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A VALIDITY STUDY OF POLICE OFFICER SELECTION, TRAINING AND PROMOTION

VOLUME VI

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VOLUME VI

VALIDATION OF THE PHYSICAL REQUIREMENTS FOR THE SELECTION OF POLICE OFFICERS

PREFACE

This report describes a comprehensive study of the City of Houston Police Department's selection, training, and promotional procedures. The report is divided into nine volumes as follows:

Volume I	Research Overview, Summary and Bibliography for the Validity Study of Selection, Training and Promotion within the Houston Police Department
Volume II	Analysis of the Labor Force Composition within the Recruiting Area of the Houston Police Department
Volume III	Adverse Impact Analyses of the Selection, Training, Assignment and Promotion Procedures of the Houston Police Department
Volume IV	Job Analysis of Positions within the Houston Police Department
Volume V	Evaluation of the Selection Requirements of the Houston Police Department
Volume VI	Validation of the Physical Requirements for the Selection of Police Officers
Volume VII	Validation of the Personal Background Requirements for the Selection of Police Officers
Volume VIII	Evaluation and Validation of the Houston Police Department Academy and Probationary Training Period
Volume IX	Validation of the Houston Police Department Promotional Process

While each volume is intended to stand alone as a unified component of the study, much of the data is referred to in several volumes, but presented in detail in only one volume. For example, the job analysis data reported in Volume IV

served as a foundation for the research described in Volumes V through IX. Consequently, at times the reader will need to refer to two or more volumes to obtain a comprehensive understanding of a specific component of the research.

It is expected that this report will be read by individuals who have a wide range of familiarity with the technical nature of the research study. Consequently, the authors have attempted to provide sufficient explanations of research methodology, statistical analyses, etc., to facilitate understanding by readers who do not have formal training or experience in the applied demographic and psychological research disciplines. At the same time, however, the authors have included appropriate technical information in the report, whereby professionals experienced in demographic and validation research can review the work of the research team.

Appendix A of Volume I is a comprehensive bibliography. The bibliography also contains detailed descriptions of reference materials cited or quoted (referred to by author and date) throughout <u>all</u> volumes of the report.

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pursuit functions (running, jumping, climbing, etc.), arm strength, and so on.

The first objective of the research pertaining to HPD's physical selection requirements was to determine which, if any, physical attributes are really *necessary* for the successful performance of a Houston Police Officer's responsibilities. If any physical traits were to be identified, then the second objective was to determine to what degree each trait is required and to develop procedures for screening job applicants on these essential traits.

Various types of methodologies were applied in this study, including many comprehensive job analysis techniques, content validity research, development of work sample tests, and criterion-related validity research. Section 1 of this volume describes the job analysis and summarizes the physical activities typically encountered by a Houston Police Department officer. Based on the job analysis data, Section 2 summarizes expert medical opinion for required physical health, general conditioning and acceptability of physical deformities. The third section identifies on-the-job requirements and converts the findings into appropriate work sample tests. The last section summarizes the criterion-related validity research for height, weight, ratio of weight to height, and vision.

INTRODUCTION

This volume is one in a series of nine which describe an extensive research study of the Houston Police Department's job requirements, hiring practices, Academy training effectiveness and promotional procedures. Volume V of this series reviewed each Class A police officer selection requirement as to adverse impact, job relatedness and justification via legal, precedent, business necessity or research findings. (Data covered in this volume, therefore, have been summarized previously in Volume V, Section II.)

The validation research relating to personal background characteristics (i.e., selection requirements pertaining to applicant age, education, employment history, driving record, military record, financial history, etc.) are reported in Volume VII. The purpose of this volume is to present information on the validation of Class A police officer selection standards of a physical or medical nature.

Anyone who reads newspapers, watches the news on television, or who is in any way familiar with the responsibilities of law enforcement officers is aware that police work is physically demanding. Consequently, the Houston Police Department (HPD) and many other police departments across the nation screen job applicants on various physical attributes such as height, weight, ratio of height to weight, physical deformities, medical history and condition, vision, ability to perform

SECTION 1

JOB ANALYSIS

CHAPTER 1

INTRODUCTION

Volume IV of the research study pertains to job analysis procedures and results. That volume discusses the importance of job analysis, the techniques selected for analyzing the Houston Police Department's entry-level officer position, details of the methodologies utilized and resulting position requirements. The interested reader should refe. to that volume, but for convenience, Chapter 2 of this section briefly describes the methodology for each job analysis technique, and Chapter 3 summarizes the major findings and conclusions pertinent to the physical attributes required of entry level police officers.

