A Factor Analysis
LCT, MI, and MMPI

Abstract:

Previous research suggested that wholistic color preference behavior on the abbreviated Lüscher Color Test assessed by its D^2 may measure a normal personality trait dimension of affective control. This article presents the factor analytic results of an investigation with 376 incarcerated criminals to gain conceptual support for this LCT color hypothesis. Of the five factors obtained, the LCT's D^2 was found to load positively on an emotional control factor. It was not found to load on a paranoid, cycloid, schizoid, or cognitive control factor. The suggestion is made that Lüscher color preference behavior generally may be more directly related to normal, situational than to abnormal, personalistic variables.

A FACTOR ANALYSIS OF THE LÜSCHER COLOR TEST, MILLON-ILLINOIS SELF REPORT INVENTORY, AND MINNESOTA MULTIPHASIC PERSONALITY INVENTORY

R. C. Rahn[1]

LONDON CORRECTIONAL INSTITUTION
LONDON, OHIO

Two articles were published recently which examined Lüscher color theory and the abbreviated Lüscher Color Test (LCT) as a possible diagnostic aid in personality assessment. In the first paper, several specific LCT personality measures were developed from Lüscher color theory (Rahn, 1976). These personality measures then were tested empirically with civilians and incarcerated criminals in an attempt to assess whether they discriminated between these two groups of individuals. The results presented supported the view that most of the specific LCT personality measures can distinguish these individuals with divergent behavioral patterns. Lüscher color theory and the LCT (Lüscher, 1969) received further empirical support from this research.

In a subsequent article, a wholistic personality measure, D^2, was developed from Lüscher color theory to describe total LCT preference behavior (Rahn, 1977). D^2 as a measure of amount of affective control then was tested empirically with

similar normal and abnormal groups of individuals in an attempt to assess whether it also could discriminate between them. Likewise, the results presented supported the view that D^2 can distinguish these individuals with divergent behavioral patterns. Lüscher color theory and the LCT continued to receive empirical support with these results as a possible diagnostic aid in personality assessment. Thus, both of the LCT's specific and general measures appeared able to detect dispositional personality differences in these groups of normal and abnormal individuals.

However, it was not completely clear from this research why incarcerated criminals were predisposed to exercise a greater amount of affective control over their behavior than civilians when adjusting to their environment. Indeed, incarcerated criminals might have been expected to exercise a lesser amount of affective control over their behavior than civilians when adjusting. It seemed that these dispositional personality differences that were found may have resulted more from atypical environmental influences which act to suppress psychological need (affiliation, power, achievement, and change) expression than to any abnormal personality influences. Thus, greater affective spontaneity of psychological need expression displayed by civilians may have been associated with a lesser controlled, more appetitive environment. Conversely, greater restraint in psychological need expression displayed by incarcerated criminals may have been associated with a greater controlled, more

aversive environment. Hence, incarcerated criminals would have been predisposed to exercise more affective control over their behavior than civilians in adjusting.

Therefore, it appeared that wholistic LCT preference behavior, when assessed with its D^2 measure, may be more situationally determined by the type of environment to which individuals have to cope and less by abnormal personality determinants. In other words, one type of environment to which individuals have to cope may encourage the behavioral expression of their psychological needs, and another type of environment to which individuals have to cope may discourage the behavioral expression of their psychological needs. The main effect would be that the amount of affective control which individuals exercise over their behavior will vary depending on situational influences. Such a view would be consistent with Lüscher color theory also.

These observations suggested that the LCT's D^2 measure of amount of affective control may be less related to pathological personality processes and more related to the amount of emotionally controlled behavior to which individuals normally become predisposed when coping with their specific environment. As a result, it was decided that the relationship of wholistic LCT preference behavior to normal and abnormal personality functioning should be investigated. To examine this relationship, a standard factor analytic study of the LCT's D^2 and two psychological instruments which are presumed to assess normal and abnormal personality functioning was performed. The current

article presents the research results that were obtained from that study of the factorial relationship of wholistic LCT preference behavior to normal and abnormal personality functioning in incarcerated criminals.

Along with the LCT's D^2, two personality questionnaires were factor analyzed, the Millon-Illinois Self Report Inventory (MI-SRI) and the Minnesota Multiphasic Personality Inventory (MMPI). The MI-SRI was selected for inclusion in the factor analysis because it attempts to assess the eight relatively normal personality styles to be found in everyday life which individuals employ to cope with their environment (Millon, 1977, Millon and Millon, 1974, and Millon, 1969). It provides a basic measure of an individual's principal personality pattern with its normal psychological mode of functioning. Correspondingly, the MMPI was selected for inclusion in the factor analysis because it attempts to assess the various abnormal personality patterns to be found in clinical populations which individuals develop in adjusting to their environment (Hathaway and McKinley, 1967). It provides a clinical measure of an individual's principal personality pattern with its pathological dimensions of functioning.

