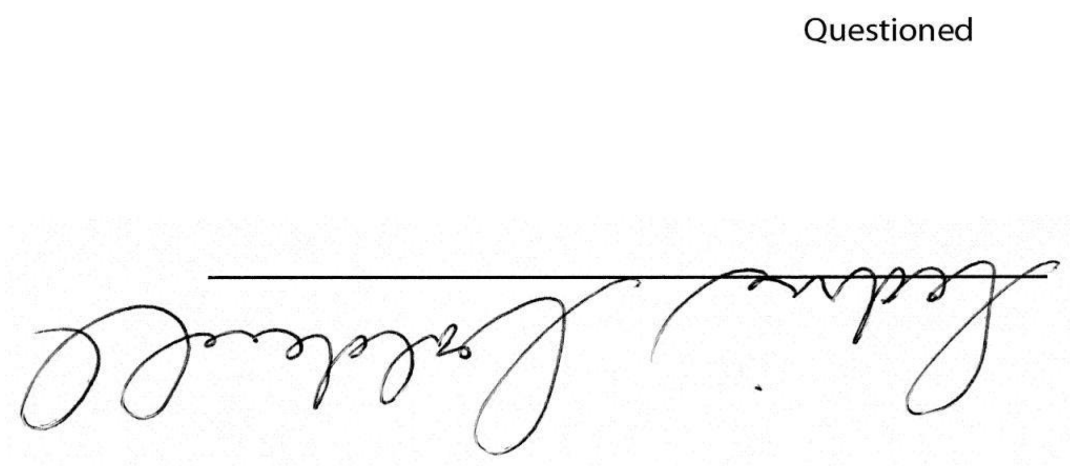
Figure 3.4.Bedford.2.



Signature 2: Cedric Caldwell (Simulated)

Figure 3.4.Caldwell.1 presents the signature of Cedric Caldwell, which is characterized as a high complexity, text based signature. This signature was presented in the upside down orientation, as pictured. Participants viewed the signature for 1s in the tachistoscope view, and were allowed to examine the signature for as long as they chose in the extended view.

Figure 3.4.Caldwell.1.



A statistically significant difference in call accuracy was found according to participant type, χ^2 (1) = 18.63, $p < .001$. Table 3.4.Caldwell.1 presents the overall distribution of correct and incorrect responses.

Table 3.4.Caldwell.1
Overall Call Accuracy by Participant Type

	Correct	Incorrect	Total
FDE	15	83	98
Lay	38	48	86
Total	53	131	184

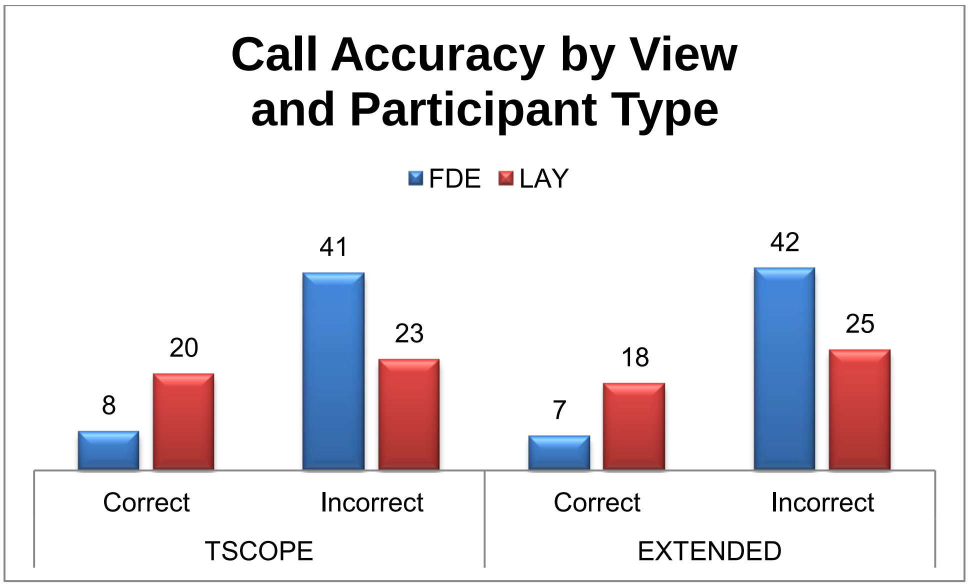
Binomial logistic regression was conducted using the enter method to determine which among two independent variables (*participant type* and *view*) predicted *call accuracy* (correct vs. incorrect). Regression results indicated that the overall model fit was poor (-2 Log Likelihood = 201.68), but was moderately statistically reliable in distinguishing call accuracy, χ^2 (2) = 19.27, $p < .001$. The model correctly classified 71.2 % of cases. Regression coefficients are presented in Table 3.4.Caldwell.2.

Table 3.4.Caldwell.2
Regression Coefficients

	B	*Wald*	*df*	*p*	*Odds*
View	-.18	.27	1	.607	.84
Participant Type	1.48	17.36	1	.000	4.39

Wald statistics indicated *participant type* (FDE vs. Lay) significantly predicted whether the call was correct or incorrect. *View* (tachistoscope vs. extended) was not a significant predictor of *call accuracy*. Figure 3.4.Caldwell.2 demonstrates the accuracy of FDE and Lay participants by tachistoscope and extended view.

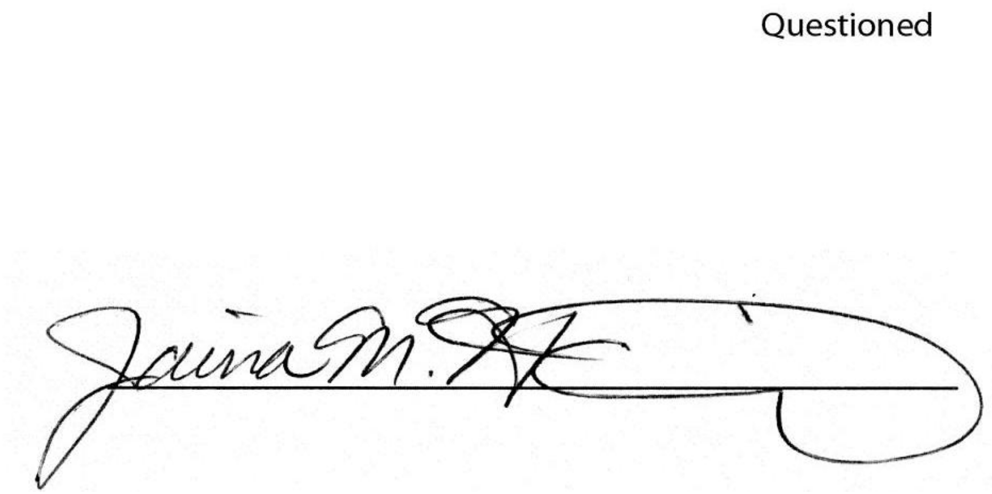
Figure 3.4.Caldwell.2.



Signature 3: Jaina Hawkins (Genuine)

Figure 3.4.Hawkins.1 presents the signature of Jaina Hawkins, which is characterized as a high complexity, text based signature. This signature was presented in the right side up orientation, as pictured. Participants viewed the signature for 1s in the tachistoscope view, and were allowed to examine the signature for as long as they chose in the extended view.

Figure 3.4.Hawkins.1.



A statistically significant difference in call accuracy was found according to participant type, χ^2 (1) = 25.26, $p < .001$. Table 3.4.Hawkins.1 presents the overall distribution of correct and incorrect responses.

Table 3.4.Hawkins.1
Overall Call Accuracy by Participant Type

	Correct	Incorrect	Total
FDE	97	1	98
Lay	64	22	86
Total	161	23	184

Binomial logistic regression was conducted using the enter method to determine which among two independent variables (*participant type* and *view)* predicted *call accuracy* (correct vs. incorrect). Regression results indicated that the overall model fit was poor (-2 Log Likelihood = 108.45), but was moderately statistically reliable in distinguishing call accuracy, χ^2 (2) = 30.21, $p < .001$. The model correctly classified 87.5 % of cases. Regression coefficients are presented in Table 3.4.Hawkins.2.

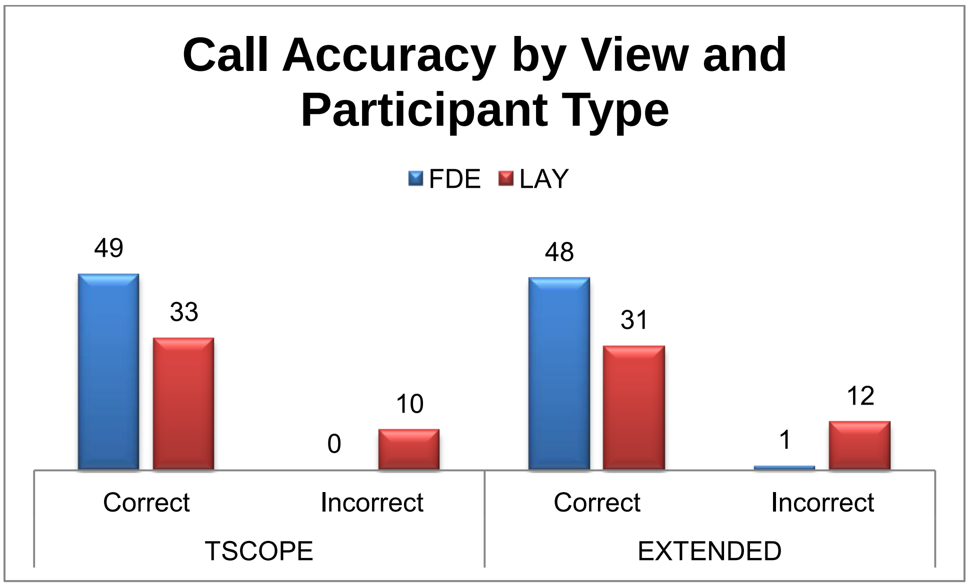
Table 3.4.Hawkins.2
Regression Coefficients

	B	*Wald*	*df*	*p*	*Odds*

View	-.35	.52	1	.473	.71
Participant Type	-3.51	11.52	1	.001	.03

Wald statistics indicated *participant type* (FDE vs. Lay) significantly predicted whether the call was correct or incorrect. *View* (tachistoscope vs. extended) was not a significant predictor of *call accuracy*. Figure 3.4.Hawkins.2 demonstrates the accuracy of FDE and Lay participants by tachistoscope and extended view.

Figure 3.4.Hawkins.2.

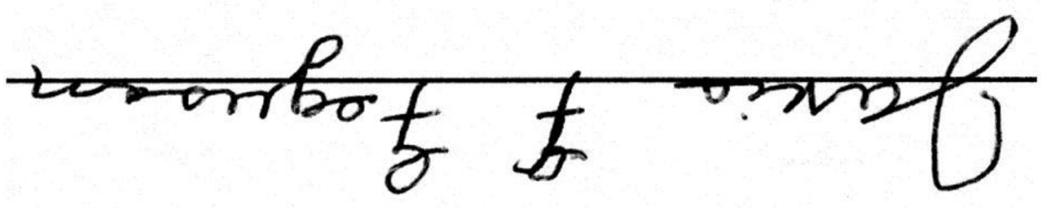


Signature 4: Janice Ferguson (Simulated)

Figure 3.4.Ferguson.1 presents the signature of Janice Ferguson, which is characterized as a high complexity, text based signature. This signature was presented in the upside down orientation, as pictured. Participants viewed the signature for 1s in the tachistoscope view, and were allowed to examine the signature for as long as they chose in the extended view.

Figure 3.4.Ferguson.1.

Questioned



No statistically significant difference in call accuracy was found according to participant type, χ^2 (1) = 2.36, p = .124, *ns*. Table 3.4.Ferguson.1 presents the overall distribution of correct and incorrect responses.

Table 3.4.Ferguson.1
Overall Call Accuracy by Participant Type

	Correct	Incorrect	Total
FDE	91	6	97
Lay	75	11	86
Total	166	17	183

Binomial logistic regression was conducted using the enter method to determine which among two independent variables (*participant type* and *view*) predicted *call accuracy* (correct vs. incorrect). Regression results indicated that the overall model fit was poor (-2 Log Likelihood = 107.54), but was highly statistically reliable in distinguishing call accuracy, correctly classifying 90.7% of cases. Regression results indicated that the overall model was not statistically significant, χ^2 (2) = 5.63, p = .060, *ns*. Table 3.4.Ferguson.2 presents the regression coefficients for this analysis.

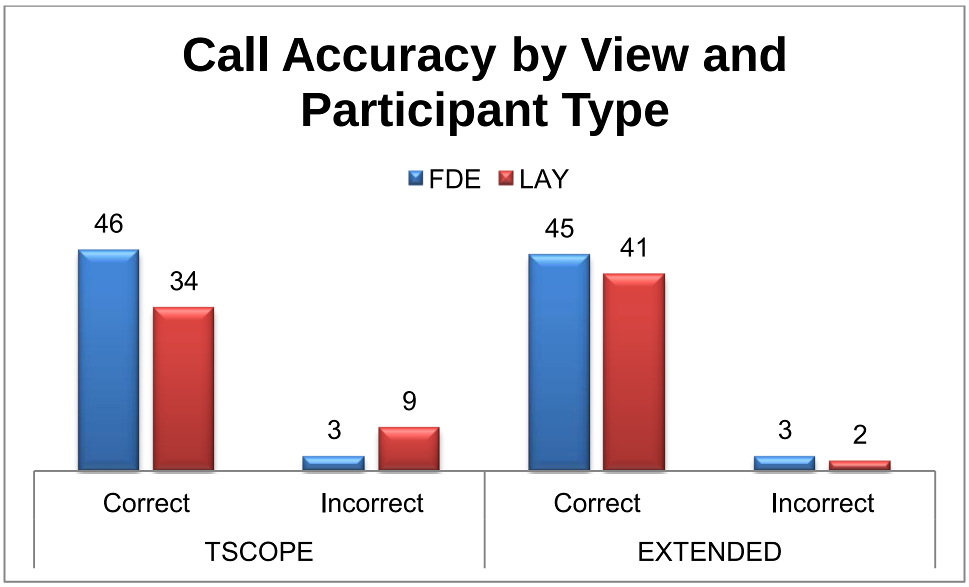
Table 3.4.Ferguson.2
Regression Coefficients

	B	***Wald***	***df***	***p***	***Odds***

View	.96	2.99	1	.084	2.62
Participant Type	-.82	2.33	1	.127	0.44

Wald statistics indicated that *view* (tachistoscope vs. extended) was a significant predictor of *call accuracy*, but *participant type* (FDE vs. Lay) was not a significant predictors of *call accuracy*. Figure 3.4.Ferguson.2 demonstrates the accuracy of FDE and Lay participants by tachistoscope and extended view.

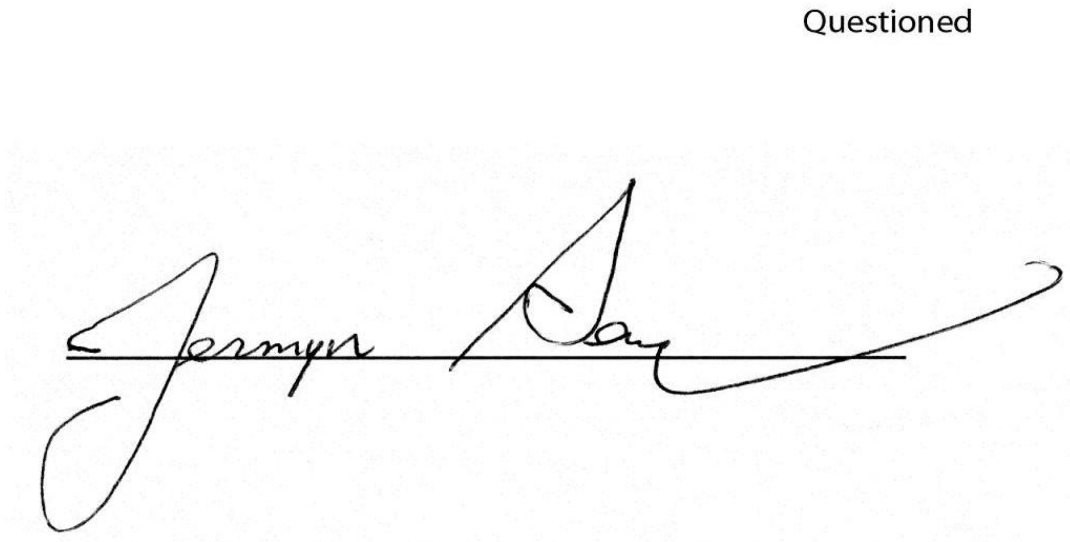
Figure 3.4.Ferguson.2.



Signature 5: Jermyn Barker (Simulated)

Figure 3.4.Barker.1 presents the signature of Jermyn Barker, which is characterized as a high complexity, mixed signature. This signature was presented in the right side up orientation, as pictured. Participants viewed the signature for 1s in the tachistoscope view, and were allowed to examine the signature for as long as they chose in the extended view.

Figure 3.4.Barker.1.



No statistically significant difference in call accuracy was found according to participant type, χ^2 (1) = 2.36, p = .124, *ns*. Table 3.4.Barker.1 presents the overall distribution of correct and incorrect responses.

Table 3.4.Barker.1
Overall Call Accuracy by Participant Type

	Correct	Incorrect	Total
FDE	66	32	98
Lay	36	50	86
Total	102	82	184

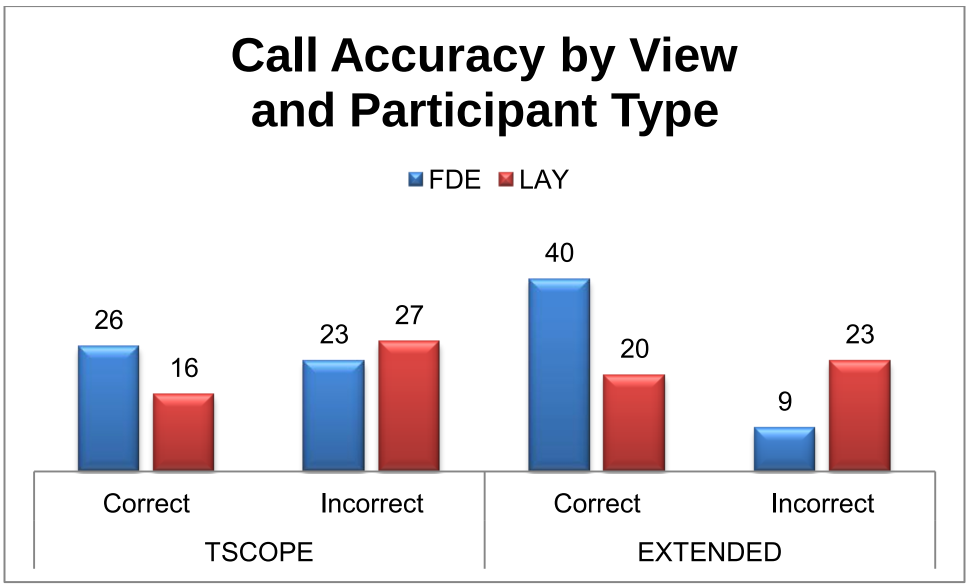
Binomial logistic regression was conducted using the enter method to determine which among two independent variables (*participant type* and *view*) predicted *call accuracy* (correct vs. incorrect). Regression results indicated that the overall model fit was poor (-2 Log Likelihood = 233.05), but was fairly statistically reliable in distinguishing call accuracy, χ^2 (2) = 19.85, p < .001. The model correctly classified 61.4 % of cases. Regression coefficients are presented in Table 3.4.Barker.2.

Table 3.4.Barker.2
Regression Coefficients

	B	*Wald*	*df*	*p*	*Odds*
View	.86	7.48	1	.006	2.37
Participant Type	-1.10	12.17	1	.000	0.33

Wald statistics indicated *participant type* (FDE vs. Lay) significantly predicted whether the call was correct or incorrect. *View* (tachistoscope vs. extended) was also a significant predictor of *call accuracy*, but the small odds ratio indicated little change in the likelihood of *call accuracy*. Figure 3.4.Barker.2 demonstrates the accuracy of FDE and Lay participants by tachistoscope and extended view.

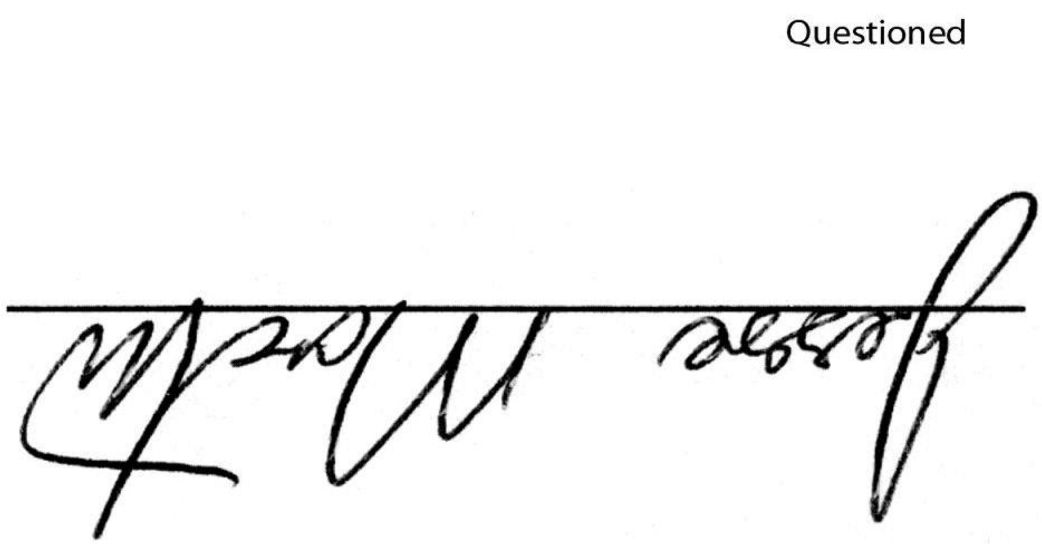
Figure 3.4.Barker.2.



Signature 6: Jessie Martin (Genuine)

Figure 3.4.Martin.1 presents the signature of Jessie Martin, which is characterized as a high complexity, text based signature. This signature was presented in the upside down orientation, as pictured. Participants viewed the signature for 1s in the tachistoscope view, and were allowed to examine the signature for as long as they chose in the extended view.

Figure 3.4.Martin.1.



No statistically significant difference in call accuracy was found according to participant type, χ^2 (1) = 3.15, p = .076, *ns*. Table 3.4.Martin.1 presents the overall distribution of correct and incorrect responses.

Table 3.4.Martin.1

Overall Call Accuracy by Participant Type

	Correct	Incorrect	Total
FDE	65	33	98
Lay	46	40	86
Total	111	73	184

Binomial logistic regression was conducted using the enter method to determine which among two independent variables (*participant type* and *view*) predicted *call accuracy* (correct vs. incorrect). Regression results indicated that the overall model fit was poor (-2 Log Likelihood = 240.09), but was fairly statistically reliable in distinguishing call accuracy, χ^2 (2) = 7.08, p = .029. The model correctly classified 63.0 % of cases. Regression coefficients are presented in Table 3.4.Martin.2.

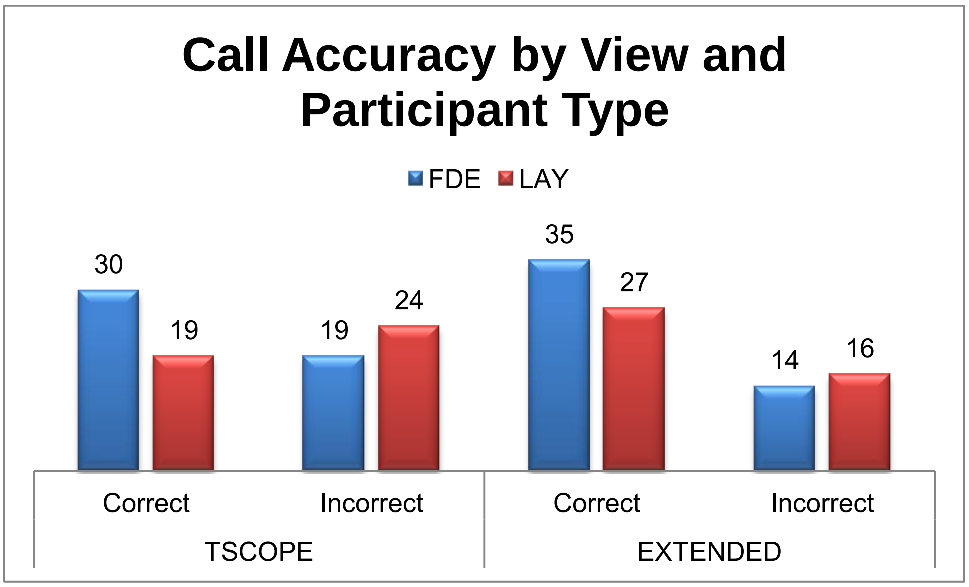
Table 3.4.Martin.2

Regression Coefficients

	B	*Wald*	*df*	*p*	*Odds*
View	.61	3.87	1	.049	1.83
Participant Type	-.55	3.20	1	.074	0.58

Wald statistics indicated *participant type* (FDE vs. Lay) significantly predicted whether the call was correct or incorrect, but the small odds ratio indicated little change in the likelihood of *call accuracy*. *View* (tachistoscope vs. extended) was also a significant predictor of *call accuracy*. Figure 3.4.Martin.2 demonstrates the accuracy of FDE and Lay participants by tachistoscope and extended view.

Figure 3.4.Martin.2.

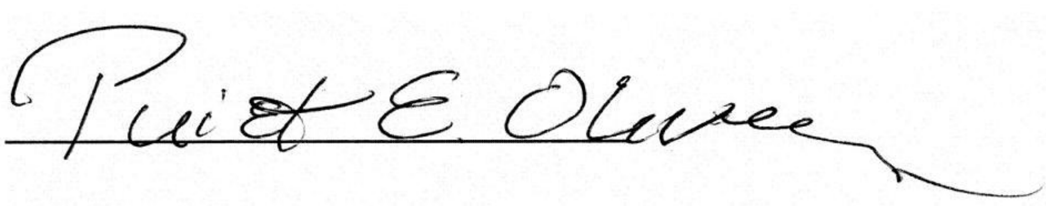


Signature 7: Juliet Oliver (Simulated)

Figure 3.4.Oliver.1 presents the signature of Juliet Oliver, which is characterized as a high complexity, text based signature. This signature was presented in the upside down orientation, as pictured. Participants viewed the signature for 1s in the tachistoscope view, and were allowed to examine the signature for as long as they chose in the extended view.

Figure 3.4.Oliver.1

Questioned



No statistically significant difference in call accuracy was found according to participant type, χ^2 (1) = 2.39, p = .122, *ns*. Table 3.4.Oliver.1 presents the overall distribution of correct and incorrect responses.

Table 3.4.Oliver.1
Overall Call Accuracy by Participant Type

	Correct	Incorrect	Total
FDE	54	44	98
Lay	57	29	86
Total	111	73	184

Binomial logistic regression was conducted using the enter method to determine which among two independent variables (*participant type* and *view*) predicted *call accuracy* (correct vs. incorrect). Regression results indicated that the overall model fit was poor (-2 Log Likelihood = 240.09), but was fairly statistically reliable in distinguishing call accuracy, χ^2 (2) = 14.74, p = .001. The model correctly classified 64.1% of cases. Regression coefficients are presented in Table 3.4.Oliver.2.

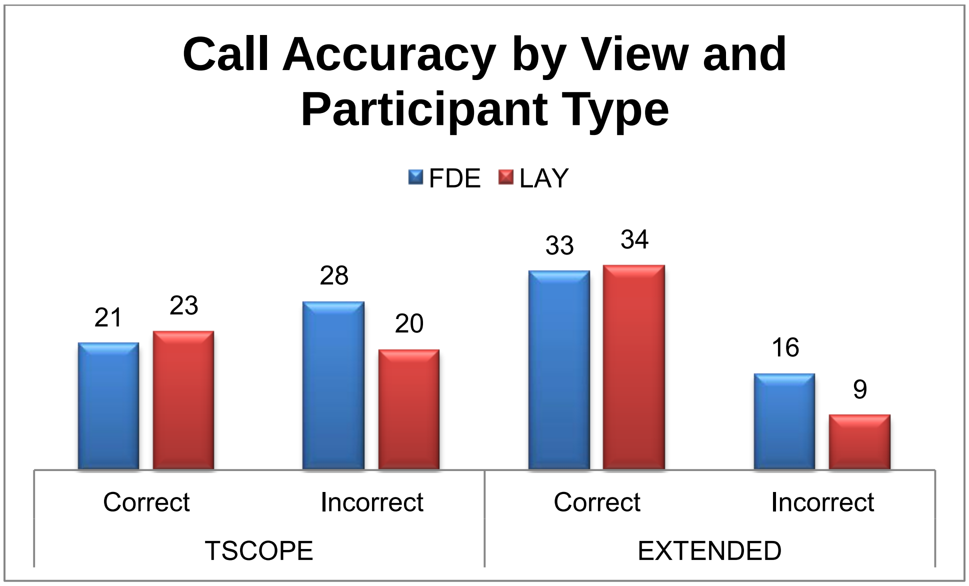
Table 3.4.Oliver.2
Regression Coefficients

	B	*Wald*	*df*	*p*	*Odds*
View	1.09	11.82	1	.001	2.97

Participant Type	0.50	2.54	1	.111	1.66

Wald statistics indicated *participant type* (FDE vs. Lay) was not a significant predictor of whether the call was correct or incorrect. *View* (tachistoscope vs. extended) was a significant predictor of *call accuracy*. Figure 3.4.Oliver.2 demonstrates the accuracy of FDE and Lay participants by tachistoscope and extended view.

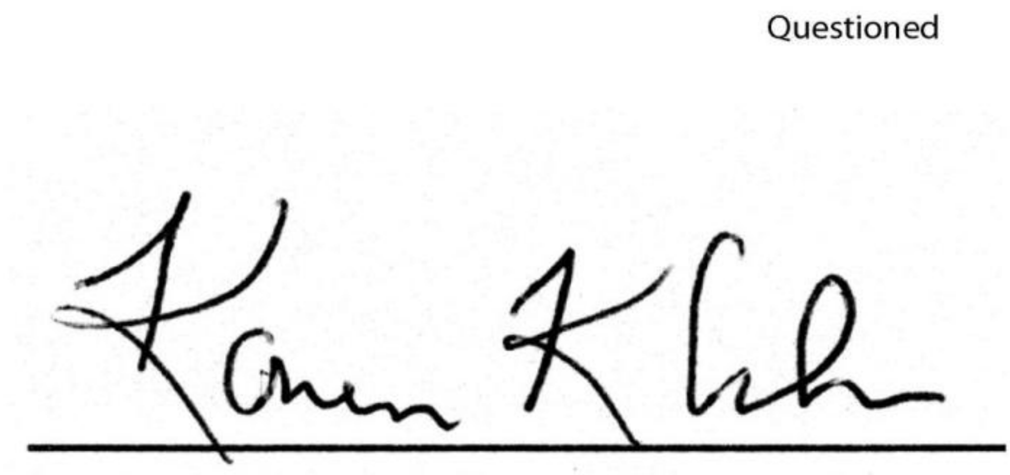
Figure 3.4.Oliver.2.



Signature 8: Karen Crissler (Genuine)

Figure 3.4.Crissler.1 presents the signature of Karen Crissler, which is characterized as a high complexity, text based signature. This signature was presented in the upside down orientation, as pictured. Participants viewed the signature for 1s in the tachistoscope view, and were allowed to examine the signature for as long as they chose in the extended view.

Figure 3.4.Crissler.1.



A statistically significant difference in call accuracy was found according to participant type, χ^2 (1) = 3.17, $p < .001$. Table 3.4.Crissler.1 presents the overall distribution of correct and incorrect responses.

Table 3.4.Crissler.1
Overall Call Accuracy by Participant Type

	Correct	Incorrect	Total
FDE	79	19	98
Lay	48	38	86
Total	127	57	184

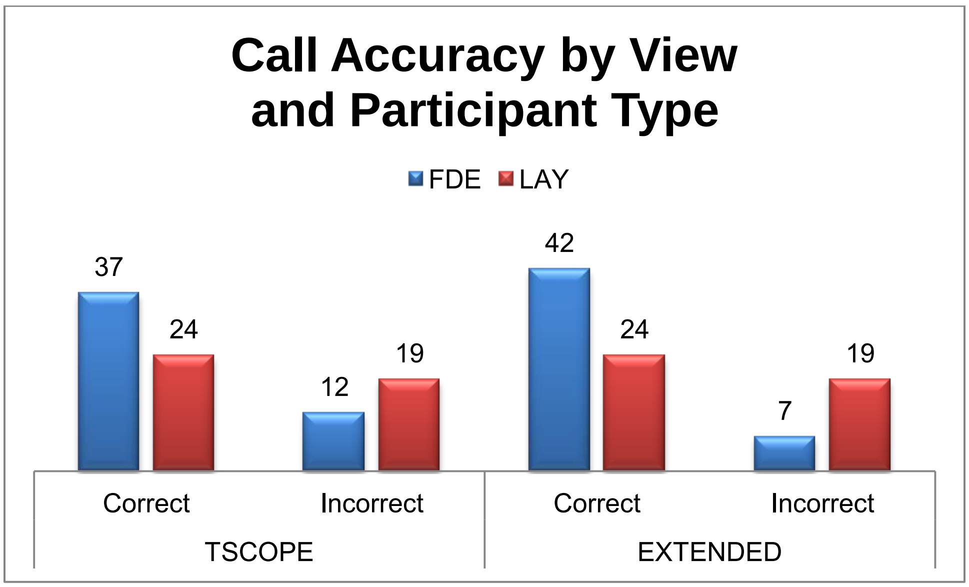
Binomial logistic regression was conducted using the enter method to determine which among two independent variables (*participant type* and *view*) predicted *call accuracy* (correct vs. incorrect). Regression results indicated that the overall model fit was poor (-2 Log Likelihood = 213.76), but was moderately statistically reliable in distinguishing call accuracy, χ^2 (2) = 14.00, $p = .001$. The model correctly classified 69.0% of cases. Regression coefficients are presented in Table 3.4.Crissler.2.

Table 3.4.Crissler.2
Regression Coefficients

	B	*Wald*	*df*	*p*	*Odds*
View	.27	.68	1	.409	1.32
Participant Type	-1.20	12.66	1	.000	0.30

Wald statistics indicated *participant type* (FDE vs. Lay) was a significant predictor of whether the call was correct or incorrect, but the small odds ratio indicated little change in the likelihood of *call accuracy*. *View* (tachistoscope vs. extended) was not a significant predictor of *call accuracy*. Figure 3.4.Crissler.2 demonstrates the accuracy of FDE and Lay participants by tachistoscope and extended view.

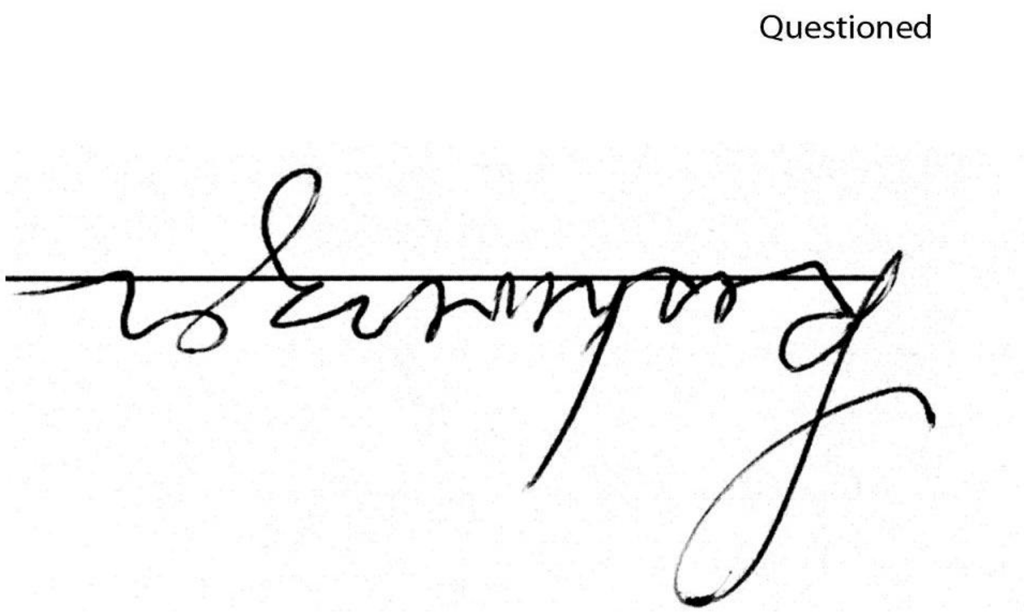
Figure 3.4.Crissler.2.



Signature 9: Kathy Schwarzer (Simulated)

Figure 3.4.Schwarzer.1 presents the signature of Kathy Schwarzer, which is characterized as a high complexity, mixed signature. This signature was presented in the upside down orientation, as pictured. Participants viewed the signature for 1s in the tachistoscope view, and were allowed to examine the signature for as long as they chose in the extended view.

Figure 3.4.Schwarzer.1.



No statistically significant difference in call accuracy was found according to participant type, χ^2 (1) = 14.81, $p < .001$. Table 3.4.Schwarzer.1 presents the overall distribution of correct and incorrect responses.

Table 3.4.Schwarzer.1
Overall Call Accuracy by Participant Type

	Correct	Incorrect	Total
FDE	53	44	97
Lay	70	16	86
Total	123	60	183

Binomial logistic regression was conducted using the enter method to determine which among two independent variables (*participant type* and *view*) predicted *call accuracy* (correct vs. incorrect). Regression results indicated that the overall model fit was poor (-2 Log Likelihood = 214.73), but was moderately statistically reliable in distinguishing call accuracy, χ^2 (2) = 16.82, $p < .001$. The model correctly classified 66.7% of cases. Regression coefficients are presented in Table 3.4.Schwarzer.2.

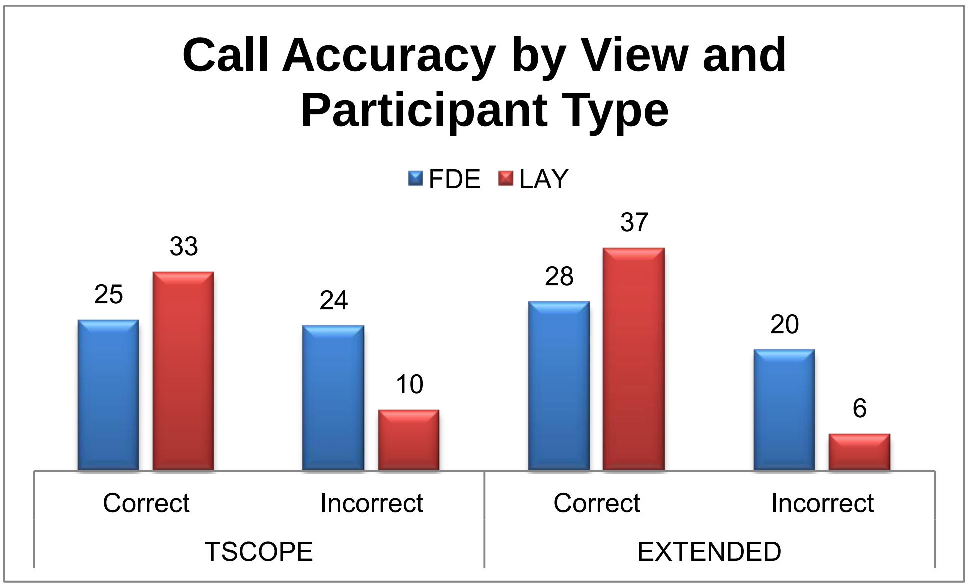
Table 3.4.Schwarzer.2

Regression Coefficients

	B	*Wald*	*df*	*p*	*Odds*
View	.41	1.53	1	.216	1.51
Participant Type	1.30	14.11	1	.000	3.67

Wald statistics indicated *participant type* (FDE vs. Lay) was a significant predictor of whether the call was correct or incorrect. *View* (tachistoscope vs. extended) was not a significant predictor of *call accuracy*. Figure 3.4.Schwarzer.2 demonstrates the accuracy of FDE and Lay participants by tachistoscope and extended view.

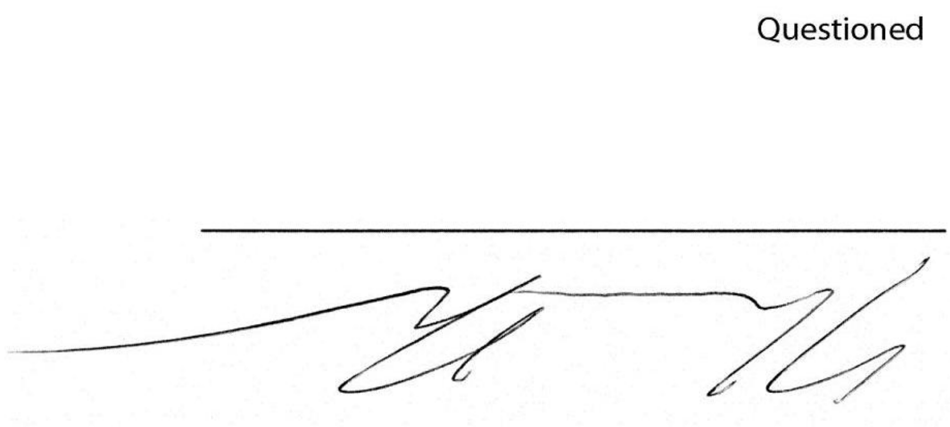
Figure 3.4.Schwarzer.2.



Signature 10: Kevin Backan (Genuine)

Figure 3.4. Backan.1 presents the signature of Kevin Backan, which is characterized as a low complexity, stylized signature. This signature was presented in the upside down orientation, as pictured. Participants viewed the signature for 1s in the tachistoscope view, and were allowed to examine the signature for as long as they chose in the extended view.

Figure 3.4. Backan.1.



No statistically significant difference in call accuracy was found according to participant type, χ^2 (1) = .006, p = .941, *ns*. Table 3.4. Backan.1 presents the overall distribution of correct and incorrect responses.

Table 3.4. Backan.1
Overall Call Accuracy by Participant Type

	Correct	Incorrect	Total
FDE	70	28	98
Lay	61	25	86
Total	131	53	184

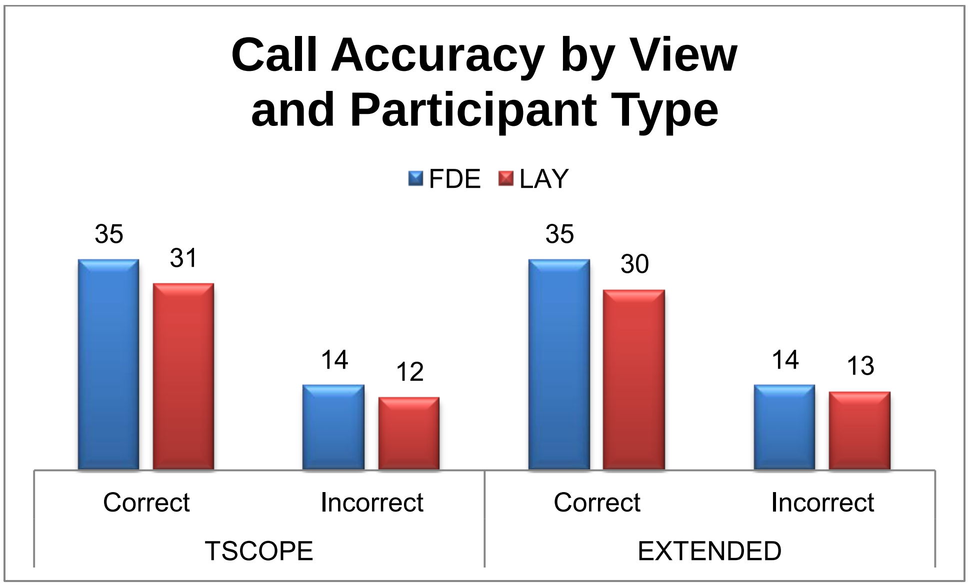
Binomial logistic regression was conducted using the enter method to determine which among two independent variables (*participant type* and *view*) predicted *call accuracy* (correct vs. incorrect). Regression results indicated that the overall model fit was poor (-2 Log Likelihood = 220.91), but the model correctly classified 71.2% of cases. Regression results indicated that the overall model was not statistically significant, χ^2 (2) = .032, p = .984, *ns*. Regression coefficients are presented in Table 3.4.Schwarzer.2.

Table 3.4. Backan.2
Regression Coefficients

	B	*Wald*	*df*	*p*	*Odds*
View	-.053	.026	1	.871	.948
Participant Type	-.024	.006	1	.941	.976

Wald statistics indicated that neither *participant type* (FDE vs. Lay) nor *view* (tachistoscope vs. extended) were significant predictors of *call accuracy*. Figure 3.4. Backan.2 demonstrates the accuracy of FDE and Lay participants by tachistoscope and extended view.

Figure 3.4. Backan.2.

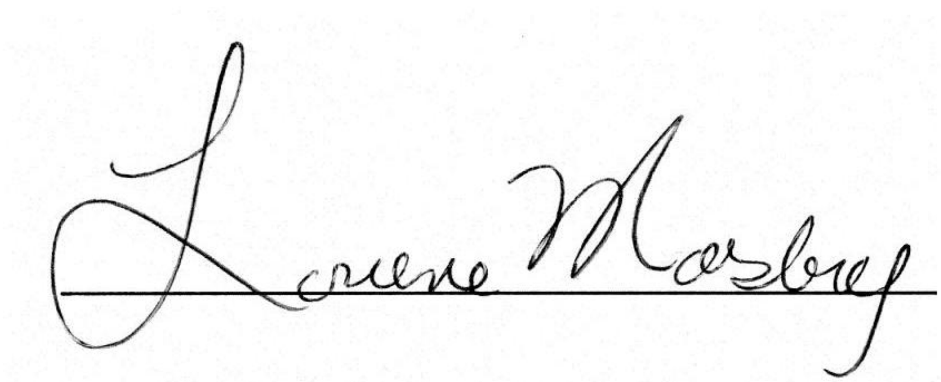


Signature 11: Lorene Mosby (Simulated)

Figure 3.4.Mosby.1 presents the signature of Lorene Mosby, which is characterized as a high complexity, text based signature. This signature was presented in the right side up orientation, as pictured. Participants viewed the signature for 1s in the tachistoscope view, and were allowed to examine the signature for as long as they chose in the extended view.

Figure 3.4.Mosby.1.

Questioned



A statistically significant difference in call accuracy was found according to participant type, χ^2 (1) = 10.46, p = .001. Table 3.4.Mosby.1 presents the overall distribution of correct and incorrect responses.

Table 3.4.Mosby.1
Overall Call Accuracy by Participant Type

	Correct	Incorrect	Total
FDE	2	96	98
Lay	13	73	86
Total	15	169	184

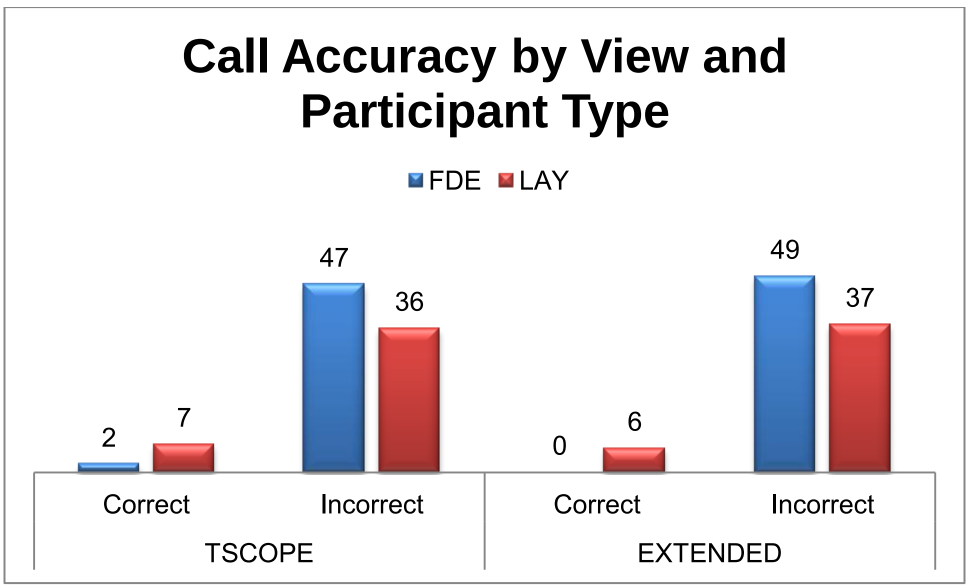
Binomial logistic regression was conducted using the enter method to determine which among two independent variables (*participant type* and *view)* predicted *call accuracy* (correct vs. incorrect). Regression results indicated that the overall model fit was poor (-2 Log Likelihood = 91.88), but was moderately statistically reliable in distinguishing call accuracy, χ^2 (2) = 2.07, p = .002. The model correctly classified 91.8% of cases. Regression coefficients are presented in Table 3.4.Mosby.2.

Table 3.4.Mosby.2
Regression Coefficients

	B	*Wald*	*df*	*p*	*Odds*
View	.47	.68	1	.408	1.60
Participant Type	-2.15	7.69	1	.006	0.12

Wald statistics indicated *participant type* (FDE vs. Lay) was a significant predictor of whether the call was correct or incorrect, but the small odds ratio indicated little change in the likelihood of *call accuracy*. *View* (tachistoscope vs. extended) was not a significant predictor of *call accuracy*. Figure 3.4.Mosby.2 demonstrates the accuracy of FDE and Lay participants by tachistoscope and extended view.

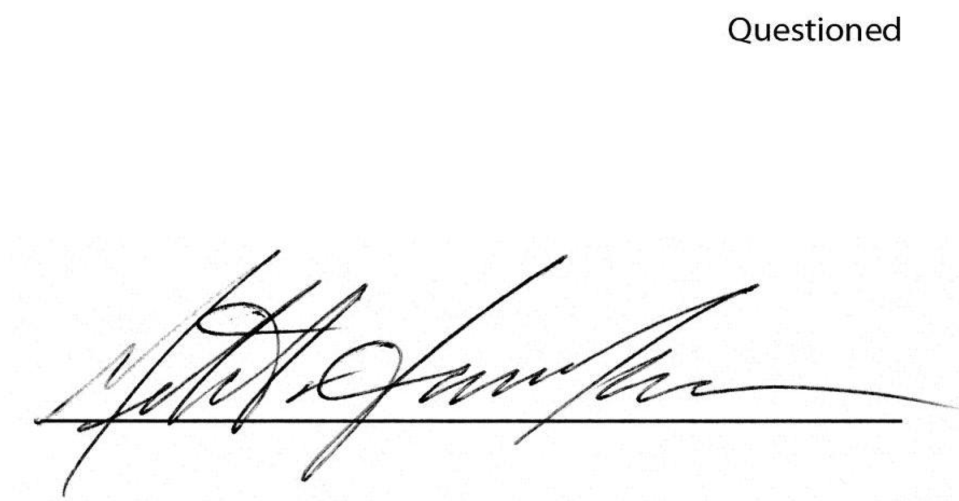
Figure 3.4.Mosby.2.



Signature 12: Mitch Hawkins (Genuine)

Figure 3.4.Hawkins.1 presents the signature of Mitch Hawkins, which is characterized as a high complexity, mixed signature. This signature was presented in the right side up orientation, as pictured. Participants viewed the signature for 1s in the tachistoscope view, and were allowed to examine the signature for as long as they chose in the extended view.

Figure 3.4.Hawkins.1.



A statistically significant difference in call accuracy was found according to participant type, χ^2 (1) = 15.94, p < .001. Table 3.4.Hawkins.1 presents the overall distribution of correct and incorrect responses.

Table 3.4.Hawkins.1
Overall Call Accuracy by Participant Type

	Correct	Incorrect	Total
FDE	98	0	98
Lay	73	13	86
Total	171	13	184

Binomial logistic regression was conducted using the enter method to determine which among two independent variables (*participant type* and *view*) predicted *call accuracy* (correct vs. incorrect). Regression results indicated that the overall model fit was poor (-2 Log Likelihood = 72.23), but was moderately statistically reliable in distinguishing call accuracy, χ^2 (2) = 21.73, p < .001. The model correctly classified 92.9% of cases. Regression coefficients are presented in Table 3.4.Hawkins.2.

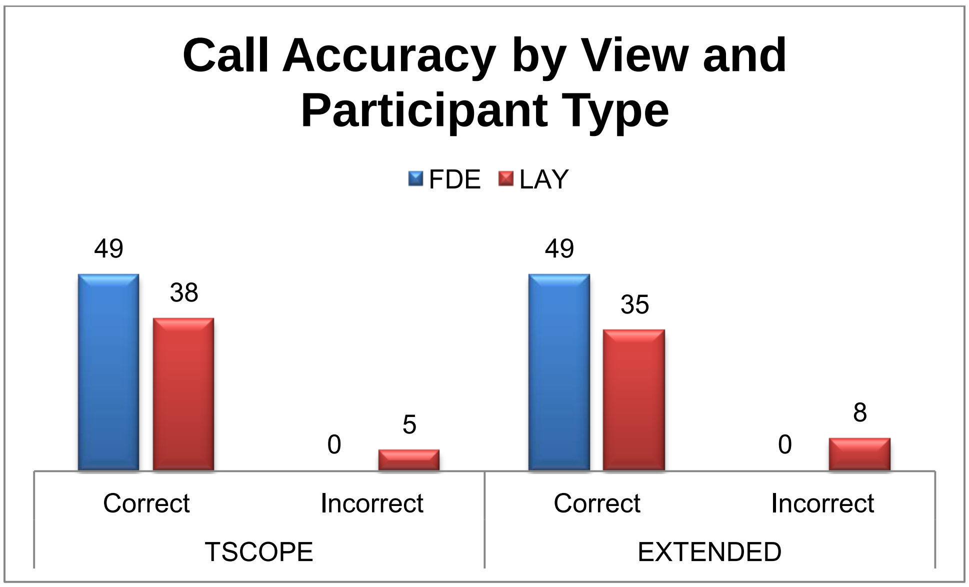
Table 3.4.Hawkins.2

Regression Coefficients

	B	*Wald*	*df*	*p*	*Odds*
View	-.55	.80	1	.370	.58
Participant Type	-19.48	.00	1	.996	.00

Wald statistics indicated that although the overall model was statistically significant, neither *participant type* (FDE vs. Lay) nor v*iew* (tachistoscope vs. extended) were significant predictors of *call accuracy*. Figure 3.4.Hawkins.2 demonstrates the accuracy of FDE and Lay participants by tachistoscope and extended view.

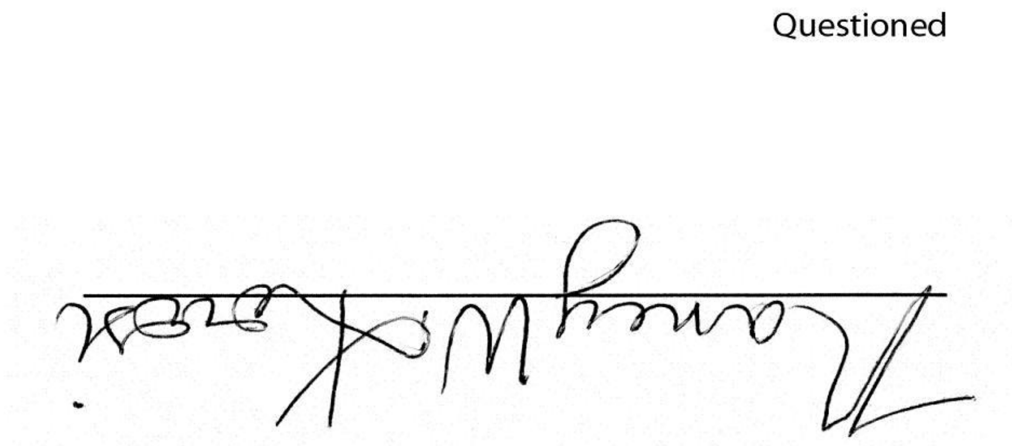
Figure 3.4.Hawkins.2.



Signature 13: Nancy Korosi (Simulated)

Figure 3.4.Korosi.1 presents the signature of Nancy Korosi, which is characterized as a high complexity, text based signature. This signature was presented in the upside down orientation, as pictured. Participants viewed the signature for 1s in the tachistoscope view, and were allowed to examine the signature for as long as they chose in the extended view.

Figure 3.4.Korosi.1.



A statistically significant difference in call accuracy was found according to participant type, χ^2 (1) = 3.89, p = .049, *ns.* Table 3.4.Korosi.1 presents the overall distribution of correct and incorrect responses.

Table 3.4.Korosi.1
Overall Call Accuracy by Participant Type

	Correct	Incorrect	Total
FDE	45	53	98
Lay	52	34	86
Total	97	87	184

Binomial logistic regression was conducted using the enter method to determine which among two independent variables (*participant type* and *view*) predicted *call accuracy* (correct vs. incorrect). Regression results indicated that the overall model fit was poor (-2 Log Likelihood = 250.61), and was marginally statistically reliable in distinguishing call accuracy, correctly classifying 57.1% of cases. Regression results indicated that the overall model was not statistically significant, χ^2 (2) = 3.93, p = .140, *ns*. Regression coefficients are presented in Table 3.4.Korosi.2.

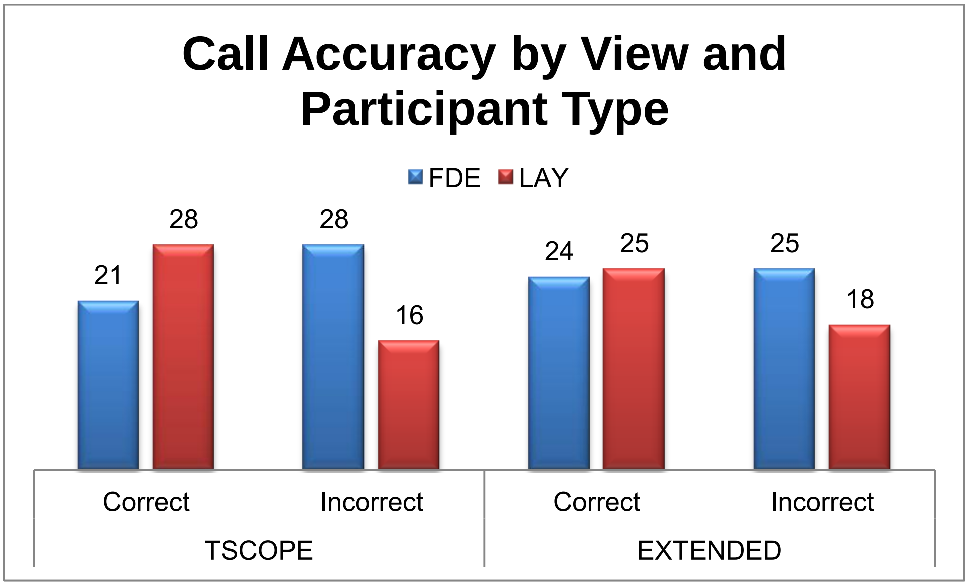
Table 3.4.Korosi.2
Regression Coefficients

	B	*Wald*	*df*	*p*	*Odds*

View	.04	.02	1	.881	1.05
Participant Type	.59	3.86	1	.049	1.80

Wald statistics indicated that neither *participant type* (FDE vs. Lay) nor *view* (tachistoscope vs. extended) were significant predictors of *call accuracy*. Figure 3.4.Korosi.2 demonstrates the accuracy of FDE and Lay participants by tachistoscope and extended view.

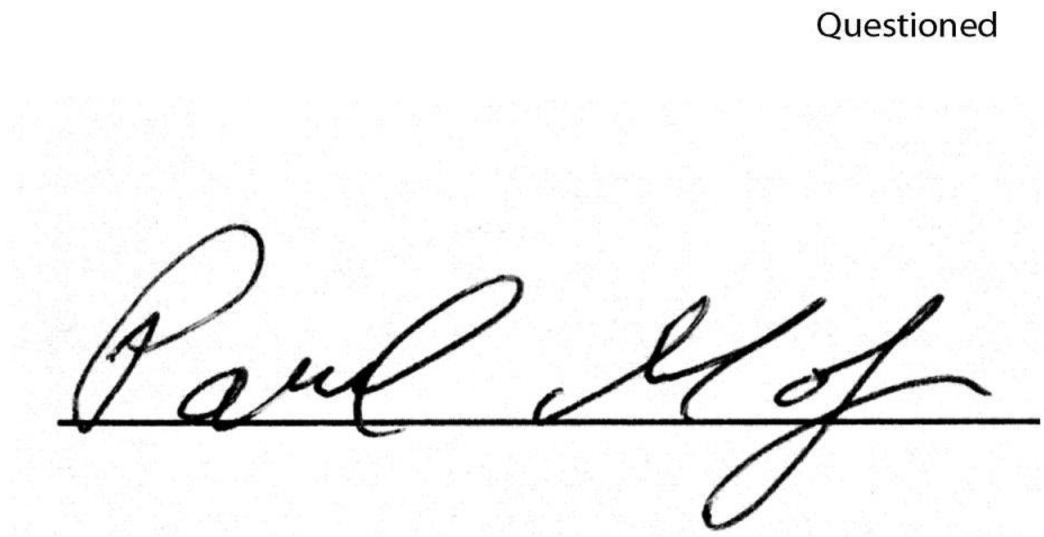
Figure 3.4.Korosi.2.



Signature 14: Paul Malizia (Simulated)

Figure 3.4.Malizia.1 presents the signature of Paul Malizia, which is characterized as a low complexity, mixed signature. This signature was presented in the right side up orientation, as pictured. Participants viewed the signature for 1s in the tachistoscope view, and were allowed to examine the signature for as long as they chose in the extended view.

Figure 3.4.Malizia.1.



No statistically significant difference in call accuracy was found according to participant type, χ^2 (1) = .002, p = .966, *ns*. Table 3.4.Malizia.1 presents the overall distribution of correct and incorrect responses.

Table 3.4.Malizia.1
Overall Call Accuracy by Participant Type

	Correct	Incorrect	Total
FDE	43	55	98
Lay	38	48	86
Total	81	103	184

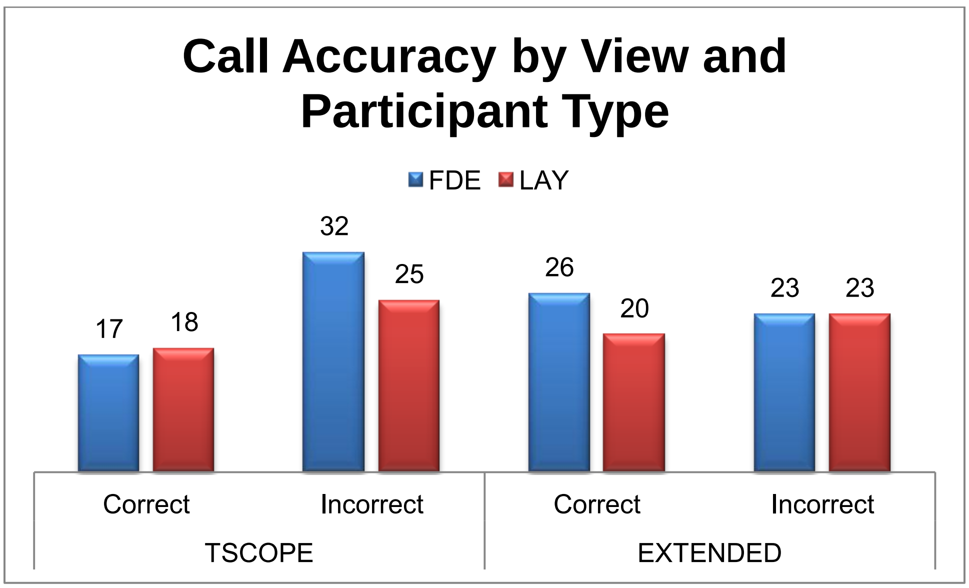
Binomial logistic regression was conducted using the enter method to determine which among two independent variables (*participant type* and *view*) predicted *call accuracy* (correct vs. incorrect). Regression results indicated that the overall model fit was poor (-2 Log Likelihood = 249.76), and was marginally statistically reliable in distinguishing call accuracy, correctly classifying 54.3% of cases. Regression results indicated that the overall model was not statistically significant, χ^2 (2) = 2.68, p = .262, *ns*.

Table 3.4.Malizia.2
Regression Coefficients

	B	*Wald*	*df*	*p*	*Odds*
View	.488	2.655	1	.103	1.629
Participant Type	.013	.002	1	.966	1.013

Wald statistics indicated that neither *participant type* (FDE vs. Lay) nor *view* (tachistoscope vs. extended) were significant predictors of *call accuracy*. Figure 3.4.Malizia.2 demonstrates the accuracy of FDE and Lay participants by tachistoscope and extended view.

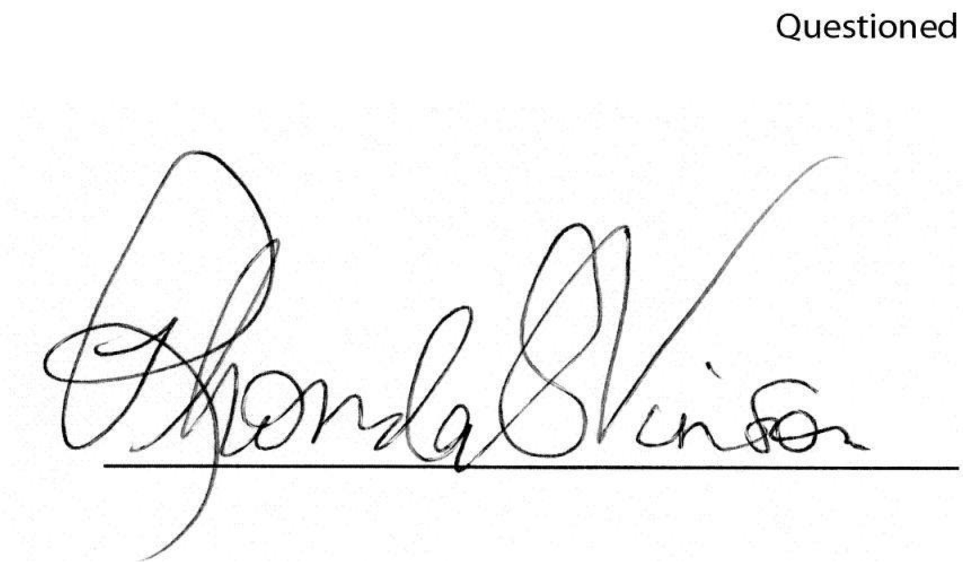
Figure 3.4.Malizia.2.



Signature 15: Rhonda Vinson (Genuine)

Figure 3.4.Vinson.1 presents the signature of Rhonda Vinson, which is characterized as a high complexity, text based signature. This signature was presented in the upside down orientation, as pictured. Participants viewed the signature for 1s in the tachistoscope view, and were allowed to examine the signature for as long as they chose in the extended view.

Figure 3.4.Vinson.1.



A statistically significant difference in call accuracy was found according to participant type, χ^2 (1) = 11.08, p < .001. Table 3.4.Vinson.1 presents the overall distribution of correct and incorrect responses.

Table 3.4.Vinson.1
Overall Call Accuracy by Participant Type

	Correct	Incorrect	Total
FDE	92	6	98
Lay	66	20	86
Total	158	26	184

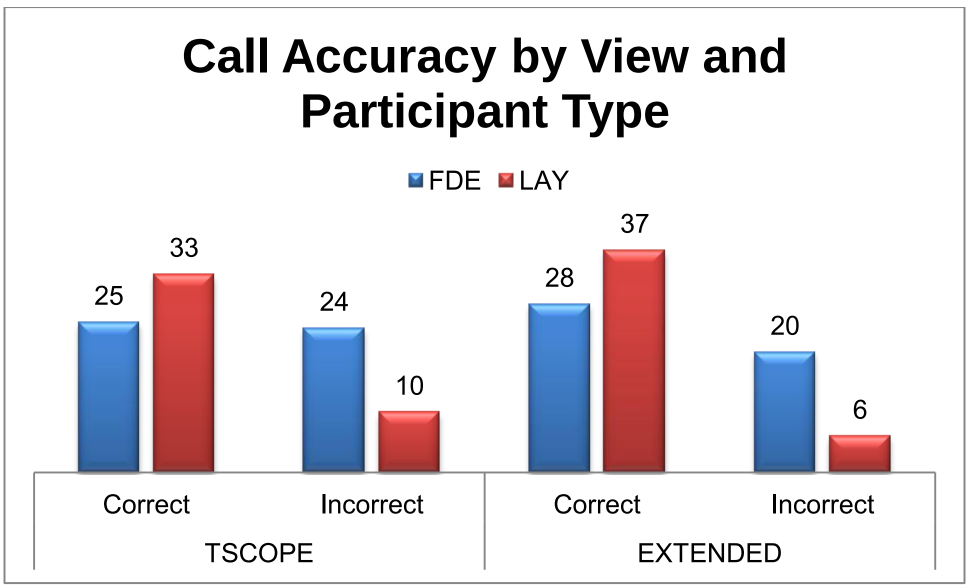
Binomial logistic regression was conducted using the enter method to determine which among two independent variables (*participant type* and *view)* predicted *call accuracy* (correct vs. incorrect). Regression results indicated that the overall model fit was poor (-2 Log Likelihood = 136.70), but was highly statistically reliable in distinguishing call accuracy, χ^2 (2) = 13.20, p = .001. The model correctly classified 85.9% of cases. Regression coefficients are presented in Table 3.4.Vinson.2.

Table 3.4.Vinson.2
Regression Coefficients

	B	*Wald*	*df*	*p*	*Odds*
View	.58	1.69	1	.194	1.79
Participant Type	-1.55	9.81	1	.002	0.21

Wald statistics indicated *participant type* (FDE vs. Lay) was a significant predictor of whether the call was correct or incorrect, but the small odds ratio indicated little change in the likelihood of *call accuracy*. *View* (tachistoscope vs. extended) was not a significant predictor of *call accuracy*. Figure 3.4.Vinson.2 demonstrates the accuracy of FDE and Lay participants by tachistoscope and extended view.

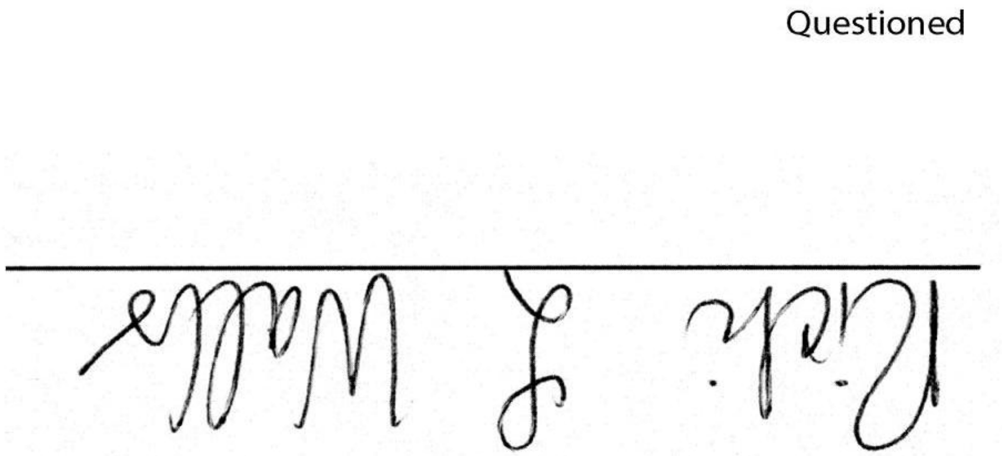
Figure 3.4.Vinson.2.



Signature 16: Ricki Walls (Genuine)

Figure 3.4.Walls.1 presents the signature of Ricki Walls, which is characterized as a high complexity, text based signature. This signature was presented in the upside down orientation, as pictured. Participants viewed the signature for 1s in the tachistoscope view, and were allowed to examine the signature for as long as they chose in the extended view.

Figure 3.4.Walls.1.



A statistically significant difference in call accuracy was found according to participant type, χ^2 (1) = 14.07, $p < .001$. Table 3.4.Walls.1 presents the overall distribution of correct and incorrect responses.

Table 3.4.Walls.1
Overall Call Accuracy by Participant Type

	Correct	Incorrect	Total
FDE	95	2	97
Lay	70	16	86
Total	165	18	183

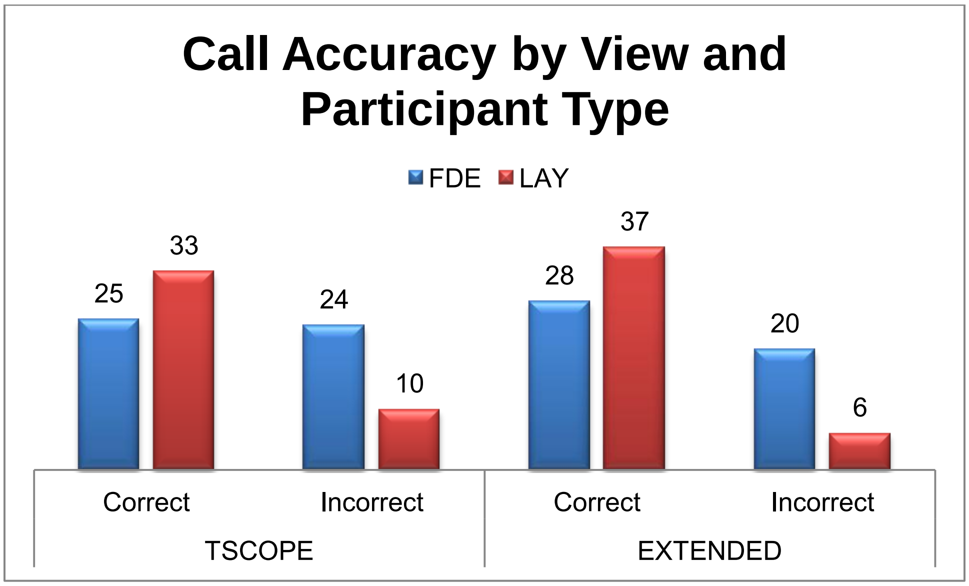
Binomial logistic regression was conducted using the enter method to determine which among two independent variables (*participant type* and *view*) predicted *call accuracy* (correct vs. incorrect). Regression results indicated that the overall model fit was poor (-2 Log Likelihood = 101.03), but was highly statistically reliable in distinguishing call accuracy, χ^2 (2) = 16.62, $p < .001$. The model correctly classified 90.2% of cases. Regression coefficients are presented in Table 3.4.Walls.2.

Table 3.4.Walls.2
Regression Coefficients

	B	*Wald*	*df*	*p*	*Odds*
View	.544	1.063	1	.303	1.724
Participant Type	-2.394	9.726	1	.002	.091

Wald statistics indicated *participant type* (FDE vs. Lay) was a significant predictor of whether the call was correct or incorrect, but the small odds ratio indicated little change in the likelihood of *call accuracy*. *View* (tachistoscope vs. extended) was not a significant predictor of *call accuracy*. Figure 3.4.Walls.2 demonstrates the accuracy of FDE and Lay participants by tachistoscope and extended view.

Figure 3.4.Walls.2.

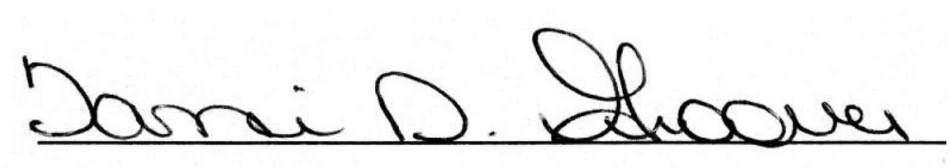


Signature 17: Tami Groover (Genuine)

Figure 3.4.Groover.1 presents the signature of Tami Groover, which is characterized as a high complexity, text based signature. This signature was presented in the right side up orientation, as pictured. Participants viewed the signature for 1s in the tachistoscope view, and were allowed to examine the signature for as long as they chose in the extended view.

Figure 3.4.Groover.1.

Questioned



A statistically significant difference in call accuracy was found according to participant type, χ^2 (1) = 7.07, *p* = .008. Table 3.4.Groover.1 presents the overall distribution of correct and incorrect responses.

Table 3.4.Groover.1
Overall Call Accuracy by Participant Type

	Correct	Incorrect	Total
FDE	98	0	98
Lay	80	6	86
Total	178	6	184

Binomial logistic regression was conducted using the enter method to determine which among two independent variables (*participant type* and *view*) predicted *call accuracy* (correct vs. incorrect). Regression results indicated that the overall model fit was fair (-2 Log Likelihood = 40.41), but was highly statistically reliable in distinguishing call accuracy, χ^2 (2) = 12.47, *p* = .002. The model correctly classified 96.7% of cases. Regression coefficients are presented in Table 3.4.Groover.2.

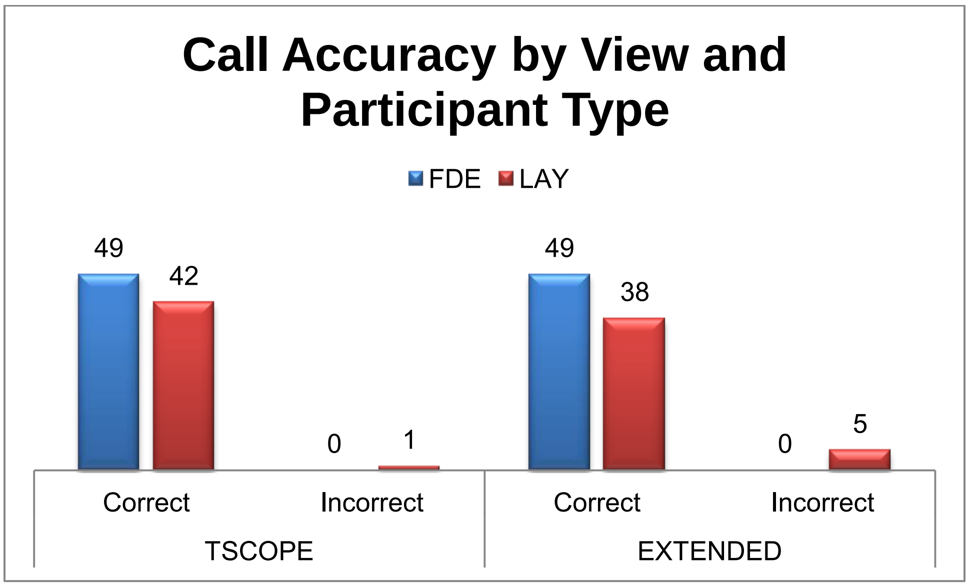
Table 3.4.Groover.2
Regression Coefficients

	B	*Wald*	*df*	*p*	*Odds*

View	-1.71	2.34	1	.126	.18
Participant Type	-18.58	0.00	1	.996	.00

Wald statistics indicated that although the overall model was statistically significant, *participant type* (FDE vs. Lay) was not a significant predictor of whether the call was correct or incorrect. *View* (tachistoscope vs. extended) was not a significant predictor of *call accuracy*. Figure 3.4.Groover.2 demonstrates the accuracy of FDE and Lay participants by tachistoscope and extended view.

Figure 3.4.Groover.2.



Signature 18: Tiffany Wright (Simulated)

Figure 3.4.Wright.1 presents the signature of Tiffany Wright, which is characterized as a high complexity, mixed signature. This signature was presented in the right side up orientation, as pictured. Participants viewed the signature for 1s in the tachistoscope view, and were allowed to examine the signature for as long as they chose in the extended view.

Figure 3.4.Wright.1.

A statistically significant difference in call accuracy was found according to participant type, χ^2 (1) = 5.58, p = .018. Table 3.4.Wright.1 presents the overall distribution of correct and incorrect responses.

Table 3.4.Wright.1
Overall Call Accuracy by Participant Type

	Correct	Incorrect	Total
FDE	97	1	98
Lay	79	7	86
Total	176	8	184

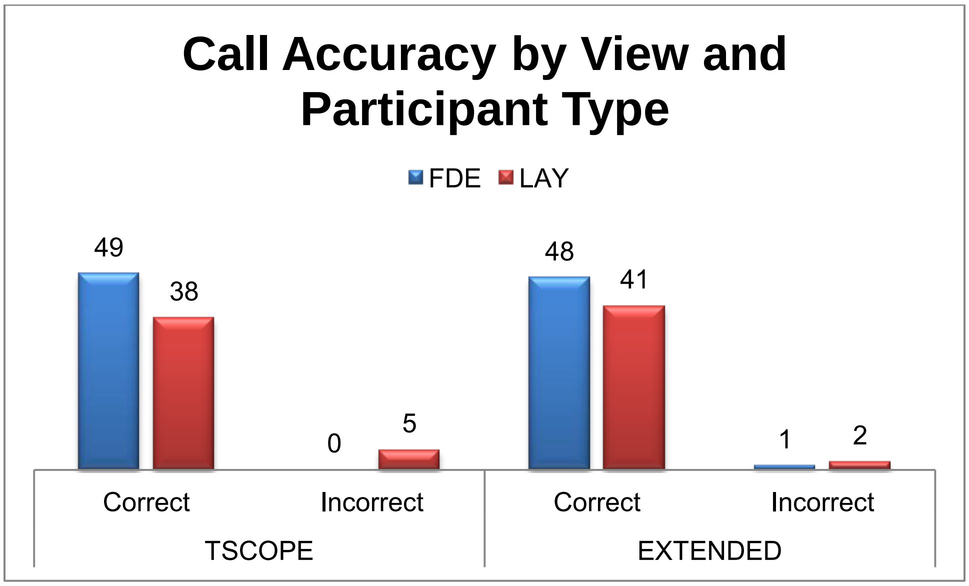
Binomial logistic regression was conducted using the enter method to determine which among two independent variables (*participant type* and *view*) predicted *call accuracy* (correct vs. incorrect). Regression results indicated that the overall model fit was fair (-2 Log Likelihood = 59.12), but was highly statistically reliable in distinguishing call accuracy, χ^2 (2) = 6.67, p = .036. The model correctly classified 95.7% of cases. Regression coefficients are presented in Table 3.4.Wright.2.

Table 3.4.Wright.2
Regression Coefficients

	B	*Wald*	*df*	*p*	*Odds*
View	.55	.53	1	.467	1.73
Participant Type	-2.16	3.98	1	.046	0.12

Wald statistics indicated *participant type* (FDE vs. Lay) was a significant predictor of whether the call was correct or incorrect, although the small odds ratio indicates little change in the likelihood of *call accuracy*. *View* (tachistoscope vs. extended) was not a significant predictor of *call accuracy*. Figure 3.4.Wright.2 demonstrates the accuracy of FDE and Lay participants by tachistoscope and extended view.

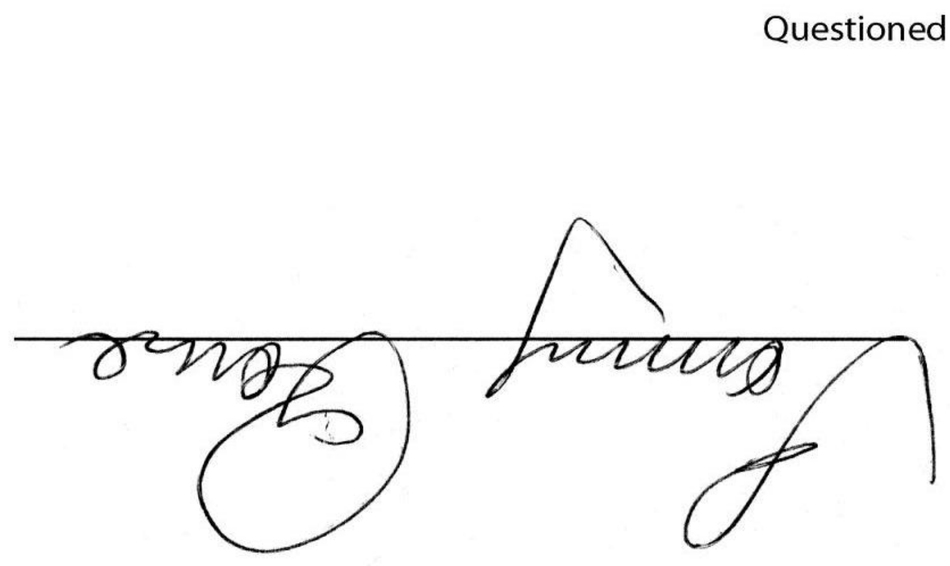
Figure 3.4.Wright.2.



Signature 19: Tommy Rouse (Genuine)

Figure 3.4.Rouse.1 presents the signature of Tommy Rouse, which is characterized as a high complexity, text based signature. This signature was presented in the upside down orientation, as pictured. Participants viewed the signature for 1s in the tachistoscope view, and were allowed to examine the signature for as long as they chose in the extended view.

Figure 3.4.Rouse.1.



A statistically significant difference in call accuracy was found according to participant type, χ^2 (1) = 23.61, $p < .001$. Table 3.4.Rouse.1 presents the overall distribution of correct and incorrect responses.

Table 3.4.Rouse.1
Overall Call Accuracy by Participant Type

	Correct	Incorrect	Total
FDE	86	12	98
Lay	48	38	86
Total	134	50	184

Binomial logistic regression was conducted using the enter method to determine which among two independent variables (*participant type* and *view*) predicted *call accuracy* (correct vs. incorrect). Regression results indicated that the overall model fit was poor (-2 Log Likelihood = 86.34), but was moderately statistically reliable in distinguishing call accuracy, χ^2 (2) = 28.93, $p < .001$. The model correctly classified 73.4% of cases. Regression coefficients are presented in Table 3.4.Rouse.2.

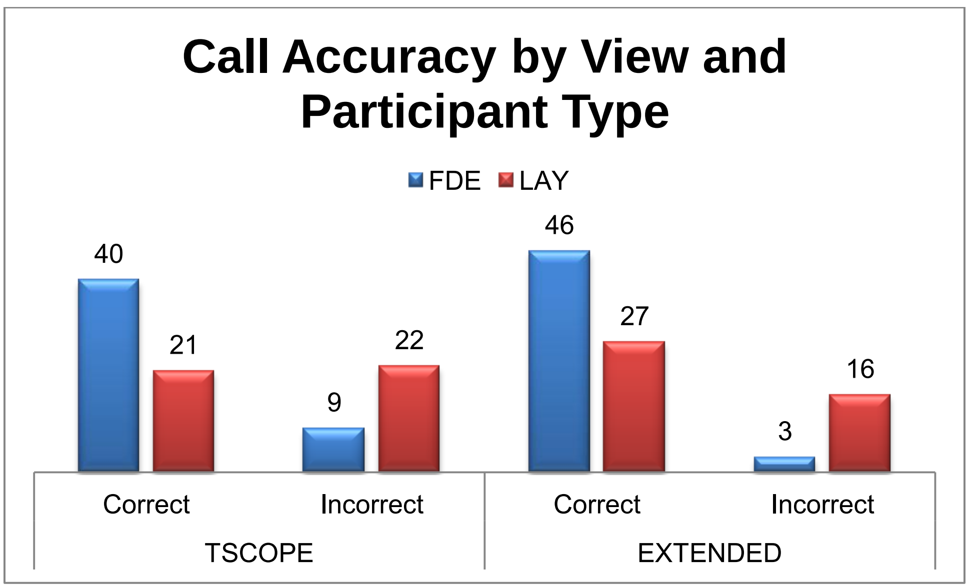
Table 3.4.Rouse.2

Regression Coefficients

	B	*Wald*	*df*	*p*	*Odds*
View	.77	4.45	1	.035	2.16
Participant Type	-1.78	21.59	1	.000	0.17

Wald statistics indicated *participant type* (FDE vs. Lay) was a significant predictor of whether the call was correct or incorrect, although the small odds ratio indicates little change in the likelihood of *call accuracy*. *View* (tachistoscope vs. extended) was also a significant predictor of *call accuracy*. Figure 3.4.Rouse.2 demonstrates the accuracy of FDE and Lay participants by tachistoscope and extended view.

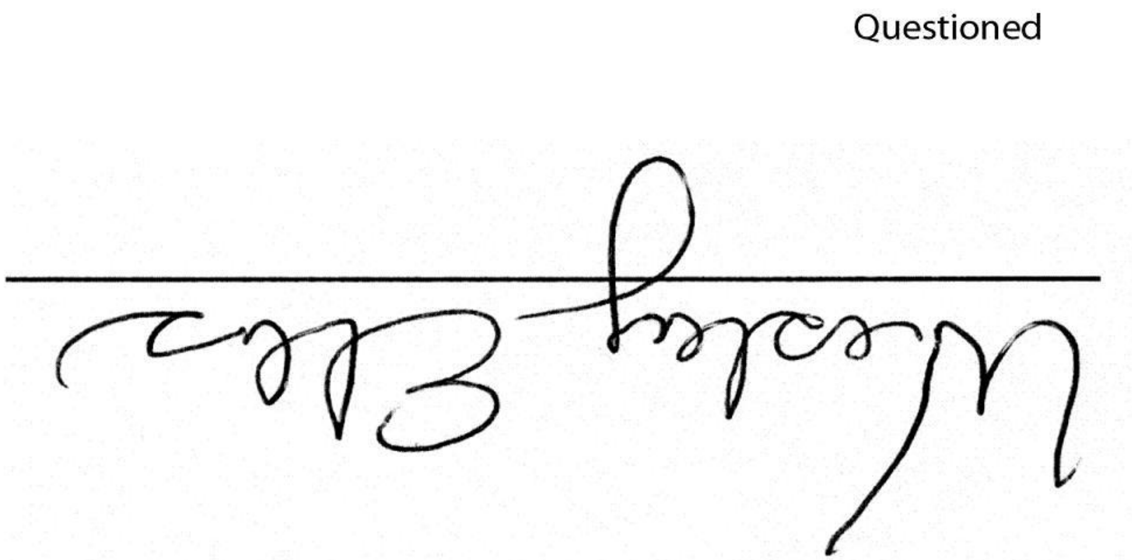
Figure 3.4.Rouse.2.



Signature 20: Wesley Ellis (Simulated)

Figure 3.4.Ellis.1 presents the signature of Wesley Ellis, which is characterized as a low complexity, text based signature. This signature was presented in the upside down orientation, as pictured. Participants viewed the signature for 1s in the tachistoscope view, and were allowed to examine the signature for as long as they chose in the extended view.

Figure 3.4.Ellis.1.



A statistically significant difference in call accuracy was found according to participant type, χ^2 (1) = 14.65, $p < .001$. Table 3.4.Ellis.1 presents the overall distribution of correct and incorrect responses.

Table 3.4.Ellis.1
Overall Call Accuracy by Participant Type

	Correct	Incorrect	Total
FDE	56	42	98
Lay	25	61	86
Total	81	103	184

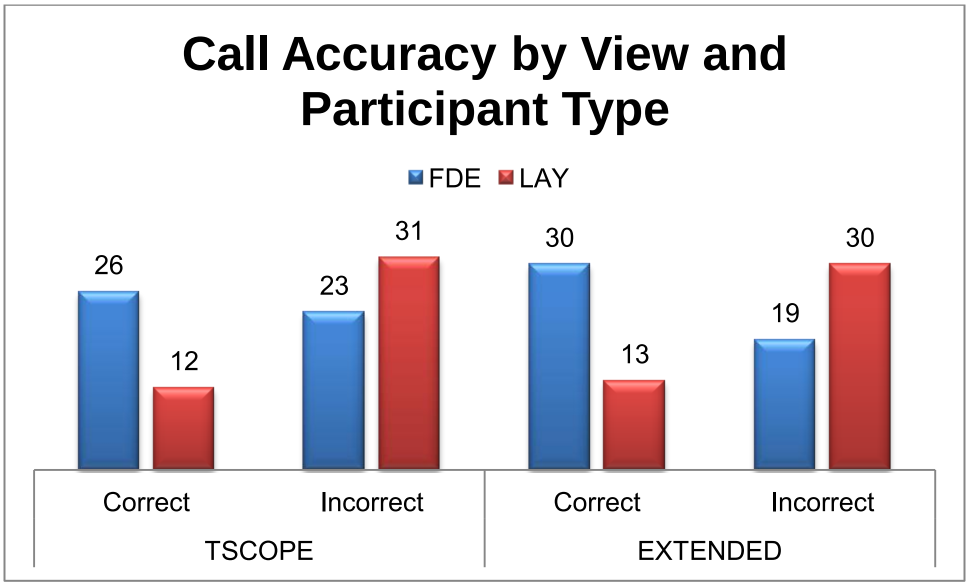
Binomial logistic regression was conducted using the enter method to determine which among two independent variables (*participant type* and *view*) predicted *call accuracy* (correct vs. incorrect). Regression results indicated that the overall model fit was poor (-2 Log Likelihood = 236.93), but was fairly statistically reliable in distinguishing call accuracy, χ^2 (2) = 15.51, $p < .001$. The model correctly classified 63.6% of cases. Regression coefficients are presented in Table 3.4.Ellis.2.

Table 3.4.Ellis.2
Regression Coefficients

	B	*Wald*	*df*	*p*	*Odds*
View	.24	.60	1	.439	1.27
Participant Type	-1.18	14.23	1	.000	0.31

Wald statistics indicated *participant type* (FDE vs. Lay) was a significant predictor of whether the call was correct or incorrect, although the small odds ratio indicates little change in the likelihood of *call accuracy*. *View* (tachistoscope vs. extended) was not a significant predictor of *call accuracy*. Figure 3.4.Ellis.2 demonstrates the accuracy of FDE and Lay participants by tachistoscope and extended view.

Figure 3.4.Ellis.2.



Conclusions

As anticipated, FDEs were more accurate overall than were Lay participants in both the tachistoscope view and the extended view of the signatures, although this varied among individual signatures. As with the signatures in the single signature protocol, the amount of information available to the participants was limited due to the absence of known signature specimens. Even without the range of variation information usually available to FDEs in signature identification tasks, FDEs were able to make correct calls in 1,399 of the 1,957 calls (71.5% accuracy), compared to Lay participants, who made correct calls in 1,109 of 1,720 calls (64.5% accuracy). This finding is consistent with previous research demonstrating that FDEs outperform Lay participants on a variety of tasks (Kam, Wetstein, & Conn, 1994; Kam, Fielding, & Conn, 1997; Kam, Gummadidala, Fielding, and Conn, 2001; Sita, Found, & Rogers, 2002; Found & Rogers, 2005; Kam & Lin, 2003; Dyer, Found, & Rogers, 2006).