A thorough job analysis is the backbone of any attempt for establishing position requirements and for conducting validation research. To assure that the Houston Police Department's entry level position was evaluated as comprehensively as possible, more than ten different job analysis techniques were employed:

- REVIEW OF OTHER LAW ENFORCEMENT JOB ANALYSIS RESEARCH
- INTERVIEWS WITH INCUMBENTS, SUPERVISORS, TRAINEES AND TRAINERS
- INSPECTION OF PERSONNEL FILES
- REVIEW OF ACTIVITY REPORTS
- DIRECT ON-THE-JOB OBSERVATIONS

- TOTAL JOB CRITICAL INCIDENTS
- PHYSICAL CRITICAL INCIDENTS
- ANALYSIS OF NEWSPAPER REPORTS
- TASK ANALYSIS
- POSITION ANALYSIS QUESTIONNAIRE (PAQ)
- PHYSICAL TASK INVENTORY (P.T.I.)
- TRAINING NEEDS ANALYSIS
- SPECIAL QUESTIONNAIRES

Since each job analysis method has advantages and disadvantages depending on its intended purpose, the utilization of many approaches yields extremely thorough data and also provides a means to estimate reliability and practical significance of research findings and conclusions. If the various job analysis methods obtain similar findings, then the results and final conclusions should have a high degree of confidence. Conversely, job analysis findings which are not mutually supportive or which yield contrary results should be questioned.

CHAPTER 2

METHODOLOGY

A. GENERAL COMMENTS

Job analysis techniques typically try to answer two basic questions, one about job composition and the other about task criticality:

1. What tasks or activities comprise the Houston Police Department entry-level police officer position, and

2. Which tasks are critical to successful performance of an officer's duties and responsibilities?

Both questions are frequently answered by subjective means. There are, however, some quantitative methods to supplement clinical insight. For example, job compositional questions are often quantified by calculating the percentage of persons performing a task, the percent of time spent in an activity, the frequency of performance, etc. These quantifiable techniques are generally appropriate for routine jobs, but have serious drawbacks for the unique situations encountered by law enforcement officers. A police officer's response to any given situation may vary from answering a specific citizen question (no physical activity) to pursuit of an actor or repelling the physical assault of a felon, carrying an unconscious person from a

burning automobile, forcing open a locked door, and so on. In these cases, the criticalness of the behavior is much more important than frequency of performance. Moreover, task composition indices only measure what has occurred. They do not describe how frequently officers *might* be faced with the prospect of having to chase an actor or to defend themselves from attack. Consequently, job composition measures, while useful, must be considered as a very conservative means of evaluating police officer physical requirements.

Task criticality is usually evaluated by considering the consequences of inadequate performance (e.g., cost of wrong decisions, effect on life and property) and the quickness of response time (i.e., time availability to check with a superior before taking action). In practice, criticality is often inferred from the frequency of performance indices. To assure comprehensiveness, the research methods selected for this phase of the investigation studied both job content and task criticalness in a variety of ways.

B. CLINICAL INSIGHT METHODS

The first three job analysis approaches were general in nature, and were completed to gain job insights for constructing other, more detailed quantitative methods. These subjective approaches involved: 1) a review of

other police departments' job analysis techniques and findings; 2) over 150 interviews with Houston Police Department trainees, job incumbents, Academy trainers and supervisors; and 3) inspection and review of personnel files, activity reports, and other types of recorded data. (See Volume IV for additional details.) The above methods did not result in quantifiable data, so conclusions reached by the researchers are only cited when they facilitate clarity of other findings.

C. PERSONAL OBSERVATIONS

Research team members experienced in job analysis rode with about 50 police officers from the Traffic and Patrol Divisions for over 250 shift hours and recorded all pertinent information. Observational data then were categorized and are reported in Volume IV. For the reader's convenience, observations of a physical nature are summarized in the next chapter of this section.

D. CRITICAL INCIDENT METHODS

The next three job analysis approaches used different types of critical incident formats: 1) a survey of total job critical incidents; 2) a survey of physical critical incidents; and 3) a review of newspaper articles. The total job critical incident survey involved a sample of about 350 police officers and focused on the entire job domain.