Thus, by including both the MI-SRI and MMPI in the factor analysis with the LCT's D^2, the relationship of wholistic LCT preference behavior to both normal and abnormal personality functioning could be ascertained. It was thought that if the LCT's D^2 does assess the extent of an individual's affective

control over his behavior, then it should be factorially related to those normal personality variables which conceptually reflect emotionally controlled behavior. At the same time, it was thought that if these views have any validity, then the LCT's D^2 need not be factorially related to those abnormal personality variables which reflect pathological psychological functioning.[2]

Method

General Procedure:

Subjects were administered the previously mentioned psychological tests concurrently and under standard conditions in accordance with their respective procedures when given a psychological examination. These examinations were conducted sequentially over a two year period on regular referrals to the institutional psychology department for a pre-parole psychological evaluation. These psychological instruments were administered as part of a routine battery of tests given before, during, and after clinical interview. The purpose of the psychological evaluations was to assess each resident's prognosis for parole release.

To obtain a measure of wholistic LCT preference behavior, subjects were asked individually to rank the eight standard LCT colors (four primary and four auxiliary) in accordance with their general preference from the most to least liked, after the colors were presented on two random sequences of cards. Two ranked sequence of color preferences were obtained under the

varying sets of LCT instructions--normal and spontaneous conditions. By computing its D^2 for the second color sequence as previously described, a general measure of LCT preference behavior for each individual was obtained.[3] Similarly, to obtain psychological measures of normal and abnormal personality functioning, subjects were administered concurrently both the MI-SRI and MMPI. By scoring their test responses on a scale-wise basis, personality measures on each of these two psychological instruments for each individual were obtained. The results presented and discussed in this paper were analyzed separately to the psychological evaluations that were prepared routinely.

Subjects:

Subjects consisted of N = 376 residents serving commitments to a medium and minimum custody correctional institution. They served on a wide variety of criminal offenses ranging from grand larceny to murder, but none at the time of testing required maximum supervision or control. Thirty-five percent of them served sentences for interpersonal offenses (e.g., murder, manslaughter, assault, rape) and 65 percent of them served sentences for impersonal offenses (e.g., robbery, burglary, larceny). Their ages ranged principally from 24 to 38 years, the mean age being 31 years. Their tested intelligence varied principally from 87 to 115, the mean IQ being 101. Their tested school achievement ranged from primarily 5 to 10

grades, the mean school achievement level being 7 grades. Racially, 52 percent of these residents were black and 48 percent were white. These residents were considered to be generally representative of those found in adult correctional institutions of a similar nature.

Method of Analysis:

Test scores on 22 personality variables consisting of the LCT's D^2, each of the 8 MI-SRI scales, and each of the MMPI scales (including its major validity scales) were intercorrelated. A significance test of randomness of the correlation matrix was performed using Bartlett's chi-square procedure (Gorsuch, 1974). This analysis produced a Chi-Square = 5656.52, df = 231, which was highly significant statistically ($p < .001$) when converted to z scores. Because the correlational matrix could be legitimately factored, factor analysis of the product-moment correlation matrix and factor rotation were performed by a computer program obtained from the Statistical Package for the Social Sciences (Nie, Bent, and Hull, 1970). A principal factoring solution (PA2) with iterations (maximum number = 25) and a mineigen value of 1.0 was used to extract the five factors obtained, accounting for 100% of the test battery variance. Factor rotation was obliquely performed (Delta = 0.0) to meet simple structure requirements. Factor interpretation was

accomplished by submitting the factor data to three experienced users of the LCT, MI-SRI, and MMPI. Factor interpretation attempted to consider previous research findings (Rahn, 1975).