FDEs tended overall to call signatures genuine more frequently than did Lay participants, and this tendency accounted for a substantial number of the incorrect calls made by FDEs. FDEs were less likely than Lay participants to incorrectly call a genuine signature a simulation. The finding that FDEs made more erroneous calls for genuine signatures is inconsistent with previous research by Kam, Wetstein, and Conn (1997), who found that FDEs were significantly less likely than Lay participants to mistakenly match documents written by different people, although we must note that far more evidence was available to the participants in the Kam et al. study. Our findings are also inconsistent with research by Kam, Gummadidala, Fielding, and Conn (2001), who reported that FDEs designated non-genuine signatures as genuine in 0.49% of cases, and genuine signatures as non-genuine in 7.1% of cases.

Given the limited information available overall, and the limited amount of time given to view the signatures in the tachistoscope view, these findings suggest that features such as line quality, speed and fluidity of execution, and other indicators of writing skill are valid and important indicators of signature authorship that are reliably used by FDEs to reach signature process decisions. They are consistent with the findings of Dyer et al. (2006), whose research suggested that FDEs and Lay participants may use different cognitive processes when evaluating signatures, which is consistent with current theories of expertise.

As described earlier, the development of expertise involves extensively greater proceduralization of problem-solving skills, tactics, and strategies. The cognitive advantages of perceiving and storing problems in terms of patterns, as well as the research demonstrating that experts in most domains are able to solve problems more quickly than are non-experts, suggested that even when given a short period of time to view a signature, FDEs should in most instances outperform Lay participants when making process decisions. Our findings are consistent with the differences that might be expected given the different levels of expertise among the two groups. Compared to Lay participants, FDEs were in fact able to reach a greater number of correct calls after viewing the signatures for only one second. This difference was in fact even greater when participants were given the opportunity to view the signatures for an extended period of time.

These findings are consistent with those of Blake (1995), who found that 91% of FDEs were able to positively or highly probably identify the author of a robbery note. Blake found that FDEs demonstrated high consensus when ranking the evidential value of letters, regardless of whether they rated evidential value of the letter as high or low, while the student control group reached only good agreement with certain letters with high evidential value was found. Blake found that the FDEs were able to utilize their prior knowledge of letter forms and other aspects of handwriting to inform their evaluative process. Students, on the other hand, had no background upon which to rely and tended to see significance when letter forms matched without analyzing less obvious aspects of handwriting that the FDEs utilized.

CHAPTER 3: RESULTS

SECTION 3.5: EYE-TRACKING ANALYSES

Peer Review Protocol

The peer review protocol was designed to investigate the effect of prior information about an examination outcome on the subsequent peer review decisions for previously viewed signatures. A substantial body of empirical evidence supports the idea that the influence of confirmation bias is extensive, potent, and that it may be manifested in a variety of ways (Nickerson, 1998). Confirmation bias is defined as a tendency to search for or interpret new information in a way that confirms one's preconceptions and avoids information and interpretations which contradict prior beliefs (Oswald & Grosjean, 2004). Confirmation bias is a type of expectancy effect that manifests as a cognitive bias, representing an error of inductive inference that favors either the confirmation of the hypothesis under study or disconfirmation of alternative explanations, and has long been believed by philosophers to be an important determinant of thought and behavior (Nickerson, 1998). Jonas et al. (2001) found that a preliminary decision may in fact be sufficient to evoke confirmation bias in subsequent decisions.

Many researchers, forensic practitioners, and legal professionals have recognized the potential sources of bias which exist in the forensic casework environment, such as case exhibits, interactions with law enforcement officials or colleagues, implicit assumptions about the source of forensic specimens, and other extraneous sources of information (Found & Ganas, 2013). Although these sources of potential domain irrelevant information have been acknowledged, to date few agencies have attempted “context management” (Found & Ganas, 2013, p. 154) to minimize these possible sources of bias.

Nickerson (1998) highlighted two paths by which confirmation bias occurs: (1) the preferential treatment of evidence that supports existing beliefs, and (2) the overweighting of positive confirmatory instances. The preferential treatment of evidence that conforms to what an individual believes does not necessarily entail completely ignoring contrary information, but it has been empirically demonstrated that selective attention and selective information seeking do occur. FDEs are often faced with time constraints and other conditions that may enhance the potency of confirmation bias if it exists in their analyses. This procedure investigated the extent to which FDEs and Lay participants differentially utilize information that is available to them (selective attention) and the extent to which they may seek out further information that supports their initial evaluation (selective information seeking).

Overall Results

Of the 954 total possible process calls, 259 (26.8%) were for genuine signatures and 695 (72.9%) were for simulated signatures. None of the signatures selected for this protocol were disguised signatures. We manipulated 373 calls (39.1%) so that the participants were given information about the results of a “prior examination” that differed from their original call. For example, if a participant responded in the questioned/known comparison that the signature was genuine, we might change that call to disguised or simulated. This manipulated call was then given to that participant as “information from a prior examination, given by a pilot participant” in the peer review procedure, so that the participant was required to re-examine the signature with new, contextual information. Table 3.5.1 lists the original process call made in the questioned/known comparison procedure, and indicates the number of calls in each category that we changed from the participants' original calls.

Table 3.5.1
Original and Manipulated Process Calls by Call Category

	Manipulated PR Process Call				
Original QK Process Call	**Genuine**	**Disguised**	**Simulated**	**Total**	**Percent of Calls Changed**
Genuine	133*	21	26	*180*	26.1%
Disguised	40	81*	56	*177*	54.2%
Simulated	71	159	367*	*597*	38.5%
Total	*244*	*261*	*449*	*954*	39.1%

*Process calls were not changed from their original calls

We changed 26% (47) of the 180 original genuine calls; 54% (96) of the original 177 disguised calls; and 39% (230) of the original 597 simulated calls. The remaining 61% (581) of the "prior examination" process calls participants were given during the peer review protocol remained the same process calls that the participants themselves gave during the questioned/known comparison protocol.[1]

Figure 3.5.1 presents the overall percentage of peer review process calls that matched the process calls originally made by the participants during the questioned/known comparison procedure (e.g., a participant made a call of genuine in the questioned/known procedure, and also made a call of genuine in the peer review procedure). FDE process calls were more consistent than were those among Lay participants when the calls were genuine or simulated, but slightly less consistent when the calls were disguised.

Figure 3.5. 1

[1] It is important to note that those responses we selected for manipulation varied by participant. The decision to change the original call for the peer review procedure was based on the characteristics of the signature and the call given by the participant. Basing our decisions on these factors resulted in fewer process calls being manipulated for FDEs than for Lay participants.

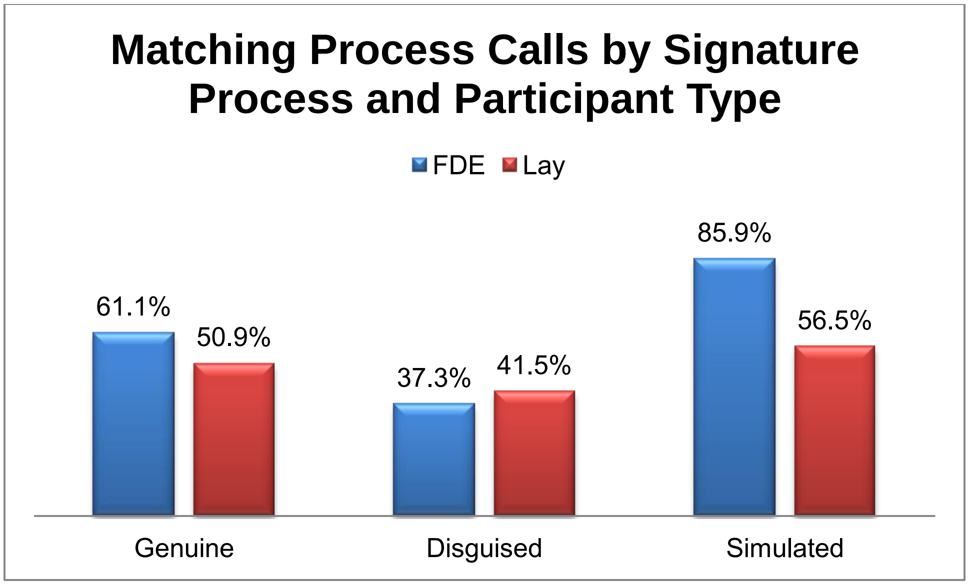


Table 3.5.2 presents the overall number of matching and non/matching process calls made by participants after viewing the signatures in the peer review procedure.

Table 3.5.2

Original Process Call and Peer Review Process Call Match

	FDE Peer Review Process Call				
FDE Original Process Call	**Genuine**	**Disguised**	**Simulated**	***Total***	**Percent Non-Match**
Genuine	44*	6	22	*72*	38.9%
Disguised	6	22*	31	*59*	62.3%
Simulated	21	33	328*	*382*	14.1%
Total	*71*	*61*	*381*	*513*	
	LAY Peer Review Process Call				
LAY Original Process Call	**Genuine**	**Disguised**	**Simulated**	***Total***	**Percent Non-Match**
Genuine	55*	21	32	*108*	49.1%
Disguised	22	49*	47	*118*	58.5%
Simulated	29	64	121*	*214*	43.5%
Total	*106*	*134*	*200*	*440*	

*Peer review process calls match original questioned/known comparison calls

Table 3.5.3 presents the peer review process call distribution for the signature calls that we manipulated. This analysis includes only those peer review calls for the signatures for which we changed the participant's original questioned/known comparison process call.

Table 3.5.3

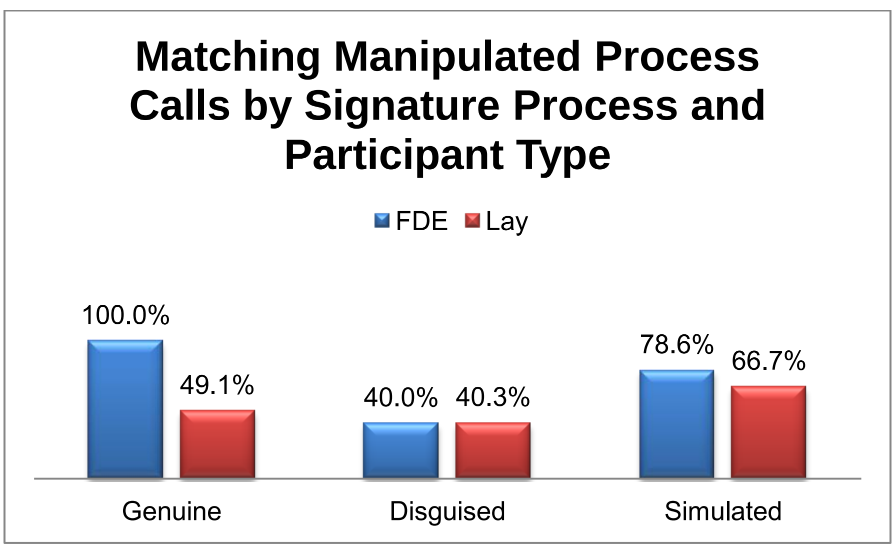
Manipulated Process Call and Peer Review Process Call Match

	FDE Peer Review Process Call				
FDE Manipulated Process Call	**Genuine**	**Disguised**	**Simulated**	***Total***	**Percent Non-Match**
Genuine	1*	0	0	*1*	0.0%
Disguised	7	18*	20	*45*	60.0%
Simulated	1	2	11*	*14*	21.4%
Total	*9*	*20*	*31*	*60*	
	LAY Peer Review Process Call				
LAY Manipulated Process Call	**Genuine**	**Disguised**	**Simulated**	***Total***	**Percent Non-Match**
Genuine	16*	15	8	*39*	60.0%
Disguised	17	56*	62	*135*	58.5%
Simulated	2	12	28*	*42*	33.3%
Total	*35*	*83*	*98*	*216*	

*Peer review process calls match manipulated questioned/known comparison calls

Figure 3.5.2 presents the overall percentage of peer review process calls that matched our process manipulation. It is important to note that only one process call was manipulated to the genuine category for FDEs, which artificially inflates the percentage in that category.

Figure 3.5.2



*Only one process call fell into the genuine category for FDEs

As a manipulation check we also examined the data for those process calls that we did not manipulate during the peer review procedure. These calls were also presented as the results of a prior examination. Table 3.5.4 presents the distribution of the peer review process calls.

Table 3.5.4

Unmanipulated Process Call and Peer Review Process Call Change

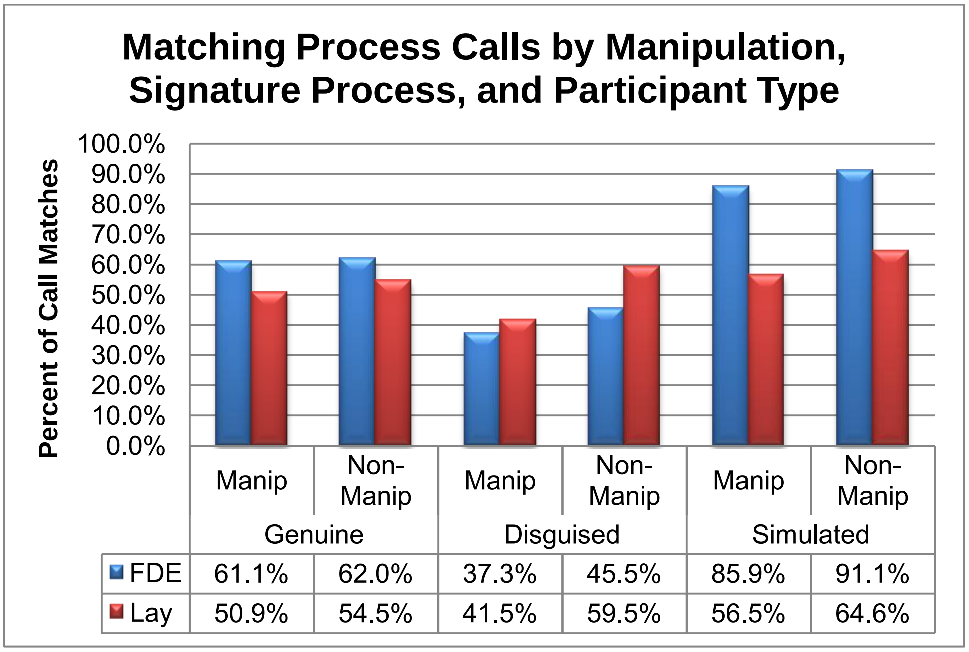
	FDE Peer Review Process Call				
FDE Original Process Call	**Genuine**	**Disguised**	**Simulated**	***Total***	**Percent Non-Match**
Genuine	44	5	22	*71*	38.0%
Disguised	4	20	20	*44*	54.5%
Simulated	14	16	308	*338*	8.9%
Total	*62*	*41*	*350*	*453*	
	LAY Peer Review Process Call				
LAY Original Process Call	**Genuine**	**Disguised**	**Simulated**	***Total***	**Percent Non-Match**
Genuine	48	13	27	*88*	45.5%
Disguised	4	22	11	*37*	40.5%
Simulated	19	16	64	*99*	35.4%
Total	*71*	*51*	*102*	*224*	

*Peer review process calls match manipulated calls

The overall match percentage is higher among FDEs than among Lay participants for signatures that were presented as genuine or simulated in the questioned/known comparison, but slightly lower for those signatures that were presented as disguised. These data suggest that FDEs may be as likely as Lay participants to be influenced by contextual information about the outcome of a prior examination, but this pattern occurs in both the manipulated and unmanipulated calls. One explanation of this outcome is that both the FDEs and the Lay participants were influenced by demand characteristics, although different demand characteristics may have influenced the two groups differently.

We used minor deception in this procedure, indicating to our participants that they would be reviewing the calls made during a previous examination. Both the manipulated and unmanipulated calls were presented in terms of the findings of “the previous examiner”, implying that the previous examination had been conducted with a different participant. In the case of the FDEs, it may be that the spontaneous change of their unmanipulated previous calls was due to an implicit expectation that all the calls might be manipulated in some way. Lay participants may have inferred that the “previous examiner” meant that the signatures had been examined by an expert rather than another lay person, and they were willing to defer to the expert’s opinion. Figure 3.5.3 compares the overall percentage of peer review process calls that matched the both the manipulated and unmanipulated questioned/known process calls.

Figure 3.5.3



We also investigated whether these findings might be related to whether the calls were changed from correct to incorrect responses, or vice versa. Figure 3.5.4 presents the difference in the percentage of questioned/known process decisions that FDEs and Lay participants changed to a different process call in the peer review procedure. Among both FDEs and Lay participants there is a pronounced increase in the percentage of correct-to-incorrect call changes when the calls were manipulated, compared to when the calls were not manipulated. The number of incorrect-to-correct calls was also greater among both FDEs and Lay participants when the calls were manipulated. Overall, FDEs moved more of their calls from incorrect to correct in a greater percentage of cases than did Lay participants, and when the process calls were not manipulated moved their calls from correct to incorrect to a lesser extent.

Figure 3.5.4

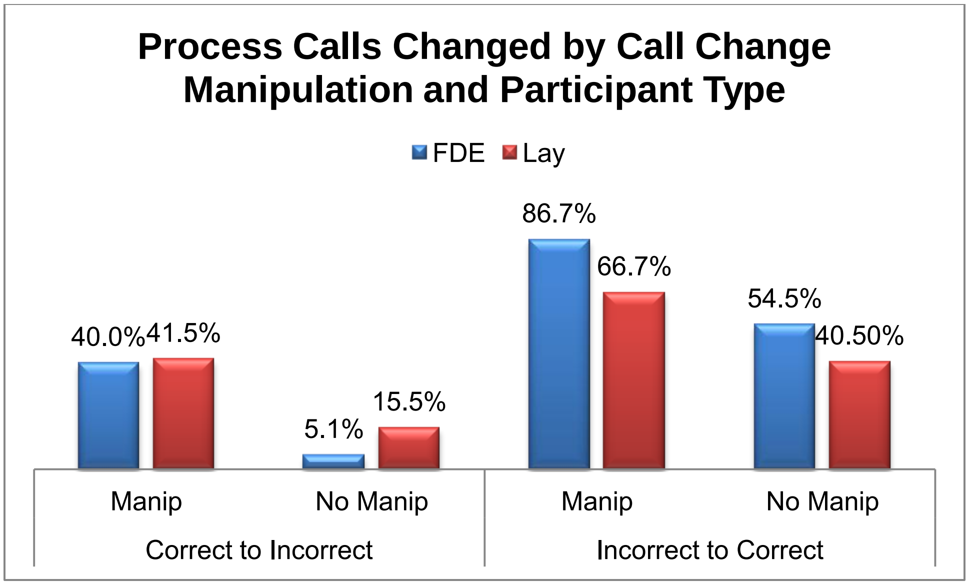


Figure 3.5.5 presents the changes in call accuracy for FDE and Lay participants for each signature in the peer review procedure. These data indicate that FDEs are more accurate than are Lay participants across signatures and across signature views, regardless of whether the questioned/known process call was manipulated. Table 3.5.5 presents the number of correct calls by signature.

Figure 3.5.5

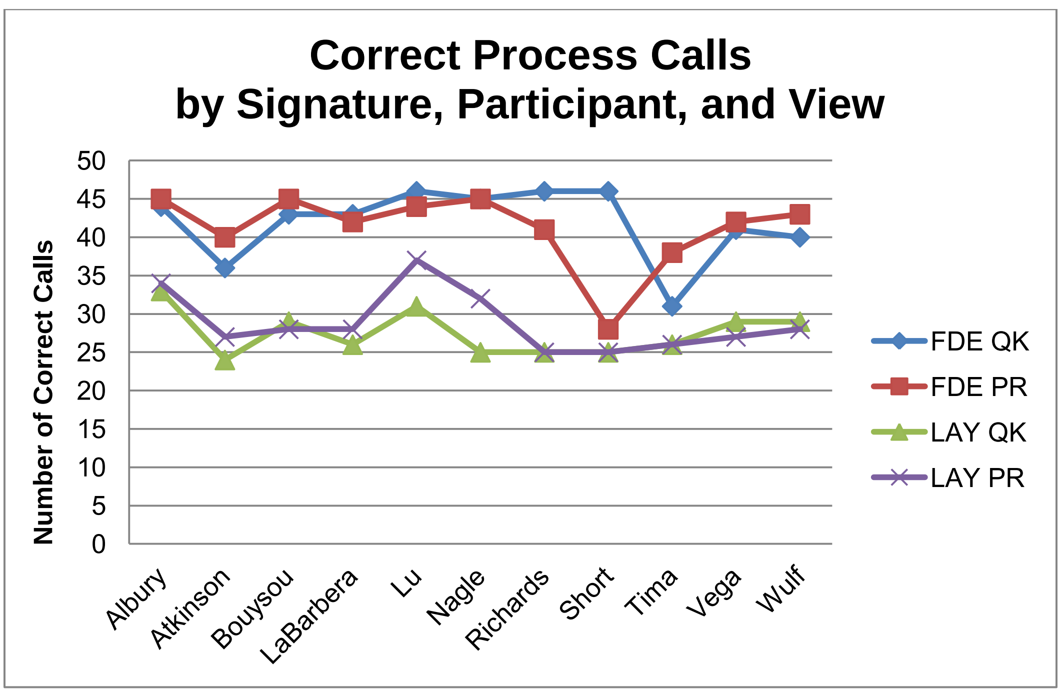


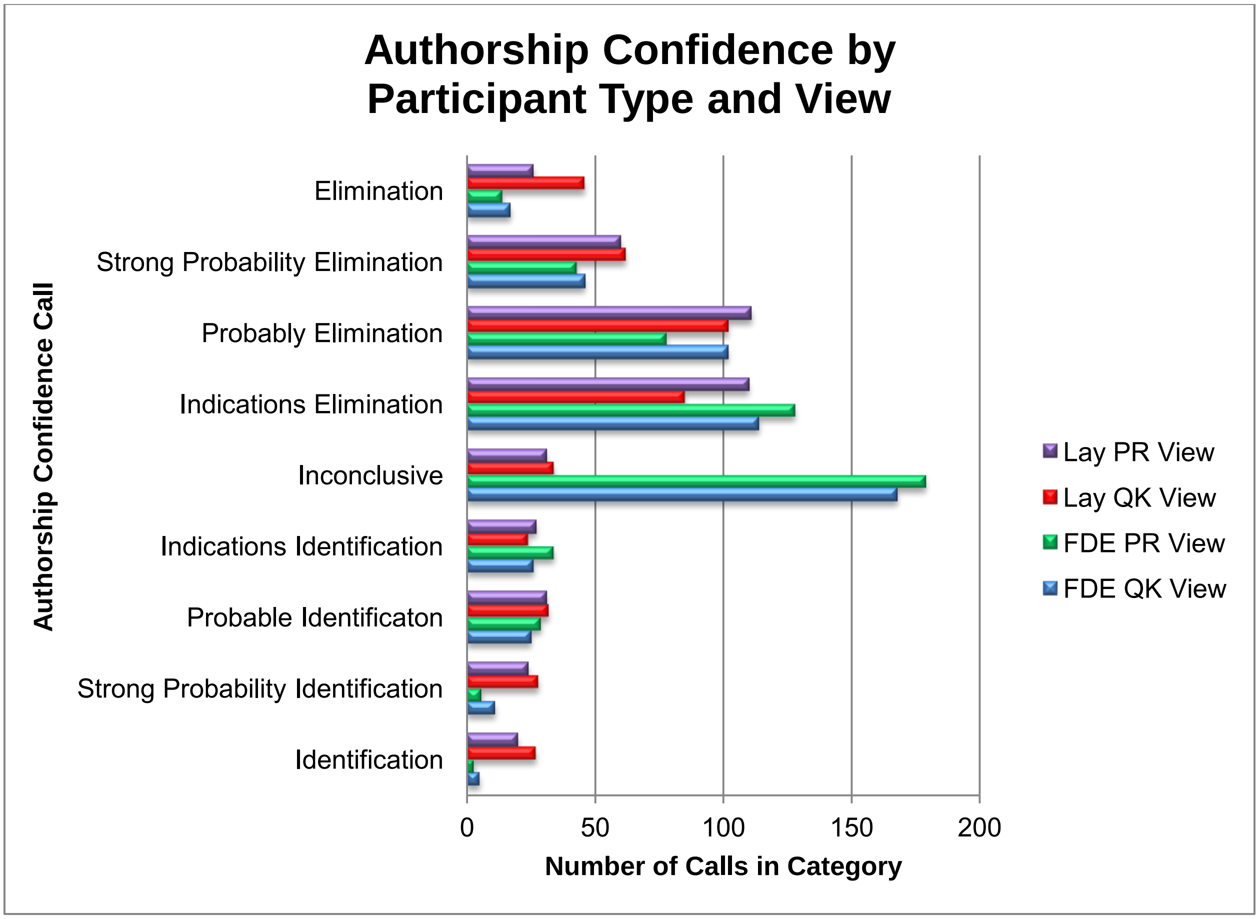
Table 3.5.5

Peer Review Correct Calls by Signature and Participant Type

Signature	**FDE**	**Lay**	**Total**	***p***
Albury4	45	33	78	.043*
Atkinson1	40	24	64	.008**
Bouysou6	45	29	74	.002**
LaBarbera1	42	26	68	.006**
Lu5	44	31	75	.030*
Nagle 4	45	25	70	<.001**
Richards4	41	29	70	.084
Short1	28	25	53	.877
Tima4	38	26	64	.062
Vega3	42	29	71	.022*
Wulf1	43	29	72	.009**
Total Correct	*453*	*306*	*759*	

Authorship confidence. Authorship confidence ratings were recoded to create a measure from 1 to 5, where 1 = the lowest level of confidence and 5 = the highest level of confidence, on the continuum of 1 = inconclusive; 2 = indications identification/elimination; 3 = probable identification/elimination; 4 = strong probable identification/elimination; and 5 = identification/elimination. Thus, a value of 1.00 to 1.99 falls within the inconclusive range; 2.00 to 2.99 falls within the indications range; 3.00 to 3.99 falls within the probable range; 4.00 to 4.99 fall within the strong probable range; and 5.00 indicates identification or elimination. Figure 3.5.6 presents the distribution of confidence ratings after the original questioned/known comparison and after the peer review comparison for the calls that we manipulated.

Figure 3.5.6



FDEs were far more likely than were Lay participants to place their authorship calls in the inconclusive category at the center of the distribution. This indicated that although FDEs were required by the protocol to make a process call of genuine, disguised, or simulated, they felt there was insufficient information contained in the signature specimens to allow them to reliably identify or eliminate the writer of the questioned signatures as the writer of the known signatures. Conversely, the distribution of Lay participant authorship calls indicated that compared to FDEs, Lay participants tended to be less conservative, expressing greater confidence for those calls. This suggests that Lay participants may have afforded somewhat greater weight to the features they evaluated than did the FDEs. Table 3.5.6 presents the number of calls falling into each category based on the signature view (questioned/known comparison or peer review), and whether or not the call was manipulated.

Table 3.5.6
Authorship Call by Participant Type, Call Change Manipulation, and View

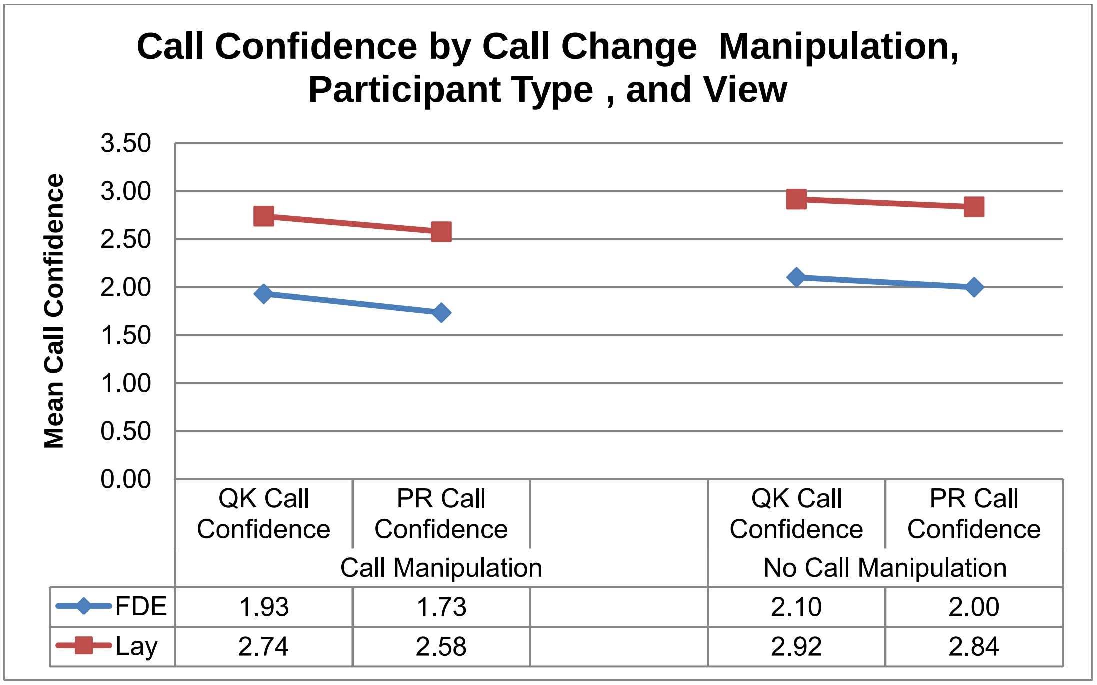
	Manipulated Process Call			**Unmanipulated Process Call**		
	Participant Type			***Participant Type***		
Original QK	**FDE**	**LAY**	***Total***	**FDE**	**LAY**	***Total***

Authorship Opinion						
Identification	1	4	*5*	4	23	27
Strong Probability Identification	0	2	*2*	11	26	37
Probable Identification	2	7	*9*	23	25	48
Indications Identification	0	7	*7*	26	17	43
Inconclusive	25	15	*40*	143	19	162
Indications Elimination	12	50	*62*	102	35	137
Probably Elimination	15	65	*80*	87	37	124
Strong Probability Elimination	4	37	*41*	42	25	67
Elimination	1	29	*30*	16	17	33
Total	*60*	*216*	*276*	*454*	*224*	*678*

	Manipulated Process Call			**Unmanipulated Process Call**		
	Participant Type			**Participant Type**		
Peer Review Authorship Opinion	**FDE**	**LAY**	***Total***	**FDE**	**LAY**	***Total***
Identification	0	4	4	3	16	19
Strong Probability Identification	0	1	1	6	23	29
Probable Identification	2	11	13	27	20	47
Indications Identification	8	14	22	26	13	39
Inconclusive	25	11	36	154	20	174
Indications Elimination	16	69	85	112	41	153
Probably Elimination	5	64	69	73	47	120
Strong Probability Elimination	4	31	35	39	29	68
Elimination	0	11	11	14	15	29
Total	*60*	*216*	*276*	*454*	*224*	*678*

We conducted a 2 (*participant type*) x 2 (*call change manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) to investigate whether significant differences existed in the mean authorship confidence rating during the initial viewing of the known comparison signatures (QK comparison) and the second viewing of the signatures signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in confidence rating existed according to the call change manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5.7 presents mean authorship confidence call by view, call change manipulation, and participant type.

Figure 3.5.7



A significant main effect was revealed for *participant type*, *F*(1, 855) = 122.00, $p < .001$, $\eta^2 = .125$, indicating that the mean authorship confidence rating was lower among FDEs than among Lay participants. A significant main effect was found for *view* *F*(1, 855) = 7.66, $p = .006$, $\eta^2 = .009$, indicating that the mean authorship confidence rating was lower in the peer review view than in the questioned/known comparison view. A significant main effect was also found for *call change manipulation* *F*(1, 855) = 8.57, $p = .004$, $\eta^2 = .010$, indicating that the mean call confidence ratings were lower for both FDEs and Lay participants when the QK process calls were manipulated.

No significant interaction effect was found for *participant type* x *call change manipulation* (*p* = .997, *ns*). No significant two-way interactions were identified for either *view* x *call change manipulation* or *view* x *participant type* (*p* = .373, *ns*, and *p* = .767, *ns*, respectively).

No significant three-way (*participant type* x *call change manipulation* x *view*) interaction effect was found (*p* = .957, *ns*). Table 3.5.7 presents the analysis means and standard deviations.

Table 3.5.7

Authorship Confidence Rating by Participant Type, Call Change Manipulation, and View

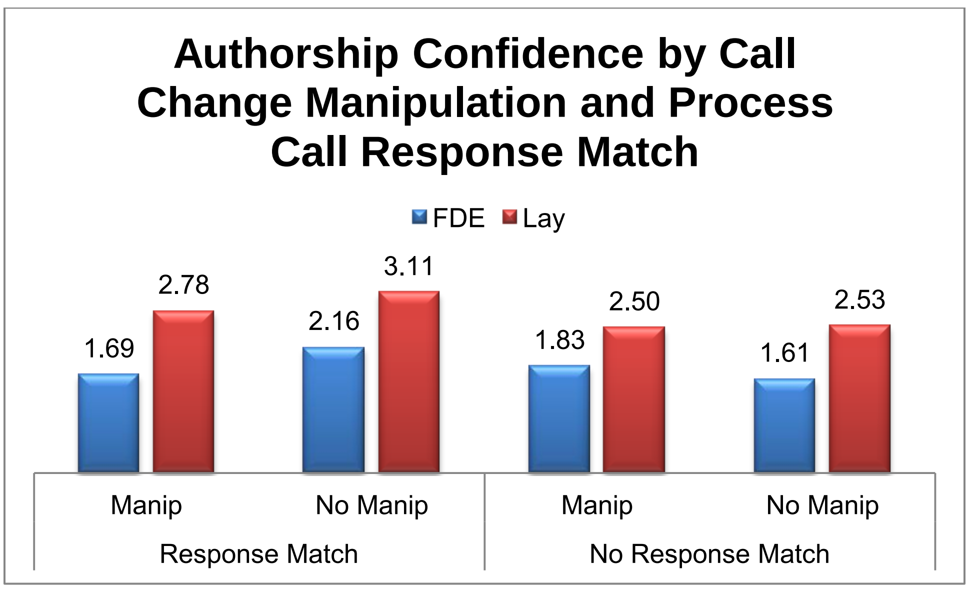
			QK Comparison View			
		Change			**No Change**	
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	1.93	1.01	56	2.10	1.02	424
Lay	2.74	0.96	179	2.92	1.20	200
			PR View			
		Change			**No Change**	
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**

FDE	1.73	0.82	56	2.00	0.97	424
Lay	2.58	0.88	179	2.84	1.13	200

These findings indicate that the mean authorship confidence rating for the known comparison signatures was significantly lower among FDEs than among Lay participants in both the questioned/known comparison view and the peer review view. The mean authorship confidence rating was lowest among both FDE and Lay participants when the questioned/known signatures were manipulated.

We conducted a 2 (*participant type*) x 2 (*process manipulation match*) factorial analysis of variance (ANOVA) to investigate whether significant differences existed in the mean authorship confidence rating among FDEs and Lay participants according to whether or not the peer review process call matched the questioned/known comparison call given to the participants during the peer review procedure. We also conducted separate 2 x 2 ANOVAS for manipulated and unmanipulated calls. Figure 3.5.8 presents the combined results of the separate analyses for mean authorship confidence call by view, call change manipulation, and participant type.

Figure 3.5.8



The full data set analysis revealed a significant main effect for *participant type*, $F(1, 907) = 147.73$, $p < .001$, $\eta^2 = .140$, indicating that the mean authorship call confidence was significantly lower among FDEs than among Lay participants. A significant main effect was found for *process manipulation match*, $F(1, 907) = 43.07$, $p < .001$, $\eta^2 = .045$, indicating that the mean authorship call confidence was greater among participants whose peer review process call matched questioned/known comparison call given to the participants during the peer review procedure (although individual analyses demonstrated that this was true only for those calls that were not manipulated). No significant interaction effect was found for *participant type* x *process manipulation match* ($p = .986$, *ns*). Table 3.5.8 presents the analysis means and standard deviations.

Table 3.5.8
Authorship Confidence by Call Change Manipulation and Process Call Response Match

	Call Manipulated					
	Response Match			No Response Match		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	1.69*	0.66	29	1.83*	0.95	30
Lay	2.78*	0.91	93	2.50*	0.84	112
	Call Not Manipulated					
	Response Match			**No Response Match**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	2.16**	1.03	342	1.61**	0.69	96
Lay	3.11**	1.17	122	2.53**	0.99	87

*Significant main effect for participant type, p < .001; **Significant main effects for participant type (p < .001), and for response match (p < .001).

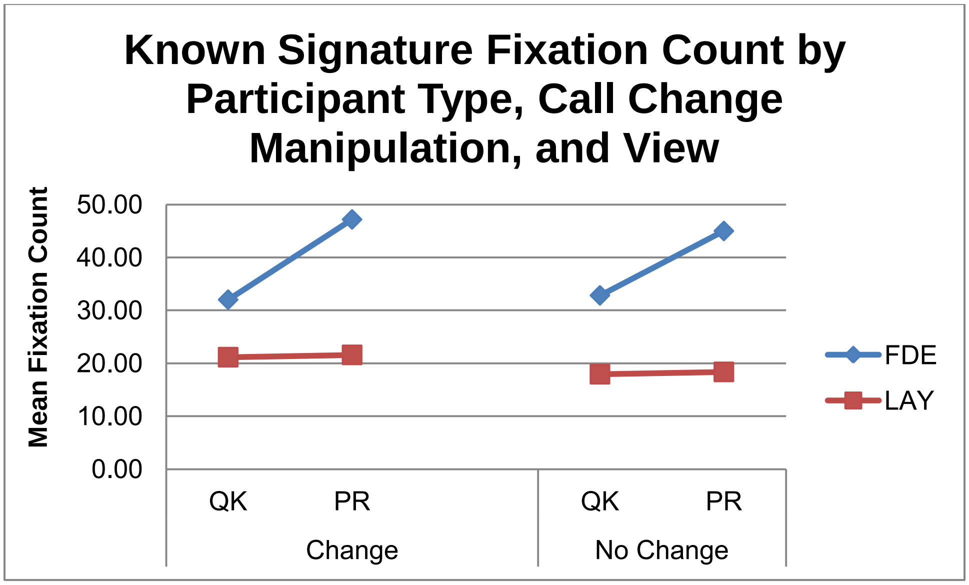
Eye-Tracking Analyses

We predicted that information about the outcome of a prior examination would systematically influence the extent of information extraction, the use of extracted information, and the amount of time spent by the examiner or layperson (selective attention, selective information seeking) when making a call on the signature comparison *(hypothesis 15).* These analyses investigated the participants' overall utilization of characteristics in the signature stimulus, and the participants' deployment of attentional resources to specific characteristics that the heat map indicated were particularly diagnostic during the examination. These overall examination process analyses were focused on the fixation counts, fixation durations, visit counts, and visit durations in the two AOIs that are common among all signatures—the AOIs containing the four known signatures, and the AOIs containing the questioned signatures the signature.

Fixation Count

Known comparison signatures. A 2 (*participant type*) x 2 (*call change manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation count during the initial viewing of the known comparison signatures (QK comparison) and the second viewing of the known comparison signatures signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation count existed according to the call change manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5.9 presents mean fixation count by view, call change manipulation, and participant type.

Figure 3.5.9



A significant main effect was revealed for *participant type*, $F(1, 915) = 88.50$, $p < .001$, $\eta^2 = .088$, indicating that the mean fixation count was greater among FDEs than among Lay participants. A significant main effect was found for *view* $F(1, 915) = 29.94$, $p < .001$, $\eta^2 = .028$, indicating that the mean fixation count was greater in the peer review view than in the questioned/known comparison view. No significant main effect was revealed for *call change manipulation* ($p = .347$, *ns*).

No significant interaction effect was found for *participant type* x *call change manipulation* ($p = .542$, *ns*). No significant two-way interactions were identified for either *view* x *call change manipulation* or *view* x *participant type* ($p = .562$, *ns*, and $p = .542$, *ns*, respectively).

No significant three-way (*participant type* x *call change manipulation* x *view*) interaction effect was found ($p = .563$, *ns*). Table 3.5.9 presents the analysis means and standard deviations.

Table 3.5.9

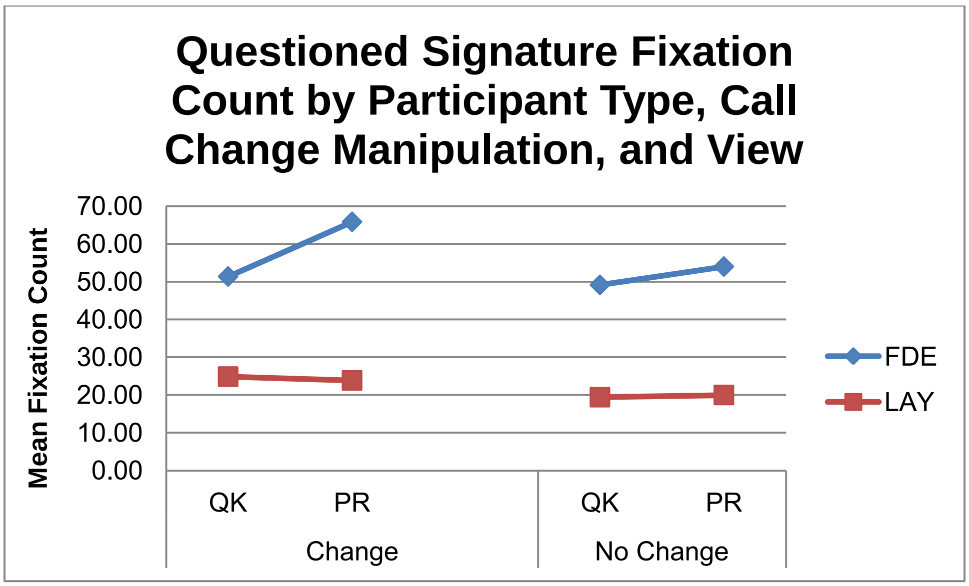
Known Signature Fixation Count by Participant Type, Call Change Manipulation, and View

	QK Comparison					
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	32.02	31.54	88	32.83	32.91	396
LAY	21.15	22.18	278	17.94	18.88	157
	PR Comparison					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	47.18	46.70	88	45.00	42.00	396
LAY	21.59	23.38	278	18.38	23.08	157

These findings indicate that the mean fixation count for the known comparison signatures was greater for FDEs than for Lay participants, and there was a significant change in fixation count from the first time the signatures were viewed (QK) to the second time it they were viewed (PR), regardless of whether we manipulated the call in the peer review view.

Questioned Signature. A 2 (*participant type*) x 2 (*call change manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation count during the initial viewing of the questioned signatures (QK comparison) and the second viewing of the questioned signatures (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation count existed according to the *call change manipulation* (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5.10 presents mean fixation count by *view*, *call change manipulation*, and *participant type*.

Figure 3.5.10



A significant main effect was revealed for *participant type*, $F(1, 915) = 203.29$, $p < .001$, $\eta^2 = .182$, demonstrating that the mean fixation count was greater among FDEs than among Lay participants. A significant main effect was for *view* revealed that on average, the fixation count was greater in the peer review view than in the questioned/known comparison view, $F(1, 915) = 11.42$, $p = .001$, $\eta^2 = .012$. The main effect for *call change manipulation* was also significant, indicating that the mean fixation count in the questioned signature was greater in when the original call was changed, $F(1, 915) = 6.36$, $p = .012$, $\eta^2 = .007$.

A significant two-way interaction was identified for *view* x *participant type*, $F(1, 915) = 12.25$, $p < .001$, $\eta^2 = .013$, revealing that the fixation count was greater among FDEs in the peer review view than among FDEs in the questioned/known comparison view. No significant interaction effect was found for *participant type* x *call change manipulation* (p = .606, *ns*), or *view* x *call change manipulation*, (p = .154, *ns*).

The significant three-way interaction (*participant type* x *call change manipulation* x *view*) indicated that fixation count was greater than FDEs than among Lay participants in both call change manipulation conditions, and that the difference was even more pronounced among Lay participants in the peer review view ($F(1, 915) = 3.93$, $p = .048$, $\eta^2 = .004$). Table 3.5.10 presents the analysis means and standard deviations.

Table 3.5.10

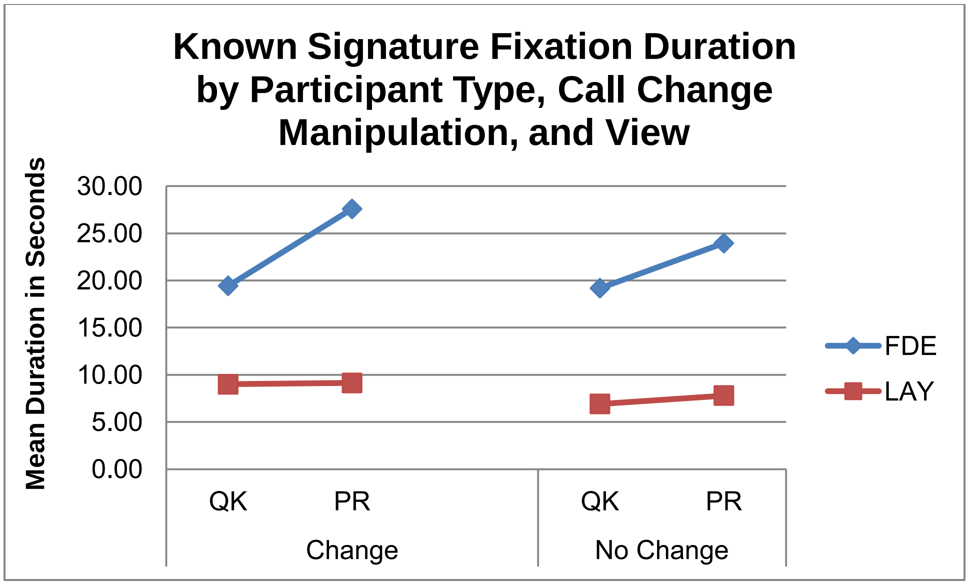
Questioned Signature Fixation Count by Participant Type, Call Change Manipulation, and View

QK Comparison						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	51.34	37.17	88	49.11	42.89	396
LAY	24.83	25.12	278	19.39	19.89	157
PR Comparison						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	65.82	52.65	88	53.96	41.99	396
LAY	23.83	24.09	278	19.97	22.41	157

Total Fixation Duration

Known comparison signatures. A 2 (*participant type*) x 2 (*call change manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation duration during the initial viewing of the known comparison signatures (QK comparison) and the second viewing of the signatures (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation duration existed according to the call change manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5.11 presents mean fixation duration by *view*, *call change manipulation*, and *participant type*.

Figure 3.5.11



A significant main effect was revealed for *participant type*, $F(1, 915) = 229.72$, $p < .001$, $\eta^2 = .201$, and for *view*, $F(1, 915) = 31.95$, $p < .001$, $\eta^2 = .034$. No significant main effect was found for *call change manipulation* ($p = .054$, *ns*).

A significant two-way interaction was found for *view* x *participant type*, $F(1, 915) = 23.20$, $p < .001$, $\eta^2 = .025$, revealing that the fixation duration was greater among FDEs in the peer review view than among FDEs in the questioned/known comparison view. No interaction effects were found for *view* x *call change manipulation* ($p = .286$, *ns*), or for call change manipulation x *participant type* ($p = .900$, *ns*).

No significant three-way (*participant type* x *call change manipulation* x *view*) interaction effects were found ($p = .094$, *ns*). Table 3.5.11 presents the analysis means and standard deviations.

Table 3.5.11

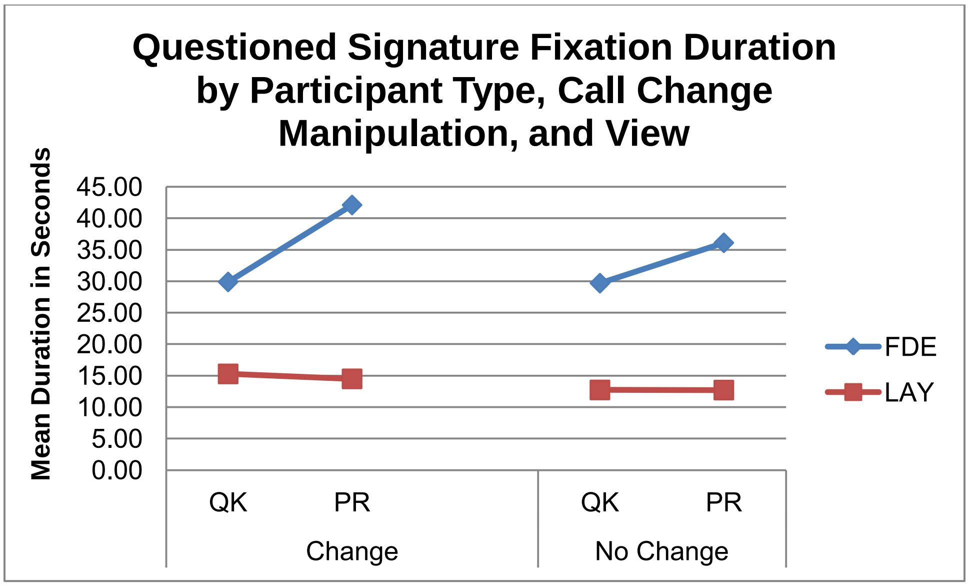
Known Signature Fixation Duration by Participant Type, Call Change Manipulation, and View

			QK Comparison			
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	19.43	13.57	88	19.18	16.45	396
LAY	8.99	9.43	278	6.91	7.67	157
			PR Comparison			
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	27.58	23.10	88	23.95	18.98	396
LAY	9.13	10.75	278	7.80	9.32	157

These findings indicate that the mean fixation duration in the known comparison signatures was greater for FDEs than for Lay participants, there was a significant increase in fixation duration from the first time the signatures were viewed (QK) to the second time they were viewed (PR), regardless of whether we manipulated the call.

Questioned Signature. A 2 (*participant type*) x 2 (*call change manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation duration in seconds during the initial viewing of the questioned signature (QK comparison) and the second viewing of the questioned signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation duration existed according to the call change manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5.12 presents mean fixation duration by *view*, *call change manipulation*, and *participant type*.

Figure 3.5.12



A significant main effect was revealed for *participant type*, $F(1, 915) = 192.10$, $p < .001$, $\eta^2 = .174$, and for *view*, $F(1, 915) = 19.23$, $p < .001$, $\eta^2 = .021$. No significant main effect was found for *call change manipulation* ($p = .077$, *ns*).

A significant two-way interaction was found for *view* x *participant type*, $F(1, 915) = 22.88$, $p < .001$, $\eta^2 = .024$, revealing that the fixation duration was greater among FDEs in the peer review view than among FDEs in the questioned/known comparison view. No interaction effects were found for *view* x *call change manipulation* ($p = .215$, *ns*), or for call change manipulation x *participant type* ($p = .755$, *ns*).

No significant three-way (*participant type* x *call change manipulation* x *view*) interaction effects were found ($p = .106$, *ns*). Table 3.5.12 presents the analysis means and standard deviations.

Table 3.5.12

Questioned Signature Fixation Duration by Participant Type, Call Change Manipulation, and View

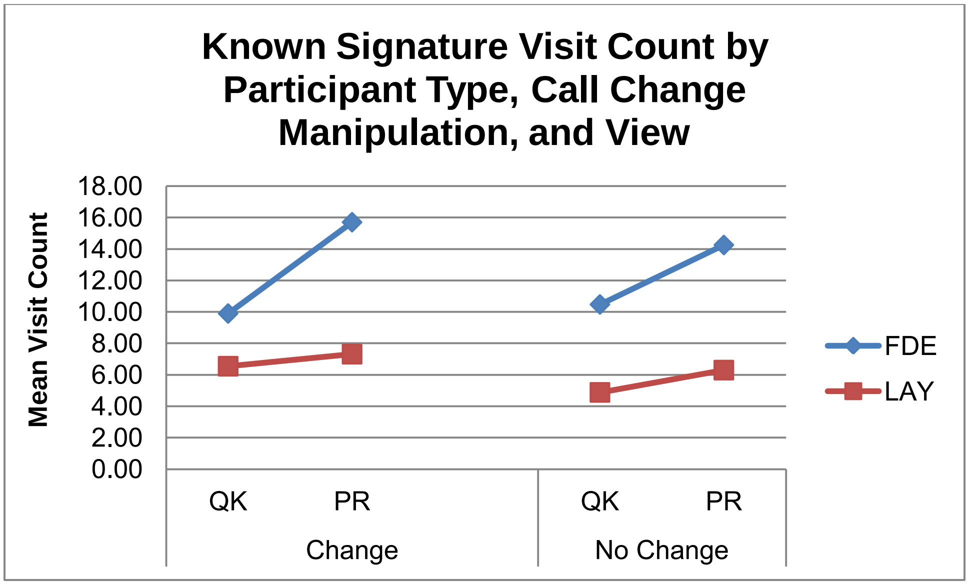
QK Comparison						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	29.89	22.19	88	29.70	24.02	396
LAY	15.28	14.94	278	12.73	12.81	157
PR Comparison						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	42.12	38.80	88	36.11	32.19	396
LAY	14.50	14.91	278	12.71	15.66	157

These findings indicate that the mean fixation duration in the questioned signatures was greater for FDEs than for Lay participants, and there was a significant change in fixation duration from the first time the signature was viewed (QK) to the second time it was viewed (PR), regardless of whether we manipulated the call in the peer review view.

Total Visit Count

Known comparison signatures. A 2 (*participant type*) x 2 (*call change manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit count during the initial viewing of the known signatures (QK comparison) and the second viewing of the signatures (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in visit count existed according to the call change manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5.13 presents mean visit count by *view*, *call change manipulation*, and *participant type*.

Figure 3.5.13



A significant main effect was revealed for *participant type*, $F(1, 915) = 110.14$, $p < .001$, $\eta^2 = .107$, and for *view*, $F(1, 915) = 46.32$, $p < .001$, $\eta^2 = .048$. No significant main effect was found for *call change manipulation* ($p = .141$, *ns*).

A significant two-way interaction was found for *view* x *participant type*, $F(1, 915) = 18.30$, $p < .001$, $\eta^2 = .020$, revealing that the visit count was greater among FDEs in the peer review view than among FDEs in the questioned/known comparison view. No interaction effects were found for *view* x *call change manipulation* ($p = .428$, *ns*), or for call change manipulation x *participant type* ($p = .453$, *ns*).

No significant three-way (*participant type* x *call change manipulation* x *view*) interaction effects were found ($p = .122$, *ns*). Table 3.5.13 presents the analysis means and standard deviations.

Table 3.5.13

Known Signature Visit Count by Participant Type, Call Change Manipulation, and View

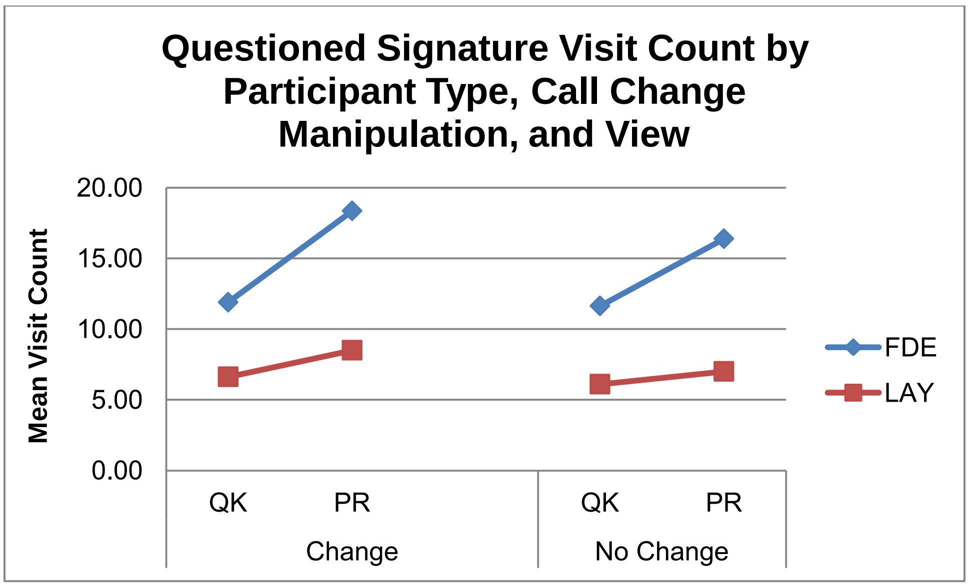
	QK Comparison					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	9.90	9.20	88	10.47	9.42	396
LAY	6.55	5.76	278	4.88	5.01	157
	PR Comparison					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	15.70	15.10	88	14.26	12.83	396
LAY	7.31	8.56	278	6.30	7.22	157

These findings indicate that the mean visit count in the known comparison signatures was greater for FDEs than for Lay participants, and there was a significant change in visit count among both FDE and

Lay participants from the first time the signature was viewed (QK) to the second time it was viewed (PR), regardless of whether we manipulated the call in the peer review view. The interaction effect revealed that this increase was more pronounced among FDEs in the peer review view than among FDEs or Lay participants in the other conditions.

Questioned Signature. A 2 (*participant type*) x 2 (*call change manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit count during the initial viewing of the questioned signature (QK comparison) and the second viewing of the questioned signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in visit count existed according to the call change manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5.14 presents mean visit count by *view*, *call change manipulation*, and *participant type*.

Figure 3.5.14



A significant main effect was revealed for *participant type*, $F(1, 915) = 138.54$, $p < .001$, $\eta^2 = .132$, and for *view*, $F(1, 915) = 7.23$, $p < .001$, $\eta^2 = .048$. No significant main effect was found for *call change manipulation* ($p = .141$, *ns*).

A significant two-way interaction was found for *view* x *participant type*, $F(1, 915) = 18.30$, $p < .001$, $\eta^2 = .020$, revealing that the visit count was greater among FDEs in the peer review view than among FDEs in the questioned/known comparison view. No interaction effects were found for *view* x *call change manipulation* ($p = .428$, *ns*), or for call change manipulation x *participant type* ($p = .453$, *ns*).

No significant three-way (*participant type* x *call change manipulation* x *view*) interaction effects were found ($p = .122$, *ns*). Table 3.5.14 presents the analysis means and standard deviations.

Table 3.5.14

Questioned Signature Visit Count by Participant Type, Call Change Manipulation, and View

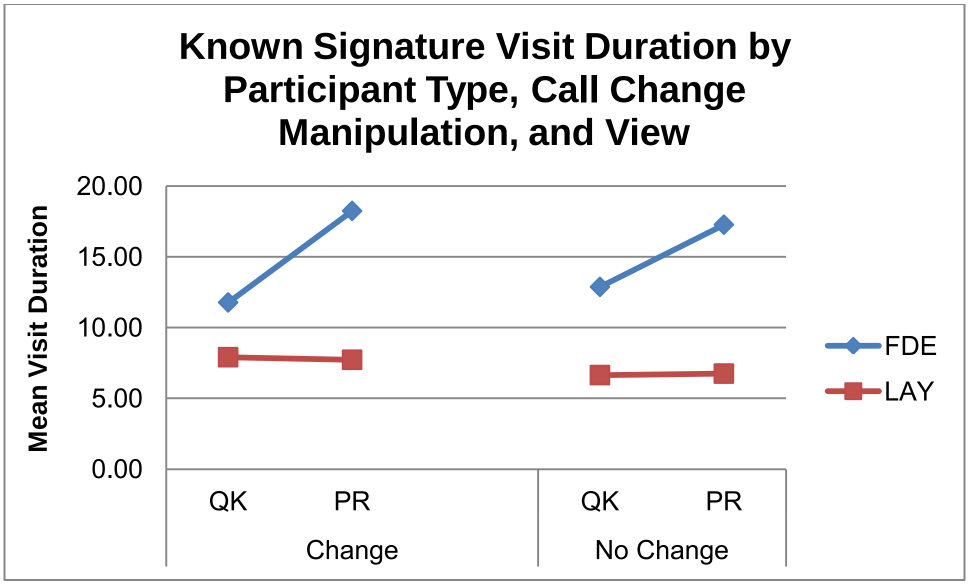
	QK Comparison					
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	11.90	9.26	88	11.64	10.20	396
LAY	6.63	5.80	278	6.10	5.47	157
	PR Comparison					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	18.36	15.49	88	16.39	12.66	396
LAY	8.50	9.04	278	7.01	7.33	157

These findings indicate that the mean visit count in the questioned signatures was greater for FDEs than for Lay participants, and there was a significant change in visit count among both FDE and Lay participants from the first time the signature was viewed (QK) to the second time it was viewed (PR), regardless of whether we manipulated the call in the peer review view. The interaction effect revealed that this increase was more pronounced among FDEs in the peer review view than among FDEs or Lay participants in the other conditions.

Total Visit Duration

Known comparison signatures. A 2 (*participant type*) x 2 (*call change manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit duration during the initial viewing of the known comparison signatures (QK comparison) and the second viewing of the known comparison signatures (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in visit duration existed according to the call change manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5.15 presents mean visit duration by *view*, *call change manipulation*, and *participant type*.

Figure 3.5.15



A significant main effect was revealed for *participant type*, $F(1, 915) = 90.16$, $p < .001$, $\eta^2 = .090$, and for *view*, $F(1, 915) = 23.06$, $p < .001$, $\eta^2 = .025$. No significant main effect was found for *call change manipulation* ($p = .518$, *ns*).

A significant two-way interaction was found for *view* x *participant type*, $F(1, 915) = 23.72$, $p < .001$, $\eta^2 = .025$, revealing that the visit duration was greater among FDEs in the peer review view than among FDEs in the questioned/known comparison view. No interaction effects were found for *view* x *call change manipulation* ($p = .427$, *ns*), or for call change manipulation x *participant type* ($p = .470$, *ns*).

No significant three-way (*participant type* x *call change manipulation* x *view*) interaction effects were found ($p = .294$, *ns*). Table 3.5.15 presents the analysis means and standard deviations.

Table 3.5.15

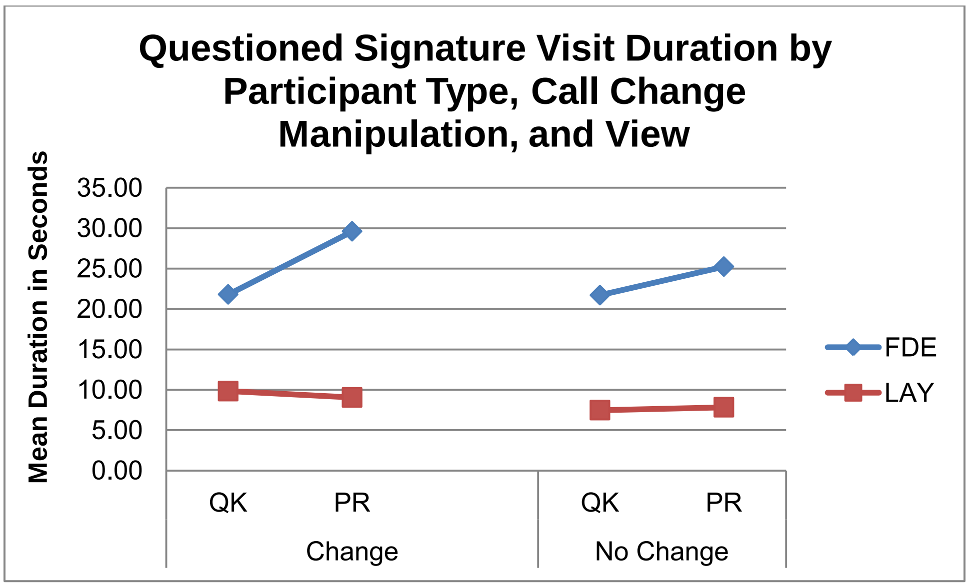
Known Signature Visit Duration by Participant Type, Call Change Manipulation, and View

QK Comparison						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	11.78	11.79	88	12.88	13.58	396
LAY	7.91	8.74	278	6.65	7.14	157
PR Comparison						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	18.25	19.28	88	17.28	17.75	396
LAY	7.73	8.59	278	6.75	8.66	157

These findings indicate that the mean visit duration in the known comparison signatures was greater for FDEs than for Lay participants, and there was a significant change in visit duration among both FDE and Lay participants from the first time the signature was viewed (QK) to the second time it was viewed (PR), regardless of whether we manipulated the call in the peer review view. The interaction effect revealed that this increase was more pronounced among FDEs in the peer review view than among FDEs or Lay participants in the other conditions.

Questioned Signature. A 2 (*participant type*) x 2 (*call change manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit duration in seconds during the initial viewing of the questioned signature (QK comparison) and the second viewing of the signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in visit duration existed according to the call change manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5.16 presents mean visit duration by *view*, *call change manipulation, and participant type*.

Figure 3.5.16



A significant main effect was revealed for *participant type*, $F(1, 915) = 261.08$, $p < .001$, $\eta^2 = .222$, and for *view*, $F(1, 915) = 17.89$, $p < .001$, $\eta^2 = .019$, and for *call change manipulation*, $F(1, 915) = 4.09$, $p = .043$, $\eta^2 = .004$.

A significant two-way interaction was found for *view* x *participant type*, $F(1, 915) = 20.83$, $p < .001$, $\eta^2 = .022$, revealing that the visit duration was greater among FDEs in the peer review view than among FDEs in the questioned/known comparison view. No interaction effect was found for *view* x *call change manipulation* ($p = .225$, *ns*), or for call change manipulation x *participant type*, ($p = .820$, *ns*).

A significant three-way (*participant type* x *call change manipulation* x *view*) interaction effect was found, $F(1, 915) = 4.41$, $p = .036$, $\eta^2 = .005$. Table 3.5.16 presents the analysis means and standard deviations.

Table 3.5.16

Questioned Signature Visit Duration by Participant Type, Call Change Manipulation, and View

QK Comparison						
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	21.79	15.54	88	21.69	18.56	396
LAY	9.82	10.80	278	7.46	8.44	157
PR Comparison						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	29.60	23.73	88	25.23	19.09	396
LAY	9.03	9.18	278	7.82	9.26	157

These findings indicate that the mean visit duration in the questioned signatures was greater for FDEs than for Lay participants, and there was a significant change in visit duration among both FDE and Lay participants from the first time the signature was viewed (QK) to the second time it was viewed (PR), regardless of whether we manipulated the call in the peer review view. The two-way interaction effect revealed that this increase was more pronounced among FDEs in the peer review view than among FDEs or Lay participants in the other conditions. The three-way interaction indicated that the interaction was more pronounced in the change condition than in the no change condition.

Conclusions

Confirmation bias is defined as a tendency to search for or interpret new information in a way that confirms one's preconceptions and avoids information and interpretations which contradict prior beliefs (Oswald & Grosjean, 2004). We manipulated a subset of the process calls made by FDEs and Lay participants during the questioned/known comparison procedure so that some of them were the same call and some of them were a different call, and presented the previously viewed signatures as the results of a “prior examination” in which the calls had been made by a “previous examiner”. We told the participants the results of the “prior examination”, and asked the FDEs and Lay to give their own process and authorship calls.

Overall, FDE process calls were more consistent with their original calls than were those among Lay participants when the calls were genuine or simulated, but slightly less consistent when the calls were disguised. The overall match percentage was higher among FDEs than among Lay participants for signatures that were presented as genuine or simulated in the questioned/known comparison, but slightly lower for those signatures that were presented as disguised. These data seem to indicate that FDEs and Lay participants are equally as likely to be influenced by contextual information about the outcome of a prior examination, but we observed this pattern not only in manipulated calls, but also in unmanipulated calls. In other words, we observed spontaneous changes in the peer review calls even when the “prior examination” results were the same as the participants’ original calls.

One explanation of this outcome is that both the FDEs and the Lay participants were influenced by demand characteristics, although different demand characteristics may have influenced the two groups differently. The "Hawthorne effect", which is a term used to describe a particular form of demand characteristic that causes changes in behavior when individuals know that they are being observed, may have been a factor among the FDEs, even though they were informed that all identifying information would be removed from their responses prior to analysis. Lay participants may have assumed that the "prior examiners" were experts, and deferred to what they assumed to be opinions made by better qualified individuals. This finding has implications for courtroom practice, as it speaks to the influence that "expertise" exerts over inexperienced lay individuals.

FDEs were more accurate than were Lay participants across signatures and across signature views, regardless of whether the questioned/known process call was manipulated. Among both FDEs and Lay participants there was a pronounced increase in the percentage of correct-to-incorrect call changes when the calls were manipulated, compared to when the calls were not manipulated. Overall, FDEs moved their calls from incorrect to correct in a greater percentage of cases than did Lay participants, and when the process calls were not manipulated moved their calls from correct to incorrect to a lesser extent.

FDEs were far more likely than were Lay participants to place their authorship calls in the inconclusive category. This suggested that although FDEs were required by the protocol to make a process call of genuine, disguised, or simulated, they may have felt there was insufficient information contained in the signature specimens to allow them to reliably identify or eliminate the writer of the questioned signatures as the writer of the known signatures. An alternative explanation for this finding may be that this is another instance of a Hawthorne effect, and that FDEs were more conservative with their authorship calls because they were being observed. Conversely, the distribution of Lay participant authorship calls indicated that compared to FDEs, Lay participants tended to be less conservative, expressing greater confidence for those calls. This suggests that Lay participants may have afforded somewhat greater weight to the features they evaluated than did the FDEs.

The mean authorship confidence rating for the known comparison signatures was significantly lower among FDEs than among Lay participants in both the questioned/known comparison view and the peer review view. The mean authorship call confidence was greater among participants whose peer review process call matched questioned/known comparison call given to the participants during the peer review procedure (although individual analyses demonstrated that this was true only for those calls that were not manipulated). The mean authorship confidence rating in the peer review protocol was lowest among both FDE and Lay participants when the questioned/known signatures were manipulated.

These findings are consistent with those of Edwards and Smith, who found that individuals viewed arguments that were consistent with their beliefs more favorably than arguments that contradict their beliefs (Edwards & Smith, 1996), and that supporting information seems more credible and valid than information that fails to support prior beliefs. Edwards and Smith concluded that this differential evaluation of supporting and conflicting arguments appears to induce a preference for supporting information even without any motivation to have one's preferences or prior decisions confirmed.

These findings are also consistent with those of Frey and colleagues (as cited in Frey & Schulz-Hardt, 2001), who found that people tend to prefer supporting information if they have decided voluntarily for a particular alternative (Frey, 1981d; Frey & Wicklund, 1978), and the sources of information are experts rather than lay people (Frey, 1981a). In the case of FDEs, the knowledge that they were being evaluated on a domain of career-relevant behavior may have produced results that are consistent with the findings of Frey and colleagues (1986), who found that confirmation bias was stronger in anxious individuals, and also consistent with Frey's findings that confirmation bias increased if there were heightened costs associated with the information search (Frey, 1981c).

Results of the eye-tracking analyses did reveal differences in the utilization of available information and the seeking of certain kinds of information, consistent with the research described above. The mean fixation count for the known comparison signatures was greater for FDEs than for Lay participants, and there was a significant change in fixation count from the first time the signatures were viewed (QK) to the second time it they were viewed (PR), regardless of whether we manipulated the call in the peer review view.

Mean fixation duration in the known comparison signatures was greater for FDEs than for Lay participants, there was a significant increase in fixation duration from the first time the signatures were viewed (QK) to the second time they were viewed (PR), regardless of whether we manipulated the call.

The mean visit count in the known comparison signatures was greater for FDEs than for Lay participants, and there was a significant change in visit count among both FDE and Lay participants from the first time the signature was viewed (QK) to the second time it was viewed (PR), regardless of whether we manipulated the call in the peer review view. The interaction effect revealed that this increase was more pronounced among FDEs in the peer review view than among FDEs or Lay participants in the other conditions.

The mean visit duration in the known comparison signatures was greater for FDEs than for Lay participants, and there was a significant change in visit duration among both FDE and Lay participants from the first time the signature was viewed (QK) to the second time it was viewed (PR), regardless of whether we manipulated the call in the peer review view. The interaction effect revealed that this increase was more pronounced among FDEs in the peer review view than among FDEs or Lay participants in the other conditions.

Participants were not aware of the outcome of the “prior examination” as they were examining the known signatures in the peer review condition, so the increases in fixation count, fixation duration, visit count, and visit duration observed among the FDEs and Lay participants in the peer review condition strongly suggest that demand characteristics were involved in these outcomes. It seems likely that participants were impacted by the knowledge that they were being observed, and this may account for the statistically significant increases for these metrics revealed during our analyses, particularly for the significantly greater increases observed among the FDEs when compared to the Lay participants.

Fixation count for the questioned/known comparison was greater among FDEs in the peer review view than among FDEs in the questioned/known comparison view. Fixation count was greater among FDEs than among Lay participants in both call change manipulation conditions. This difference was even more pronounced among Lay participants in the peer review view.

The mean fixation duration in the questioned signatures was greater for FDEs than for Lay participants, and there was a significant change in fixation duration from the first time the signature was viewed (QK) to the second time it was viewed (PR), regardless of whether we manipulated the call in the peer review view.

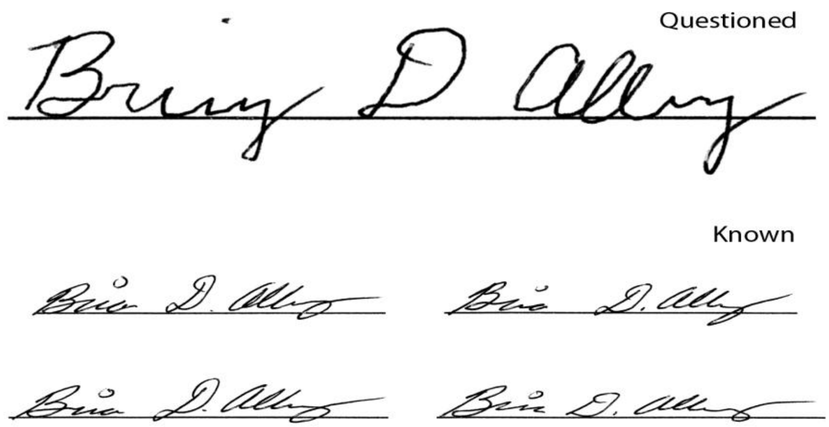
The mean visit count in the questioned signatures was greater for FDEs than for Lay participants, and there was a significant change in visit count among both FDE and Lay participants from the first time the signature was viewed (QK) to the second time it was viewed (PR), regardless of whether we manipulated the call in the peer review view. This increase was more pronounced among FDEs in the peer review view than among FDEs or Lay participants in the other conditions.

The mean visit duration in the questioned signatures was greater for FDEs than for Lay participants, and there was a significant change in visit duration among both FDE and Lay participants from the first time the signature was viewed (QK) to the second time it was viewed (PR), regardless of whether we manipulated the call in the peer review view. This increase was more pronounced among FDEs in the peer review view than among FDEs or Lay participants in the other conditions, and more pronounced in the change condition than in the no change condition.

Overall, these findings provide tentative support for Found and Ganas's assertion that domain irrelevant information has the potential to introduce bias into human decision making processes, although the extent to which our findings are due to the manipulation of the prior examination outcomes or to demand characteristics is difficult to ascertain from these data. It is clear from the eye-tracking data that the call manipulations impacted the subsequent deployment of attentional resources, and the data suggest that changing the original calls may have resulted in a greater extent of bottom-up cognitive processing as participants engaged in more extensive evaluation of signature features. However, given the indications that demand characteristics may also have contributed to these changes, these findings must be interpreted with caution.

These results varied according to the signatures viewed. Results of the individual signature analyses are presented below.

PEER REVIEW ANALYSES: Brian Albury Signature 4 (Simulated, High-Complexity, Mixed)



Binomial logistic regression was conducted to determine which among four independent variables (*process call change, authorship call change, influence of process call change,* and *influence of authorship call change*) predicted participant type (FDE or Lay). Regression results indicated that the overall model fit was questionable (-2 Log Likelihood = 91.41), but was statistically reliable in distinguishing between participant types, χ^2 (4) = 20.27, p < .001. The model correctly classified 74.1 % of cases.

Regression coefficients are presented in Table 3.5. Albury PR1. *Wald* statistics indicated that change process call, change authorship call, and process change influence significantly predicted whether the participant was a FDE or Lay participant. However, the odds ratios for change of authorship call is small, indicating little change in the likelihood of participant type related to this factor.

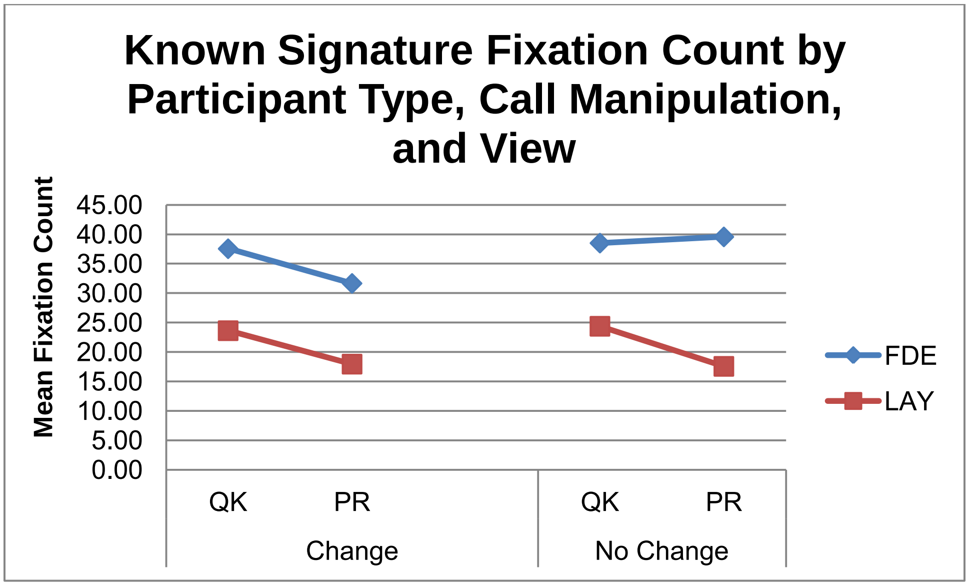
Table 3.5. Albury1
Logistic Regression Coefficients for Peer Review Analysis of Albury Signature 4

	B	*Wald*	*df*	*p*	*Odds Ratio*
Change Process Call	1.31	4.90	1	0.027	3.72
Change Authorship Call	-1.91	4.35	1	0.037	0.15
Process Change Influence	-1.35	5.61	1	0.018	0.26
Authorship Change Influence	0.24	0.13	1	0.715	1.27
Constant	1.81	4.23	1	0.040	6.10

Total Fixation Count

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation count during the initial viewing of the signature (QK Comparison View) and the second viewing of the signature (PR Comparison View) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation count existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Albury 1 presents mean fixation count by view, call manipulation, and participant type.

Figure 3.5 Albury 1



A significant main effect was revealed for *participant type*, $F(1, 80) = 6.11$, $p = .016$, $\eta^2 = .071$. No significant main effect was found for *view* ($p = .293$, *ns*), or *call manipulation* ($p = .721$, *ns*).

No significant interaction effect was found for *participant type* x *call manipulation* ($p = .743$, *ns*). No significant two-way interactions were identified for either *view* x *call manipulation* or *view* x *participant type* ($p = .723$, *ns*, and $p = .641$, *ns*, respectively).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction effect was found ($p = .623$, *ns*). Table 3.5. Albury 2 presents the analysis means and standard deviations.

Table 3.5. Albury 2

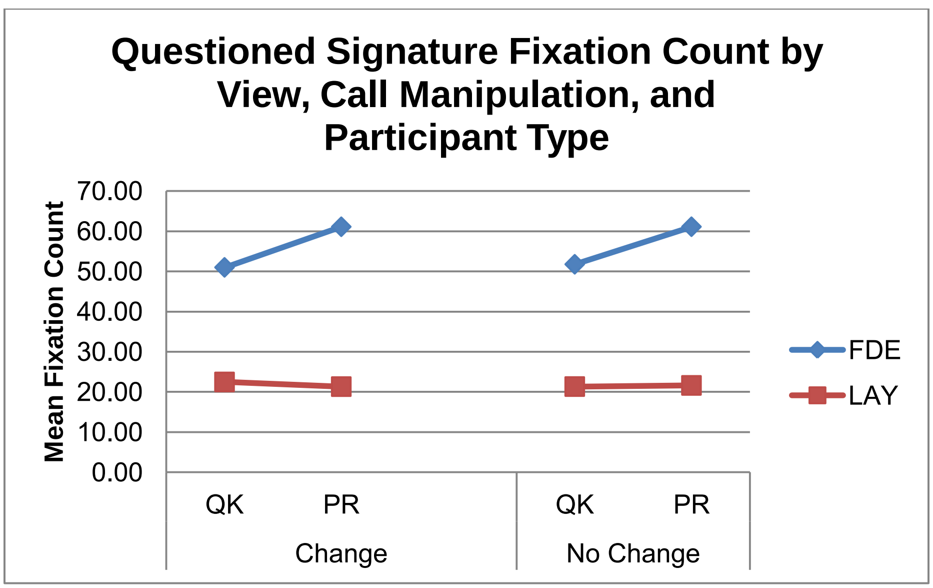
Known Signature Fixation Count by View, Call Manipulation, and Participant Type

	QK Comparison View					
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	37.56	41.16	9	38.51	34.75	35
LAY	23.63	18.43	19	24.38	20.35	21
	PR Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	31.67	20.72	9	39.57	45.91	35
LAY	17.95	16.67	19	17.57	18.09	21

These findings indicate that although the mean fixation count for the known comparison signatures was greater for FDEs than for Lay participants, there was no significant change in fixation count from the first time the signature was viewed (QK) to the second time it was viewed (PR), regardless of whether we manipulated the call in the peer review view.

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation count during the initial viewing of the signature (QK Comparison View) and the second viewing of the signature (PR Comparison View) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation count existed according to the *call manipulation* (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Albury 2 presents mean fixation count by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Albury 2



A significant main effect was revealed for *participant type*, $F(1, 80) = 30.10$, $p < .001$, $\eta^2 = .273$. No significant main effect was found for *view* ($p = .298$, *ns*), or for *call manipulation* ($p = .998$, *ns*).

No significant two-way interactions were identified for either *view* x *call manipulation* or *view* x *participant type* ($p = .970$, *ns*, and $p = .255$, *ns*, respectively). No significant interaction effect was found for *participant type* x *call manipulation* ($p = .949$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction effects were found ($p = .901$, *ns*). Table 3.5. Albury 3 presents the analysis means and standard deviations.

Table 3.5. Albury 3

Questioned Signature Fixation Count by View, Call Manipulation, and Participant Type

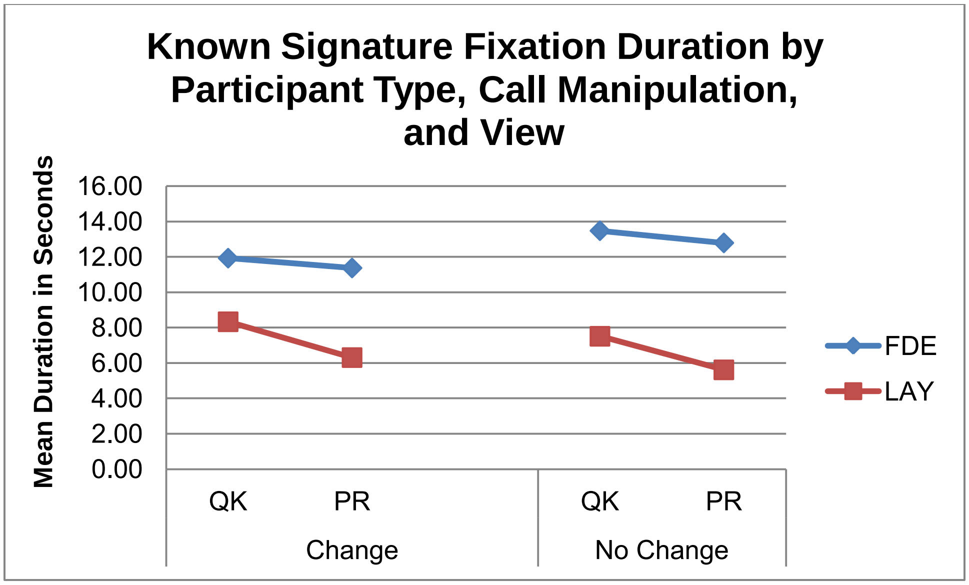
	QK Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	51.00	36.48	9	51.77	30.66	35
LAY	22.47	20.14	19	21.33	15.60	21
	PR Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	61.11	50.97	9	61.11	45.01	35
LAY	21.32	16.39	19	21.62	21.31	21

These findings indicate that although the mean fixation count in the questioned signatures was greater for FDEs than for Lay participants, there was no significant change in fixation count from the first time the signature was viewed (QK) to the second time it was viewed (PR), regardless of whether we manipulated the call in the peer review view.

Total Fixation Duration

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation duration during the initial viewing of the known comparison signatures (QK Comparison View) and the second viewing of the signatures (PR Comparison View) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Albury 3 presents mean fixation duration by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Albury 3



A significant main effect was revealed for *participant type*, $F(1, 80) = 6.48$, $p = .013$, $\eta^2 = .075$. No significant main effect was found for *view* ($p = .361$, *ns*), or *call manipulation* ($p = .866$, *ns*).

No significant two-way interaction was found for *view* x *call manipulation* ($p = .999$, *ns*), or for *view* x *participant type* ($p = .635$, *ns*). No significant interaction was found for call *manipulation* x *participant type* ($p = .602$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction effects were found ($p = .963$, *ns*). Table 3.5. Albury 4 presents the analysis means and standard deviations.

Table 3.5. Albury 4X

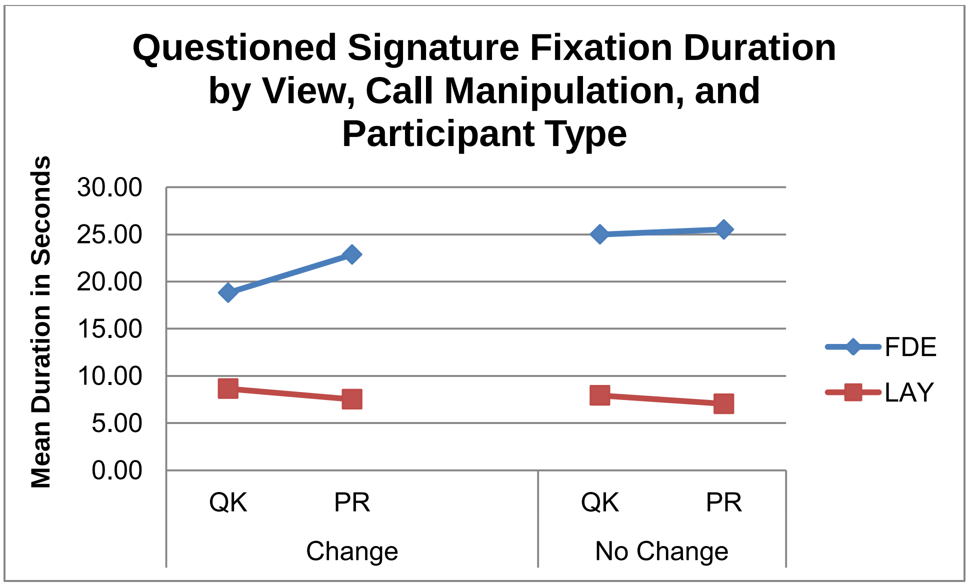
Known Signature Fixation Duration by View, Call Manipulation, and Participant Type

	QK Comparison					
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	11.93	11.83	9	13.48	12.57	35
LAY	8.33	6.82	19	7.51	5.48	21
	PR Comparison					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	11.37	11.01	9	12.79	14.12	35
LAY	6.31	6.89	19	5.61	7.00	21

These findings indicate that although the mean fixation duration in the known comparison signatures was greater for FDEs than for Lay participants, there was no significant change in fixation duration from the first time the signatures were viewed (QK) to the second time they were viewed (PR), regardless of whether we manipulated the call in the peer review view.

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation duration in seconds during the initial viewing of the questioned signature (QK Comparison View) and the second viewing of the questioned signature (PR Comparison View) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Albury 4 presents mean fixation duration by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Albury 4



A significant main effect was revealed for *participant type*, $F(1, 80) = 28.23$, $p < .001$, $\eta^2 = .261$. No significant main effect was found for *view* ($p = .351$, *ns*), or for *call manipulation* ($p = .825$, *ns*).

No significant two-way interactions were identified for either *view* x *call manipulation* or *view* x *participant type* ($p = .685$ and $p = .220$, respectively). No significant interaction effect was found for *participant type* x *call manipulation* ($p = .568$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction effects were found ($p = .645$, *ns*). Table 3.5. Albury 5 presents the analysis means and standard deviations.

Table 3.5. Albury 5
Questioned Signature Fixation Duration by View, Call manipulation, and Participant Type

	QK Comparison View					
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	18.81	10.89	9	22.86	14.50	35

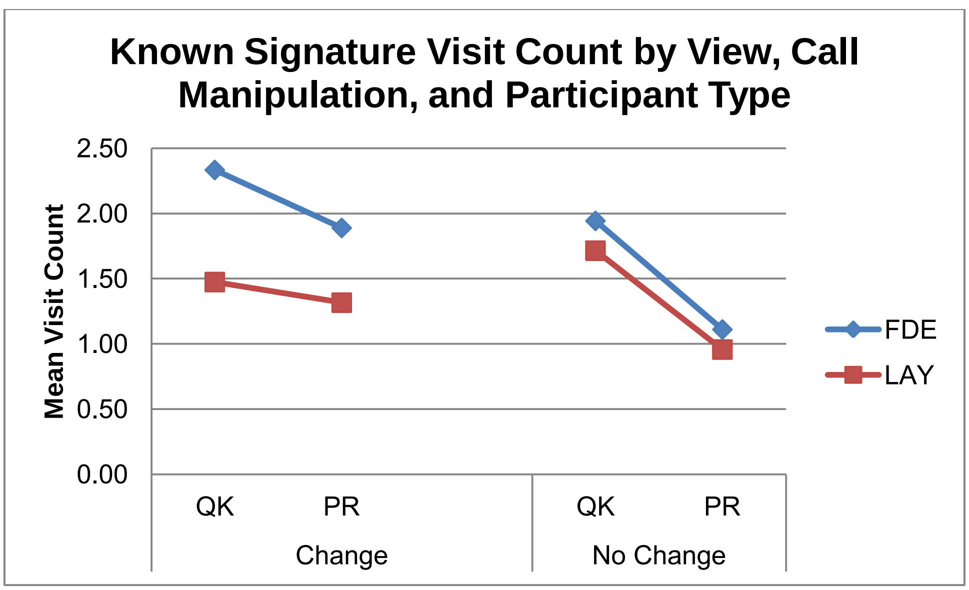
LAY	8.65	10.39	19	7.52	5.44	21
			PR Comparison View			
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	25.00	26.74	9	25.51	21.09	35
LAY	7.93	6.02	19	7.03	6.81	21

These findings indicate that although the mean fixation duration in the questioned signatures was greater for FDEs than for Lay participants, there was no significant change in fixation duration from the first time the signature was viewed (QK) to the second time it was viewed (PR), regardless of whether we manipulated the call in the peer review view.

Total Visit Count

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit count during the initial viewing of the known comparison signatures (QK Comparison View) and the second viewing of the signatures (PR Comparison View) for FDE and Lay participants. The analysis also investigated whether mean differences in visit count existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Albury 5 presents mean visit count by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Albury 5



A significant main effect was revealed for *participant type*, $F(1, 80) = 5.84$, $p = .018$, $\eta^2 = .068$. No significant main effect was found for *view* ($p = .169$, *ns*), or *call manipulation* ($p = .801$, *ns*).

No significant two-way interactions were identified for either *view* x *call manipulation* or *view* x *participant type* (p = .952, *ns*, and p = .803, *ns*, respectively). No significant interaction effect was found for *participant type* x *call manipulation* (p = .628, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction effects were found (p = .350, *ns*). Table 3.5. Albury 6 presents the analysis means and standard deviations.

Table 3.5. Albury 6

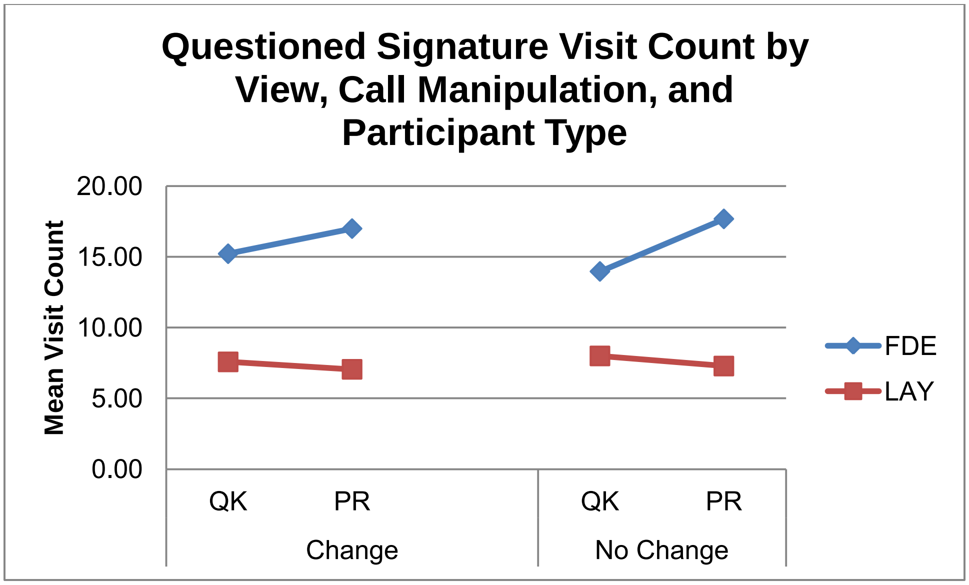
Known Signature Visit Count by View, Call Manipulation, and Participant Type

			QK Comparison View			
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	2.33	2.18	9	1.94	1.11	35
LAY	1.47	1.12	19	1.71	0.96	21
			PR Comparison View			
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	1.89	1.62	9	1.91	1.87	35
LAY	1.32	0.89	19	1.19	0.40	21

These findings indicate that although the mean visit count in the known comparison signatures was greater for FDEs than for Lay participants, there was no significant change in visit count from the first time the signatures were viewed (QK) to the second time they were viewed (PR), regardless of whether we manipulated the call in the peer review view.