Of the more than 1,200 incidents received, most were very broad and stressed honesty, emotional stability and other personality characteristics that were critical to successful job performance. However, a number of respondents did refer to physical attributes critical to successful job performance, and these 188 incidents are summarized in the next chapter of this section.

The second critical incident technique used was a Physical Task Critical Incident form, requesting entry level officers to describe recent occurrences that required them to engage in some type of physical activity. A total of 754 usable physical incidents were reported by 318 police officers in the Patrol Division and are summarized in the next chapter. The third critical incident approach consisted of an analysis of newspaper articles appearing during the course of this study. Categorizing police activities which are newsworthy is another approach to critical incidents, especially when one considers the importance of public reaction and image to law enforcement activities. The analysis of newspaper accounts are certainly not intended to stand alone, but are included as additional confirmation for major findings from other job analysis techniques.

E. TRAINING NEEDS ANALYSIS

The identification and documentation of job content was

also approached from a training point of view. As part of the overall research plan, a training needs assessment was made for the Houston Police Department Academy to establish job task training priorities. Because the final task priority evaluations were based on percent time spent, difficulty to learn, task criticalness and delay tolerance, results are very meaningful for the entry level police officer position, and selected findings are presented in the next chapter. (See Volume VIII for complete data on the training needs analysis.)

F. JOB INVENTORIES

The remaining three job analysis techniques involved quantitative questionnaires and inventories: 1) the Task Analysis Inventory; 2) the Position Analysis Questionnaire; and 3) the Physical Task Inventory. The Task Analysis Inventory completed by 860 officers was the single most comprehensive form utilized and provided the baseline information for developing job descriptions, completing the training needs analysis, and examining the validity of the promotional examinations. It also provided information on the relative importance of physical activities in the entire police officer task domain. The Position Analysis Questionnaire (PAQ) was completed by experienced research team job analysts, and the resulting physical, psychomotor and sensory job attributes (characteristics)

were compared against the physical demands of jobs in general, sampled from the entire world of work. (See Volume IV for a detailed description of the PAQ and related attitude data.) The third inventory, the Physical Task Inventory (PTI) was constructed specifically to study the finer aspects of physical actions required of officers in the field. Details of the PTI are summarized below and included in Appendix A.

G. PHYSICAL TASK INVENTORY

The Physical Task Inventory, or PTI, consists of two parts. Part I lists a series of specific activities requiring strength and/or agility. For example, one item was to "climb over a solid barrier that has no footholds: six feet in height, as fast as possible". Another item was "climb over barrier that has handholds and footholds (chain link fence, decorative concrete block wall, etc.): eight feet in height, at a moderate pace". Part II of the PTI was the critical incident format referred to above. (See Appendix A for a copy of the PTI.)

The Physical Task Inventory was administered to all officers hired from 1970 to 1975 and still serving in the entry level police officer position. Because most officers begin their career in the Patrol Division, because the patrol officer has the most physically demandin

position, and because any individual of police officer rank could be transferred back into the Patrol Division at any time, those police officers still serving in the patrol function became the sample for detailing job activities of a physical nature.

Over 400 police officers were asked to complete the inventory by specifying "how many times in the past twelve months you have needed to perform this activity as part of your job." A limited period of twelve months was used to minimize recall errors and to indicate the type of physical challenges immediately facing the new officer. Naturally, officers could not remember every instance and frequently estimated certain details. However, it has generally been found that officers have very good recall about events that involved some significant physical activity on their part. Although a few officers may have been too liberal with their estimates, pretrial and post PTI administration attitudes and comments revealed that most officers were afraid to commit themselves to answers they could not verify. This is certainly understandable when one realizes that an officer's notes and records frequently are used in court testimony. Consequently, most participants appeared to be cautious in their responses to the PTI, and the results should be reasonable estimates of task occurrence.

Because the resulting frequencies of performance often were highly skewed or bimodal, means and medians are not

appropriate statistics for adequately describing the results. Consequently, the data were analyzed by calculating the percentages of officers performing a given activity at a given degree of difficulty. In addition, results were obtained separately for the different patrol shifts (day, evening and night) to provide an indication of the reliability of the PTI data.