Results

Examination of the product-moment correlations upon which the factor analysis of the LCT's D^2, MI-SRI, and MMPI was based revealed that the LCT's D^2 was related to both the MI-SRI and MMPI. However, the LCT's D^2 correlated significantly only at a reduced level with the individual MI-SRI, and MMPI scales. Yet neither the MI-SRI nor MMPI scales measured completely pure personality variables. Most of the intercorrelations among the MI-SRI, and MMPI scales were statistically significant. At the same time, the MI-SRI and MMPI instruments assessed a number of related personality variables. These correlational data showed definite relationships between the individual MI-SRI and MMPI scales, a sizeable number of correlations having been statistically significant.[4]

Table 1 presents the factor pattern and commonalities obtained after simple structure rotation. These loadings are the normalized weights obtained using the factor variables in a battery to predict each of the test variables of the LCT's D^2, MI-SRI, and MMPI. Of the five factors obtained, Factor I was associated principally with MMPI scales, accounting for

49 percent of the total test battery variance. Factors II, III, and V were associated with both the MI-SRI and MMPI, accounting for 28 percent, 10 percent, and 6 percent of the total test battery variance, respectively. Finally, Factor IV was associated principally with the MI-SRI scales and the LCT's D^2, accounting for 8 percent of the total test battery variance.

Insert Table 1 about here

As primarily an MMPI personality dimension, Factor I appears to measure a paranoid style of functioning. It was associated mainly with high positive factor pattern loadings on MMPI scales Schizophrenia (.78), Frequency (.69), Paranoia (.68), Psychasthenia (.66), and Hypochrondria (.66). The LCT's D^2 did not obtain a high positive factor pattern loading on the Factor I dimension of paranoid suspicion-healthy trust. As a combined MI-SRI and MMPI personality dimension, Factor II appears to measure the extent of intellectual control over which an individual imposes on his behavior. High and moderate positive factor pattern loadings on MMPI scales Correction (.75), Lie (.69), and Hysteria (.56) were associated with moderate negative loadings on the MI-SRI and MMPI scales Negativistic (-.52), Psychasthenia (-.48), and Mania (-.34). The LCT's D^2 likewise did not obtain a salient positive factor pattern loading on the Factor II personality dimension of cognitive control-dyscontrol.

As a joint MI-SRI and MMPI personality dimension, Factor III appears to reflect a cycloid mode of functioning. Moderate positive factor pattern loadings on MI-SRI and MMPI scales Gregarious (.53), Aggressive (.48), Mania (.45), and Narcissistic (.44) were associated with moderate negative loadings on MMPI scales Introversion (-.67), and Depression (-.49). Again, the LCT's D^2 did not obtain a salient positive factor pattern loading on the Factor III dimension of elation-depression. As a combined MI-SRI and MMPI personality dimension, Factor V appears to reflect the extent of interpersonal responsiveness to people. High to moderate negative factor pattern loadings on MI-SRI and MMPI scales Asocial (-.78), Avoidant (-.59), Aggressive (-.45), Introversion (-.43), Frequency (-.38), and Schizophrenia (-.31) were obtained. The LCT's D^2 also did not obtain a salient factor pattern loadings on the Factor V dimension of healthy attachment-schizoid detachment.

However, the LCT's D^2 did obtain a salient positive factor pattern loading on Factor IV. As primarily a joint personality dimension of the MI-SRI and the LCT's D^2, Factor IV appears to measure the extent of affective control or restraint which an individual imposes upon his interpersonal behavior. High to moderate positive factor pattern loadings on the MI-SRI scales Conforming (.78), Submissive (.65), Narcissistic (.47), Gregarious (.38), and LCT's D^2 (.32) were obtained. Thus, the LCT's D^2 obtained a salient but moderate positive factor pattern loading only on the Factor IV personality dimension of affective

control-dyscontrol. Although it was not high, the only other factor on which the LCT's D^2 obtained any positive factor pattern loading at all was Factor II, cognitive control-dyscontrol.

Insert Tables 2 and 3 about here

Table 2 presents the factor structure correlational loadings obtained from the factor analytic computer program. It also identifies the various MI-SRI and MMPI personality scales which were associated with each of the five factors obtained. Inspection of this table reveals that the product-moment correlations of the various personality scales with the factors tend generally to support the interpretations that have been given to each of the five factors. Finally, Table 3 presents the product-moment correlations found among the five factors. Although the factor analytic program which was employed in this study permits correlated factors to emerge, it produced oblique factor personality dimensions which only correlate to a small degree. Although most of the factor correlations were significant, none of them exceeded an absolute value of .30. Thus, most factors were relatively independent and represent essentially different personality dimensions.[5]

Discussion

The results of this factor analytic study of the LCT's D^2, MI-SRI, and MMPI tend to support the notion that the LCT's D^2 can be viewed as a measure of the amount of affective control over which an individual imposes on his behavior. It would appear

that the LCT's D^2 can vary along a dimension of affective control with low values associated with affective expression and high values associated with affective suppression. It was found to load positively on a combined MI-SRI and MMPI personality factor which is best described by those personality scales associated with affectively and emotionally controlled behavior toward the environment. Thus, the LCT's D^2 was found to load positively (.31) on the Factor IV, which included mainly positive correlational loadings on the MI-SRI's Conforming (.76), Submissive (.69), and Narcissistic (.60) personality scales. According to Millon's nosology, each of these personality patterns reflect "passive" interpersonal coping strategy styles. Additionally, it was found to load on Factor IV, which also includes a positive correlational loading on the MMPI's Psychasthenia (.37) scale but a negative loading on the MMPI's Correction (-.42) scale.