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit count during the initial viewing of the signature (QK Comparison View) and the second viewing of the signature (PR Comparison View) for FDE and Lay participants. The analysis also investigated whether mean differences in visit count existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Albury 6 presents mean visit count by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Albury 6



A significant main effect was revealed for *participant type*, $F(1, 80) = 20.34$, $p < .001$, $\eta^2 = .203$. No significant main effect was found for *view* ($p = .474$, *ns*), or *call manipulation* ($p = .991$, *ns*).

No significant two-way interactions were identified for either *view* x *call manipulation* or *view* x *participant type* ($p = .768$, *ns*, and $p = .258$, *ns*, respectively). No significant interaction effect was found for *participant type* x *call manipulation* ($p = .872$, *ns*).

No significant three-way (*participant type* x *call manipulation x view*) interaction effects were found ($p = .720$, *ns*). Table 3.5. Albury 7 presents the analysis means and standard deviations.

Table 3.5. Albury 7

Questioned Signature Visit Count by View, Call Manipulation, and Participant Type

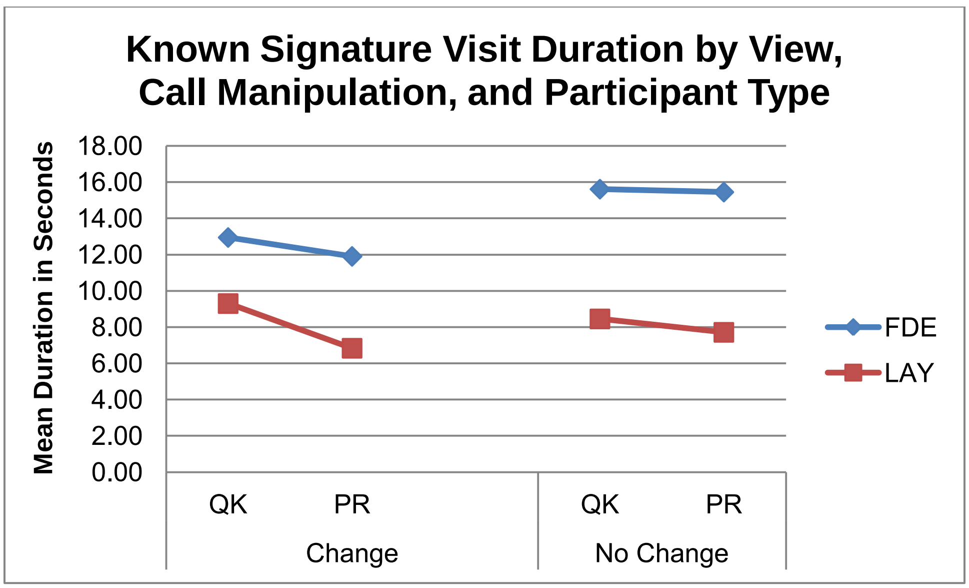
			QK Comparison View			
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	15.22	10.47	9	13.97	7.71	35
LAY	7.58	6.62	19	8.00	4.80	21
			PR Comparison View			
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	17.00	9.70	9	17.69	16.03	35
LAY	7.05	6.00	19	7.29	7.05	21

These findings indicate that although the mean visit count in the questioned signatures was greater for FDEs than for Lay participants, there was no significant change in visit count from the first time the signature was viewed (QK) to the second time it was viewed (PR), regardless of whether we manipulated the call in the peer review view.

Total Visit Duration

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit duration during the initial viewing of the known comparison signatures (QK Comparison View) and the second viewing of the known comparison signatures (PR Comparison View) for FDE and Lay participants. The analysis also investigated whether mean differences in visit duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Albury 7 presents mean visit duration by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Albury 7



A significant main effect was revealed for *participant type*, $F(1, 80) = 5.72$, $p = .019$, $\eta^2 = .067$. No significant main effect was found for *view* ($p = .265$, *ns*), or *call manipulation* ($p = .746$, *ns*).

No significant two-way interaction was found for *view* x *participant type* ($p = .941$, *ns*). No significant two-way interaction was identified for *view* x *call manipulation* ($p = .821$, *ns*) or *participant type* x *call manipulation* ($p = .558$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction effects were found ($p = .843$, *ns*). Table 3.5. Albury 8 presents the analysis means and standard deviations.

Table 3.5. Albury 8

Known Signature Visit Duration by View, Call Manipulation, and Participant Type

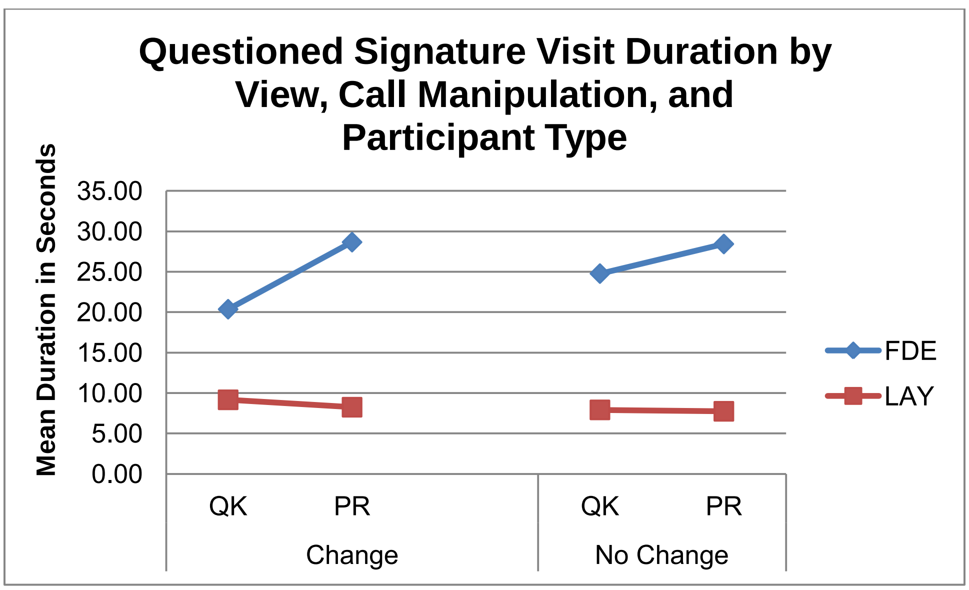
	QK Comparison View	
	Change	**No Change**

Participant	*M*	*SD*	n	*M*	*SD*	n
FDE	12.94	13.74	9	15.61	15.82	35
LAY	9.30	7.60	19	8.45	6.46	21
			PR Comparison View			
	Change			No Change		
Participant	*M*	*SD*	n	*M*	*SD*	n
FDE	11.90	10.95	9	13.66	15.45	35
LAY	6.83	6.97	19	6.40	7.71	21

These findings indicate that although the mean visit duration in the known comparison signatures was greater for FDEs than for Lay participants, there was no significant change in visit duration from the first time the known comparison signatures were viewed (QK) to the second time they were viewed (PR), regardless of whether we manipulated the call in the peer review view.

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit duration in seconds during the initial viewing of the questioned signature (QK Comparison View) and the second viewing of the questioned signature (PR Comparison View) for FDE and Lay participants. The analysis also investigated whether mean differences in visit duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Albury 8 presents mean visit duration by *view*, *call manipulation, and participant type*.

Figure 3.5 Albury 8



A significant main effect was revealed for *participant type*, $F(1, 80) = 34.02$, $p < .001$, $\eta^2 = .298$. No significant main effect was found for *view* ($p = .214$, *ns*), or for *call manipulation* ($p = .838$, *ns*).

No significant two-way interactions were identified for either *view* x *call manipulation* or *view* x *participant type* ($p = .655$ and $p = .137$, respectively). No significant interaction effect was found for *participant type* x *call manipulation* ($p = .619$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction effects were found ($p = .537$, *ns*). Table 3.5. Albury 9 presents the analysis means and standard deviations.

Table 3.5. Albury 9

Questioned Signature Visit Duration by View, Call Manipulation, and Participant Type

QK Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	20.37	12.69	9	24.77	14.87	35
LAY	9.16	11.11	19	7.91	5.74	21
PR Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	28.66	27.47	9	28.43	21.94	35
LAY	8.24	6.16	19	7.74	7.76	21

These findings indicate that although the mean visit duration in the questioned signatures was greater for FDEs than for Lay participants, there was no significant change in visit duration from the first time the signature was viewed (QK) to the second time it was viewed (PR), regardless of whether we manipulated the call in the peer review view.

PEER REVIEW ANALYSES: Will Atkinson Signature 1 (Simulated, High Complexity, Mixed)

Binomial logistic regression was conducted to determine which among four independent variables (*process call change, authorship call change, influence of process call change,* and *influence of authorship call change*) predicted participant type (FDE or Lay). Regression results indicated that the overall model fit was questionable (-2 Log Likelihood = 106.55), and was statistically unreliable in distinguishing between participant types, χ^2 (4) = 3.55, p = .470, *ns.*

Regression coefficients are presented in Table 3.5. Atkinson 1. *Wald* statistics indicated that change process call significantly predicted whether the participant was a FDE or Lay participant. The odds ratio for change of process call is large, indicating a sizeable change in the likelihood of participant type.

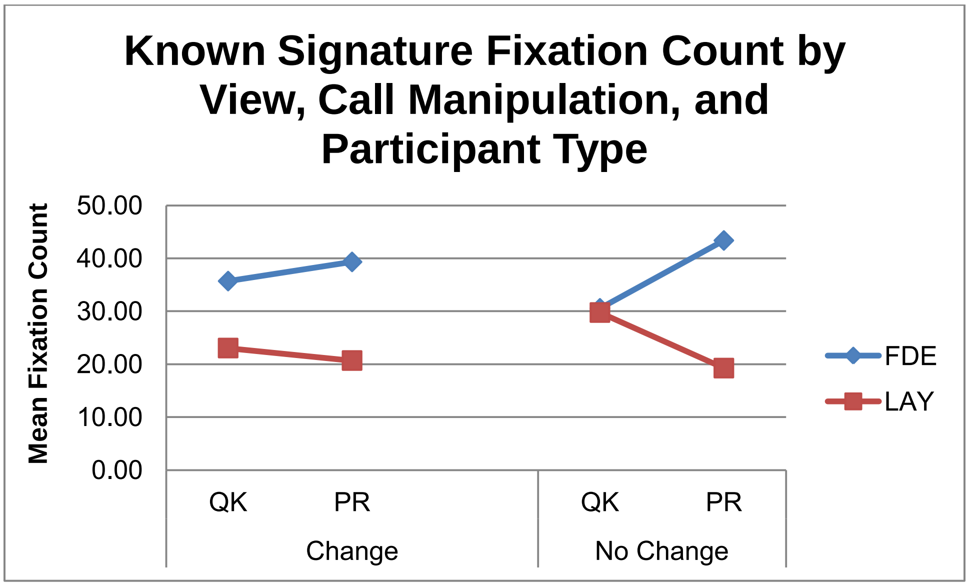
Table 3.5. Atkinson 1
Logistic Regression Coefficients for Peer Review Analysis of Atkinson Signature 1

	B	*Wald*	*df*	*p*	*Odds Ratio*
Change Process Call	1.31	2.950	1	.086	2.419
Change Authorship Call	-1.91	.089	1	.766	.749
Influence Process Change	-1.35	.029	1	.864	.912
Influence Authorship Change	0.24	.054	1	.816	.863
Constant	1.81	.073	1	.787	.790

<u>*Total Fixation Count*</u>

Known Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation count during the initial viewing of the signature (QK Comparison View) and the second viewing of the signature (PR Comparison View) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation count existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Atkinson 1 presents mean fixation count by view, call manipulation, and participant type.

Figure 3.5 Atkinson 1



A significant main effect was revealed for *participant type*, $F(1, 79) = 4.79$, $p = .031$, $\eta^2 = .057$. No significant main effect was found for *view* ($p = .821$, *ns*), or *call manipulation* ($p = .871$, *ns*).

No significant two-way interactions were identified for either *view* x *call manipulation* or *view* x *participant type* ($p = .947$, *ns*, and $p = .067$, *ns*, respectively). No significant interaction effect was found for *participant type* x *call manipulation* ($p = .804$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction effects were found ($p = .276$, *ns*). Table 3.5. Atkinson 2 presents the analysis means and standard deviations.

Table 3.5. Atkinson 2

Known Signature Fixation Count by View, Call Manipulation, and Participant Type

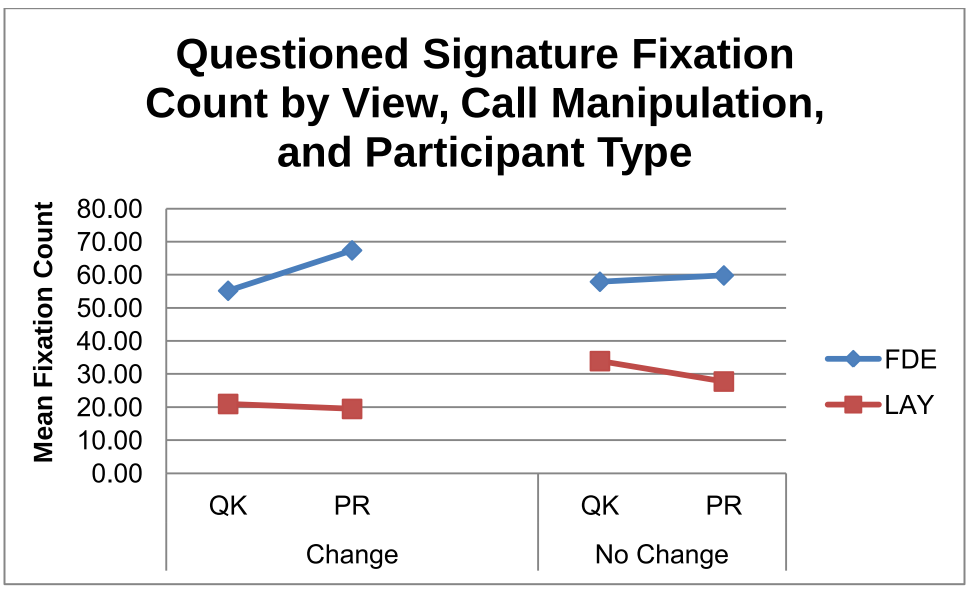
	QK Comparison View					
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	35.69	33.41	32	30.55	25.80	11
LAY	23.04	24.75	28	29.75	19.84	12
	PR Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**

FDE	39.31	46.23	32	43.36	24.84	11
LAY	20.68	19.45	28	19.25	18.99	12

These findings indicate that although the mean fixation count in the known comparison signatures was greater for FDEs than for Lay participants, there was no significant change in fixation count from the first time the signatures were viewed (QK) to the second time they were viewed (PR), regardless of whether we manipulated the call in the peer review view.

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation count during the initial viewing of the signature (QK Comparison View) and the second viewing of the signature (PR Comparison View) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation count existed according to the *call manipulation* (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Atkinson 2 presents mean fixation count by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Atkinson 2



A significant main effect was revealed for *participant type*, $F(1, 79) = 19.52$, $p < .001$, $\eta^2 = .198$. No significant main effect was found for *view* ($p = .757$, *ns*), or for *call manipulation* ($p = .602$, *ns*).

No significant two-way interactions were identified for either *view* x *call manipulation* or *view* x *participant type* ($p = .474$, *ns*, and $p = .298$, *ns*, respectively). No significant interaction effect was found for *participant type* x *call manipulation* ($p = .407$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction effects were found ($p = .787$, *ns*). Table 3.5. Atkinson 3 presents the analysis means and standard deviations.

Table 3.5. Atkinson 3

Questioned Signature Fixation Count by View, Call Manipulation, and Participant Type

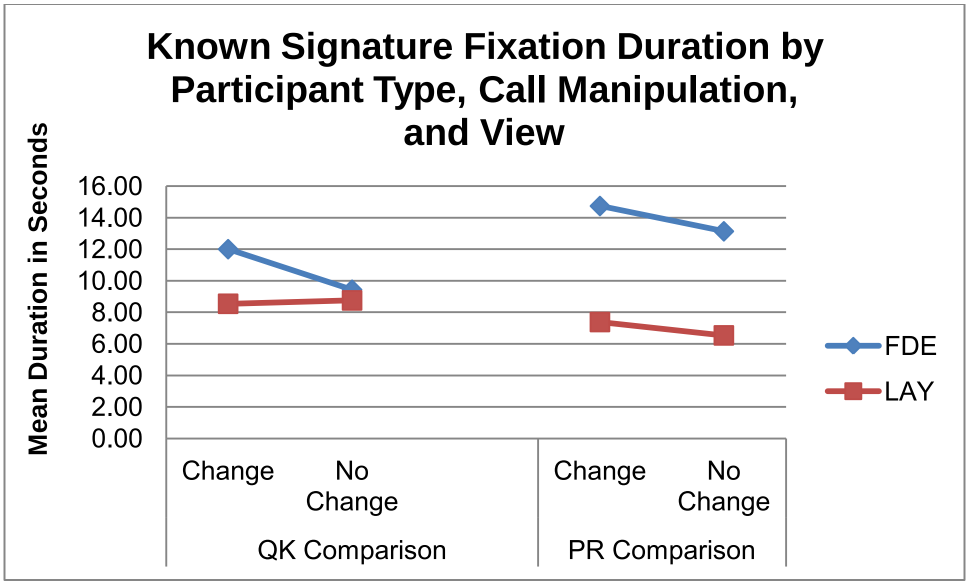
	QK Comparison View					
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	55.19	34.58	32	57.91	38.06	11
LAY	20.96	23.75	28	33.92	31.26	12
	PR Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	67.41	62.85	32	59.82	41.92	11
LAY	19.46	16.47	28	27.75	23.77	12

These findings indicate that the mean fixation count in the questioned signature was greater for FDEs the first time the signature was viewed (QK), and decreased for FDEs the second time it was viewed (PR), the opposite was true for Lay participants. There was no significant change in fixation count for either FDEs or Lay participants from the first time the signature was viewed (QK), regardless of whether we manipulated the call in the peer review view.

Total Fixation Duration

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation duration during the initial viewing of the known comparison signatures (QK Comparison View) and the second viewing of the known comparison signatures (PR Comparison View) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Atkinson 3 presents mean fixation count by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Atkinson 3



No significant main effect was found for *view* (*p* = .361, *ns*), or *call manipulation* (*p* = .866, *ns*). No significant main effect was found for *participant type*, (*p* = .081, *ns*).

No significant two-way interaction was found for *view* x *call manipulation* (*p* = .999, *ns*), or for *view* x *participant type* (*p* = .635, *ns*). No significant interaction was found for call *manipulation* x *participant type* (*p* = .602, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction effects were found (*p* = .963, *ns*).

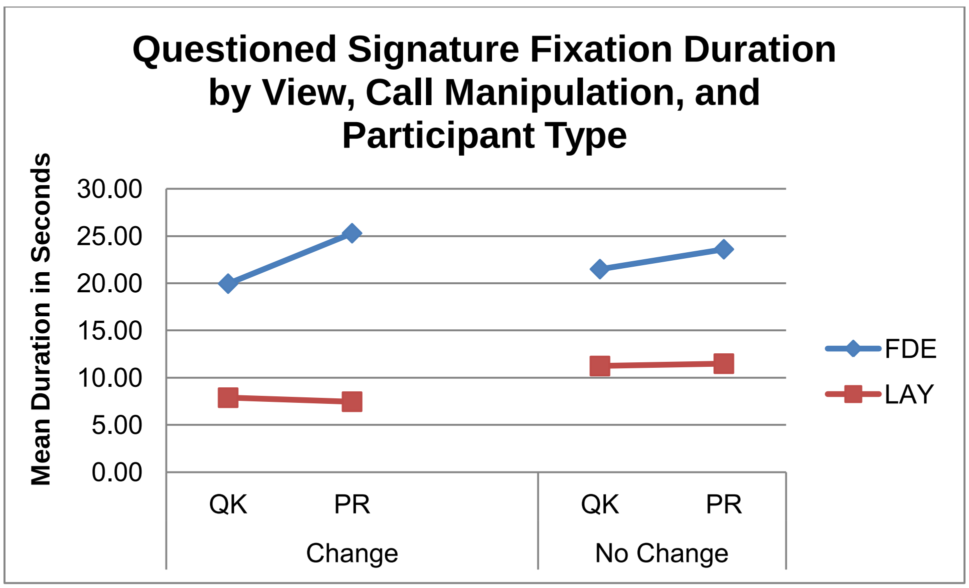
Table 3.5. Atkinson 4
Questioned Signature Fixation Duration by View, Call Manipulation, and Participant Type

QK Comparison View						
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	12.00	12.05	32	9.43	7.68	11
LAY	8.54	13.52	28	8.75	4.78	12
PR Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	14.74	19.57	32	13.13	7.45	11
LAY	7.38	9.09	28	6.53	6.41	12

These findings indicate that although fixation duration was greater for FDEs the second time the known comparison signatures were viewed (PR), there was no significant change in fixation duration in the known comparison signatures from the first time the signatures were viewed (QK) to the second time they were viewed (PR), regardless of whether the participant was a FDE or Lay participant, or whether we manipulated the call in the peer review view.

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation duration in seconds during the initial viewing of the questioned signature (QK Comparison View) and the second viewing of the questioned signature (PR Comparison View) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Atkinson 4 presents mean fixation duration by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Atkinson 4



A significant main effect was revealed for *participant type*, $F(1, 79) = 20.85$, $p < .001$, $\eta^2 = .209$. No significant main effect was found for *view* ($p = .371$, *ns*), or for *call manipulation* ($p = .530$, *ns*).

No significant two-way interactions were identified for either *view* x *call manipulation* or *view* x *participant type* ($p = .752$ and $p = .348$, respectively). No significant interaction effect was found for *participant type* x *call manipulation* ($p = .512$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction effects were found ($p = .630$, *ns*). Table 3.5. Atkinson 5 presents the analysis means and standard deviations.

Table 3.5. Atkinson 5

Questioned Signature Fixation Duration by View, Call Manipulation, and Participant Type

	QK Comparison View	
	Change	**No Change**

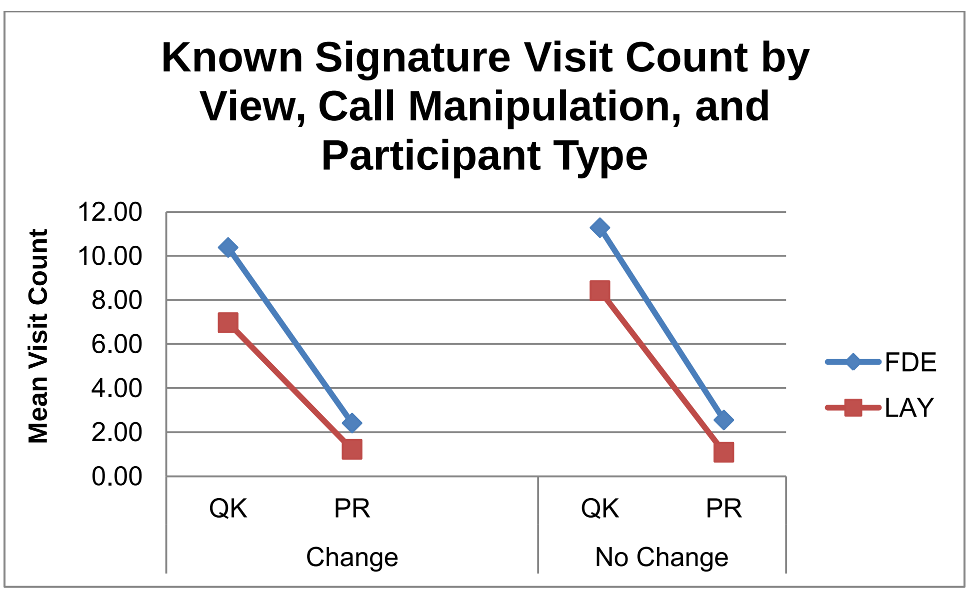
Participant	*M*	*SD*	n	*M*	*SD*	n
FDE	19.96	11.61	32	21.50	14.86	11
LAY	7.88	9.92	28	11.24	9.34	12
			PR Comparison View			
		Change			**No Change**	
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	25.30	23.10	32	23.60	16.15	11
LAY	7.46	6.81	28	11.48	12.62	12

These findings indicate that although the mean fixation duration in the questioned signature was greater for FDEs than for Lay participants, there was no significant change in fixation duration from the first time the signature was viewed (QK) to the second time it was viewed (PR), regardless of whether we manipulated the call in the peer review view.

<u>*Total Visit Count*</u>

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit count during the initial viewing of the signature (QK Comparison View) and the second viewing of the signature (PR Comparison View) for FDE and Lay participants. The analysis also investigated whether mean differences in visit count existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Atkinson 5 presents mean visit count by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Atkinson 5



A significant main effect was revealed for *participant type*, $F(1, 79) = 5.34$, $p = .023$, $\eta^2 = .063$. A significant main effect was revealed for *view*, $F(1, 79) = 94.45$, $p < .001$, $\eta^2 = .545$. No significant main effect was found for *call manipulation* ($p = .801$, *ns*).

No significant two-way interactions were identified for either *view* x *call manipulation* or *view* x *participant type* ($p = .447$, *ns*, and $p = .242$, *ns*, respectively). No significant interaction effect was found for *participant type* x *call manipulation* ($p = .941$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction effects were found ($p = .788$, *ns*). Table 3.5. Atkinson 6 presents the analysis means and standard deviations.

Table 3.5. Atkinson 6

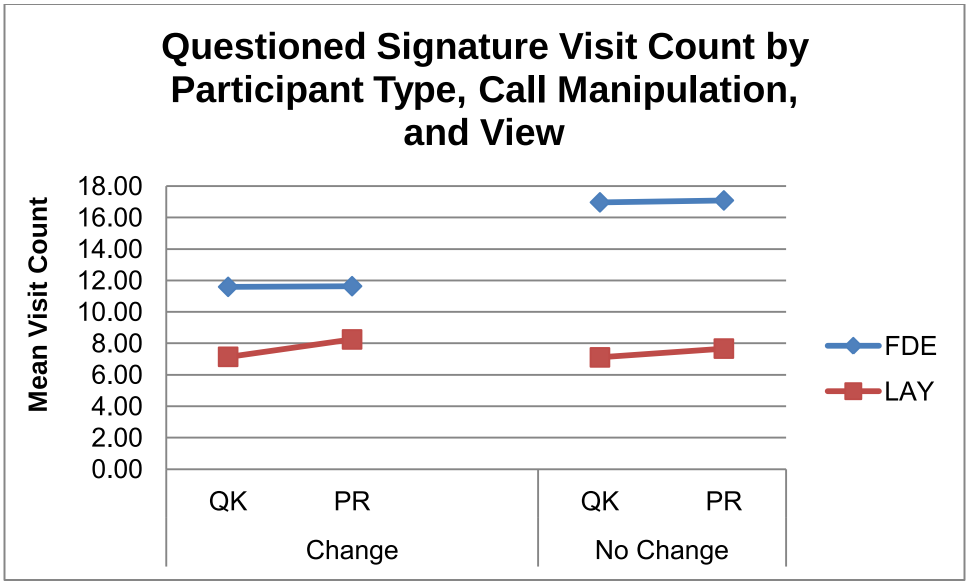
Known Signature Visit Count by View, Call Manipulation, and Participant Type

	QK Comparison View					
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	10.38	7.67	32	11.27	7.48	11
LAY	6.96	5.15	28	8.42	4.70	12
	PR Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	2.41	4.23	32	2.55	2.62	11
LAY	1.21	0.57	28	1.08	0.29	12

These findings indicate that the mean fixation count in the known comparison signatures was greater for FDEs than for Lay participants, and that fixation count was significantly lower the second time the known comparison signatures were viewed (PR), regardless of whether we manipulated the call in the peer review view.

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit count during the initial viewing of the questioned signature (QK Comparison View) and the second viewing of the questioned signature (PR Comparison View) for FDE and Lay participants. The analysis also investigated whether mean differences in visit count existed according to the call manipulation (experimental – change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Atkinson 6 presents mean visit count by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Atkinson 6



Significant main effects were revealed for *participant type*, $F(1, 79) = 12.34$, $p = .001$, $\eta^2 = .135$, and *view*, $F(1, 79) = 4.12$, $p = .046$, $\eta^2 = .050$. No significant main effect was found for *call manipulation* ($p = .813$, *ns*).

A significant interaction effect was found for *view* x *participant type*, $F(1, 79) = 5.18$, $p = .025$, $\eta^2 = .062$. No significant two-way interaction was identified for *view* x *call manipulation* ($p = .926$, *ns*). No significant interaction effect was found for *participant type* x *call manipulation* ($p = .846$, *ns*).

No significant three-way (*participant type* x *call manipulation x view*) interaction effects were found ($p = .901$, *ns*). Table 3.5. Atkinson a PR 7 presents the analysis means and standard deviations.

Table 3.5. Atkinson 7

Questioned Signature Visit Count by View, Call Manipulation, and Participant Type

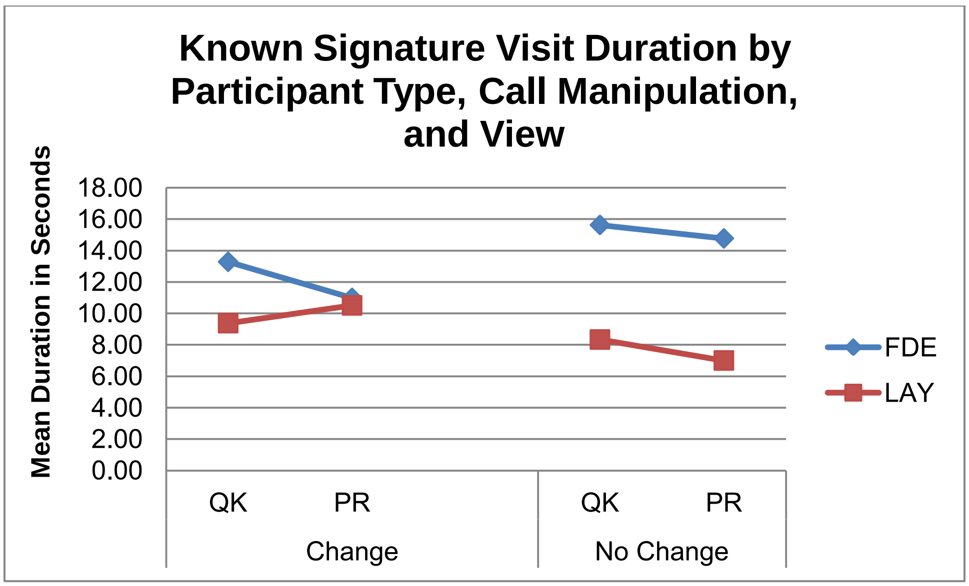
			QK Comparison View			
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	11.59	7.37	32	11.64	7.59	11
LAY	7.14	5.47	28	8.25	4.11	12
			PR Comparison View			
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	16.97	16.27	32	17.09	9.80	11
LAY	7.11	6.02	28	7.67	6.75	12

These findings indicate that the mean visit count in the questioned signature was greater for FDEs than for Lay participants, and that among FDEs the mean number of visits was greater from the first time the signature was viewed (QK) to the second time it was viewed (PR), regardless of whether we manipulated the call in the peer review view. Conversely, no significant changes were identified among Lay participants for either view or call manipulation.

<u>*Total Visit Duration*</u>

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit duration during the initial viewing of the signatures (QK Comparison View) and the second viewing of the signatures (PR Comparison View) for FDE and Lay participants. The analysis also investigated whether mean differences in visit duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Atkinson 7 presents mean visit duration by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Atkinson 7



No significant main effect was found for *view* (p = .833, *ns*), for *call manipulation* (p = .762, *ns*), or for *participant type*, (p = .081, *ns*).

No significant two-way interaction was found for *view* x *call manipulation* (p = .891, *ns*), or for *view* x *participant type* (p = .157, *ns*). No significant interaction was found for call *manipulation* x *participant type* (p = .790, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction effects were found (p = .603, *ns*). Table 3.5. Atkinson 8 presents the analysis means and standard deviations.

Table 3.5. Atkinson 8

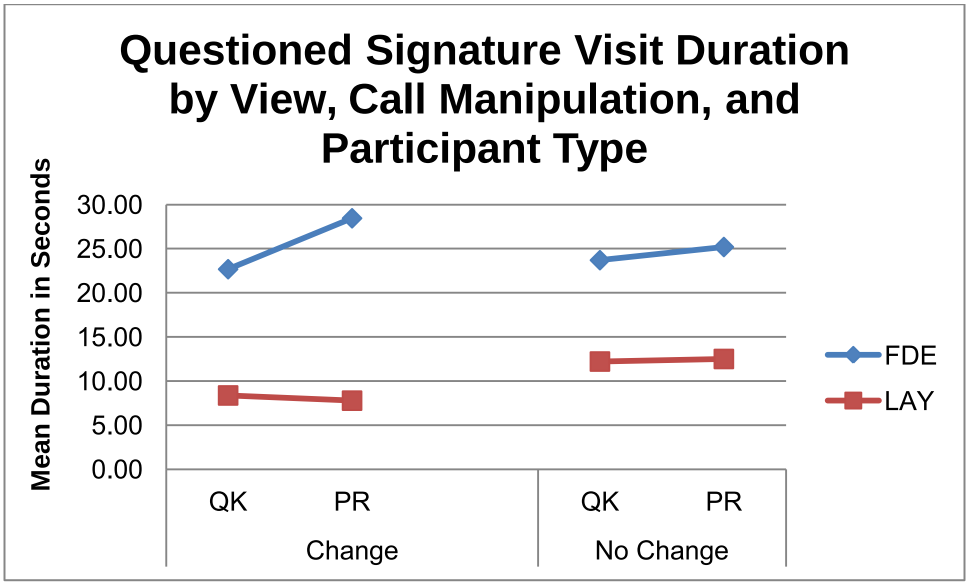
Known Signature Visit Duration by View, Call Manipulation, and Participant Type

QK Comparison View						
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	13.28	13.46	32	10.98	9.49	11
LAY	9.37	13.84	28	10.51	6.70	12
PR Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	15.62	20.60	32	14.77	8.44	11
LAY	8.33	9.58	28	7.00	6.83	12

These findings indicate that the mean visit duration in the known comparison signatures was no greater for FDEs than for Lay participants, and there was no significant change in visit duration from the first time the signatures were viewed (QK) to the second time they were viewed (PR), regardless of whether we manipulated the call in the peer review view.

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit duration in seconds during the initial viewing of the signature (QK Comparison View) and the second viewing of the signature (PR Comparison View) for FDE and Lay participants. The analysis also investigated whether mean differences in visit duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Atkinson 8 presents mean visit duration by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Atkinson 8



A significant main effect was revealed for *participant type*, $F(1, 79) = 22.73$, $p < .001$, $\eta^2 = .223$. No significant main effect was found for *view* ($p = .431$, *ns*), or *call manipulation* ($p = .611$, *ns*).

No significant two-way interaction was found for *view* x *participant type* ($p = .700$, *ns*). No significant two-way interaction was identified for *view* x *call manipulation* ($p = .393$, *ns*) or *participant type* x *call manipulation* ($p = .387$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction effects were found ($p = .559$, *ns*). Table 3.5. Atkinson 9 presents the analysis means and standard deviations.

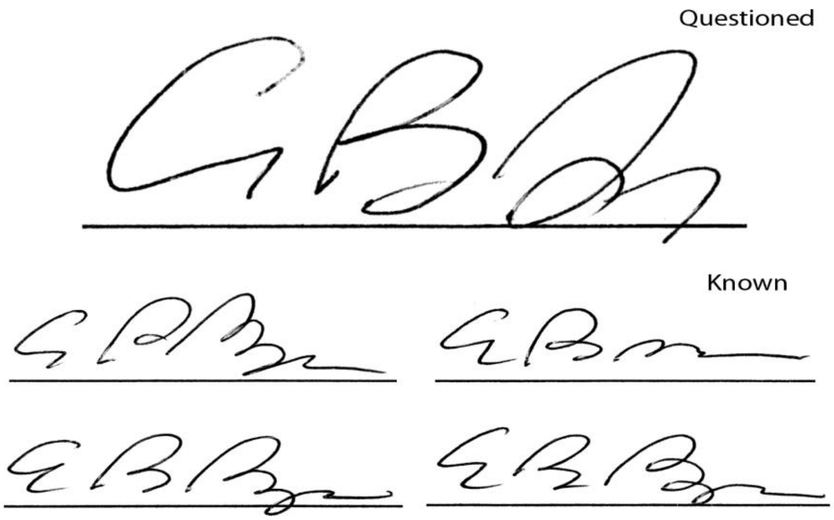
Table 3.5. Atkinson 9

Questioned Signature Visit Duration by View, Call Manipulation, and Participant Type

QK Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	22.69	13.45	32	23.72	17.21	11
LAY	8.38	10.31	28	12.23	10.19	12
PR Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	28.46	24.71	32	25.21	17.70	11
LAY	7.79	7.10	28	12.52	13.16	12

These findings indicate that although the mean visit duration in the questioned signature was greater for FDEs than for Lay participants, there was no significant change in visit duration from the first time the signature was viewed (QK) to the second time it was viewed (PR), regardless of whether we manipulated the call in the peer review view.

PEER REVIEW ANALYSES: Bryan Bouysou Signature 6 (Simulated, Low Complexity, Mixed)



Binomial logistic regression was conducted to determine which among four independent variables (*process call change, authorship call change, influence of process call change,* and *influence of authorship call change*) predicted participant type (FDE or Lay). Regression results indicated that the overall model fit was questionable (-2 Log Likelihood = 84.49), but was statistically reliable in distinguishing between participant types, χ^2 (4) = 16.74, p = .002. The model correctly classified 71.6 % of cases.

Regression coefficients are presented in Table 3.5. Bouysou 1. *Wald* statistics indicated that change process call, and change authorship call significantly predicted whether the participant was a FDE or Lay participant. The odds ratios for change of process call and change of authorship call are large, indicating a sizeable change in the likelihood of participant type.

Table 3.5. Bouysou 1
Logistic Regression Coefficients for Peer Review Analysis of Bouysou Signature 6

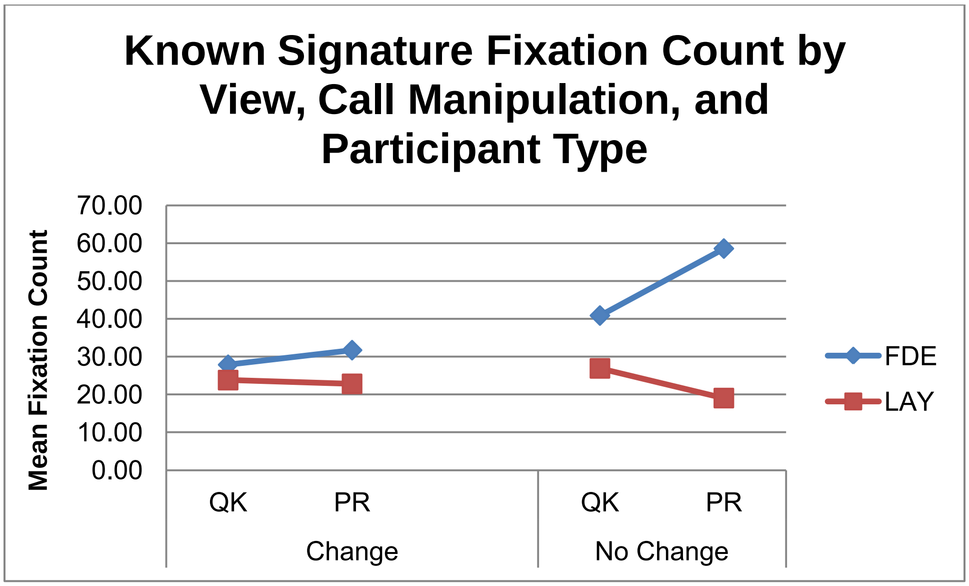
	B	*Wald*	*df*	*Sig.*	*Exp(B)*
Change Process Call	.987	2.90	1	.089	2.684
Change Authorship Call	2.835	5.29	1	.021	17.026
Influence Process Change	-.225	0.14	1	.704	.799
Influence Authorship Change	-1.692	2.14	1	.144	.184
Constant	-1.319	3.42	1	.064	.267

<u>Total Fixation Count</u>

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant

differences existed in the mean fixation count during the initial viewing of the known comparison signatures (QK comparison) and the second viewing of the signatures (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation count existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Bouysou 1 presents mean fixation count by view, call manipulation, and participant type.

Figure 3.5 Bouysou 1



A significant main effect was revealed for *participant type*, $F(1, 80) = 4.61$, $p = .035$, $\eta^2 = .055$. No significant main effect was found for *view* ($p = .475$, *ns*), or *call manipulation* ($p = .209$, *ns*).

No significant two-way interactions were identified for either *view* x *call manipulation* or *view* x *participant type* ($p = .694$, *ns*, and $p = .090$, *ns*, respectively). No significant interaction effect was found for *participant type* x *call manipulation* ($p = .194$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction effects were found ($p = .246$, *ns*). Table 3.5. Bouysou 2 presents the analysis means and standard deviations.

Table 3.5. Bouysou 2

Known Signature Fixation Count by View, Call Manipulation, and Participant Type

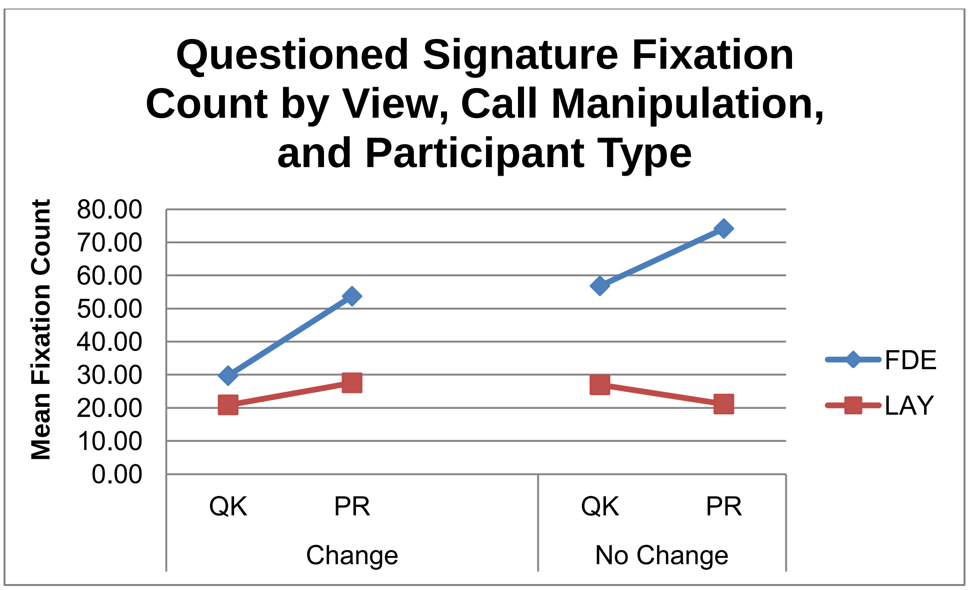
	QK Comparison View					
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	27.86	19.76	7	40.86	35.75	37
LAY	23.80	23.83	20	26.90	23.92	20
	PR Comparison View					
	Change			**No Change**		

Participant	*M*	*SD*	n	*M*	*SD*	n
FDE	31.71	18.27	7	58.57	52.84	37
LAY	22.80	23.26	20	19.05	17.17	20

These findings indicate that although the mean fixation count for the known comparison signatures was overall greater for FDEs than for Lay participants, there was no significant change in fixation count from the first time the signature was viewed (QK) to the second time it was viewed (PR), regardless of whether we manipulated the call in the peer review view. Although the fixation count was greater for Lay participants in the No Change/PR condition, this interaction was not statistically significant.

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation count during the initial viewing of the questioned signature (QK comparison) and the second viewing of the questioned signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation count existed according to the *call manipulation* (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Bouysou 2 presents mean fixation count by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Bouysou 2



A significant main effect was revealed for *participant type*, $F(1, 80) = 12.46$, $p = .001$, $\eta^2 = .135$. No significant main effect was found for *view* ($p = .060$, *ns*), or for *call manipulation* ($p = .161$, *ns*).

No significant two-way interactions were identified for either *view* x *call manipulation* or *view* x *participant type* (p = .389, *ns*, and p = .070, *ns*, respectively). No significant interaction effect was found for *participant type* x *call manipulation* (p = .155, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction effects were found (p = .794, *ns*). Table 3.5. Bouysou 3 presents the analysis means and standard deviations.

Table 3.5. Bouysou 3
Questioned Signature Fixation Count by View, Call Manipulation, and Participant Type

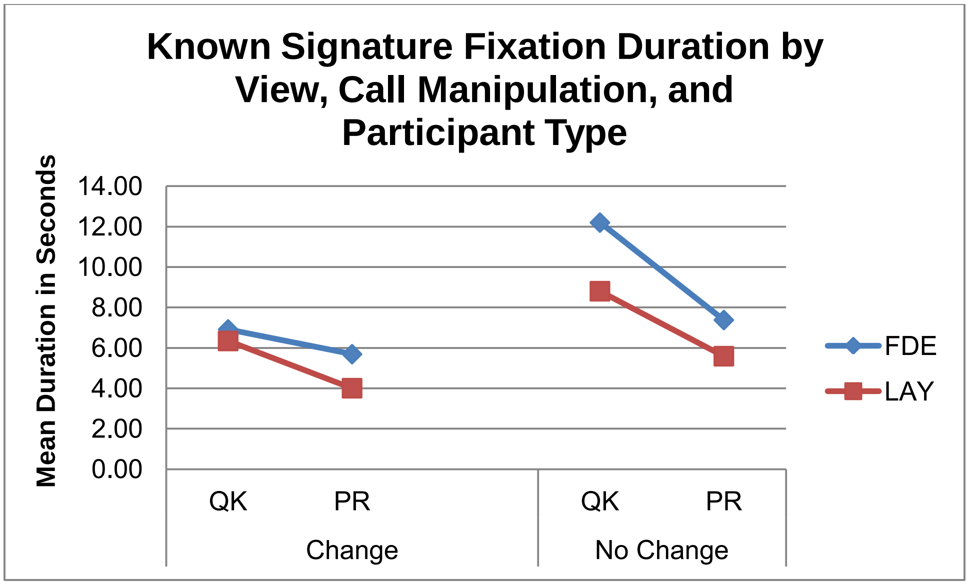
	QK Comparison View					
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	29.71	7.41	7	56.84	43.70	37
LAY	20.90	19.11	20	26.95	22.97	20
	PR Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	53.71	21.78	7	74.16	59.53	37
LAY	27.55	27.87	20	21.15	18.15	20

These findings indicate that although the mean fixation count in the questioned signature was greater for FDEs than for Lay participants, there was no significant change in fixation count from the first time the signature was viewed (QK) to the second time it was viewed (PR), regardless of whether we manipulated the call in the peer review view.

Total Fixation Duration

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation duration during the initial viewing of the signatures (QK comparison) and the second viewing of the signatures (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Bouysou 3 presents mean fixation count by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Bouysou 3



A significant main effect was found for *view*, $F(1, 80) = 4.49$, $p = .037$, $\eta^2 = .053$. No significant main effect was found for *participant type* ($p = .636$, *ns*), or *call manipulation* ($p = .078$, *ns*).

No significant two-way interaction was found for *view* x *call manipulation* ($p = .416$, *ns*), or for *view* x *participant type* ($p = .928$, *ns*). No significant interaction was found for call *manipulation* x *participant type* ($p = .636$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction effects were found ($p = .621$, *ns*). Table 3.5. Bouysou 4 presents the analysis means and standard deviations.

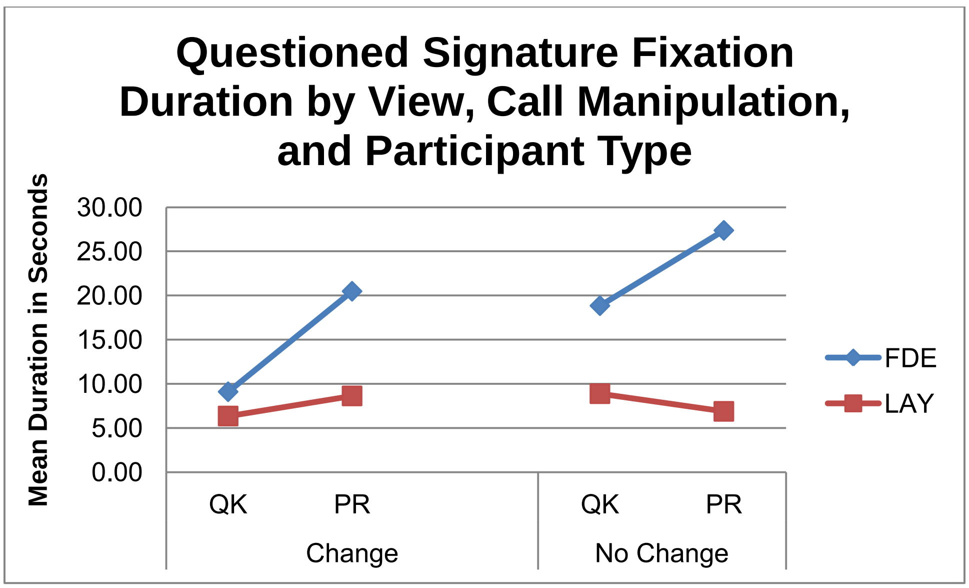
Table 3.5. Bouysou 4
Known Signature Fixation Duration by View, Call Manipulation, and Participant Type

QK Comparison View						
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	6.91	3.48	7	12.20	11.54	37
LAY	6.34	4.74	20	8.80	9.44	20
PR Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	5.69	5.83	7	7.37	7.24	37
LAY	4.00	3.23	20	5.59	6.48	20

These findings indicate that although the mean fixation duration for the known comparison signatures was no different for FDEs and Lay participants, there was a significant change in fixation duration from the first time the known comparison signatures were viewed (QK) to the second time they were viewed (PR), regardless of whether we manipulated the call in the peer review view. Although this trend is more pronounced in the No Change than in the Change condition, this factor was not statistically significant.

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation duration in seconds during the initial viewing of the questioned signature (QK comparison) and the second viewing of the signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Bouysou 4 presents mean fixation duration by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Bouysou 4



A significant main effect was revealed for *participant type*, $F(1, 80) = 15.74$, $p < .001$, $\eta^2 = .164$, and also for *view*, $F(1, 80) = 6.36$, $p = .014$, $\eta^2 = .074$. No significant main effect was found *call manipulation* ($p = .530$, *ns*).

A significant interaction effect was found for *view* x *participant type*, $F(1, 80) = 6.02$, $p = .016$, $\eta^2 = .070$. No significant two-way interactions were identified for either *view* x *call manipulation* ($p = .375$, ns). No significant interaction effect was found for *participant type* x *call manipulation* ($p = .166$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction effects were found ($p = .859$, *ns*). Table 3.5. Bouysou 5 presents the analysis means and standard deviations.

Table 3.5. Bouysou 5

Questioned Signature Fixation Duration by View, Call Manipulation, and Participant Type

QK Comparison View

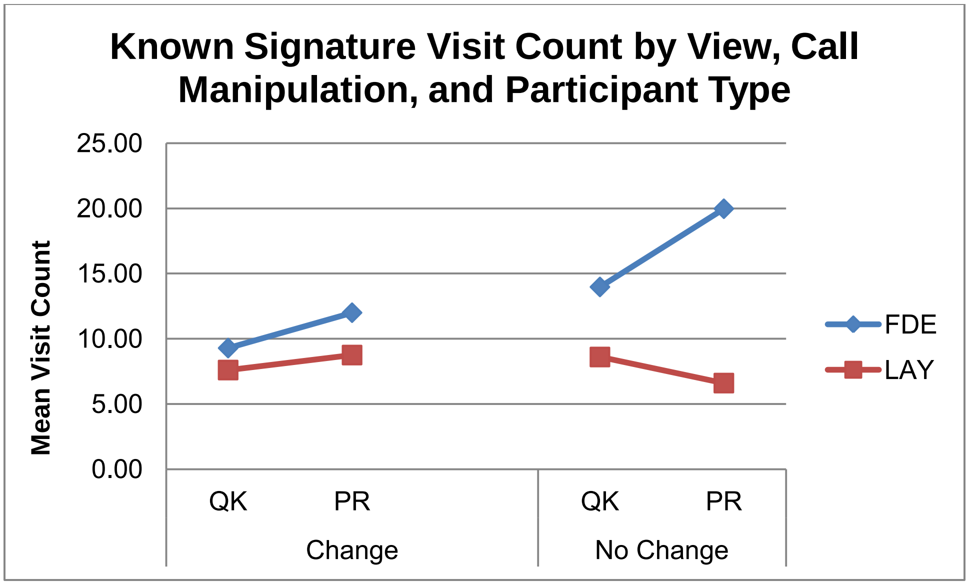
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	9.10	1.82	7	18.85	14.42	37
LAY	6.35	6.15	20	8.88	8.94	20
PR Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	20.48	9.27	7	27.38	21.29	37
LAY	8.63	8.01	20	6.88	6.61	20

These findings indicate that the mean fixation duration in the questioned signature was greater for FDEs than for Lay participants, and that among FDEs there was a significant increase in fixation duration from the first time the signature was viewed (QK) to the second time it was viewed (PR), regardless of whether we manipulated the call in the peer review view. By contrast, fixation duration decreased for Lay participants from the first time the signature was viewed (QK) to the second time it was viewed (PR). Fixation duration tended to be greater for FDEs in the No Change condition, but this trend was not statistically significant.

Total Visit Count

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit count during the initial viewing of the known comparison signatures (QK comparison) and the second viewing of the signatures (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in visit count existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Bouysou 5 presents mean visit count by *view, call manipulation*, and *participant type*.

Figure 3.5 Bouysou 5



A significant main effect was revealed for *participant type*, $F(1, 80) = 6.39$, $p = .013$, $\eta^2 = .074$. No significant main effect was found for *call manipulation* or *view* ($p = .223$, *ns*, and $p = .117$, *ns*, respectively).

No significant two-way interactions were identified for either *view* x *call manipulation* or *view* x *participant type* ($p = .978$, *ns*, and $p = .057$, *ns*, respectively). No significant interaction effect was found for *participant type* x *call manipulation* ($p = .144$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction effects were found ($p = .198$, *ns*). Table 3.5. Bouysou 6 presents the analysis means and standard deviations.

Table 3.5. Bouysou 6

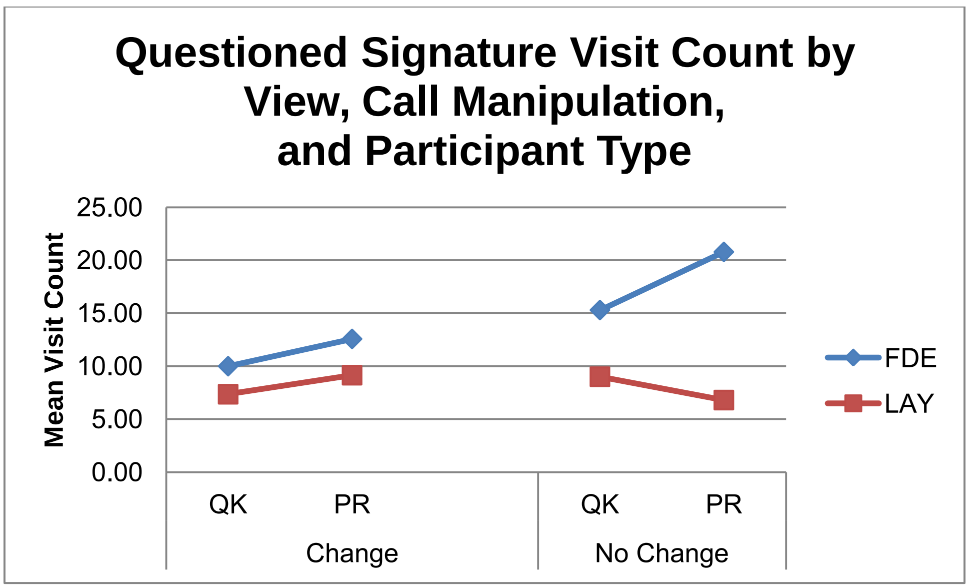
Known Signature Visit Count by View, Call Manipulation, and Participant Type

	QK Comparison View					
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	9.29	3.55	7	13.97	10.99	37
LAY	7.60	5.31	20	8.60	7.47	20
	PR Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	12.00	5.32	7	19.97	15.54	37
LAY	8.75	8.14	20	6.60	5.23	20

These findings indicate that although the mean visit count for the known comparison signatures was greater for FDEs than for Lay participants, there was no significant change in visit count from the first time the signatures were viewed (QK) to the second time they were viewed (PR), regardless of whether we manipulated the call in the peer review view. Visit count tended to be greater for FDEs in the No Change condition, but this trend was not statistically significant.

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit count during the initial viewing of the questioned signature (QK comparison) and the second viewing of the questioned signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in visit count existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Bouysou 6 presents mean visit count by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Bouysou 6



A significant main effect was revealed for *participant type*, $F(1, 80) = 7.44$, $p = .008$, $\eta^2 = .085$. No significant main effect was found for *call manipulation* or *view* ($p = .189$, *ns*, and $p = .143$, *ns*, respectively).

No significant two-way interaction was identified for *view* x *call manipulation* ($p = .835$, *ns*). No significant interaction effect was found for *participant type* x *call manipulation* ($p = .145$, *ns*). No significant interaction effect was found for *view* x *participant type*, ($p = .107$, *ns*).

No significant three-way (*participant type* x *call manipulation x view*) interaction effects were found ($p = .186$, *ns*). Table 3.5. Bouysou 7 presents the analysis means and standard deviations.

Table 3.5. Bouysou 7

Questioned Signature Visit Count by View, Call Manipulation, and Participant Type

QK Comparison View

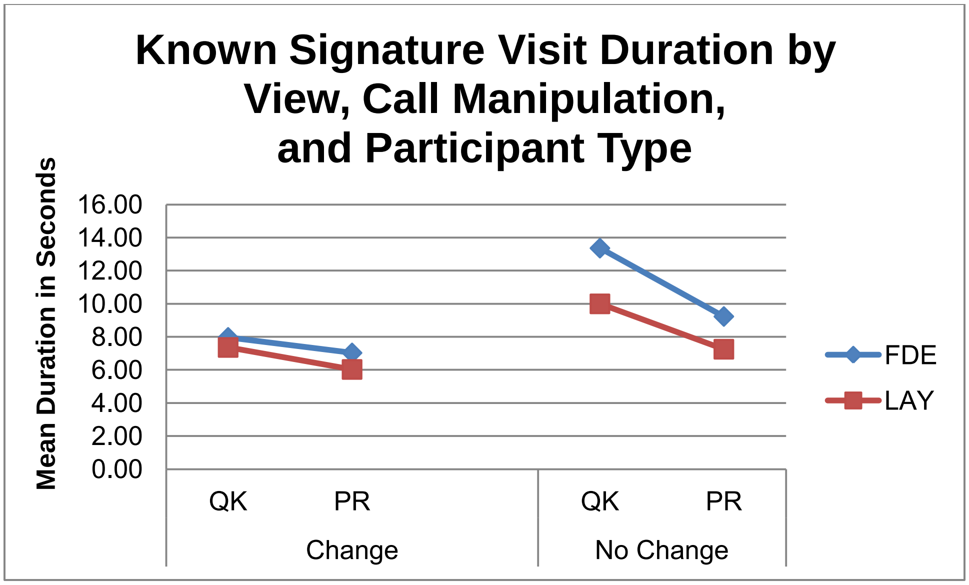
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	10.00	2.89	7	15.30	11.67	37
LAY	7.35	5.59	20	9.00	7.62	20
			PR Comparison View			
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	12.57	4.86	7	20.78	15.82	37
LAY	9.15	8.72	20	6.80	5.49	20

These findings indicate that although the mean visit count for the questioned signature was greater for FDEs than for Lay participants, there was no significant change in visit count from the first time the signature was viewed (QK) to the second time it was viewed (PR), regardless of whether we manipulated the call in the peer review view. Visit count tended to be greater for FDEs in the No Change condition, but this trend was not statistically significant.

Total Visit Duration

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit duration during the initial viewing of the known comparison signatures (QK comparison) and the second viewing of the known comparison signatures (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in visit duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Bouysou 7 presents mean visit count by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Bouysou 7



No significant main effect was found for *view* (p = .145, *ns*), *call manipulation* (p = .111, *ns*), or *participant type* (p = .330, *ns*).

No significant two-way interaction was found for *view* x *participant type* (p = .460, *ns*). No significant two-way interaction was identified for *view* x *call manipulation* (p = .873, *ns*) or *participant type* x *call manipulation* (p = .601, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction effects were found (p = .776, *ns*). Table 3.5. Bouysou 8 presents the analysis means and standard deviations.

Table 3.5. Bouysou 8

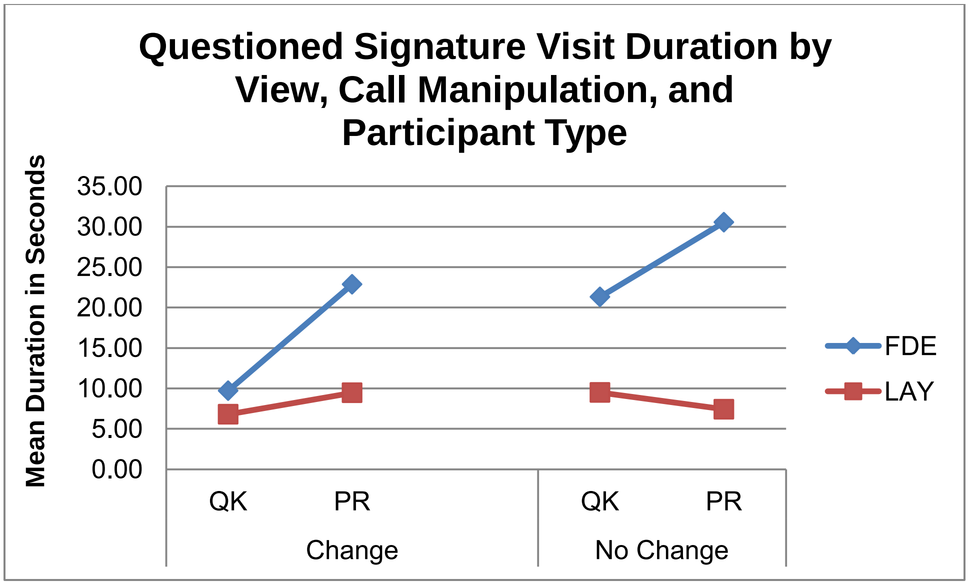
Known Signature Visit Count by View, Call Manipulation, and Participant Type

QK Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	7.97	5.22	7	13.36	12.66	37
LAY	7.36	6.46	20	9.99	9.86	20
PR Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	7.03	6.84	7	9.23	8.60	37
LAY	6.03	5.72	20	7.25	7.49	20

These findings indicate that there was no significant change in visit duration in the known comparison signatures from the first time the signatures were viewed (QK) to the second time they were viewed (PR), regardless of whether the participant was a FDE or Lay participant, or whether we manipulated the call in the peer review view.

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit duration in seconds during the initial viewing of the questioned signature (QK comparison) and the second viewing of the questioned signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in visit duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Bouysou 8 presents mean visit duration by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Bouysou 8



Significant main effects were found for *view*, $F(1, 80) = 6.16$, $p = .015$, $\eta^2 = .071$, and for *participant type*, $F(1, 80) = 16.82$, $p < .001$, $\eta^2 = .174$. No significant main effect was found for *call manipulation* ($p = .115$, *ns*).

No significant two-way interaction was found for *view* x *call manipulation* ($p = .352$, *ns*), or for *call manipulation* x *participant type* ($p = .140$, *ns*). A significant interaction was found for *participant type* x *view*, $F(1, 80) = 5.55$, $p = .021$, $\eta^2 = .065$.

No significant three-way (*participant type* x *call manipulation* x *view*) interaction effects were found ($p = .930$, *ns*). Table 3.5. Bouysou 9 presents the analysis means and standard deviations.

Table 3.5. Bouysou 9

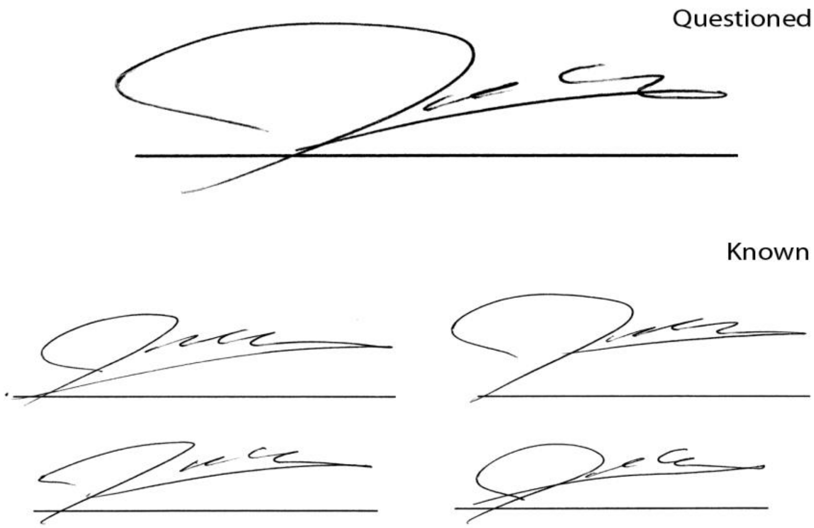
Questioned Signature Visit Duration by View, Call Manipulation, and Participant Type

	QK Comparison View					
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**

FDE	9.70	2.01	7	21.31	15.76	37
LAY	6.79	6.75	20	9.49	9.53	20
			PR Comparison View			
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	22.86	10.32	7	30.54	24.37	37
LAY	9.45	8.57	20	7.41	6.82	20

These findings indicate that the mean visit duration in the questioned signature was greater for FDEs than for Lay participants, and that among FDEs there was a significant increase in visit duration from the first time the signature was viewed (QK) to the second time it was viewed (PR), regardless of whether we manipulated the call in the peer review view. By contrast, visit duration decreased for Lay participants from the first time the signature was viewed (QK) to the second time it was viewed (PR).

PEER REVIEW ANALYSES: Jim LaBarbera Signature 4 (Simulated, Low Complexity, Stylized)



Binomial logistic regression was conducted to determine which among four independent variables (*process call change, authorship call change, influence of process call change,* and *influence of authorship call change*) predicted participant type (FDE or Lay). Regression coefficients are presented in Table 3.5. LaBarbera 1. Regression results indicated that the overall model fit was questionable (-2 Log Likelihood = 105.96). The overall model was not statistically significant, or statistically reliable in distinguishing between participant types, χ^2 (4) = 4.50, *p* = .343, *ns*. The model correctly classified only 58.8 % of cases.

Wald statistics indicated that influence of authorship call change significantly predicted whether the participant was a FDE or Lay participant. The odds ratio for this factor is small, indicating a small change in the likelihood of participant type.

Table 3.5. LaBarbera 1

Logistic Regression Coefficients for Peer Review Analysis of LaBarbera Signature 4

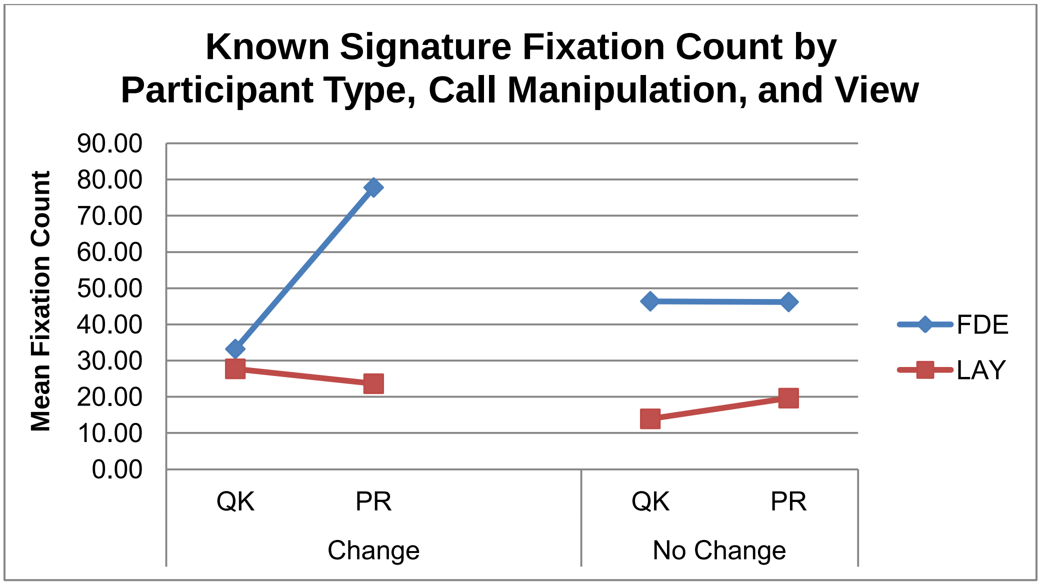
	B	***Wald***	***df***	***p***	***Odds Ratio***
Change Process Call	-.271	.289	1	.591	.763
Change Authorship Call	.434	.256	1	.613	1.543
Process Change Influence	-.402	.651	1	.420	.669
Authorship Change Influence	-1.215	3.365	1	.067	.297
Constant	.621	.837	1	.360	1.861

<u>*Total Fixation Count*</u>

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant

differences existed in the mean fixation count during the initial viewing of the questioned signature (QK comparison) and the second viewing of the questioned signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation count existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 LaBarbera 1 presents mean fixation count by view, call manipulation, and participant type.

Figure 3.5 LaBarbera 1



Significant main effects were found for *view*, *F*(1, 78) = 4.49, *p* = .037, η^2 = .054, and for *participant type*, *F*(1, 78) = 14.22, *p* < .001, η^2 = .154. No significant main effect was found for *call manipulation* (*p* = .721, *ns*).

No significant two-way interactions were identified for either *view* x *call manipulation* or *view* x *participant type* (*p* = .111, *ns*, and *p* = .052, *ns*, respectively). No significant interaction effect was found for *participant type* x *call manipulation* (*p* = .984, *ns*).

A significant three-way (*participant type* x *call manipulation* x *view*) interaction was found, *F*(1, 78) = 6.33, *p* = .014, η^2 = .075. Table 3.5. LaBarbera 2 presents the analysis means and standard deviations.

Table 3.5. LaBarbera 2

Known Signature Fixation Count by View, Call Manipulation, and Participant Type

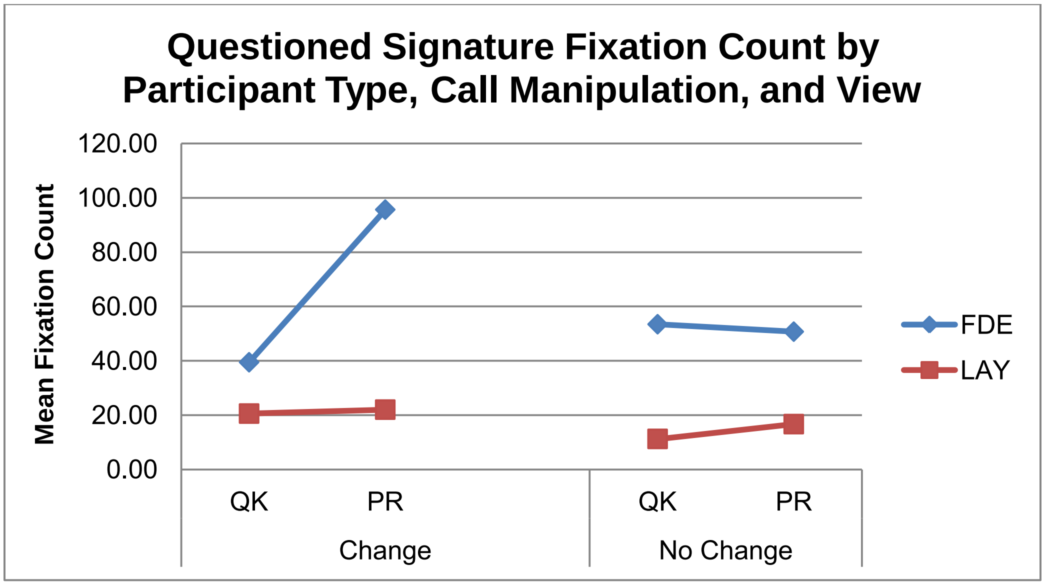
	QK Comparison View					
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	33.20	23.82	5	46.38	36.23	37
LAY	27.72	27.45	29	13.91	8.35	11

PR Comparison View						
	Change			No Change		
Participant	*M*	*SD*	n	*M*	*SD*	n
FDE	77.80	45.80	5	46.19	40.05	37
LAY	23.62	27.40	29	19.64	18.25	11

These findings indicate that the mean fixation count in the known comparison signatures was greater for FDEs than for Lay participants, and that among FDEs there was a significant increase in fixation count from the first time the signatures were viewed (QK) to the second time they were viewed (PR) if we manipulated the call in the peer review view. By contrast, fixation count decreased slightly for Lay participants from the first time the signatures were viewed (QK) to the second time they were viewed (PR).

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation count during the initial viewing of the questioned signature (QK comparison) and the second viewing of the questioned signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation count existed according to the *call manipulation* (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 LaBarbera 2 presents mean fixation count by *view*, *call manipulation*, and *participant type*.

Figure 3.5 LaBarbera 2



Significant main effects were revealed for *participant type*, $F(1, 78) = 24.75$, $p < .001$, $\eta^2 = .241$, and *view*, $F(1, 78) = 11.07$, $p = .001$, $\eta^2 = .124$. No significant main effect was found for *call manipulation* ($p = .183$, *ns*).

Significant two-way interactions were identified for *view* x *call manipulation* $F(1, 78) = 9.16$, $p = .003$, $\eta^2 = .105$, and *view* x *participant type* $F(1, 78) = 6.59$, $p = .012$, $\eta^2 = .078$. No significant interaction effect was found for *participant type* x *call manipulation* ($p = .633$, *ns*).

A significant three-way (*participant type* x *call manipulation* x *view*) interaction effect was found, $F(1, 78) = 12.03$, $p = .001$, $\eta^2 = .134$. Table 3.5. LaBarbera 3 presents the analysis means and standard deviations.

Table 3.5. LaBarbera 3

Questioned Signature Fixation Count by View, Call Manipulation, and Participant Type

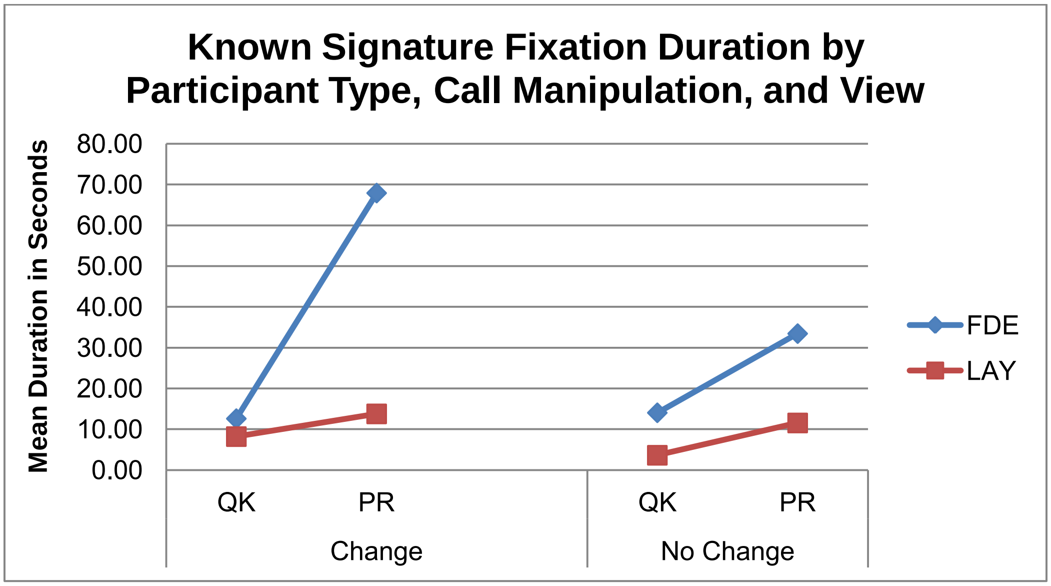
QK Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	39.40	18.94	5	53.41	42.92	37
LAY	20.52	18.07	29	11.18	8.26	11
PR Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	95.60	59.35	5	50.68	40.93	37
LAY	21.97	18.62	29	16.64	14.46	11

These findings indicate that the mean fixation count in the questioned signature was again greater for FDEs than for Lay participants, and that among FDEs there was a significant increase in fixation count from the first time the questioned signatures were viewed (QK) to the second time they were viewed (PR) if we manipulated the call in the peer review view. By contrast, fixation count increased very slightly for Lay participants from the first time the signatures were viewed (QK) to the second time they were viewed (PR), but this difference was not statistically significant.

Total Fixation Duration

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation duration during the initial viewing of the known comparison signatures (QK comparison) and the second viewing of the signatures (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 LaBarbera 3 presents mean fixation duration by *view*, *call manipulation*, and *participant type*.

Figure 3.5 LaBarbera 3



Significant main effects were found for *view*, $F(1, 78) = 39.27$, $p < .001$, $\eta^2 = .335$, for *call manipulation*, $F(1, 78) = 5.39$, $p = .023$, $\eta^2 = .065$, and for *participant type*, $F(1, 78) = 28.07$, $p < .001$, $\eta^2 = .265$.

Significant two-way interactions were found for *view* x *call manipulation* $F(1, 78) = 5.69$, $p = .020$, $\eta^2 = .068$, and for *view* x *participant type*, $F(1, 78) = 18.93$, $p < .001$, $\eta^2 = .195$. No significant interaction was found for *call manipulation* x *participant type* ($p = .234$, *ns*).

A significant three-way (*participant type* x *call manipulation* x *view*) interaction effect was found, $F(1, 78) = 6.48$, $p = .013$, $\eta^2 = .075$. Table 3.5. LaBarbera 4 presents the analysis means and standard deviations.

Table 3.5. LaBarbera 4

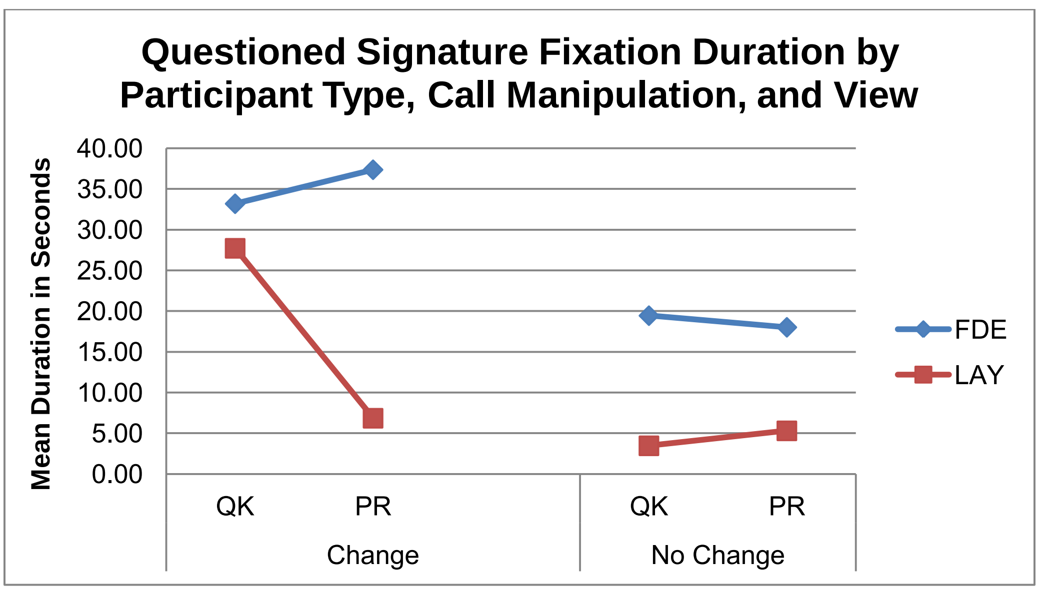
Known Signature Fixation Duration by View, Call Manipulation, and Participant Type

			QK Comparison View			
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	12.62	13.10	5	14.06	13.97	37
LAY	8.21	9.56	29	3.64	2.19	11
			PR Comparison View			
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	67.94	54.04	5	33.47	27.68	37
LAY	13.78	12.14	29	11.56	8.89	11

These findings indicate that the mean fixation duration in the known comparison signatures were again greater for FDEs than for Lay participants, and that among FDEs there was a significant increase in fixation duration from the first time the signatures were viewed (QK) to the second time they were viewed (PR) if we manipulated the call in the peer review view. By contrast, fixation duration increased very slightly for Lay participants from the first time the signatures were viewed (QK) to the second time there were viewed (PR), but this difference was not statistically significant. Fixation duration for FDEs increased in the peer review view, even when the call was not manipulated (e.g., the peer review call was the same as the call the examiner made in the original questioned/known comparison).

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation duration in seconds during the initial viewing of the questioned signature (QK comparison) and the second viewing of the signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 LaBarbera 4 presents mean fixation duration by *view*, *call manipulation*, and *participant type*.

Figure 3.5 LaBarbera 4



Significant main effects were found for *view*, $F(1, 78) = 6.27$, $p = .014$, $\eta^2 = .074$, and for *participant type*, $F(1, 78) = 33.56$, $p < .001$, $\eta^2 = .301$. No significant main effect was found for *call manipulation*, $F(1, 78) = 3.73$, $p = .057$, $\eta^2 = .046$, *ns*.

Significant two-way interactions were found for *view* x *call manipulation* $F(1, 78) = 5.74$, $p = .019$, $\eta^2 = .069$, and for *view* x *participant type*, $F(1, 78) = 4.19$, $p < .044$, $\eta^2 = .051$. No significant interaction was found for *call manipulation* x *participant type* ($p = .271$, *ns*).

A significant three-way (*participant type* x *call manipulation* x *view*) interaction effect was found, $F(1, 78) = 8.48$, $p = .005$, $\eta^2 = .098$. Table 3.5. LaBarbera 5 presents the analysis means and standard deviations.

Table 3.5. LaBarbera 5

Questioned Signature Fixation Duration by View, Call Manipulation, and Participant Type

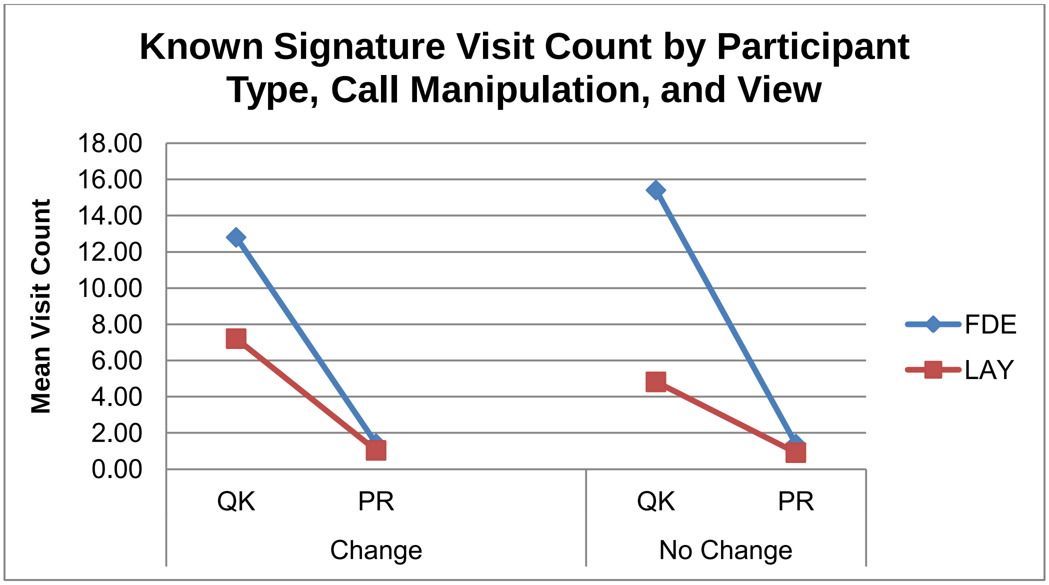
	QK Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	18.73	12.92	5	19.45	15.34	37
LAY	6.96	6.88	29	3.47	2.21	11
	PR Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	37.38	29.08	5	18.02	14.84	37
LAY	6.85	5.79	29	5.30	4.35	11

These findings indicate that the mean fixation duration in the questioned signature was again greater for FDEs than for Lay participants, but among Lay participants there was a significant decrease in fixation duration from the first time the questioned signature was viewed (QK) to the second time it was viewed (PR) if we manipulated the call in the peer review view. By contrast, fixation duration increased for FDEs from the first time the questioned signature was viewed (QK) to the second time it was viewed (PR). Fixation duration for both FDEs and Lay participants remained consistent from the original questioned/known comparison to the peer review view when the call was not manipulated (e.g., the peer review call was the same as the call the examiner made in the original questioned/known comparison).

<u>*Total Visit Count*</u>

Known Comparison Signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit count during the initial viewing of the known comparison signatures (QK comparison) and the second viewing of the known comparison signatures (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in visit count existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 LaBarbera 5 presents mean visit count by *view*, *call manipulation*, and *participant type*.

Figure 3.5 LaBarbera 5



A significant main effect was revealed for *participant type*, $F(1, 78) = 10.11$, $p = .002$, $\eta^2 = .115$, and for *view*, $F(1, 78) = 43.15$, $p < .001$, $\eta^2 = .356$. No significant main effect was found for *call manipulation* ($p = .990$, *ns*).

A significant interaction effect was found for *participant type* x *call manipulation*, $F(1, 78) = 8.06$, $p = .006$, $\eta^2 = .094$. No significant two-way interactions were identified for either *view* x *call manipulation* or *view* x *participant type* ($p = .947$, *ns*, and $p = .344$, *ns*, respectively).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction effects were found ($p = .368$, *ns*). Table 3.5. LaBarbera 6 presents the analysis means and standard deviations.

Table 3.5. LaBarbera 6

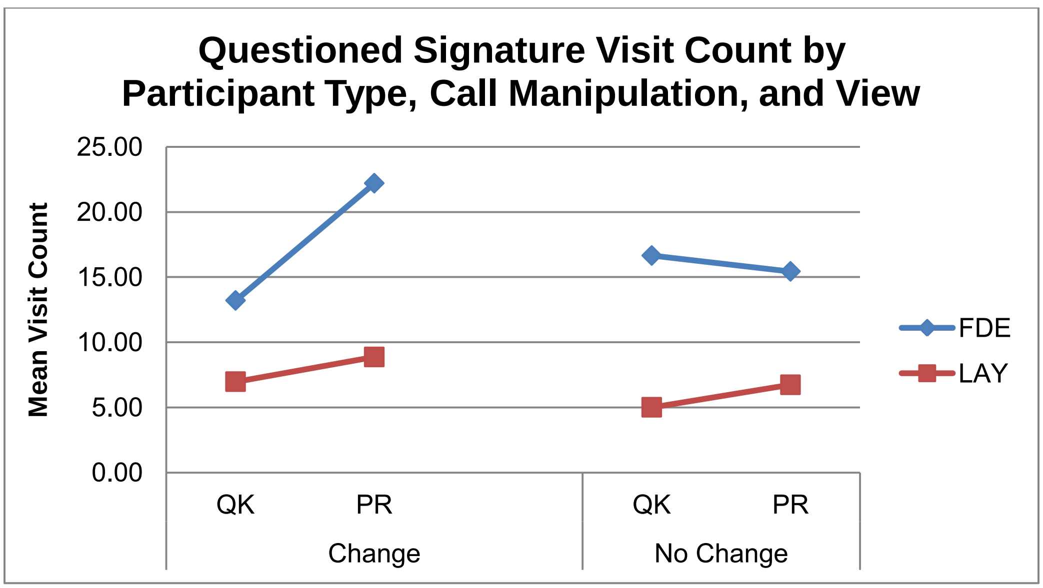
Known Signature Visit Count by View, Call Manipulation, and Participant Type

QK Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	12.80	9.63	5	15.41	11.90	37
LAY	7.21	5.37	29	4.82	2.44	11
PR Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	1.40	0.89	5	1.38	1.28	37
LAY	1.03	0.33	29	0.91	0.30	11

These findings indicate that the mean visit count in the known comparison signatures was again greater for FDEs than for Lay participants, but among both FDEs and Lay participants there was a significant decrease in visit count from the first time the signatures were viewed (QK) to the second time they were viewed (PR). This was true whether or not we manipulated the call in the peer review view. Visit count was slightly lower for FDEs from the when the call was not manipulated (e.g., the peer review call was the same as the call the examiner made in the original questioned/known comparison). Conversely, visit count was slightly lower for Lay participants when the call was not manipulated.

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit count during the initial viewing of the questioned signature (QK comparison) and the second viewing of the questioned signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in visit count existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 LaBarbera 6 presents mean visit count by *view*, *call manipulation*, and *participant type*.

Figure 3.5 LaBarbera 6



A significant main effect was revealed for *participant type*, $F(1, 78) = 17.79$, $p < .001$, $\eta^2 = .186$. No significant main effect was found for *call manipulation* ($p = .079$, *ns*). The main effect for *view*, although not statistically significant, approached significance ($p = .050$, *ns*).

No significant two-way interactions were identified for either *view* x *call manipulation* or *view* x *participant type* ($p = .124$, *ns*, and $p = .070$, *ns*, respectively). No significant interaction effect was found for *participant type* x *call manipulation* ($p = .553$, *ns*).

A significant three-way (*participant type* x *call manipulation x view*) interaction effect was found $F(1, 78) = 5.60$, $p = .020$, $\eta^2 = .067$. Table 3.5. LaBarbera 7 presents the analysis means and standard deviations.

Table 3.5. LaBarbera 7

Questioned Signature Visit Count by View, Call Manipulation, and Participant Type

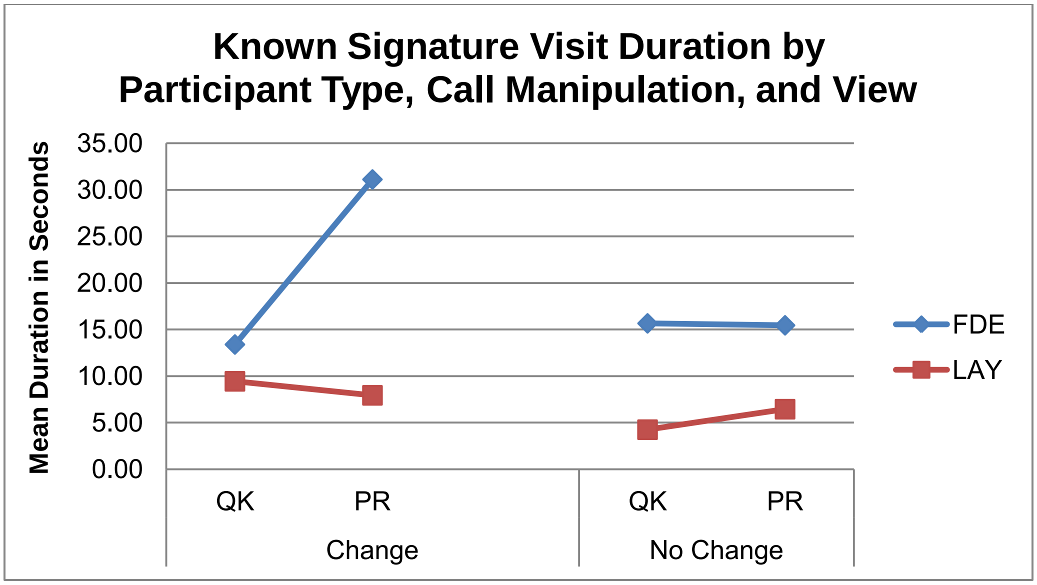
QK Comparison View						
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	13.20	10.55	5	16.65	13.14	37
LAY	6.97	5.37	29	5.00	2.65	11
PR Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	22.20	12.40	5	15.43	11.01	37
LAY	8.86	8.59	29	6.73	4.98	11

These findings indicate that the mean visit count in the questioned signature was again greater for FDEs than for Lay participants, and among FDEs there was a significant increase in visit count from the first time the signature was viewed (QK) to the second time it was viewed (PR) if we manipulated the call in the peer review view. Fixation duration for both FDEs and Lay participants remained consistent from the original questioned/known comparison to the peer review view when the call was not manipulated (e.g., the peer review call was the same as the call the examiner made in the original questioned/known comparison).

Total Visit Duration

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit duration during the initial viewing of the known comparison signatures (QK comparison) and the second viewing of the known comparison signatures (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in visit duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 LaBarbera 7 presents mean visit duration by *view, call manipulation*, and *participant type*.

Figure 3.5 LaBarbera 7



A significant main effect was revealed for *participant type*, $F(1, 78) = 17.79$, $p < .001$, $\eta^2 = .186$. No significant main effect was found for *call manipulation* ($p = .079$, *ns*). The main effect for *view*, although not statistically significant, approached significance ($p = .050$, *ns*).

No significant two-way interactions were identified for either *view* x *call manipulation* or *view* x *participant type* ($p = .124$, *ns*, and $p = .070$, *ns*, respectively). No significant interaction effect was found for *participant type* x *call manipulation* ($p = .553$, *ns*).

A significant three-way (*participant type* x *call manipulation x view*) interaction effect was found $F(1, 78) = 5.60$, $p = .020$, $\eta^2 = .067$. Table 3.5. LaBarbera 8 presents the analysis means and standard deviations.