CHAPTER 3

RESULTS

Results are cited below, separately for each major job analysis technique. When evaluating the findings it is important to remember that certain techniques stress job compositional considerations, others emphasize criticality and some stress both composition and criticalness. Due to the nature of law enforcement activities, however, most physical tasks identified as part of the job are evaluated by job analysts as critical. When laws are not broken and when special situations do not arise, officers primarily spend their time patrolling in a vehicle, answering calls, completing reports and engaging in other functions which require little or minimal physical activity. But when officers are required to force open doors, chase burglars, capture or subdue fighting actors, the situation is not normal. Officers typically engage in physical action only when something is wrong - when laws are broken or when emergency situations arise. Therefore, the research team job analysts consistently regarded all data reported in this chapter as critical and necessary to successful officer performance.

A. TASK ANALYSIS RESULTS

The task analysis procedure was used to determine both job composition and criticalness of physical activities. In completing the Task Analysis Inventory, officers in entry

level positions were requested to note which tasks they actually perform as part of their job. Then, their Sergeants rated the selected tasks on a seven point scale as to consequences of inadequate performance and to delay tolerance (i.e., response immediacy).

Although many Task Analysis Inventory items imply physical strength or agility, some can be accomplished by non-physical means. For example, one item, "control fights among prisoners", does not explicitly state the need to "control" by physical force. To allow a comparison of the relative importance of physical activities to other officer tasks, redundant and potentially ambiguous items were omitted, resulting in the following items which clearly require physical abilities:

Task Inventory Item Number	Task Statement
B12	"Engage in high speed driving when required."
E4	"Subdue suspect using knowledge of physical restraining techniques and defensive tactics which may include use of a baton or any common item which may be used as a weapon."
E6	"Pursue fleeing actors on foot."

Task Inventory Item Number	Task Statement
E8	"Discharge firearm when threatened with danger to life or serious bodily injury."
F6	"Physically restrain members of either party at a strike or demonstration."
J20	"Protect self if physically attacked and subdue prisoners."

The percentage of officers performing these six tasks are presented in Table 1. As expected, the frequency of officers involved in the tasks related to pursuit of fleeing actors and to restraint and combat activities are quite high. In fact, items B12, E4 and E6 have some of the highest item percentages when compared to all other entry level police officer functions (see Volume IV for comparative statistics).

Furthermore, these pursuit, restraint and combat items are among the most important functions of police officers when defined in terms of two dimensions: consequences of inadequate performance and delay tolerance. Table 2 shows the mean importance ratings on the above dimensions, with seven being the highest possible score. To aid interpretation, the importance of items B12, E4, E6, E8, F6 and J20 were compared to the importance of all other officer tasks.

TABLE 1

PERCENTAGE OF ENTRY LEVEL POLICE OFFICERS

PERFORMING SELECTED TASK INVENTORY ITEMS

Task Analysis Inventory Item Number and Content	Percent Performing
B12 High Speed Driving	96
E4 Subdue Suspect/Actor	92
E6 Foot Pursuit of Suspect/Actor	96
E8 Proper Use of Firearms	76
F6 Restraint of Unruly Persons	43
J20 Subdue Prisoner if Attacked	68

CRITICALITY OF SELECTED TASK INVENTORY ITEMS

Criteria/Item	Item Rating	Percentage of Time Item Rating Was Greater Than Ratings for All Other Tasks
1. Consequences of Inadequate Performance		
B12 High Speed Driving	5.30	96.2
E4 Subdue Suspect/Actor	5.10	95.3
E6 Foot Pursuit of Suspect/Actor	4.40	86.9
E8 Proper Use of Firearms	6.10	99.7
F6 Restraint of Unruly Persons	4.85	93.9
J20 Subdue Prisoner if Attacked	5.35	96.5
2. Delay Tolerance		
B12 High Speed Driving	6.00	93.6
E4 Subdue Suspect/Actor	6.29	98.6
E6 Foot Pursuit of Suspect/Actor	6.29	98.6
E8 Proper Use of Firearms	6.12	95.6
F6 Restraint of Unruly Persons	5.47	83.8
J20 Subdue Prisoner if Attacked	6.76	99.6

Clearly, each of the six items are highly critical, with inadequate foot pursuit of actors having worse consequences than 86.9 percent of all other police officer tasks and a shorter delay tolerance than 98.6 percent of the other tasks. Likewise, pursuit driving, use of firearms, restraint and subdue activities have very potentially dangerous consequences when inadequately performed, and very short response times.