These research results also replicate the existence of the three relatively independent pathological MMPI factors I, II, and III that have been found previously with incarcerated criminals (Rahn, 1975). Factor I, previously labeled as a general pathological factor with an unconventional-conventional personality dimension, has been relabeled in this paper to reflect its basic paranoid or paraphrenic nature. Positive correlational loadings on this factor by the MI-SRI's Avoidant (.45) and Negativistic (.40) scales support the interpretation given to Factor I. It is similar also to Welsh's Factor I, anxiety (Welsh, 1956);

Kassebaum, Couch, and Slater's Factor I, ego-weakness vs. ego-strength (Kassebaum, Couch, and Slater, 1959); Finney's factor, maladjustment vs. adjustment (Finney, 1961); and Horn, Wanberg, and Appel's factor, anxiety vs. ego-strength (Horn, Wanberg, and Appel, 1973). Standard MMPI configurational interpretation more appropriately supports the labeling of Factor I that has been given in this paper.

Factor II, previously labeled as a cognitive control factor with an overcontrol-undercontrol personality dimension, retains its general label in this paper to reflect its basic intellectual reflective-impulsive nature. High negative correlational loadings on this factor by the MI-SRI's four "active" personality scales, particularly the Negativistic (-.67) scale, support the Factor II interpretation. Factor II is similar also to Welsh's Factor II, repression vs. expression; Kassebaum, Couch, and Slater's factor, tenderminded vs. tough minded sensitivity; and Horn, Wanberg, and Appel's factor, acquiesence vs. negativism.

Factor III, previously labeled as a general arousal factor with an overactive-underactive personality dimension, has been relabeled to reflect its basic cycloid or cyclophrenic nature. Positive correlational loadings on the MI-SRI Gregarious (.62), Aggressive (.54), and Narcissistic (.52) personality scales and the MMPI's Mania (.45) scale as well as the negative correlational loadings on the MMPI's Introversion (-.66) and Depression (-.60) personality scales support the Factor III interpretation with its mood extremes. Factor III also is almost identical to Kassebaum, Couch, and Slater's Factor III,

extroversion vs. introversion and is similar to Welsh's Factor III.

Although not previously found in a factor analysis of the MMPI with incarcerated criminals, Factor V has been labeled to reflect its basic schizoid or schizophrenic nature. A positive correlational loading on the MMPI's Correction (.44) scale and the negative correlational loadings on the MI-SRI's Asocial (-.76) and Avoidant (-.76) scales also tend to support the interpretation that has been given to Factor V in this study. Because Factor V appears to have been the least significant dimension, future research will need to be performed to see whether this personality dimension can be replicated with incarcerated criminals.

These research results also suggest that wholistic LCT performance as reflected in its D^2 measure is more clearly related to normal than abnormal personality functioning. Thus, the LCT's D^2 was found to be positively correlated principally with the MI-SRI's relatively normal personality scales, especially with the Conforming personality pattern. It was not positively correlated with any of the principally pathological MMPI factors, regardless whether they reflect paranoid, cycloid, or schizoid functioning. Additionally, it was not positively correlated with the principally MMPI cognitive control factor.[6]

Thus, these factor analytic results suggest that individuals who employ conforming interpersonal coping strategies to adjust to an environment will tend to act in a cognitively constricted and affectively restrained way toward others. As a consequence of psychological need frustration effects, they will tend to show color

preferences on the LCT for the auxiliary colors (Grey, Black, Brown, and Violet) but color rejections on the LCT for the primary colors (Yellow, Red, Green, and Blue). In essence, amount of affective control as measured by the LCT's D^2 may be determined partially by the type of environment to which one has to cope.

Future research needs to be done to demonstrate a stronger relationship between the LCT's D^2 and the personality dimension, affective control. While this research has presented a suggestive factoral relationship between the LCT's D^2 and affective control, this relationship was not high. As was noted, a loading on Factor IV by the LCT's D^2 tended to be reduced. But as has been noted also, personality coefficients between personality questionnaires and behavioral measures generally are not found to be much higher than that obtained between Factor IV and the LCT's D^2 (Mischel, 1976). It is suspected that when LCT performance is examined in relationship to "purer" measures of affective control with a less restricted sample of subjects and environment, the relationship of the LCT's D^2 to a personality dimension such as affective control will be higher.