Table 3.5. LaBarbera 8

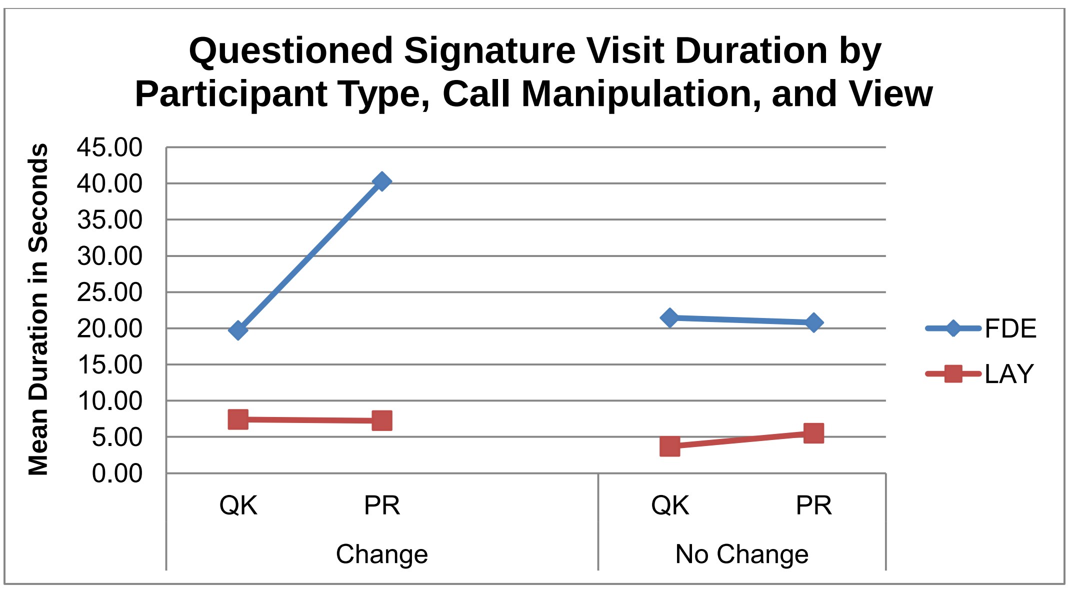
Known Signature Visit Duration by View, Call Manipulation, and Participant Type

QK Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	13.38	12.92	5	15.65	14.78	37
LAY	9.43	10.73	29	4.24	2.87	11
PR Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	31.11	22.18	5	15.44	14.33	37
LAY	7.92	8.04	29	6.43	5.70	11

These findings indicate that the mean visit duration in the known comparison signatures was again greater for FDEs than for Lay participants, and among FDEs there was a significant increase in visit duration from the first time the signatures were viewed (QK) to the second time they were viewed (PR) if we manipulated the call in the peer review view. Visit duration for both FDEs and Lay participants remained consistent from the original questioned/known comparison to the peer review view when the call was not manipulated (e.g., the peer review call was the same as the call the examiner made in the original questioned/known comparison).

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit duration in seconds during the initial viewing of the questioned signature (QK comparison) and the second viewing of the questioned signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in visit duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 LaBarbera 8 presents mean visit duration by *view*, *call manipulation, and participant type*.

Figure 3.5 LaBarbera 8



A significant main effect was revealed for *participant type*, $F(1, 78) = 33.85$, $p < .001$, $\eta^2 = .303$, and for *view*, $F(1, 78) = 7.57$, $p = .007$, $\eta^2 = .089$. No significant main effect was found for *call manipulation* ($p = .089$, *ns*).

Significant two-way interactions were identified for *view* x *call manipulation* $F(1, 78) = 6.04$, $p < .016$, $\eta^2 = .072$, and *view* x *participant type* $F(1, 78) = 5.43$, $p = .022$, $\eta^2 = .065$. No significant interaction effect was found for *participant type* x *call manipulation* ($p = .364$, *ns*).

A significant three-way (*participant type* x *call manipulation x view*) interaction effect was found $F(1, 78) = 8.77$, $p = .004$, $\eta^2 = .101$. Table 3.5. LaBarbera 9 presents the analysis means and standard deviations.

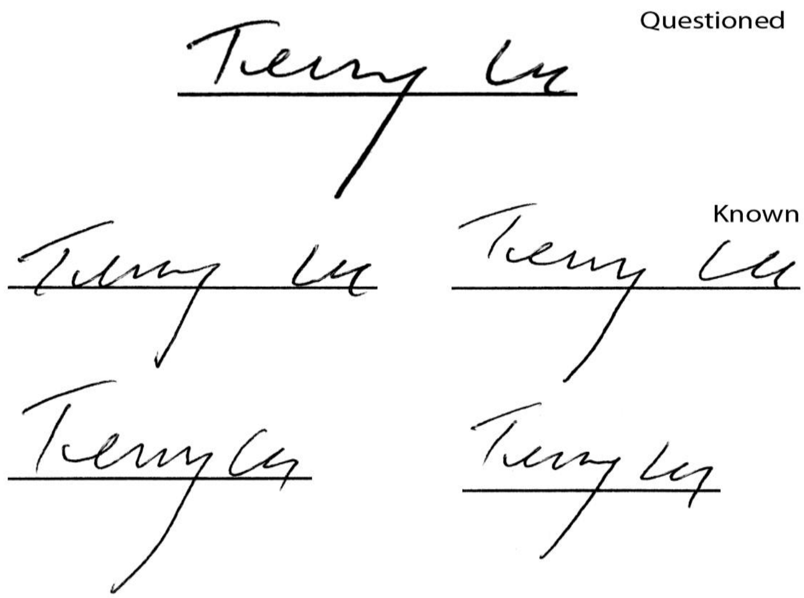
Table 3.5. LaBarbera 9

Questioned Signature Visit Duration by View, Call Manipulation, and Participant Type

	QK Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	19.69	12.40	5	21.43	17.14	37
LAY	7.40	7.31	29	3.68	2.57	11
	PR Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	40.27	30.81	5	20.77	15.91	37
LAY	7.24	5.94	29	5.50	4.65	11

These findings indicate that the mean visit duration in the questioned signature was again greater for FDEs than for Lay participants, and among FDEs there was a significant increase in visit duration from the first time the questioned signature was viewed (QK) to the second time it was viewed (PR) if we manipulated the call in the peer review view. Visit duration for both FDEs and Lay participants remained consistent from the original questioned/known comparison to the peer review view when the call was not manipulated (e.g., the peer review call was the same as the call the examiner made in the original questioned/known comparison).

PEER REVIEW ANALYSES: Terry Lu Signature 5 (Genuine, Low Complexity, Text)



Binomial logistic regression was conducted to determine which among four independent variables (*process call change, authorship call change, influence of process call change,* and *influence of authorship call change*) predicted participant type (FDE or Lay). Regression results indicated that the overall model fit was questionable (-2 Log Likelihood = 85.63). The overall model was statistically significant, and statistically reliable in distinguishing between participant types, $\chi^2(4) = 28.85$, $p < .001$. The model correctly classified 69.9 % of cases. Examination of the contribution of each factor to the model revealed that none of the factors significantly predicted *participant type.* Table 3.5. Lu 1 presents the regression coefficients for this model.

Table 3.5. Lu 1
Logistic Regression Coefficients for Peer Review Analysis of Lu Signature 5

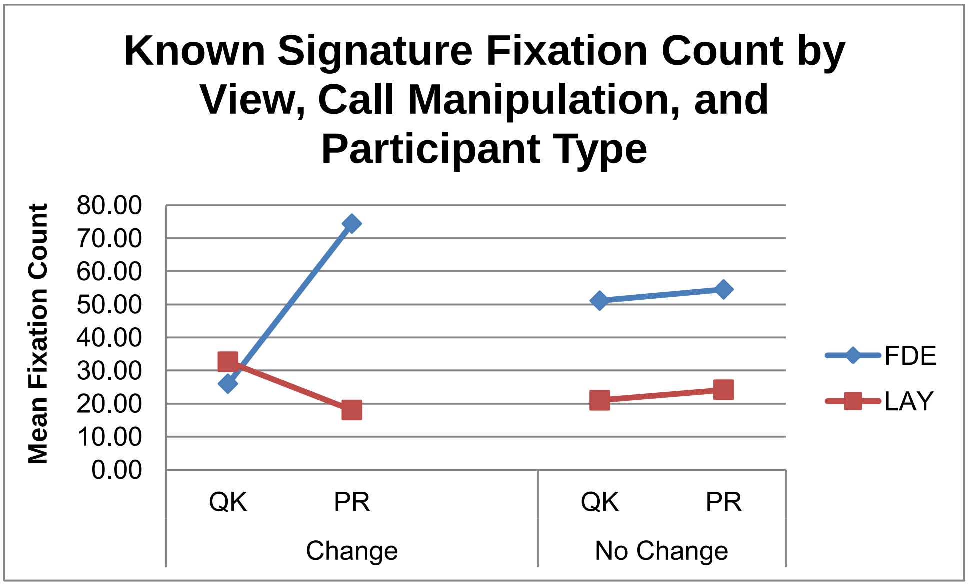
	B	*Wald*	*df*	*p*	*Odds Ratio*
Change Process Call	-.51	.688	1	.407	.60
Change Authorship Call	-21.35	2.517	1	.113	2.55
Process Change Influence	-1.35	.688	1	.407	.60
Authorship Change Influence	-1.01	1.712	1	.191	.36
Constant	21.67	.000	1	.999	2589239053.82

<u>*Total Fixation Count*</u>

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation count during the initial viewing of the known comparison

signatures (QK comparison) and the second viewing of the signatures (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation count existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Lu 1 presents mean fixation count by view, call manipulation, and participant type.

Figure 3.5 Lu 1



A significant main effect was found for *participant type*, $F(1, 80) = 12.59$, $p = .001$, $\eta^2 = .136$. No significant main effects were found for *call manipulation* ($p = .992$, *ns*) or *view* ($p = .056$, *ns*).

A significant interaction effect was found for *view* x *participant type*, $F(1, 80) = 9.21$, $p = .003$, $\eta^2 = .103$. No significant two-way interactions were identified for *view* x *call manipulation* ($p = .195$, *ns*), or for *participant type* x *call manipulation* ($p = .730$, *ns*).

A significant three-way (*participant type* x *call manipulation* x *view*) interaction was found, $F(1, 80) = 9.07$, $p = .003$, $\eta^2 = .102$. Table 3.5. Lu 2 presents the analysis means and standard deviations.

Table 3.5. Lu 2

Known Signature Fixation Count by View, Call Manipulation, and Participant Type

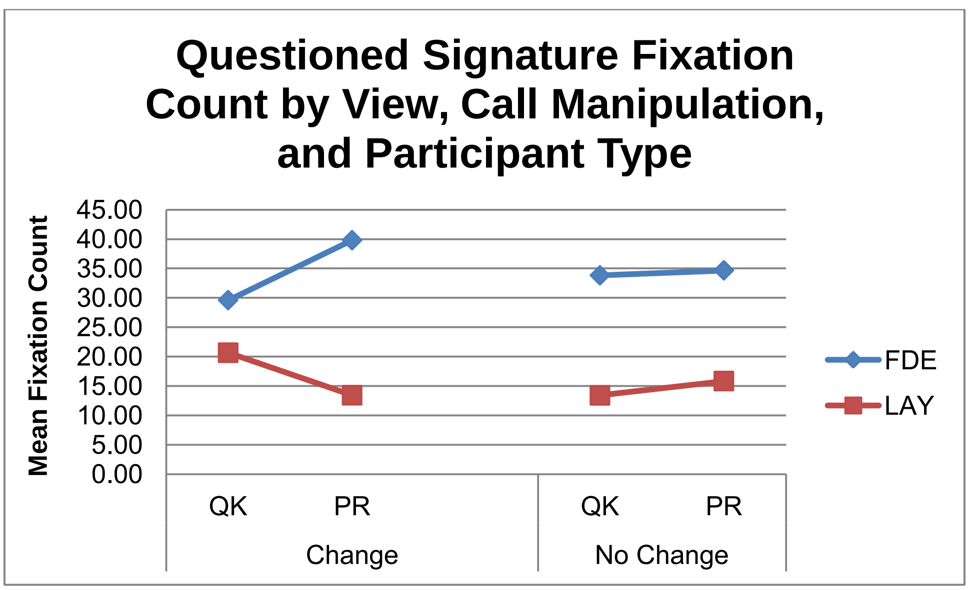
	QK Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	26.00	13.73	5	51.10	41.40	39
LAY	32.65	22.11	17	21.00	19.04	23
	PR Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**

FDE	74.40	70.88	5	54.51	35.57	39
LAY	18.06	16.54	17	24.17	27.15	23

These findings indicate that although the mean fixation count for the known comparison signatures was overall greater for FDEs than for Lay participants, there was no significant change in fixation count from the first time the known signatures were viewed (QK) to the second time they were viewed (PR), regardless of whether we manipulated the call in the peer review view. Although the fixation count was slightly greater for Lay participants than for FDEs in the Change/QK condition, this interaction was not statistically significant.

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation count during the initial viewing of the questioned signature (QK comparison) and the second viewing of the signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation count existed according to the *call manipulation* (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Lu 2 presents mean fixation count by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Lu 2



A significant main effect was revealed for *participant type*, $F(1, 80) = 10.09$, $p = .002$, $\eta^2 = .112$. No significant main effect was found for *call manipulation* ($p = .807$, *ns*), or for *view* ($p = .690$, *ns*).

No significant interaction effects were found for *participant type* x *call manipulation* ($p = .984$, *ns*), for *view* x *call manipulation* ($p = .313$, *ns*), or for *view* x *participant type* ($p = .868$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction effect was found (p = .227, *ns*). Table 3.5. Lu 3 presents the analysis means and standard deviations.

Table 3.5. Lu 3
Questioned Signature Fixation Count by View, Call Manipulation, and Participant Type

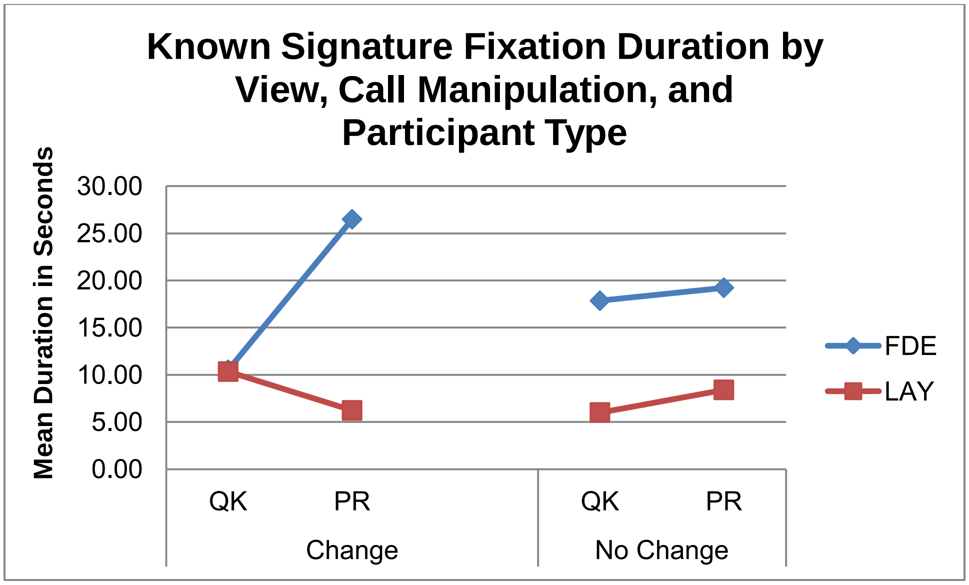
	QK Comparison View					
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	29.60	18.45	5	33.82	35.20	39
LAY	20.65	13.11	17	13.39	13.52	23
	PR Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	39.80	40.53	5	34.67	27.36	39
LAY	13.41	10.41	17	15.83	15.19	23

These findings indicate that although the mean fixation count for the questioned signature was overall greater for FDEs than for Lay participants, there was no significant change in fixation count from the first time the signature was viewed (QK) to the second time it was viewed (PR), regardless of whether we manipulated the call in the peer review view. Although the fixation count for Lay participants decreased in the Change/Peer Review condition, this decrease was not statistically significant.

<u>*Total Fixation Duration*</u>

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation duration during the initial viewing of the known comparison signatures (QK comparison) and the second viewing of the signatures (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Lu 3 presents mean fixation duration by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Lu 3



Significant main effects were found for *view*, $F(1, 80) = 4.18$, $p < .044$, $\eta^2 = .050$, and for *participant type*, $F(1, 80) = 12.99$, $p = .001$, $\eta^2 = .140$. No significant effect was found for *call manipulation* ($p = .861$, *ns*).

A significant interaction effect was found for *view* x *participant type*, $F(1, 80) = 6.22$, $p = .015$, $\eta^2 = .072$. No significant two-way interaction was found for call *manipulation* x *participant type* ($p = .853$, *ns*) or for *view* x *call manipulation* ($p = .295$, *ns).*

A significant three-way (*participant type* x *call manipulation* x *view*) interaction effect was found, $F(1, 80) = 7.63$, $p = .007$, $\eta^2 = .087$. Table 3.5. Lu 4 presents the analysis means and standard deviations.

Table 3.5. Lu 4

Known Signature Fixation Duration by View, Call Manipulation, and Participant Type

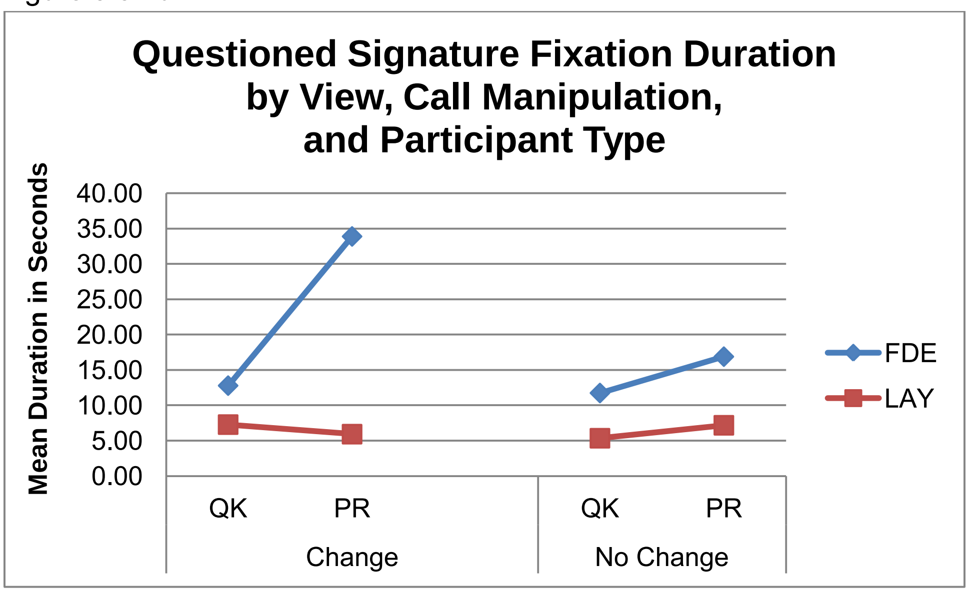
QK Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	10.53	5.22	5	17.85	15.62	39
LAY	10.35	7.68	17	6.01	5.91	23
PR Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	26.49	21.26	5	19.23	15.44	39
LAY	6.23	6.03	17	8.40	9.61	23

These findings indicate that the mean fixation duration for the known comparison signatures was overall greater for FDEs than for Lay participants. This difference was quite pronounced in the

Change/Peer Review condition, indicating that when the call was manipulated the fixation duration for FDEs was significantly greater from the first time the signatures were viewed (QK) to the second time they were viewed (PR). Conversely, the fixation duration for Lay participants decreased in the Change/Peer Review condition, but this decrease was not statistically significant.

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation duration in seconds during the initial viewing of the questioned signature (QK comparison) and the second viewing of the signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Lu 4 presents mean fixation duration by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Lu 4



Significant main effects were found for *view*, $F(1, 80) = 13.82$, $p < .001$, $\eta^2 = .147$, and for *participant type*, $F(1, 80) = 22.70$, $p = .001$, $\eta^2 = .221$. No significant effect was found for *call manipulation* ($p = .076$, *ns*).

A significant interaction effect was found for *view* x *participant type*, $F(1, 80) = 12.85$, $p = .001$, $\eta^2 = .138$. No significant two-way interaction was found for call *manipulation* x *participant type* ($p = .099$, *ns*) or for *view* x *call manipulation* ($p = .079$, *ns).*

A significant three-way (*participant type* x *call manipulation* x *view*) interaction effect was found, $F(1, 80) = 7.09$, $p = .009$, $\eta^2 = .081$. Table 3.5. Lu 5 presents the analysis means and standard deviations.

Table 3.5. Lu 5

Questioned Signature Fixation Duration by View, Call Manipulation, and Participant Type

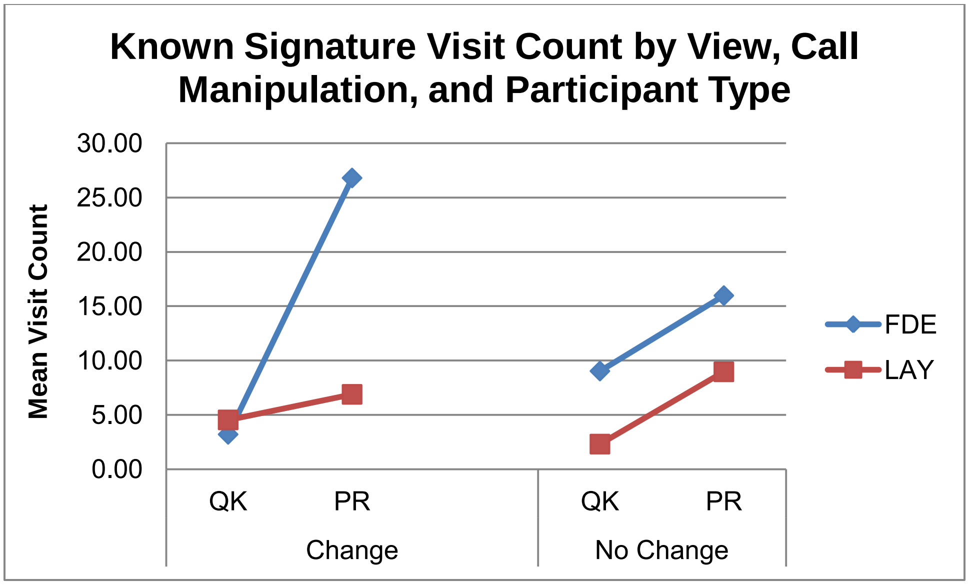
QK Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	12.80	8.64	5	11.75	12.67	39
LAY	7.28	5.79	17	5.35	5.62	23
PR Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	33.90	27.60	5	16.89	13.91	39
LAY	5.93	5.26	17	7.18	6.91	23

These findings indicate that the mean fixation duration for the questioned signature was overall greater for FDEs than for Lay participants. This difference was more pronounced in the Change/Peer Review condition, indicating that when the call was manipulated the fixation duration for FDEs was significantly greater from the first time the signature was viewed (QK) to the second time it was viewed (PR).

Total Visit Count

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit count during the initial viewing of the known comparison signatures (QK comparison) and the second viewing of the signatures (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in visit count existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Lu 5 presents mean visit count by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Lu 5



Significant main effects were found for *view*, $F(1, 80) = 44.94$, $p < .001$, $\eta^2 = .360$, and for *participant type*, $F(1, 80) = 18.39$, $p < .001$, $\eta^2 = .187$. No significant effect was found for *call manipulation* ($p = .496$, *ns*).

A significant interaction effect was found for *view* x *participant type*, $F(1, 80) = 13.33$, $p < .001$, $\eta^2 = .143$, and for *view* x *call manipulation*, $F(1, 80) = 4.38$, $p = .039$, $\eta^2 = .052$). No significant two-way interaction was found for call *manipulation* x *participant type* ($p = .522$, *ns*).

A significant three-way (*participant type* x *call manipulation* x *view*) interaction effect was found, $F(1, 80) = 12.60$, $p = .001$, $\eta^2 = .136$. Table 3.5. Lu 6 presents the analysis means and standard deviations.

Table 3.5. Lu 6

Known Signature Visit Count by View, Call Manipulation, and Participant Type

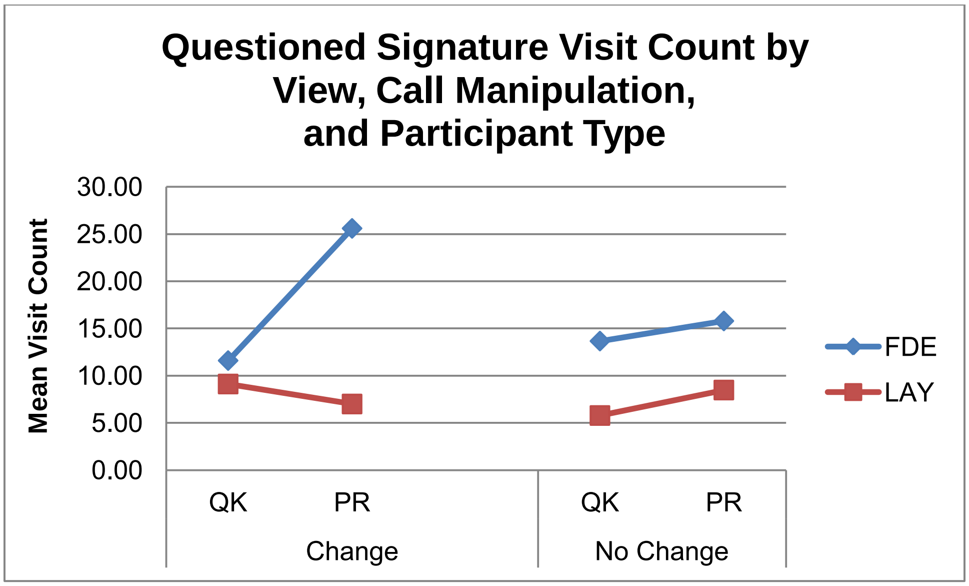
QK Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	3.20	3.03	5	9.03	8.09	39
LAY	4.53	3.18	17	2.30	2.84	23
PR Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	26.80	20.18	5	15.97	10.88	39
LAY	6.88	5.88	17	8.96	8.63	23

These findings indicate that the mean visit count for the known comparison signatures was overall greater for FDEs than for Lay participants. This difference was more pronounced in the

Change/Peer Review condition, indicating that when the call was manipulated the visit count for FDEs was significantly greater from the first time the known comparison signatures were viewed (QK) to the second time they were viewed (PR).

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit count during the initial viewing of the questioned signature (QK comparison) and the second viewing of the signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in visit count existed according to the call manipulation (change vs. no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Lu 6 presents mean visit count by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Lu 6



Significant main effects were found for *view*, $F(1, 80) = 10.78$, $p = .002$, $\eta^2 = .119$, and for *participant type*, $F(1, 80) = 13.47$, $p < .001$, $\eta^2 = .144$. No significant effect was found for *call manipulation* ($p = .335$, *ns*).

A significant interaction effect was found for *view* x *participant type*, $F(1, 80) = 9.34$, $p = .003$, $\eta^2 = .105$. No significant two-way interaction was found for *call manipulation* x *participant type* ($p = .553$, *ns*), or for *view* x *call manipulation* ($p = .169$, *ns*).

A significant three-way (*participant type* x *call manipulation* x *view*) interaction effect was found, $F(1, 80) = 10.76$, $p = .002$, $\eta^2 = .119$. Table 3.5. Lu 7 presents the analysis means and standard deviations.

Table 3.5. Lu 7

Questioned Signature Visit Count by View, Call Manipulation, and Participant Type

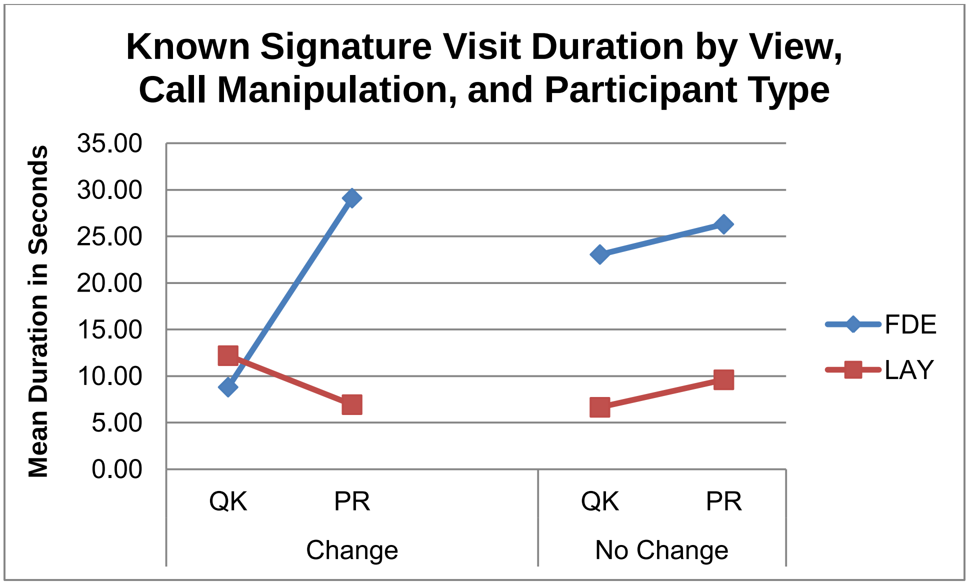
QK Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	11.60	3.58	5	13.67	11.51	39
LAY	9.12	6.19	17	5.78	6.24	23
PR Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	25.60	17.53	5	15.79	11.64	39
LAY	7.00	6.13	17	8.48	8.35	23

These findings indicate that the mean visit count for the questioned signature was overall greater for FDEs than for Lay participants. This difference was more pronounced in the Change/Peer Review condition, indicating that when the call was manipulated the visit count for FDEs was significantly greater from the first time the questioned signature was viewed (QK) to the second time the signature was viewed (PR).

Total Visit Duration

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit duration during the initial viewing of the known comparison signatures (QK comparison) and the second viewing of the signatures (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in visit duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Lu 7 presents mean visit duration by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Lu 7



A significant main effect was found for *participant type*, $F(1, 80) = 9.34$, $p = .003$, $\eta^2 = .105$. No significant effects were found for *call manipulation*, or for *view* ($p = .616$, *ns*, and $p = .067$, *ns*, respectively).

A significant interaction effect was found for *view* x *participant type*, $F(1, 80) = 5.12$, $p = .026$, $\eta^2 = .060$. No significant two-way interaction was found for *call manipulation* x *participant type* ($p = .402$, *ns*), or for *view* x *call manipulation* ($p = .442$, *ns*).

A significant three-way (*participant type* x *call manipulation* x *view*) interaction effect was found, $F(1, 80) = 4.89$, $p = .030$, $\eta^2 = .058$. Table 3.5. Lu 8 presents the analysis means and standard deviations.

Table 3.5. Lu 8

Known Signature Visit Duration by View, Call Manipulation, and Participant Type

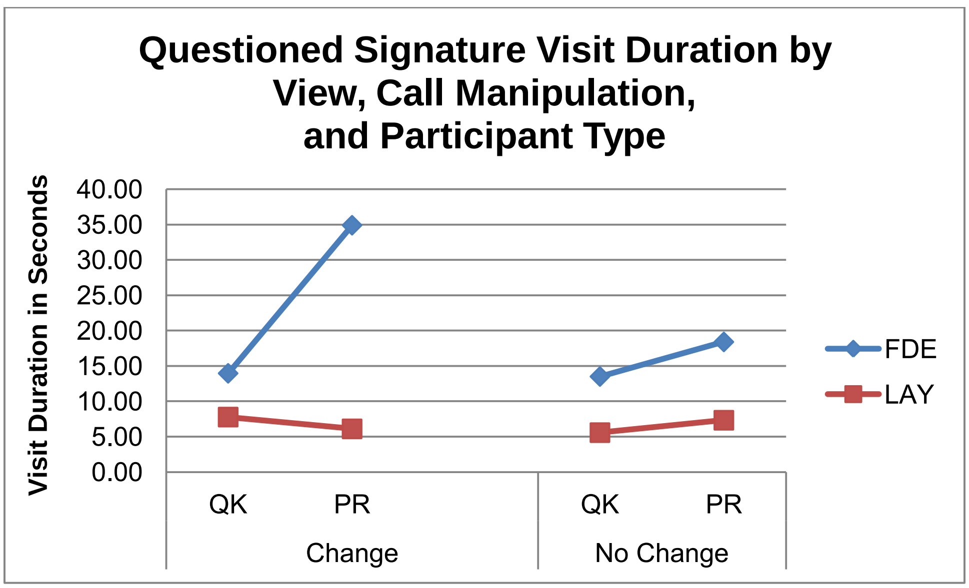
QK Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	8.80	5.35	5	23.04	21.80	39
LAY	12.18	9.25	17	6.64	6.76	23
PR Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	29.10	25.18	5	26.29	25.60	39
LAY	6.92	6.59	17	9.59	10.47	23

These findings indicate that the mean visit duration for the known comparison signatures was overall greater for FDEs than for Lay participants. This difference was more pronounced in the

Change/Peer Review condition, indicating that when the call was manipulated the visit duration for FDEs was significantly greater from the first time the questioned signature was viewed (QK) to the second time the signature was viewed (PR).

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit duration in seconds during the initial viewing of the questioned signature (QK comparison) and the second viewing of the signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in visit duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Lu 8 presents mean visit duration by *view*, *call manipulation, and participant type*.

Figure 3.5 Lu 8



A significant main effect was found for *participant type*, $F(1, 80) = 22.14$, $p < .001$, $\eta^2 = .217$, and for *view*, $F(1, 80) = 12.22$, $p = .001$, $\eta^2 = .133$. No significant effects were found for *call manipulation* ($p = .122$, *ns*).

A significant interaction effect was found for *view* x *participant type*, $F(1, 80) = 12.06$, $p = .001$, $\eta^2 = .131$. No significant two-way interaction was found for *call manipulation* x *participant type* ($p = .168$, *ns*), or for *view* x *call manipulation* ($p = .092$, *ns*).

A significant three-way (*participant type* x *call manipulation* x *view*) interaction effect was found, $F(1, 80) = 6.89$, $p = .010$, $\eta^2 = .079$. Table 3.5. Lu 9 presents the analysis means and standard deviations.

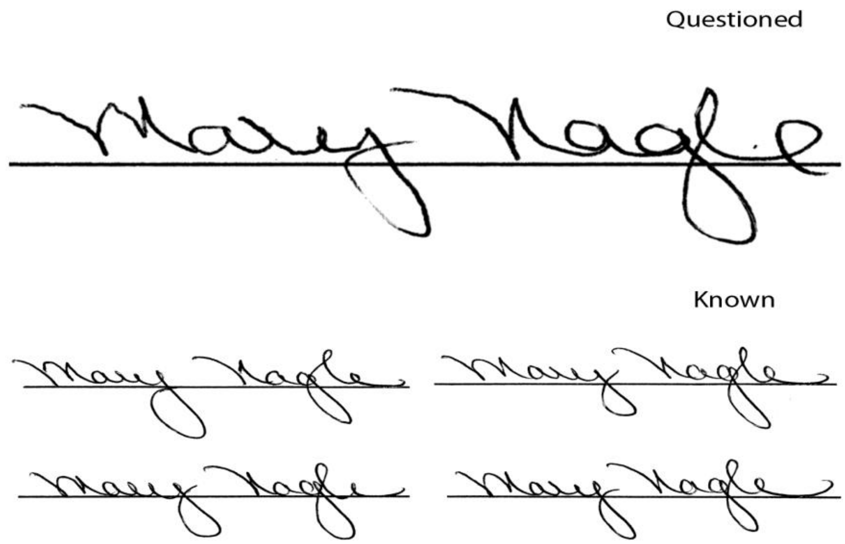
Table 3.5. Lu 9

Questioned Signature Visit Duration by View, Call Manipulation, and Participant Type

QK Comparison View						
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	13.97	9.93	5	13.52	14.19	39
LAY	7.78	5.94	17	5.58	5.88	23
PR Comparison View						
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	34.92	29.92	5	18.41	14.76	39
LAY	6.11	5.41	17	7.33	7.04	23

These findings indicate that the mean visit duration for the questioned signature was overall greater for FDEs than for Lay participants. This difference was more pronounced in the Change/Peer Review condition, indicating that when the call was manipulated the fixation duration for FDEs was significantly greater from the first time the questioned signature was viewed (QK) to the second time the signature was viewed (PR).

PEER REVIEW ANALYSES: Mary Nagle Signature 4 (Simulated, High Complexity, Text)



Binomial logistic regression was conducted to determine which among four independent variables (*process call change, authorship call change, influence of process call change,* and *influence of authorship call change*) predicted participant type (FDE or Lay). Regression results indicated that the overall model fit was modest (-2 Log Likelihood = 67.46). The overall model was statistically significant, and statistically reliable in distinguishing between participant types, $\chi^2(4) = 34.26$, $p < .001$. The model correctly classified 85.1% of cases. Examination of the contribution of each factor to the model revealed that changing the process call and process call change influence significantly predicted *participant type.* The odds ratio for process call change is significant, but quite small, indicating very little change in the likelihood of *participant type.* Table 3.5. Nagle 1 presents the regression coefficients for this model.

Table 3.5. Nagle 1

Logistic Regression Coefficients for Peer Review Analysis of Nagle Signature 4

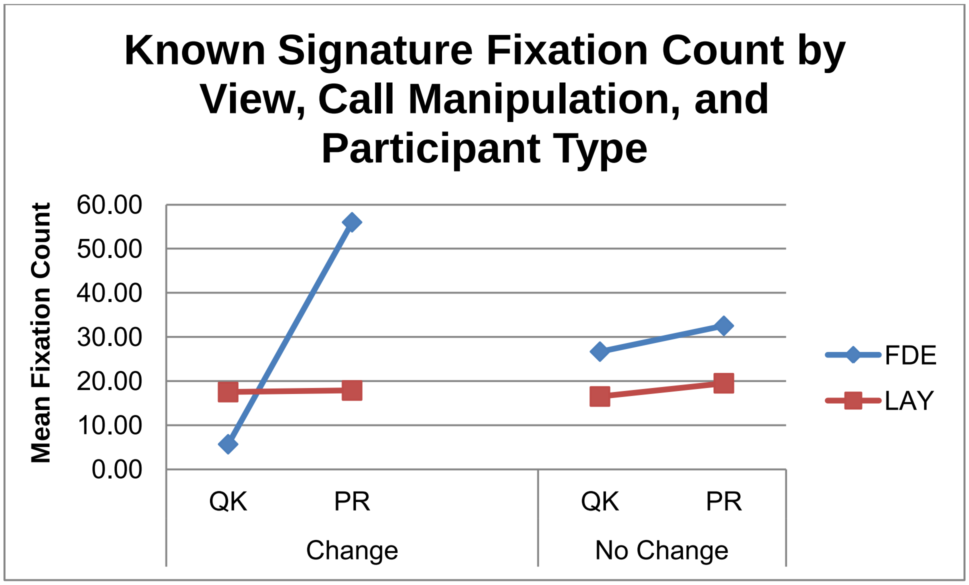
	B	*Wald*	*df*	*p*	*Odds Ratio*
Change Process Call	-2.58	8.619	1	.003	.08
Change Authorship Call	-0.21	.064	1	.801	.81
Process Change Influence	2.30	11.797	1	.001	10.01
Authorship Change Influence	-0.52	.157	1	.692	.59
Constant	1.68	1.745	1	.186	5.38

<u>*Total Fixation Count*</u>

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant

differences existed in the mean fixation count during the initial viewing of the known comparison signatures(QK comparison) and the second viewing of the signatures (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation count existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Nagle 1 presents mean fixation count by view, call manipulation, and participant type.

Figure 3.5 Nagle 1



A significant main effect was found for *view*, $F(1, 81) = 15.74$, $p < .001$, $\eta^2 = .163$. No significant main effects were found for *call manipulation* ($p = .953$, *ns*), or for *participant type*, ($p = .114$, *ns*).

Significant two-way interactions were identified for *view* x *call manipulation*, $F(1, 81) = 7.77$, $p = .007$, $\eta^2 = .088$, and for *view* x *participant type*, $F(1, 81) = 12.39$, $p = .001$, $\eta^2 = .133$. No significant interaction effect was found for *participant type* x *call manipulation* ($p = .920$, *ns*).

A significant three-way (*participant type* x *call manipulation* x *view*) interaction was found, $F(1, 81) = 9.86$, $p = .002$, $\eta^2 = .108$. Table 3.5. Nagle 2 presents the analysis means and standard deviations.

Table 3.5. Nagle 2

Known Signature Fixation Count by View, Call Manipulation, and Participant Type

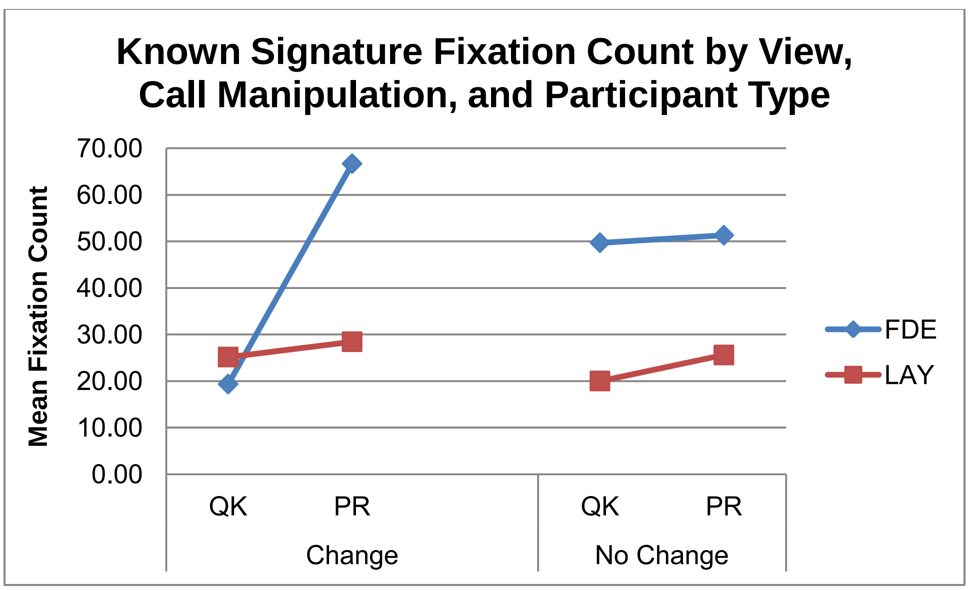
	QK Comparison View					
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	5.67	5.03	3	26.67	25.75	42
LAY	17.50	23.76	28	16.50	19.24	12
	PR Comparison View					

	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	56.00	61.83	3	32.52	23.98	42
LAY	17.86	26.15	28	19.50	20.59	12

These findings indicate that the mean fixation count for the known comparison signatures was on average greater for FDEs than for Lay participants. There was a significant increase in fixation count from the first time the signatures were viewed (QK) to the second time they were viewed (PR). This difference was particularly pronounced for FDEs in the Change condition. Lay participants demonstrated little change in fixation count across all conditions.

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation count during the initial viewing of the questioned signature (QK comparison) and the second viewing of the signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation count existed according to the *call manipulation* (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Nagle 2 presents mean fixation count by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Nagle 2



A significant main effect was found for *view*, $F(1, 81) = 7.29$, $p = .008$, $\eta^2 = .083$, and for *participant type*, $F(1, 81) = 4.82$, $p = .031$, $\eta^2 = .056$. No significant main effects were found for *call manipulation* ($p = .861$, *ns*).

A significant two-way interaction was identified for *view* x *call manipulation*, $F(1, 81) = 4.11$, $p = .046$, $\eta^2 = .048$. No significant interaction effect was found for *participant type* x *call manipulation* ($p = .567$, *ns*), or for *view* x *participant type* ($p = .065$, *ns*).

A significant three-way (*participant type* x *call manipulation* x *view*) interaction was found, $F(1, 81) = 5.03$, $p = .028$, $\eta^2 = .058$. Table 3.5. Nagle 3 presents the analysis means and standard deviations.

Table 3.5. Nagle 3

Questioned Signature Fixation Count by View, Call Manipulation, and Participant Type

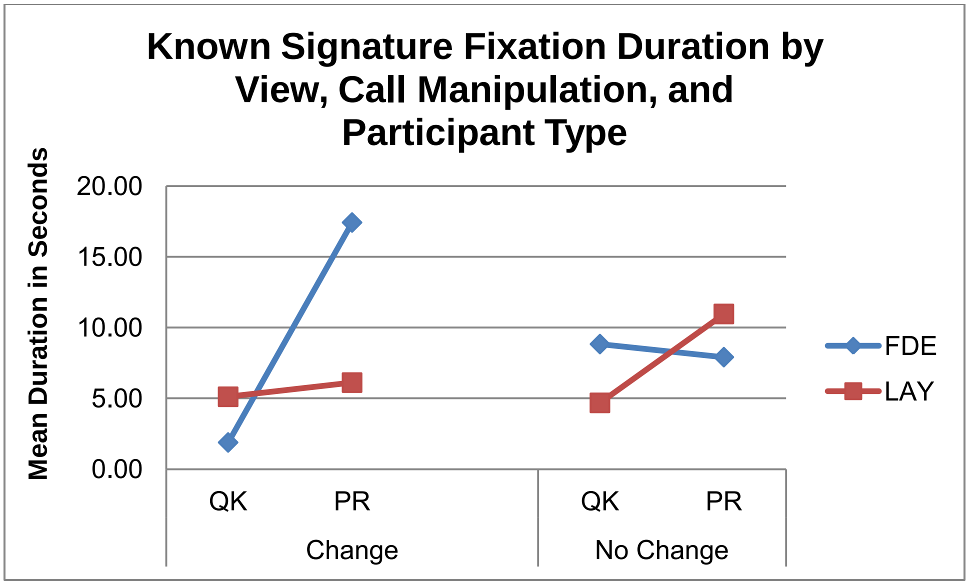
	QK Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	19.33	17.47	3	49.69	40.98	42
LAY	25.14	28.42	28	20.00	15.39	12
	PR Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	66.67	33.84	3	51.31	28.92	42
LAY	28.43	37.81	28	25.58	23.53	12

These findings indicate that the mean fixation count for the questioned signature was on average greater for FDEs than for Lay participants. There was a significant increase in fixation count from the first time the questioned signature was viewed (QK) to the second time it was viewed (PR). This difference was particularly pronounced for FDEs in the Change condition. Lay participants demonstrated little change in fixation count across all conditions.

Total Fixation Duration

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation duration during the initial viewing of the known comparison signatures (QK comparison) and the second viewing of the signatures (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Nagle 3 presents mean fixation duration by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Nagle 3



A significant main effect was found for *view*, $F(1, 81) = 14.77$, $p < .001$, $\eta^2 = .154$. No significant main effects were found for *call manipulation* ($p = .965$, *ns*), or for *participant type* ($p = .077$, *ns*).

A significant two-way interaction was identified for *view* x *call manipulation*, $F(1, 81) = 6.07$, $p = .016$, $\eta^2 = .070$, and for *view* x *participant type*, $F(1, 81) = 9.37$, $p = .003$, $\eta^2 = .104$. No significant interaction effect was found for *participant type* x *call manipulation* ($p = .956$, *ns*).

A significant three-way (*participant type* x *call manipulation* x *view*) interaction was found, $F(1, 81) = 7.71$, $p = .007$, $\eta^2 = .087$. Table 3.5. Nagle 4 presents the analysis means and standard deviations.

Table 3.5. Nagle 4

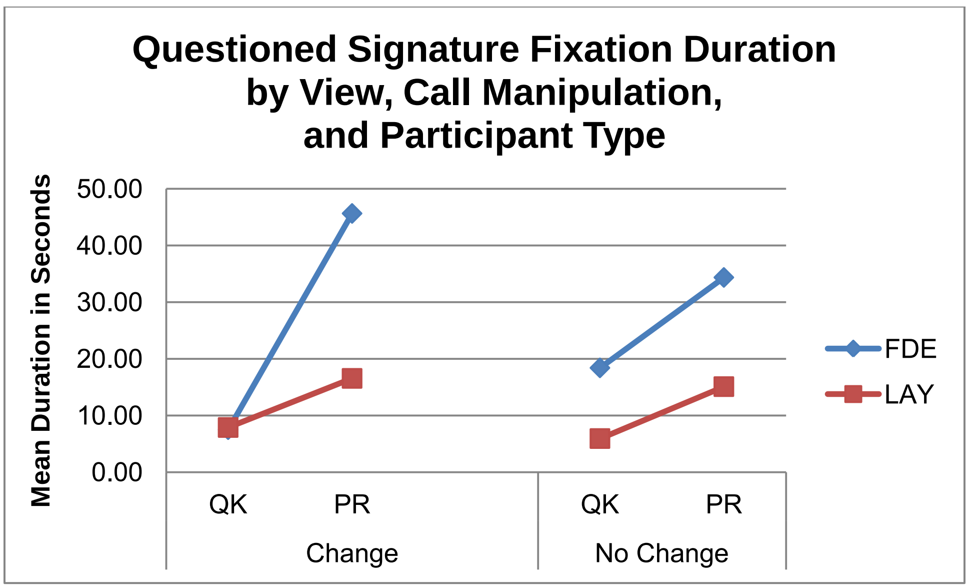
Known Signature Fixation Duration by View, Call Manipulation, and Participant Type

	QK Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	1.89	1.56	3	8.84	8.97	42
LAY	5.11	5.29	28	4.68	5.06	12
	PR Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	17.43	16.41	3	10.97	8.44	42
LAY	5.71	9.03	28	6.09	5.96	12

These findings indicate that the mean fixation duration for the questioned signature was on average significantly greater in the second time the signature was viewed (PR) than the first time it was viewed (QK). The fixation duration was greater for FDEs in the Change/Peer Review condition, but greater for Lay participants in the No Change/Peer Review condition.

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation duration in seconds during the initial viewing of the signature (QK comparison) and the second viewing of the signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Nagle 4 presents mean fixation duration by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Nagle 4



Significant main effects were found for *view*, $F(1, 81) = 31.78$, $p < .001$, $\eta^2 = .282$, and for *participant type*, $F(1, 81) = 8.26$, $p = .005$, $\eta^2 = .093$. No significant effect was found for *call manipulation* ($p = .857$, *ns*).

A significant interaction effect was found for *view* x *participant type*, $F(1, 81) = 8.09$, $p = .006$, $\eta^2 = .091$. No significant two-way interaction was found for call *manipulation* x *participant type* ($p = .886$, *ns*) or for *view* x *call manipulation* ($p = .093$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction effect was found, ($p = .079$, *ns*). Table 3.5. Nagle 5 presents the analysis means and standard deviations.

Table 3.5. Nagle 5

Questioned Signature Fixation Duration by View, Call Manipulation, and Participant Type

QK Comparison View

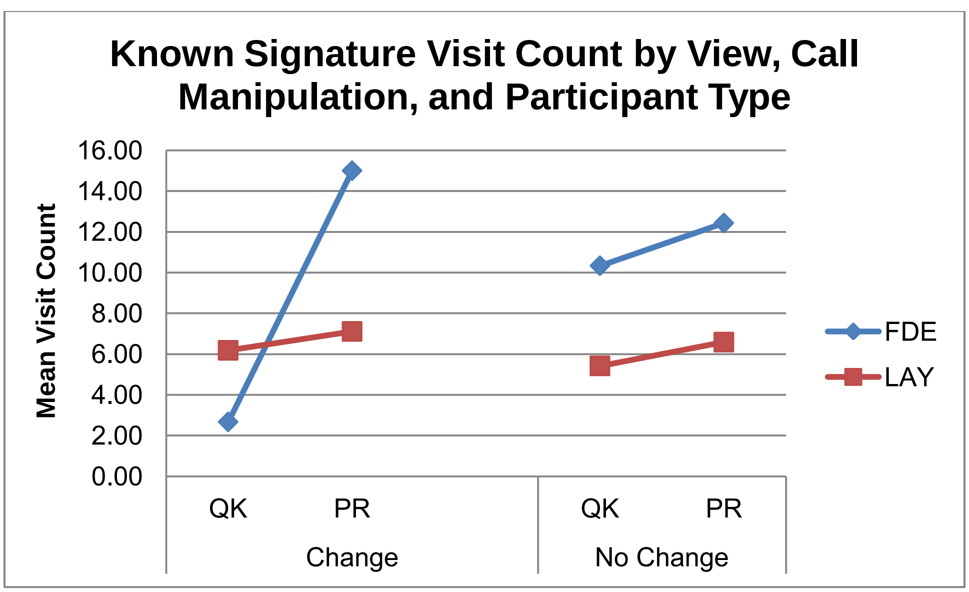
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	7.49	6.99	3	18.40	15.55	42
LAY	7.88	8.70	28	5.93	4.72	12
			PR Comparison View			
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	45.66	29.75	3	34.36	22.72	42
LAY	16.55	23.30	28	15.09	12.22	12

These findings indicate that the mean fixation duration for the questioned signature was on average greater for FDEs than for Lay participants. There was a significant increase in fixation duration from the first time the questioned signature was viewed (QK) to the second time it was viewed (PR). This difference was particularly pronounced for FDEs in the Change condition.

<u>*Total Visit Count*</u>

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit count during the initial viewing of the signature (QK comparison) and the second viewing of the signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in visit count existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Nagle 5 presents mean visit count by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Nagle 5



A significant main effect was found for *view*, $F(1, 81) = 10.72$, $p = .002$, $\eta^2 = .117$. No significant effect was found for *call manipulation* ($p = .725$, *ns*), or for *participant type* ($p = .164$, *ns*).

A significant interaction effect was found for *view* x *participant type*, $F(1, 81) = 5.97$, $p = .017$, $\eta^2 = .069$. No significant two-way interaction was found for call *manipulation* x *participant type* ($p = .556$, *ns*), or for *view* x *call manipulation* ($p = .051$, *ns*), although this interaction approached significance.

A significant three-way (*participant type* x *call manipulation* x *view*) interaction effect was found, $F(1, 81) = 4.31$, $p = .041$, $\eta^2 = .051$. Table 3.5. Nagle 6 presents the analysis means and standard deviations.

Table 3.5. Nagle 6

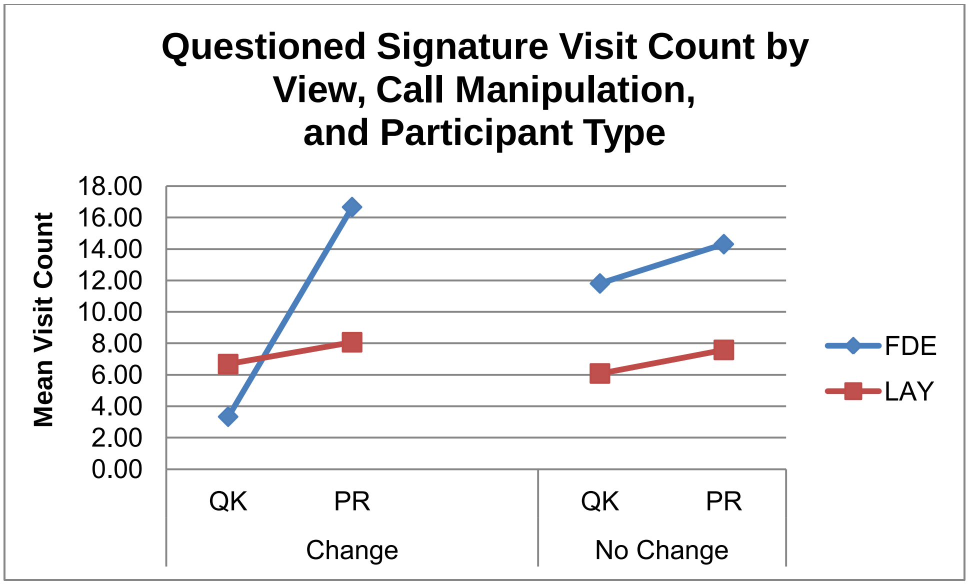
Known Signature Visit Count by View, Call Manipulation, and Participant Type

			QK Comparison View			
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	2.67	1.53	3	10.33	9.42	42
LAY	6.18	8.18	28	5.42	5.09	12
			PR Comparison View			
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	15.00	7.21	3	12.43	7.52	42
LAY	7.11	11.37	28	6.58	6.05	12

These findings indicate that the mean visit count for the known comparison signatures was on average greater from the first time the signatures were viewed (QK) to the second time they were viewed (PR). Compared to Lay participants, this difference was particularly pronounced for FDEs in the Change condition.

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit count during the initial viewing of the questioned signature (QK comparison) and the second viewing of the signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in visit count existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Nagle 6 presents mean visit count by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Nagle 6



A significant main effect was found for *view*, $F(1, 81) = 12.37$, $p = .001$, $\eta^2 = .133$. No significant effect was found for *call manipulation* ($p = .657$, *ns*), or for *participant type*, ($p = .121$, *ns*).

A significant interaction effect was found for *view* x *participant type*, $F(1, 81) = 5.91$, $p = .017$, $\eta^2 = .068$, and for *view* x *call manipulation* $F(1, 81) = 4.06$, $p = .047$, $\eta^2 = .048$. No significant two-way interaction was found for *call manipulation* x *participant type* ($p = .526$, *ns*).

A significant three-way (*participant type* x *call manipulation* x *view*) interaction effect was found, $F(1, 81) = 4.22$, $p = .043$, $\eta^2 = .050$. Table 3.5. Nagle 7 presents the analysis means and standard deviations.

Table 3.5. Nagle 7

Questioned Signature Fixation Count by View, Call Manipulation, and Participant Type

	QK Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	3.33	2.89	3	11.81	10.17	42
LAY	6.68	7.80	28	6.08	5.04	12
	PR Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	16.67	6.66	3	14.31	7.51	42
LAY	8.07	12.50	28	7.58	6.44	12

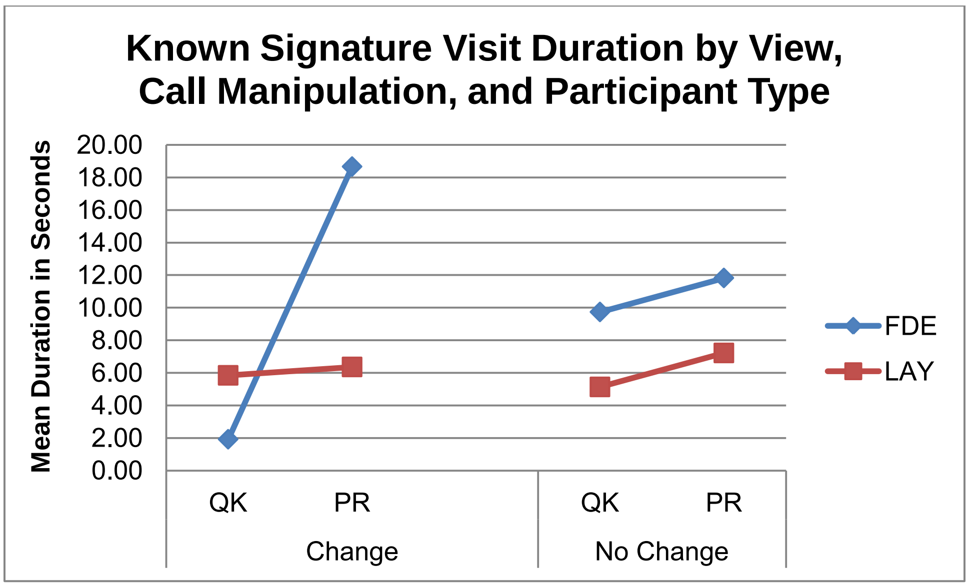
These findings indicate that the mean visit count for the questioned signature was on average greater from the first time the signature was viewed (QK) to the second time it was viewed (PR).

Compared to Lay participants, this difference was particularly pronounced for FDEs in the Change condition, while there was little change in visit count across conditions for the Lay participants.

<u>*Total Visit Duration*</u>

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit duration during the initial viewing of the known comparison signatures (QK comparison) and the second viewing of the signatures (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in visit duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Nagle 7 presents mean visit duration by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Nagle 7



A significant main effect was found for *view*, $F(1, 81) = 14.61$, $p < .001$, $\eta^2 = .153$. No significant effect was found for *call manipulation* ($p = .917$, *ns*), or for *participant type*, ($p = .106$, *ns*).

A significant interaction effect was found for *view* x *participant type*, $F(1, 81) = 8.37$, $p = .005$, $\eta^2 = .094$, and for *view* x *call manipulation* $F(1, 81) = 5.44$, $p = .022$, $\eta^2 = .063$. No significant two-way interaction was found for *call manipulation* x *participant type* ($p = .939$, *ns*). A significant three-way (*participant type* x *call manipulation* x *view*) interaction effect was found, $F(1, 81) = 8.37$, $p = .005$, $\eta^2 = .094$. Table 3.5. Nagle 8 presents the analysis means and standard deviations.

Table 3.5. Nagle 8

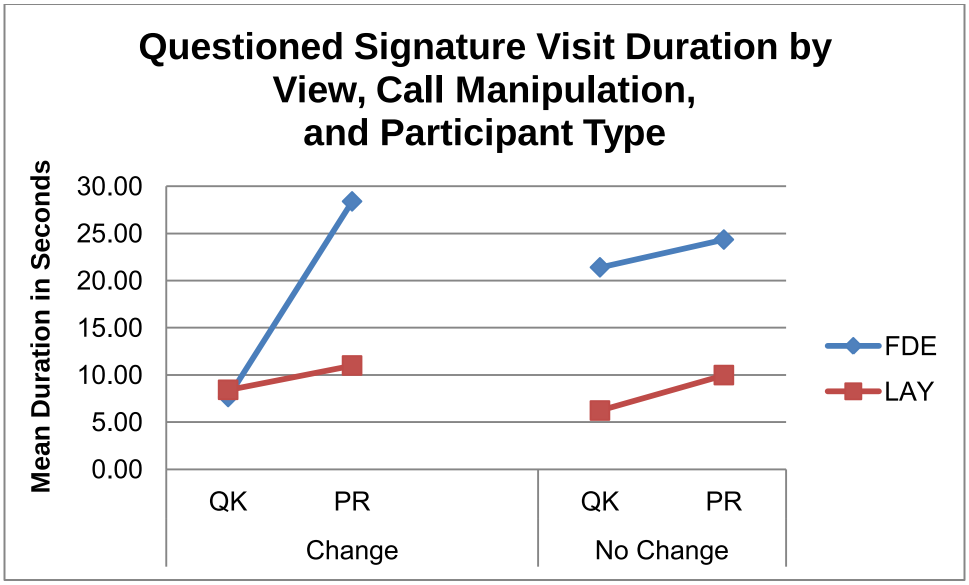
Known Signature Visit Duration by View, Call Manipulation, and Participant Type

QK Comparison View						
	Change			No Change		
Participant	*M*	*SD*	n	*M*	*SD*	n
FDE	1.91	1.60	3	9.73	9.44	42
LAY	5.84	6.89	28	5.13	5.66	12
PR Comparison View						
	Change			No Change		
Participant	*M*	*SD*	n	*M*	*SD*	n
FDE	18.66	18.23	3	11.82	9.05	42
LAY	6.35	9.80	28	7.21	7.54	12

These findings indicate that the mean visit duration for the questioned signature was on average greater from the first time the known comparison signatures were viewed (QK) to the second time they were viewed (PR). Compared to Lay participants, this difference was particularly pronounced for FDEs in the Change condition, while there was little change in visit duration across conditions for the Lay participants.

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit duration in seconds during the initial viewing of the questioned signature (QK comparison) and the second viewing of the signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in visit duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Nagle 8 presents mean visit duration by *view*, *call manipulation, and participant type*.

Figure 3.5 Nagle 8



A significant main effect was found for *participant type*, $F(1, 81) = 7.10$, $p = .009$, $\eta^2 = .081$, and for *view*, $F(1, 81) = 9.71$, $p = .003$, $\eta^2 = .107$. No significant effects were found for *call manipulation* ($p = .709$, *ns*).

No significant two-way interaction was found for *call manipulation* x *participant type* ($p = .458$, *ns*), for *view* x *call manipulation* ($p = .088$, *ns*), or for *view* x *participant type* ($p = .075$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction effect was found ($p = .052$, *ns*), although the three-way interaction approached significance. Table 3.5. Nagle 9 presents the analysis means and standard deviations.

Table 3.5. Nagle 9

Questioned Signature Visit Duration by View, Call Manipulation, and Participant Type

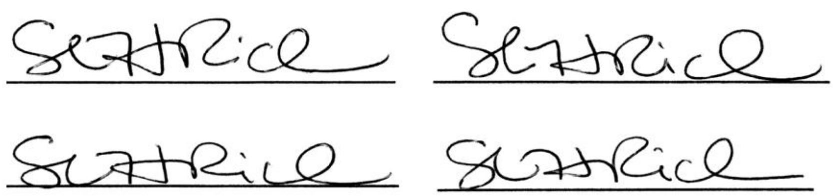
QK Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	7.65	7.16	3	21.40	17.85	42
LAY	8.41	9.46	28	6.21	4.81	12
PR Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	28.39	13.88	3	24.34	15.73	42
LAY	10.99	15.23	28	9.97	8.64	12

These findings indicate that the mean visit duration in the questioned signature was greater for FDEs than for Lay participants, and that among FDEs there was a significant increase in visit duration from the first time the signature was viewed (QK) to the second time it was viewed (PR), regardless of whether we manipulated the call in the peer review view. This difference was particularly pronounced for FDEs in the Change condition, while there was little change in visit duration across conditions for the Lay participants.

PEER REVIEW ANALYSES: Shawn Richards Signature 4 (Simulated, Low Complexity, Mixed)

Questioned

Known



Binomial logistic regression was conducted to determine which among four independent variables (*process call change, authorship call change, influence of process call change,* and *influence of authorship call change*) predicted participant type (FDE or Lay). Regression results indicated that the overall model fit was modest (-2 Log Likelihood = 82.43). The overall model was statistically significant, and statistically reliable in distinguishing between participant types, $\chi^2(4) = 28.86$, $p < .001$. The model correctly classified 80.2% of cases. Examination of the contribution of each factor to the model revealed that only changing the process call significantly predicted *participant type.* The odds ratio for process call change is significant and large, indicating substantial change in the likelihood of *participant type.* Table 3.5. Richards 1 presents the regression coefficients for this model.

Table 3.5. Richards 1

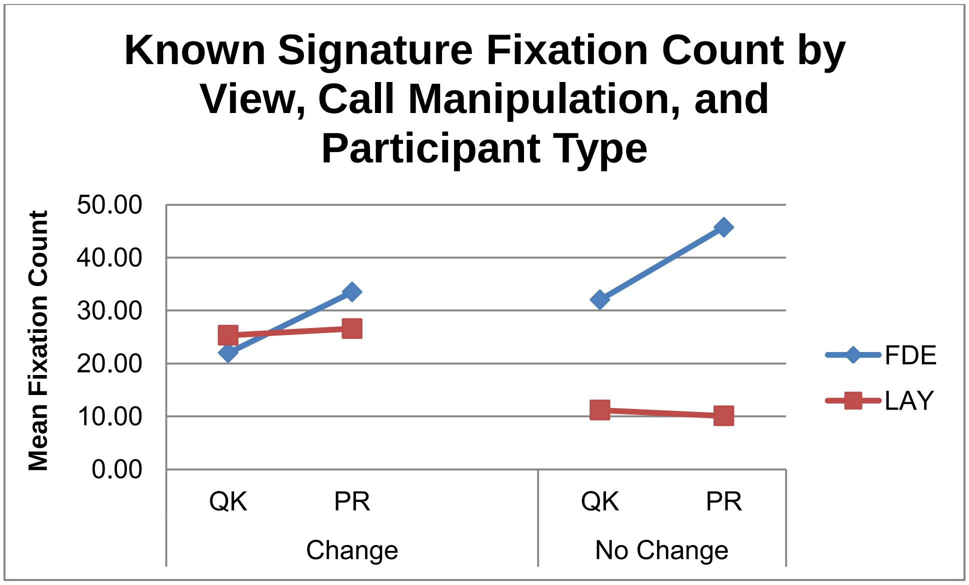
Logistic Regression Coefficients for Peer Review Analysis of Richards Signature 4

	B	*Wald*	*df*	*p*	*Odds Ratio*
Change Process Call	1.88	10.437	1	.001	6.53
Change Authorship Call	0.80	.592	1	.442	2.22
Process Change Influence	-0.84	1.782	1	.182	0.43
Authorship Change Influence	0.28	.084	1	.772	1.32
Constant	-1.05	1.915	1	.166	0.35

<u>*Total Fixation Count*</u>

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation count during the initial viewing of the known comparison signatures (QK comparison) and the second viewing of the signatures (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation count existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Richards 1 presents mean fixation count by view, call manipulation, and participant type.

Figure 3.5 Richards 1



A significant main effect was found for *participant type*, $F(1, 81) = 4.67$, $p = .034$, $\eta^2 = .055$. No significant main effects were found for *call manipulation* ($p = .764$, *ns*), or for *view* ($p = .111$, *ns*).

No significant two-way interactions were identified for *view* x *call manipulation* ($p = .992$, *ns*), or for *view* x *participant type* ($p = .116$, *ns*). No significant interaction effect was found for *participant type* x *call manipulation* ($p = .061$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction was found ($p = .774$, *ns*). Table 3.5. Richards 2 presents the analysis means and standard deviations.

Table 3.5. Richards 2

Known Signature Fixation Count by View, Call Manipulation, and Participant Type

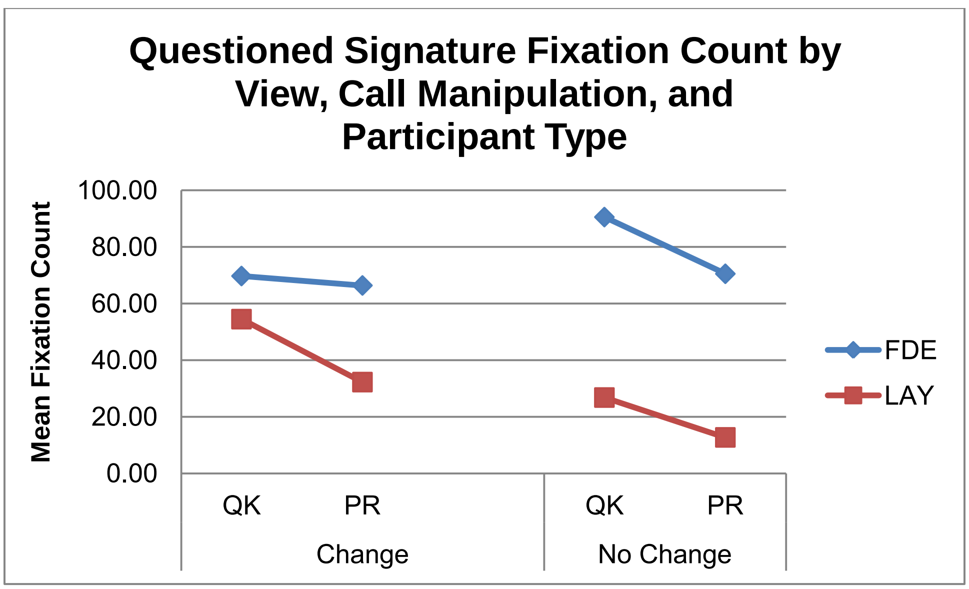
	QK Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	22.00	20.64	6	32.03	29.57	39
LAY	25.32	22.76	28	11.18	14.90	11
	PR Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	33.50	35.40	6	45.72	39.11	39

LAY	26.57	20.47	28	10.09	8.19	11

These findings indicate that although the mean fixation count in the known comparison signatures was greater for FDEs than for Lay participants, there was no significant change in fixation count from the first time the signatures were viewed (QK) to the second time they were viewed (PR), regardless of whether we manipulated the call in the peer review view. Fixation count for Lay participants in the Change/Questioned/know condition was slightly higher than that for FDEs, but this difference was not statistically significant.

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation count during the initial viewing of the signature (QK comparison) and the second viewing of the signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation count existed according to the *call manipulation* (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Richards 2 presents mean fixation count by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Richards 2



A significant main effect was found for *participant type*, $F(1, 81) = 13.70$, $p < .001$, $\eta^2 = .146$, and for *view* $F(1, 81) = 5.02$, $p = .028$, $\eta^2 = .028$. No significant main effects were found for *call manipulation* ($p = .631$, *ns*),

No significant two-way interactions were identified for *view* x *call manipulation* ($p = .750$, *ns*), or for *view* x *participant type* ($p = .627$, *ns*). No significant interaction effect was found for *participant type* x *call manipulation* ($p = .122$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction was found (p = .354, *ns*). Table 3.5. Richards 3 presents the analysis means and standard deviations.

Table 3.5. Richards 3

Questioned Signature Fixation Count by View, Call Manipulation, and Participant Type

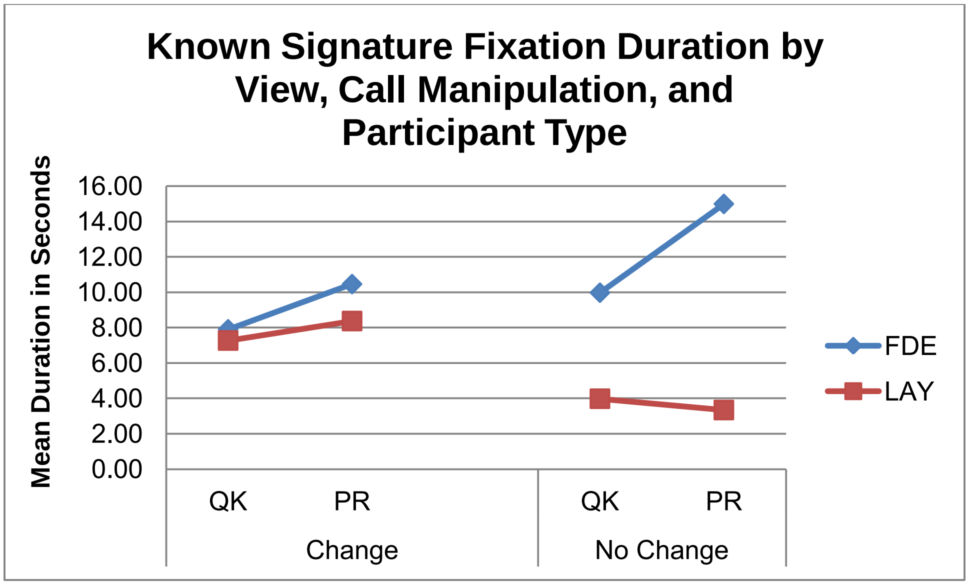
	QK Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	69.67	33.76	6	90.49	69.28	39
LAY	54.43	44.71	28	26.73	30.97	11
	PR Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	66.33	53.19	6	70.46	44.55	39
LAY	32.18	23.06	28	12.64	10.91	11

These findings indicate that the mean fixation count in the questioned signature was greater for FDEs than for Lay participants. There was a significant decrease in fixation count from the first time the questioned signature was viewed (QK) to the second time it was viewed (PR), regardless of whether we manipulated the call in the peer review view.

Total Fixation Duration

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation duration during the initial viewing of the known comparison signatures (QK comparison) and the second viewing of the signatures (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Richards 3 presents mean fixation duration by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Richards 3



A significant main effect was found for *participant type*, $F(1, 81) = 5.16$, $p = .026$, $\eta^2 = .061$. No significant main effects were found for *call manipulation* ($p = .848$, *ns*), or for *view* ($p = .130$, *ns*).

No significant two-way interactions were identified for *view* x *call manipulation* ($p = .891$, *ns*), or for *view* x *participant type* ($p = .180$, *ns*). No significant interaction effect was found for *participant type* x *call manipulation* ($p = .100$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction was found ($p = .427$, *ns*). Table 3.5. Richards 4 presents the analysis means and standard deviations.

Table 3.5. Richards 4

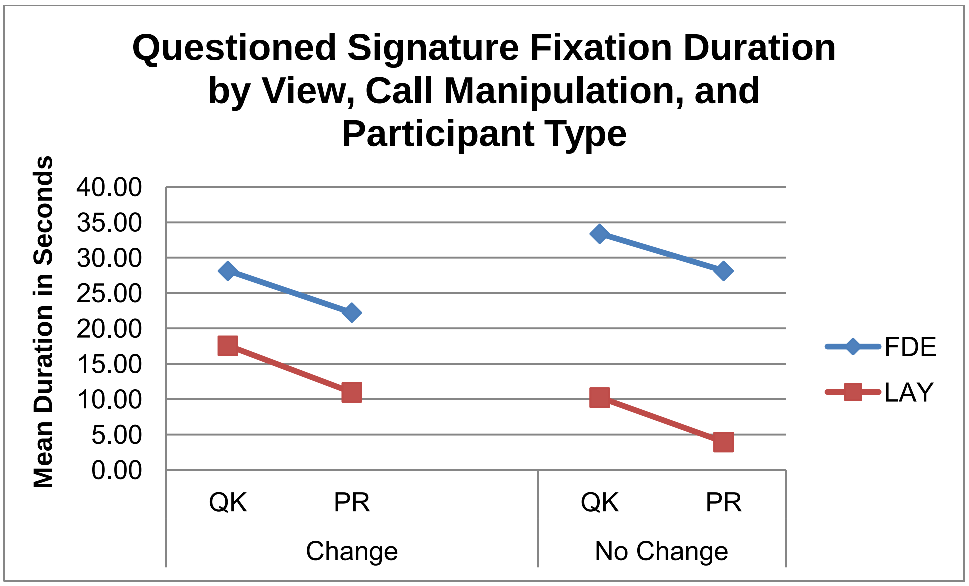
Known Signature Fixation Duration by View, Call Manipulation, and Participant Type

	QK Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	7.90	7.12	6	9.97	8.75	39
LAY	7.27	6.78	28	3.98	6.55	11
	PR Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	10.46	8.67	6	15.00	13.56	39
LAY	8.37	6.86	28	3.34	3.03	11

These findings indicate that the mean fixation duration in the known comparison signatures was greater for FDEs than for Lay participants, and that fixation duration was significantly lower the second time the known comparison signatures were viewed (PR), regardless of whether we manipulated the call in the peer review view.

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation duration in seconds during the initial viewing of the questioned signature (QK comparison) and the second viewing of the signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Richards 4 presents mean fixation duration by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Richards 4



A significant main effect was found for *participant type*, $F(1, 81) = 15.90$, $p < .001$, $\eta^2 = .166$, and for *view* $F(1, 81) = 5.47$, $p = .022$, $\eta^2 = .064$. No significant main effects were found for *call manipulation* ($p = .854$, *ns*).

No significant two-way interactions were identified for *view* x *call manipulation* ($p = .926$, *ns*), or for *view* x *participant type* ($p = .867$, *ns*). No significant interaction effect was found for *participant type* x *call manipulation* ($p = .146$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction was found ($p = .972$, *ns*). Table 3.5. Richards 5 presents the analysis means and standard deviations.

Table 3.5. Richards 5

Questioned Signature Fixation Duration by View, Call Manipulation, and Participant Type

	QK Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	28.14	20.26	6	33.38	25.35	39

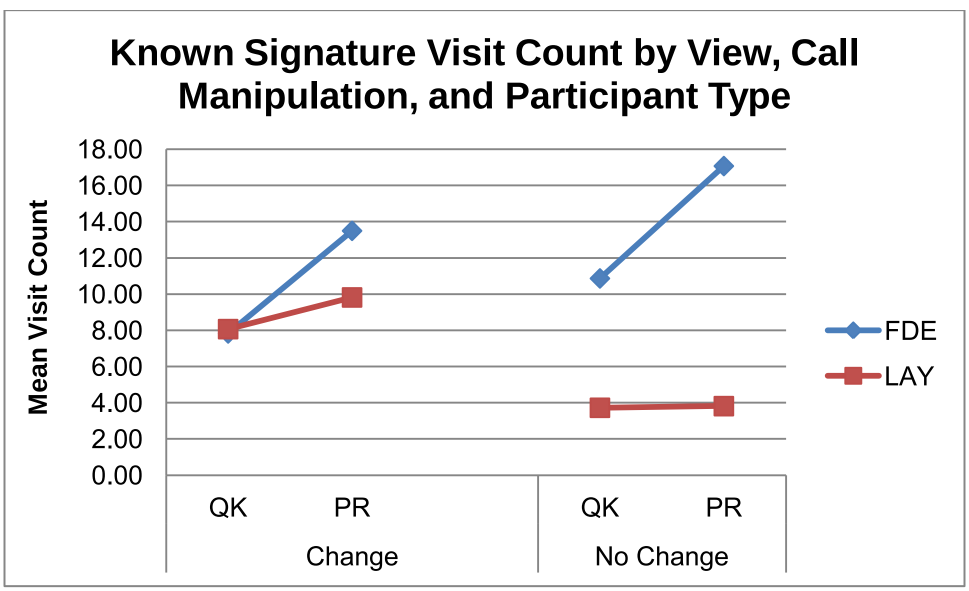
Participant	M	SD	n	M	SD	n
LAY	17.56	14.85	28	15.49	14.81	39
			PR Comparison View			
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	22.25	12.26	6	28.14	18.52	39
LAY	10.98	9.97	28	3.96	3.59	11

These findings indicate that the fixation duration in the questioned signature was greater for FDEs than for Lay participants. There was a significant decrease in fixation duration from the first time the questioned signature was viewed (QK) to the second time it was viewed (PR), regardless of whether we manipulated the call in the peer review view.

<u>*Total Visit Count*</u>

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit count during the initial viewing of the known comparison signatures (QK comparison) and the second viewing of the signatures (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in visit count existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Richards 5 presents mean visit count by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Richards 5



A significant main effect was found for *participant type*, $F(1, 81) = 7.78$, $p = .007$, $\eta^2 = .089$, and for *view* $F(1, 81) = 7.20$, $p = .009$, $\eta^2 = .083$. No significant main effects were found for *call manipulation* ($p = .664$, *ns*).

No significant two-way interactions were identified for *view* x *call manipulation* ($p = .827$, *ns*), or for *view* x *participant type* ($p = .053$, *ns*), although this interaction approached significance. No significant interaction effect was found for *participant type* x *call manipulation* ($p = .051$, *ns*), while this interaction also approached significance.

No significant three-way (*participant type* x *call manipulation* x *view*) interaction was found ($p = .668$, *ns*). Table 3.5. Richards 6 presents the analysis means and standard deviations.

Table 3.5. Richards 6

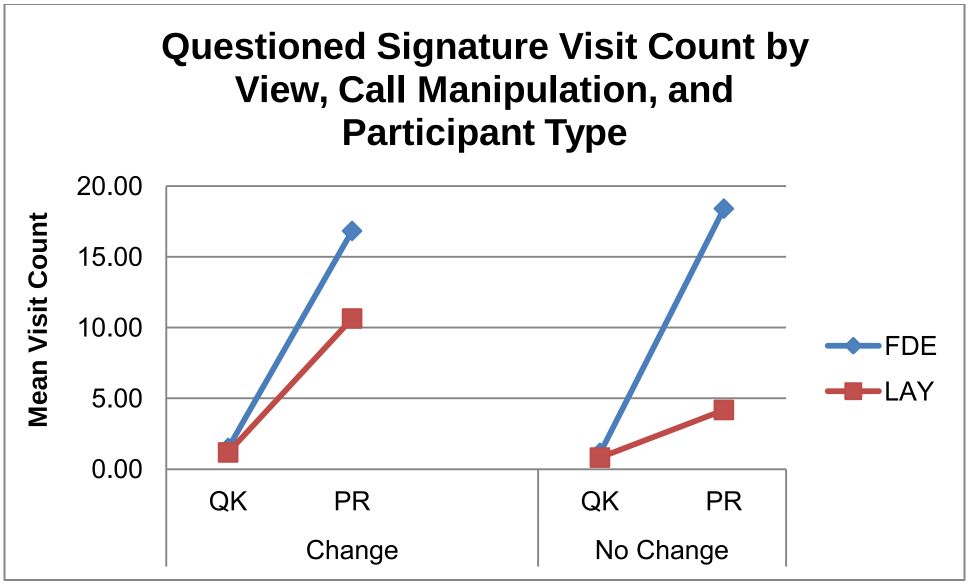
Known Signature Visit Count by View, Call Manipulation, and Participant Type

QK Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	7.83	7.65	6	10.87	9.09	39
LAY	8.07	7.55	28	3.73	4.43	11
PR Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	13.50	11.48	6	17.08	11.33	39
LAY	9.82	7.86	28	3.82	2.64	11

These findings indicate that the mean visit count in the questioned signature was greater for FDEs than for Lay participants, and that among FDEs the mean number of visits was greater from the first time the signature was viewed (QK) to the second time it was viewed (PR). This trend was less pronounced for Lay participants, particularly in the No Change condition.

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit count during the initial viewing of the questioned signature (QK comparison) and the second viewing of the signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in visit count existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Richards 6 presents mean visit count by *view, call manipulation*, and *participant type*.

Figure 3.5 Richards 6



A significant main effect was found for *participant type*, $F(1, 81) = 15.58$, $p < .001$, $\eta^2 = .163$, and for *view* $F(1, 81) = 71.86$, $p < .001$, $\eta^2 = .473$. No significant main effects were found for *call manipulation* ($p = .298$, *ns*).

A significant interaction effect was found for *view* x *participant type*, $F(1, 81) = 15.90$, $p < .001$, $\eta^2 = .166$. A significant interaction effect was found for *view* x *participant type*, $F(1, 81) = 15.90$, $p < .001$, $\eta^2 = .166$. No significant two-way interactions were identified for *view* x *call manipulation* ($p = .438$, *ns*), or for *participant type* x *call manipulation* ($p = .146$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction was found ($p = .138$, *ns*). Table 3.5. Richards 7 presents the analysis means and standard deviations.

Table 3.5. Richards 7

Questioned Signature Fixation Count by View, Call Manipulation, and Participant Type

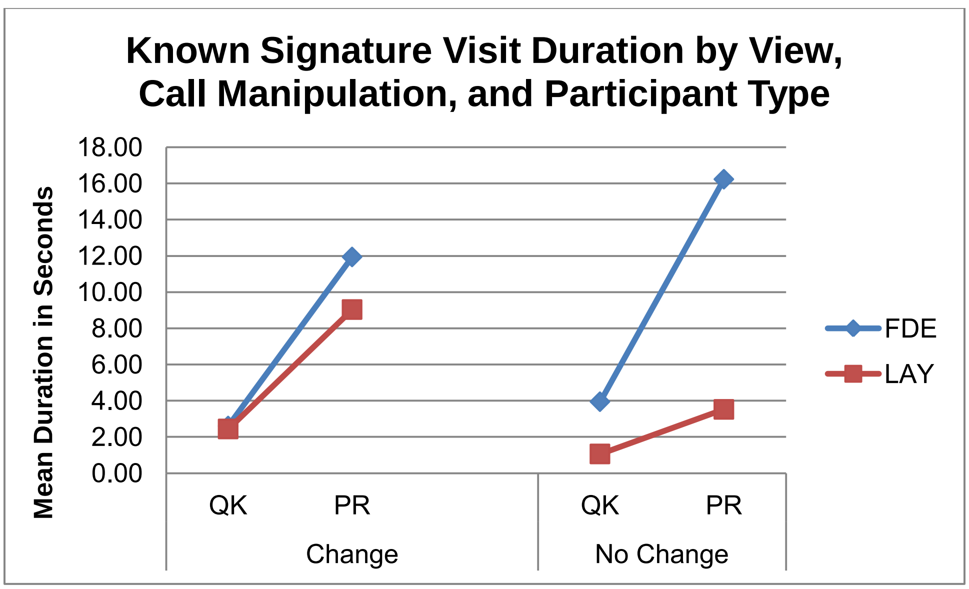
QK Comparison View						
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	1.50	0.55	6	1.15	0.67	39
LAY	1.18	0.39	28	0.82	0.40	11
PR Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	16.83	9.17	6	18.41	11.53	39
LAY	10.64	7.66	28	4.18	3.03	11

These findings indicate that the mean visit count in the questioned signature was greater for FDEs than for Lay participants, and that visit count was significantly greater for both FDEs and Lay participants the second time the questioned signature was viewed (PR), regardless of whether we manipulated the call in the peer review view.

Total Visit Duration

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit duration during the initial viewing of the known comparison signatures (QK comparison) and the second viewing of the signatures (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in visit duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Richards 6 presents mean visit duration by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Richards 6



A significant main effect was found for *participant type*, $F(1, 81) = 6.78$, $p = .011$, $\eta^2 = .078$, and for *view*, $F(1, 81) = 28.83$, $p < .001$, $\eta^2 = .265$. No significant main effects were found for *call manipulation* ($p = .861$, *ns*).

A significant interaction effect was found for *view* x *participant type*, $F(1, 81) = 4.84$, $p = .031$, $\eta^2 = .057$. No significant two-way interactions were identified for *view* x *call manipulation* ($p = .837$, *ns*), or for *participant type* x *call manipulation* ($p = .084$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction was found ($p = .219$, *ns*). Table 3.5. Richards 8 presents the analysis means and standard deviations.

Table 3.5. Richards 8

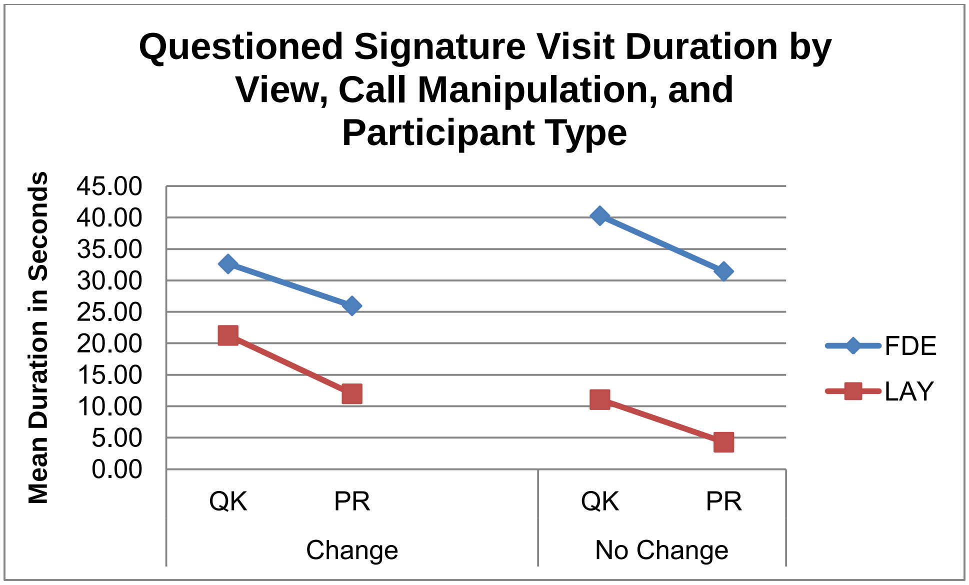
Known Signature Visit Duration by View, Call Manipulation, and Participant Type

	QK Comparison View					
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	2.60	2.56	6	3.94	3.07	39
LAY	2.44	2.39	28	1.06	2.12	11
	PR Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	11.94	11.32	6	16.23	14.32	39
LAY	9.03	7.22	28	3.52	3.16	11

These findings indicate that the mean visit duration in the known comparison signatures was greater for FDEs than for Lay participants, and that visit duration was significantly greater for both FDEs and Lay participants the second time the known comparison signatures were viewed (PR), regardless of whether we manipulated the call in the peer review view.

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit duration in seconds during the initial viewing of the questioned signature (QK comparison) and the second viewing of the signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in visit duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Richards 8 presents mean visit duration by *view, call manipulation, and participant type*.

Figure 3.5 Richards 8



A significant main effect was found for *participant type*, $F(1, 81) = 18.23$, $p < .001$, $\eta^2 = .186$, and for *view*, $F(1, 81) = 6.93$, $p = .010$, $\eta^2 = .080$. No significant main effects were found for *call manipulation* ($p = .804$, *ns*).

No significant two-way interactions were identified for *view* x *call manipulation* ($p = .978$, *ns*), for *participant type* x *call manipulation* ($p = .109$, *ns*), or for *view* x *participant type* ($p = .964$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction was found ($p = .697$, *ns*). Table 3.5. Richards 9 presents the analysis means and standard deviations.

Table 3.5. Richards 9

Questioned Signature Visit Duration by View, Call Manipulation, and Participant Type

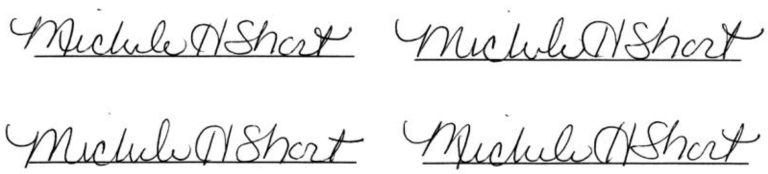
			QK Comparison View			
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	32.63	18.28	6	40.28	28.81	39
LAY	21.25	18.99	28	11.05	14.53	11
			PR Comparison View			
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	25.96	18.04	6	31.44	19.41	39
LAY	11.98	10.26	28	4.28	3.96	11

These findings indicate that the mean visit duration in the questioned signature was greater for FDEs than for Lay participants, and that visit duration was significantly lower for both FDEs and Lay participants the second time the questioned signature was viewed (PR), regardless of whether we manipulated the call in the peer review view.

PEER REVIEW ANALYSES: Michele Short Signature 1 (Simulated, High Complexity, Text)

Questioned

Known



Binomial logistic regression was conducted to determine which among four independent variables (*process call change, authorship call change, influence of process call change,* and *influence of authorship call change*) predicted participant type (FDE or Lay). Regression results indicated that the overall model fit was modest (-2 Log Likelihood = 81.18). The overall model was statistically significant, and statistically reliable in distinguishing between participant types, χ^2 (4) = 25.66, $p < .001$. The model correctly classified 80.8% of cases. Examination of the contribution of each factor to the model revealed that changing the process call and the influence of authorship call significantly predicted *participant type.* The odds ratio for process call change is small, indicating little change in the likelihood of participant type, while the influence of change in the authorship call is quite large, indicating substantial change in the likelihood of *participant type.* Table 3.5. Short 1 presents the regression coefficients for this model.