Applying a slightly different focus, various ratings of Task Analysis Inventory items were combined into a single score to indicate task priorities for the police Academy. The combined rating consisted of consequences of inadequate performance, delay tolerance, percent members performing, and task difficulty level (see Volume VII). Only the eight highest priority items out of a total of 344 tasks are presented in Table 3.

Two of these items (B12 and D12) directly refer to the importance of high-speed driving. While not explicitly stating the importance of psychomotor skills for discharging a firearm, item E7 implies both judgment and use. (The actual use of firearms, item E8, received a rating of 24, which placed it in the second category after the first eight items, but still in the top quartile.) Again, psychomotor skills related to driving and shooting are quite critical to an officer's performance on the job. Thus,

TABLE 3

PRIORITY OF TRAINING NEEDS

Priority Value	Task Inventory Item	
28	E3	"Decide what weapon and force, if any, should be used when faced with resistance to an arrest."
28	D11	"Coordinate activities of other officers at a crime-in-progress scene to prevent escape; protect officers and citizens by engaging in activities such as clearing the area and positioning officers."
27	B12	"Engage in high-speed driving when required."
27	E4	"Subdue suspect using knowledge of physical restraining techniques and defensive tactics which may include use of baton or any common item which may be used as a weapon."
27	E7	"Draw sidearm, in accordance with Departmental policies, when extreme violence seems imminent."
26	D5	"Analyze situation to determine best method of handling and whether assistance from others (such as supervisors, detectives, ambulance service, medical examiner, etc.) will be necessary."
26	D10	"Respond to felony-in-progress or 'assist the officer' calls as quickly as possible to protect officers, victims, and bystanders; to apprehend actors; and to recover any property or evidence."
26	D12	"Engage in high speed driving to scene."

visual acuity, peripheral vision, reaction time, hand steadiness, etc., are important attributes related to an individual's potential for driving and marksmanship.

Of the remaining five items cited in Table 3, at least four refer to the use of physical force with suspects/actors. Item E4 directly refers to the physical aspects of subduing actions, while E3 reveals the importance of judgment when force is required. The potential need to protect officers and citizens, and to apprehend actors, are directly implied by items D10 and D11. Even though these eight activities should receive the highest priority in the Academy, their overwhelming importance dictates that both selection and training are necessary to assure that individuals are capable of fulfilling the physical demands of the entry level police officer position.

In summary, results from the task analysis strongly indicate that activities related to driving, shooting, chasing, and forcibly subduing resistant actors are a necessary and essential part of the Houston Police Department officer's routine. These results are strong, consistent evidence for the need of some type of physical attribute screening during the process of selecting new officers. Because of the strength of these results, it would be surprising indeed if other job analysis methods did not confirm these findings.

B. OVERALL JOB CRITICAL INCIDENTS

Responses to the general critical incident questionnaire also had references to a number of situations requiring a police officer to use physical strength and agility. Each of the comments cited (see Volume IV) is particularly meaningful because responses were to an open-end format which referred to all aspects of the job. The physical incidents obtained were similar to prior findings, but more detailed, and stressed fighting, chasing fleeing actors, climbing barriers, jumping across obstacles, carrying people out of burning buildings, pulling actors out of cars, climbing down ropes, running up stairs, and even being able to reach the gas pedal of a patrol car. Table 4 presents a comprehensive listing of reported physical incidents.

C. NEWSPAPER ARTICLES

Although most law enforcement incidents are not thoroughly reported in newspapers unless they are headline news, such articles can be informative. Incidents reported in the Houston Chronicle and Houston Post involving physical behaviors during the course of this study are summarized in Table 5. Although most newsworthy reports did not detail physical activities, a substantial number did provide specific data. These specifics included "kicking in" a