TABLE 1
Communalities and Factor Pattern Loadings
After Simple Structure Rotation with
Kaiser Normalization[a]

Test Scales:	Factors: I	II	III	IV	V	h^2
A Submissive	-04	-30	-13	65	00	56
B Gregarious	12	-26	53	38	02	66
C Conforming	-26	00	05	78	-03	65
D Negativistic	23	-52	-03	26	-30	73
E Narcissistic	-02	-02	44	47	-23	59
F Aggressive	02	-22	48	21	-45	71
G Asocial	-05	06	-07	02	-78	59
H Avoidant	22	-27	-20	16	-59	76
L Lie	00	69	-11	10	-05	48
F Frequency	69	06	09	-14	-38	69
K Correction	-17	75	08	-21	14	83
1 Hypochrondria	66	08	-21	12	-17	63
2 Depression	44	18	-49	02	-11	59
3 Hysteria	52	56	-20	-02	19	69
4 Psychopathy	57	-16	-04	-11	02	36
5 Femininity	43	-04	-04	07	18	19
6 Paranoia	68	22	10	-01	-12	50
7 Psychasthenia	66	-48	-21	19	-06	93
8 Schizophrenia	78	-20	-06	01	-31	94
9 Mania	47	-34	45	02	-02	58
0 Introversion	16	-21	-67	04	-43	80
LCT-D^2	09	13	02	32	00	12
Eigenvalue	6.66	3.73	1.33	1.08	.77	
Variance %	49.1	27.5	9.8	8.0	5.7	
Cumulative %	49.1	76.6	86.3	94.3	100.0	

[a]Decimals were deleted. Loadings .30 or greater are considered salient.

TABLE 2
Factor Structure Correlational Loadings[a]

Test Scales:		Factors: I	II	III	IV	V
A	Submissive	09	-42	04	69	-24
B	Gregarious	11	-46	62	52	-16
C	Conforming	-16	-16	22	76	-17
D	Negativistic	40	-67	07	48	-56
E	Narcissistic	03	-27	52	60	-34
F	Aggressive	10	-48	54	45	-55
G	Asocial	16	-12	-10	20	-76
H	Avoidant	45	-44	-17	37	-76
L	Lie	-03	68	-24	-06	10
F	Frequency	75	-09	-07	05	-50
K	Correction	-33	84	-08	-42	44
1	Hypochrondria	74	-02	-32	20	-35
2	Depression	53	20	-60	00	-20
3	Hysteria	44	60	-39	-16	20
4	Psychopathy	57	-18	-12	-02	-14
5	Femininity	40	-05	-08	08	04
6	Paranoia	67	10	-06	07	-23
7	Psychasthenia	78	-56	-19	37	-41
8	Schizophrenia	88	-38	-03	25	-56
9	Mania	44	-49	45	23	-22
0	Introversion	40	-20	-66	12	-56
LCT-D^2		12	05	03	31	-08

[a]Decimals have been deleted. Correlations with absolute values $r > .20$, $p < .05$.

TABLE 3

Oblique Factor Correlations After Rotation[a]

Factors	I	II	III	IV	V
I	-				
II	-11	-			
III	-16	-20	-		
IV	13	-22	16	-	
V	-25	25	03	27	-

[a]Decimals have been deleted. Correlations with absolute values $r > .10$, $p < .05$.

FOOTNOTES

1. Special thanks is extended to Paul Hedel, Project Coordinator, Bureau of Research and Classification, Ohio Department of Rehabilitation and Correction, for aid in this study's data analysis.

2. According to general color theory, different color preferences are associated with differential personality functioning. The development of the LCT's D^2 made possible the investigation of the relationship of the LCT's primary and auxiliary color preferences to normal and abnormal personality functioning.

3. The LCT's D^2 provides a quantitative measure of the extent to which an individual's total LCT protocol deviates from the optimal color protocol found in the more typical individual. Low values are associated with preferences for LCT's primary colors, and high values are associated with preferences for LCT's auxiliary colors.

4. For brevity, the correlational tables were not included in this article. Copies may be obtained by contacting the author.

5. Second-order factor analytic results are not reported. The primary concern of this study was the relationship of the LCT's D^2 to MI-SRI and MMPI first-order personality dimensions.

6. It is felt that Factor II and IV, both personality control dimensions, differ in that Factor II reflects an inner or personalistic control whereas Factor IV reflects an outer or environmental control over behavior.

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