Table 3.5. Short 1
Logistic Regression Coefficients for Peer Review Analysis of Short Signature 1

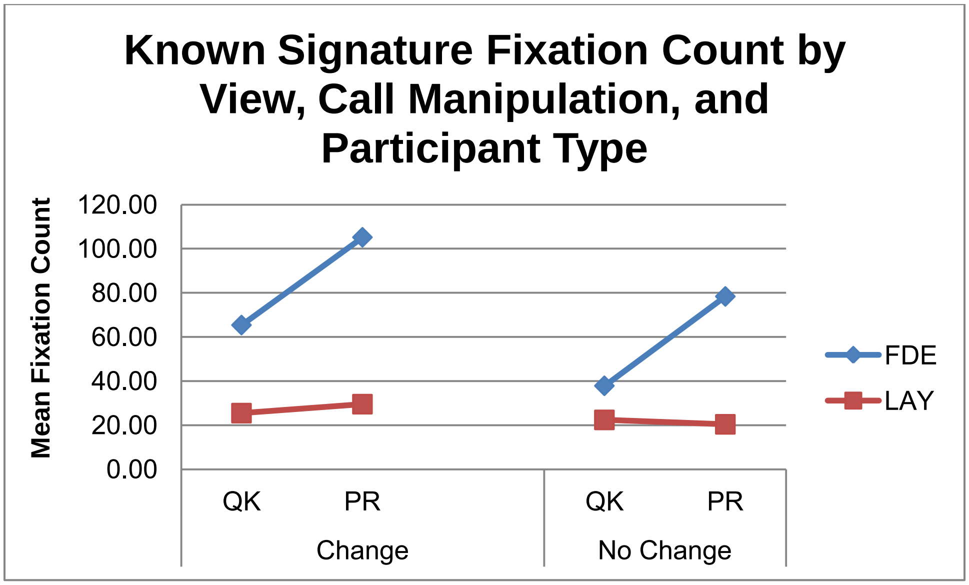
	B	*Wald*	*df*	*Sig.*	*Odds Ratio*
Change Process Call	-1.543	6.818	1	.009	.214
Change Authorship Call	.711	1.652	1	.199	2.036
Process Change Influence	-.601	.515	1	.473	.548
Authorship Change Influence	2.558	6.084	1	.014	12.904
Constant	-1.115	2.127	1	.145	.328

<u>*Total Fixation Count*</u>

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant

differences existed in the mean fixation count during the initial viewing of the known comparison signatures (QK comparison) and the second viewing of the signatures (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation count existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Short 1 presents mean fixation count by view, call manipulation, and participant type.

Figure 3.5 Short 1



A significant main effect was found for *participant type*, $F(1, 80) = 20.11$, $p < .001$, $\eta^2 = .201$, and for *view*, $F(1, 80) = 12.44$, $p = .001$, $\eta^2 = .123$. No significant main effect was found for *call manipulation* ($p = .118$, *ns*).

A significant interaction effect was found for *view* x *participant type*, $F(1, 80) = 11.22$, $p = .001$, $\eta^2 = .123$. No significant two-way interactions were identified for *view* x *call manipulation* ($p = .820$, *ns*), or for *participant type* x *call manipulation* ($p = .320$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction was found ($p = .772$, *ns*). Table 3.5. Short 2 presents the analysis means and standard deviations.

Table 3.5. Short 2
Known Signature Fixation Count by View, Call Manipulation, and Participant Type

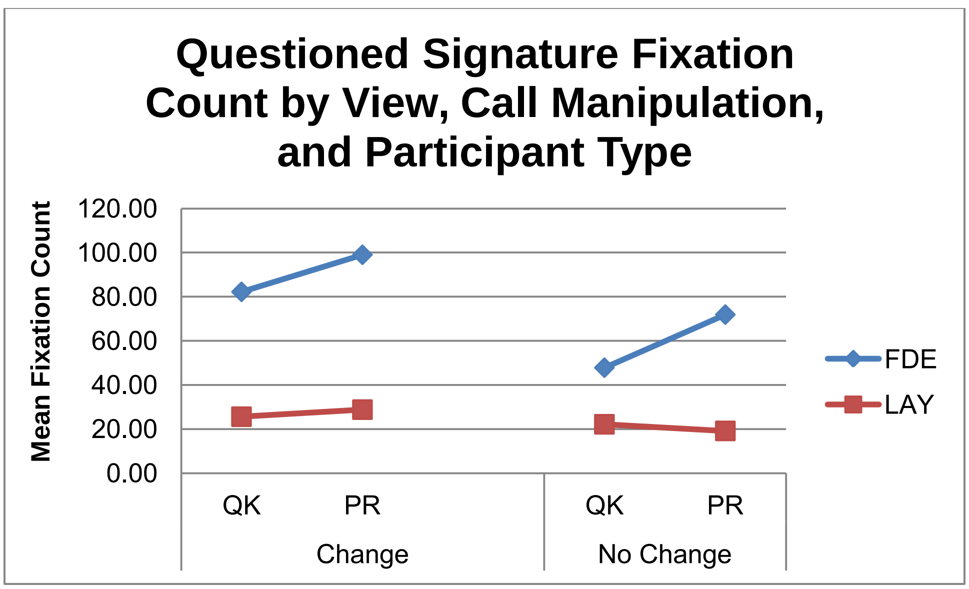
	QK Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	65.40	47.06	5	37.85	30.84	40
LAY	25.45	23.83	31	22.38	25.57	8
	PR Comparison View					

Participant	Change			No Change		
	M	*SD*	n	*M*	*SD*	n
FDE	105.20	68.51	5	78.38	55.98	40
LAY	29.52	32.57	31	20.38	20.18	8

These findings indicate that the mean fixation count for the known comparison signatures was on average greater for FDEs than for Lay participants. There was a significant increase in fixation count from the first time the known comparison signatures were viewed (QK) to the second time they were viewed (PR). This difference was particularly pronounced for FDEs in the Change condition. Conversely, little difference was noted among Lay participants according to call manipulation or view.

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation count during the initial viewing of the questioned signature (QK comparison) and the second viewing of the signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation count existed according to the *call manipulation* (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Short 2 presents mean fixation count by *view, call manipulation*, and *participant type*.

Figure 3.5 Short 2



A significant main effect was found for *participant type*, $F(1, 80) = 25.12$, $p < .001$, $\eta^2 = .239$, and for *view* $F(1, 80) = 4.02$, $p = .048$, $\eta^2 = .048$. No significant main effects were found for *call manipulation* ($p = .072$, *ns*).

No significant two-way interactions were identified for *view* x *call manipulation* (p = .958, *ns*), or for *view* x *participant type* (p = .050, *ns*), although this factor approached significance. No significant interaction effect was found for *participant type* x *call manipulation* (p = .241, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction was found (p = .513, *ns*). Table 3.5. Short 3 presents the analysis means and standard deviations.

Table 3.5. Short 3

Questioned Signature Fixation Count by View, Call Manipulation, and Participant Type

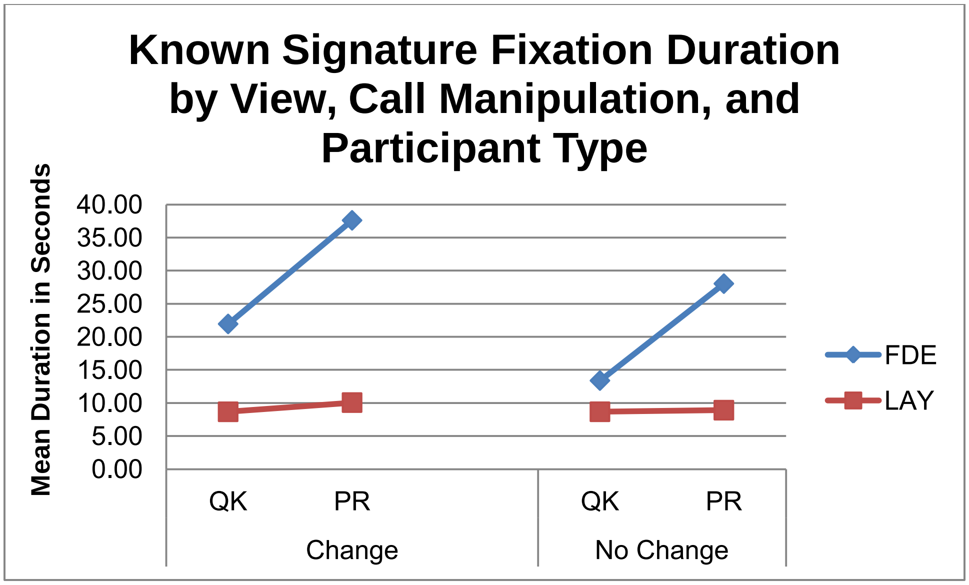
QK Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	82.20	36.13	5	47.80	37.07	40
LAY	25.58	18.43	31	22.13	23.78	8
PR Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	99.00	50.97	5	71.88	52.79	40
LAY	28.77	29.46	31	19.13	14.12	8

These findings indicate that the mean fixation count for the questioned signature was on average greater for FDEs than for Lay participants. There was a significant increase in fixation count from the first time the questioned signature was viewed (QK) to the second time it was viewed (PR), but this was not significantly related to the call manipulation. This difference was greater for FDEs in the Change condition. Conversely, little difference was noted among Lay participants according to call manipulation or view.

Total Fixation Duration

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation duration during the initial viewing of the known comparison signatures (QK comparison) and the second viewing of the signatures (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Short 3 presents mean fixation duration by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Short 3



A significant main effect was found for *participant type*, $F(1, 80) = 18.53$, $p < .001$, $\eta^2 = .188$, and for *view* $F(1, 80) = 12.73$, $p = .001$, $\eta^2 = .137$. No significant main effects were found for *call manipulation* ($p = .203$, *ns*).

A significant interaction effect was found for *participant type* x *view*, $F(1, 80) = 10.27$, $p = .002$, $\eta^2 = .114$. No significant two-way interactions were identified for *view* x *call manipulation* ($p = .810$, *ns*), or for *participant type* x *call manipulation* ($p = .261$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction was found ($p = .987$, *ns*). Table 3.5. Short 4 presents the analysis means and standard deviations.

Table 3.5. Short 4

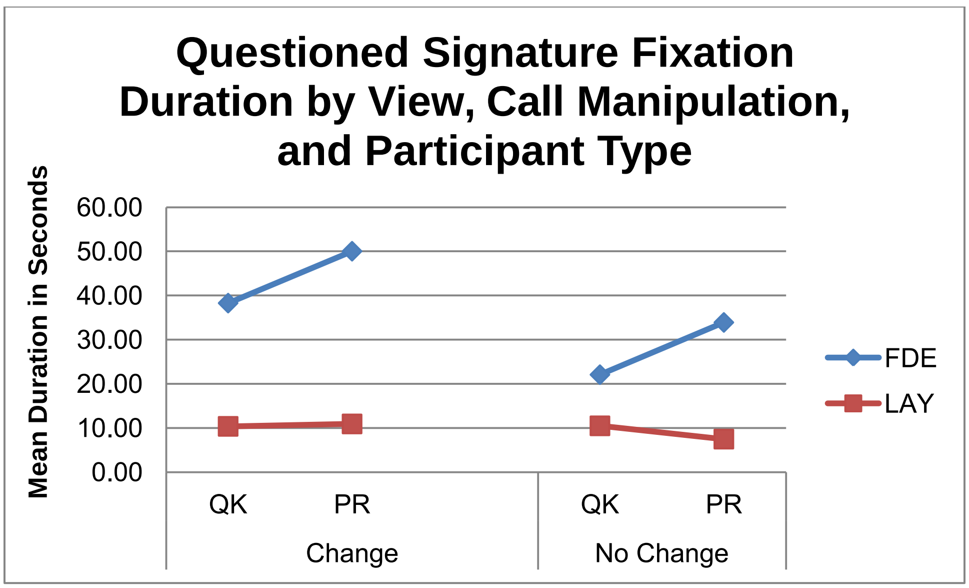
Known Signature Fixation Duration by View, Call Manipulation, and Participant Type

	QK Comparison View					
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	21.95	13.59	5	13.39	11.71	40
LAY	8.67	7.66	31	8.68	12.12	8
	PR Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	37.61	23.54	5	28.04	20.93	40
LAY	10.06	9.70	31	8.91	11.98	8

These findings indicate again that the mean fixation duration for the known comparison signatures was on average greater for FDEs than for Lay participants. There was a significant increase in fixation duration from the first time the known comparison signatures were viewed (QK) to the second time they were viewed (PR), but this was not significantly related to the call manipulation. Conversely, little difference was noted among Lay participants according to call manipulation or view.

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation duration in seconds during the initial viewing of the questioned signature (QK comparison) and the second viewing of the signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Short 4 presents mean fixation duration by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Short 4



A significant main effect was found for *call manipulation*, $F(1, 80) = 4.22$, $p = .043$, $\eta^2 = .050$, for *participant type*, $F(1, 80) = 36.61$, $p < .001$, $\eta^2 = .314$, and for *view*, $F(1, 80) = 5.11$, $p = .026$, $\eta^2 = .060$.

A significant interaction effect was found for *participant type* x *call manipulation*, $F(1, 80) = 7.77$, $p = .007$, $\eta^2 = .089$. No significant two-way interactions were identified for *view* x *call manipulation* ($p = .710$, *ns*), or for *view* x *participant type* ($p = .099$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction was found ($p = .698$, *ns*). Table 3.5. Short 5 presents the analysis means and standard deviations.

Table 3.5. Short 5

Questioned Signature Fixation Duration by View, Call Manipulation, and Participant Type

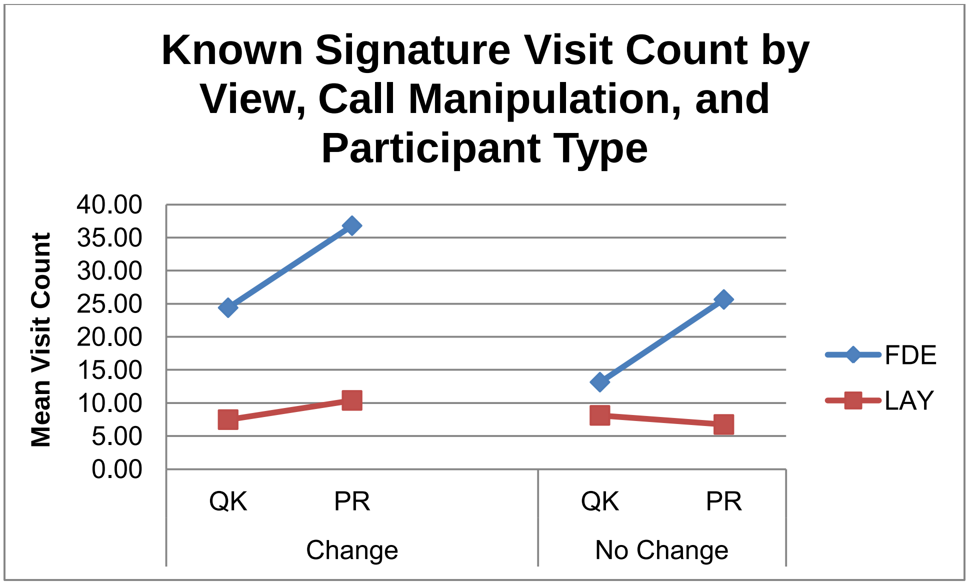
QK Comparison View						
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	38.29	15.25	5	22.08	17.73	40
LAY	10.36	8.76	31	10.48	12.79	8
PR Comparison View						
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	50.04	26.41	5	33.91	20.95	40
LAY	10.91	11.21	31	7.47	7.25	8

These findings indicate that the mean fixation duration for the questioned signature was on average greater for FDEs than for Lay participants. There was a significant increase in fixation duration from the first time the questioned signature was viewed (QK) to the second time it was viewed (PR), particularly among the FDEs. Conversely, little difference was noted among Lay participants according to call manipulation or view.

Total Visit Count

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit count during the initial viewing of the known comparison signatures (QK comparison) and the second viewing of the known comparison signatures (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in visit count existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Short 5 presents mean visit count by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Short 5



A significant main effect was found for *participant type*, $F(1, 80) = 24.55$, $p < .001$, $\eta^2 = .235$, and for *view* $F(1, 80) = 11.46$, $p = .001$, $\eta^2 = .125$. No significant main effects were found for *call manipulation* ($p = .065$, *ns*).

A significant interaction was found for *view* x *participant type*, $F(1, 80) = 8.96$, $p = .004$, $\eta^2 = .101$. No significant two-way interactions were identified for *view* x *call manipulation* ($p = .594$, *ns*), or for *participant type* x *call manipulation* ($p = .157$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction was found ($p = .596$, *ns*).Table 3.5. Short 6 presents the analysis means and standard deviations.

Table 3.5. Short 6

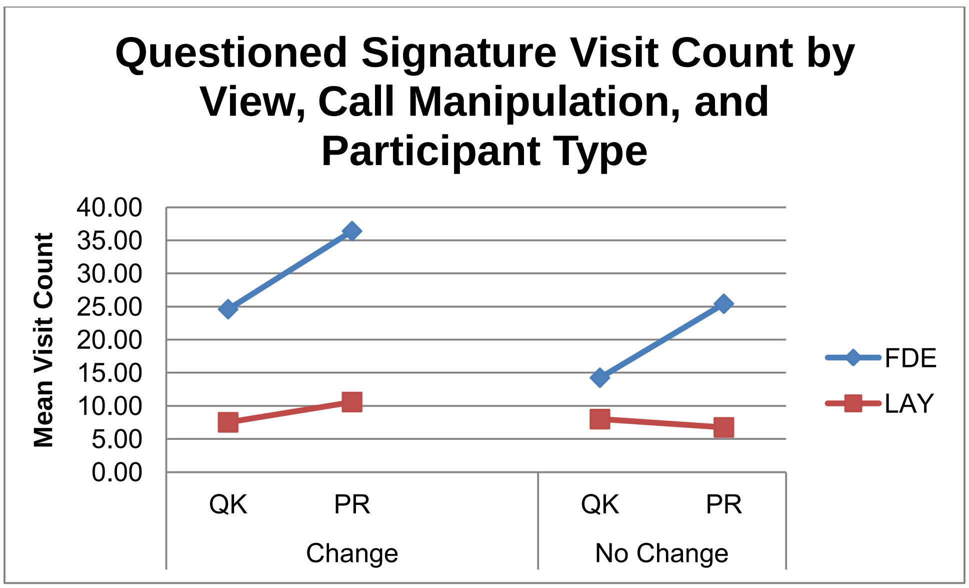
Known Signature Visit Count by View, Call Manipulation, and Participant Type

	QK Comparison View					
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	24.40	13.41	5	13.15	11.59	40
LAY	7.48	6.69	31	8.13	8.29	8
	PR Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	36.80	28.59	5	25.65	15.68	40
LAY	10.39	12.66	31	6.75	5.47	8

These findings indicate again that the mean visit count for the known comparison signatures was on average greater for FDEs than for Lay participants. Among FDEs there was a significant increase in visit count from the first time the known comparison signatures were viewed (QK) to the second time they were viewed (PR), but this was not significantly related to the call manipulation. Again, little difference was noted among Lay participants according to call manipulation or view.

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit count during the initial viewing of the questioned signature (QK comparison) and the second viewing of the signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in visit count existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Short 6 presents mean visit count by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Short 6



A significant main effect was found for *participant type*, $F(1, 80) = 24.12$, $p < .001$, $\eta^2 = .232$, and for *view* $F(1, 80) = 10.23$, $p = .002$, $\eta^2 = .113$. No significant main effects were found for *call manipulation* ($p = .078$, *ns*).

A significant interaction effect was found for *view* x *participant type*, $F(1, 80) = 7.45$, $p = .008$, $\eta^2 = .085$. No significant two-way interactions were identified for *view* x *call manipulation* ($p = .526$, *ns*), or for *participant type* x *call manipulation* ($p = .197$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction was found ($p = .635$, *ns*). Table 3.5. Short 7 presents the analysis means and standard deviations.

Table 3.5. Short 7

Questioned Signature Fixation Count by View, Call Manipulation, and Participant Type

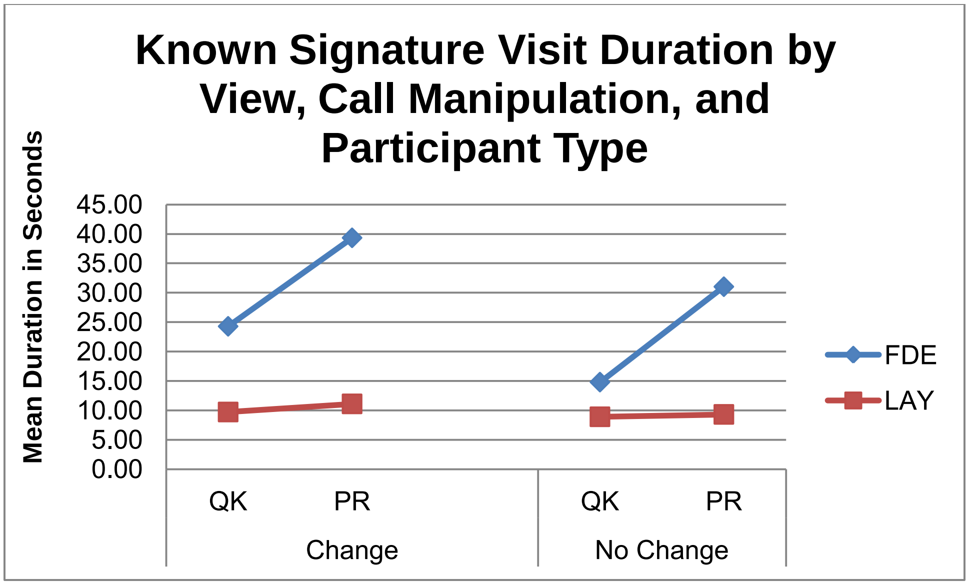
QK Comparison View						
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	24.60	13.01	5	14.25	11.35	40
LAY	7.52	6.52	31	8.00	8.28	8
PR Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	36.40	28.82	5	25.43	16.15	40
LAY	10.58	13.05	31	6.75	5.23	8

These findings indicate that the mean visit count for the questioned signature was on average greater for FDEs than for Lay participants. Among FDEs there was a significant increase in visit count from the first time the questioned signature was viewed (QK) to the second time it was viewed (PR), but this was not significantly related to the call manipulation. Again, little difference was noted among Lay participants according to call manipulation or view.

<u>*Total Visit Duration*</u>

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit duration during the initial viewing of the known comparison signatures (QK comparison) and the second viewing of the known comparison signatures (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in visit duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Short 7 presents mean visit duration by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Short 7



A significant main effect was found for *participant type*, $F(1, 80) = 19.28$, $p < .001$, $\eta^2 = .194$, and for *view*, $F(1, 80) = 11.20$, $p = .001$, $\eta^2 = .123$. No significant main effect was found for *call manipulation* ($p = .207$, *ns*).

A significant interaction effect was found for *view* x *participant type*, $F(1, 80) = 8.91$, $p = .004$, $\eta^2 = .100$. No significant two-way interactions were identified for *view* x *call manipulation* ($p = .984$, *ns*), or for *participant type* x *call manipulation* ($p = .346$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction was found ($p = .828$, *ns*). Table 3.5. Short 8 presents the analysis means and standard deviations.

Table 3.5. Short 8

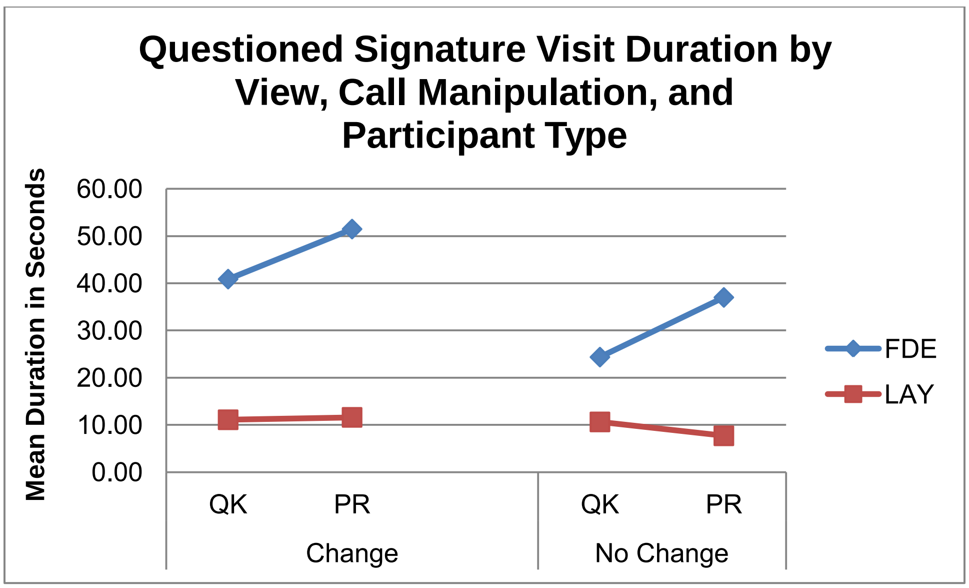
Known Signature Visit Duration by View, Call Manipulation, and Participant Type

	QK Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	24.29	13.58	5	14.80	12.16	40
LAY	9.72	9.06	31	8.91	12.24	8
	PR Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	39.34	23.65	5	31.03	22.84	40
LAY	11.10	10.70	31	9.31	12.55	8

These findings indicate again that the mean visit duration for the known comparison signatures was on average greater for FDEs than for Lay participants. Among FDEs there was a significant increase in visit duration from the first time the known comparison signatures were viewed (QK) to the second time they were viewed (PR), but this was not significantly related to the call manipulation. Little difference was noted among Lay participants according to call manipulation or view.

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit duration in seconds during the initial viewing of the questioned signature (QK comparison) and the second viewing of the questioned signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in visit duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Short 8 presents mean visit duration by *view*, *call manipulation*, *and participant type*.

Figure 3.5 Short 8



A significant main effect was found for *participant type*, $F(1, 80) = 37.37$, $p < .001$, $\eta^2 = .318$. No significant main effect was found for *call manipulation* ($p = .059$, *ns*), or for *view* ($p = .052$, *ns*), although this factor approached significance.

A significant interaction effect was found for *view* x *participant type*, $F(1, 80) = 5.90$, $p = .017$, $\eta^2 = .069$. No significant two-way interactions were identified for *view* x *call manipulation* ($p = .894$, *ns*), or for *participant type* x *call manipulation* ($p = .153$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction was found ($p = .605$, *ns*). Table 3.5. Short 9 presents the analysis means and standard deviations.

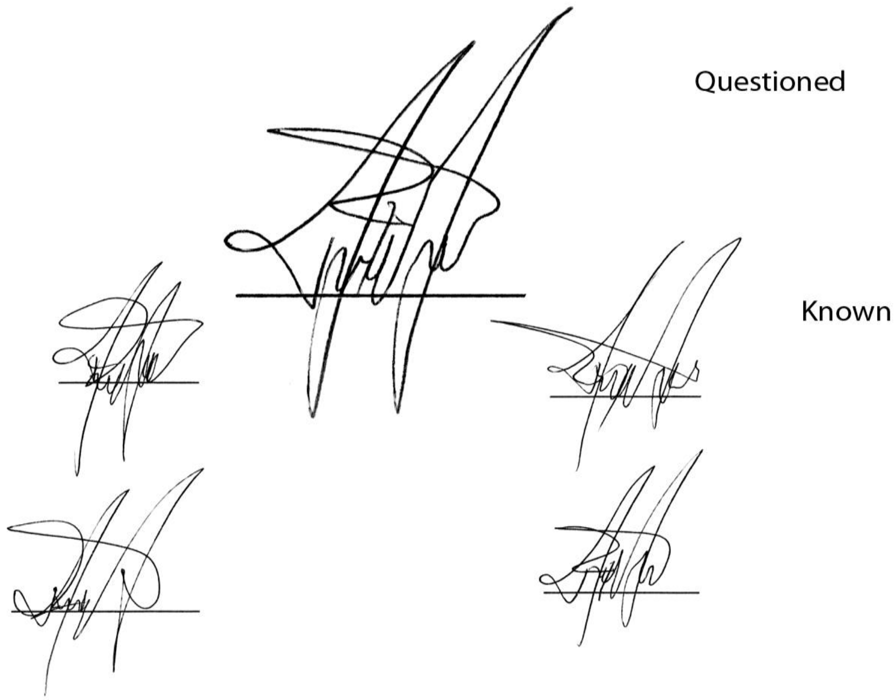
Table 3.5. Short 9

Questioned Signature Visit Duration by View, Call Manipulation, and Participant Type

QK Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	40.88	15.77	5	24.36	19.06	40
LAY	11.09	9.45	31	10.63	12.90	8
PR Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	51.48	26.23	5	37.00	23.27	40
LAY	11.59	11.59	31	7.69	7.35	8

These findings indicate that the mean visit duration for the questioned signature was on average greater for FDEs than for Lay participants. Among FDEs there was a significant increase in visit count from the first time the questioned signature was viewed (QK) to the second time it was viewed (PR), but this was not significantly related to the call manipulation. Conversely, Lay participants demonstrated a slight decrease in visit duration in the No Change/Peer Review condition, but this trend was not statistically significant. Little difference was noted among Lay participants according to call manipulation or view.

PEER REVIEW ANALYSES: Vilcise Tima Signature 1 (Simulated, High Complexity, Stylized)



Binomial logistic regression was conducted to determine which among four independent variables (*process call change, authorship call change, influence of process call change,* and *influence of authorship call change*) predicted participant type (FDE or Lay). Regression results indicated that the overall model fit was questionable (-2 Log Likelihood = 87.45). The overall model was statistically significant, and fairly statistically reliable in distinguishing between participant types, $\chi^2(4) = 11.47$, p = .022. The model correctly classified 68.1% of cases. Examination of the contribution of each factor to the model revealed that changing the authorship call and the influence of changing the process call significantly predicted *participant type.* The odds ratio for both factors is small, indicating little change in the likelihood of *participant type.* Table 3.5. Tima 1 presents the regression coefficients for this model.

Table 3.5. Tima 1

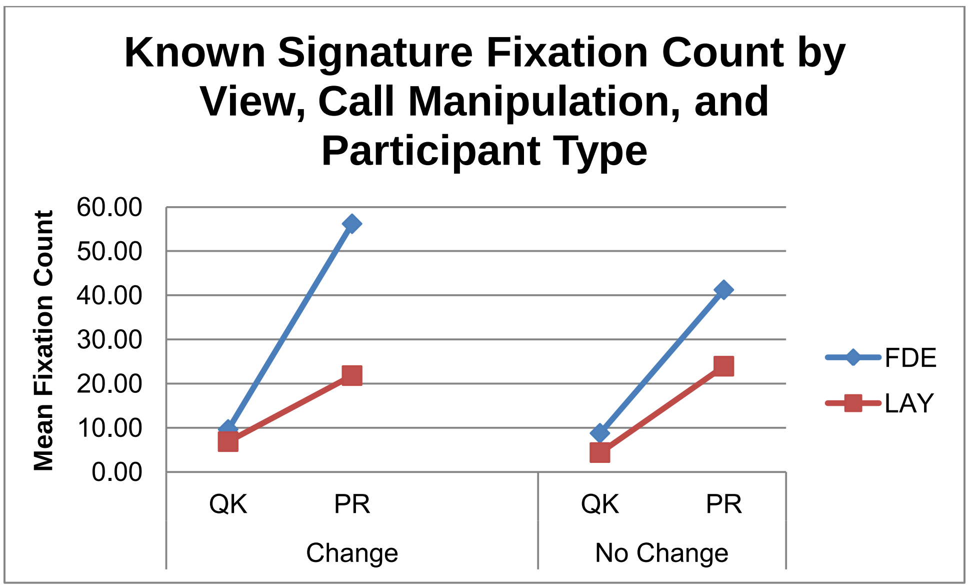
Logistic Regression Coefficients for Peer Review Analysis of Tima Signature 1

	B	*Wald*	*df*	*Sig.*	*Odds*
Change Process Call	.330	.323	1	.570	1.391
Change Authorship Call	-2.032	3.597	1	.058	.131
Process Change Influence	-1.342	5.487	1	.019	.261
Authorship Change Influence	-.133	.033	1	.856	.875
Constant	2.321	5.539	1	.019	10.189

Total Fixation Count

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation count during the initial viewing of the signature (QK comparison) and the second viewing of the signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation count existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Tima 1 presents mean fixation count by view, call manipulation, and participant type.

Figure 3.5 Tima 1



A significant main effect was found for *participant type*, $F(1, 79) = 6.55$, $p = .012$, $\eta^2 = .077$, and for *view*, $F(1, 79) = 28.63$, $p = .001$, $\eta^2 = .256$. No significant main effect was found for *call manipulation* ($p = .484$, *ns*).

A significant interaction effect was found for *view* x *participant type*, $F(1, 79) = 4.40$, $p = .039$, $\eta^2 = .053$. No significant two-way interactions were identified for *view* x *call manipulation* ($p = .656$, *ns*), or for *participant type* x *call manipulation* ($p = .503$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction was found ($p = .381$, *ns*). Table 3.5. Tima 2 presents the analysis means and standard deviations.

Table 3.5. Tima 2
Known Signature Fixation Count by View, Call Manipulation, and Participant Type

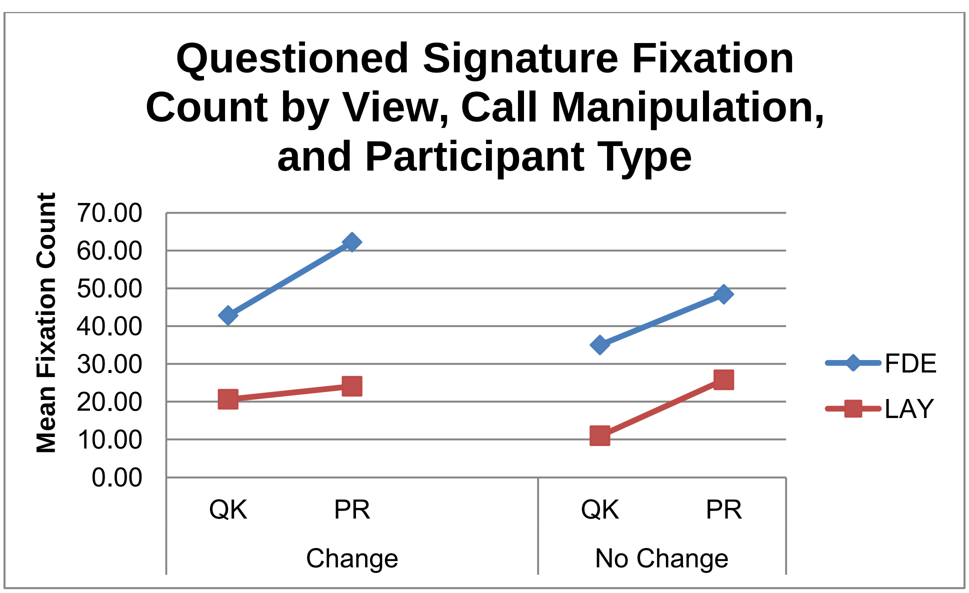
QK Comparison View	
Change	**No Change**

Participant	*M*	*SD*	n	*M*	*SD*	n
FDE	9.60	7.16	5	8.74	7.97	39
LAY	6.84	5.73	25	4.36	4.16	14
			PR Comparison View			
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	56.20	41.31	5	41.23	38.16	39
LAY	21.80	25.10	25	23.93	51.06	14

These findings indicate that the mean fixation count in the known comparison signatures were greater for FDEs than for Lay participants, and that there was a significant increase in fixation count from the first time the signatures were viewed (QK) to the second time they were viewed (PR), regardless of whether we manipulated the call in the peer review view. The interaction effect revealed that this effect was more pronounced among FDEs than Lay participants. Although not significantly different, this trend was also more pronounced for FDEs in the Change condition, while there was less change in visit duration across conditions for the Lay participants.

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation count during the initial viewing of the questioned signature (QK comparison) and the second viewing of the signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation count existed according to the *call manipulation* (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Tima 2 presents mean fixation count by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Tima 2



A significant main effect was found for *participant type*, $F(1, 79) = 18.21$, $p < .001$, $\eta^2 = .187$, and for *view* $F(1, 79) = 6.43$, $p = .013$, $\eta^2 = .075$. No significant main effects were found for *call manipulation* ($p = .242$, *ns*).

No significant two-way interactions were identified for *view* x *call manipulation* ($p = .791$, *ns*), or for *view* x *participant type* ($p = .471$, *ns*). No significant interaction effect was found for *participant type* x *call manipulation* ($p = .587$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction was found ($p = .392$, *ns*). Table 3.5. Tima 3 presents the analysis means and standard deviations.

Table 3.5. Tima 3

Questioned Signature Fixation Count by View, Call Manipulation, and Participant Type

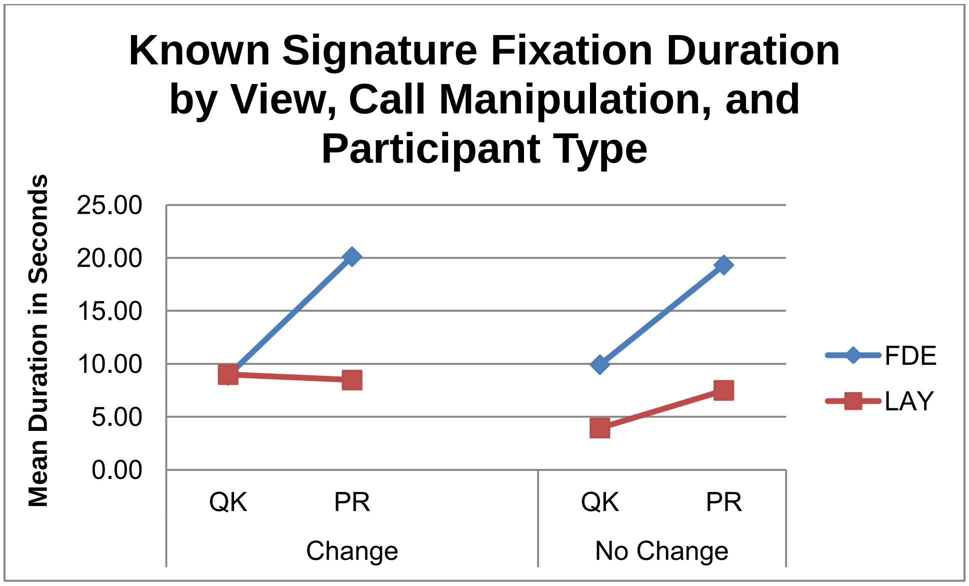
	QK Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	42.80	36.20	5	35.00	22.22	39
LAY	20.64	17.06	25	11.00	8.43	14
	PR Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	62.20	42.59	5	48.41	31.38	39
LAY	24.08	20.47	25	25.79	51.41	14

These findings indicate that the mean fixation count for the questioned signature was on average greater for FDEs than for Lay participants. There was a significant increase in fixation count from the first time the questioned signature was viewed (QK) to the second time it was viewed (PR), but these effects were not significantly related to the call manipulation.

Total Fixation Duration

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation duration during the initial viewing of the known comparison signatures (QK comparison) and the second viewing of the signatures (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Tima 3 presents mean fixation duration by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Tima 3



A significant main effect was found for *participant type*, $F(1, 79) = 7.25$, $p = .009$, $\eta^2 = .084$, and for *view* $F(1, 79) = 6.11$, $p = .016$, $\eta^2 = .072$. No significant main effects were found for *call manipulation* ($p = .598$, *ns*).

No significant two-way interactions were identified for *view* x *call manipulation* ($p = .814$, *ns*), for *participant type* x *call manipulation* ($p = .070$, *ns*), or for *participant type* x *view*, ($p = .568$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction was found ($p = .541$, *ns*). Table 3.5. Tima 4 presents the analysis means and standard deviations.

Table 3.5. Tima 4

Known Signature Fixation Duration by View, Call Manipulation, and Participant Type

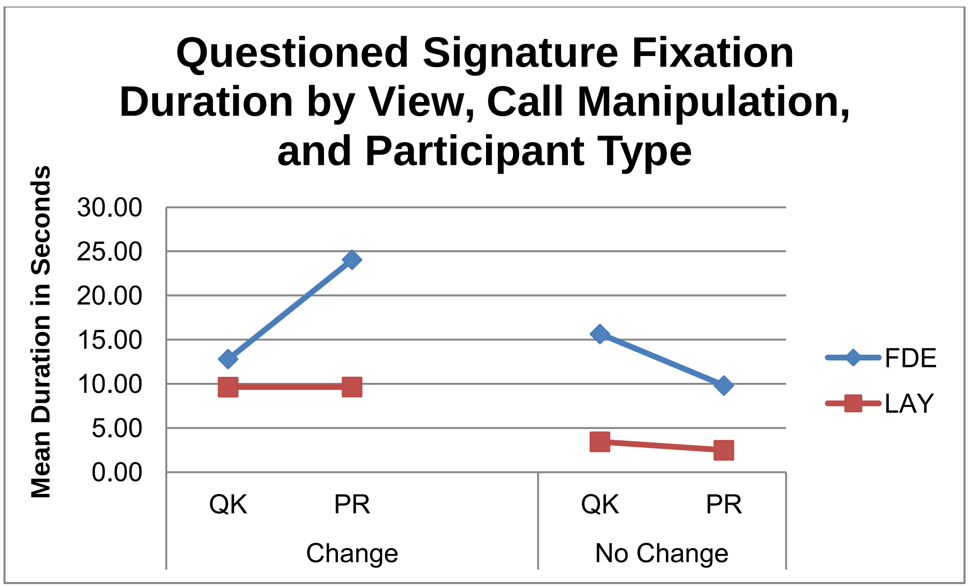
	QK Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	8.91	5.51	5	9.93	8.82	39
LAY	8.99	9.77	25	3.95	2.97	14
	PR Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	20.12	13.72	5	19.33	18.42	39
LAY	8.47	11.49	25	7.50	13.59	14

These findings indicate that the mean fixation duration for the known comparison signatures was on average greater for FDEs than for Lay participants. There was a significant increase in fixation duration from the first time the questioned signature was viewed (QK) to the second time it was viewed

(PR), but this was not significantly related to the call manipulation. This increase was more pronounced for FDEs than for Lay participants, but this trend was not statistically significant.

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation duration during the initial viewing of the questioned signature (QK comparison) and the second viewing of the signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation duration existed according to the call manipulation (change vs. no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Tima 4 presents mean fixation duration by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Tima 4



A significant main effect was found for *participant type*, $F(1, 79) = 15.60$, $p < .001$, $\eta^2 = .165$, and for *view* $F(1, 79) = 8.66$, $p = .004$, $\eta^2 = .099$. No significant main effects were found for *call manipulation* ($p = .927$, *ns*).

No significant two-way interactions were identified for *view* x *call manipulation* ($p = .556$, *ns*), for *participant type* x *call manipulation* ($p = .147$, *ns*), or for *participant type* x *view*, ($p = .398$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction was found ($p = .382$, *ns*). Table 3.5. Tima 5 presents the analysis means and standard deviations.

Table 3.5. Tima 5

Questioned Signature Fixation Duration by View, Call Manipulation, and Participant Type

	QK Comparison View	
	Change	**No Change**

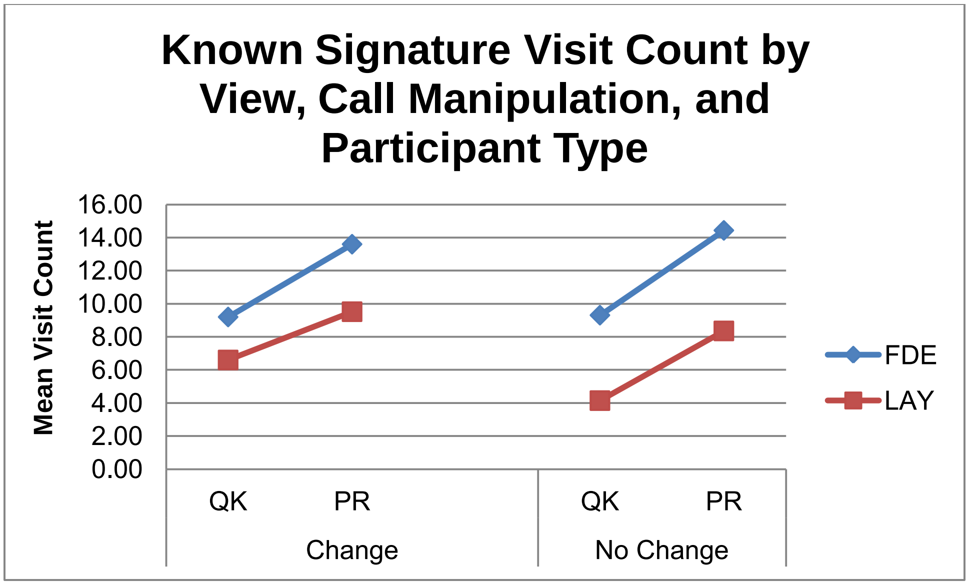
Participant	*M*	*SD*	n	*M*	*SD*	n
FDE	12.80	6.46	5	15.64	9.80	39
LAY	9.62	9.24	25	3.43	2.47	14
			PR Comparison View			
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	24.06	16.43	5	25.51	18.11	39
LAY	9.64	7.94	25	10.49	19.36	14

These findings indicate that the mean fixation duration for the questioned signature was on average greater for FDEs than for Lay participants. There was a significant increase in fixation duration from the first time the questioned signature was viewed (QK) to the second time it was viewed (PR), among the FDEs in the Change condition, while a decrease was observed for FDEs in the No Change condition, although this interaction was not statistically significant. Little difference was noted among Lay participants according to call manipulation or view.

<u>*Total Visit Count*</u>

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit count during the initial viewing of the known comparison signatures(QK comparison) and the second viewing of the signatures (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in visit count existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Tima 5 presents mean visit count by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Tima 5



A significant main effect was found for *participant type*, $F(1, 79) = 5.68$, $p = .020$, $\eta^2 = .067$, and for *view* $F(1, 79) = 7.70$, $p = .007$, $\eta^2 = .089$. No significant main effects were found for *call manipulation* ($p = .723$, *ns*).

No significant two-way interactions were identified for *view* x *call manipulation* ($p = .737$, *ns*), for *participant type* x *call manipulation* ($p = .691$, *ns*), or for *participant type* x *view*, ($p = .546$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction was found ($p = .925$, *ns*). Table 3.5. Tima 6 presents the analysis means and standard deviations.

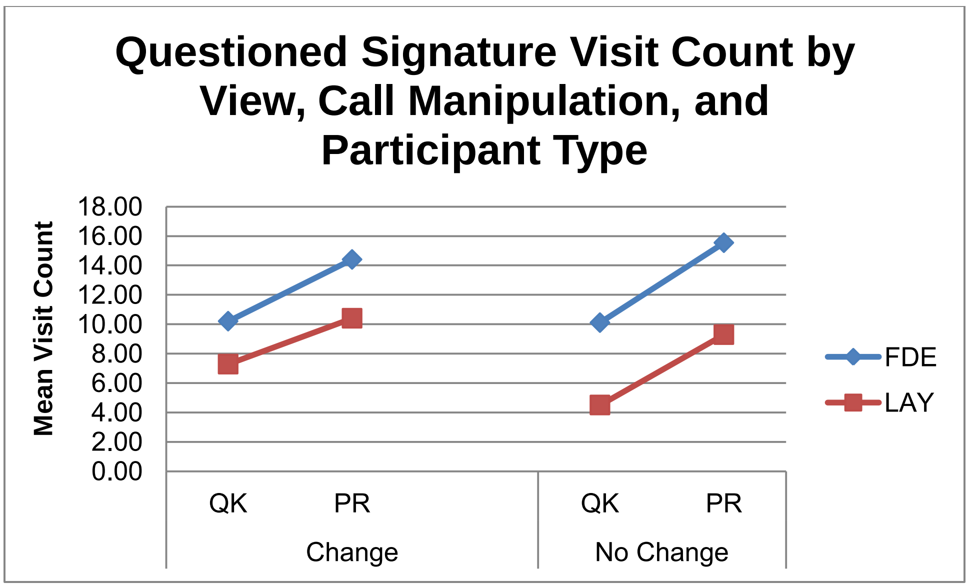
Table 3.5. Tima 6
Known Signature Visit Count by View, Call Manipulation, and Participant Type

	QK Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	9.20	6.72	5	9.31	6.35	39
LAY	6.60	3.88	25	4.14	2.98	14
	PR Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	13.60	6.91	5	14.44	9.18	39
LAY	9.52	9.85	25	8.36	15.04	14

These findings indicate that the mean visit count for the known comparison signatures was on average greater for FDEs than for Lay participants. There was a significant increase among both FDEs and Lay participants in visit count from the first time the known comparison signatures were viewed (QK) to the second time they were viewed (PR), but this was not significantly related to the call manipulation.

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit count during the initial viewing of the questioned signature (QK comparison) and the second viewing of the questioned signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in visit count existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Tima 6 presents mean visit count by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Tima 6



A significant main effect was found for *participant type*, $F(1, 79) = 5.90$, $p = .017$, $\eta^2 = .070$, and for *view* $F(1, 79) = 7.92$, $p = .006$, $\eta^2 = .091$. No significant main effects were found for *call manipulation* ($p = .713$, *ns*).

No significant two-way interactions were identified for *view* x *call manipulation* ($p = .643$, *ns*), for *participant type* x *call manipulation* ($p = .782$, *ns*), or for *participant type* x *view*, ($p = .525$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction was found ($p = .945$, *ns*). Table 3.5. Tima 7 presents the analysis means and standard deviations.

Table 3.5. Tima 7
Questioned Signature Fixation Count by View, Call Manipulation, and Participant Type

	QK Comparison View					
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	10.20	7.19	5	10.10	6.60	39

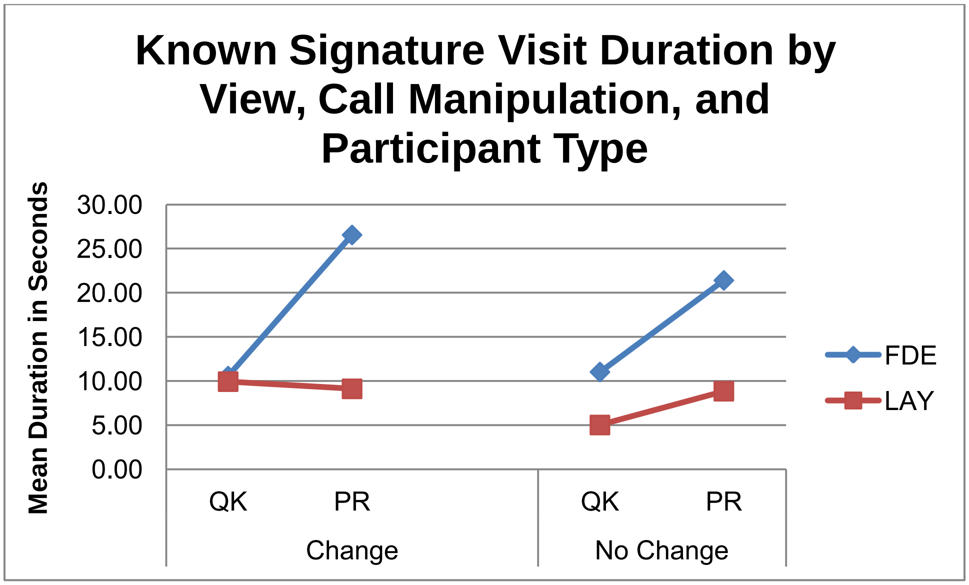
Participant	M	SD	n	M	SD	n
LAY	7.28	4.50	25	4.50	3.06	14
PR Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	14.40	7.23	5	15.54	9.51	39
LAY	10.40	9.92	25	9.29	15.37	14

These findings indicate that the mean visit count for the questioned signature was on average greater for FDEs than for Lay participants. There was a significant increase among both FDEs and Lay participants in visit count from the first time the questioned signature was viewed (QK) to the second time it was viewed (PR), but this was not significantly related to the call manipulation.

<u>*Total Visit Duration*</u>

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit duration during the initial viewing of the known comparison signatures (QK comparison) and the second viewing of the known comparison signatures (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in visit duration existed according to the call manipulation (change vs. no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Tima 7 presents mean visit duration by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Tima 7



A significant main effect was found for *participant type*, $F(1, 79) = 10.12$, $p = .002$, $\eta^2 = .114$, and for *view*, $F(1, 79) = 7.95$, $p = .006$, $\eta^2 = .091$. No significant main effect was found for *call manipulation* ($p = .394$, *ns*).

A significant interaction effect was found for *view* x *participant type*, $F(1, 79) = 5.02$, $p = .028$, $\eta^2 = .060$. No significant two-way interactions were identified for *view* x *call manipulation* ($p = .926$, *ns*), or for *participant type* x *call manipulation* ($p = .965$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction was found ($p = .328$, *ns*). Table 3.5. Tima 8 presents the analysis means and standard deviations.

Table 3.5. Tima 8

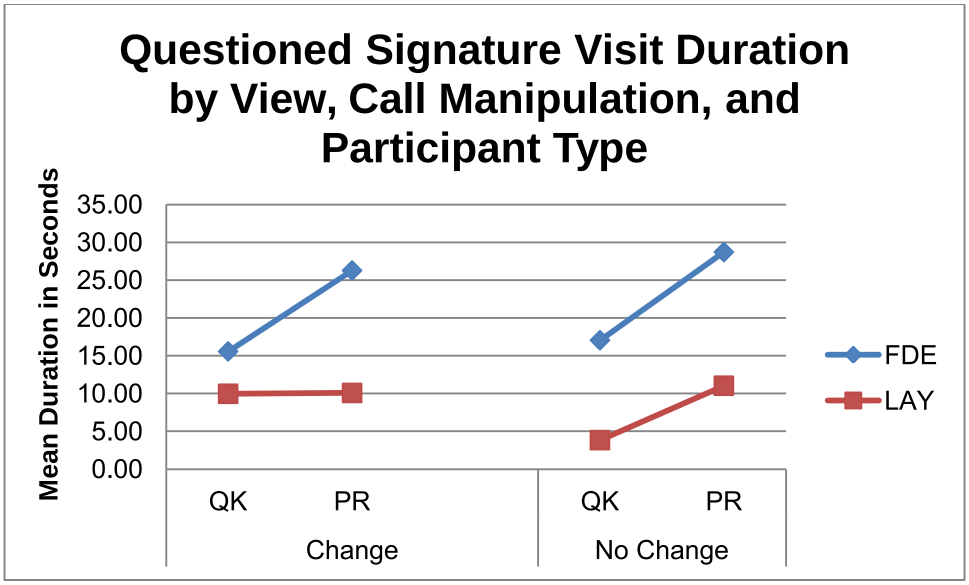
Known Signature Visit Duration by View, Call Manipulation, and Participant Type

QK Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	10.56	5.90	5	11.03	9.29	39
LAY	9.94	10.03	25	5.02	3.69	14
PR Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	26.57	14.03	5	21.42	19.34	39
LAY	9.12	12.11	25	8.85	17.01	14

These findings indicate that the mean visit duration for the questioned signature was on average greater for FDEs than for Lay participants. There was a significant increase in visit duration from the first time the questioned signature was viewed (QK) to the second time it was viewed (PR). The significant interaction effect demonstrated that this difference was particularly pronounced for FDEs in the Peer Review condition.

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit duration in seconds during the initial viewing of the questioned signature (QK comparison) and the second viewing of the signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in visit duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Tima 8 presents mean visit duration by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Tima 8



A significant main effect was found for *participant type*, $F(1, 79) = 37.37$, $p < .001$, $\eta^2 = .318$, and for view, $F(1, 79) = 9.31$, $p = .003$, $\eta^2 = .105$. No significant main effect was found for *call manipulation* ($p = .914$, *ns*).

No significant two-way interactions were identified for *view* x *call manipulation* ($p = .411$, *ns*), or for *participant type* x *call manipulation* ($p = .437$, *ns*), or for *view* x *participant type* ($p = .437$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction was found ($p = .530$, *ns*). Table 3.5. Tima 9 presents the analysis means and standard deviations.

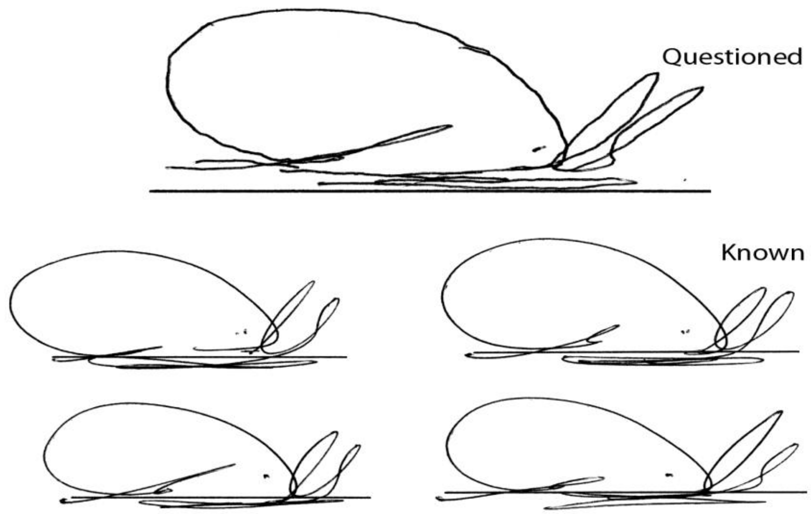
Table 3.5. Tima 9

Questioned Signature Visit Duration by View, Call Manipulation, and Participant Type

	QK Comparison View					
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	15.57	10.63	5	17.05	10.35	39
LAY	9.97	9.65	25	3.84	2.86	14
	PR Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	26.27	17.80	5	28.71	17.61	39
LAY	10.08	8.25	25	11.03	20.38	14

These findings indicate that the mean visit duration for the questioned signature was on average greater for FDEs than for Lay participants. There was a significant increase among both FDEs and Lay participants in visit duration from the first time the questioned signature was viewed (QK) to the second time it was viewed (PR), but this was not significantly related to the call manipulation.

PEER REVIEW ANALYSES: Ricardo Vega Signature 3 (Simulated, Low Complexity, Stylized)



Binomial logistic regression was conducted to determine which among four independent variables (*process call change, authorship call change, influence of process call change,* and *influence of authorship call change*) predicted participant type (FDE or Lay). Regression results indicated that the overall model fit was questionable (-2 Log Likelihood = 71.43). The overall model was statistically significant, and fairly statistically reliable in distinguishing between participant types, $\chi^2(4) = 20.72$, $p < .001$. The model correctly classified 79.1% of cases. Examination of the contribution of each factor to the model revealed that the influence of changing the process call significantly predicted *participant type.* The odds ratio for this factor is small, indicating little change in the likelihood of *participant type.* Table 3.5. Vega 1 presents the regression coefficients for this model.

Table 3.5. Vega 1
Logistic Regression Coefficients for Peer Review Analysis of Vega Signature 3

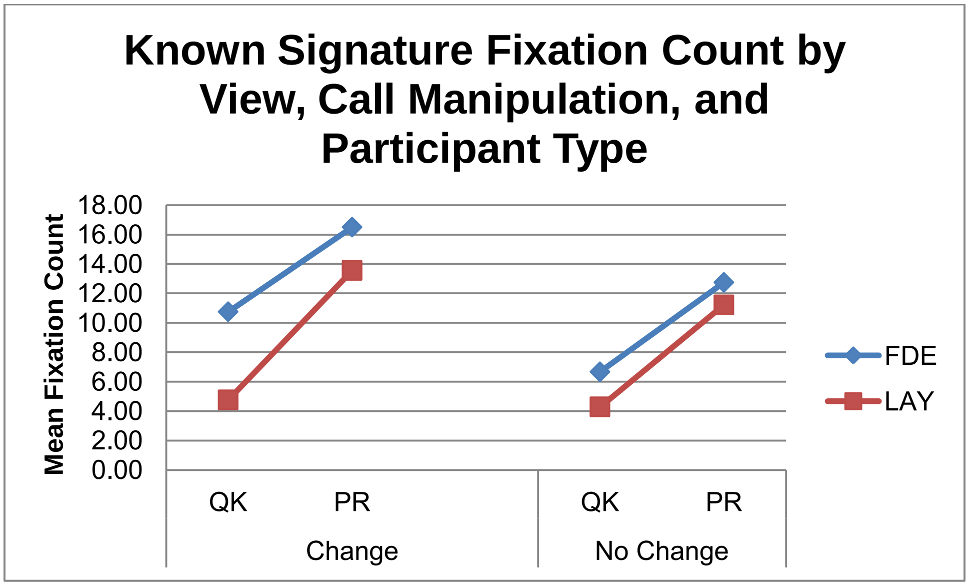
	B	*Wald*	*df*	*p*	*Odds Ratio*
Change Process Call	.858	1.160	1	.281	2.359
Change Authorship Call	-.694	.306	1	.580	.500
Process Change Influence	-2.466	13.605	1	.000	.085
Authorship Change Influence	.124	.022	1	.881	1.132
Constant	1.760	2.273	1	.132	5.813

Total Fixation Count

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation count during the initial viewing of the known comparison

signatures (QK comparison) and the second viewing of the signatures (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation count existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Vega 1 presents mean fixation count by view, call manipulation, and participant type.

Figure 3.5 Vega 3 PR 1



A significant main effect was found for *view*, $F(1, 78) = 10.55$, $p = .002$, $\eta^2 = .119$. No main effect was found for *call manipulation* ($p = .250$, *ns*), or for *participant type* ($p = .167$, *ns*).

No significant two-way interactions were identified for *view* x *call manipulation* ($p = .856$, *ns*), for *participant type* x *call manipulation* ($p = .587$, *ns*), or for *view* x *participant type* ($p = .647$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction was found ($p = .796$, *ns*). Table 3.5. Vega 2 presents the analysis means and standard deviations.

Table 3.5. Vega 3 PR 2

Known Signature Fixation Count by View, Call Manipulation, and Participant Type

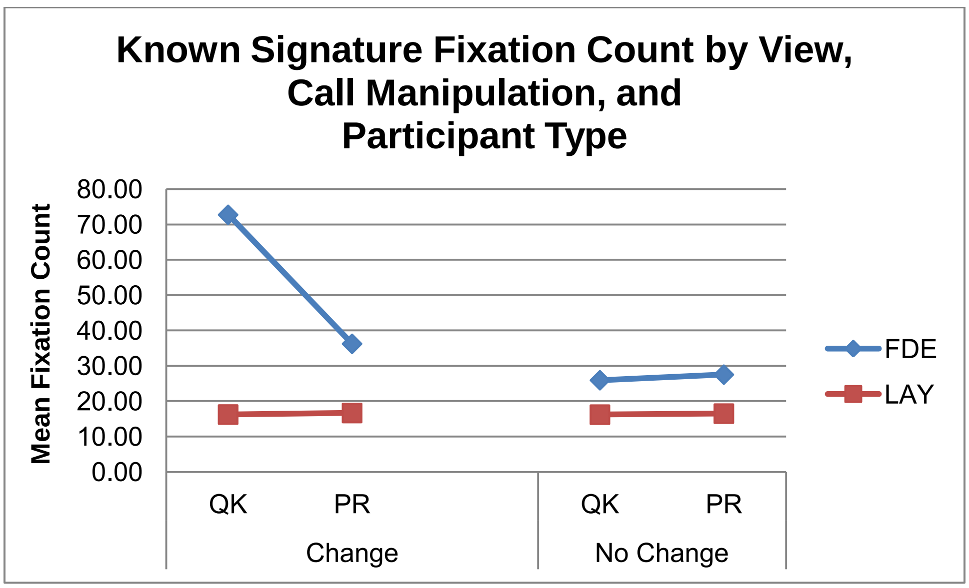
			QK Comparison View			
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	10.75	9.57	4	6.67	5.24	39
LAY	4.76	3.83	25	4.29	6.11	14
			PR Comparison View			
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	16.50	7.77	4	12.74	15.22	39

LAY	13.56	11.46	25	11.21	10.71	14

These findings indicate again that the mean fixation count for the known comparison signatures was on average greater for FDEs than for Lay participants, although this difference was not statistically significant. There was a significant increase in fixation count for both FDEs and Lay participants from the first time the known comparison signatures were viewed (QK) to the second time they were viewed (PR), but this was not significantly related to the call manipulation.

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation count during the initial viewing of the questioned signature (QK comparison) and the second viewing of the questioned signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation count existed according to the *call manipulation* (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Vega 2 presents mean fixation count by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Vega 2



Significant main effects were found for *call manipulation, F*(1, 78) = 6.33, *p* = .014, η^2 = .075, and for *participant type, F*(1, 78) = 19.13, *p* < .001, η^2 = .197. No significant main effect was found for *view* (*p* = .052, *ns*), although this factor approached significance.

Significant two-way interactions were identified for *view* x *call manipulation F*(1, 78) = 4.97, *p* = .032, η^2 = .058, for *view* x *participant type*, *F*(1, 78) = 4.23, *p* = .043, η^2 = .051, and for *participant type* x *call manipulation*, *F*(1, 78) = 6.24, *p* = .015, η^2 = .074.

A significant three-way (*participant type* x *call manipulation* x *view*) interaction was found $F(1, 78) = 4.87$, $p = .030$, $\eta^2 = .059$. Table 3.5. Vega3 PR 3 presents the analysis means and standard deviations.

Table 3.5. Vega 3

Questioned Signature Fixation Count by View, Call Manipulation, and Participant Type

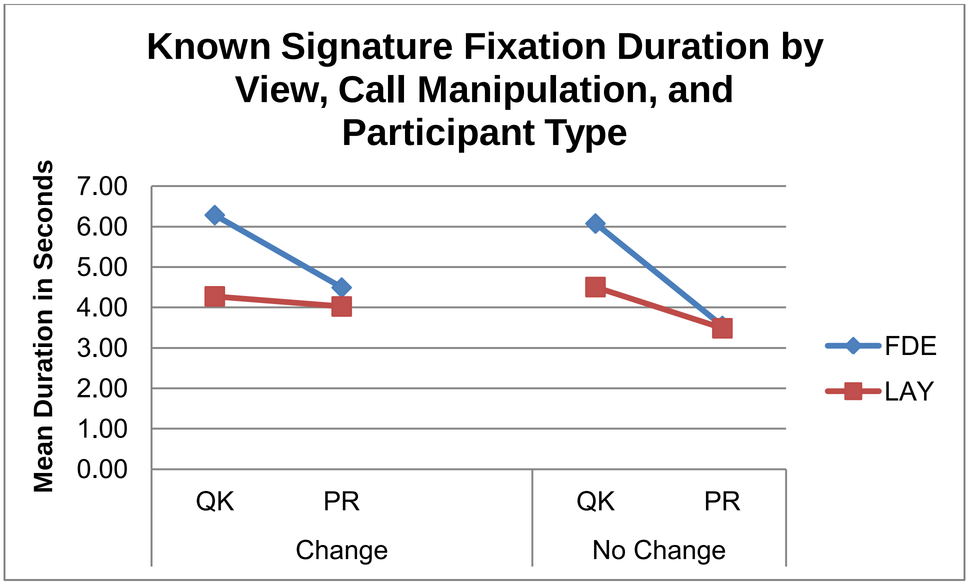
	QK Comparison View					
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	72.75	98.55	4	25.95	20.56	39
LAY	16.24	15.55	25	17.94	18.88	157
	PR Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	36.25	16.21	4	27.54	20.58	39
LAY	16.68	12.10	25	16.50	14.01	14

These findings indicate again that the mean fixation count for the questioned signature was on average greater for FDEs than for Lay participants, and that there was a decrease in fixation count among FDEs in the Change/Peer Review condition. Although this finding was statistically significant, it should be considered a trend due to the small number of FDEs in this condition (n=4). The FDE/Change group also accounts for the significant interaction effects identified, so these findings must also be considered trends. Virtually no changes in fixation count were identified among Lay participants by either view or call manipulation.

Total Fixation Duration

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation duration during the initial viewing of the known comparison signatures (QK comparison) and the second viewing of the signatures (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Vega 3 presents mean fixation duration by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Vega 3



No significant main effects were found for *call manipulation* (p = .727, *ns*), *participant type* (p = .329, *ns*), or for *view* (p = .137, *ns*).

No significant two-way interactions were identified for *view* x *call manipulation* (p = .686, *ns*), for *participant type* x *call manipulation* (p = .840, *ns*), or for *participant type* x *view*, (p = .414, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction was found (p = .993, *ns*). Table 3.5. Vega 4 presents the analysis means and standard deviations.

Table 3.5. Vega 4

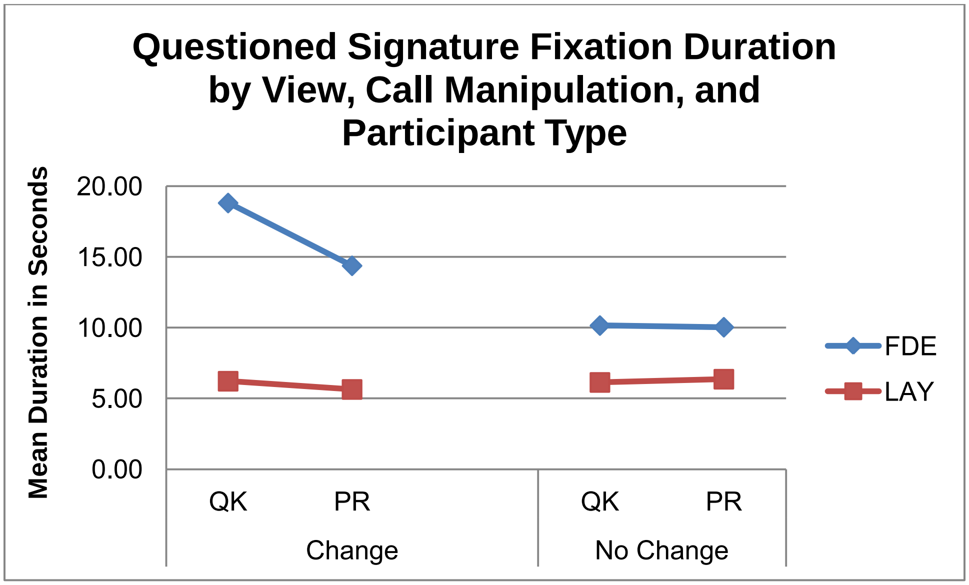
Known Signature Fixation Duration by View, Call Manipulation, and Participant Type

	QK Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	6.28	6.24	4	6.07	5.09	39
LAY	4.27	3.15	25	4.50	5.86	14
	PR Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	4.49	1.60	4	3.54	4.49	39
LAY	4.02	4.24	25	3.48	3.55	14

Although slight decreases in fixation duration were identified for both FDEs and Lay participants from the QK view to the PR view of the known comparison signatures, these differences were not statistically significant. No differences were found according to the call manipulation.

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation duration during the initial viewing of the questioned signature (QK comparison) and the second viewing of the questioned signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Vega 4 presents mean fixation duration by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Vega 4



A significant main effect was found for *participant type*, $F(1, 78) = 15.69$, $p < .001$, $\eta^2 = .167$. No significant main effects were found for *call manipulation* ($p = .096$, *ns*), or for *view* ($p = .398$, *ns*).

No significant two-way interactions were identified for *view* x *call manipulation* ($p = .378$, *ns*), for *participant type* x *call manipulation* ($p = .067$, *ns*), or for *participant type* x *view*, ($p = .470$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction was found ($p = .546$, *ns*). Table 3.5. Vega 5 presents the analysis means and standard deviations.

Table 3.5. Vega 5

Questioned Signature Fixation Duration by View, Call Manipulation, and Participant Type

	QK Comparison View					
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	18.82	21.55	4	10.16	7.90	39
LAY	6.22	6.77	25	6.14	7.78	14
	PR Comparison View					

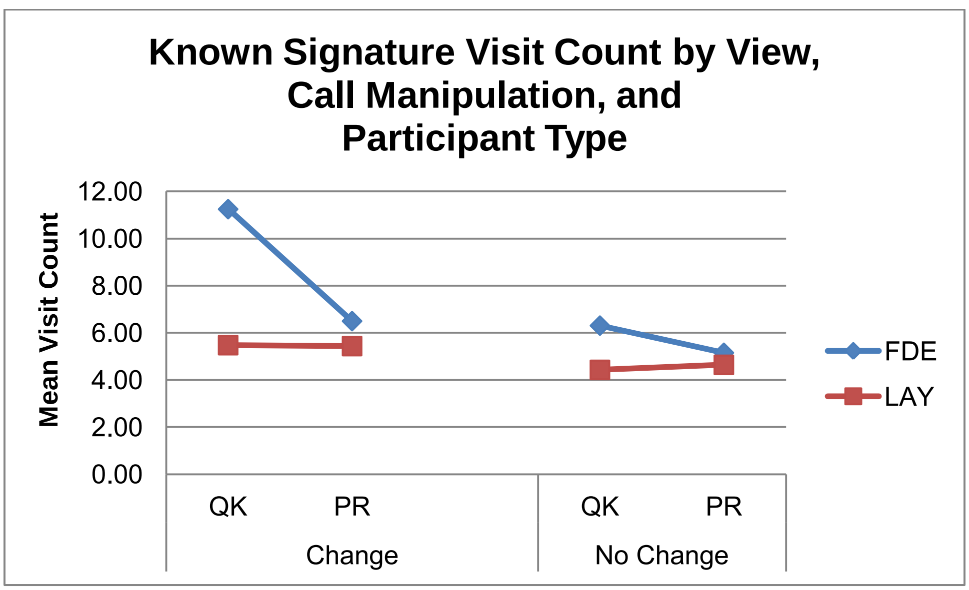
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	14.38	6.18	4	10.04	7.64	39
LAY	5.64	3.90	25	6.37	5.76	14

These findings indicate that although the mean fixation duration for the questioned signature was greater for FDEs than for Lay participants, there was no significant change in fixation duration from the first time the signature was viewed (QK) to the second time it was viewed (PR), regardless of whether we manipulated the call in the peer review view.

Total Visit Count

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit count during the initial viewing of the known comparison signatures (QK comparison) and the second viewing of the signatures (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in visit count existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Vega 5 presents mean visit count by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Vega 5



A significant main effect was found for *participant type*, $F(1, 78) = 4.47$, $p = .038$, $\eta^2 = .054$. No significant main effects were found for *call manipulation* ($p = .066$, *ns*), or for *view* ($p = .097$, *ns*).

No significant two-way interactions were identified for *view* x *call manipulation* (p = .262, *ns*), for *participant type* x *call manipulation* (p = .312, *ns*), or for *participant type* x *view,* (p = .079, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction was found (p = .330, *ns*). Table 3.5. Vega 3 PR 6 presents the analysis means and standard deviations.

Table 3.5. Vega 6

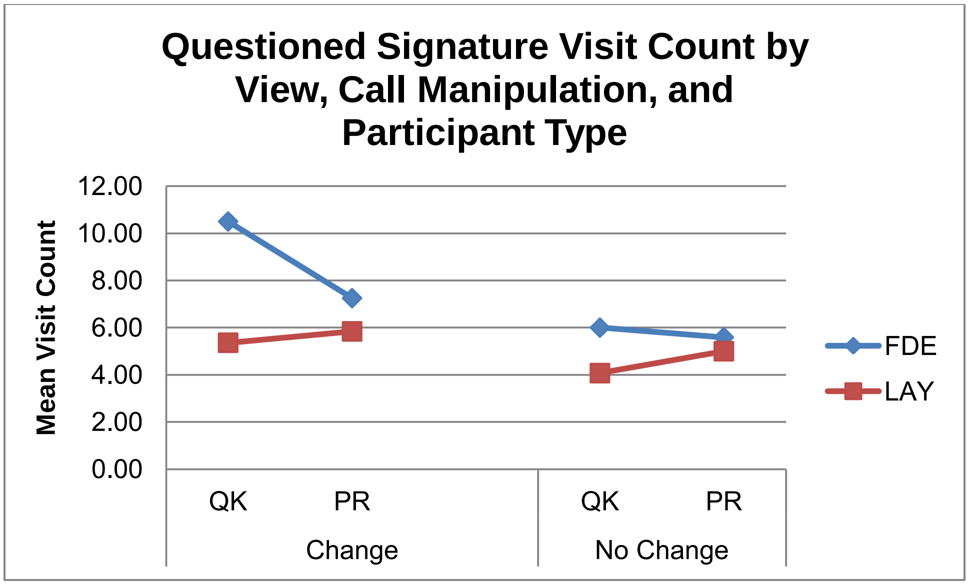
Known Signature Visit Count by View, Call Manipulation, and Participant Type

	QK Comparison View					
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	11.25	13.40	4	6.31	3.58	39
LAY	5.48	3.49	25	4.43	3.59	14
	PR Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	6.50	3.42	4	5.15	4.85	39
LAY	5.44	4.06	25	4.64	4.63	14

These findings indicate that although the mean visit count for the known comparison signatures was greater for FDEs than for Lay participants, there was no significant change in visit count from the first time the signatures were viewed (QK) to the second time they were viewed (PR), regardless of whether we manipulated the call in the peer review view.

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit count during the initial viewing of the questioned signature (QK comparison) and the second viewing of the questioned signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in visit count existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Vega 6 presents mean visit count by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Vega 6



A significant main effect was found for *participant type*, $F(1, 78) = 4.72$, $p = .033$, $\eta^2 = .057$. No significant main effect was found for *call manipulation* ($p = .051$, *ns*), although this factor approached significance. No significant main effect was found for *view* ($p = .482$, *ns*).

No significant two-way interactions were identified for *view* x *call manipulation* ($p = .305$, *ns*), for *participant type* x *call manipulation* ($p = .337$, *ns*), or for *participant type* x *view*, ($p = .115$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction was found ($p = .455$, *ns*). Table 3.5. Vega 7 presents the analysis means and standard deviations.

Table 3.5. Vega 7

Questioned Signature Visit Count by View, Call Manipulation, and Participant Type

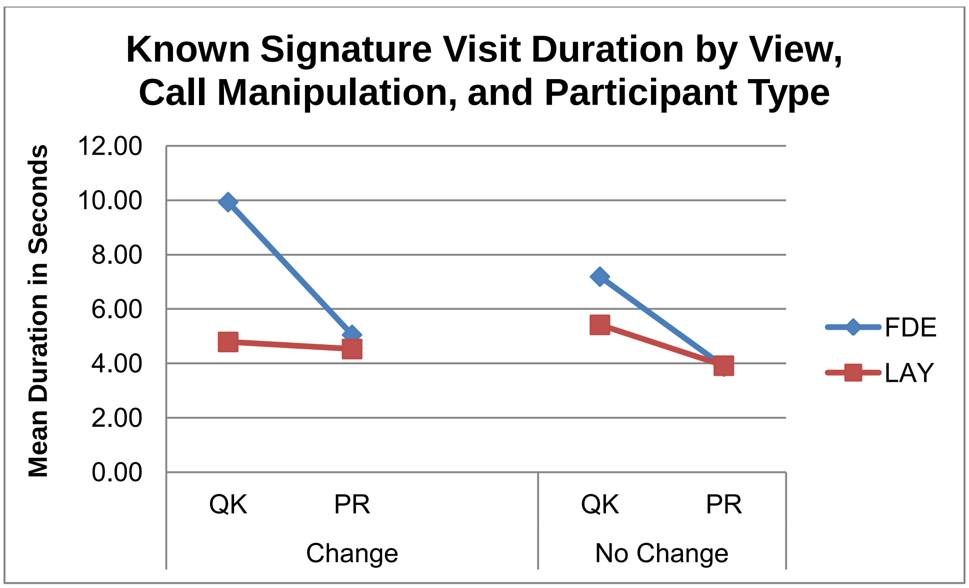
		QK Comparison View				
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	10.50	12.50	4	6.00	3.37	39
LAY	5.36	3.58	25	4.07	3.45	14
		PR Comparison View				
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	7.25	2.63	4	5.59	4.56	39
LAY	5.84	3.68	25	5.00	4.62	14

These findings indicate that although the mean visit count for the questioned signature was greater for FDEs than for Lay participants, there was no significant change in visit count from the first time the questioned signature was viewed (QK) to the second time it was viewed (PR), regardless of whether we manipulated the call in the peer review view.

Total Visit Duration

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit duration during the initial viewing of the known comparison signatures (QK comparison) and the second viewing of the known comparison signatures (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in visit duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Vega 6 presents mean visit duration by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Vega 6



A significant main effect was found for *view*, $F(1, 78) = 4.99$, $p = .028$, $\eta^2 = .060$. No significant main effect was found for *call manipulation* ($p = .435$, *ns*). No significant main effect was found for *participant type* ($p = .139$, *ns*).

No significant two-way interactions were identified for *view* x *call manipulation* ($p = .940$, *ns*), for *participant type* x *call manipulation* ($p = .431$, *ns*), or for *participant type* x *view*, ($p = .940$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction was found ($p = .528$, *ns*). Table 3.5. Vega 8 presents the analysis means and standard deviations.

Table 3.5. Vega 3 PR 8

Known Signature Visit Duration by View, Call Manipulation, and Participant Type

	QK Comparison View			
	Change		No Change	

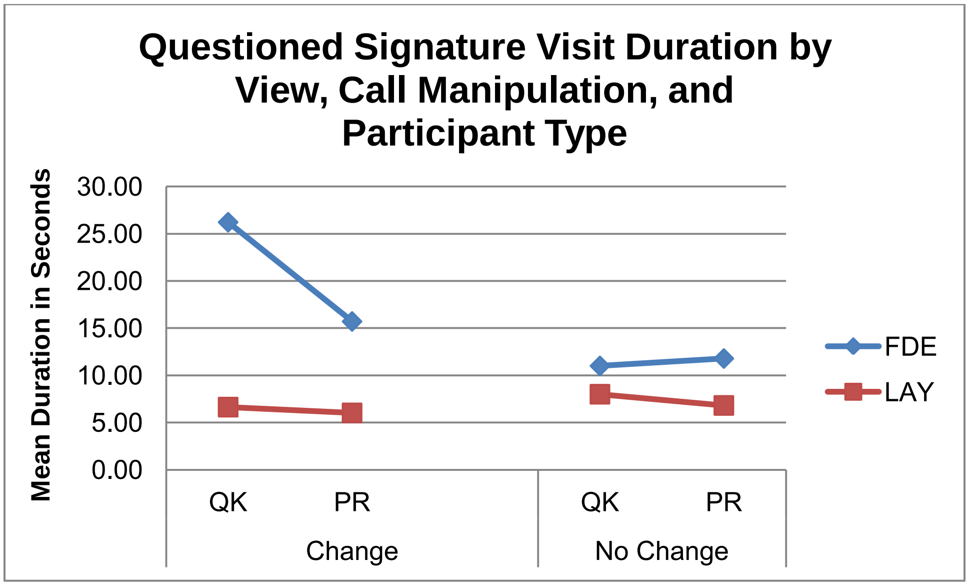
Participant	*M*	*SD*	n	*M*	*SD*	n
FDE	9.93	12.59	4	7.19	5.68	39
LAY	4.79	3.42	25	5.42	8.07	14

	PR Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	5.05	2.01	4	3.88	4.95	39
LAY	4.53	4.70	25	3.91	3.64	14

These findings indicate that although the mean visit duration for the known comparison signatures was greater for FDEs than for Lay participants, there was no significant change in visit count from the first time the signatures were viewed (QK) to the second time they were viewed (PR), regardless of whether we manipulated the call in the peer review view.

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit duration in seconds during the initial viewing of the questioned signature (QK comparison) and the second viewing of the questioned signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in visit duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Vega 8 presents mean visit duration by *view*, *call manipulation, and participant type*.

Figure 3.5 Vega 8



A significant main effect was found for *participant type*, $F(1, 78) = 17.44$, $p < .001$, $\eta^2 = .183$. No significant main effect was found for *call manipulation* (*p* = .061, *ns*), or for *view* (*p* = .110, *ns*).

A significant two-way interaction was revealed for *participant type* x *call manipulation*, $F(1, 78) = 5.71$, $p = .019$, $\eta^2 = .068$. No significant two-way interactions were identified for *view* x *call manipulation* (*p* = .137, *ns*), or for *participant type* x *view*, (*p* = .115, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction was found (*p* = .100, *ns*). Table 3.5. Vega 9 presents the analysis means and standard deviations.

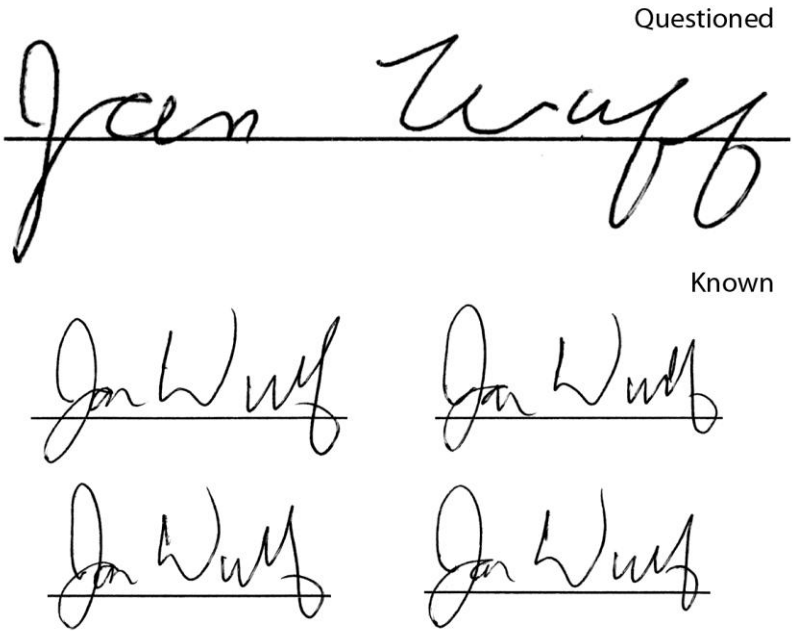
Table 3.5. Vega 9

Questioned Signature Visit Duration by View, Call Manipulation, and Participant Type

	QK Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	26.22	35.12	4	11.00	8.59	39
LAY	6.64	7.21	25	8.00	11.86	14
	PR Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	15.71	6.45	4	11.79	8.17	39
LAY	6.02	4.17	25	6.82	6.02	14

These findings indicate that the mean visit duration for the questioned signature was on average greater for FDEs than for Lay participants, and that there was a decrease in visit duration among FDEs in the Change/Peer Review condition. This interaction was statistically significant, but should also be considered a trend due to the small number of FDEs in this condition (n=4). Again, virtually no changes in fixation count were identified among Lay participants by either view or call manipulation.

PEER REVIEW ANALYSES: John Wulf Signature 1 (Genuine, Low Complexity, Text)



Binomial logistic regression was conducted to determine which among four independent variables (*process call change*, *authorship call change*, *influence of process call change*, and *influence of authorship call change*) predicted participant type (FDE or Lay). Regression results indicated that the overall model fit was questionable (-2 Log Likelihood = 110.96). The overall model was not statistically significant, and only somewhat statistically reliable in distinguishing between participant types, $\chi^2(4) = 3.80$, $p = .434$. The model correctly classified only 60.2% of cases. Table 3.5. Wulf 1 presents the regression coefficients for this model.

Table 3.5. Wulf 1
Logistic Regression Coefficients for Peer Review Analysis of Wulf Signature 1

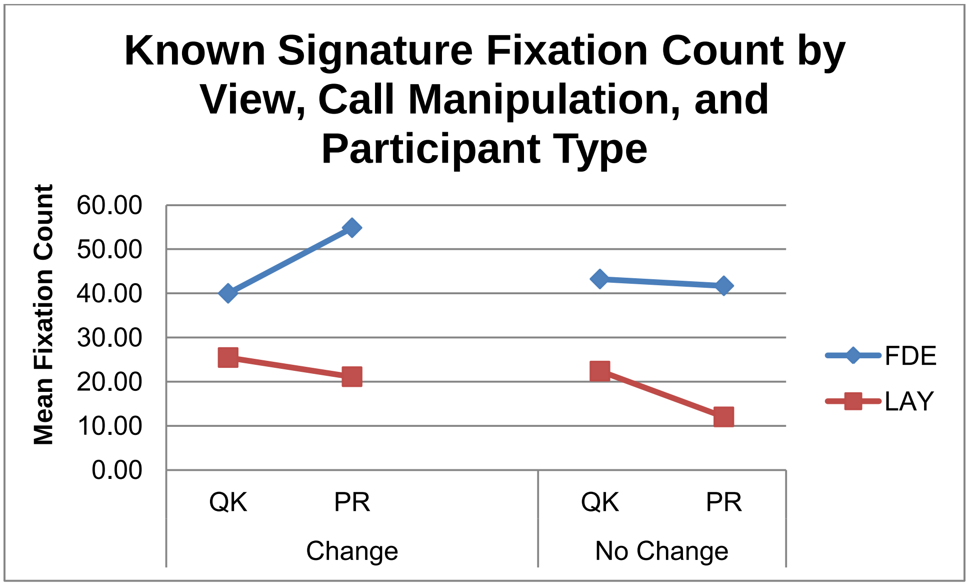
	B	*Wald*	*df*	*p*	*Odds*
Change Process Call	.816	2.949	1	.086	2.262
Change Authorship Call	-.954	.452	1	.501	.385
Process Change Influence	-.058	.014	1	.906	.944
Authorship Change Influence	.015	.000	1	.984	1.015
Constant	.506	.140	1	.708	1.658

Total Fixation Count

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation count during the initial viewing of the known comparison

signatures (QK comparison) and the second viewing of the known comparison signatures (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation count existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Wulf 1 presents mean fixation count by view, call manipulation, and participant type.

Figure 3.5 Wulf 1



A significant main effect was found for *participant type*, $F(1, 79) = 18.24$, $p < .001$, $\eta^2 = .188$. No significant main effect was found for *call manipulation* (p = .255, *ns*), or for *view*, (p = .632, *ns*).

No significant two-way interactions were identified for *view* x *call manipulation* (p = .385, *ns*), for *participant type* x *call manipulation* (p = .714, *ns*), or for *view* x *participant type* (p = .304, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction was found (p = .324, *ns*). Table 3.5. Wulf 2 presents the analysis means and standard deviations.

Table 3.5. Wulf 2

Known Signature Fixation Count by View, Call Manipulation, and Participant Type

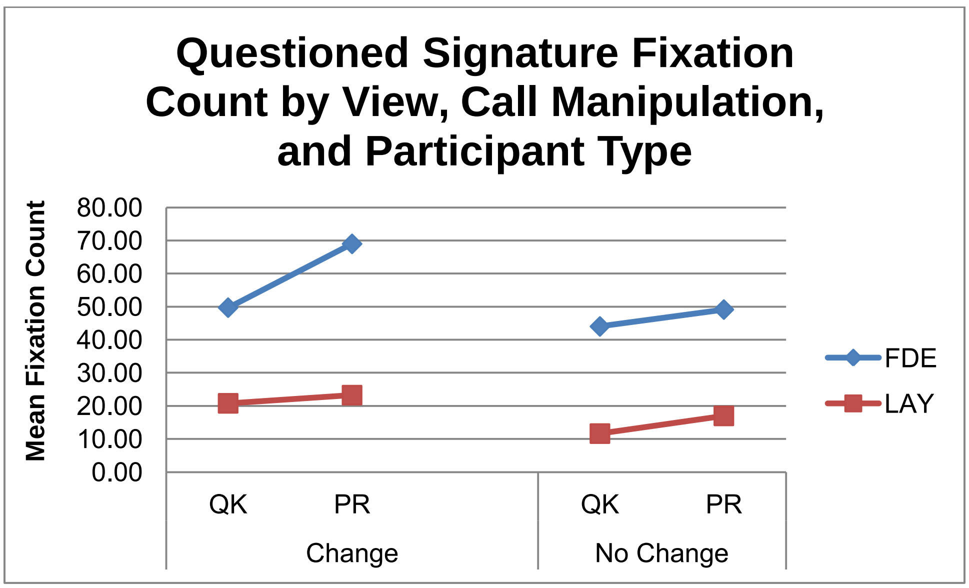
QK Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	40.00	35.25	7	43.24	33.67	37
LAY	24.07	18.35	28	13.91	11.23	11
PR Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	54.86	46.41	7	41.70	33.32	37

LAY	21.11	23.85	28	12.00	7.84	11

These findings indicate that although the mean fixation count for the known comparison signatures was greater for FDEs than for Lay participants, there was no significant change in fixation count from the first time the signatures were viewed (QK) to the second time they were viewed (PR), regardless of whether we manipulated the call in the peer review view.

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation count during the initial viewing of the questioned signature (QK comparison) and the second viewing of the signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation count existed according to the *call manipulation* (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Wulf 2 presents mean fixation count by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Wulf 2



A significant main effect was found for *participant type*, $F(1, 79) = 27.99$, $p < .001$, $\eta^2 = .262$. No significant main effect was found for *call manipulation* (p = .124, *ns*), or for *view*, (p = .095, *ns*).

No significant two-way interactions were identified for *view* x *call manipulation* (p = .556, *ns*), for *participant type* x *call manipulation* (p = .701, *ns*), or for *view* x *participant type* (p = .387, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction was found (p = .373, *ns*). Table 3.5. Wulf 3 presents the analysis means and standard deviations.

Table 3.5. Wulf 3

Questioned Signature Fixation Count by View, Call Manipulation, and Participant Type

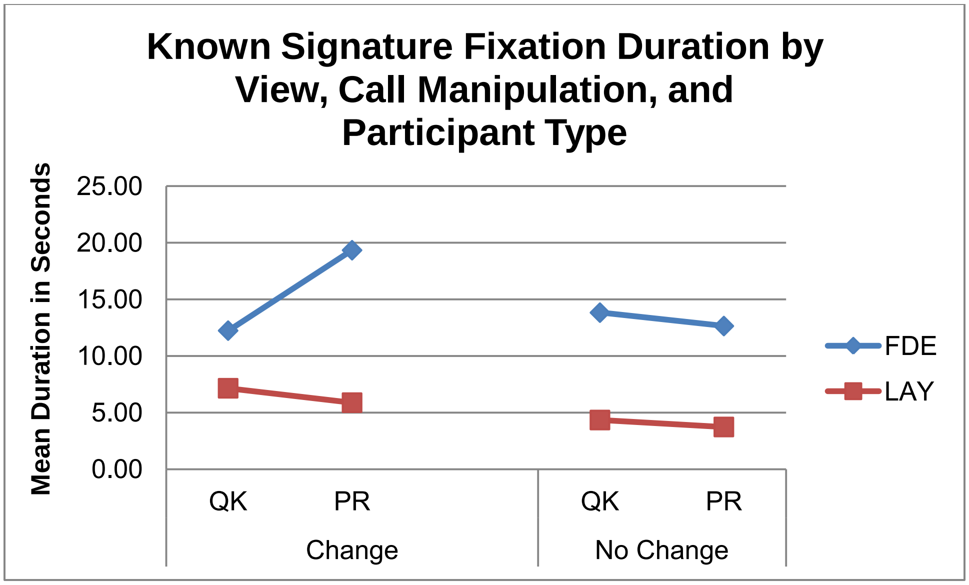
	QK Comparison View					
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	49.71	27.59	7	49.71	27.59	7
LAY	20.79	14.55	28	11.64	8.86	11
	PR Comparison View					
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	69.00	59.60	7	49.14	31.75	37
LAY	23.25	28.83	28	17.00	9.82	11

These findings indicate that although the mean fixation count for the questioned signature was greater for FDEs than for Lay participants, there was no significant change in fixation count from the first time the signature was viewed (QK) to the second time it was viewed (PR), regardless of whether we manipulated the call in the peer review view.