TABLE 4

SPECIFIC PHYSICAL ACTIVITY CATEGORIES

AS SUMMARIZED FROM CRITICAL INCIDENTS

Physical Activity	Number of Incide: Involving this Activity
Several officers subdued several attackers	1
Four officers subdued one actor	5
Three officers subdued one actor	8
Three officers formed train by grabbing waists and end officer pulled man back from ledge	1
Two officers chased, caught and apprehended three actors	1
Two officers chased, caught and apprehended one actor	11
Two officers fought and subdued one actor	21
One officer held onto actor and defended self from bystanders' assault	4
One officer fought two or three actors and was unable to apprehend any of the actors	3
One officer fought two actors, apprehended one but was unable to apprehend the second	1
One officer chased, caught and apprehended two actors	1
One officer apprehended two actors	2
One officer chased, caught and apprehended one actor	25
One officer chased, caught but could not apprehend actor	3
One officer chased actor, actor was shot in chase	3
One officer chased actor, but could not catch actor	11

TABLE 4 (Cont'd.)

Physical Activity	Number of Incidents Involving this Activity
One officer let actor run away and didn't try to catch him (officer was overweight)	1
One officer fought/apprehended/subdued/handcuffed resisting actor	37
One officer could not apprehend/subdue an actor (not enough strength)	17
One officer was beat up or pinned down by an actor	5
One officer kicked in a door	8
One officer carried people out of a burning building	3
One officer pulled person out of a car	2
One officer retrieved a body from the bayou	1
One officer climbed in the window of a house from the ground	1
One officer climbed a ladder	2
One officer climbed to the roof of a building	1
One officer climbed a tree and jumped to the roof of a building	1
One officer jumped from a window to the roof of a building next door	1
One officer lowered another officer into a building from a roof by rope or water hose	3
One officer was lowered into building from a roof by rope or water hose	3
One officer could not reach gas pedal in patrol car to drive it	1

Note: Chases included climbing six foot fences, jumping drainage ditches and running up stairs.

TABLE 5

SAMPLE OF PHYSICAL ACTIVITIES AS REPORTED IN HOUSTON AREA NEWSPAPERS JANUARY to DECEMBER, 1976

Officers engaged in high speed auto chases and running gun battles with burglary suspects.

Officers pursue fleeing burglary suspects until suspects' vehicle crashed.

Officers shot and wounded/killed suspects reaching for a weapon.

Officers were shot at/wounded by actors.

Officers struggled with and subdued actors.

Officers struggled with and disarmed suspects.

Officers were assaulted and injured by actors.

Officers pursued on foot and caught fleeing actors.

Officers pursued on foot and lost fleeing actor.

Officers kicked door in during apprehension of actor.

Officer lifted heart attack victim into helicopter during emergency rescue.

Officer dodged actor trying to run the officer down with an automobile.

door, wrestling with armed and unarmed actors, foot pursuit of fleeing actors, carrying and lifting a sick person, using firearms and high-speed pursuit driving activities.

D. PTI PHYSICAL CRITICAL INCIDENTS

Over 750 usable physical critical incidents were obtained from 318 patrol officers utilizing a separate questionnaire for this purpose (PTI - Part II). For discussion purposes, the incidents can be divided into two categories, those involving actors and those not involving actors.

1. Incidents Involving Actors

The most frequently mentioned incidents in this category were the need to chase and subdue actors. Chasing activities involved pursuit at maximum speed along the shortest possible path, over bushes, across ditches, around buildings and cars and so on. Critical incidents pertaining to the restraint and subduing of hostile actors frequently involved multiple assailants, or one intoxicated, drugged or mentally disturbed actor. Combat occurred under a variety of circumstances, usually ending in street fights or barroom brawls. Although fights usually involved only one officer, assistance was sometimes available for handcuffing the actor.

Examples of non-combat situations included carrying or

dragging an actor that refused to move, dislodging an actor from a hiding place (i.e., from under a car, etc.), or movement of an actor who had been subdued by another officer.

2. Incidents Not Involving Actors

Of the critical incidents not involving an actor, speed was usually moderate as opposed to "as fast as possible". Examples of these incidents included climbing into a building in answer to an alarm, recovery and movement of stolen merchandise, pushing vehicles, and prying open doorways to both automobiles and buildings.

A summary of the more common critical incidents involving physical activity is shown in Table 6 along with a list of the individual physical demands each incident required. Table 7 lists the physical activities most often mentioned in the critical incidents along with the percentage of officers that reported involvement. Typical and full ranges of distances, heights, lengths, and weights are also summarized in the table.