<u>*Total Fixation Duration*</u>

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation duration during the initial viewing of the known comparison signatures (QK comparison) and the second viewing of the signatures (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Wulf 3 presents mean fixation duration by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Wulf 3



A significant main effect was found for *participant type*, $F(1, 79) = 17.57$, $p < .001$, $\eta^2 = .182$. No significant main effect was found for *call manipulation* ($p = .257$, *ns*), or for *view*, ($p = .510$, *ns*).

No significant two-way interactions were identified for *view* x *call manipulation* ($p = .215$, *ns*), for *participant type* x *call manipulation* ($p = .986$, *ns*), or for *view* x *participant type* ($p = .205$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction was found ($p = .146$, *ns*). Table 3.5. Wulf 4 presents the analysis means and standard deviations.

Table 3.5. Wulf 4

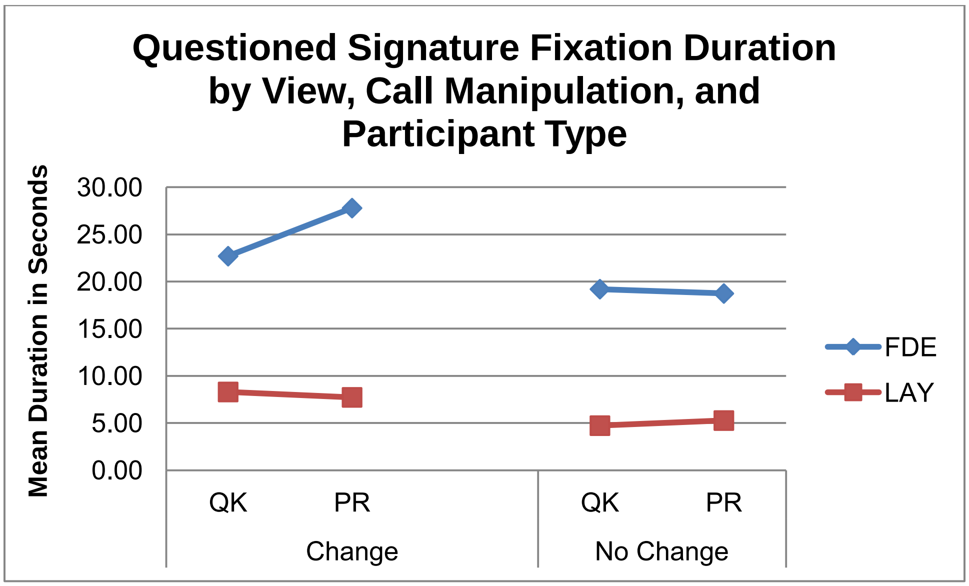
Known Signature Fixation Duration by View, Call Manipulation, and Participant Type

QK Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	12.23	10.93	7	13.83	12.81	37
LAY	7.14	5.63	28	4.34	4.12	11
PR Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	19.34	21.73	7	12.64	10.46	37
LAY	5.87	5.50	28	3.72	2.86	11

These findings indicate that although the mean fixation duration for the known comparison signatures was greater for FDEs than for Lay participants, there was no significant change in fixation duration from the first time the signatures were viewed (QK) to the second time they were viewed (PR), regardless of whether we manipulated the call in the peer review view.

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean fixation duration during the initial viewing of the questioned signature (QK comparison) and the second viewing of the questioned signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in fixation duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Wulf 4 presents mean fixation duration by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Wulf 4



A significant main effect was found for *participant type*, $F(1, 79) = 34.37$, $p < .001$, $\eta^2 = .303$. No significant main effect was found for *call manipulation* ($p = .085$, *ns*), or for *view*, ($p = .562$, *ns*).

No significant two-way interactions were identified for *view* x *call manipulation* ($p = .576$, *ns*), for *participant type* x *call manipulation* ($p = .542$, *ns*), or for *view* x *participant type* ($p = .556$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction was found ($p = .401$, *ns*). Table 3.5. Wulf 5 presents the analysis means and standard deviations.

Table 3.5. Wulf 5

Questioned Signature Fixation Duration by View, Call Manipulation, and Participant Type

	QK Comparison View					
	Change			No Change		
Participant	*M*	*SD*	n	*M*	*SD*	n
FDE	22.70	14.94	7	19.20	15.08	37
LAY	8.30	6.92	28	4.73	4.31	11

PR Comparison View

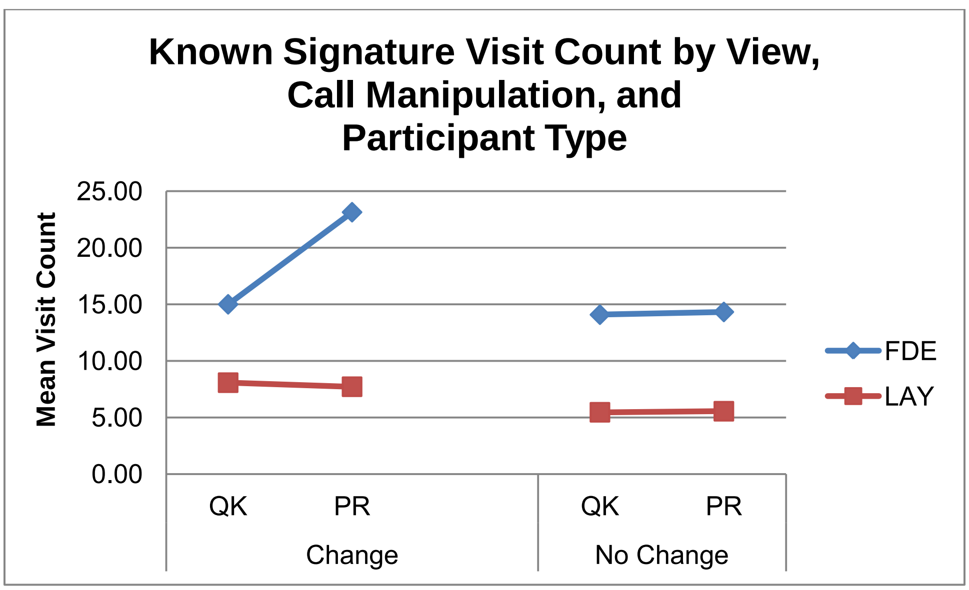
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	27.80	28.90	7	18.74	12.16	37
LAY	7.73	8.55	28	5.27	3.10	11

These findings indicate that although the mean fixation duration for the questioned signature was greater for FDEs than for Lay participants, there was no significant change in fixation duration from the first time the signature was viewed (QK) to the second time it was viewed (PR), regardless of whether we manipulated the call in the peer review view.

<u>*Total Visit Count*</u>

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit count during the initial viewing of the known comparison signatures (QK comparison) and the second viewing of the known comparison signatures (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in visit count existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Wulf 5 presents mean visit count by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Wulf 5



A significant main effect was found for *participant type*, $F(1, 79) = 23.72$, $p < .001$, $\eta^2 = .231$. No significant main effect was found for *call manipulation* ($p = .079$, *ns*), or for *view*, ($p = .188$, *ns*).

No significant two-way interactions were identified for *view* x *call manipulation* (p = .226, *ns*), for *participant type* x *call manipulation* (p = .546, *ns*), or for *view* x *participant type* (p = .161, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction was found (p = .176, *ns*). Table 3.5. Wulf 6 presents the analysis means and standard deviations.

Table 3.5. Wulf 6

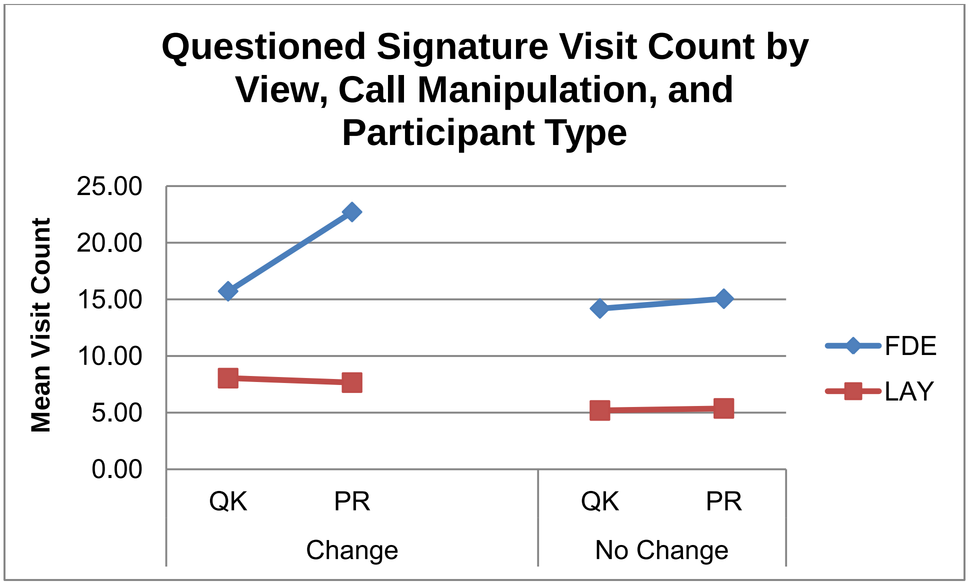
Known Signature Visit Count by View, Call Manipulation, and Participant Type

			QK Comparison View			
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	15.00	13.35	7	14.08	9.06	37
LAY	8.07	5.48	28	5.45	4.48	11
			PR Comparison View			
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	23.14	18.92	7	14.32	10.74	37
LAY	7.71	9.39	28	5.55	3.80	11

These findings indicate that although the mean visit count for the known comparison signatures was greater for FDEs than for Lay participants, there was no significant change in visit count from the first time the known comparison signatures were viewed (QK) to the second time they were viewed (PR), regardless of whether we manipulated the call in the peer review view.

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit count during the initial viewing of the questioned signature (QK comparison) and the second viewing of the signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in visit count existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Wulf 6 presents mean visit count by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Wulf 6



A significant main effect was found for *participant type*, $F(1, 79) = 24.43$, $p < .001$, $\eta^2 = .236$. No significant main effect was found for *call manipulation* ($p = .092$, *ns*), or for *view*, ($p = .244$, *ns*).

No significant two-way interactions were identified for *view* x *call manipulation* ($p = .396$, *ns*), for *participant type* x *call manipulation* ($p = .630$, *ns*), or for *view* x *participant type* ($p = .219$, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction was found ($p = .306$, *ns*). Table 3.5. Wulf 1 PR 7 presents the analysis means and standard deviations.

Table 3.5. Wulf 7

Questioned Signature Visit Count by View, Call Manipulation, and Participant Type

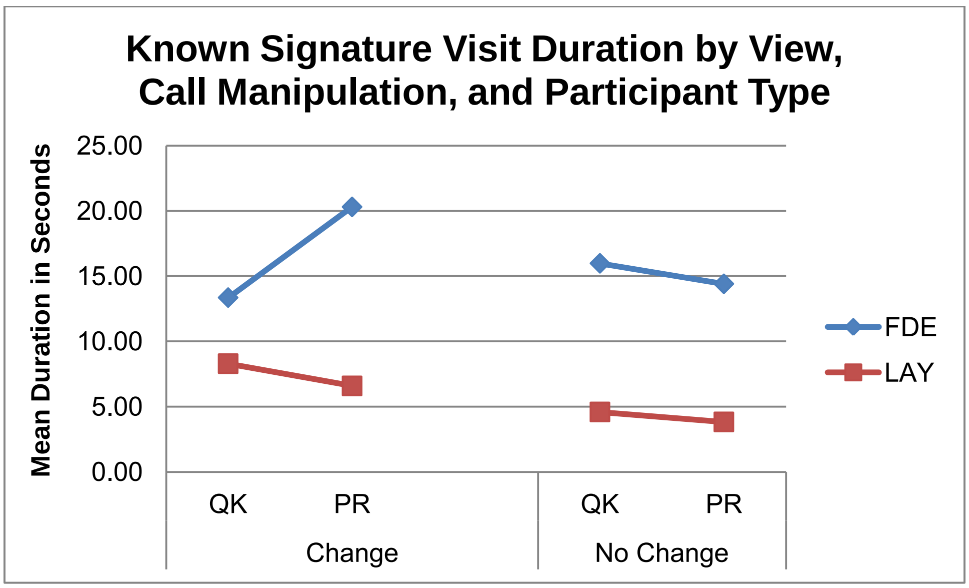
			QK Comparison View			
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	15.71	13.24	7	14.19	9.19	37
LAY	8.04	5.71	28	5.18	4.47	11
			PR Comparison View			
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	22.71	21.88	7	15.05	10.87	37
LAY	7.64	9.81	28	5.36	3.56	11

These findings indicate that although the mean visit count for the questioned signature was greater for FDEs than for Lay participants, there was no significant change in visit count from the first time the questioned signature was viewed (QK) to the second time it was viewed (PR), regardless of whether we manipulated the call in the peer review view.

<u>*Total Visit Duration*</u>

Known comparison signatures. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit duration during the initial viewing of the known comparison signatures (QK comparison) and the second viewing of the known comparison signatures (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in visit duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Wulf 7 presents mean visit duration by *view*, *call manipulation*, and *participant type*.

Figure 3.5 Wulf 7



A significant main effect was found for *participant type*, $F(1, 79) = 17.81$, $p < .001$, $\eta^2 = .184$. No significant main effect was found for *call manipulation* (p = .317, *ns*), or for *view*, (p = .665, *ns*).

No significant two-way interactions were identified for *view* x *call manipulation* (p = .261, *ns*), for *participant type* x *call manipulation* (p = .742, *ns*), or for *view* x *participant type* (p = .246, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction was found (p = .162, *ns*). Table 3.5. Wulf 8 presents the analysis means and standard deviations.

Table 3.5. Wulf 8

Known Signature Visit Duration by View, Call Manipulation, and Participant Type

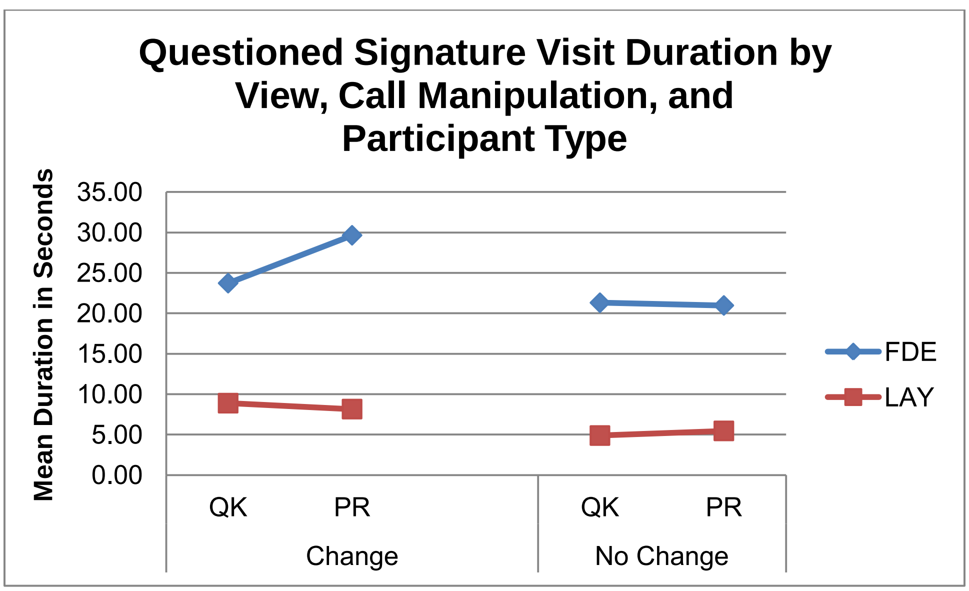
	QK Comparison View					
	Change			No Change		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	13.35	11.37	7	15.98	14.32	37

LAY	8.29	6.37	28	4.59	4.13	11
			PR Comparison View			
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	20.30	22.64	7	14.41	11.50	37
LAY	6.58	6.28	28	3.82	2.97	11

These findings indicate that although the mean visit duration for the known comparison signatures was greater for FDEs than for Lay participants, there was no significant change in visit duration from the first time the known comparison signatures were viewed (QK) to the second time they were viewed (PR), regardless of whether we manipulated the call in the peer review view.

Questioned Signature. A 2 (*participant type*) x 2 (*call manipulation*) x 2 (*view*) repeated measures factorial analysis of variance (ANOVA) was conducted to investigate whether significant differences existed in the mean visit duration in seconds during the initial viewing of the questioned signature (QK comparison) and the second viewing of the signature (PR comparison) for FDE and Lay participants. The analysis also investigated whether mean differences in visit duration existed according to the call manipulation (experimental - change vs. control - no change in the genuine/disguised/simulated process call) for FDE and Lay participants. Figure 3.5 Wulf 8 presents mean visit duration by *view*, *call manipulation, and participant type*.

Figure 3.5 Wulf 8



A significant main effect was found for *participant type*, $F(1, 79) = 35.18$, $p < .001$, $\eta^2 = .308$. No significant main effect was found for *call manipulation* ($p = .126$, *ns*), or for *view*, ($p = .537$, *ns*).

No significant two-way interactions were identified for *view* x *call manipulation* (p = .572, *ns*), for *participant type* x *call manipulation* (p = .704, *ns*), or for *view* x *participant type* (p = .513, *ns*).

No significant three-way (*participant type* x *call manipulation* x *view*) interaction was found (p = .389, *ns*). Table 3.5. Wulf 9 presents the analysis means and standard deviations.

Table 3.5. Wulf 9

Questioned Signature Visit Duration by View, Call Manipulation, and Participant Type

QK Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	23.72	14.91	7	21.30	17.22	37
LAY	8.87	7.24	28	4.87	4.34	11
PR Comparison View						
	Change			**No Change**		
Participant	***M***	***SD***	**n**	***M***	***SD***	**n**
FDE	29.64	30.12	7	20.96	13.49	37
LAY	8.14	8.87	28	5.45	3.13	11

These findings indicate that although the mean visit duration for questioned signature was greater for FDEs than for Lay participants, there was no significant change in visit duration from the first time the questioned signature was viewed (QK) to the second time it was viewed (PR), regardless of whether we manipulated the call in the peer review view.

CHAPTER 3: RESULTS

SECTION 3.6: QUALITATIVE INTERVIEW ANALYSES

Qualitative Interview Protocol

The qualitative, open-ended interview protocol was designed to add an additional interpretive dimension to the quantitative eye-tracking data. In their eye-tracking study, Dyer and colleagues (2006) noted eye movement, response time, and opinions, and although they found that FDE opinions were significantly more accurate than the control group, the FDEs and Lay participants appeared to view the signatures similarly. Dyer and colleagues suggested that FDEs may have employed different cognitive processes during their examination than did lay participants (2006). FDEs must make subjective judgments about the information they extract from the signatures, so it is important to gather both quantitative and qualitative information about how examiners reach their decisions.

Busey and colleagues (2013) found that fingerprint experts and lay participants performed similarly when correctly identifying true correspondences between points on two separate fingerprint images, but found a difference between experts and lay participants in the temporal sequences and length of their saccades. They suggested that the experts may have been identifying multiple corresponding points in an area, while the lay participants may have been limited to making point-by-point visual correspondences. Busey and colleagues concluded that examining these clusters of short-saccade fixations may be more diagnostic of individualizing characteristics than may focusing on fixation pairs separated by a single saccade.

As with these studies, our eye-tracking procedure provided quantitative information about the number of different features attended to, the number of times each feature or area was visited by experts and Lay participants during the analysis, the length of time the participants spent on the feature, and the sequence of eye fixations. In addition to these data, however, the qualitative information given by our FDE and Lay participants for the 11 signatures below provided a thick, rich description of thought processes and decision points involved in their interpretation of the signature features, and helped us to better understand the extent to which the two groups differed in their approach to the examinations.

Here we present the top 15 mentions of features made by FDEs for each of the 11 signatures in the interview protocol with some examples of the kinds of comments that fell into the coding categories. We also present examples of interview transcripts from three FDEs and three Lay participants, in which they discuss their decision making processes with reference to their own personal eye-tracking gaze plots and heat maps.

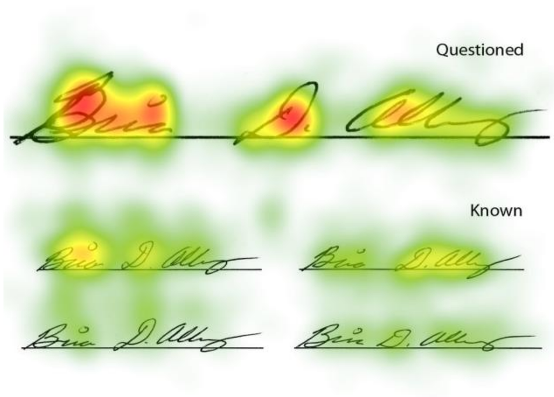
SIGNATURE 1: Brian Albury Signature 3 (Genuine)

This signature is classified as a high complexity, mixed signature. Figure Albury 3.6.1 presents the heat maps for all participants together, all FDEs separately, and all Lay participants separately. The areas of interest (AOIs) used for the eye-tracking analyses were based on the All Participants gaze plots.

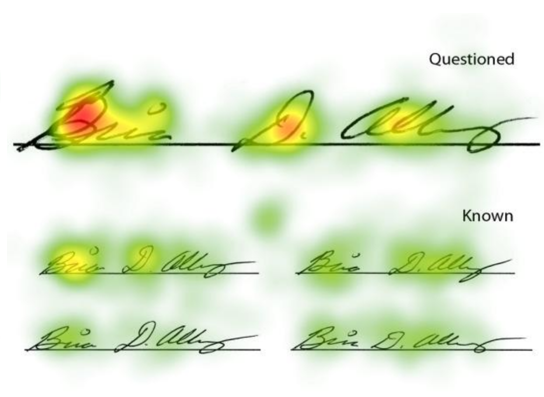
Figure Albury 3.6.1

All Participants

All FDE



All Lay



Visual comparison of the two heat maps in which the FDE and Lay participant gaze data are separated reveals that there are clear differences in the gaze behavior for the two groups. This is particularly noticeable for the extended area of red hot spots and larger orange warm spots covering the first name, and the more extended and intense areas on the middle initial, last name, and the first name of the upper left known signature.

This suggests that the Lay participants attended to a greater extent to the very obvious differences between the questioned signature and the known signatures, but that they paid less attention to the subtle attributes of the signatures. Conversely, FDEs attended to a greater of variety of features and, "red flagged" more information that they found diagnostic of simulation, leading many of them to conclude that the signature was simulated. Below are examples of how the FDEs and Lay participants discussed the signature features during their interviews. Figure Albury 3.6.2 presents examples of some of the coding categories, and examples of comments that fell into those categories.

Figure Albury 3.6.2

The FDEs Said:

207- Baseline Alignment: *"Its position, relationship to the ruled writing line, where it's just below the lower loop of the 'D', violates the ruled line as it does in two of the known 'Ds'."*

235 - Initial / Beginning Stroke: "*It appears to be a tapered beginning stroke."*

274 - Punctuation: "*Briefly [looking] at the diacritic, the "I" dot in Brian…"*

224 - Pictorial Similarity: *"I believe that this was simulated signature because they were changing the first and middle initial and the remaining portions."*

The Lay Participants Said:

207 - Baseline Alignment: *"Under the circle it was a little low. Low in relation to the other line. From the dot it was a little bit lower, it just stood out."*

235 - Initial / Beginning Stroke: *"The last name is consistent on every signature. Where he starts on the 'A' is the same on every one."*

274 - Punctuation: *"I mean it is just a period down here but he might have done it to throw someone off."*

224 - Pictorial Similarity: *"Its looks really close every time from the questioned signature to all the knowns. Each person has their own way of writing their name so when somebody is trying to trace it or copy it or forge it no matter how good you are you're going to be able to do it."*

The most frequently mentioned feature among FDEs was the baseline alignment of the questioned signature, compared to the known signatures. Table Albury 3.6.1 presents the 15 most frequently mentioned signature features in order of their frequency.

Table Albury 3.6.1
Frequency of Feature Mention for Albury Signature 3

Features	n	% Mentions	Features	n	% Mentions
Baseline alignment/ placement/orientation	21	43%	Execution	10	20%
Initial/beginning stroke	16	33%	Spacing	10	20%
Punctuation	15	31%	Connecting stroke	9	18%
Shape	14	29%	Lower loop	9	18%
Stroke	14	29%	Height	7	14%
Line quality	13	27%	Pictorial similarity	7	14%
Terminal/end stroke	13	27%	Retrace	7	14%
Slope/slant/angularity	12	24%			

The comments below are the actual transcripts of the qualitative interviews for an FDE and a Lay participant (the X/Y coordinates correspond to the area on a printed copy of the signature grid sheet with X/Y coordinates, which coders used to locate the part of the signature under discussion during the audio recording). Participants were asked to refer to their gaze plot and heat map, and then describe to the interviewer how they evaluated that aspect of the signature. The comments have been separated and numbered according to the features the participants identified.

Figure Albury 3.6.3 presents the gaze plot and heat map for an FDE for Albury Signature 3. Recall that each dot on the gaze plot represents a fixation. Larger dots represent longer fixation durations. The lines between the dots represent saccades (eye movements between fixations).

Figure Albury 3.6.3

FDE 1 Gaze Plot **FDE 1 Heat Map**

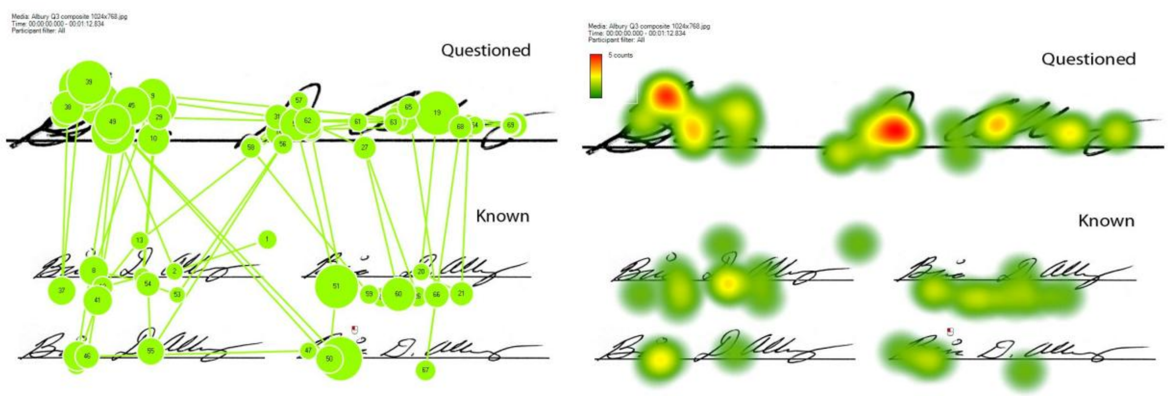
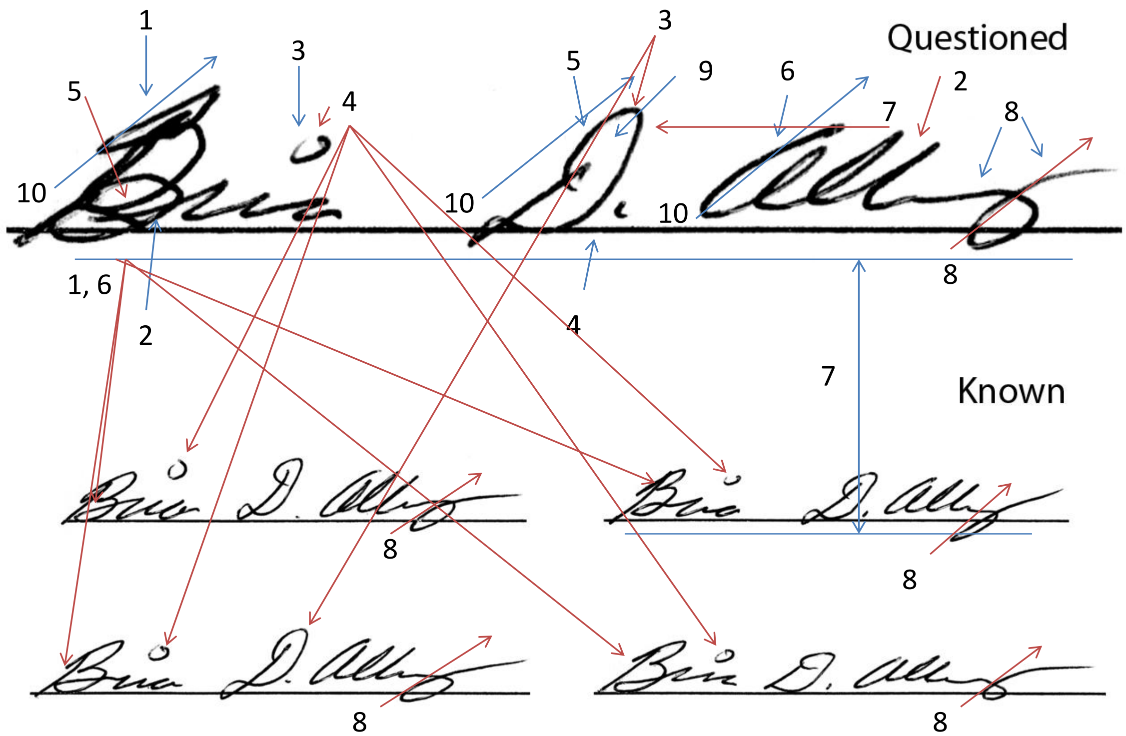


Figure Albury 3.6.4 presents the Albury 3 signature with numbered arrows indicating the feature(s) that correspond to each of the comments. The blue arrows correspond to the FDE comments, and the red arrows correspond to the Lay participant comments.

Figure Albury 3.6.4



FDE 1:

(1) Top part of the B. Y15/14/x2 a lot of pen movement or overwriting. Appears to be rapid movement, line quality appears to be rapid but it's overwriting. So the extended gaze is because I was fixated on what kind of movements were taking place with the letter formation of B.

(2) y14/15 coordinates with red spot on heat map and the other red spot would be the transition from the overwriting into the remainder of the first name y13/x3-4. Again, reading line quality of the transition from the first letter to the second letter. Looking at assessing the line quality. It appears to be rapid line quality as it transitions through the first name so the flow, the speed appears rapid.

(3) The circle I dot at y14/x6 I have a fixation, line quality appears rapid, suggests natural writing.

(4) As I move left to right reading the signature to the middle initial D I have another heat fixation over that middle initial/dot combination which is coordinate y13-14/x10-12 that would be assessing line quality, punctuation, letter formation.

(5) Assessing the fluency of the middle initial D, suggests rapid natural writing characteristic.

(6) As I progressed left to right on the last name I have a heat or extended gaze on y13-14/x16-17 assessing the line quality of the uppercase letter A, the loop formation on the fluency of the line quality as the signature is moving forward from left to right and finishing out the last name. I saw characteristics of natural line movements, line quality was very good, suggesting natural writing.

(7) Comparing questioned signature/known signatures, how signature appears on the baseline, I do assess whether the known signature is off or on baseline, my gaze plots suggest more towards the baseline of the known, particularly upper right hand known, there was consistency with the orientation of the signature to the baseline.

(8) In the questioned signature as it finishes before and after the y, I am assessing the line quality and speed of the signature, especially as it is finishing, assessing the line quality, its fluency. It appears rapid and natural.

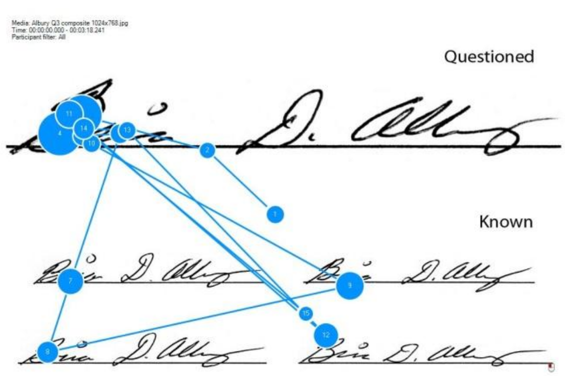
(9) Looking at the inside volume of the letter D, a spatial assessment of the letter formation.

(10) Forward slant of the angle of the signature. Slant is consistent between questioned signature and known signatures. It's difficult because the questioned signature is larger than the known signatures. That's perspective in the examination.

Figure Albury 3.6.5 presents the gaze plot and heat map for a Lay participant for Albury Signature 3. Recall that each dot on the gaze plot represents a fixation. Larger dots represent longer fixation durations. The lines between the dots represent saccades (eye movements between fixations).

Figure Albury 3.6.5

Lay Participant 1 Gaze Plot **Lay Participant 1 Heat Map**



Lay Participant 1:

(1) From my heat signatures from the start the B is the biggest difference with all the known signatures to the questioned signature, that really is what I focused on. I mean it just stood out among all the rest

of it. Y12-y15 x1-x3. It is inconclusive it almost looks scribbled, compared to the known signatures it looks more like it took its time starting off with a B than he did with the questioned signature. Y13 X1 and 2. In that specific area I'm not certain I know like I said just more of the focus was maybe the B and itself so it could just be where I was gazing at. Just mainly that it almost looked scribbled compared.

(2) I did note that on the last name that the L's were similar. Y13 Y15 x17-18.

(3) And then the only other thing was finding the top of the D as so much similar with the way it looks at the top. The loop at the top of the D Y13-15 X11-12. It was only similar to this known here.

(4) I did look at the I, the way that they I had been dotted and the I dot is located at Y14 X6 and the first X7. I just compared it and I thought it was inconclusive to me to say that , that was different or not different to these, I mean they were similar but he could have been in some kind of hurry signing that and didn't finish the circle completely for the dot of the I.

(5) Well as the signature all together with the way the B started out I would have assumed just from that start that if he whoever it was signing their name that they were in a hurry for something the way that the B was just scribbled compared to the signatures that they have down here where the B is more looks like he is taking his time.

(6) I would say that this I dot is constant. I would just say that I mean I don't know how I answered on the test but I would say right now looking at it right now I would say that it was probably genuine it was just a speed thing to me like I know I've signed things many of time and just have been trying to get out of the store signing the check or anything that I would just slop anything down sometimes compared to actually writing my actual signature more so and that kind of looks like it's what happened.

(7) But the last thing the L's matched the loop on top of the D matches somewhat.

(8) Looking at the way the Y was in the signature how it's slanted in the questioned signature and in some of the knowns.

Conclusions

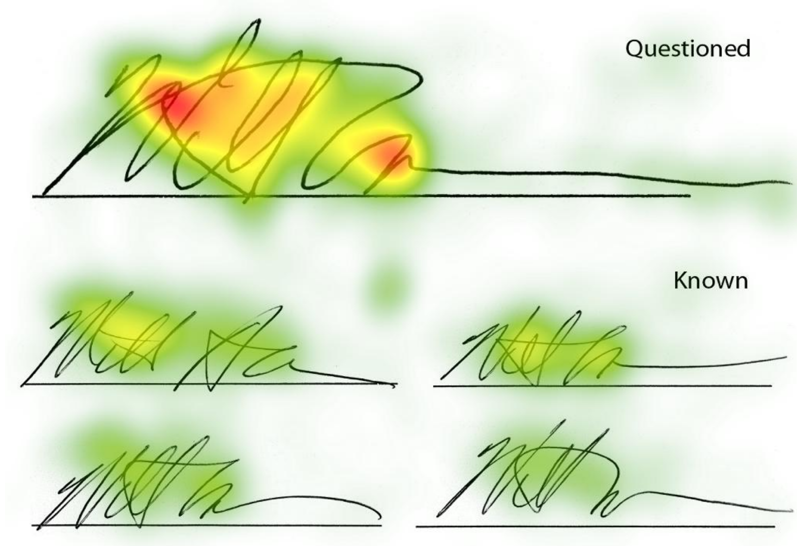
Of the 49 FDE participants, 19 responded correctly as genuine, with the remaining 30 identifying that the signature as non-genuine. Of the 43 Lay participants, 42 responded correctly that the signature was genuine, while 1 identified the signature as non-genuine. This difference was statistically significant, χ^2 (1, N = 92) = 35.56, p = < .001. This suggests that the Lay participants attended to a greater extent to the very obvious differences between the questioned signature and the known signatures, but that they paid less attention to the subtle attributes of the signatures. Conversely, FDEs attended to a greater of variety of features and, "red flagged" more information that they found diagnostic of simulation, leading many of them to conclude that the signature was simulated.

SIGNATURE 2: Will Atkinson Signature 1 (Traced)

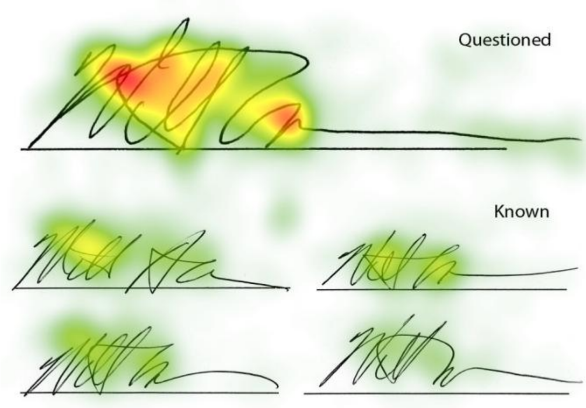
This signature is classified as a high complexity, mixed signature. Figure Atkinson 3.6.1 presents the heat maps for all participants together, all FDEs separately, and all Lay participants separately. The areas of interest (AOIs) used for the eye-tracking analyses were based on the All Participants gaze plots.

Figure Atkinson 3.6.1

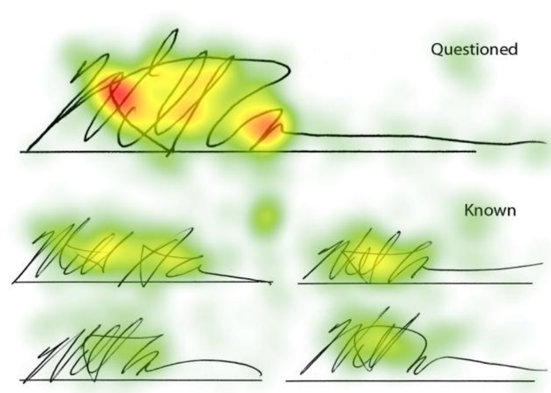
All Participants



All FDE



All Lay



Visual comparison of the two heat maps in which the FDE and Lay participant gaze data are separated reveals that there are again noticeable differences in the gaze behavior for the two groups. This is particularly noticeable for the extended area of red hot spots and larger orange warm spots covering the first name. Below are examples of how the FDEs and Lay participants discussed the signature features during their interviews. Figure Atkinson 3.6.2 presents examples of some of the coding categories, and examples of comments that fell into those categories.

Figure Atkinson 3.6.2

The FDEs Said:

237 - Line quality: *"But looking at this questioned signature number two, again, line quality is not real good, a lot of, I mean there is really no line width variation there, everything looks like it's all a pretty constant pen pressure for the most part, blunt beginning and ending strokes. in the known signatures there's definitely some line width variation, especially between the down strokes and the up stroke."*

263 - Stroke: *"In the known signatures there's definitely some line width variation, especially between the down strokes and the up stroke."*

265 - Terminal/End Stroke: *"…and I noted the fact that there was a possible ending stroke at the bottom of the line that makes the fourth high loop."*

241-Pen Lift: *"What I thought was odd on the questioned signature is that it looks like there's been a pen lift and restart to make this line because they might have been looking at a signature and not know what this line should be, so it was added at a later time. So this would be the line, there's a pen lift and pen start right here which you really don't see in the known signatures, it's all a continual pull back and not a pen lift, it's a very smooth motion within the known signatures"*

The Lay Participants Said:

237 - Line quality: *"Main thing I was looking for was similarities and thickness of handwriting. I called it genuine because I don't see any difference in thickness or how it looks. It would be extremely hard to copy something like that."*

263 - Stroke: *"I know I just kept coming back looking at these down here. See this right here, this line…where they topped it here, this one is up higher than any of these are."*

265 - Terminal/End Stroke: *"The ending stroke was the "W" was inconsistent in the knowns."*

241- Pen Lift: "*In all of the known signatures he or she kind of does that but in the questioned signatures he gets crazy with it and it looked like he picked up his pencil right here when in the knowns he didn't pick up his pencil.*

The most frequently mentioned feature among FDEs was the line quality of the questioned signature, compared to the known signatures. Table Atkinson 3.6.1 presents the 15 most frequently mentioned signature features in order of their frequency.

Table Atkinson 3.6.1

Frequency of Feature Mention for Atkinson Signature 1

Features	n	% Mentions	Features	n	% Mentions

Line quality	29	59%	Variation	8	16%
Stroke	29	59%	Pictorial similarity	8	16%
Terminal/end stroke	20	41%	Execution	7	14%
Pen lift	16	33%	Baseline alignment, placement, orientation	6	12%
Initial/beginning stroke	13	27%	Tremor	6	12%
Speed	9	18%	Pressure	6	12%
Shape	9	18%	Height	5	10%
Upper loop	9	18%			

The comments below are the actual transcripts of the qualitative interviews for an FDE and a Lay participant (the X/Y coordinates correspond to the area on a printed copy of the signature grid sheet with X/Y coordinates, which coders used to locate the part of the signature under discussion during the audio recording). Participants were asked to refer to their gaze plot and heat map, and then describe to the interviewer how they evaluated that aspect of the signature. The comments have been separated and numbered according to the features the participants identified.

Figure Atkinson 3.6.3 presents the gaze plot and heat map for an FDE for Atkinson Signature 3. Recall that each dot on the gaze plot represents a fixation. Larger dots represent longer fixation durations. The lines between the dots represent saccades (eye movements between fixations).

Figure Albury 3.6.3

FDE 2 Gaze Plot **FDE 2 Heat Map**

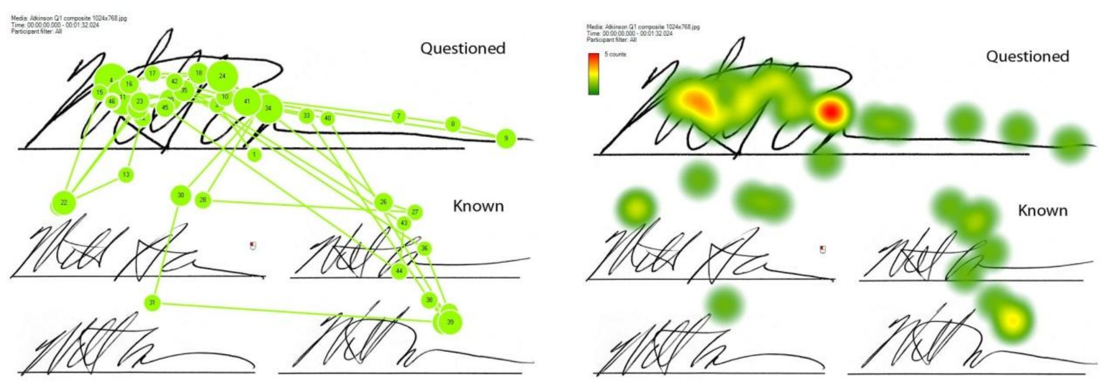
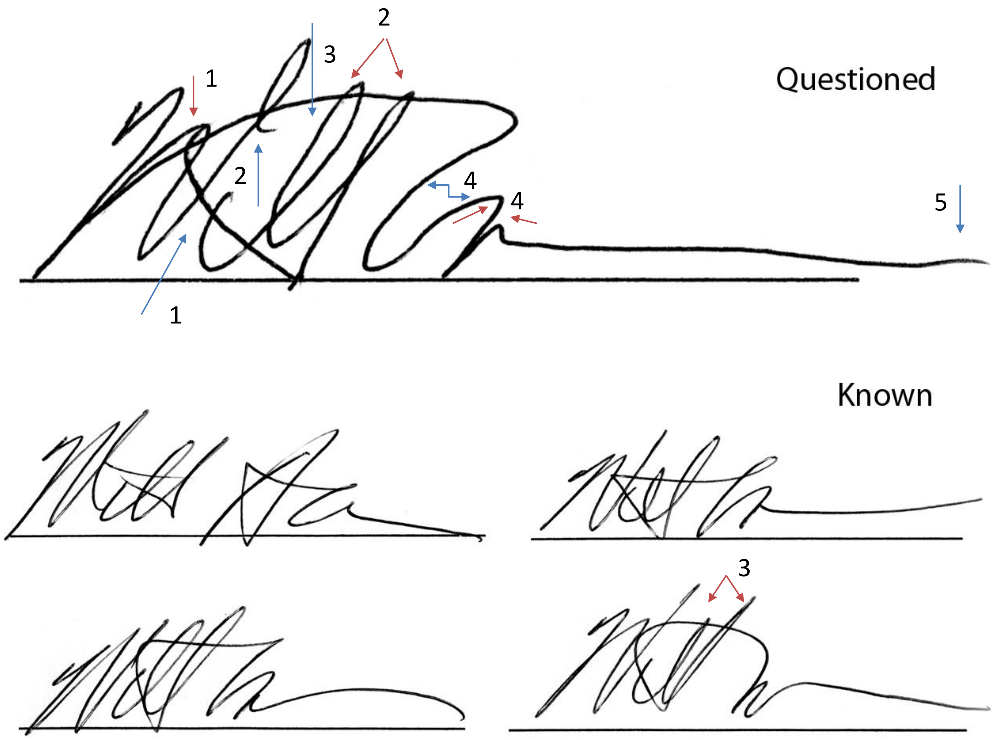


Figure Atkinson 3.6.4 presents the Atkinson 1 signature with numbered arrows indicating the feature(s) that correspond to each of the comments. The blue arrows correspond to the FDE comments, and the red arrows correspond to the Lay participant comments.

Figure Atkinson 3.6.4



FDE 2:

(1) I remember looking at this one and not knowing what the name was, and I couldn't really tell if this was an M or maybe a W, Milt or Walt, perhaps, and this was one that seemed to have an extra stroke going on in here, I wasn't sure what was going on with this stroke Y15-12/X4-6. It looked very drawn to me, I thought I saw some tremor in there. [1]

(2) Moving throughout the signature, let's go with that first initial. At the top where it terminates seemed a lot shorter than it did in the known signatures Y15/X6, so I think this is what's going on in this area.

(3) With regard to this L, I thought there was quite a bit of tremor in that letter, as well as the one next to it, so that was a little worrisome Y15/X6-7,

(4) and then that continues on, more tremor in this whole loop area, which I would imagine is an uppercase A. This whole thing looks tremulous to me Y12-14/X9-11, I was seeing some tremor there, less so in the known signatures.

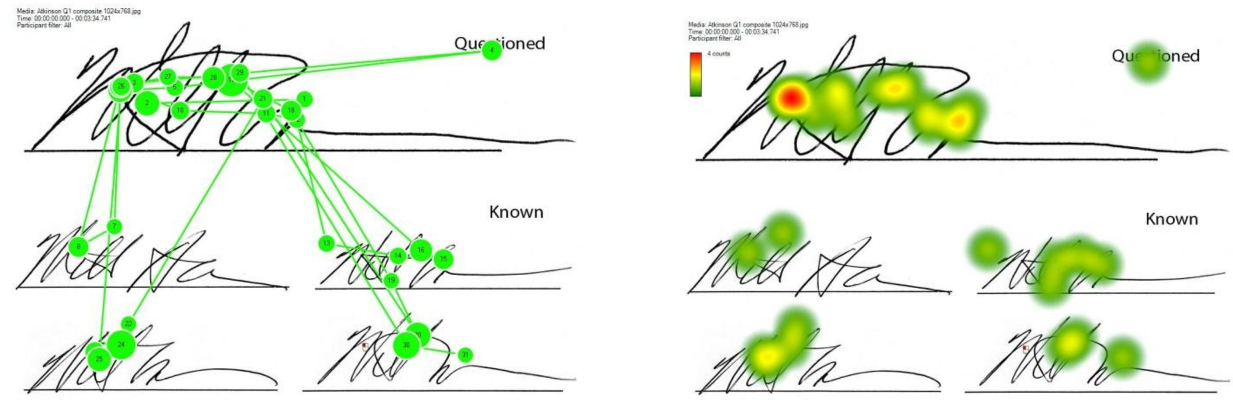
(5) I looked at the terminal stroke, I always look at the beginning and terminal strokes, and I wanted to see if it was ending bluntly or did it have a tapered ending like the known signatures Y12 past X22, just looking at the endings there.

[1] Comments about the lack of semantic content such as this one were common among both FDE and Lay participants, both during the eye-tracking procedures as they were examining the signatures and during the qualitative interview.

Figure Atkinson 3.6.5 presents the gaze plot and heat map for a Lay participant for Atkinson Signature 1. Recall that each dot on the gaze plot represents a fixation. Larger dots represent longer fixation durations. The lines between the dots represent saccades (eye movements between fixations).

Figure Atkinson 3.6.5

Lay Participant 2 Gaze Plot **Lay Participant 2 Heat Map**



Lay Participant 2:

(1) I focused on the middle of the first name of the questioned signature at Y15, X4 and compared it to the bottom left k. I determined that there were extraneous strokes and loops in the questioned signature than in all of the knowns which would make that inconsistent.

(2) In the area of Y15, Y16; X7, X9 I compared the height proportion; in the questioned signature it is almost parallel however, in the k the first letter is actually shorter than the second one which would make that inconsistent.

(3) I also noticed that at X16, X17; Y3 the first letter is not as tall and proportionate as it is in the questioned signature.

(4) The last part I noticed at the hump in the end of the signature. In the area of Y13, X11 I noticed that the angle of that stroke was more open whereas in the questioned signature it is more closed. That area was most consistent with the top right however, it was still different which made it inconsistent with the knowns.

Conclusions

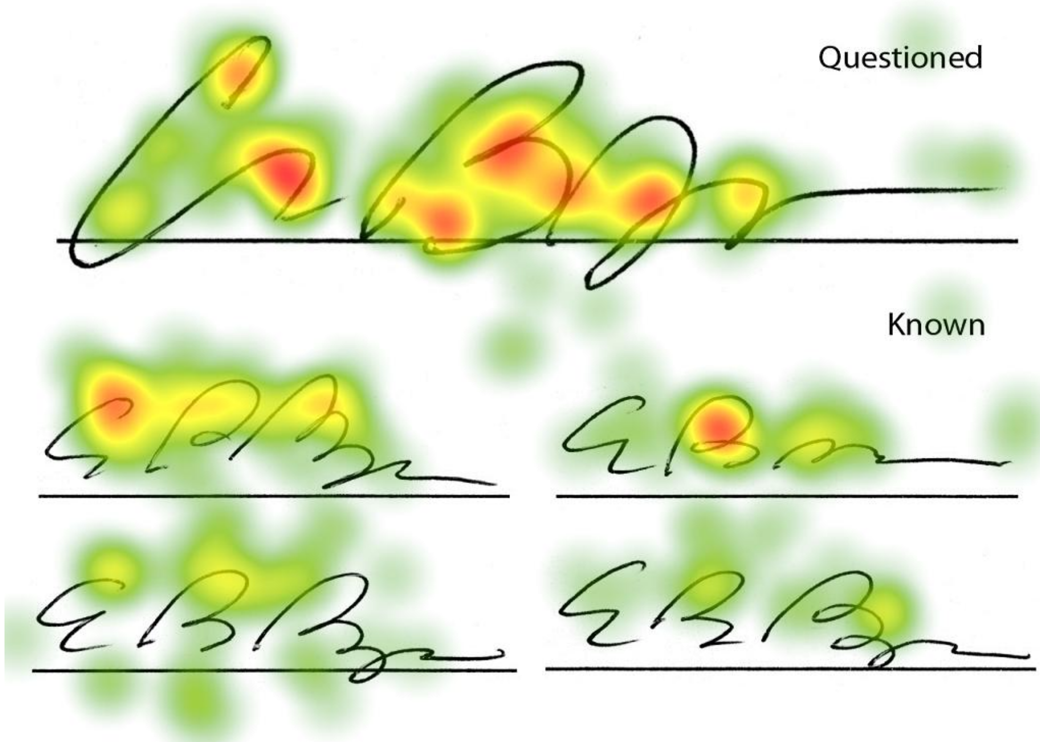
All 49 of the FDEs responded correctly that the signature was non-genuine, and none responded that it was genuine. Of the 43 Lay participants, 41 responded correctly that the signature was non-genuine, and 2 responded that the signature was genuine. This difference was not statistically significant, $p = .127$, *ns*. Although both groups were highly accurate, the differences in the heat maps indicate again that the Lay participants were more focused on the very obvious differences between the questioned signature and the known signatures, but that they paid less attention to the subtle attributes of the signatures, while FDEs attended to a greater variety of features, evaluated the signatures more extensively, and utilized more information in reaching their conclusions.

<u>SIGNATURE 3: Bryan Bouysou Signature 2 (Simulated)</u>

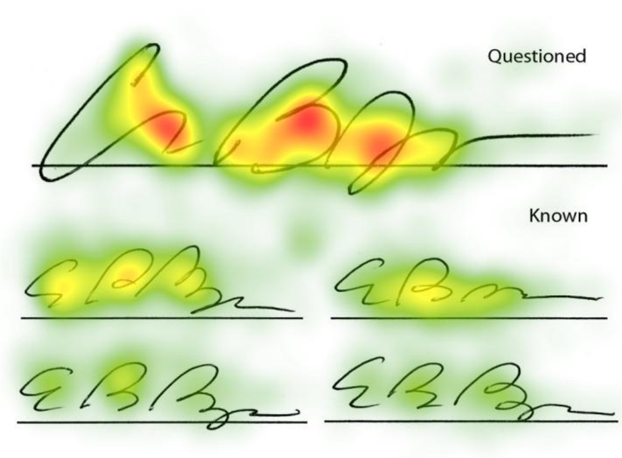
This signature is classified as a low complexity, mixed signature. Figure Bouysou 3.6.1 presents the heat maps for all participants together, all FDEs separately, and all Lay participants separately. The areas of interest (AOIs) used for the eye-tracking analyses were based on the All Participants gaze plots.

Figure Bouysou 3.6.1

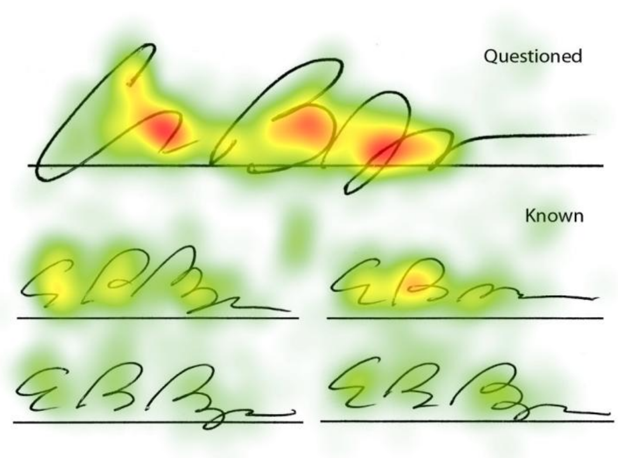
All Participants



All FDE



All Lay



Visual comparison of the two heat maps in which the FDE and Lay participant gaze data are separated reveals that the gaze behavior in the two groups is very similar, but there are some noticeable differences in the lower loop of the B, where the extended area of red hot spots and larger orange warm spots is noticeable, as well as in the utilization of the information in the known signatures. Below are examples of how the FDEs and Lay participants discussed the signature features during their interviews. Figure Bouysou 3.6.2 presents examples of some of the coding categories, and examples of comments that fell into those categories.

Figure Bouysou 3.6.2

The FDEs Said:

265 - Terminal Stroke: *"The bottom terminal stroke of the 'E' in the questioned signature, very short stroke, I spent some time looking at that and saw it was an add-on."*

235 - Initial Stroke: *"The elongated initial stroke on the, the E of the questioned signature was a beginning point."*

263 - Stroke: *"Very obvious down stroke relatively emphatic down stroke on what is the capital B on the questioned signature."*

253 - Shape: *"The first 'D' also violated, went down below the ruled line."*

The Lay Participants Said:

265 - Terminal Stroke: *"First thing I noticed was this 'C' or 'E' which ever it's supposed to be here at the end on some of these he makes it distinguish an 'E' almost like a main script 'E' but here it almost look like a 'C' but it's kind of inconsistent with this first known signature."*

235 - Initial Stroke: *"The 'R'. The second character kind of looks like a 'B', it doesn't come down far then any of the knowns, none of them but it also doesn't touch like any of them. Almost like here in this bottom left signature."*

263 - Stroke: *"Pointing at left side of the knowns. Goes down three times."*

253 - Shape: *"Another thing I noticed was the 'R' kind of looks like a 'B' but it never touched kind of like in the second known signature here or in the third one."*

The most frequently mentioned feature among FDEs was the terminal/end stroke of the first formation on the questioned signature, compared to the known signatures. Table Bouysou 3.6.1 presents the 15 most frequently mentioned signature features in order of their frequency.

Table Bouysou 3.6.1
Frequency of Feature Mention for Bouysou Signature 2

Features	n	% Mentions	Features	n	% Mentions

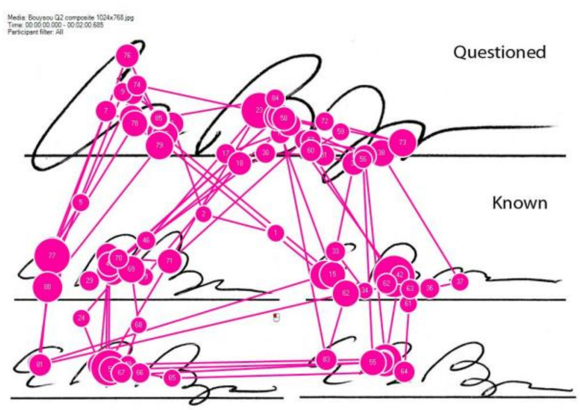
Terminal/end stroke	26	53%	Accidental/extraneous stroke	9	18%
Initial/beginning stroke	23	47%	Pressure	8	16%
Stroke	20	41%	Speed	6	12%
Baseline alignment	17	35%	Fluency/fluidity	6	12%
Pen lift	13	27%	Spur/tick mark	6	12%
Line quality	12	24%	Height	6	12%
Shape	12	24%	Pictorial similarity	5	10%
Lower loop	10	20%			

The comments below are the actual transcripts of the qualitative interviews for an FDE and a Lay participant (the X/Y coordinates correspond to the area on a printed copy of the signature grid sheet with X/Y coordinates, which coders used to locate the part of the signature under discussion during the audio recording). Participants were asked to refer to their gaze plot and heat map, and then describe to the interviewer how they evaluated that aspect of the signature. The comments have been separated and numbered according to the features the participants identified.

Figure Bouysou 3.6.3 presents the gaze plot and heat map for an FDE for Bouysou Signature 2. Recall that each dot on the gaze plot represents a fixation. Larger dots represent longer fixation durations. The lines between the dots represent saccades (eye movements between fixations).

Figure Bouysou 3.6.3

FDE 3 Gaze Plot



FDE 3 Heat Map

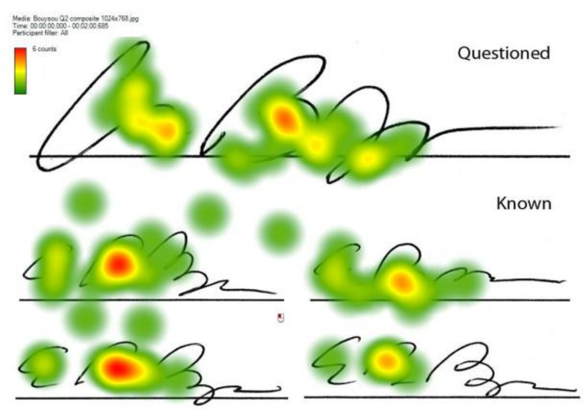
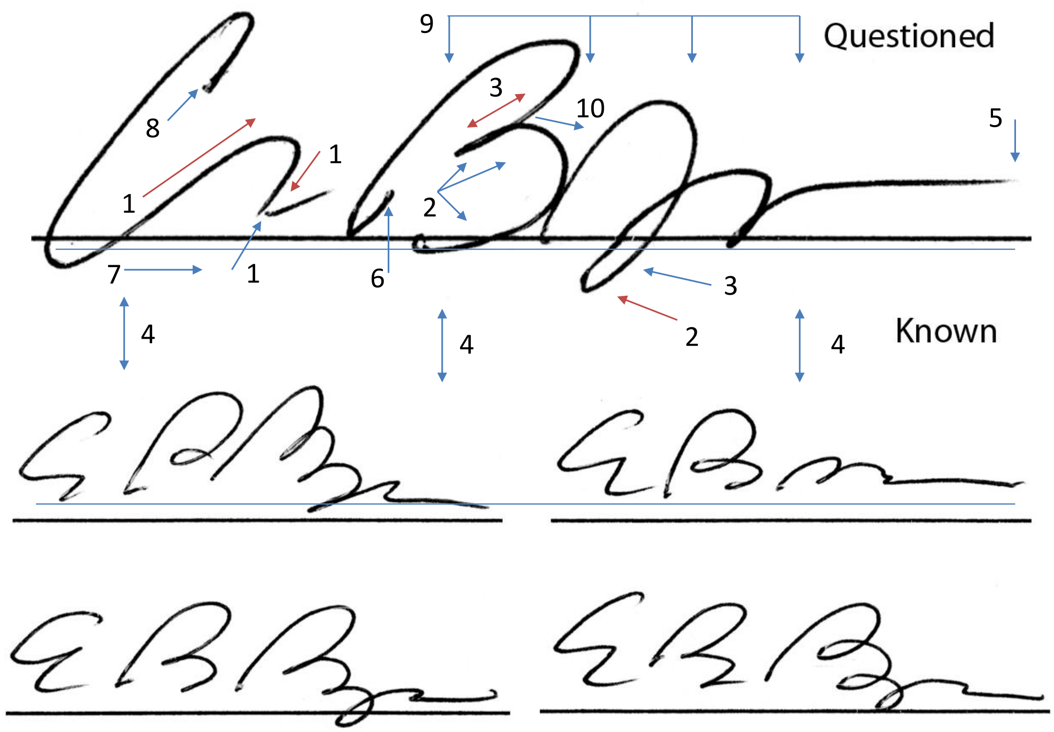


Figure Bouysou 3.6.4 presents the Bouysou 2 signature with numbered arrows indicating the feature(s) that correspond to each of the comments. The blue arrows correspond to the FDE comments, and the red arrows correspond to the Lay participant comments.

Figure Bouysou 3.6.4



FDE 1:

(1) I'm trying to figure out if this is an E or a C with a beard. I think I think it's an E. Like I said, the first thing that drew my interest on this was the pen lift and pen start on the first initial y12/x5-6. I noted that it was continual on the known signatures, that didn't show up and that the known signatures actually look more and E than they do a C with a—they laterally pushed it out more, where it should have been up and angled more to make it so that this little tick I was looking at, should be within the intro stroke at the top of the E. If you note that here they're all within it, and here on the questioned signature it's on the outside of the initial intro stroke on this letter. So that was the first thing that kind of made me question this signature.

(2) So then I started looking at is the angle of the line similar, and that's probably why there's so much looking here at the retrace on the B in the center. Looking at how does that come in on that retrace, it comes in at a 45 degree angle, comes back out on an exact retrace on that 45 degree angle, and then heads south. So I looked at the known signatures, and when I did that it comes in at more of a curved line, not so much of a 45 degree angle. It comes in, curved, and makes a loop, on this one in comes in at a 45 degree angle, but it's curved and then it's open. And then on this one here you did finally find that same curved line where it's more of a retrace, so I think that's why I spent quite a bit of time looking at that, because there is some variation here, so I was kind of watching for that.

(3) I noted that on these signatures they're up off the line from the known signatures, except for one area here where I don't know if that would be a Y, could be the loop of the Y, touches on the lower right hand known, and it actually crosses the baseline on the lower left hand known. So I was kind of looking at that area too, to see if they had this touching area right here that goes below on this loop, so is that something they did down here y11/x13.

(4) So one of the things that bothered me is the fact that you had all of the letters in this name were either pretty much on the baseline or below, and most of the letters in the known are above the baseline, or barely cross with the Y loop.

(5) I did note, which isn't on here, but the ending stroke was a nice tapered, so then I'm starting to think okay, is the fact that that's tapered, that this is all natural, but I went back and looked on the intro stroke on the first letter, the ending stroke where the retouch is, and the stop, those are kind of blunt.

(6) The beginning stroke on the B is kind of blunt, so I kind of let that tapering go that the person just was ending and they were okay with it so they tapered the last, ending stroke.

(7) So I would say the things that were really important to me and that I did spend quite a bit of time, as you can see right here on the baseline, the fact that these were above the baseline, too, and this was on the baseline, that baseline really bothered me (gaze was all along the bottom of the signatures).

(8) So I think what I did is indicate this could be a simulation because of the baseline and because of these pen lifts, and again you have a lot of very steady pressure in the signature. However, I took into account that there was also pretty even, heavy pressure on the known signatures also. So it was a weak indications it could be a simulation because most people, when they're trying to simulate somebody else's signature, would not think of where you place your signature on the baseline. So that would be the thing I was looking at, it was really that baseline, I didn't like that, the pen lifts,

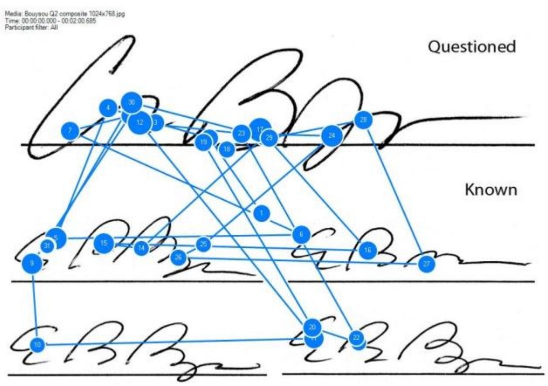
(9) the last name was a little bit more spread out lengthwise on the knowns, and even on these, when the name was shorter, when they only did one or two humps vs. the many humps, it was still fairly long and on this one it's pretty short. Not a lot shorter, but it was something I did look at, the length of the last name vs. the other ones.

(10) And the height proportions between the letters. This first letter is very tall, and on all the known signatures it was either even to the second letter or the third letter, or shorter than, so the height proportions between the first letters. So I indicated it could be a simulation, I did not believe that somebody would try to change their signature this way, by say, writing on the line. They would do something more different with the letters, I would assume.

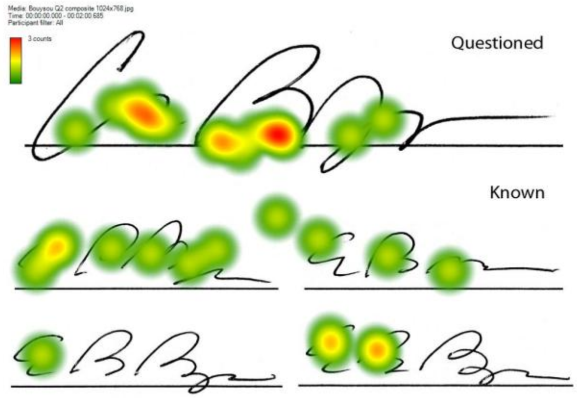
Figure Bouysou 3.6.5 presents the gaze plot and heat map for a Lay participant for Bouysou Signature 2. Recall that each dot on the gaze plot represents a fixation. Larger dots represent longer fixation durations. The lines between the dots represent saccades (eye movements between fixations).

Figure Bouysou 3.6.5

Lay Participant 3 Gaze Plot



Lay Participant 3 Heat Map



Lay Participant 2:

(1) It doesn't really look a lot similar, I guess the curve on the first letter goes up a lot more than compared to the other ones. It looks like it's connected and none of the other ones really are. Y12, x3-4 Y12, x6; upper loop

(2) On the M or whatever it is this one is like just one loop, like it looks similar to this one but it's not really a loop though compared to the other ones it's like two or three, then a straight line Y11,x13; not the same compared to knowns, lower loop

(3) The B, it looks the same on this known signature, but compared to the rest of them it doesn't really look similar so it's either disguised or simulated one of the two. Y13-14, x10

Conclusions

Of the 49 FDE participants, 46 responded correctly that the signature was non-genuine, and 2 responded that the signature was genuine. One FDE declined to respond. Of the 43 Lay participants, 34 responded correctly that the signature was non-genuine, and 9 responded that the signature was genuine. This difference was statistically significant, χ^2 (2, N = 92) = 6.89, p = .032.

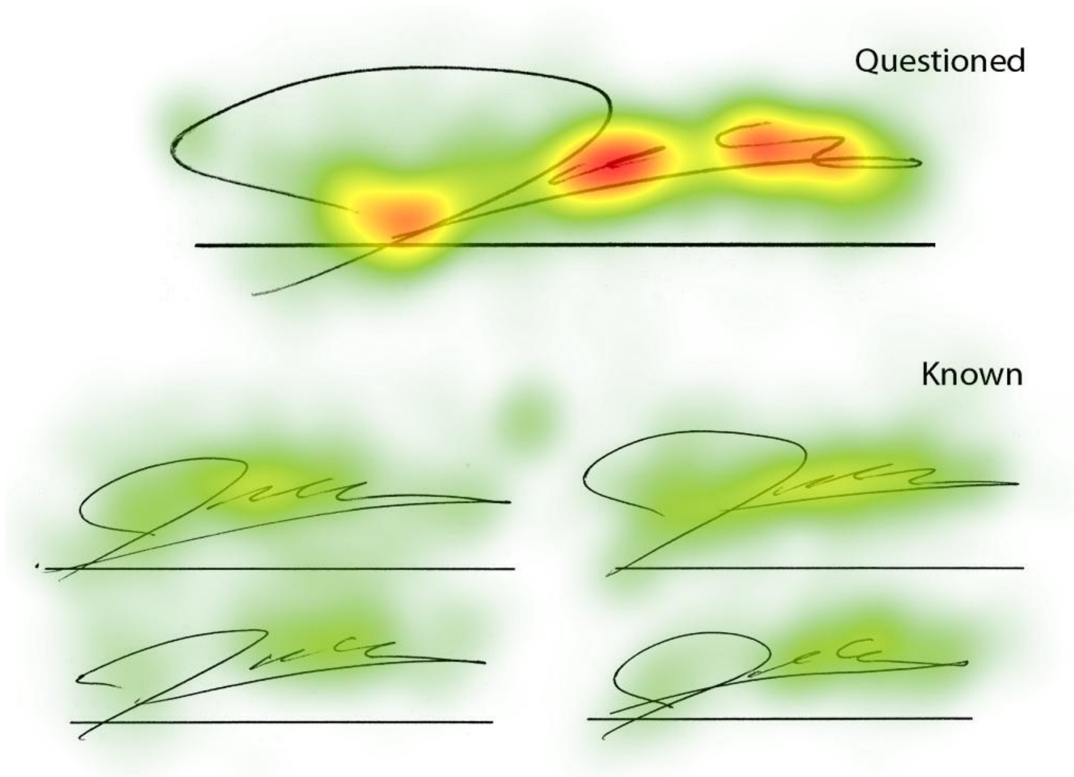
This again suggests that the Lay participants were more focused on the very obvious feature or letter form differences between the questioned signature and the known signatures, but that they paid less attention to the spatial and proportional attributes of the signatures, which provide more subtle evidence of simulation.

SIGNATURE 4: Jim LaBarbera Signature 1 (Genuine)

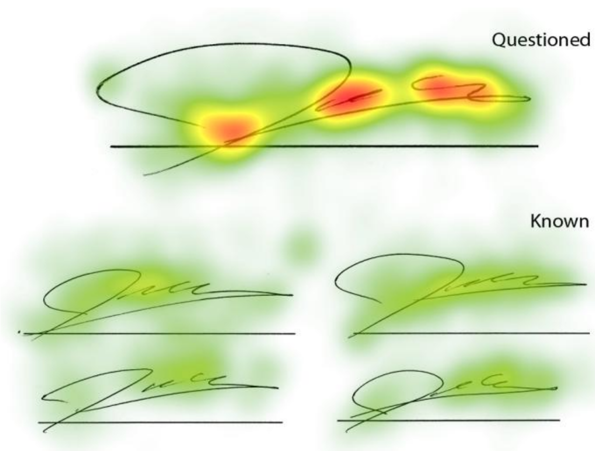
This signature is classified as a low complexity, stylized signature. Figure LaBarbera 3.6.1 presents the heat maps for all participants together, all FDEs separately, and all Lay participants separately. The areas of interest (AOIs) used for the eye-tracking analyses were based on the All Participants gaze plots.

Figure LaBarbera 3.6.1

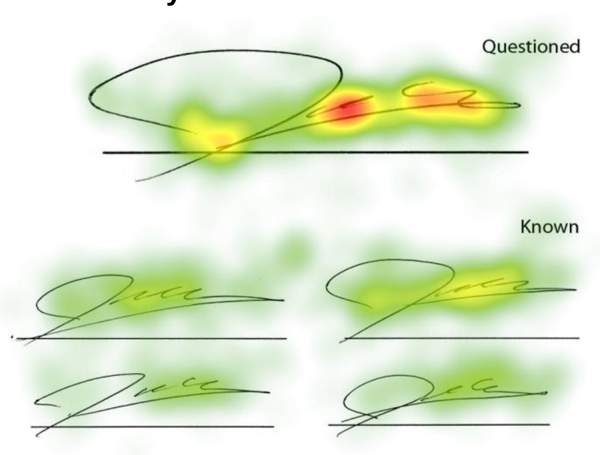
All Participants



All FDE



All Lay



Visual comparison of the two heat maps in which the FDE and Lay participant gaze data are separated reveals that there are some noticeable differences in the gaze behavior for the two groups. This is particularly noticeable for the extended area of the red hot spots and larger orange warm spots covering the J at the baseline, and the more extended and intense areas on the other structures. Examination of the knowns demonstrates that the Lay participants spent somewhat more time examining the upper left known than did the FDEs. Below are examples of how the FDEs and Lay participants discussed the signature features during their interviews. Figure LaBarbera 3.6.2 presents examples of some of the coding categories, and examples of comments that fell into those categories.

Figure LaBarbera 3.6.2

The FDEs Said:

265 - Terminal Stroke: *"There was definitely some line width variations, tapered beginning and ending strokes."*

235 - Initial Stroke: *"The width of the top loop of the 'J', the spacing between the starting point and the terminal down stroke, the top right to lower left for the terminal of the 'J'."*

253 - Shape: *"We see something similar to that in the knowns that are in the lower portion is difficult to tell what those exact movements are there."*

207 - Baseline Alignment: *"The location of the, the writing above the ruled baseline is good."*

The Lay Participants Said:

265 - Terminal Stroke: *"The terminal stroke of the first character was inconsistent in shape in comparison to the knowns."*

235 - Initial Stroke: *"The way he makes the first letter of his name, the way he comes around with the rest of it, it's still consistent, how it comes down, and it has the same kind of hardness."*

253 - Shape: *"Also there's a turn here in the n where she comes down she actually looped it and most of her actually signatures there's only one where she looped it like it's really cut short and this one is a definite loop."*

207 - Baseline Alignment: *"In the questioned signature and in the known there's a lot of space between line and signature."*

The most frequently mentioned feature among FDEs was the terminal stroke of the first letter of the questioned signature, compared to the known signatures. Table LaBarbera 3.6.1 presents the 15 most frequently mentioned signature features in order of their frequency.

Table LaBarbera 3.6.1

Frequency of Feature Mention for LaBarbera Signature 3

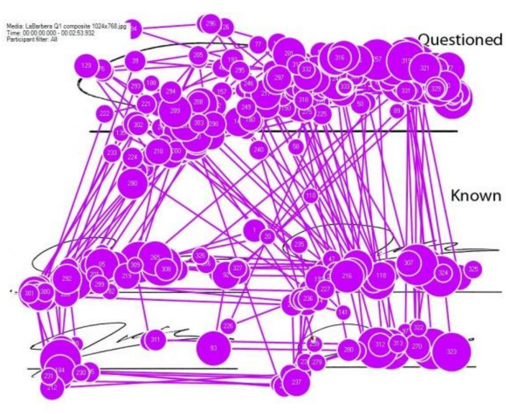
Features	n	% Mentions	Features	n	% Mentions
Terminal/end stroke	25	51%	Speed	12	24%
Initial/beginning stroke	20	41%	Upper loop	11	22%
Shape	17	35%	Spacing	8	16%
Pen lift	15	31%	Signature type	6	12%
Baseline alignment/ placement/orientation	15	31%	Variation	6	12%
Stroke	15	31%	Height	4	8%
Line quality	14	29%	Body	4	8%
Execution	13	27%			

The comments below are the actual transcripts of the qualitative interviews for an FDE and a Lay participant (the X/Y coordinates correspond to the area on a printed copy of the signature grid sheet with X/Y coordinates, which coders used to locate the part of the signature under discussion during the audio recording). Participants were asked to refer to their gaze plot and heat map, and then describe to the interviewer how they evaluated that aspect of the signature. The comments have been separated and numbered according to the features the participants identified.

Figure LaBarbera 3.6.3 presents the gaze plot and heat map for an FDE for LaBarbera Signature 2. Recall that each dot on the gaze plot represents a fixation. Larger dots represent longer fixation durations. The lines between the dots represent saccades (eye movements between fixations).

Figure LaBarbera 3.6.3

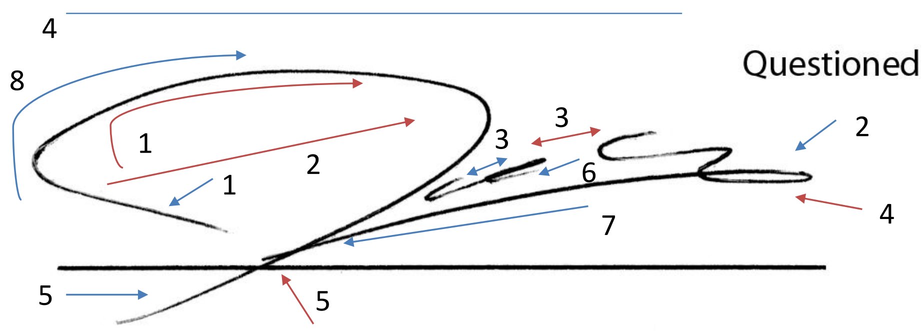
FDE 1 Gaze Plot

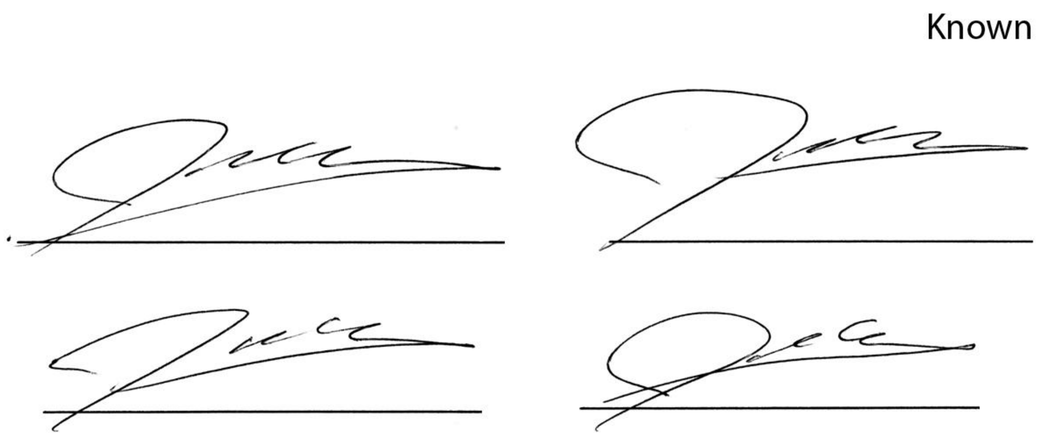


FDE 1 Heat Map

Figure LaBarbera 3.6.4 presents the LaBarbera 1 signature with numbered arrows indicating the feature(s) that correspond to each of the comments. The blue arrows correspond to the FDE comments, and the red arrows correspond to the Lay participant comments.

Figure LaBarbera 3.6.4





FDE 1:

(1) This one I have a lot of plotting going on. This is a signature with not a lot of letter detail, it's very stylized. With all the plots, I'm attempting to assess the line quality of movement. It appears rapid, the initial circle of the beginning part of the signature.

(2) Abbreviated movements with in y13-14/x13-14 there's the ending part of the abbreviated signature the area of y15/x16-18 appears more slowly prepared, it's more of a larger loop created in that area compared to the Known signatures. I'm thinking this may be because of the larger questioned signature than knowns, the beginning of the signature appears large, but that's trying to assess the sizing of the whole signature and its proportions.

(3) It's a very abbreviated sig and I'm not sure whether there's a slow pause at y15 at the beginning of the loop to turn around and come back, I'm not sure, it's difficult to assess. Wish I had more known signatures.

(4) But it's just trying to assess the line quality in the written signatures is very simple but complex, I have questions about the line quality that concern me.

(5) Baseline at y12 the first part of the letter extended to the baseline farther than the known signatures x5-7, a longer descending stroke through the baseline. So I'm concentrating on the baseline y12-13/x6-7, the initial at y15-14/x11-14 significant concentration in that area, looking at line quality, initial marking, movement of the writing instrument,

(6) and then proceeding there's a pen lift at y15/x14-15 there's a pickup of the pen

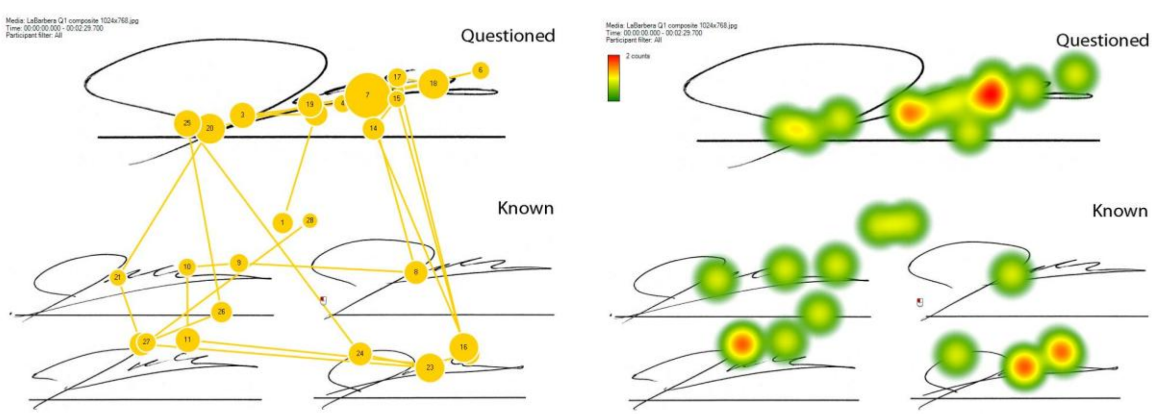
(7) and then proceeding to the finish of the signature. Significant heat gaze as I assess the line quality of the finishing of the signature,

(8) the line quality of that large loop compared to the known signatures, appears to be more slowly prepared than the known signatures, but more known signatures would be helpful.

Figure LaBarbera 3.6.5 presents the gaze plot and heat map for a Lay participant for LaBarbera Signature 2. Recall that each dot on the gaze plot represents a fixation. Larger dots represent longer fixation durations. The lines between the dots represent saccades (eye movements between fixations).

Figure LaBarbera 3.6.5

Lay Participant 1 Gaze Plot **Lay Participant 1 Heat Map**



Lay Participant 1:

(1) The J looked fairly consistent. It had some kind of loop to an L. They all looked consistent.

(2) Y14 Y17 X3-13 loop was consistent throughout all knowns. Y14-15 X10-17 was consistent.

(3) Y15-Y16 X13-15 the break in the stroke was consistent. Bottom right known stood out. Spacing was only consistent in one of the knowns.

(4) At the end stroke the loop in the very back of the signature compared to the known Y15 X17-19 that area was consistent through all of the knowns.

(5) Y13 X7 end stroke comes back to the first letter. Looking for consistency with the end stroke looked as if there were a lot of slinging the pen. Pretty genuine signature.

Conclusions

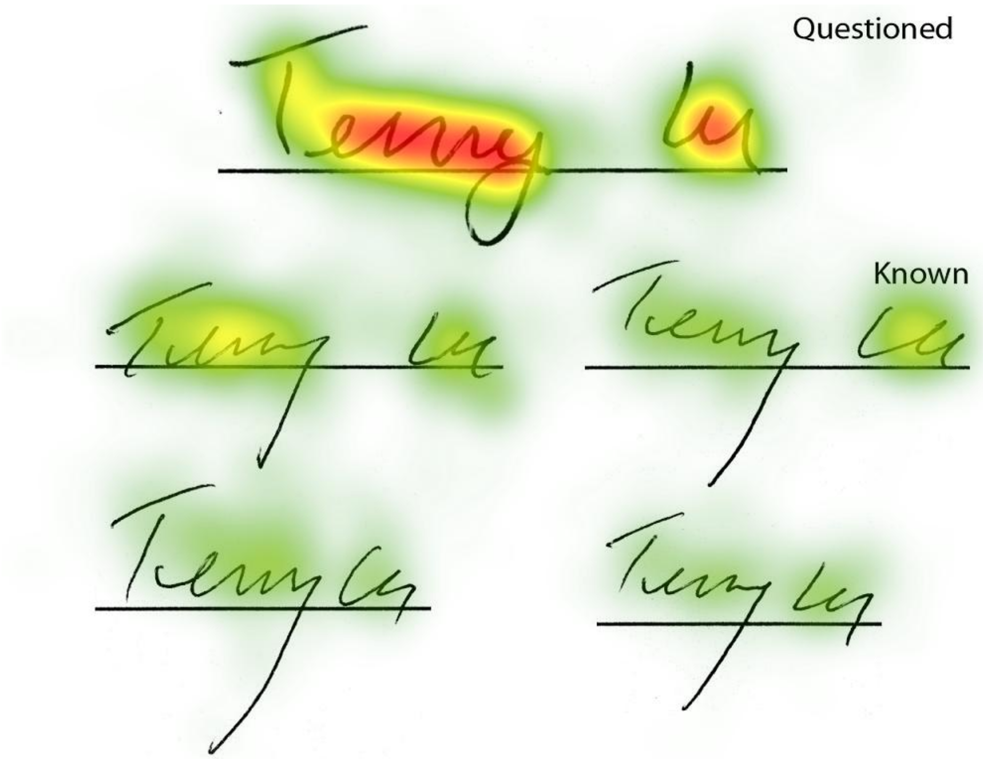
Of the 49 FDE participants, 40 responded correctly that the signature was genuine, with one refusal and 8 incorrect calls. Of the 43 Lay participants, 42 responded correctly that the signature was genuine, and one responded incorrectly that the signature was non-genuine. This difference was statistically significant, χ^2 (2, N = 92) = 6.13, p = .047. The overall heat maps demonstrate that FDEs and Lay participants were attending to a great extent to the same areas of the signatures, but that they were evaluating different characteristics of the signatures. While these data again suggests that the Lay participants were more focused on the very obvious differences between the point by point features of questioned signature and the known signatures, FDEs were attending to the more subtle characteristics of line quality and the speed and fluidity of execution.

SIGNATURE 5: Terry Lu Signature 1 (Simulated)

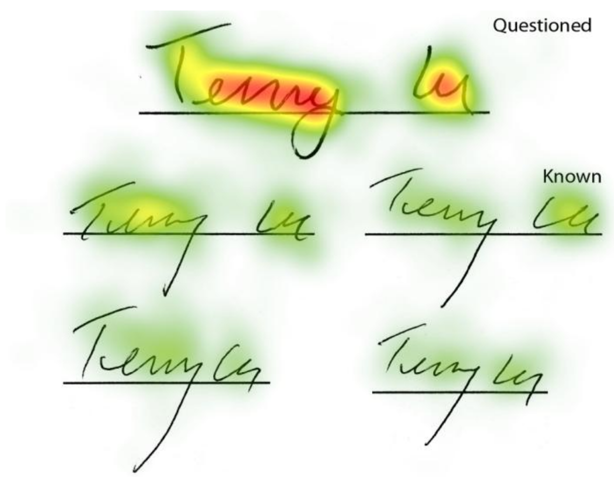
This signature is classified as a low complexity, text-based signature. Figure Lu 3.6.1 presents the heat maps for all participants together, all FDEs separately, and all Lay participants separately. The areas of interest (AOIs) used for the eye-tracking analyses were based on the All Participants gaze plots.

Figure Lu 3.6.1

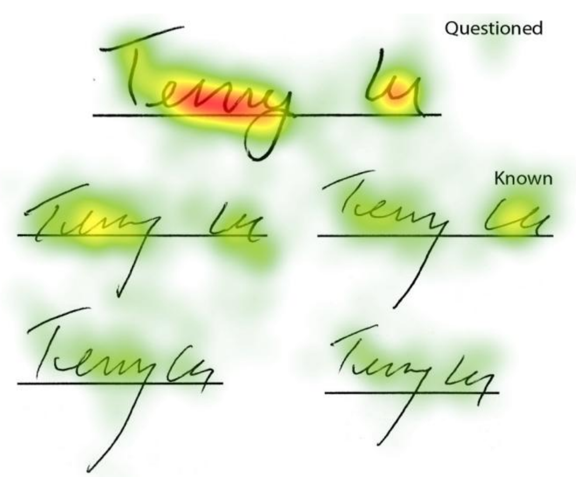
All Participants



All FDE



All Lay



Visual comparison of the two heat maps in which the FDE and Lay participant gaze data are separated reveals that there is very little difference in the gaze behavior for the two groups. This may be due to the low complexity of the signature, which does not provide much basis for comparison. Of the 49 FDE participants, 48 responded correctly that the signature was non-genuine, and 1 responded that it was genuine. Below are examples of how the FDEs and Lay participants discussed the signature features during their interviews. Figure Lu 3.6.2 presents examples of some of the coding categories, and examples of comments that fell into those categories.

Figure Lu 3.6.2

The FDEs Said:

238 - Lower Loop: *"Then the simulator got to the letter Y and kinda forgot what the mission was. And the traditional Y with the lower, it didn't take a lot of study on that one."*

235 - Initial Stroke: *"The beginning stroke or the crossbar of the 'T'. There is little bit of tapering there."*

262 - Staff: *"The staff of the 'T' was more vertical than the 'Ts' of the known writings."*

237 - Line quality: *"The line quality, again just showed slowness."*

The Lay Participants Said:

238 - Lower Loop: *"There is not enough of a loop in this area in comparison to the knowns which would make it inconsistent."*

235 - Initial Stroke: *"I noticed that just like his known signatures he always does the e more in the middle instead of towards the beginning that I guess falls back in a loop. It has a pen stroke on the front of the 'E'."*

262 - Staff: *"What started throwing me off that his 'Ts' are all on his known are angled up right to left and the questioned signature is straight with a bend in the middle."*

237 - Line quality: *"In reference to the whole signature, the line quality was inconsistent in sharpness in comparison to the knowns."*

The most frequently mentioned feature among FDEs was the lower loop of the y of the questioned signature, compared to the known signatures. Table Lu 3.6.1 presents the 15 most frequently mentioned signature features in order of their frequency.

Table Lu 3.6.1
Frequency of Feature Mention for Lu Signature 1

Features	n	% Mentions	Features	n	% Mentions
Lower loop	20	41%	Crossbar	10	20%

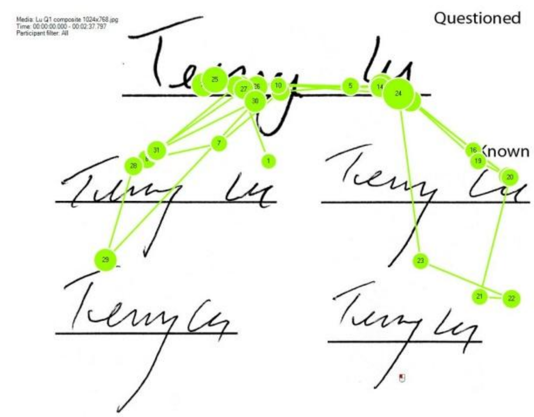
Initial/beginning stroke	17	35%	Shape	9	18%
Staff/stem	15	31%	Speed	9	18%
Line quality	13	27%	Accidental/extraneous stroke	7	14%
Pressure	13	27%	Descender	6	12%
Terminal/end stroke	13	27%	Stroke	6	12%
Baseline alignment/ placement/orientation	11	22%	Slope/Slant/angularity	6	12%
Trough	10	20%			

The comments below are the actual transcripts of the qualitative interviews for an FDE and a Lay participant (the X/Y coordinates correspond to the area on a printed copy of the signature grid sheet with X/Y coordinates, which coders used to locate the part of the signature under discussion during the audio recording). Participants were asked to refer to their gaze plot and heat map, and then describe to the interviewer how they evaluated that aspect of the signature. The comments have been separated and numbered according to the features the participants identified.

Figure Lu 3.6.3 presents the gaze plot and heat map for an FDE for Lu Signature 3. Recall that each dot on the gaze plot represents a fixation. Larger dots represent longer fixation durations. The lines between the dots represent saccades (eye movements between fixations).

Figure Lu 3.6.3

FDE 2 Gaze Plot



FDE 2 Heat Map

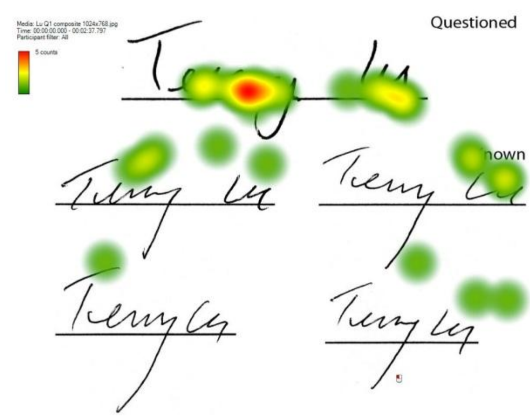
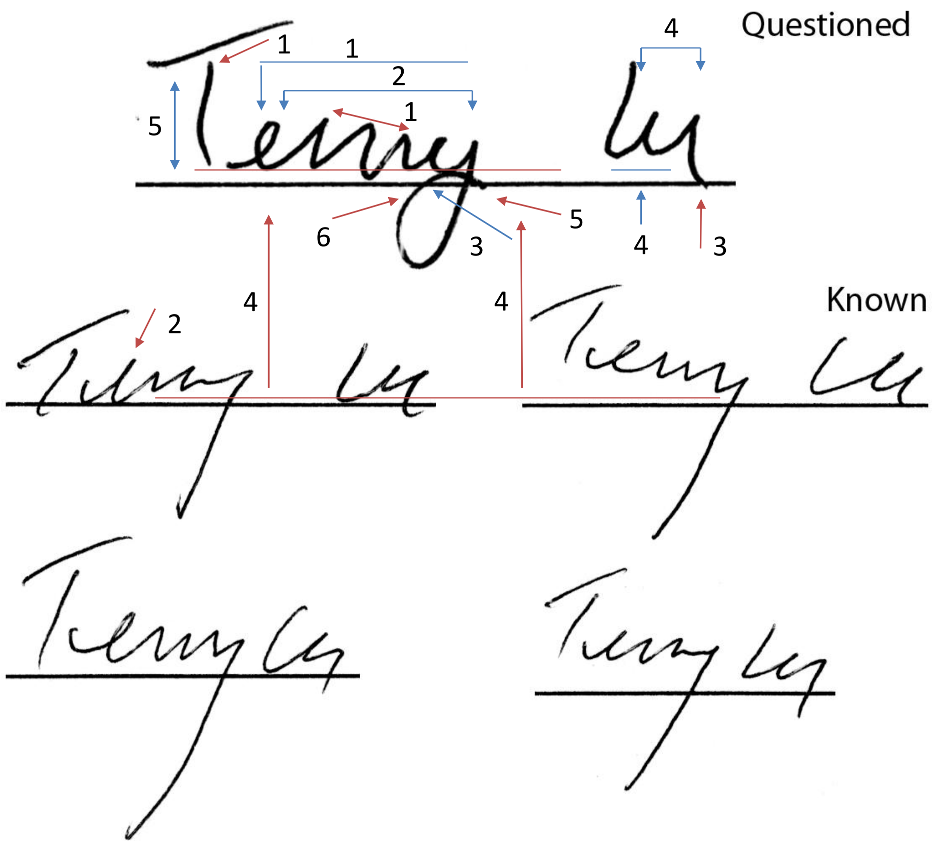


Figure Lu 3.6.4 presents the Lu 1 signature with numbered arrows indicating the feature(s) that correspond to each of the comments. The blue arrows correspond to the FDE comments, and the red arrows correspond to the Lay participant comments.

Figure Lu 3.6.4



FDE 2:

(1) I didn't know what was up with this one, either. This was one of those ones, I wasn't certain if it was simulation or disguised, only because it seemed like the questioned signature was almost more legible than the Known signatures, and I know writers sometimes do that as a form of disguise. Their genuine signatures are more stylized and then they try to make the questioned signature more legible, which was what I saw here especially with regard to the E.

(2) I felt that the E and the RR and even the nicely formed Y I felt was almost too legible when it came for comparison to the known signatures. So I spent a great deal of time on that, the ERRY of the first name.

(3) In the questioned signature it's a fully enclosed loop of the Y and the known signatures didn't do that, so that was a bit concerning Y13-14/X10-12. So this one was a bit more recent to me.

(4) I didn't know if the last name was Lu or Wu, wasn't sure what that first letter was so it was kind of difficult because you didn't know what that letter was representing. I looked at the baseline of that, it appeared to be raised quite a bit above the baseline and the known writer does do that sometimes, but

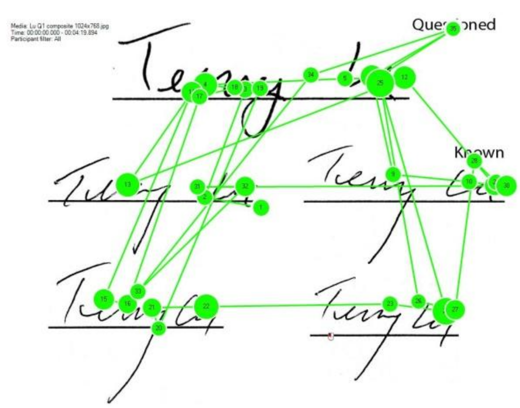
seemed not as high. So sometimes he writes on the baseline, sometimes above the baseline, so I don't know that that was all that helpful,

(5) and then I was concerned that the initial stroke of the L was more curved than the known signatures, this was more of a curvy line, more straight to concave. But again, I wasn't sure if it was a simulation or a disguised.

Figure Lu 3.6.5 presents the gaze plot and heat map for a Lay participant for Lu Signature 1. Recall that each dot on the gaze plot represents a fixation. Larger dots represent longer fixation durations. The lines between the dots represent saccades (eye movements between fixations).

Figure Lu 3.6.5

Lay Participant 2 Gaze Plot



Lay Participant 2 Heat Map

Lay Participant 2:

(1) I noticed the space between the staff and the crossbar of the "T" at Y7, X6 is consistent with the knowns. I also noticed that the humps in the "R" at Y15, Y16; X10 which were consistent with the variations in the knowns.

(2) I noticed more consistency with the "R" in the first known in comparison to the questioned signature.

(3) I then noticed the terminal stroke at Y14, X17

(4) and the orientation to baseline which is similar to the knowns.

(5) The terminal stroke in the questioned signature goes a little bit below the baseline which is consistent with the knowns.

(6) I also looked at Y15 under the "L" the orientation to baseline was within the range of variation in the knowns.

Conclusions

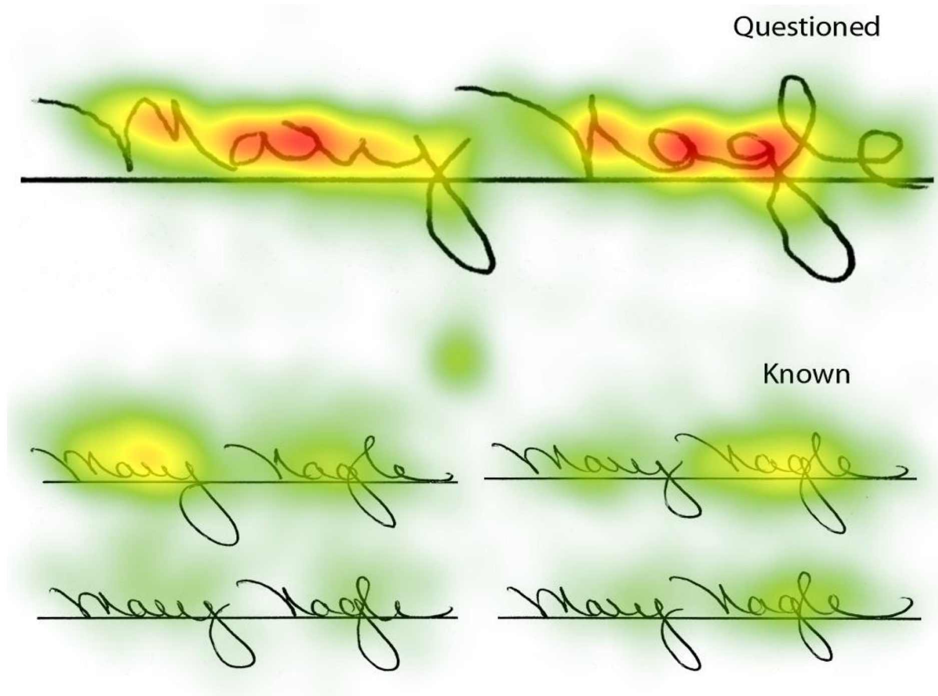
Of the 49 FDE participants, 48 responded correctly that the signature was non-genuine, and 1 responded that it was genuine. Of the 43 Lay participants, 38 responded correctly that the signature was non-genuine, and 5 responded that the signature was genuine. This difference was not statistically significant, $p = .063$, *ns*. Although there was very little difference in the gaze behavior for the two groups, the comments of the FDEs and the Lay participants reveal that in addition to the obvious similarities and differences of the letter forms, FDEs were attending to a greater extent to features such as line quality, speed and fluidity of execution, and the qualities of the beginning and ending strokes of the forms. As stated previously, the similarity of the gaze behavior may be due to the low complexity of the signature, which does not provide much basis for comparison, but the qualitative data suggest that compared to Lay participants, FDEs attended to and evaluated a greater variety of diagnostic characteristics.

<u>SIGNATURE 6: Mary Nagle Signature 2 (Simulated)</u>

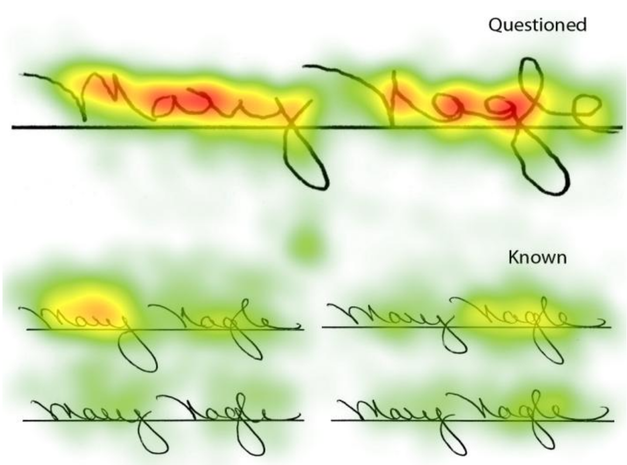
This signature is classified as a high complexity, text-based signature. Figure Nagle 3.6.1 presents the heat maps for all participants together, all FDEs separately, and all Lay participants separately. The areas of interest (AOIs) used for the eye-tracking analyses were based on the All Participants gaze plots.

Figure Nagle 3.6.1

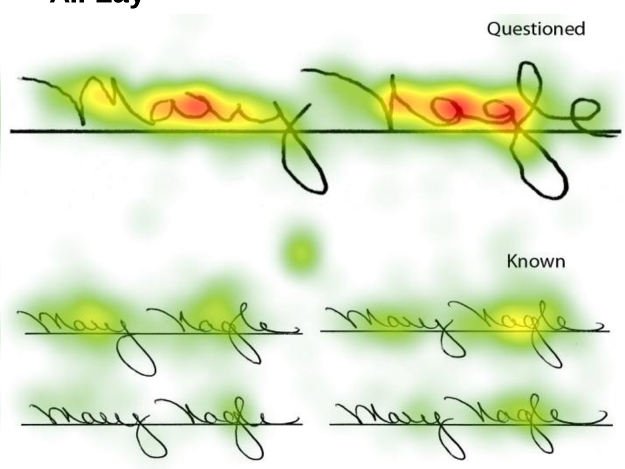
All Participants



All FDE



All Lay



Visual comparison of the two heat maps in which the FDE and Lay participant gaze data are separated reveals that there are clear differences in the gaze behavior for the two groups. This is particularly noticeable for the extended area of red hot spots and larger orange warm spots covering the first and last name, and the more extended and intense areas on both names in the questioned, and the first name of the upper left known signature. Below are examples of how the FDEs and Lay participants discussed the signature features during their interviews. Figure Nagle 3.6.2 presents examples of some of the coding categories, and examples of comments that fell into those categories.

Figure Nagle 3.6.2

The FDEs Said:

237 - Line quality: *"Although it's pictorially very similar to the known signatures, the line quality has hesitation throughout."*

235 - Initial / Beginning Stroke: *"The beginning part of the Mary is very shaky."*

265 - Terminal Stroke: *"The ending of the signature was very blunt, so the whole signature to me looked bad and I knew it was some kind of simulation, possibly by tracing."*

253 - Shape: *"The double loop 'G', that way my big hotspot, uh 'G' in Nagel in the questioned signature was slowly drawn."*

The Lay Participants Said:

237 - Line quality: *"The whole thing, see how it's all shaky more tremors and it's inconsistent throughout."*

235 - Initial / Beginning Stroke: *"But from the front I noticed how in signatures beforehand this would almost look like an 'N' or an' H'."*

265 - Terminal Stroke: *"Terminal stroke on questioned signature 'Y' is too straight."*

253 - Shape: *"The 'E' was inconsistent in comparison to the knowns because of the curve there."*

The most frequently mentioned feature among FDEs was the line quality of the questioned signature, compared to the known signatures. Table Nagle 3.6.1 presents the 15 most frequently mentioned signature features in order of their frequency.

Table Nagle 3.6.1

Frequency of Feature Mention for Nagle Signature 2

Features	n	% Mentions	Features	n	% Mentions
Line quality	40	82%	Pressure	7	14%
Initial/beginning stroke	18	37%	Pictorial similarity	7	14%

Terminal/end stroke	16	33%	Speed	7	14%
Shape	10	20%	Lower loop	7	14%
Tremor	9	18%	Connecting stroke	7	14%
Execution	9	18%	Pen lift	5	10%
Stroke	9	18%	Spacing	5	10%
Slope/Slant/angularity	8	16%			

The comments below are the actual transcripts of the qualitative interviews for an FDE and a Lay participant (the X/Y coordinates correspond to the area on a printed copy of the signature grid sheet with X/Y coordinates, which coders used to locate the part of the signature under discussion during the audio recording). Participants were asked to refer to their gaze plot and heat map, and then describe to the interviewer how they evaluated that aspect of the signature. The comments have been separated and numbered according to the features the participants identified.

Figure Nagel 3.6.3 presents the gaze plot and heat map for an FDE for Nagle Signature 2. Recall that each dot on the gaze plot represents a fixation. Larger dots represent longer fixation durations. The lines between the dots represent saccades (eye movements between fixations).

Figure Nagle 3.6.3

FDE 3 Gaze Plot **FDE 3 Heat Map**

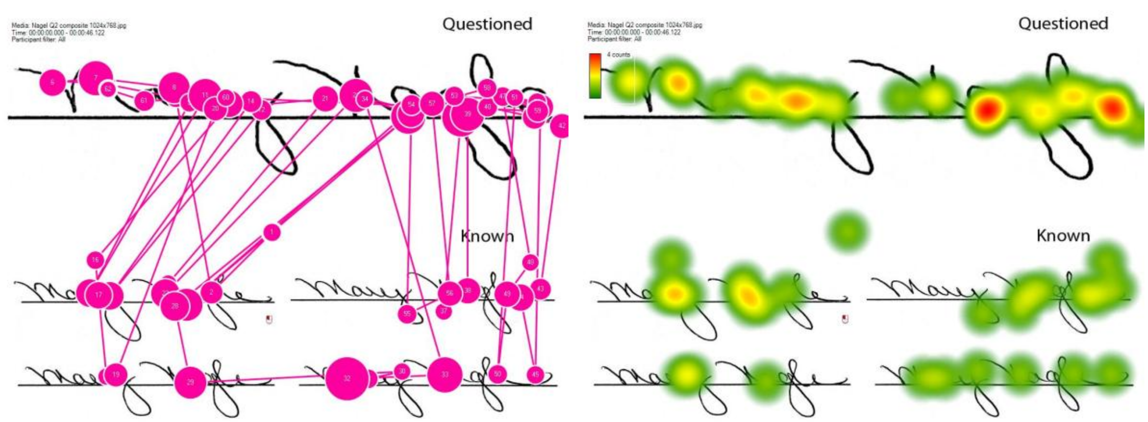
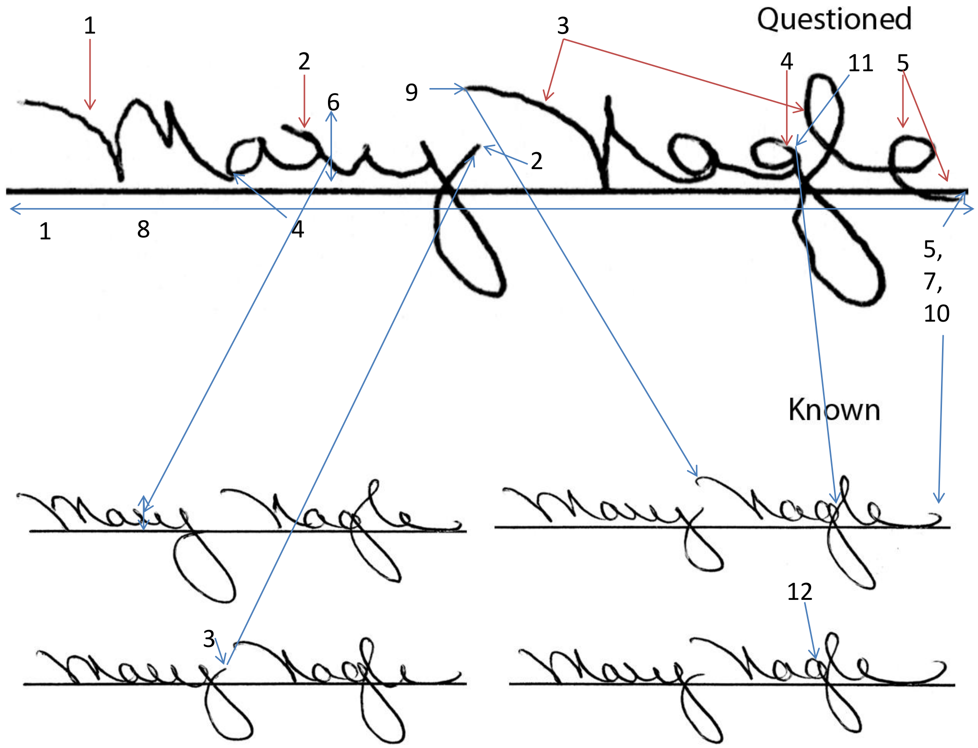


Figure Nagle 3.6.4 presents the Nagle 2 signature with numbered arrows indicating the feature(s) that correspond to each of the comments. The blue arrows correspond to the FDE comments, and the red arrows correspond to the Lay participant comments.

Figure Nagle 3.6.4



FDE 3:

(1) First thing I noted was the tremor that was in the questioned signature. That I just drew a circle around because you can see the hesitation and things like that.

(2) I also noted that it was pretty even pen pressure throughout, there wasn't a lot of tapering of the ends of the intro strokes or the ending strokes, so that kind of set me off right there.

(3) I think the next thing I looked at really was I went down and looked at the Known signatures, and if I would have had my microscope this would have been a little bit clearer, but I did finally find right here in the lower left K there was an ending stroke for the M telling me that she does do a pen lift.

(4) I don't know if the rest of these were lost and there's a pen lift, or if there's actually a connecting stroke, but this one actually looked like there was a pen lift there, too. But I just couldn't quite figure out if this was a continual stroke into the A and then out of the A (circled in pencil).

(5) If I would have had my microscope that would have made me a little bit more comfortable because the person that I think was trying to simulate the signature or—I don't think I came up with a tracing, and I can't really tell, but I'm thinking that's why there's so much time spent on this E—I don't think I called it a tracing because the E is angled the wrong way. The E is angled out, the last E on Nagle, where if somebody would have traced the E, the E in the Known signatures in Nagle is slanted up.

(6) Some of the detail that can be lost when people trace things is like I would expect them to not be able to tell if this was a connecting stroke or ending stroke, so that I kind of expect, some of the things you also lose is how far a line goes, so maybe the height of the R in the known signatures vs. this one in the questioned signature extending so much. That might be something I might expect to see in a tracing y15/x7. So these are things I would expect to see from a tracing.

(7) The one thing that made me hold off of the tracing idea completely was the ending E on Nagle. It angled out to the right, where all of the Es in the K angled back toward the L or slanted back.

(8) I don't really expect to see something like that with a tracing, so that's why I went with this one, because of the tremor, the line quality, the height proportions were there,

(9) the little tick was missing on the intro stroke of the N that was present on some of the known signatures. That would be another thing I would expect that might get lost if somebody was tracing. I just couldn't get to a tracing because of this E. I don't think somebody would have missed that, and if it was case work I'm a little hinkier. One thing that bothered me yesterday quite a bit was these kind of signatures—if somebody was doing an autoforgery, would this be something somebody might try to do. So the disguise/simulation thing was kind of a struggle for me yesterday, because I'm like okay, if somebody slowed down, they changed it so that there was tremor added, and then maybe just changed the slant of this E. Is this something they want to do for disguise vs. somebody simulating something and got careless at the end and didn't notice that this E should go the other way.

(10) So the disguise/simulation thing yesterday I really struggled with quite a bit. So I didn't call this a tracing, and I did call it a simulation just because there were some things that were off that somebody if they were trying to disguise their signature probably wouldn't have thought of. Like the E, that might be something you think of,

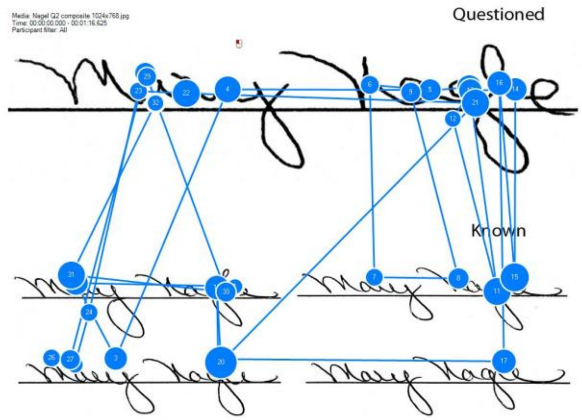
(11) but the spacing right here between the G y14/x19, not being tight like it is in the known signatures, there's no space—this is tight,

(12) there's a little retrace down in the K, the G and the extender that comes back across at the top—I think I called this a simulation and a freehand because of these things. This one caused me some issues yesterday, I didn't like the call I had to make on that one.

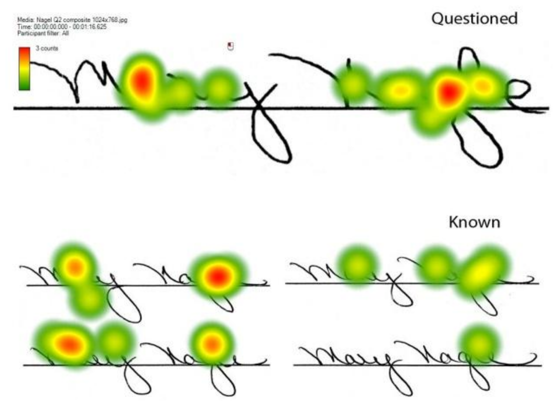
Figure Nagle 3.6.5 presents the gaze plot and heat map for a Lay participant for Nagle Signature 2. Recall that each dot on the gaze plot represents a fixation. Larger dots represent longer fixation durations. The lines between the dots represent saccades (eye movements between fixations).

Figure Nagle 3.6.5

Lay Participant 1 Gaze Plot



Lay Participant 1 Heat Map



Lay Participant 3:

(1) When they first started off the known signatures look really smooth and this one just look like it's forced like its ridged right there. Y16, x2

(2) On the r's these look almost natural like they just kind of made a loop that looks like they kind of looked at the signatures or something then correct what they were doing and went back down to fast. Y15, x7

(3) The N's look almost similar but the way they did their g is the same way as the first part of the signature it's really kind of forced instead of just flowy and the L as well. Y12, x19; Y16, x19

(4) Then the loop on the g on this one is the only one out of all five that doesn't really loop around on the g. Y15, x19

(5) And then the e. I guess I don't know what you may call that, the loop in the e is a lot bigger in that signature then these and that curve at the bottom it just looks different. Y13, x22

Conclusions

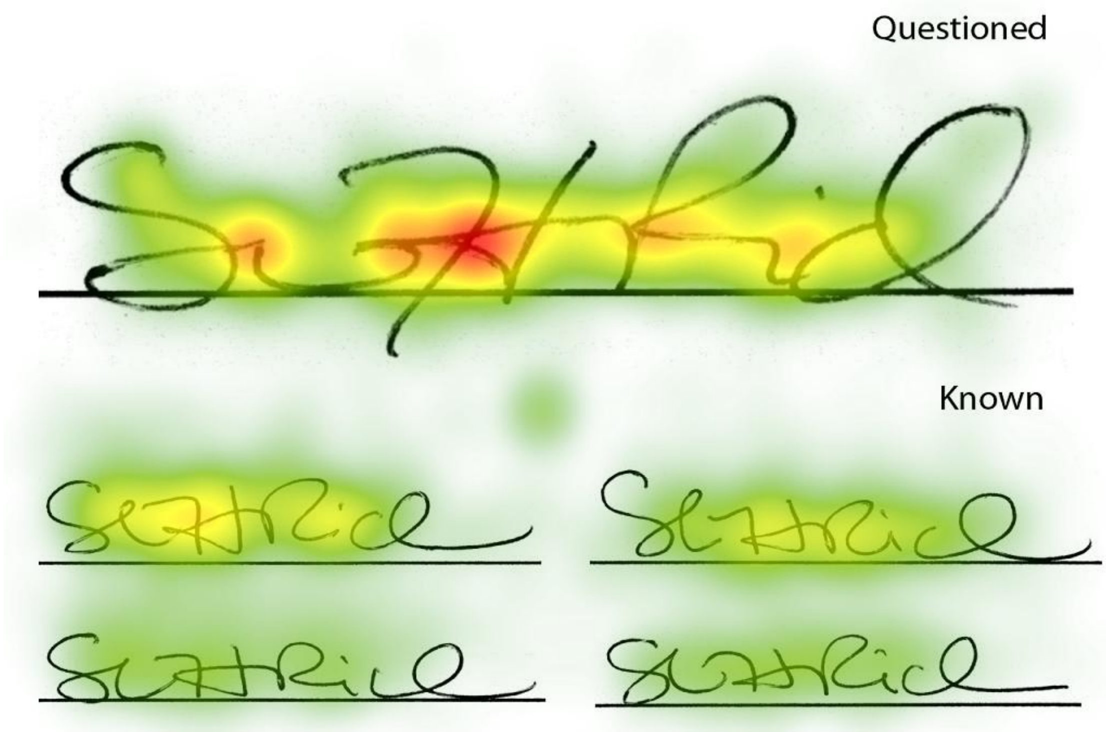
Of the 49 FDE participants, all 49 responded correctly that the signature was non-genuine. Of the 43 Lay participants, 40 responded correctly that the signature was non-genuine, and 3 responded that the signature was genuine. This difference was not statistically significant, $p = .060$, *ns*. This suggests that the Lay participants were again more focused on the very obvious feature by feature differences between the questioned signature and the known signatures, while FDEs attended to a wider variety of diagnostic features.

SIGNATURE 7: Shawn Richards Signature 1 (Simulated)

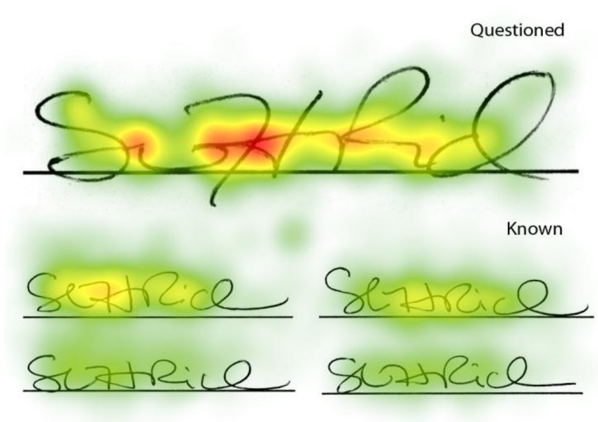
This signature is characterized as a low-complexity mixed-type signature. This difference was not statistically significant, *p* = .079, *n*s. Figure Richards 3.6.5 presents the gaze plot and heat map for a Lay participant for Richards Signature 1. Recall that each dot on the gaze plot represents a fixation. Larger dots represent longer fixation durations. The lines between the dots represent saccades (eye movements between fixations).

Figure Richards 3.6.1

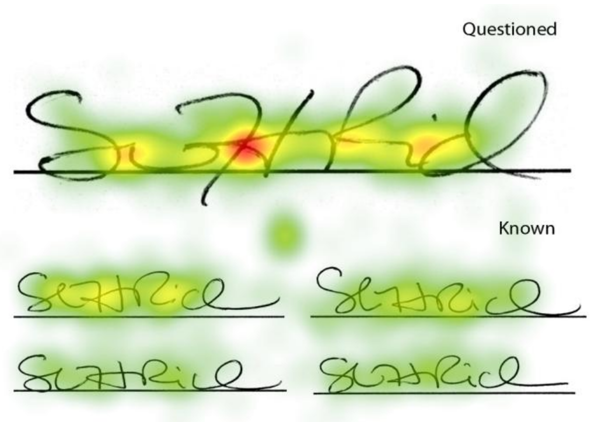
All Participants



All FDE



All Lay



Visual comparison of the two heat maps in which the FDE and Lay participant gaze data are separated reveals that there are clear differences in the gaze behavior for the two groups. This is particularly noticeable for the extended area of red hot spots and larger orange warm spots covering the first name, and the more extended and intense areas on the middle initial, last name, and the first name of the upper left known signature. Below are examples of how the FDEs and Lay participants discussed the signature features during their interviews. Figure Richards 3.6.2 presents examples of some of the coding categories, and examples of comments that fell into those categories.

Figure Richards 3.6.2

The FDEs Said:

216 - Connecting Stroke: *"The connector stroke from the, the bottom of the right vertical of the 'H', going back to the left and coming across, for the cross center of the 'H', was an overhand motion "*

241 - Pen Lift: *"This same structure, first of all there's a pen lift and a pen start, and it's very, very low in comparison to the intro stroke of the 'H'."*

263 - Stroke: *"The next letterform after the eyelet at the bottom of the 'S' appears to be a little less emphasis."*

237 - Line quality: *"Then again we had that same thing, it almost looks like, I don't know if it's line quality or if it was a hesitation or a pen stop or a pen stroke, a stop right here and a stop right here of the continuation of the 'R' into the 'I'."*

The Lay Participants Said:

216 - Connecting Stroke: *"Also it connects to the second name in none of his known signatures doesn't more than barely touch the second name"*

241 - Pen Lift: *"Then I looked at this 'R' in the questioned signature and compared it to the knowns. The 'R' in the questioned signature connects to the main line there; whereas down in the knowns it never connects, there is just a big space."*

263 - Stroke: *"I noticed the strokes were consistent in comparison to the knowns."*

237 - Line quality: *"I was comparing it down to the knowns. I also noticed this middle one caught my eyes because these are all straight, this line right here. All the knowns are very straight."*

The most frequently mentioned feature among FDEs was the connecting strokes of the questioned signature, compared to the known signatures. Table Richards 3.6.1 presents the 15 most frequently mentioned signature features in order of their frequency.

Table Richards 3.6.1

Frequency of Feature Mention for Richards Signature 1

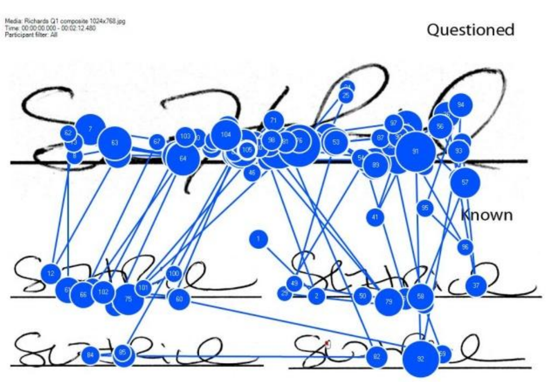
Features	n	% Mentions	Features	n	% Mentions
Connecting stroke	23	47%	Spacing	11	22%
Pen lift	21	43%	Staff/stem	11	22%
Stroke	20	41%	Execution	9	18%
Terminal/end stroke	18	37%	Buckle/knot	8	16%
Line quality	17	35%	Slope/Slant/angularity	7	14%
Shape	16	33%	Pictorial similarity	6	12%
Initial/beginning stroke	13	27%	Upper loop	0	0%
Baseline alignment/ placement/orientation	12	24%			

The comments below are the actual transcripts of the qualitative interviews for an FDE and a Lay participant (the X/Y coordinates correspond to the area on a printed copy of the signature grid sheet with X/Y coordinates, which coders used to locate the part of the signature under discussion during the audio recording). Participants were asked to refer to their gaze plot and heat map, and then describe to the interviewer how they evaluated that aspect of the signature. The comments have been separated and numbered according to the features the participants identified.

Figure Richards 3.6.3 presents the gaze plot and heat map for an FDE for Richards Signature 1. Recall that each dot on the gaze plot represents a fixation. Larger dots represent longer fixation durations. The lines between the dots represent saccades (eye movements between fixations).

Figure Richards 3.6.3

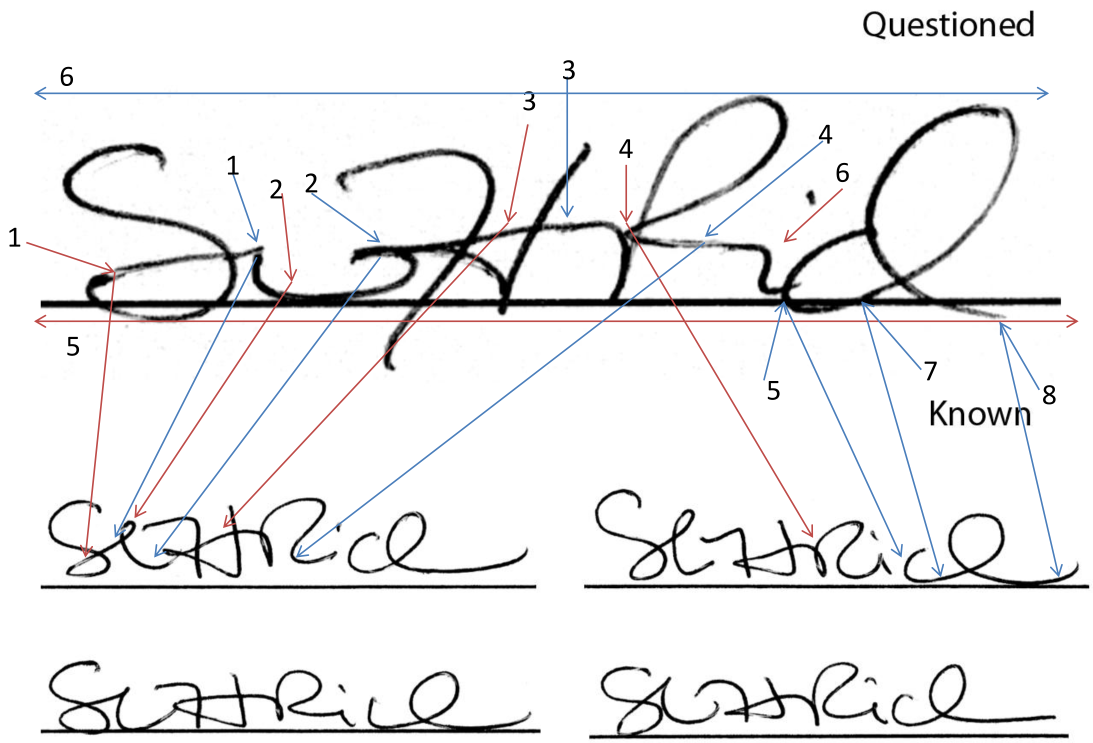
FDE 1 Gaze Plot



FDE 1 Heat Map

Figure Richards 3.6.4 presents the Richards 1 signature with numbered arrows indicating the feature(s) that correspond to each of the comments. The blue arrows correspond to the FDE comments, and the red arrows correspond to the Lay participant comments.

Figure Richards 3.6.4



FDE 1:

(1) Y12/x4-5 overall assessing line quality. Appears to be a hiatus or stop from s to whatever, but appears to be a stoppage in writing movement that is not in known signatures.

(2) The y12/x7-8 the looping feature of that movement is not in the known signatures, this is a short, more horizontal writing movement than in the known signatures. There's a difference in that formation. Line quality appears natural, but difference.

(3) Scripted letter capital H within the letter formation of the interior y12-13/x9-13 looking at that H the line movement compared to the knowns. There appears to be a hesitation between y13 and x11-12.

(4) Uppercase R in Richards, fixated on the shoulder of the uppercase letter R y13-12/x14-16 so I'm looking at line quality formation of the line movement and how it compares to known signatures. The shoulder in known signature is different in angularity and construction, the known signatures are more curved and flowing as it transitions from the upper to lower loop, questioned signature is more angular and square.

(5) Curvature of C y13-12,x17-18 in the questioned signature, it's more a shorter angular letter C compared to the knowns, known signatures is more rounded, questioned signature is more angular, not as rounded as the knowns,

(6) more of a forward slant in questioned signature compared to knowns.

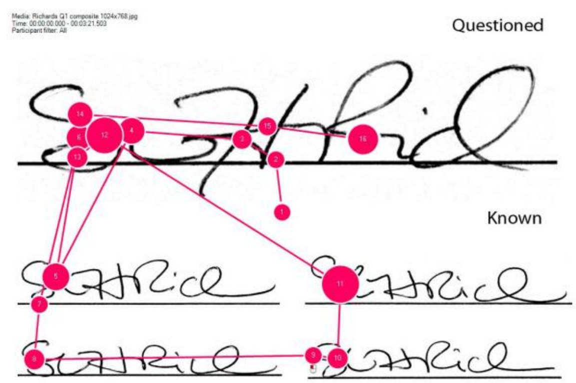
(7) The top of the C butts up with the loop of finishing portion of the L, not apparent in the knowns, so there's the spatial arrangement between the C and the ending loop of the signature in the questioned signature y13/x18 where the top portion of the C formation touches the loop of the finish of questioned signature, where the C in the Known signatures doesn't butt up against that loop, so difference in spatial arrangement.

(8) Terminal ending loop of questioned signature in Richards ends downward below baseline, known signatures are above baseline in upward direction y11/x20.

Figure Richards 3.6.5 presents the gaze plot and heat map for a Lay participant for Richards Signature 1. Recall that each dot on the gaze plot represents a fixation. Larger dots represent longer fixation durations. The lines between the dots represent saccades (eye movements between fixations).

Figure Richards 3.6.5

Lay Participant 1 Gaze Plot



Lay Participant 1 Heat Map

Lay Participant 1:

(1) I just tried to focus on some of the loops in the signature the first one would be the S that stands out to me Y11-12 X1-4 we actually call that loop a bowl. I thought the bowl in the questioned looks a little inconsistent to the rest of the known signatures. Pretty inconsistent throughout the knowns. Y12 X5-6.

(2) Coming of the bowl the stroke it kind of loops in some of the known signatures. It's more consistent with the bottom two signatures.

(3) I looked at the H a little bit just looking at where it crossed to see if it was consistent. Crossbar at Y13 X9-11 noticed it was inconsistent. The way it was shaped and comes back around Y11-15 X10. The questioned signature makes a triangle compared to some of the known signatures.

(4) Looking at the shape Y12-13 X10 inconsistent throughout the knowns. The R kind of contacts and is very inconsistent in the knowns to the unknowns Y13 x13 inconsistent because there was no connection.

(5) I thought the rest of the signature was fairly consistent.

(6) Y12 X16 inconsistent because it doesn't actually make an I. This was a simulated signature due to the inconsistencies.

Conclusions

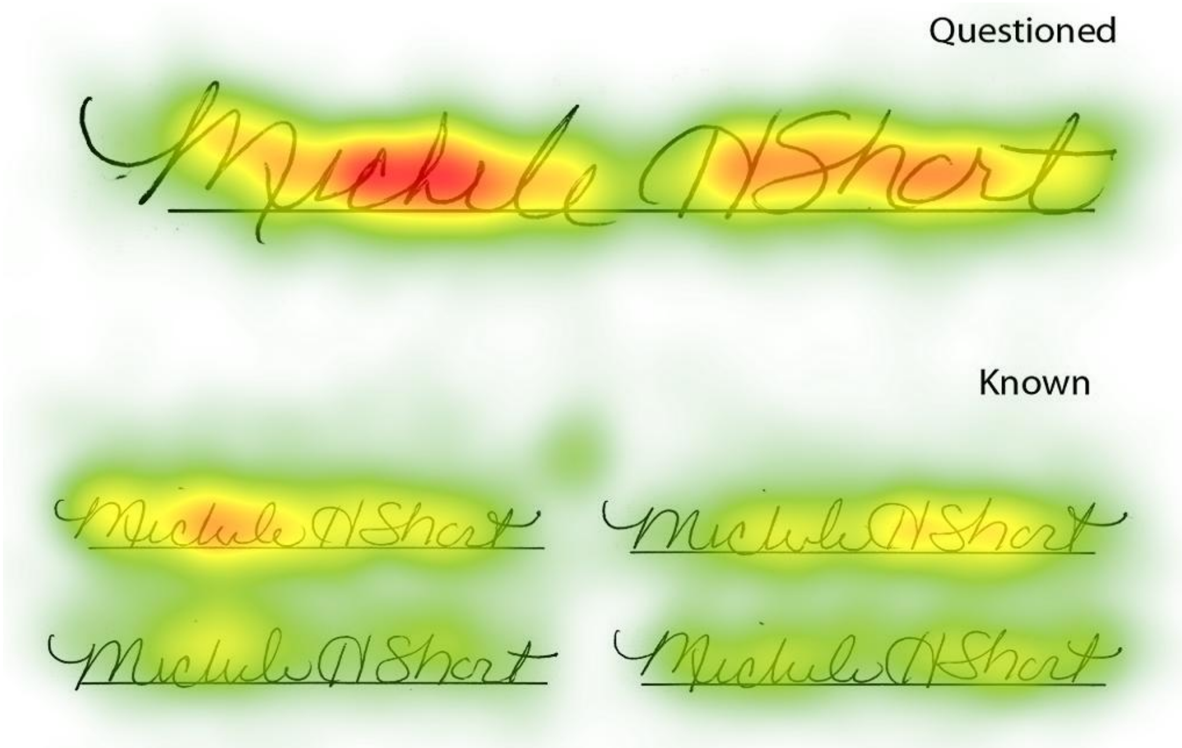
Of the 49 FDE participants, 45 responded correctly that the signature was non-genuine, while 4 responded that the signature was genuine. Of the 43 Lay participants, 34 responded correctly that the signature was non-genuine, while 9 responded that the signature was genuine. This suggests again that the Lay participants were more focused on the very obvious differences between the questioned signature and the known signatures, but that they paid less attention to the subtle attributes of the signatures. Conversely, FDEs appear to have attended to the signature features in a more deliberate and holistic way, finding more diagnostic information present than did Lay participants.

<u>SIGNATURE 8: Michele Short Signature 1 (Simulation)</u>

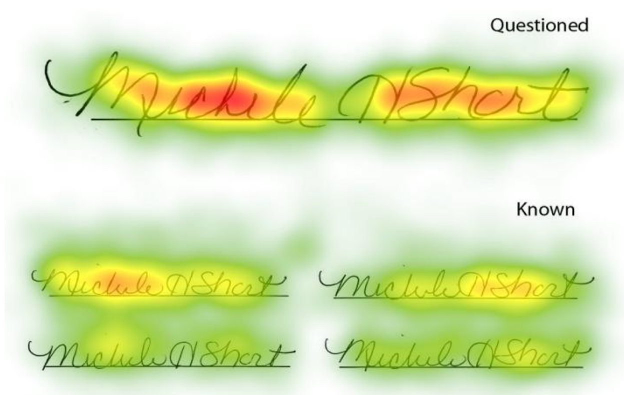
This signature is classified as a high complexity, text-based signature. Figure Short 3.6.1 presents the heat maps for all participants together, all FDEs separately, and all Lay participants separately. The areas of interest (AOIs) used for the eye-tracking analyses were based on the All Participants gaze plots.

Figure Short 3.6.1

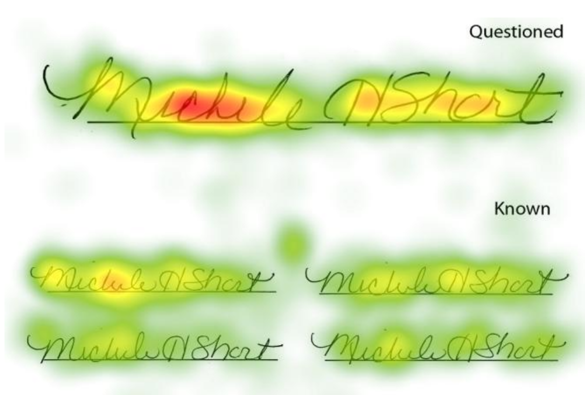
All Participants



All FDE



All Lay



Visual comparison of the two heat maps in which the FDE and Lay participant gaze data are separated reveals that there are clear differences in the gaze behavior for the two groups. This is particularly noticeable for the extended area of red hot spots and larger orange warm spots covering the first name, and the more extended and intense areas on the middle initial, last name, and the first name of the upper left and upper right known signatures. Below are examples of how the FDEs and Lay participants discussed the signature features during their interviews. Figure Short 3.6.2 presents examples of some of the coding categories, and examples of comments that fell into those categories.

Figure Albury 3.6.2

The FDEs Said:

265 - Terminal / End Stroke: *"How the 'M' is formed, there's a tapered ending right here in the capital 'M' and there's some variation in the known."*

253 - Shape: *"The 'H' is typically two slightly diagonal staffs with a very large curve that occurs on the second one. This shape is similar between the questioned signature and the k."*

237 - Line quality: *"So overall the line quality is not very poor."*

242 - Pictorial Similarity: *"So just looking at the questioned signature versus the known it looks pictorially similar."*

The Lay Participants Said:

265 - Terminal / End Stroke: *"The end stroke of the 'T' was inconsistent in shape in comparison to the knowns."*

253 - Shape: *"Here the 'R' is a little rounded that's probably the one slight inconsistency. It's got a point."*
237 - Line quality: *"In every signature that she has written in the knowns the 'C' is crisp, clean it always looks like one sharp motion but this time it looks like she may have messed up somewhere."*

242 - Pictorial Similarity: *"The 'H' in the middle looks similar in loops and slope in terms of the 'Hs' on the original signature."*

The most frequently mentioned feature among FDEs was the baseline alignment of the questioned signature, compared to the known signatures. Table Short 3.6.1 presents the 15 most frequently mentioned signature features in order of their frequency.

Table Short 3.6.1
Frequency of Feature Mention for Short Signature 1

Features	n	% Mentions	Features	n	% Mentions
Terminal/end stroke	21	43%	Stroke	12	24%

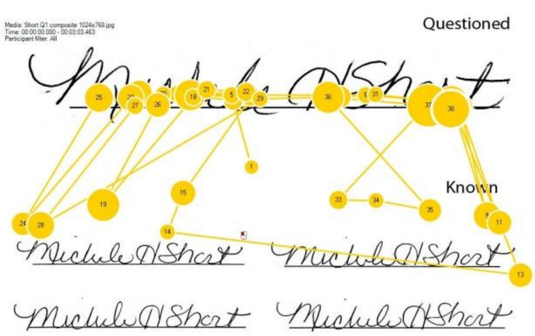
Shape	17	35%	Punctuation	12	24%
Line quality	17	35%	Retrace	12	24%
Initial/beginning stroke	14	29%	Staff/stem	12	24%
Arch / arcade	14	29%	Connecting stroke	10	20%
Pictorial similarity	13	27%	Execution	9	18%
Baseline alignment/ placement/orientation	13	27%	Angularity	9	18%
Shoulder	12	24%			

The comments below are the actual transcripts of the qualitative interviews for an FDE and a Lay participant (the X/Y coordinates correspond to the area on a printed copy of the signature grid sheet with X/Y coordinates, which coders used to locate the part of the signature under discussion during the audio recording). Participants were asked to refer to their gaze plot and heat map, and then describe to the interviewer how they evaluated that aspect of the signature. The comments have been separated and numbered according to the features the participants identified.

Figure Short 3.6.3 presents the gaze plot and heat map for an FDE for Short Signature 1. Recall that each dot on the gaze plot represents a fixation. Larger dots represent longer fixation durations. The lines between the dots represent saccades (eye movements between fixations).

Figure Short 3.6.3

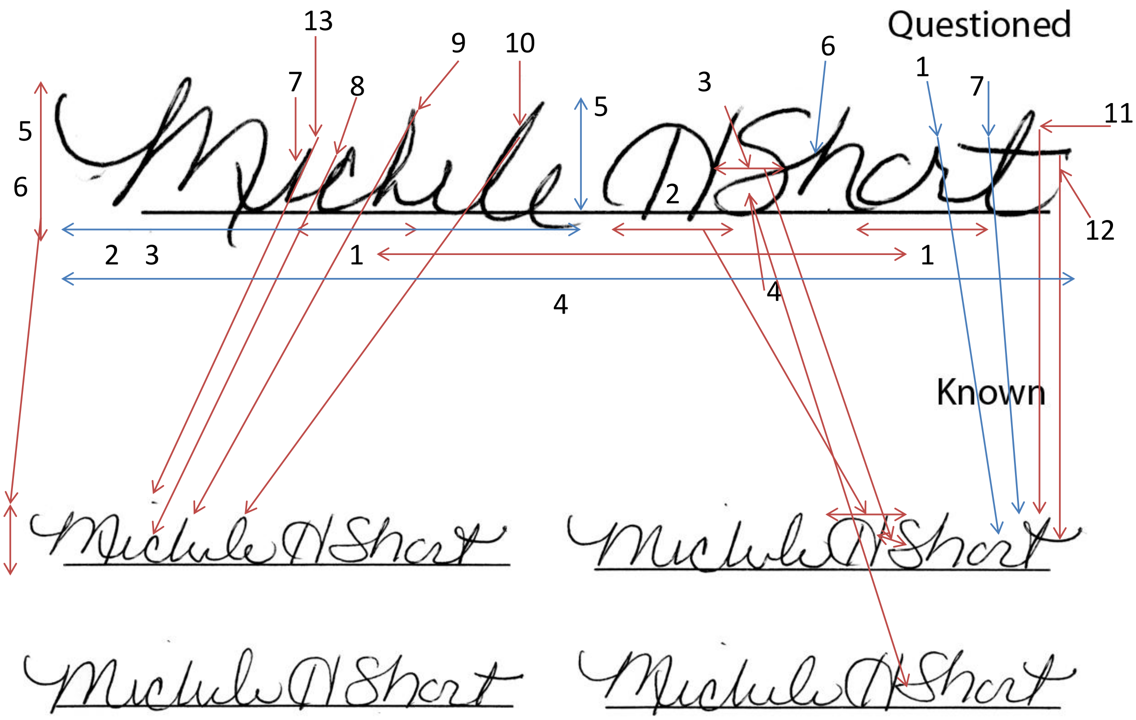
FDE 2 Gaze Plot



FDE 2 Heat Map

Figure Short 3.6.4 presents the Short 1 signature with numbered arrows indicating the feature(s) that correspond to each of the comments. The blue arrows correspond to the FDE comments, and the red arrows correspond to the Lay participant comments.

Figure Short 3.6.4



FDE 2:

(1) I remember this one and I thought it looked quickly written and natural, but I was troubled by the lowercase R in the last name Short, which had kind of a nice angular and slanted top in the questioned signature Y15/x15, because compared to the known signatures it looked to me like she had an almost rounded top, so that seemed to be outside of her—that top of the R was initially troubling to me because the rest of the signature looked quickly written and pretty fluent.

(2) I didn't really find anything when I compared the first name Michele, it was the same letter formations, there was nothing that really worried me about that, the spacing within the name

(3) , the letter formation,

(4) the base alignment, there was nothing really troubling to me. That R, I can see that I lingered on it for quite some time.

(5) I liked the formation of the middle initial which I guess is an H.

(6) The SH connection in the last name Short, all of that seemed fine, I did not know what to make of that lower case R.

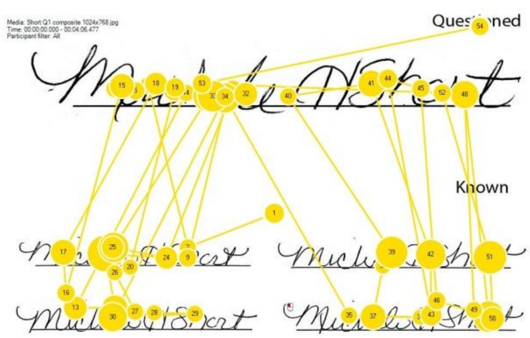
(7) I also looked a little bit at the T, but I did see because sometimes this writer in the known signatures varies the way she makes the lowercase Ts, sometimes she loops up and back and sometimes she just crosses it very similar to what was seen in the questioned signature, so that was not that troubling to me.

(8) So nothing really troubled me about this signature and I probably would have called it a genuine, but I do remember being troubled by that lowercase R in the Y15 area.

Figure Short 3.6.5 presents the gaze plot and heat map for a Lay participant for Short Signature 1. Recall that each dot on the gaze plot represents a fixation. Larger dots represent longer fixation durations. The lines between the dots represent saccades (eye movements between fixations).

Figure Short 3.6.5

Lay Participant 2 Gaze Plot



Lay Participant 2 Heat Map

Lay Participant 2:

(1) In the area of Y14, Y15; X18, X19 and Y14, Y14; X6, X8 the line quality was not fluid at all.

(2) The middle initial at Y14, Y16; X13, X16 in the questioned signature at the crossbar was consistent in shape with the knowns.

(3) The spacing of that area and the last name was also consistent with the knowns.

(4) The eyelet in the first letter of the last name was consistent in shape with the knowns as well.

(5) The shape of the capital "M" in the first name overall was consistent with the knowns.

(6) Specifically the slant of the "M" was consistent,

(7) as well as the placement of the initial stroke of the "I" in the questioned signature.

(8) The cap of the "C" appears to be a retrace which was inconsistent with the knowns.

(9) The loop at the top of the "H" has a pen lift in the questioned signature which is inconsistent with the knowns.

(10) The "L" loop was consistent in shape with the knowns.

(11) The staff of the "T" was consistent in shape with the knowns.

(12) The shape of the cross bar of the "T" was consistent in direction with the knowns.

(13) The "I" dot in the questioned signature is inconsistent with the knowns because they appear in the knowns, but not the questioned signature.

Conclusion

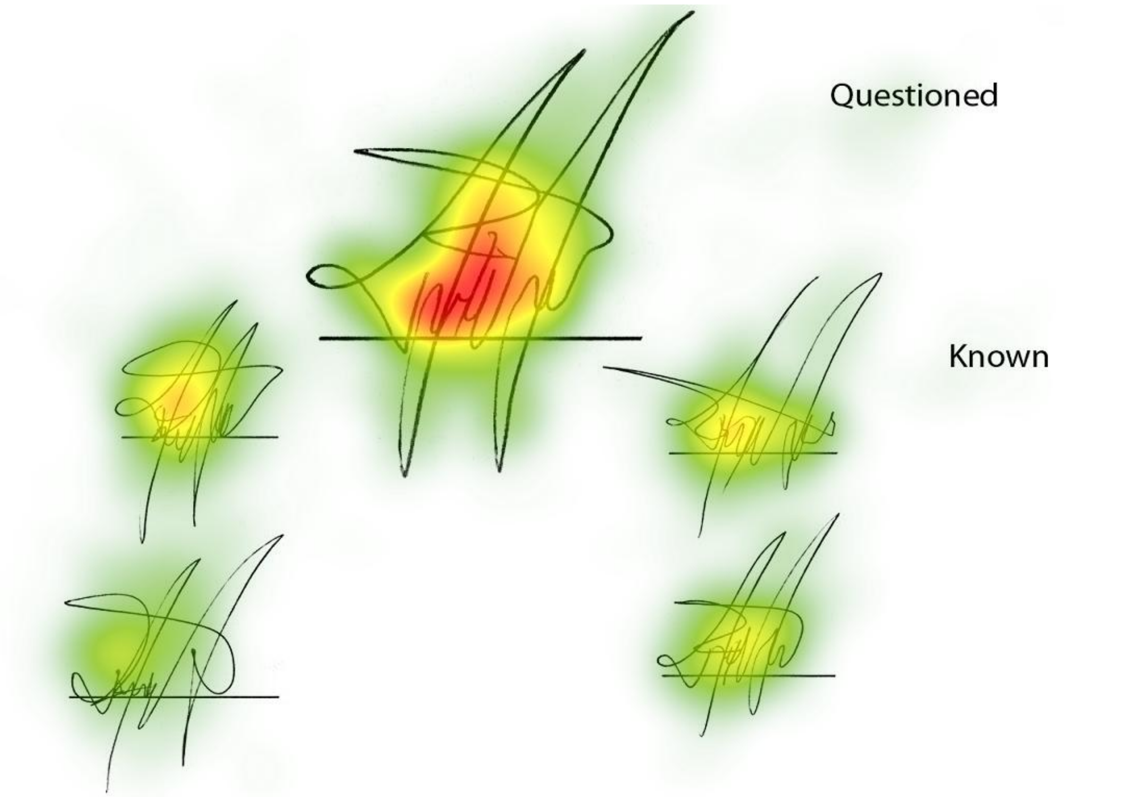
Of the 49 FDE participants, 46 responded correctly that the signature was non-genuine, while 3 FDEs responded that the signature was genuine. Of the 43 Lay participants, 26 responded correctly that the signature was non-genuine, while 17 responded that the signature was genuine. This difference was statistically significant, χ^2 (2, N = 92) = 15.03, $p < .001$. The differences in heat map concentrations suggest that FDEs attended to the overall characteristics of the signature to a greater extent than did the Lay people. This again suggests that the Lay participants were more focused on the very obvious differences between the questioned signature and the known signatures, but that they paid less attention to the subtle attributes of the signatures, again placing a lot of diagnostic value on the letter features, and less value on the overall execution of the signature.

SIGNATURE 9: Vilcise Tima Signature 4 (Genuine)

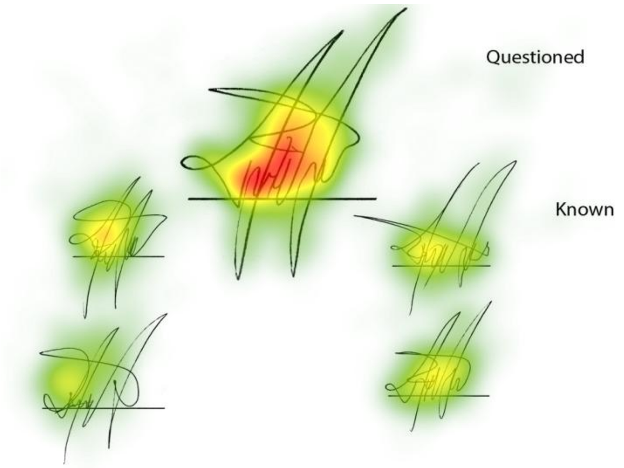
This signature is classified as a high complexity, stylized signature. Figure Tima 3.6.1 presents the heat maps for all participants together, all FDEs separately, and all Lay participants separately. The areas of interest (AOIs) used for the eye-tracking analyses were based on the All Participants gaze plots.

Figure Tima 3.6.1

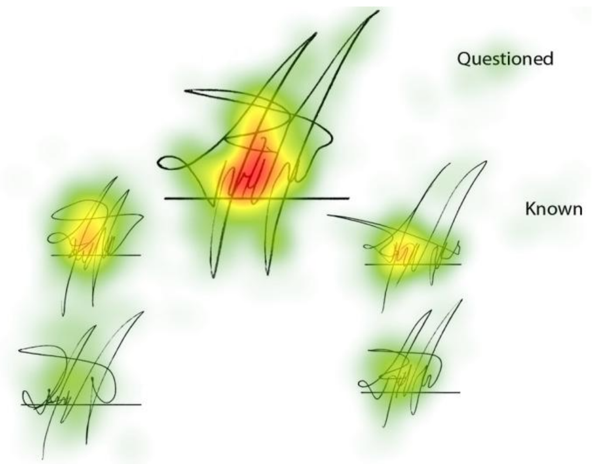
All Participants



All FDE



All Lay



Visual comparison of the two heat maps in which the FDE and Lay participant gaze data are separated reveals that there are few differences in the gaze behavior for the two groups. The red hot spots and larger orange warm spots covering the questioned signature are only slightly larger for the FDEs than for the Lay participants, but the Lay participants demonstrate slightly more attention to the two upper known signatures than do the FDEs. FDEs demonstrate slightly more attention to the two lower known signatures than do the Lay participants. Below are examples of how the FDEs and Lay participants discussed the signature features during their interviews. Figure Tima 3.6.2 presents examples of some of the coding categories, and examples of comments that fell into those categories.

Figure Tima 3.6.2

The FDEs Said:

263 - Stroke: *"The stroke goes down, up to the left, makes a loop in y12, and then goes up to the top, changes direction, and comes down."*

235 - Initial / Beginning Stroke: *"You look at the beginning stroke, what the hell is this? What I have here is this thing, this is kind of a compound curve movement."*

237 - Line quality: *"I focused on the details, the starting and stopping points, obvious speed in all the writings, with the tapering of writing lines, thinning of the writing lines, indicative of the speed."*

The Lay Participants Said:

263 - Stroke: *"It looks like it may have been done in two strokes while this signature down here has a lot of gooping."*

235 - Initial / Beginning Stroke: *"The only few things I can really pick up on this one was right here at the beginning of the name it looks consistent to me it looks genuine."*

237 - Line quality: *"Another thing I noticed was the line that goes through the entire signature this one looks like it may have been done backwards like it started here then went in the last name instead of coming out like in the other signatures."*

The most frequently mentioned feature among FDEs was the strokes of the questioned signature, compared to the known signatures. Table Tima 3.6.1 presents the 15 most frequently mentioned signature features in order of their frequency.

Table Tima 3.6.1

Frequency of Feature Mention for Tima Signature 4

Features	n	% Mentions	Features	n	% Mentions
Stroke	13	27%	Ascender	7	14%
Initial/beginning stroke	12	24%	Pressure	7	14%

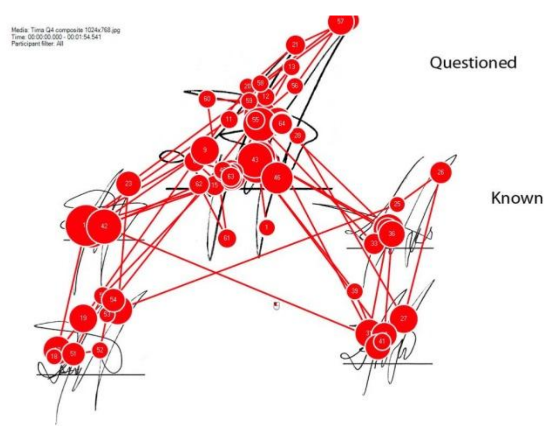
Line quality	11	22%	Baseline alignment/ placement/orientation	7	14%
Speed	10	20%	Descender	6	12%
Execution	9	18%	Pattern/pen movement consistency	5	10%
Height	8	16%	Spacing	5	10%
Terminal/end stroke	8	16%	Pictorial similarity	0	0%
Complexity	8	16%			

The comments below are the actual transcripts of the qualitative interviews for an FDE and a Lay participant (the X/Y coordinates correspond to the area on a printed copy of the signature grid sheet with X/Y coordinates, which coders used to locate the part of the signature under discussion during the audio recording). Participants were asked to refer to their gaze plot and heat map, and then describe to the interviewer how they evaluated that aspect of the signature. The comments have been separated and numbered according to the features the participants identified.

Figure Tima 3.6.3 presents the gaze plot and heat map for an FDE for Tima Signature 4. Recall that each dot on the gaze plot represents a fixation. Larger dots represent longer fixation durations. The lines between the dots represent saccades (eye movements between fixations).

Figure Albury 3.6.3

FDE 3 Gaze Plot



FDE 3 Heat Map

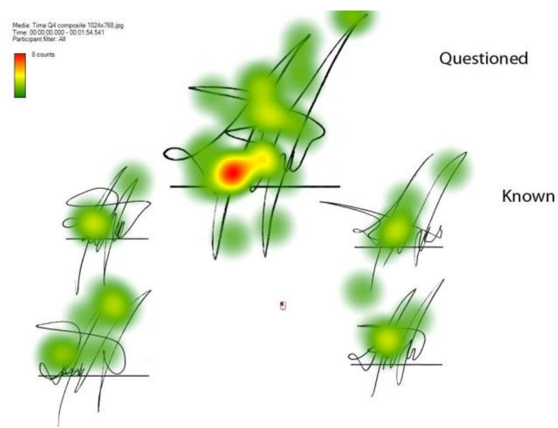
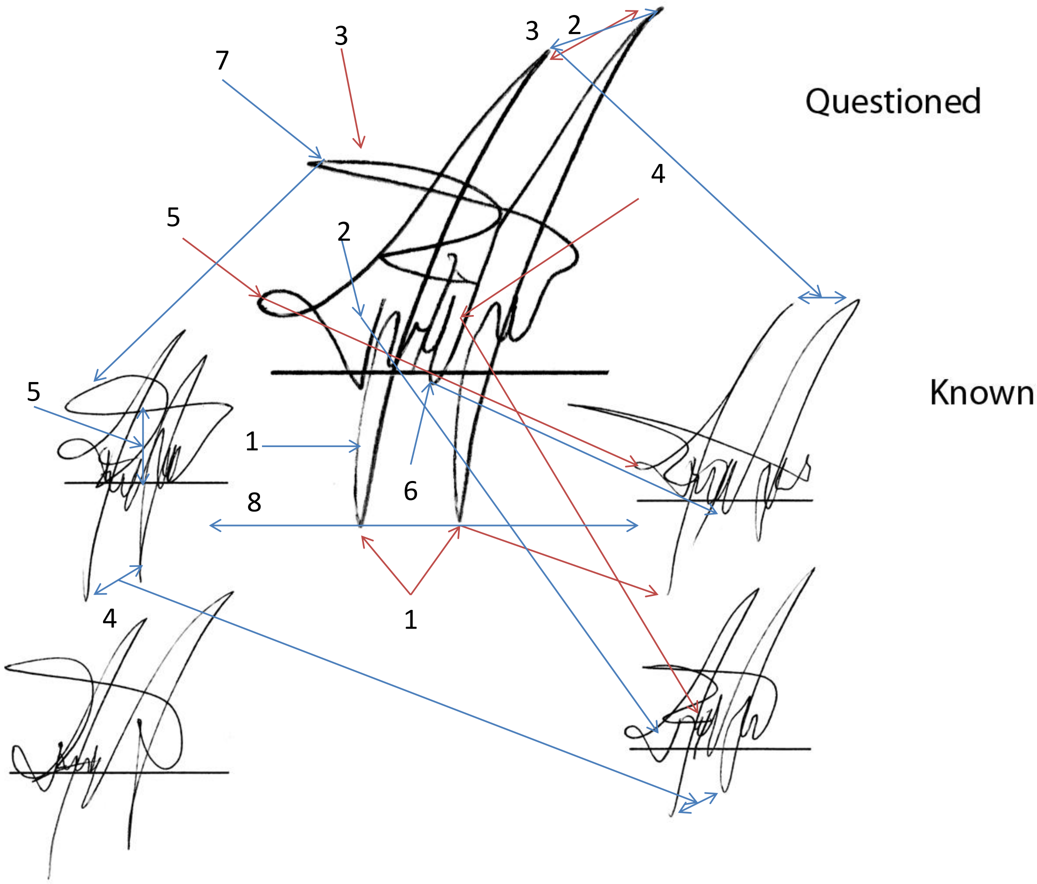


Figure Tima 3.6.4 presents the Tima 3 signature with numbered arrows indicating the feature(s) that correspond to each of the comments. The blue arrows correspond to the FDE comments, and the red arrows correspond to the Lay participant comments.

Figure Tima 3.6.4



FDE 3:

(1) This is one I actually did like when I was working on it. It was actually very hard because of all the information without the microscope to be able to see where things started and stopped, what lines crossed, and what lines belonged to what, but one thing I did notice was that on the questioned signature there was the variation in the line pressure, where it gets lighter and darker (first sail below baseline). So that speed of being able to write that fast, to be able to get that, made me feel that this was a free and natural signature. I knew there was a lot of information in here that I could not see without the microscope and I was working on the screen, so I was conservative.

(2) The intro stroke that starts here, kind of comes down and goes around into a loop, and I found that same intro stroke on the questioned signature, they would come down and come into a loop (maybe the V, I have no idea what letter it is) but I found the same formation within the known signatures, the intro stroke coming down, going into that first tall ascender stroke.

(3) I looked at the height proportions of the extenders and descenders. On the questioned signature the first one is lower, the second one is higher. On the questioned signature the first one is higher on the first known and the second one is lower, but on the remainder of the known signatures they're either close to being even, or the second one was higher.

(4) On the descenders there's a range of variation on those within the known signatures. Usually the second one is much shorter than the first one, but on the first known there isn't a large amount of difference. There was a little bit of a difference, not a lot, so the descenders, I thought, still be a little bit careful not knowing the letter formations and what I'm really looking at, being a more stylized signature.

(5) I looked at the height proportions of where all of this, you'll see all this in the middle. I looked at the height proportions of the body of the middle of the signature, and with all of them they were either probably about a third of the way up the ascender, or a fourth of the way up the ascender, and then kind of came to baseline. Maybe a couple of strokes went below baseline, but not very many, most of them were on the baseline.

(6) Within the known signatures there was this one loop that came down before the last ascender (circled below baseline). There is this one, and this also was in the questioned signature, that last loop that goes below the baseline before it goes into the last ascender y10/x10.

(7) There was also the pull back that came across the letters, there was a wide variation of how this was formed in the known signatures. On the top right known it just came out and came back without a loop, but there's a small retrace at the end. On the second one it actually appears to go below and then come back, but being on the screen and not having a microscope I can't tell.[2] On the one on the lower left of the known signatures, that one goes out and under and comes back up and over, and on the top left known it's again straight out and comes up and over. On the questioned signature it actually comes out at an angle and comes up and over.

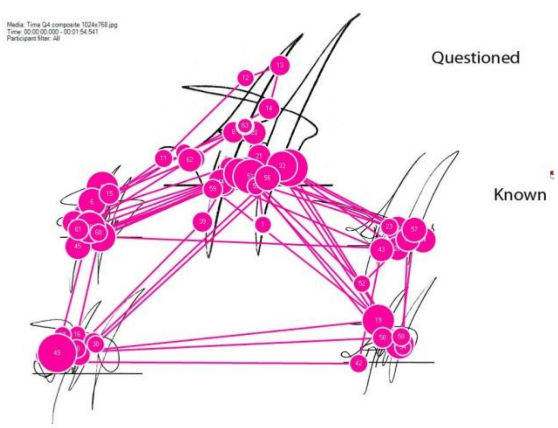
(8) Like I said, with this stylized signature, the fact that I didn't have a microscope, I couldn't see which things were starting and stopping and ending. I was conservative, however with the fluid and fast nature of the questioned in this one I think I was a probable genuine signature on this one. I would have really liked my microscope. It's a beautiful signature once you get the hang of it.

Figure Tima 3.6.5 presents the gaze plot and heat map for a Lay participant for Tima Signature 4. Recall that each dot on the gaze plot represents a fixation. Larger dots represent longer fixation durations. The lines between the dots represent saccades (eye movements between fixations).

Figure 3.6.5

Lay Participant 3 Gaze Plot **Lay Participant 3 Heat Map**

[2] This was a common comment among FDEs, both during the eye-tracking procedure and the qualitative interview. Many FDEs indicated that in cases like the complex, highly stylized signature here, the execution of the signature and the sequence of the pen movements would be important diagnostic features.



Lay Participant 3:

(1) The loops at the bottom are more lines in the known signature and there loops in the questioned signature. Y8, x7-10

(2) The top of the signature looks almost the same to me there's just so much going on in this signature.

(3) The loop right here and right here looks pretty much the same how it goes down and around its almost identical in those two signatures. Y14, x10; Y2-x15

(4) Then I guess just the way towards the middle it looks like I guess how they used the how they slant their writing it's pretty much the same in the signatures Y2,x16

(5) The first letter pretty much the shape is the same. The loop Y12 x7; Y7, x14

Conclusion

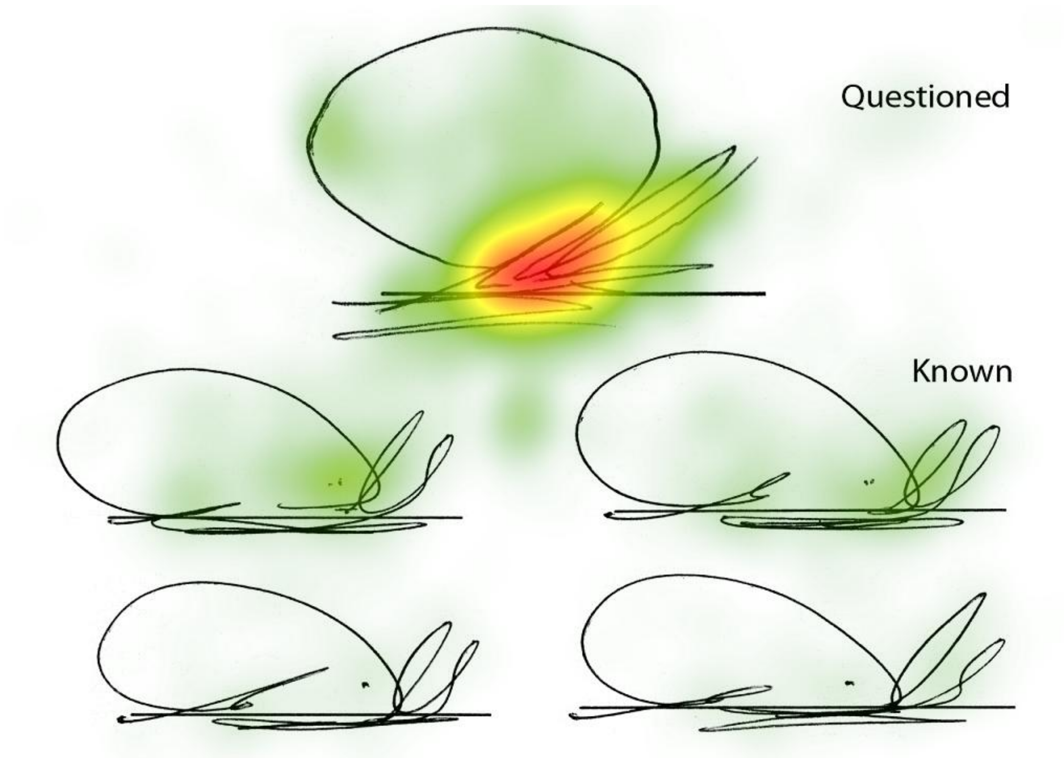
Of the 49 FDE participants, 39 responded correctly that the signature was genuine, and 9 responded that it was non-genuine. One FDE declined to respond. Of the 43 Lay participants, 42 responded correctly that the signature was genuine, and 1 responded that the signature was non-genuine. This difference was statistically significant, χ^2 (2, N = 92) = 7.15, p = .028. This suggests that the FDEs may have been somewhat more focused on the range of variation among the signatures, but overall the heat map patterns were very similar. As with the Albury signature, the extent to which FDEs attended to a greater of variety of features may indicate that they "red flagged" more information that they found diagnostic of simulation, leading some to conclude that the signature was simulated.

SIGNATURE 10: Ricardo Vega Signature 6 (Simulated)

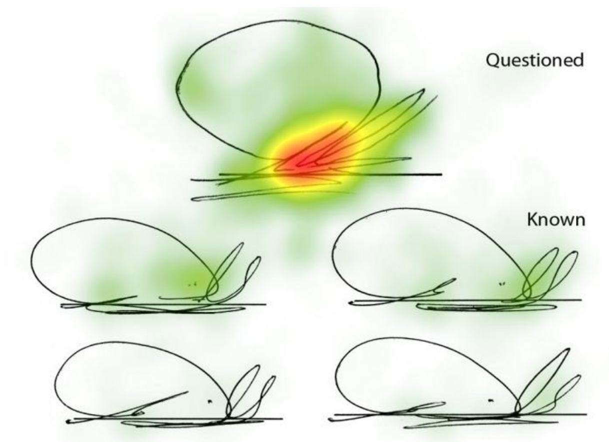
This signature is classified as a low complexity, stylized signature. Figure Vega 3.6.1 presents the heat maps for all participants together, all FDEs separately, and all Lay participants separately. The areas of interest (AOIs) used for the eye-tracking analyses were based on the All Participants gaze plots.

Figure Vega 3.6.1

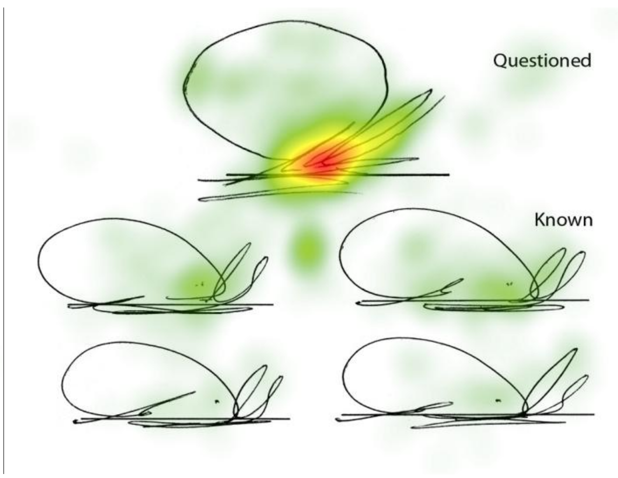
All Participants



All FDE



All Lay



Visual comparison of the two heat maps in which the FDE and Lay participant gaze data are separated reveals almost no difference in the gaze behavior for the two groups. Below are examples of how the FDEs and Lay participants discussed the signature features during their interviews. Figure Vega 3.6.2 presents examples of some of the coding categories, and examples of comments that fell into those categories.

Figure Vega 3.6.2

The FDEs Said:

253 - Shape: *"So the next thing I looked at was that the shape was distorted."*

237- Line quality: *"And then just looking at line quality of the questioned signature, there's more of an even line thickness, looks like it's kinda waving back and forth versus the knowns are all smooth, they don't have that same line quality where it looks like hesitation, it's happening slowly."*

263- Stroke: "*Extension of that lower flourish is too far below the baseline."*

274 - Punctuation: *"The bunny doesn't have any eyes in the questioned signature while it does in the knowns."*

The Lay Participants Said:

253 - Shape: *"Also in the questioned signature at Y12-Y18; X6-14 it looks like a circle whereas in the knowns it is more of an oval so it is inconsistent with the knowns."*

233- Line quality: *"First thing I noticed was right in here. It's rounded in all of the known signatures. If you'll look at this one, it's like it's a little bump with a hesitant. If you look here, it's like they stopped and started again. They looped it over, the stroke right below here, in which you don't see it in here."*

263 - Stroke: *"The series of strokes that fall below the baseline in all of the knowns are consistent with each other, but the questioned signature marks that are below the baseline are different because the line on the knowns are closer together back and forth and on the questioned signature there is like a half of a centimeter space between the lines created below the baseline."*

274 - Punctuation: *"Not sure what these dots are missing in the questioned signature."*

The most frequently mentioned feature among FDEs was the shape of the questioned signature, compared to the known signatures. Table Vega 3.6.1 presents the 15 most frequently mentioned signature features in order of their frequency.

Table Vega 3.6.1

Frequency of Feature Mention for Vega Signature 6

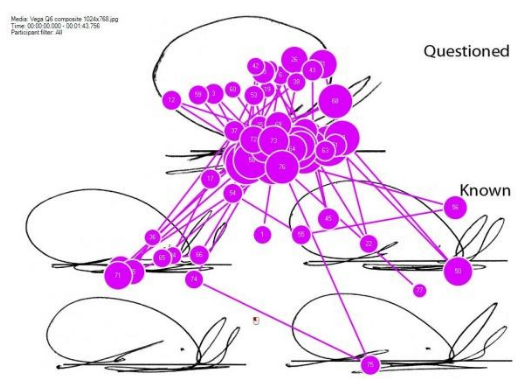
Features	n	% Mentions	Features	n	% Mentions
Shape	23	47%	Initial/beginning stroke	7	14%
Line quality	20	41%	Terminal/end stroke	6	12%
Stroke	19	39%	Speed	6	12%
Punctuation	18	37%	Complexity	5	10%
Upper loop	10	20%	Tremor	4	8%
Pen lift	8	16%	Signature type	4	8%
Execution	8	16%	Variation	4	8%
Pictorial similarity	7	14%			

The comments below are the actual transcripts of the qualitative interviews for an FDE and a Lay participant (the X/Y coordinates correspond to the area on a printed copy of the signature grid sheet with X/Y coordinates, which coders used to locate the part of the signature under discussion during the audio recording). Participants were asked to refer to their gaze plot and heat map, and then describe to the interviewer how they evaluated that aspect of the signature. The comments have been separated and numbered according to the features the participants identified.

Figure Vega 3.6.3 presents the gaze plot and heat map for an FDE for Vega Signature 6. Recall that each dot on the gaze plot represents a fixation. Larger dots represent longer fixation durations. The lines between the dots represent saccades (eye movements between fixations).

Figure Vega 3.6.3

FDE 1 Gaze Plot



FDE 1 Heat Map

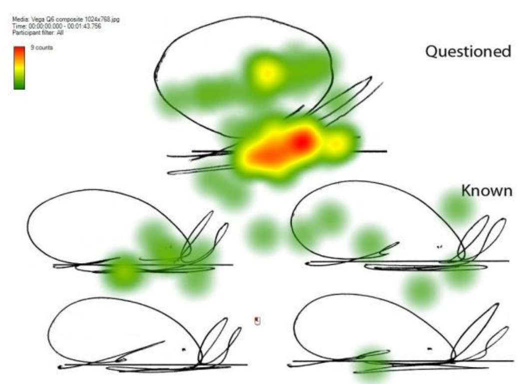
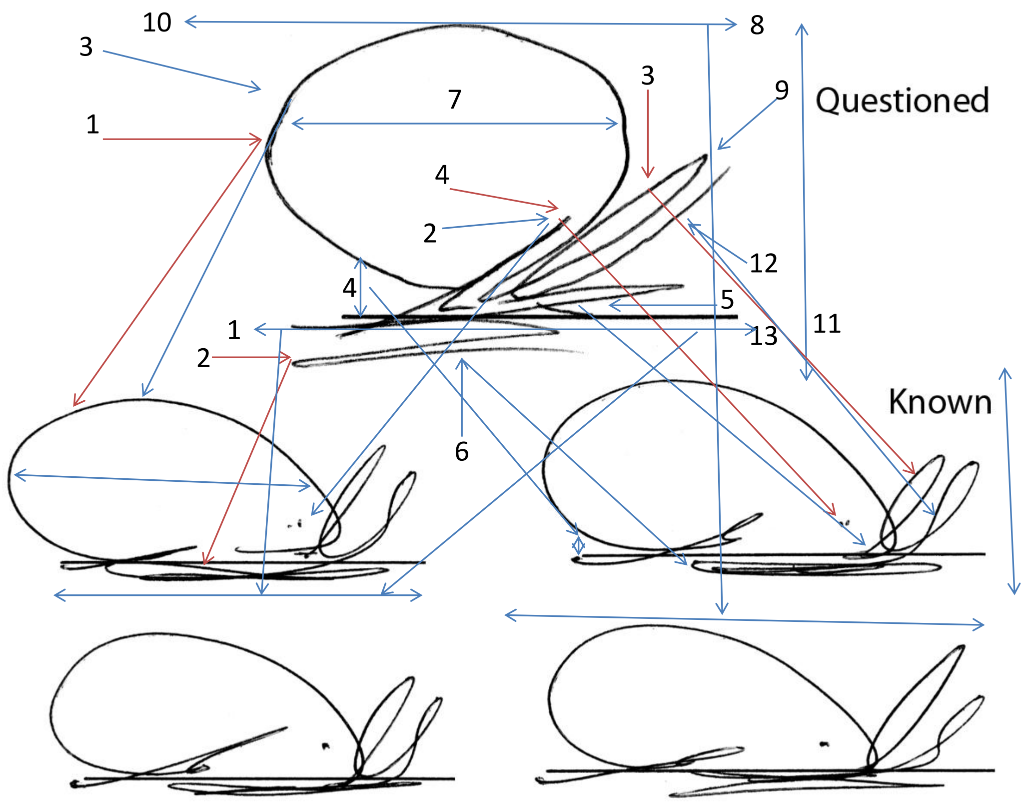


Figure Vega 3.6.4 presents the Vega 6 signature with numbered arrows indicating the feature(s) that correspond to each of the comments. The blue arrows correspond to the FDE comments, and the red arrows correspond to the Lay participant comments.

Figure Vega 3.6.4



FDE 1:

(1) Heavily concentrated on the questioned signature, right off the bat looking at the line quality. Overall line quality appears slow and laborious. Looks like a drawing of the Known signatures. Assessing the line quality of the many movements, line quality appears slow and slowly prepared compared to the knowns.

(2) The known signatures have I dots in the enclosed signature, questioned signature does not have I dots or diacritic dots.

(3) Proportion wise, my gaze is left to right as I'm assessing the spatial volume of the oblong shape. Proportion wise it's out of proportion with the knowns. Known signatures are more elongated.

(4) The questioned signature sits higher on the baseline, it's a taller signature than the knowns, and overall line quality is very poor. The elliptical pattern of the known signatures is more elongated vs. questioned signature, which is more round, so there's a dissimilarity.

(5) Assessing movements between baseline, trying to assess the pattern, line quality, pattern is more disjointed in the questioned signature than in the known signatures, pattern is more rhythmic in the

known signatures than in the questioned signature, which is more of a drawn than naturally written signature.

(6) The questioned signature sits below baseline y11/x7-13 the scribble is lower below baseline than the known signatures.

(7) Spatial volume of the elliptical pattern of the signature,

(8) horizontal spatial arrangement is dissimilar compared to the knowns.

(9) The proportions of the extensions of the ending of the signature, two L loops after the circle is dissimilar with regards to line quality, line quality is poor,

(10) focused on overall shape

(11) and size,

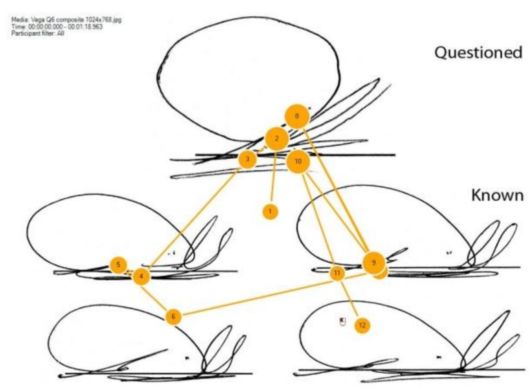
(12) angularity of the L after elliptical pattern of questioned signature, y14-13/x14 focused on general shape and angularity, dissimilar to known signatures.

(13) Assessing overall line quality of the questioned signature, line quality is poor compared to known signatures which are rapid and appear natural. Questioned signature has an unnatural appearance with line quality compared to known signatures.

Figure Vega 3.6.5 presents the gaze plot and heat map for a Lay participant for Vega Signature 6. Recall that each dot on the gaze plot represents a fixation. Larger dots represent longer fixation durations. The lines between the dots represent saccades (eye movements between fixations).

Figure Vega 3.6.5

Lay Participant 1 Gaze Plot



Lay Participant 1 Heat Map

Lay Participant 1:

(1) I did look at the loop Y12-18 X6-14. Big loop looks like an egg, compared to the knowns was inconsistent. The shape of the loop was inconsistent.

(2) I focused a lot on the baseline of the signature, I noticed that one of the pen strokes came under the baseline.Y11 X7-12. It was consistent in all the knowns.

(3) I noticed that these were loops Y13-15 X14-16, this area was inconsistent throughout the knowns. Almost like it was a real fast scribble.

(4) Not sure what these dots are Y7 X7 missing in the questioned signatureY14 X12-13. This signature was simulated.

Conclusion

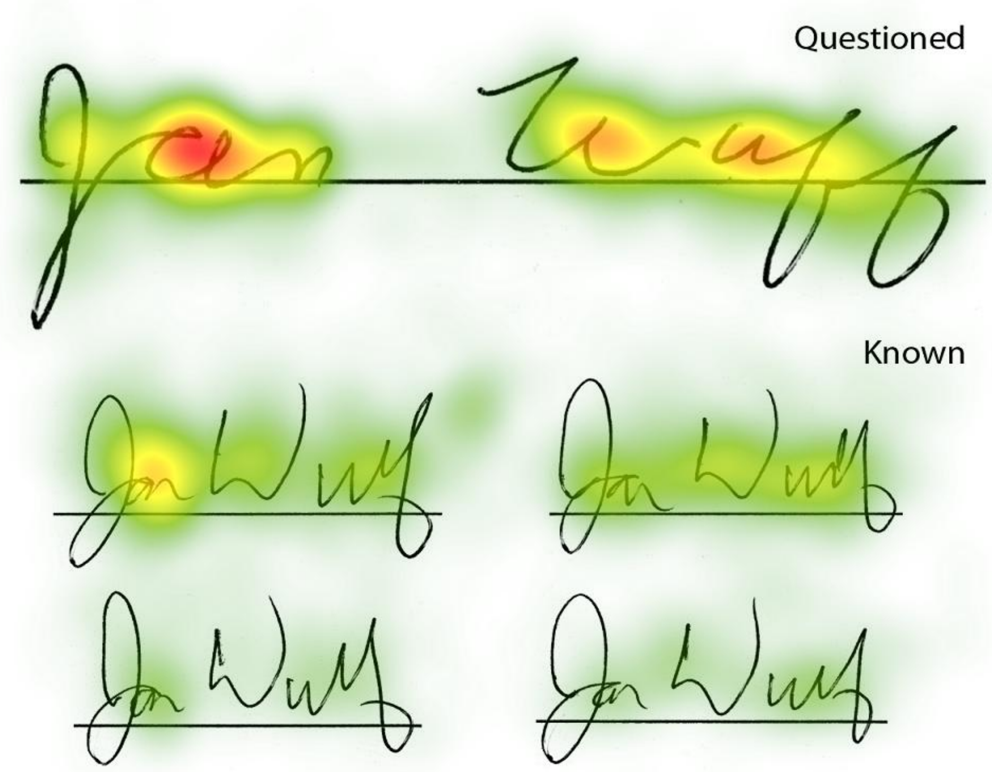
Of the 49 FDE participants, 47 responded correctly that the signature was non-genuine. Two FDEs declined to respond. Of the 43 Lay participants, all 43 responded correctly that the signature was non-genuine. This difference was not statistically significant, χ^2 (2, N = 92) = 1.79, p = .180. Visual examination of the heat maps indicated that there is very little difference in the deployment of attentional resources among FDEs and Lay participants, although overall FDEs found more diagnostic information upon which to base their opinions.

SIGNATURE 11: Jon Wulf Signature 1 (Simulated)

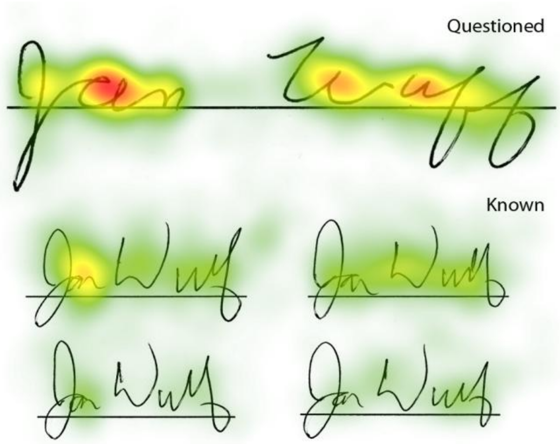
This signature is classified as a low complexity, text-based signature. Figure Wulf 3.6.1 presents the heat maps for all participants together, all FDEs separately, and all Lay participants separately. The areas of interest (AOIs) used for the eye-tracking analyses were based on the All Participants gaze plots.

Figure Wulf 3.6.1

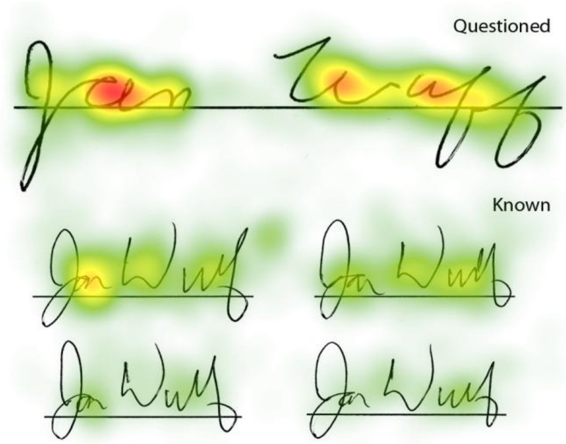
All Participants



All FDE



All Lay



Visual comparison of the two heat maps in which the FDE and Lay participant gaze data are separated reveals almost no difference in the gaze behavior for the two groups. Below are examples of how the FDEs and Lay participants discussed the signature features during their interviews. Figure Wulf 3.6.2 presents examples of some of the coding categories, and examples of comments that fell into those categories.

Figure Wulf 3.6.2

The FDEs Said:

235 - Initial/Beginning Stroke: "*It's almost a retrace but totally different than the entry stroke to the 'W' in the questioned signature.*"

265 - Terminal/End Stroke: "*The round terminal stroke of the lower extension of the second F in the questioned signature is nicely formed and it's consistent with the known signatures.*"

259 - Spacing: *"Second thing that drew my eye right away was the spacing between the first and last name. First and last name on the Known signatures is much smaller, so technically it's name spacing or word spacing was very different between questioned signature and knowns."*

The Lay Participants Said:

235- Initial/Beginning Stroke: *"In the known signature the w doesn't start with that line it just starts with a w."*

265- Terminal/End Stroke:*"All the known signatures the W comes up in the air or ends very high and this one goes into the next letter. Compared down to the knowns was inconsistent. The whole shape of the W is inconsistent."*

The most frequently mentioned feature among FDEs was the initial/beginning stroke of the questioned signature, compared to the known signatures. Table Wulf 3.6.1 presents the 15 most frequently mentioned signature features in order of their frequency.

Table Wulf 3.6.1

Frequency of Feature Mention for Wulf Signature 1

Features	n	% Mentions	Features	n	% Mentions
Initial/beginning stroke	29	59%	Slope/Slant/angularity	13	27%
Spacing	28	57%	Line quality	12	24%
Terminal/end stroke	23	47%	Trough	12	24%
Connecting stroke	20	41%	Retrace	11	22%
Shape	20	41%	Upper loop	9	18%
Lower loop	17	35%	Descender	9	18%
Stroke	14	29%	Eyelet	8	16%
Baseline alignment/	13	27%			

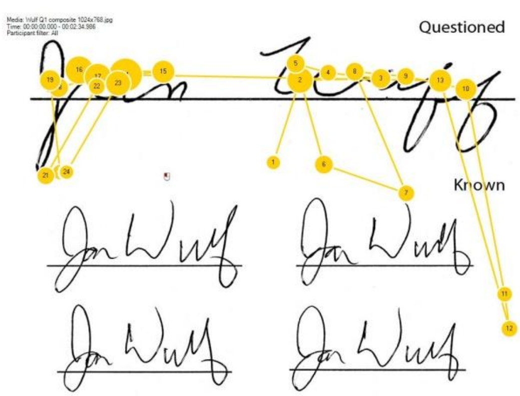
placement/orientation

The comments below are the actual transcripts of the qualitative interviews for an FDE and a Lay participant (the X/Y coordinates correspond to the area on a printed copy of the signature grid sheet with X/Y coordinates, which coders used to locate the part of the signature under discussion during the audio recording). Participants were asked to refer to their gaze plot and heat map, and then describe to the interviewer how they evaluated that aspect of the signature. The comments have been separated and numbered according to the features the participants identified.

Figure Wulf 3.6.3 presents the gaze plot and heat map for an FDE for Wulf Signature 3. Recall that each dot on the gaze plot represents a fixation. Larger dots represent longer fixation durations. The lines between the dots represent saccades (eye movements between fixations).

Figure Wulf 3.6.3

FDE 1 Gaze Plot



FDE 1 Heat Map

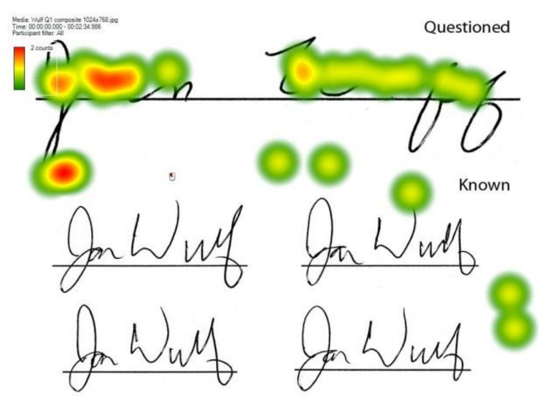
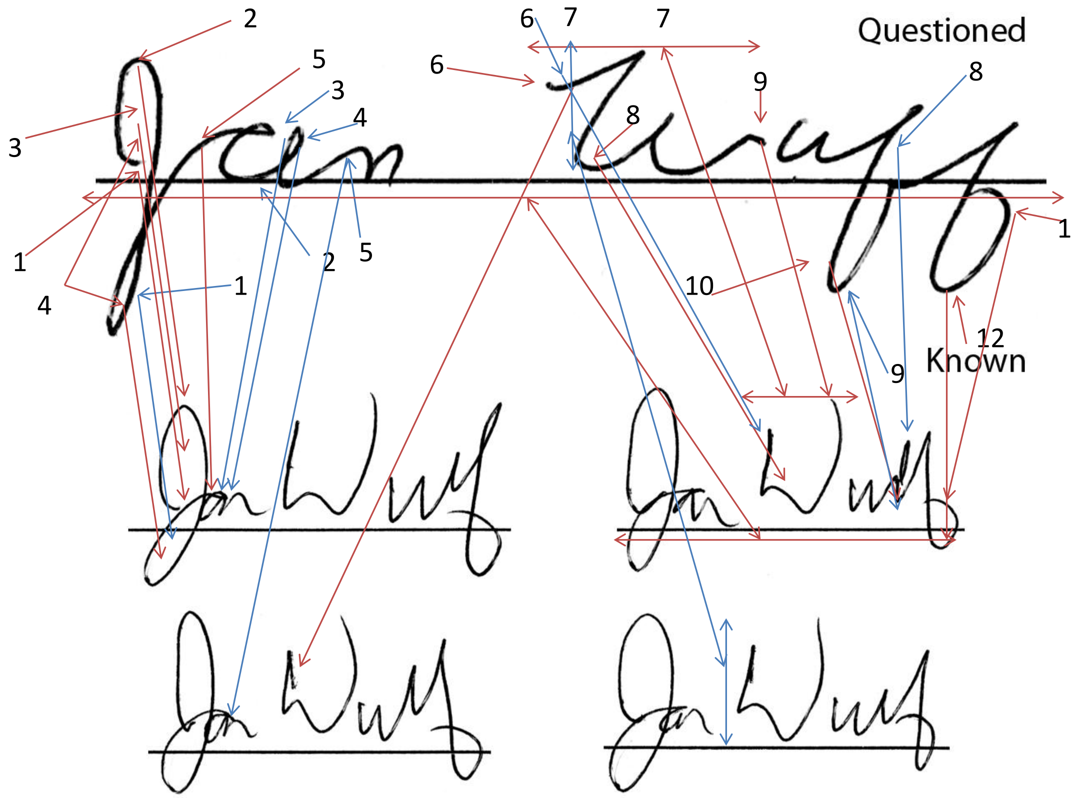


Figure Wulf 3.6.4 presents the Wulf 3 signature with numbered arrows indicating the feature(s) that correspond to each of the comments. The blue arrows correspond to the FDE comments, and the red arrows correspond to the Lay participant comments.

Figure Wulf 3.6.4



FDE 2:

(1) It seemed to show quite a bit of discrepancies when compared to the known signatures. The shape of the uppercase J seemed to be all wrong, the lower descending loop of that uppercase J was way longer and narrower than it was in the known signatures.

(2) The A was a lot bigger and

(3) there was this big giant opening at the top of it Y15/X5, that didn't exist in the known signatures,

(4) where the ascending stroke of that letter in the known signatures always overshot the descending staff of that letter, so that was cause for concern.

(5) I didn't like the N in Jan, it almost seemed too defined to me when compared to the known signatures, in the known signatures the A and N are pretty much one letter, they're joined, whereas the descender of the A also forms the staff of the N, whereas in the questioned signature it was a whole distinct letter N, so that was kind of worrisome.

(6) In the last name, the W in the last name in the questioned signature had this lead in ascending stroke that was fairly long, and it wasn't present in the W other than this kind of very coming from the

opposite direction almost in a couple of the known signatures, going upward opposed to going inward toward the letter in the questioned signature, this is on the other side of the staff of the W, so this was cause for alarm.

(7) This has a kind of distinct right slant, that whole letter in the W, where this is more vertical in the known signatures. In the questioned signature it leans more toward the right.

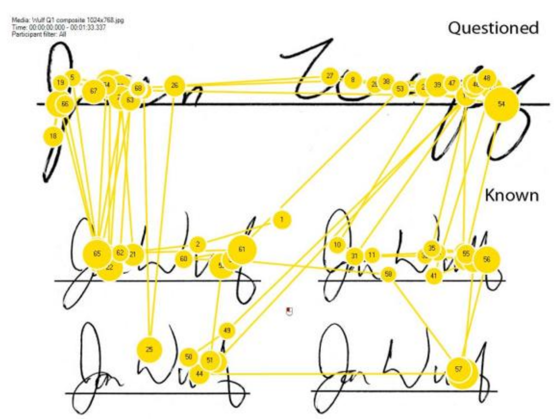
(8) There seemed to be a letter which is supposed to be an L present in the known signatures which became and F in the questioned signature, and that was all wrong,

(9) so this that should have stopped there had this descender added on to it that wasn't present in the known signatures. So again, this signature had some issues and I didn't think it was a genuine signature.

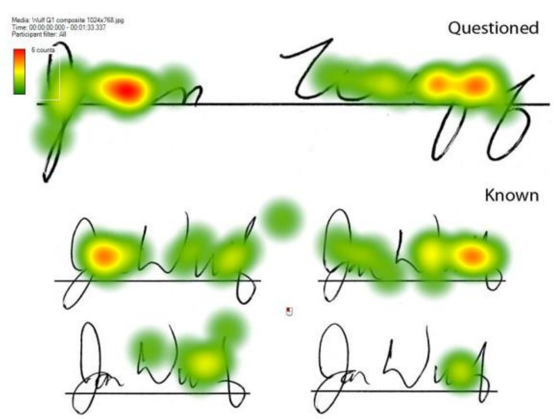
Figure Wulf 3.6.5 presents the gaze plot and heat map for a Lay participant for Wulf Signature 1. Recall that each dot on the gaze plot represents a fixation. Larger dots represent longer fixation durations. The lines between the dots represent saccades (eye movements between fixations).

Figure Wulf 3.6.5

Lay Participant 1 Gaze Plot



Lay Participant 1 Heat Map



Lay Participant 2:

(1) The shape of the "J" in the questioned signature was inconsistent with the knowns Y13, Y14; X1, X2. In that area the spacing between the upper loop and lower loop of the "J" is bigger in the questioned signature than in the knowns which would make that inconsistent.

(2) The shape of the top of the "J" in the knowns is more pointy in comparison to the questioned signature, where it is more round.

(3) The overall shape of the upper loop of the “J” is inconsistent with the knowns. Also the upper loop of the “J” is inconsistent in volume with the knowns in comparison to the questioned signature.

(4) The exterior and interior of the volume in the lower loop of the “J” is also inconsistent with the knowns.

(5) The connecting stroke between the “J” and the “O” in reference to spacing is inconsistent with the knowns.

(6) The entire signature was inconsistent in spacing with the knowns. The initial stroke of the “W’s” was inconsistent in the retrace with the knowns.

(7) The shape of the “W” in the questioned signature was also inconsistent with the knowns.

(8) The bowl of the “W” was inconsistent in shape in comparison to the knowns as well.

(9) The ending stroke of the “W” was inconsistent in direction with the knowns.

(10) The lower loop of the of the “L” is inconsistent in shape with the knowns.

(11) The “F” at Y12, Y13; X20, X21 was inconsistent in reference to the orientation to baseline, the character falls below the baseline.

(12) At X12, X13; Y20, Y21 the shape of the lower part of the “F” is inconsistent with the knowns.

Conclusion

Of the 49 FDE participants, 48 responded correctly that the signature was non-genuine, and none responded that it was genuine. One FDE declined to respond. Of the 43 Lay participants, 41 responded correctly that the signature was non-genuine, and 1 responded that the signature was genuine. This difference was not statistically significant, $p = .205$, *ns.*

Visual comparison of the two heat maps in which the FDE and Lay participant gaze data are separated reveals almost no difference in the deployment of attentional resources for the two groups, although the representative gaze plots and heat maps for the individual FDE and Lay participant for the Wulf 1 signature demonstrate the variability present among each group of participants. The eye-tracking data do indicate significant differences in gaze behavior, supporting the suggestion that FDEs and Lay participants differ in the amount of diagnostic information they attended to and used to reach their decisions.

Conclusions

Purdy (2006) stated “…handwriting usually consists of personalized letter forms accompanied by certain idiosyncrasies and preferences that give an individual’s handwriting a distinctive appearance. Some of these manifestations are quite unusual and can carry considerable weight when conducting a handwriting comparison…FDEs usually assign significance to each feature based on how rarely it occurs in writing by the general population and how consistently the feature appears in repetitions of the same letter or word written by a particular individual…The cornerstone of handwriting identification is the presence of a significant combination of unusual habitual features in both the questioned and specimen handwriting. However, if two documents were *not* [emphasis in original] prepared by the same writer, this can often be established by the presence of significant or irreconcilable differences" (p. 60). Thus, it is important to investigate not only what features are attended to using the eye-tracking methodology described above, but also how these features are interpreted and applied by individual examiners.

Our qualitative and quantitative data support McClary's (2006) description of the variety of features of handwriting specimens that FDEs are trained to evaluate. While Lay participants focused to a greater extent on individual feature characteristics such as arches, eyelets, hooks, shoulders, connections, troughs, or other individual features, they appear less likely to use holistic features such as alignment, slant, pen lifts, rhythm, the size of the writing, the slope or slant of the letters, or other characteristics which may also be diagnostic of the process used to create the signatures.

The consistencies in the deployment of attentional resources by FDEs and Lay participants revealed in the eye-tracking data and in the qualitative interview data support the idea that FDEs used a large and well-specified index of handwriting features as evidence upon which to make their decisions, while Lay participants used a narrower range of features for this purpose. These findings are consistent with the conclusions of Dyer and colleagues (2006), who proposed that that FDEs and Lay participants used different cognitive processes during signature identification tasks. They are also consistent with the 1995 and 2007 studies, in which Blake found that experts and novices ranked the evidential value of signature attributes differently, and that novice rankings were less consistent than those of FDEs.

Our findings are also consistent with the series of studies conducted by of Kam and colleagues (Kam et al., 1994; Kam et al., 1997; Kam et al., 2001). These researchers consistently found that FDEs outperformed novices in a variety of handwriting identification tasks. Although we obtained varied results among our several protocols and sample of over 100 signature specimens, overall our qualitative and quantitative findings support Kam's conclusions that forensic document examination is a distinct field of expertise, and that overall FDEs are more accurate than are novices when asked to determine whether signatures are genuine or simulated in some way. Our findings are also consistent with those of Dyer and colleagues, who similarly found that FDEs were significantly more accurate at determining whether signatures were genuine or simulated than were lay participants.

Our qualitative and quantitative findings also support the conclusions of Busey and colleagues (2013), who found that their professional examiners and lay participants appeared to differ in their deployment of attentional resources, and who suggested that different search strategies and cognitive processes which were identifiable through the durations and temporal sequences of their fixations.

CHAPTER 4: CONCLUSIONS

Discussion of Findings

The purpose of this proposed collaborative, multidisciplinary research was to empirically explore the reliability, measurement validity, and accuracy of established FDE procedures. Our project was a collaborative effort among professional document examiners, vision scientists, survey research experts, and psychologists who shared an interest in informing and expanding the extant empirical research on the general study of FDE expertise.

We conducted a brief telephone/web survey to gather information about the experience, education, and credentials of our participants, and their views about the strengths and weaknesses of education and training in forensic document examination. We conducted a series of eye-tracking procedures to gather quantitative information about how FDEs and Lay participants deploy cognitive and attentional resources during signature examinations. We investigated the influence of information about prior examination outcomes on subsequent examination outcomes using eye-tracking methodology. Finally, we conducted an open-ended, qualitative interview with FDEs and laypeople following the eye-tracking task to discover how much evidential value they assigned signature features, and how they used those features in making their decisions.

Our research addressed several research goals. First, we addressed basic issues of validity and reliability in signature comparison tasks. Next, we addressed the relationship between the amount and kind of training, education, and experience an examiner has had and the examiner's deployment of attentional resources and use of the information available in a variety of signature tasks. Finally, we addressed the extent of the effect of confirmation bias on the decision making processes of FDEs and a comparison group of Lay participants.

Single Signature Protocol

The single signature protocol was designed to investigate the evidentiary value of limited information such as line quality, speed and fluidity of execution, and other indicators of writing skill. According to McClary (2006), FDEs are taught and trained to evaluate a wide variety of writing characteristics. Features such as rhythm, or the regularity in the curvature of the writing, the size of the writing, and the slope or slant of the letters provide evidence of an individual's writing habits (McClary, 2006). Writing speed and fluidity, line quality, or the presence or absence of other patterns which point to the habits of the signature writer allow FDEs to make assertions about the authorship of the specimen and the extent of their confidence in their decisions.

Although a preliminary part of the decision making process involved in FDE casework is to determine whether a sufficient quantity of questioned and/or known writing has been provided to form an opinion about whether the writing is genuine or simulated, even a small sample of writing may provide useful information. Examining the eye-tracking behavior of FDEs and Lay participants as they examined single signature specimens provided information about how the two groups used such limited evidence.

The single signature protocol also allowed us to investigate the influence of contextual cues on the deployment of attentional resources. As previously mentioned, a substantial literature exists on the effects of top-down processing on visual word recognition. In pattern recognition, top-down processing occurs when the context or high-level general knowledge of a word influences the interpretation of lower-level perceptual units such as letters or parts of letters (Anderson, 2010). Reicher (1969, as cited in Revlin, 2013) demonstrated that letters are better recalled when they are presented in a real word than by themselves. This “word superiority” effect is so pervasive that even when every other letter in a sentence is missing, the sentence can still be read.

Signatures vary in terms of the semantic content they contain. A text-based signature containing a relatively high number of identifiable letters carries more semantic information than a highly stylized signature. Semantic information, such as informing the examiner of the writer’s name prior to an examination, may influence the interpretation of signature features by producing a context that affects the examiner’s perception of the stimulus. This influence may occur due to cognitive phenomena such as top-down processing, perceptual set, and confirmation bias.

FDEs and Lay participants may experience selective attention or selective information seeking if they are aware of the name of the contributor of the known signatures. We investigated the possible influences of these attentional phenomena by manipulating the amount of information available for selective attention and selective information seeking, presenting signatures that varied according to signature style and signature complexity.

As predicted, FDEs were significantly more accurate overall in the single comparison than were Lay participants. FDEs outperformed Lay participants in 24 of the 30 signature examinations, while Lay participants outperformed the FDEs in six of the 30 examinations. Analyses of each individual signature revealed that for 20 of the 30 signature specimens, a statistically significant different was found, and that FDEs were significantly more accurate than were Lay participants in 17 of these 20 cases, while Lay participants were more accurate than were FDEs in the other three statistically significant cases. In nearly all the cases in which Lay participants outperformed FDEs, the call accuracy for both groups was quite low. These findings supported hypothesis 1, that the handwriting features have construct validity. They also support hypothesis 3, indicating that untrained Lay participants use a commonsense index. These findings also supported hypothesis 5, that the index demonstrated high discriminant validity for FDEs and Lay participants, and hypothesis 10, that compared to Lay participants, FDEs make more accurate calls. The extent of call accuracy also supported hypothesis 12, that greater inter-rater reliability would be demonstrated among FDEs than among Lay participants.

Overall, Lay participants were significantly more confident than were FDEs in their process decisions, except in the case of the high complexity, stylized signature category. On average, confidence among both groups was higher for correct calls than for incorrect calls, but confidence was lower among FDEs who made incorrect calls than among FDEs who made correct calls, while call confidence remained fairly consistent among Lay participants. These findings supported hypothesis 11, that compared to Lay participants, FDEs would make a greater number of qualified calls.

According to Anderson (2010), top-down (or “large chunk”) processing occurs when we form perceptions (or focus our attention) by starting with the larger concept or idea and then working our way down to the finer details of that concept or idea. One who learns new ideas and concepts (or forms impressions) by starting first with the high-level aspects and then working down to the fine details is a top-down processor. Conversely, one who begins with the smaller, finer details of an element and then builds upward until achieving a solid mental representation of the element is engaging in bottom-up (or “small chunk”) processing.

In pattern recognition, top-down processing occurs when the context or high-level general knowledge of a word influences the interpretation of lower-level perceptual units such as letters or parts of letters (Anderson, 2010). Reicher (1969, as cited in Revlin, 2013) demonstrated that letters are better recalled when they are presented in a real word than by themselves. This "word superiority" effect is so pervasive that even when every other letter in a sentence is missing, the sentence can still be read.

FDEs were more accurate than were Lay participants for the text-based and mixed signatures. Lay participants were slightly more accurate than FDEs in the stylized signature (only one stylized signature was used in this procedure), but this difference was not statistically significant. The findings that FDEs outperformed Lay participants when signatures were text-based or mixed (e.g., higher in semantic content), and that FDEs also outperformed Lay participants regardless of signature complexity, suggest that the participants relied to a greater extent on top-down processing in some contexts, and bottom-up processing in others. These findings support hypothesis 6, that the formal index FDEs are taught and trained to use would be more comprehensive than the commonsense index used by Lay participants. They also provide additional support for hypothesis 12, greater inter-rater reliability among FDEs than among Lay participants.

Eye-tracking results provide some support for the idea that different attentional and cognitive processes were deployed by FDEs and Lay participants. Fixation count among FDEs was significantly greater than that among Lay participants. Fixation count among FDEs remained fairly consistent between the high complexity text-based and mixed signatures, but was significantly higher for the high complexity stylized signature. This suggests that the semantic context provided by the text-based and mixed signatures allowed a greater extent of top-down processing and required fewer fixations, while the lack of semantic context increased the need to engage in bottom-up processing, requiring a greater number of fixations.

Fixation duration among FDEs was also significantly greater than that among Lay participants, and was significantly greater among FDEs for high complexity signatures than for low complexity signatures, while fixation duration stayed fairly consistent among Lay participants across all signature types and both levels of signature complexity.

Visit count was significantly greater among FDEs than among Lay participants, and differed significantly according to whether the signature was text-based, mixed, or stylized. Visit count was significantly different between high and low complexity signatures, depending on whether the signature was text-based, mixed, or stylized.

As with the other eye-tracking metrics, visit duration among FDEs was significantly greater than that among Lay participants. Visit duration remained fairly consistent among Lay participants, while among FDEs visit duration decreased significantly among the low complexity text-based and low complexity stylized signatures. These findings support hypothesis 5, that high discriminant validity would be demonstrated between FDEs and Lay participants; hypothesis 6, that the formalized index used by FDEs would be more comprehensive than the commonsense index used by Lay participants; hypothesis 9, that FDEs would identify a greater variety of features than would Lay participants; and hypothesis 12, higher inter-rater reliability among FDEs than among Lay participants.

Questioned/Known Comparison

The questioned/known comparison protocol was designed to explore how FDEs use the information contained within signature specimens to reach their conclusions. This investigation touches on two different but related areas of cognitive functioning—attention, and expertise.

The decision making process by which FDEs reach their conclusions about the authenticity of signatures has been described as a series of stages of comparison. These stages include evaluating the writing for internal consistency, range of variation, and the presence or absence of features suitable for comparison; determining the extent of similarities, dissimilarities, or absent characteristics during the comparison; evaluating the significance of these features individually and in combination; determining if the amount of evidence provided by the writing specimens is sufficient to form an opinion about the authenticity of the questioned writing; and, ultimately reporting an opinion based on the available evidence (or lack thereof).

FDEs seek those features and characteristics which may be characterized as a document's identifying attributes or characteristics. The quantity and quality of these features observed to be present or absent when comparing specimens from a known source (commonly referred to as a "standard") and disputed specimens form the basis of the FDE's opinion. McClary (2006) stated that FDEs are trained to evaluate such features as alignment, or the habit of placing all written words above or below the baseline; connections, or strokes connecting adjacent letters of adjoining words; pen lifts, or the presence or absence of other patterns of interruptions in a pen stroke; rhythm, or the regularity in the curvature of the writing; size of the writing; the slope or slant of the letters; and a variety of other characteristics which provide evidence of an individual's writing habits. The number and quality of these features allow FDEs to make assertions about the authorship of the specimen and the extent of their confidence in their decisions.

Attention is defined as the sustained focus of cognitive resources on information, while filtering or ignoring extraneous information (Anderson, 2010). Choosing where to focus vision determines where one focuses visual processing resources, and often precedes all other neural or cognitive functions. It is important to understand how and why attentional resources are deployed during signature comparison tasks, and how this deployment is related to the decision making process.

According to Anderson, what we attend to is determined by stimulus-driven (exogenous) factors, which are features of the stimulus that grab our attention, and goal-directed (endogenous) factors, which are features that we purposefully attend to or that guide our attention. Anderson stated that many current theories of attention propose that attention is based on "the interplay of a bottom-up, saliency-based attentional system and a top-down, feature specific selection mechanism" (p.248).

According to Becker, another kind of information which guides attention is relational information about the target, or information about how the irrelevant information of a non-target differs from the features of the target (2007). Relational models of visual search demonstrate that visual attention can be guided by attending to specific feature values such as color, size, or intensity, by inhibiting attention to irrelevant features, or by directing attention to how stimuli differ. Relational models place the target in relation to its context, offering more specific (e.g., directional) information about differences (Becker, 2007).

Research has demonstrated that in a variety of domains, expertise influences the deployment of attentional resources. In the domain of signature examination, experts might be distinguished from Lay people by the number and pattern of eye movements, the location and length of gaze fixations, and other evidence of the various dimensions of expertise development (e.g., proceduralization, tactical learning, strategic learning, problem perception, pattern learning and memory, long-term memory, and deliberate practice). The eye-tracking methodology used in this study provides evidence that expertise is clearly related to the deployment of visual resources in these signature examination tasks.

FDEs were significantly more accurate overall in the questioned/known comparisons than were Lay participants, although Lay participants outperformed FDEs in nine of the 66 signature comparisons. Although Lay participants did outperform FDEs in these instances, in nearly all cases there was very low overall accuracy among both FDEs and Lay participants, and the difference between FDEs and Lay participants was quite small. In only four of the nine cases the difference was statistically significant. FDEs were more accurate overall than were Lay participants across all signature types and both levels of complexity. In addition to proving support for hypothesis 1, high construct validity of the formal index, these findings support hypothesis 3, lower construct validity for the commonsense index; hypothesis5, high discriminant validity between FDEs and Lay participants; hypothesis 10, greater accuracy among FDEs than among Lay participants; and hypothesis 12, greater inter-rater reliability among FDEs than among Lay participants.

Although FDEs were more accurate than were Lay participants, they were also more likely than were Lay participants to make qualified authorship opinion calls. Overall, Lay participants were significantly more confident than were FDEs in their process decisions. On average, Lay participant authorship confidence calls fell within the “probable” range for their accurate calls, and approached the “probable” level for their inaccurate calls. FDEs were less confident, placing their authorship confidence on average at the “indications” level for accurate calls, and just above the “inconclusive” level for the inaccurate calls. This indicates that FDEs and Lay participants tended to weight the available evidence differently. These findings support hypotheses 8, that Lay participants would report higher evidential weight for the features they identified than would FDEs; and hypothesis 11, that FDEs would make more qualified calls than would Lay participants, indicating that they afforded different evidential weight to the features.

As previously discussed, in the domain of signature examination, FDE experts might be distinguished from Lay people by the number and pattern of eye movements, the location and length of gaze fixations, and other evidence of the various dimensions of expertise development (e.g., proceduralization, tactical learning, strategic learning, problem perception, pattern learning and memory, long-term memory, and deliberate practice). The eye-tracking data for the overall analyses, as well as for the individual signature by signature analyses reported in the following sections, clearly demonstrate expertise-based differences between the FDE and Lay participant groups on the signature comparison tasks. The results of the eye-tracking analyses reported below support hypothesis 3,that lack of formal training would result in reliance among Lay participants on a commonsense index lower in construct validity, while FDEs relied on an index with higher construct validity; hypothesis 5, that high discriminant validity would be demonstrated; hypothesis 6, that the formalized index used by FDEs would be more comprehensive than the commonsense index used by Lay participants; hypothesis 7, that FDEs would find evidential weight in a greater variety of features than would Lay participants; and hypothesis 9, that FDEs would identify a greater number of features than would Lay participants.

Recall that Droll and Hayhoe (2007) found differences in eye movement among participants who knew in advance that the information they were about to see was relevant to the next sorting task they would be performing. Droll and Hayhoe suggested that the changes in visual behavior were related to changes from participants’ use working memory (in cognitive terms, information to which one is able to attend for a limited amount of time, and which is not permanently stored in long-term memory without some form of elaboration or rehearsal) to participants’ reliance on gaze. They concluded that this trade-off is largely determined by the demands of the task, and that the participants’ sensitivity to changes in the visual stimuli (sometimes referred to as “change blindness”) is an important determinant of where the brain looks, what it attends to, and what it subsequently remembers (Droll & Hayhoe, 2007).

Known signature analyses demonstrated that the mean fixation count among FDEs was greater than that for Lay participants on the known signature stimuli. This indicates that FDEs attended to a greater amount of information contained within the known signature specimens than did Lay participants, and is consistent with Droll and Heyhoe's findings. Among both FDE and Lay participants the mean fixation count for text-based signatures was significantly lower than that for mixed signatures for both high complexity and low complexity signatures, although the greater number of fixations for FDEs suggests an expertise effect.

Fixation duration for the known signature stimuli was also significantly greater among FDEs than among Lay participants. The mean fixation duration for text-based signatures was significantly lower than that for mixed signatures and for stylized signatures among both FDEs and Lay participants, and fixation duration was significantly greater among FDEs than among Lay participants for high-complexity mixed and high complexity stylized signatures. This is also consistent with Droll and Hayhoe's findings.

Mean visit count for the known signature stimuli was also was greater on average among FDEs than that among Lay participants. Among both FDE and Lay participants, mean visit count for text-based signatures was significantly lower than that for mixed signatures, but no differences were found for signature complexity. Visit count among FDEs was greater than that among Lay participants for mixed signatures than for text-based or stylized signatures.

Visit duration for the known signature stimuli was also significantly greater among FDEs than among Lay participants. Among both FDE and Lay participants the mean visit duration for text-based signatures was significantly lower than that for stylized signatures. Visit duration was significantly greater among FDEs than among Lay participants for high complexity mixed and high complexity stylized signatures.

These findings indicate that FDEs spent a greater amount of time systematically investigating the range of variation among the known signatures and identifying features that might carry evidential weight prior to beginning the questioned/known comparison, and provide support for Droll and Hayhoe's argument that sensitivity to changes in the visual stimuli (sometimes referred to as "change blindness") is an important determinant of where the brain looks, what it attends to, and what it subsequently remembers (Droll & Hayhoe, 2007).

Eye-tracking analyses for the actual questioned/known signature comparisons revealed that FDEs approached the comparison aspect of the tasks differently from the Lay participants. The mean fixation count among FDEs was again greater than fixation count and fixation duration for Lay participants. The mean fixation count for mixed signatures and text-based signatures was significantly higher than that for stylized signatures, and among both FDEs and Lay participants the mean fixation count for stylized signatures was significantly lower than that for mixed signatures for both high complexity and low complexity signatures.

Fixation duration among FDEs was also significantly greater than that among Lay participants, particularly for text-based and mixed signatures. The mean fixation duration for text-based signatures was significantly lower than that for mixed signatures and for stylized signatures among both FDEs and Lay participants.

Visit count among FDEs was greater than that for Lay participants. Among both FDE and Lay participants, mean visit count for text-based signatures was significantly greater than that for mixed and stylized signatures, particularly among FDEs viewing the low complexity text-based signatures.

Mean visit duration was greater among FDEs than among Lay participants across signature type and signature complexity. For FDEs, this effect was greater among mixed signatures and less among text-based and stylized signatures.

Similar to the results of the known signature analyses, the results of the questioned/known comparison eye-tracking analyses demonstrate expertise effects in the deployment of attentional and cognitive resources, and the differences in accuracy between FDEs and Lay participants indicate that the two groups weight the available information differently. Additional information about the systematic analyses employed by FDEs can be empirically observed by examining the heat maps and gaze plots of individual FDE and Lay participants.

Recall that Busey and colleagues (2013) found that fingerprint experts and lay participants were both able to correctly identify true correspondences between points on two separate fingerprint images, similar to our own findings for FDE and Lay participants. The similarity in visual locations identified by both our study and that of Busey et al. is consistent with the findings of Dyer et al., but Busey and colleagues noted a difference between experts and lay participants in the temporal sequences and length of their saccades. According to Busey and colleagues, shorter and more numerous visual saccades observed among the experts suggested that experts may have been identifying multiple corresponding points in an area, while the lay participants may have been limited to making point-by-point visual correspondences. Figure 3.2.QK.14 presents gaze plots for two signatures, viewed by two different FDEs (on the left) and two different Lay participants (on the right). The gaze plots clearly demonstrate the differences in fixation count (each numbered dot represents a fixation) and fixation duration (the size of the numbered dots indicated that a greater amount of time was spent in that area), which is consistent with the findings of Busey and collegues.

The gaze plots for these comparisons clearly demonstrate the phenomenon described by Busey and colleagues, and provide support for the argument that differences in expertise are revealed by examining the pattern and sequence of the eye movements. According to Busey et al. (2013), the shorter saccades are consistent with the expertise literature on pattern learning and memory, and provide indirect evidence of "a 'chunking' strategy in which several features are placed into working memory" (p. 21). Busey and colleagues concluded that examining these clusters of short-saccade fixations, which they referred to as a "bag of fixations approach" (p. 21), may be more diagnostic of the individualizing characteristics of the stimuli than may focusing on fixation pairs separated by a single saccade.

Tachistoscope/Extended View

This protocol was originally conceptualized as a distraction task to separate the questioned/known signature protocol from the peer review protocol (in which participants examined previously-viewed signatures). Although we did not propose any formal hypotheses for these data, the tachistoscope/extended view protocol provided an opportunity to further explore some of the characteristics of expertise.

The development of expertise involves extensively greater proceduralization of problem-solving skills, tactics, and strategies. The cognitive advantages of perceiving and storing problems in terms of patterns, as well as the research demonstrating that experts in most domains are able to solve problems more quickly than are non-experts suggested that even when given a short period of time to view a signature, FDEs should in most instances outperform Lay participants when making process decisions. This difference should be even more pronounced when participants were given the opportunity to view the signatures for an extended period of time.

As anticipated, FDEs were more accurate overall than were Lay participants in both the tachistoscope view and the extended view of the signatures, although this varied among individual signatures. As with the signatures in the single signature protocol, the amount of information available to the participants was limited due to the absence of known signature specimens. Even without the range of variation information usually available to FDEs in signature identification tasks, FDEs were able to make correct calls in 1,399 of the 1,957 calls (71.5% accuracy), compared to Lay participants, who made correct calls in 1,109 of 1,720 calls (64.5% accuracy). This finding is consistent with previous research demonstrating that FDEs outperform Lay participants on a variety of tasks (Kam, Wetstein, & Conn, 1994; Kam, Fielding, & Conn, 1997; Kam, Gummadidala, Fielding, and Conn, 2001; Sita, Found, & Rogers, 2002; Found & Rogers, 2005; Kam & Lin, 2003; Dyer, Found, & Rogers, 2006). These findings provide additional support for hypothesis 1, high construct validity for identity; hypothesis 3, lower construct validity for the index used by Lay participants; hypothesis 5, high discriminant validity between FDEs and Lay participants; hypothesis 6, a more comprehensive formalized index used by FDEs than by Lay participants; hypothesis 9, that FDEs would make more distinctions among features than would Lay participants; hypothesis 10, that FDEs would make more accurate calls than would Lay participants; and hypothesis 12, higher inter-rater reliability among FDEs than among Lay participants.

FDEs tended overall to call signatures genuine more frequently than did Lay participants, and this tendency accounted for a substantial number of the incorrect calls made by FDEs. FDEs were less likely than Lay participants to incorrectly call a genuine signature a simulation. The finding that FDEs made more erroneous calls for genuine signatures is inconsistent with previous research by Kam, Wetstein, and Conn (1997), who found that FDEs were significantly less likely than Lay participants to mistakenly match documents written by different people, although we must note that far more evidence was available to the participants in the Kam et al. study. Our findings are also inconsistent with research by Kam, Gummadidala, Fielding, and Conn (2001), who reported that FDEs designated non-genuine signatures as genuine in 0.49% of cases, and genuine signatures as non-genuine in 7.1% of cases.

Given the limited information available overall, and the limited amount of time given to view the signatures in the tachistoscope view, these findings suggest that features such as line quality, speed and fluidity of execution, and other indicators of writing skill are valid and important indicators of signature authorship that are reliably used by FDEs to reach signature process decisions. They are consistent with the findings of Dyer et al. (2006), whose research suggested that FDEs and Lay participants may use different cognitive processes when evaluating signatures, which is consistent with current theories of expertise. This also supports hypothesis 5, greater discriminant validity for FDEs than for Lay participants; and hypothesis 6, a more comprehensive formalized index used by FDEs compared to Lay participants. Although hypothesis 13 and hypothesis 14 were not fully supported, these findings suggest that there is an expertise effect, such that FDEs are able to gather more information from minimal exposure to the signatures than are Lay participants, even though this effect is statistically unrelated to the amount of education, training, or experience among the FDEs.

As described earlier, the development of expertise involves extensively greater proceduralization of problem-solving skills, tactics, and strategies. The cognitive advantages of perceiving and storing problems in terms of patterns, as well as the research demonstrating that experts in most domains are able to solve problems more quickly than are non-experts, suggested that even when given a short period of time to view a signature, FDEs should in most instances outperform Lay participants when making process decisions. Our findings are consistent with the differences that might be expected given the different levels of expertise among the two groups. Compared to Lay participants, FDEs were in fact able to reach a greater number of correct calls after viewing the signatures for only one second. This difference was in fact even greater when participants were given the opportunity to view the signatures for an extended period of time.

These findings are consistent with those of Blake (1995), who found that 91% of FDEs were able to positively or highly probably identify the author of a robbery note. Blake found that FDEs demonstrated high consensus when ranking the evidential value of letters, regardless of whether they rated evidential value of the letter as high or low, while the student control group reached only good agreement with certain letters with high evidential value was found. Blake found that the FDEs were able to utilize their prior knowledge of letter forms and other aspects of handwriting to inform their evaluative process. Students, on the other hand, had no background upon which to rely and tended to see significance when letter forms matched without analyzing less obvious aspects of handwriting that the FDEs utilized.

Peer Review Protocol

The peer review protocol was designed to investigate the effect of prior information about an examination outcome on the subsequent peer review decisions for previously viewed signatures. A substantial body of empirical evidence supports the idea that the influence of confirmation bias is extensive, potent, and that it may be manifested in a variety of ways (Nickerson, 1998). Confirmation bias is defined as a tendency to search for or interpret new information in a way that confirms one's preconceptions and avoids information and interpretations which contradict prior beliefs (Oswald & Grozjean, 2004). Confirmation bias is a type of expectancy effect that manifests as a cognitive bias, representing an error of inductive inference that favors either the confirmation of the hypothesis under study or disconfirmation of alternative explanations, and has long been believed by philosophers to be an important determinant of thought and behavior (Nickerson, 1998). Jonas et al. (2001) found that a preliminary decision may in fact be sufficient to evoke confirmation bias in subsequent decisions.

Many researchers, forensic practitioners, and legal professionals have recognized the potential sources of bias which exist in the forensic casework environment, such as case exhibits, interactions with law enforcement officials or colleagues, implicit assumptions about the source of forensic specimens, and other extraneous sources of information (Found & Ganas, 2013). Although these sources of potential domain irrelevant information have been acknowledged, to date few agencies have attempted "context management" (Found & Ganas, 2013, p. 154) to minimize these possible sources of bias.

Nickerson (1998) highlighted two paths by which confirmation bias occurs: (1) the preferential treatment of evidence that supports existing beliefs, and (2) the overweighting of positive confirmatory instances. The preferential treatment of evidence that conforms to what an individual believes does not necessarily entail completely ignoring contrary information, but it has been empirically demonstrated that selective attention and selective information seeking do occur. FDEs are often faced with time constraints and other conditions that may enhance the potency of confirmation bias if it exists in their analyses. This procedure investigated the extent to which FDEs and Lay participants differentially utilized information that was available to them (selective attention) and the extent to which they sought further information that supported their initial evaluation (selective information seeking).

Confirmation bias is defined as a tendency to search for or interpret new information in a way that confirms one's preconceptions and avoids information and interpretations which contradict prior beliefs (Oswald & Grozjean, 2004). We manipulated a subset of the process calls made by FDEs and Lay participants during the questioned/known comparison procedure so that some of them were the same call and some of them were a different call, and presented the previously viewed signatures as the results of a "prior examination" in which the calls had been made by a "previous examiner". We told the participants the results of the "prior examination", and asked the FDEs and Lay to give their own process and authorship calls.

Overall, FDE process calls were more consistent with their original calls than were those among Lay participants when the calls were genuine or simulated, but slightly less consistent when the calls were disguised. These data seem to indicate that FDEs and Lay participants are in some cases equally as likely to be influenced by contextual information about the outcome of a prior examination, but we observed this pattern not only in manipulated calls, but also in unmanipulated calls. In other words, we observed spontaneous changes in the peer review calls even when the "prior examination" results were the same as the participants' original calls.

One explanation of this outcome is that both the FDEs and the Lay participants were influenced by demand characteristics, although different demand characteristics may have influenced the two groups differently. The "Hawthorne effect", which is a term used to describe a particular form of demand characteristic that causes changes in behavior when individuals know that they are being observed, may have been a factor among the FDEs, even though they were informed that all identifying information would be removed from their responses prior to analysis. Lay participants may have assumed that the "prior examiners" were experts, and deferred to what they assumed to be opinions made by better qualified individuals. This finding has implications for courtroom practice, as it speaks to the influence that "expertise" exerts over inexperienced lay individuals.

FDEs were more accurate than were Lay participants across signatures and across signature views, regardless of whether the questioned/known process call was manipulated. This finding supports hypothesis 10, that FDEs would be more accurate than would Lay participants. Among both FDEs and Lay participants there was a pronounced increase in the percentage of correct-to-incorrect call changes when the calls were manipulated, compared to when the calls were not manipulated. Overall, FDEs moved their calls from incorrect to correct in a greater percentage of cases than did Lay participants, and when the process calls were not manipulated moved their calls from correct to incorrect to a lesser extent.

FDEs were far more likely than were Lay participants to place their authorship calls in the inconclusive category. This suggested that although FDEs were required by the protocol to make a process call of genuine, disguised, or simulated, they may have felt there was insufficient information contained in the signature specimens to allow them to reliably identify or eliminate the writer of the questioned signatures as the writer of the known signatures. This finding supports hypothesis 16, that knowing the outcome of a previous examination would influence the level of confidence FDEs and Lay participants had in their decisions. However, an alternative explanation for this finding may be that this is another instance of a Hawthorne effect, and that FDEs were more conservative with their authorship calls because they were being observed. Conversely, the distribution of Lay participant authorship calls indicated that compared to FDEs, Lay participants tended to be less conservative, expressing greater confidence for those calls. This suggests that Lay participants may have afforded somewhat greater weight to the features they evaluated than did the FDEs. These findings again seem to support hypothesis 16, although demand characteristics may also have been an influence.

The mean authorship confidence rating for the known comparison signatures was significantly lower among FDEs than among Lay participants in both the questioned/known comparison view and the peer review view. The mean authorship call confidence was greater among participants whose peer review process call matched questioned/known comparison call given to the participants during the peer review procedure (although individual analyses demonstrated that this was true only for those calls that were not manipulated). The mean authorship confidence rating in the peer review protocol was lowest among both FDE and Lay participants when the questioned/known signatures were manipulated. This finding supports hypothesis 16.

These findings are consistent with those of Edwards and Smith, who found that individuals viewed arguments that were consistent with their beliefs more favorably than arguments that contradict their beliefs (Edwards & Smith, 1996), and that supporting information seems more credible and valid than information that fails to support prior beliefs. Edwards and Smith concluded that this differential evaluation of supporting and conflicting arguments appears to induce a preference for supporting information even without any motivation to have one's preferences or prior decisions confirmed.

These findings are also consistent with those of Frey and colleagues (as cited in Frey & Schulz-Hardt, 2001), who found that people tend to prefer supporting information if they have decided voluntarily for a particular alternative (Frey, 1981d; Frey & Wicklund, 1978), and the sources of information are experts rather than lay people (Frey, 1981a). In the case of FDEs, the knowledge that they were being evaluated on a domain of career-relevant behavior may have produced results that are consistent with the findings of Frey and colleagues (1986), who found that confirmation bias was stronger in anxious individuals, and also consistent with Frey's findings that confirmation bias increased if there were heightened costs associated with the information search (Frey, 1981c).

Results of the eye-tracking analyses did provide support for hypothesis 15, that knowing the results of a prior examination would influence the extent of information extraction, the use of extracted information, and the amount of time spent by FDEs and Lay participants. Eye-tracking results revealed differences in the utilization of available information and the seeking of certain kinds of information, consistent with the research described above. The mean fixation count for the known comparison signatures was greater for FDEs than for Lay participants, and there was a significant change in fixation count from the first time the signatures were viewed (QK) to the second time it they were viewed (PR), regardless of whether we manipulated the call in the peer review view.

Mean fixation duration in the known comparison signatures was greater for FDEs than for Lay participants, there was a significant increase in fixation duration from the first time the signatures were viewed (QK) to the second time they were viewed (PR), regardless of whether we manipulated the call.

The mean visit count in the known comparison signatures was greater for FDEs than for Lay participants, and there was a significant change in visit count among both FDE and Lay participants from the first time the signature was viewed (QK) to the second time it was viewed (PR), regardless of whether we manipulated the call in the peer review view. The interaction effect revealed that this increase was more pronounced among FDEs in the peer review view than among FDEs or Lay participants in the other conditions.

The mean visit duration in the known comparison signatures was greater for FDEs than for Lay participants, and there was a significant change in visit duration among both FDE and Lay participants from the first time the signature was viewed (QK) to the second time it was viewed (PR), regardless of whether we manipulated the call in the peer review view. The interaction effect revealed that this increase was more pronounced among FDEs in the peer review view than among FDEs or Lay participants in the other conditions.

Participants were not aware of the outcome of the "prior examination" as they were examining the known signatures in the peer review condition, so the increases in fixation count, fixation duration, visit count, and visit duration observed among the FDEs and Lay participants in the peer review condition strongly suggest that demand characteristics were involved in these outcomes. It seems likely that participants were impacted by the knowledge that they were being observed, and this may account for the statistically significant increases for these metrics revealed during our analyses, particularly for the significantly greater increases observed among the FDEs when compared to the Lay participants.

Fixation count for the questioned/known comparison was greater among FDEs in the peer review view than among FDEs in the questioned/known comparison view. Fixation count was greater among FDEs than among Lay participants in both call change manipulation conditions. This difference was even more pronounced among Lay participants in the peer review view.

The mean fixation duration in the questioned signatures was greater for FDEs than for Lay participants, and there was a significant change in fixation duration from the first time the signature was viewed (QK) to the second time it was viewed (PR), regardless of whether we manipulated the call in the peer review view.

The mean visit count in the questioned signatures was greater for FDEs than for Lay participants, and there was a significant change in visit count among both FDE and Lay participants from the first time the signature was viewed (QK) to the second time it was viewed (PR), regardless of whether we manipulated the call in the peer review view. This increase was more pronounced among FDEs in the peer review view than among FDEs or Lay participants in the other conditions.

The mean visit duration in the questioned signatures was greater for FDEs than for Lay participants, and there was a significant change in visit duration among both FDE and Lay participants from the first time the signature was viewed (QK) to the second time it was viewed (PR), regardless of whether we manipulated the call in the peer review view. This increase was more pronounced among FDEs in the peer review view than among FDEs or Lay participants in the other conditions, and more pronounced in the change condition than in the no change condition.

Overall, these findings provide tentative support for Found and Ganas's assertion that domain irrelevant information has the potential to introduce bias into human decision making processes, although the extent to which our findings are due to the manipulation of the prior examination outcomes or to demand characteristics is difficult to ascertain from these data. It is clear from the eye-tracking data that the call manipulations impacted the subsequent deployment of attentional resources, and the data suggest that changing the original calls may have resulted in a greater extent of bottom-up cognitive processing as participants engaged in more extensive evaluation of signature features. However, given the indications that demand characteristics may also have contributed to these changes, these findings must be interpreted with caution.

Qualitative Interview

Purdy (2006) stated "…handwriting usually consists of personalized letter forms accompanied by certain idiosyncrasies and preferences that give an individual's handwriting a distinctive appearance. Some of these manifestations are quite unusual and can carry considerable weight when conducting a handwriting comparison…FDEs usually assign significance to each feature based on how rarely it occurs in writing by the general population and how consistently the feature appears in repetitions of the same letter or word written by a particular individual…The cornerstone of handwriting identification is the presence of a significant combination of unusual habitual features in both the questioned and specimen handwriting. However, if two documents were *not* [emphasis in original] prepared by the same writer, this can often be established by the presence of significant or irreconcilable differences" (p. 60). Thus, it is important to investigate not only what features are attended to using the eye-tracking methodology described above, but also how these features are interpreted and applied by individual examiners.

The results of the qualitative interview provide additional support for a number of hypotheses. Our qualitative and quantitative data support McClary's (2006) description of the variety of features of handwriting specimens that FDEs are trained to evaluate. While Lay participants focused to a greater extent on individual feature characteristics such as arches, eyelets, hooks, shoulders, connections, troughs, or other individual features, they appeared less likely to use holistic features such as alignment, slant, pen lifts, rhythm, the size of the writing, the slope or slant of the letters, or other characteristics which may also be diagnostic of the process used to create the signatures. This finding supports hypothesis 2, that high convergent validity would be demonstrated for the eye-tracking and self-report measures; hypothesis 4, lower convergent validity for the use of the commonsense index among Lay participants than for the formal index used by FDEs; hypothesis 5, high discriminant validity between FDEs and Lay participants; hypothesis 6, the more comprehensive index used by FDEs; hypothesis 7, that FDEs would report that a greater variety of features carry evidential weight than would Lay participants; and hypothesis 9, that FDEs would identify a greater number of factors than would Lay participants.

The consistencies in the deployment of attentional resources by FDEs and Lay participants revealed in the eye-tracking data and in the qualitative interview data support the idea that FDEs used a large and well-specified index of handwriting features as evidence upon which to make their decisions, while Lay participants used a narrower range of features for this purpose. These findings support hypothesis 3, that lower construct validity would be demonstrated because Lay participants use a commonsense index consisting of fewer features than do FDEs. These findings are consistent with the conclusions of Dyer and colleagues (2006), who proposed that that FDEs and Lay participants used different cognitive processes during signature identification tasks. They are also consistent with the 1995 and 2007 studies, in which Blake found that experts and novices ranked the evidential value of signature attributes differently, and that novice rankings were less consistent than those of FDEs. These findings support hypothesis 8, that Lay participants would report consistently high evidential weight for the features they identified, while the evidential weight would be more varied for FDEs.

Our findings are also consistent with the series of studies conducted by of Kam and colleagues (Kam et al., 1994; Kam et al., 1997; Kam et al., 2001). These researchers consistently found that FDEs outperformed novices in a variety of handwriting identification tasks. Although we obtained varied results among our several protocols and sample of over 100 signature specimens, overall our qualitative and quantitative findings support Kam's conclusions that forensic document examination is a distinct field of expertise, and that overall FDEs are more accurate than are novices when asked to determine whether signatures are genuine or simulated in some way. Our findings are also consistent with those of Dyer and colleagues, who similarly found that FDEs were significantly more accurate at determining whether signatures were genuine or simulated than were lay participants.

Our qualitative and quantitative findings also support the conclusions of Busey and colleagues (2013), who found that their professional examiners and lay participants appeared to differ in their deployment of attentional resources, and who suggested that different search strategies and cognitive processes which were identifiable through the durations and temporal sequences of their fixations.

<u>In Summary</u>

Based on the results we have obtained from the survey, the eye-tracking procedures, and the qualitative interview we conclude:

- ✓ Hypothesis 1: We predicted that high construct validity for identity would be demonstrated in the self-report and eye-tracking tasks for FDEs (intra-group). *This hypothesis was supported.*

- ✓ Hypothesis 2: We also predicted that high convergent validity, or the extent to which identity is measured by two different methods (eye-tracking and self-report), would be found for FDEs. *This hypothesis was supported.*

- ✓ Hypothesis 3: We predicted that due to lack of formal training on all the features of the document examiner index[1] and use of a commonsense index, lower construct validity for the index would be demonstrated for identity in laypeople, as measured by eye-tracking and self-report. *This hypothesis was supported.*

- ✓ Hypothesis 4: We also predicted that lower convergent validity would be demonstrated among Lay participants. *This hypothesis was supported.*

- ✓ Hypothesis 5: We predicted that high discriminant validity will be demonstrated between FDEs and laypeople. *This hypothesis was partially supported.*

- ✓ Hypothesis 6: We predicted that the formalized index used by FDEs would be more comprehensive than the commonsense index used by laypeople. *This hypothesis was supported.*

- ✓ Hypothesis 7: We predicted that FDEs would report that a greater variety of features carry high evidential weight than would Lay participants. *This hypothesis was supported.*

- ✓ Hypothesis 8: We predicted that Lay participants would report consistently high evidential weight for those features they identified, while the evidential weight of features would vary more for FDEs. *This hypothesis was supported.*

- ✓ Hypothesis 9: We predicted that FDEs would identify a greater number of factors (e.g., make more distinctions among the features) than would Lay participants. *This hypothesis was supported.*

- ✓ Hypothesis 10: We predicted that FDEs would make more accurate calls than would laypeople. *This hypothesis was supported.*

[1] It was necessary to give the Lay participants some training concerning the types of information FDEs use when making their decisions so that they would be able to complete the tasks. The overall project training took approximately an hour and a half to complete, but the portion of the training dedicated to the index of features was a relatively small part of the training.

- ✓ Hypothesis 11: We predicted that FDEs would make a greater number of qualified calls, indicating that they afforded different evidential weight to the features they evaluated. *This hypothesis was supported.*

- ✓ Hypothesis 12: We predicted that inter-rater reliability among FDEs will be higher than will inter-rater reliability among laypeople. *This hypothesis was supported.*

- ✓ Hypothesis 13: We predicted that the extent and kind of training, education, and experience would be related the type and number of features FDEs extracted and the weight they assigned this information. *This hypothesis was not supported.*

- ✓ Hypothesis 14: We also predicted that the number of years of education, training, and experience would reliably predict the extent to which FDEs outperform laypeople on signature tasks, such that examiners with more years of training and experience would outperform both FDEs with fewer years of experience and Lay participants. *This hypothesis was not supported.*

- ✓ Hypothesis 15: We predicted that information about the outcome of a prior examination would systematically influence the extent of information extraction, the use of extracted information, and the amount of time spent by the FDE or Lay participants (selective attention, selective information seeking) when making a call on the signature comparison . *This hypothesis was supported.*

- ✓ Hypothesis 16: We also predicted that information about the outcome of a prior examination would increase the degree of confidence FDEs and Lay participants had in their decisions, while knowledge about a prior contrary outcome would decrease the confidence they had in their decisions. *This hypothesis was supported.*

Implications for Policy and Practice

<u>Consequences of Erroneous Findings</u>

Challenges to the admissibility of forensic document examination after *Daubert* and *Kumho* have brought into focus some important issues for all areas of forensic science. The serious consequences of erroneous findings are of paramount importance to litigants, attorneys, judges, experts, and scholars. Many forensic document examiners have taken seriously the need for standardized training and proficiency testing, and are working to define and establish valid and reliable measures of proficiency and error. Forensic experts are striving to ensure that their methods are transparent to the courts, and that judges are given the information they need to make their decisions. Efforts to organize and present information effectively have been an important consequence of the *Daubert* trilogy. Forensic scientists are also seeking opportunities to collaborate with judges, attorneys, and scientists from other fields on research and education projects.

While acknowledging the importance and utility of the forensic disciplines, the Forensic Science Committee of the National Academy of Sciences also addressed the perceived flaws in such evidence. Erroneous or misleading forensic evidence has contributed to the wrongful conviction of innocent individuals (Strengthening Forensic Science, 2009). The report called for improvements in forensic science practices, arguing that increased and demonstrated reliability and validity in forensics will help law enforcement investigations by improving the reliability of identifications. Homeland security efforts will also improve as improvements are made in the methods and procedures of the forensic disciplines (2009).

The severe consequences for others resulting from erroneous conclusions in live casework (e.g., denying someone their life, liberty, or property) makes the nature of expertise and the detection of possible sources of bias in the forensic sciences crucial areas of inquiry. This study provided information about visual attention to handwriting features, the extraction and use of information from signatures, and the influence of features of writing on examiner and layperson decision making. The study also provided information about the possible biasing effects of information about prior examination outcomes, and information about the strengths and weaknesses of current education and training practices, with suggestions about how those practices might be improved.

Valid and Reliable Measures of Proficiency and Error

The extensive scrutiny of the methods and findings of numerous areas of expert testimony following what Margaret Berger (2000) called "the *Daubert* Trilogy" has prompted acrimonious debate among academicians, forensic practitioners, and legal professionals concerning what has been referred to by the Forensic Science Committee of the National Academy of Sciences ("Committee") as "faulty forensic science analyses" (Strengthening Forensic Science, 2009, p. 4).

According to the Committee, the admissibility of forensic expert testimony should rest on two questions: (1) to what extent is the forensic discipline based upon reliable scientific methodology which results in accurate analysis and reporting of findings; and (2) to what extent does the discipline rely on subjective interpretation of evidence, which may be subject to bias or error, rather than sound operational procedures and robust performance standards?

Dr. Itiel Dror cogently pointed out that the dichotomy between "objective" and "subjective" inquiry is neither accurate nor fruitful. Rather, empirical observation exists on a continuum, and most forensic inquiries fall somewhere between the extremes of pure objectivity and pure opinion (Dror, 2013). Dr. Dror argued that even subjective, experience-based expert opinion can be accurate and valuable, despite the possibility that such expert opinion may be at increased risk from error, bias, and contextual influences. He made the important point that "even with quantification and statistical tools, the human element still plays a critical role, and therefore cognitive issues may continue to play an important role even in the less subjective domains of forensic science" (2013, p. 81).

Those who are critical of the current state of knowledge concerning the validity and reliability of various domains of forensic have argued that members of the judiciary have failed to sufficiently address the shortcomings of the forensic science evidence proffered in criminal trials. Specifically, critics of forensic document examination have argued that little empirical evidence exists to support the validity and reliability of the methodology and findings of forensic document examination (see Denbeaux & Risinger, 2003; Faigman, Kaye, Saks, Sanders & Cheng, 2006; Faigman, Kaye, Saks, & Sanders, 2002; Risinger, Denbeaux & Saks, 1989; Saks, 1989, 2003; Saks & Koehler, 2005; Saks & Vander Haar, 2005).

The results of the current study provide important empirical support for the validity and reliability of the foundations and methods forensic document examination. The combination of objective eye-tracking measures and qualitative descriptive data demonstrated that FDEs used both top-down and bottom-up cognitive processes and an extensive range of information present in the signature specimens to reach their decisions. FDEs are taught and trained not only to recognize the features that are present or absent within a signature, but also to weigh the significance of such features given the context of the examination. During the qualitative interviews, Lay participants discussed features that were different from each other, but FDEs additionally discussed what processes those features implied. For example, one FDE commented that differences in the slant of the signature or differences in the beginning letters of words were a common indicator of disguise because these features are obvious changes and easy for the signature writer to deny. FDEs consistently evaluated a greater variety of features and performed more extensive evaluations as indicated by the significant differences observe in the eye-tracking data than did Lay participants.

Expertise

Some scholars have argued that too little research supports the claim that forensic document examiners (FDEs) outperform jury eligible lay people in successfully identifying the source of questioned handwriting samples (Denbeaux & Risinger, 2003; Risinger, et al., 1989). The results of this study demonstrated that overall call accuracy among FDES was better than that among Lay participants. These findings are consistent with previous research concerning the existence of a specific domain of knowledge and expertise among FDEs. Although call accuracy among FDEs was consistently more accurate than that among Lay participants, in some instances the opposite was true. Additional research to address the relationships among signature type and complexity and call accuracy should incorporate additional methodologies, such as casework simulations conducted in conditions similar to those in document examination laboratories.

Others argue that the subjective methodology and inconsistent methods of reporting findings fail to reach the level of scientific methodology (see Faigman et al., 2006; Faigman et al., 2002; Risinger et al., 1989; Saks & Koehler, 2005; Saks & Vander Haar, 2005). The present study provided evidence that FDEs engage in a systematic evaluation of signature features, and that they assign meaning to these features based on common principles that are quite consistent across most trained examiners. This research supported the reliability and validity of the current methods, even though the interpretation of the features is subjective on the part of the individual examiner.

Expectancy Effects and Confirmation Bias

Questions have also been raised both in court and in a number of scholarly treatises and articles that the conclusions of FDEs may be biased due to the lack of blind review of examination results (see Risinger et al., 1989). In addition to exploring the cognitive processes that guide forensic document examination, we will explore potentially biasing social dynamics that may occur within the forensic lab environment. The use of the peer/technical review system as a quality control measure has the potential to introduce expectancy effects into the evaluation process. Confirming or disconfirming the presence and extent of expectancy effects may enable practitioners to control for the influence of such effects through education, training, and possible adjustments to evidence handling protocols which may inadvertently introduce bias into examination procedures.

The present research suggests that lack of blind review may indeed be problematic, but our findings must be interpreted with caution due to the possible effects of demand characteristics. This study demonstrated that FDEs were less influenced by information about a prior examination than were Lay participants, and were also less confident about their decisions. Additional research in this area is needed to clarify the relationship between lack of blind review and peer/technical review outcomes.

Standardized Training and Proficiency Testing

The Committee's review revealed several challenges related to forensic document examination, including practitioner certification, accreditation, and the availability of skilled, well-trained personnel (Strengthening Forensic Science, 2009). Many areas of forensic science lack of uniformity in training, accreditation, and practice standards. The report stated that operational principles and procedures for many disciplines are not standardized between or within jurisdictions, and attempts at standardization are not viewed favorably in many instances, and that even protocols such as Scientific Working Group (SWG) standards "often are vague and not enforced in any meaningful way…These shortcomings obviously pose a continuing and serious threat to the quality and credibility of forensic science practice" (Strengthening Forensic Science, 2009, p. 6).

By using the eye-tracking methodology, the qualitative interview, and the survey procedures discussed above, this study provides insight into the cognitive and behavioral aspects of FDE task performance. This information will facilitate the development of greater standardized training and testing procedures.

The most common factor that FDEs cited as a positive contributor to their training was access to high-quality materials. FDEs reported that the availability of textbooks, publications, and actual cases allowed them to build upon the knowledge and experience of their mentors. Hands-on experience with highly skilled trainers was listed among the more common contributors to high-quality FDE training. Finally, FDEs reported that the repetition inherent in working through a large number of cases gave them experience that directly applied to work that they would be doing in the field. Some participants indicated that being taught to take a conservative approach to document examination ensured that their opinions and conclusions were defensible and supported by evidence.

Many of the areas recommended for improvement parallel factors that FDEs listed above as what made for high quality training. Some FDEs recommended that training should include more hands-on practice and practical experience. FDEs also recommended that programs provide more structure throughout the training process and that this structure should be standardized across training programs. Some participants stated that they would have liked to get more experience with outside laboratories and experts in order to maximize the variety of experiences and viewpoints from which trainees can learn. Some participants stated that training needs to account for the increased use of digital means through which many questioned documents are originally created (e.g., the ability to critically examine documents existing in digital form or created from a printer. Some participants suggested that the training process should be longer in order to better prepare FDEs for work in the field.

This qualitative information demonstrates a recognized need among members of the field to establish as set of standard core competencies that indicate mastery in the field, and education curricula and training methods that are specifically designed to provide training in those areas of competencies. This training should include opportunities for experiential learning, lab work, and exposure to a variety of work environments.

This research investigated the relationship between the number of certifications held by FDEs and their call accuracy. Although we found no statistically significant relationship between these factors, the most frequent comment about FDE certification was the belief that certification is absolutely necessary and should be pursued following training and prior to working with any court cases. Some FDEs said that they believe the training and certification process should be standardized, and several FDEs believed that ABFDE standards (compared to BFDE standards) are the only acceptable standards on which certification should be based.

Transparent Methods

Daubert, Joiner, and *Kumho,* agents of change in a time of rapid advances in science and technology, have given FDEs much to consider as they rise to the challenges created by changing definitions of evidentiary reliability. In her 2001 article *Fingerprint Evidence in an Age of DNA Profiling,* Jennifer Mnookin wrote "…the scrutiny of expert evidence does not take place in a cultural vacuum. What seems obvious, what needs to be proven, what can be taken for granted, and what is viewed as problematic all depend on cultural assumptions and shared beliefs, and these can change over time in noticeable and dramatic ways. Whatever the ostensible legal standard used, it is filtered through these shared beliefs and common practices" (p. 13). Thus, understanding the reliability and validity of the forensic sciences is an ongoing process based on effort, critical thinking, collaboration, cooperation, communication, evaluation, discovery, and self-examination. Truly understanding the development of any field of expertise requires at the very least some recognition of the reciprocal influences of historical and social context and human agency on the development of such knowledge. The research provides important information which may be utilized by FDEs, judges, and attorneys to help ensure just outcomes for litigants.

Experts, attorneys, and judges use normative images of science to explain and legitimate decisions about relevance, sufficiency, and admissibility, although "science" itself may be discredited as just another social activity (Caudill, 2001). Thus, information heard by triers of fact does not directly represent nature. It contains a social component consisting of human agency, institutions and their norms and values, and the processes of science. Debates about the admissibility of many forms of expert testimony following *Daubert* and its progeny illustrate this social component of scientific knowledge.

The movement of expert testimony from the status of "proffer" to that of "admissible evidence" is a social process in which experts, attorneys, and judges all participate. It is a negotiated movement from "science," which is itself a social construction (Jasanaoff, 1993), to "legal science" (Caudill, 2001), which is mediated by the rhetoric and discourse of attorneys, judges, and academicians. Transparency of methods is an important component of the admissibility of FDE testimony.

The multi-method design of this study allowed us to increase the transparency of the decision making processes involved in the examination and classification of the signature specimens in our sample. These findings help to illustrate the cognitive and physiological aspects of examinations, and to inform the performance of judges, attorneys, and experts as they work together to communicate the methods and conclusions of forensic document examinations to each other and to jurors.

Collaboration across Disciplines

Judges' interpretations of their gatekeeping responsibilities under the *Daubert* trilogy have imposed more objective, stringent requirements (relevancy, legal sufficiency, and reliability) for the admissibility of some kinds of evidence which for 70 years had been considered admissible under the

Frye decision's general acceptance standard, while other kinds of evidence have remained relatively unaffected by the *Daubert* trilogy (Merlino, Murray, & Richardson, 2008). Confronted with challenges to the admissibility of their testimony, many FDEs have responded to the questions about the reliability and validity of their testimony by seeking ways to both improve their disciplines and demonstrate to judges, attorneys, academicians, and fellow experts that their underlying assumptions, methods, and conclusions meet the requirements of the *Daubert* trilogy.

Dror argued that evaluating forensic opinions requires evaluating the strength of the conclusions (2013). Examining these issues from a multidisciplinary perspective--a collaborative effort among experts from the fields of physiology, forensic document examination, and social and behavioral sciences—allows an understanding of the methods and cognitive processes of forensic document examination from multiple levels, providing a richer and more nuanced understanding of these phenomena than would be afforded by research from a single discipline. Dror wrote:

> The courtroom is not the best place…to do science and to establish the limits of the domain and the ability of the examiner. This evaluation should be done by the appropriate scientific and professional bodies…As per maximizing the value and strength of forensic opinion, it requires to understand the cognitive underpinning of expertise…Once we understand the cognitive architecture, and the strengths and weaknesses it entails, then we can develop practical best practices. (2013, p.82)

This research exemplifies the value of interdisciplinary collaboration and the use of multi-methods research designs for investigations of the validity, reliability, and accuracy of forensic science disciplines. Research such as that conducted by Busey and colleagues (2013), Droll and Heyhoe (2007), Dyer and colleagues (2006), which involve collaborations with experts from forensic science, psychology, physiology, and other areas have provided information about the nature of forensic expertise, the effects of training, and many other aspects of the more subjective fields of forensic practice. The ultimate benefits of this research are improved training, education, and proficiency, better evidence, more effective handling of such evidence by the court system, and, ultimately, better access to justice for the public.

STEM Education and Workforce Development

The research project provided teaching and training opportunities in quantitative and qualitative research methods and data analysis for approximately 20 undergraduate student research assistants from a small, historically black university, as well as education, training, and experience in survey research for graduate and undergraduate students at a larger research university. These students acted as project supervisors and experimenters. They worked directly with the participants in the eye-tracking laboratory, and also participated in coding, check-coding, check-verification, data entry and cleaning, data analysis, and preparing project deliverables for presentation and publication. Six students participated in meetings of the American Academy of Forensic Sciences, where they had the opportunity to learn about various areas of forensic science, and to meet with faculty from other institutions and practitioners in the field. This experience has especially benefitted the students at Kentucky State University, which is a small, historically black liberal arts college. This underserved population had the opportunity to engage in a national research project involving internationally-known scholars. The skills and experience these students gained has strengthened their credentials for employment and for graduate school admissions.

Successful execution of this project increased the visibility and reputation of both institutions among colleges and universities, and will enhance their ability to obtain future grant funding.

Study Limitations

As with any research, this study has several limitations. As mentioned earlier, the findings about the extent of bias introduced by information about a prior examination should be interpreted cautiously. Demand characteristics may have confounded these results. Additional research is needed to clarify the extent to which contextual information influences the outcome of peer/technical review.

A second limitation of this research is that it is experimental. The eye-tracking protocols are significantly different from the procedures and conditions present in most working document examination laboratories. While experimental research has the virtue of isolating causal factors in a controlled environment, much experimental research lacks structural verisimilitude, and this study suffers from the same limitations. The FDEs were removed from their normal working environment and placed under numerous constraints which may have impacted the accuracy of their calls. For example, the eye-tracking protocol made it necessary to limit the number of known signatures available for the questioned/known comparison task. While the FDEs were willing to work with this limitation, many of them commented that they would very seldom make any kind of call with only four known standards, and that they would have preferred more known signatures so that they could gain a better sense of the range of variation in the individual's writing. It is reasonable to assume that their accuracy would have been even higher if they had had additional known signatures.

Another limitation of this study is that FDEs were not allowed to use the equipment that they would ordinarily have used during the examinations. Many stated that they would have liked to examine some of the signatures under a microscope, or use other tools that were not available to them.

Another limitation involves the digitized images used in the eye-tracking protocols. Scanning the signatures resulted in the loss of some of the signature details, such as the order of execution of the pen strokes, or evidence of gooping or pen lifts.

Additionally, the scanned images on the eye-tracking screen were not all the same size. The size and number of signatures was determined by the size of the eye-tracker display. The questioned signature needed to be large enough to allow us to determine the location of the fixations with a sufficient degree of certainty, while at the same time we needed to display enough known signatures for comparison. Thus, the questioned signature was larger than the known signatures. This distorted the thickness of the lines, which some examiners found troubling.

A final limitation involves differences in the qualitative interviewing skills among some of the undergraduate research assistants. Some of the interviews might have been improved by more extensive probing and prompting on the part of the interviewers, which in some instances would have elicited more detailed descriptions of the examiner's decision making processes than were provided.

Implications for Further Research

The present study has provided much valuable information about the validity and reliability of forensic document examination, but it has also raised a number of additional questions.

As previously mentioned, additional research needs to be conducted to investigate the extent of bias in the peer/technical review process that is attributable to contextual information. This research is needed to confirm the tentative findings of the present research, and would inform decisions about best practices for how such evidence should be developed and presented.

Additional research is needed to investigate the attentional and cognitive processes related to the development of expertise in various areas of forensic science, particularly those in which subjective interpretation of the evidence is the basis for the expert's opinion. Eye-tracking data can continue to provide valuable information about the deployment of attention and cognitive resources, and can also inform training and education in the field.

Future research might investigate areas such as the relationships among visual context, semantic content, attentional resources, salience, bottom-up/top-down processing, perception, and feature matching in the accuracy and strength of FDE decisionmaking. It might also address the measurement properties of the nine-point opinion scale and the utility of fuzzy set theory in quantifying scale values. Additional research might address the effect of physical manipulation of signature attributes on the accuracy and strength of participant opinions.

Laboratory research which experimentally isolates various factors should ideally be removed from the laboratory in put back into the context of the working environment of the examiners. Thus, future research about the use of signature features, decision making processes, and contextual bias should be conducted in an environment similar to a working document examination laboratory to determine whether the reliability and validity of the methodology increases when examiners have access to their usual tools and resources.

Conclusion

The influence of the excellent research from which the present study draws both intellectually and methodologically must be acknowledged, particularly that of Dyer and colleagues, and Busey and colleagues, whose previous research using eye-tracking methodology informed our own. While broader in its scope, this research complements previous studies by providing greater detail about how forensic document examiners reach their opinions.

The Forensic Science Committee of the National Academy of Sciences concluded that research to establish the limits and measures of performance and the sources of variability and potential bias is badly needed, especially in those disciplines based on subjective assessments of similarity (2009). While our research offers an interdisciplinary understanding of these issues encompassing expertise from forensic practice, social and cognitive psychology, and vision science, ongoing research is needed to strengthen our understanding of the basis and extent of expertise, to develop rigorous protocols and measures, and to establish education and training programs that consistently and comprehensively address the knowledge and skills required to establish expertise in forensic fields.

We look forward to continuing and to expanding these investigations, and to future collaborations with those professionals who are dedicated to gaining new knowledge which will facilitate growth and change in the service of justice.

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CHAPTER 6: DISSEMINATION

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Merlino, M.L., Freeman, T.M., Springer, V., Dahir, V., Hammond, D., Dyer, A.D., & Found, B.J. (2014, February). *Semantic Content and Signature Process Identification in Single Signature Specimens.* Paper presented at the 2014 Annual Meeting of the American Academy of Forensic Sciences, Seattle, WA.

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Other Presentations

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Merlino, M.L., Freeman, T.M., Springer, V., Dahir, V.B., Hammond, D., Dyer, A.D., & Found, B.J. (2012, September). *Validity, Reliability and Accuracy in Forensic Signature Identification: A Research Demonstration.* Paper presented at the Kentucky State University Fall 2012 Brown Bag Colloquium Series, Frankfort, KY.

Validity, Reliability, Accuracy, and Bias in Forensic Signature Identification

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Validity, Reliability, Accuracy, and Bias in Forensic Signature Identification

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This research empirically explored the reliability, measurement validity, and accuracy of established FDE procedures using a multi-method, multidisciplinary approach. We investigated basic issues of validity and reliability in signature comparison tasks. We also addressed the relationship between the amount and kind of training, education, and experience an examiner has had and the examiner's deployment of attentional resources and use of the information available in a variety of signature tasks. Finally, we addressed the extent of the effect of confirmation bias on the decision making processes of FDEs and a comparison group of Lay participants.

The study was conducted in three phases, and employed several methodologies. The first phase was a multimodal (Internet/phone) survey conducted with 97 fully qualified professional FDEs, which was designed to gather information about the experience, education, and credentials of our participants, and their views of the strengths and weaknesses of forensic education. The survey instrument consisted of a combination of closed- and open-ended questions concerning FDE participant education, training, experience, and certification.

The second phase, conducted with 49 FDE and 43 Lay participants as a comparison group, encompassed four different experimental eye-tracking protocols, and was conducted under controlled laboratory conditions using Tobii T-60 model binocular eye tracker systems. The signature stimuli were prepared to capture several different signature features, such as signature complexity, signature type (text-based, mixed, or stylized), and type of process used to create the signature (genuine, disguised, traced, or freehand simulation) that might be encountered as part of the FDE caseload.

The third phase was an open-ended, qualitative interview with the FDE and Lay participants. We elicited verbal descriptions about the participants' decision-making processes for a subset of eleven of the questioned/know signature comparisons. Participants were asked to describe in detail which features they felt were diagnostic in determining whether the signatures were genuine, disguised, or simulated, and how important these features were in reaching their decisions.

Eye-tracking and self-report results revealed high construct validity for the formal index used by FDEs to evaluate the authenticity of handwriting. High convergent validity was also demonstrated via the two methods, indicating that the results obtained by eye-tracking and self-report revealed similar findings. Lay participants without formal training relied on a commonsense index which demonstrated both lower construct and convergent validity.

The formalized index used by FDEs was more comprehensive than the commonsense index used by laypeople. FDEs made more distinctions among the features than did Lay participants. FDEs reported that a greater variety of features carried high evidential weight than did Lay participants. Lay participants reported consistently high evidential weight for those features they identified, while the evidential weight of features varied more among FDEs.

FDEs made more accurate calls than did Lay participants, but FDEs made a greater number of qualified calls, indicating that they afforded different evidential weight to the features they evaluated. Inter-rater reliability among FDEs was higher than that among Lay participants. The extent and kind of training, education, and experience was not related to the type and number of features FDEs extracted or the weight they assigned this information, or to the extent to which FDEs outperformed Lay participants.

Information about the outcome of a prior examination may have influenced the extent of information extraction, the use of extracted information, and the amount of time spent by the FDE or Lay participants when making a call on the signature comparison . Confirmatory information increased the degree of confidence both groups had had in their decisions. Disconfirmatory information decreased decision confidence.

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Validity, Reliability, Accuracy, and Bias in Forensic Signature Identification

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The extensive scrutiny of the methods and findings of numerous areas of expert testimony following the *Daubert* trilogy has prompted acrimonious debate among academicians, forensic practitioners, and legal professionals concerning what has been referred to by the Forensic Science Committee of the National Academy of Sciences as "faulty forensic science analyses".

The field of forensic document examination consists of a wide array of specialized tasks related to the history and preparation of questioned documents. Forensic document examiners (FDEs) identify the source of handwriting and handprinting, distinguish among genuine, forged, traced, or disguised writing; to analyze inks, papers, and other substances related to documents, and perform other scientific or technical analyses requiring highly specialized skills.

Handwriting analysis is based on the premise that handwriting is based on physiological and neurological foundations. Handwriting is a behavioral artifact, identifiable by the presence of features and characteristics within the writing (e.g., signatures, hand printing, numerals). The combination of these features individualizes the habit pattern of the writer. Thus, the two primary tenets of handwriting analysis are: (1) no two people write exactly alike in all features and characteristics when considered cumulatively and in combination (*inter*-writer variation); and (2) a person does not write exactly the same way twice (*intra*-writer variation).

One important issue which has not been adequately resolved by extant research is information about the validity of forensic document examination. If one conceptualizes the various features evaluated by FDEs as an index, then it is possible to examine them for validity, reliability, and accuracy. Our study addressed the following research questions:

- To what extent does forensic document examination demonstrate construct, content, and criterion validity? In other words, do the features and characteristics observed and evaluated by FDEs actually measure the "habits" of individual writers such that it is possible to distinguish genuine signatures from questioned signatures?
- What is the extent of inter-rater and intra-rater reliability among FDEs and laypeople in signature tasks?
- To what extent does knowing the outcome of a previous examination influence the outcome of the sequential technical (peer) review process?

This research empirically explored the reliability, measurement validity, and accuracy of established FDE procedures using a multi-method, multidisciplinary approach. The study was conducted in three phases, and employed several methodologies.

The first phase of the project was a multimodal (Internet/phone) survey conducted with 97 fully qualified professional FDEs, which was designed to gather information about the experience, education, and credentials of our participants, and their views of the strengths and weaknesses of forensic education. The survey instrument consisted of a combination of closed- and open-ended questions concerning FDE participant education, training, experience, and certification.

The second phase of the project, conducted with 49 FDE and 43 Lay participants as a comparison group, encompassed four different experimental eye-tracking protocols, and was conducted under controlled laboratory conditions using Tobii T-60 model binocular eye tracker systems. The signature stimuli were prepared to capture several different signature features, such as signature complexity, signature type (text-based, mixed, or stylized), and type of process used to create the signature (genuine, disguised, traced, or freehand simulation) that might be encountered as part of the FDE caseload.

The third phase of the study was an open-ended, qualitative interview with the FDE and Lay participants. We elicited verbal descriptions about the participants' decision-making processes for a subset of eleven of the questioned/know signature comparisons. Participants were asked to describe in detail what features they felt were diagnostic in determining whether the signatures were genuine, disguised, or simulated, and how important these features were in reaching their decisions.

The single signature protocol investigated the influence of contextual cues on the deployment of attentional resources. FDEs were significantly more accurate overall in the single comparison than were Lay participants, outperforming Lay participants in 24 of the 30 signature examinations, while Lay participants outperformed the FDEs in six of the 30 examinations. Individual signature analyses revealed that for 20 of the 30 signature specimens, a statistically significant difference was found. FDEs were significantly more accurate than were Lay participants in 17 of these 20 cases, while Lay participants were more accurate than were FDEs in the other three statistically significant cases. In nearly all the cases in which Lay participants outperformed FDEs, the call accuracy for both groups was quite low.

Overall, Lay participants were significantly more confident than were FDEs in their process decisions, except in the high complexity, stylized signature category. Confidence among both groups was higher for correct calls than for incorrect calls. Confidence was lower among FDEs who made incorrect calls than among FDEs who made correct calls. Call confidence remained fairly consistent among Lay participants.

FDEs were more accurate than were Lay participants for the text-based and mixed signatures. Lay participants were slightly more accurate than FDEs in the stylized signature, but this difference was not statistically significant. The findings that FDEs outperformed Lay participants when signatures were text-based or mixed (e.g., higher in semantic content), and that FDEs also outperformed Lay participants regardless of signature complexity, suggest that the participants relied to a greater extent on top-down processing in some contexts, and bottom-up processing in others.

Fixation count among FDEs was significantly greater than that among Lay participants. FDE fixation count remained fairly consistent between the high complexity text-based and mixed signatures, but was significantly higher for the high complexity stylized signature. This suggests that the semantic context in the text-based and mixed signatures allowed more top-down processing and required fewer fixations, while the lack of semantic context increased the need for bottom-up processing, requiring a greater number of fixations.

Fixation duration among FDEs was also significantly greater than that among Lay participants, particularly among FDEs for high complexity signatures than for low complexity signatures, while fixation duration stayed fairly consistent among Lay participants regardless of signature type and complexity.

Visit count was significantly greater among FDEs than among Lay participants, and differed according to signature type. Visit count was significantly different between high and low complexity signatures, depending on whether the signature was text-based, mixed, or stylized.

Visit duration among FDEs was significantly greater than that among Lay participants. Visit duration remained fairly consistent among Lay participants, while among FDEs visit duration decreased significantly among the low complexity text-based and low complexity stylized signatures.

The questioned/known comparison protocol was designed to explore how FDEs use the information contained within signature specimens to reach their conclusions. This investigation touched on two different but related areas of cognitive functioning—attention, and expertise.

FDEs were significantly more accurate overall in the questioned/known comparisons than were Lay participants, although Lay participants outperformed FDEs in 9 of the 66 signature comparisons. Although Lay participants did outperform FDEs in these instances, in nearly all cases there was very low overall accuracy among both FDEs and Lay participants, and the difference between FDEs and Lay participants was quite small. The difference was statistically significant in only 4 of the 9 cases. FDEs were more accurate overall than were Lay participants across all signature types and both levels of complexity.

FDEs were more accurate than were Lay participants, but more likely to make qualified authorship opinion calls. On average, Lay participant authorship confidence calls fell within the "probable" range for their accurate calls, and approached the "probable" level for their inaccurate calls. FDEs were less confident, placing their authorship confidence on average at the "indications" level for accurate calls, and just above the "inconclusive" level for the inaccurate calls. This indicates that FDEs and Lay participants tended to weight the available evidence differently.

Known signature analyses demonstrated that the mean fixation count among FDEs was greater than that for Lay participants on the known signature stimuli, indicating that FDEs attended to a greater amount of information within the known signature specimens than did Lay participants. Among both groups the mean fixation count for text-based signatures was significantly lower than that for mixed signatures for both high complexity and low complexity signatures, although the greater number of fixations for FDEs suggests an expertise effect.

Fixation duration for the known signature stimuli was also significantly greater among FDEs than among Lay participants. The mean fixation duration for text-based signatures was significantly lower than that for mixed signatures and for stylized signatures among both FDEs and Lay participants. Fixation duration was significantly greater among FDEs for high-complexity mixed and high complexity stylized signatures.

Mean visit count for the known signature stimuli was also was greater on average among FDEs than that among Lay participants. Among both groups, mean visit count for text-based signatures was significantly lower than that for mixed signatures, but no differences were found for signature complexity. Visit count among FDEs was greater for mixed signatures than for text-based or stylized signatures.

Visit duration for the known signature stimuli was also significantly greater among FDEs than among Lay participants. Among both groups the mean visit duration for text-based signatures was significantly lower than that for stylized signatures. Visit duration was significantly greater among FDEs for high complexity mixed and high complexity stylized signatures.

Eye-tracking analyses for the questioned/known signature comparisons revealed that FDEs approached the comparison aspect of the tasks differently from the Lay participants. The mean fixation count among FDEs was greater than fixation count and fixation duration for Lay participants. The mean fixation count for mixed signatures and text-based signatures was significantly higher than that for stylized signatures, and among both FDEs and Lay participants the mean fixation count for stylized signatures was significantly lower than that for mixed signatures for both high complexity and low complexity signatures.

Fixation duration among FDEs was significantly greater than that among Lay participants, particularly for text-based and mixed signatures. Mean fixation duration for text-based signatures was significantly lower than that for mixed signatures and for stylized signatures among both groups.

Visit count among FDEs was greater than that for Lay participants. Mean visit count for text-based signatures was significantly greater than that for mixed and stylized signatures among both groups, particularly among FDEs viewing the low complexity text-based signatures.

Mean visit duration was greater among FDEs across signature type and signature complexity. For FDEs, this effect was greater among mixed signatures and less among text-based and stylized signatures.

Similar to the results of the known signature analyses, the results of the questioned/known comparison eye-tracking analyses demonstrate expertise effects in the deployment of attentional and cognitive resources. Differences in accuracy between FDEs and Lay participants indicate that the two groups weight the available information differently.

The tachistoscope/extended view protocol was originally conceptualized as a distraction task to separate the questioned/known signature protocol from the peer review protocol (in which participants examined previously-viewed signatures). Although we did not propose any formal hypotheses for these data, the tachistoscope/extended view protocol provided an opportunity to further explore some of the characteristics of expertise.

FDEs were more accurate overall than were Lay participants in both the tachistoscope view and the extended view of the signatures, although this varied among individual signatures. Even without the range of variation information usually available to FDEs in signature identification tasks, FDEs were able to make a significantly greater number of correct calls than did Lay participants.

FDEs called signatures genuine more frequently than did Lay participants. This tendency accounted for a substantial number of the incorrect calls made by FDEs. FDEs were less likely than Lay participants to incorrectly call a genuine signature a simulation. Given the limited information available overall, and the limited amount of time given to view the signatures in the tachistoscope view, these findings suggest that features such as line quality, speed and fluidity of execution, and other indicators of writing skill are valid and important indicators of signature authorship that are reliably used by FDEs to reach signature process decisions.

Confirmation bias is a tendency to search for or interpret new information in a way that confirms one's preconceptions and avoids information and interpretations which contradict prior beliefs. The peer review protocol investigated the effect of prior information about an examination outcome on the subsequent peer review decisions for previously viewed signatures.

We manipulated a subset of the process calls made by FDEs and Lay participants during the questioned/known comparison procedure so that some of them were the same call and some of them were a different call, and presented the previously viewed signatures as the results of a “prior examination” in which the calls had been made by a “previous examiner”. We told the participants the results of the “prior examination”, and asked the FDEs and Lay to give their own process and authorship calls.

Overall, FDE process calls were more consistent with their original calls than were those among Lay participants when the calls were genuine or simulated, but slightly less consistent when the calls were disguised. The overall match percentage was higher among FDEs than among Lay participants for signatures that were presented as genuine or simulated in the questioned/known comparison, but slightly lower for those signatures that were presented as disguised. These data seem to indicate that FDEs and Lay participants are equally as likely to be influenced by contextual information about the outcome of a prior examination, but we observed spontaneous changes in the peer review calls even when the "prior examination" results were the same as the participants' original calls. Both FDEs and Lay participants may have been influenced by demand characteristics, although different demand characteristics may have influenced the two groups differently.

FDEs were more accurate than were Lay participants across signatures and across signature views, regardless of whether the questioned/known process call was manipulated. Among both groups there was a pronounced increase in the percentage of correct-to-incorrect call changes when the calls were manipulated, compared to when the calls were not manipulated. Overall, FDEs moved their calls from incorrect to correct in a greater percentage of cases than did Lay participants. When process calls were not manipulated FDEs moved fewer calls from correct to incorrect.

FDEs were far more likely than were Lay participants to place their authorship calls in the inconclusive category. This suggested that although FDEs were required by the protocol to make a process call of genuine, disguised, or simulated, they may have felt there was insufficient information contained in the signature specimens to allow them to reliably identify or eliminate the writer of the questioned signatures as the writer of the known signatures.

The mean authorship confidence rating for the known comparison signatures was significantly lower among FDEs than among Lay participants in both the questioned/known comparison view and the peer review view. The call confidence was greater among participants whose unmanipulated peer review process call matched questioned/known comparison call given to the participants during the peer review procedure. The confidence rating in the peer review protocol was lowest among both groups when the questioned/known signatures were manipulated.

The eye-tracking analyses revealed differences in the utilization of available information and the seeking of certain kinds of information. Mean fixation count for the known comparison signatures was greater for FDEs than for Lay participants. There was a significant change in fixation count from the first time the signatures were viewed (QK) to the second time it they were viewed (PR), regardless of whether we manipulated the call in the peer review view.

Mean fixation duration in the known comparison signatures was greater for FDEs than for Lay participants from the first time the signatures were viewed (QK) to the second time they were viewed (PR), regardless of whether we manipulated the call.

Mean visit count in the known comparison signatures was greater for FDEs than for Lay participants. Visit count changed significantly among both groups from the first time the signature was viewed (QK) to the second time it was viewed (PR), regardless of whether we manipulated the call in the peer review view. This increase was more pronounced among FDEs in the peer review view than among FDEs or Lay participants in the other conditions.

Mean visit duration in the known comparison signatures was greater for FDEs than for Lay participants. Visit duration among both groups changed significantly from the first time the signature was viewed (QK) to the second time it was viewed (PR), regardless of whether we manipulated the call in the peer review view. This increase was more pronounced among FDEs in the peer review view than among FDEs or Lay participants in the other conditions.

Participants were unaware of the outcome of the "prior examination" as they were examining the known signatures in the peer review condition, so the increases in fixation count, fixation duration, visit count, and visit duration observed among participants in the peer review condition strongly suggest that demand characteristics influenced these outcomes. The participants' knowledge that they were being observed may account for the statistically significant increases for these metrics, particularly for the significantly greater increases observed among FDEs compared to the Lay participants.

Fixation count for the questioned/known comparison was greater among FDEs in the peer review view than among FDEs in the questioned/known comparison view. Fixation count was greater among FDEs than among Lay participants in both call change manipulation conditions, particularly among Lay participants in the peer review view.

Mean fixation duration in the questioned signatures was greater for FDEs than for Lay participants. Fixation duration changed significantly from the first time the signature was viewed (QK) to the second time it was viewed (PR), regardless of call manipulation in the peer review view.

Mean visit count in the questioned signatures was greater for FDEs than for Lay participants. Visit count changed significantly among both groups from the first time the signature was viewed (QK) to the second time it was viewed (PR), regardless of call manipulation in the peer review view, particularly among FDEs in the peer review view.

Mean visit duration in the questioned signatures was greater for FDEs than for Lay participants. Visit duration changes significantly among both groups from the first time the signature was viewed (QK) to the second time it was viewed (PR), regardless of call manipulation in the peer review view, particularly among FDEs in the peer review view, and in the change condition.

Overall, these findings provide tentative evidence that domain irrelevant information may introduce bias into human decision making processes, although the extent to which our findings are due to the manipulation of the prior examination outcomes or to demand characteristics is difficult to ascertain from these data. Eye-tracking data demonstrate that the call manipulations impacted the subsequent deployment of attentional resources, and the data suggest that changing the original calls may have resulted in a greater extent of bottom-up cognitive processing as participants engaged in more extensive evaluation of signature features. However, given the indications that demand characteristics may also have contributed to these changes, these findings must be interpreted with caution.

Our qualitative and quantitative data revealed that Lay participants focused to a greater extent on individual feature characteristics such as arches, eyelets, hooks, shoulders, connections, troughs, or other individual features. They appear less likely to use holistic features such as alignment, slant, pen lifts, rhythm, the size of the writing, the slope or slant of the letters, or other characteristics which may also be diagnostic of the process used to create the signatures.

Consistencies in the deployment of attentional resources by both groups revealed in the eye-tracking and the qualitative interview data support the idea that FDEs used a large and well-specified index of handwriting features as evidence upon which to make their decisions, while Lay participants used a narrower range of features for this purpose.

These findings have several implications for policy and practice. The severe consequences resulting from erroneous conclusions in live casework (e.g., denying someone their life, liberty, or property) makes the nature of expertise and the detection of possible sources of bias in the forensic sciences crucial areas of inquiry. This study provided information about visual attention to handwriting features, the extraction and use of information from signatures, and the influence of features of writing on examiner and layperson decision making. It also provided information about the possible biasing effects of information about prior examination outcomes, and about the strengths and weaknesses of current education and training practices, with suggestions about how those practices might be improved.

These findings provide important empirical support for the validity and reliability of the foundations and methods of forensic document examination. The combination of objective eye-tracking measures and qualitative descriptive data demonstrated that FDEs used both top-down and bottom-up cognitive processes and an extensive range of information present in the signature specimens to reach their decisions. They provided evidence that FDEs engage in a systematic evaluation of signature features, and that they assign meaning to these features based on common principles that are quite consistent across most trained examiners. This research supported the reliability and validity of the current methods, even though the interpretation of handwriting features is subjective on the part of the individual examiner.

Our findings suggest that lack of blind review may indeed be problematic, but must be interpreted with caution due to the possible effects of demand characteristics. This study demonstrated that FDEs were less influenced by information about a prior examination than were Lay participants, and were also less confident about their decisions. Additional research in this area is needed to clarify the relationship between lack of blind review and peer/technical review outcomes.

We investigated the relationship between the number of certifications held by FDEs and their call accuracy. Although we found no statistically significant relationship between these factors, the most frequent comment about FDE certification was the belief that certification is absolutely necessary and should be pursued following training and prior to working with any court cases. Some FDEs believed the training and certification process should be standardized, and several believed that ABFDE standards (compared to BFDE standards) are the only acceptable standards on which certification should be based.

The multi-method design of this study allowed us to increase the transparency of the decision making processes involved in the examination and classification of the signature specimens in our sample. These findings help to illustrate the cognitive and physiological aspects of examinations, and to inform the performance of judges, attorneys, and experts as they work together to communicate the methods and conclusions of forensic document examinations to each other and to jurors.

This research exemplifies the value of interdisciplinary collaboration and the use of multi-method research designs for investigations of the validity, reliability, and accuracy of forensic science disciplines. The ultimate benefits of this research are improved training, education, and proficiency, better evidence, more effective handling of such evidence by the court system, and, ultimately, better access to justice for the public.

The research project provided teaching and training opportunities in quantitative and qualitative research methods and data analysis for approximately 20 undergraduate student research assistants from a small, historically black university, as well as education, training, and experience in survey research for graduate and undergraduate students at a larger research university. Successful execution of this project increased the visibility and reputation of both institutions among colleges and universities, and will enhance their ability to obtain future grant funding.

The Forensic Science Committee of the National Academy of Sciences concluded that research to establish the limits and measures of performance and the sources of variability and potential bias is badly needed, especially in those disciplines based on subjective assessments of similarity. While our research offers an interdisciplinary understanding of these issues encompassing expertise from forensic practice, social and cognitive psychology, and vision science, ongoing research is needed to strengthen our understanding of the basis and extent of expertise, to develop rigorous protocols and measures, and to establish education and training programs that consistently and comprehensively address the knowledge and skills required to establish expertise in forensic fields. We look forward to continuing and to expanding these investigations, and to future collaborations with those professionals who are dedicated to gaining new knowledge which will facilitate growth and change in the service of justice.