E. DIRECT OBSERVATIONS

In support of the validity of other job analysis methods, the research team job analysts personally observed incumbents performing their jobs. Of the approximately 336

TABLE 6

COMMONLY REPORTED PTI CRITICAL INCIDENTS

INVOLVING PHYSICAL ABILITIES

Incident	Physical Demands
1. Chasing and subduing an actor	Running Climbing over obstacles Jumping over obstacles Combat and/or restraint of an actor
2. Subduing an actor(s) unassisted	Combat and restraint Lifting actor Carrying or dragging actor
3. Subduing an actor(s) assisted	Combat (one or several) Assisted restraint Assisted lifting, carrying, or dragging the actor
4. Investigate commercial or industrial alarm	Pulling up to visual vantage point Climbing over guard fences Climbing through windows Climbing to roof Jumping down from fences, roofs, or windows
5. Recovery and movement of stolen merchandise	Lifting objects Carrying objects Dragging objects
6. Scene of an accident	Pushing vehicles Prying open doors Lifting objects and persons Carrying objects and persons Dragging objects and persons

TABLE 7

SUMMARY OF PHYSICAL ACTIVITIES
REPORTED IN THE PTI

Activity	% Officers Mentioned	Full Demand Range	Typical Demand Range*
Running	87%	7 yards - 4 miles	25-800 yards
Climbing	62%		
• In pursuit	49%	Over: 3-12 feet	Over: 4-8 feet
• Investigative	13%	Over: 4-12 feet	Over: 6-10 feet
		Onto: 2 stories	Onto: 1 story
Jumping	53%		
• In pursuit	49%	Across: 2-8 feet	Across: 3-6 feet
		Over: 1-6 feet	Over: 2-4 feet
		Down: 4-20 feet	Down: 3-6 feet
• Investigative	4%	Down: 4-20 feet	Down: 6-12 feet
Lift, Carry, Drag	67%		
• Actors, unassisted	19%	110-205 lbs	140-170 lbs
• Actors, assisted	51%	100-300 lbs	140-210 lbs
• Objects, unassisted	8%	20-350 lbs	50-100 lbs
• Objects, assisted	5%	75-350 lbs	100-150 lbs

* Definition of typical: Exclusion of approximately upper and lower 10% of full range.

hours of observation (42 full shifts), about 250 hours were in the Patrol and Traffic Divisions. A complete listing of observational data is reported in Volume IV, but those activities relating to physical attributes are reproduced in Table 8.

As the data in Table 8 indicate, job analysts personally observed the same physical activities reported by officers in the Task Inventory and Critical Incident techniques. More specifically, they observed pursuit activities such as forcing open a door and chasing an actor. A number of restraint and control activities were observed, including the lifting and carrying of resisting actors, forcing actors into patrol cars, and the general need to subdue struggling and intoxicated actors. Other physical activities observed were the pushing of stalled automobiles, climbing over fences, lifting/carrying persons and objects, pulling oneself up to a ledge with arm strength only and hanging there with one hand. Psychomotor skills required in high-speed driving also were experienced.

Potential conclusions for the observational data alone suggest the need to screen job applicants for ability to run, climb, lift, carry, push, pull up and hold position; for the abilities to defend oneself and subdue belligerent actors; and for psychomotor skills related to driving and marksmanship.

TABLE 8

TYPES OF PHYSICAL ACTIVITIES OBSERVED*

A1. Pushing a stalled automobile off the street (alone) (with assistance)

A2. Breaking through a door to gain forcible entry (with assistance)

A3. Handcuffing prisoners (alone) (with assistance)

A4. Climbing over a five-foot fence to enter property (alone)

A5. Subduing and controlling a struggling actor/intoxicated actor (alone) (with assistance)

A6. Controlling several intoxicated persons (alone)

A7. Lifting and carrying a resisting actor into the patrol car (with assistance)

A8. Running approximately 100 yards and catching a fleeing actor (alone)

A9. Lifting and carrying portable scales (alone)

A10. Lifting injured person from automobile onto a stretcher

A11. Forcing a resisting actor to the patrol car (alone) (with assistance)

A12. Pulling self up through attic entrance and hanging there with flashlight in one hand (alone)

B1. High speed driving

B2. Pursuit driving

B3. Flying helicopter

E11. Drawing weapons to have ready for use

*See Volume IV for complete listing of observed activities.

F. POSITION ANALYSIS QUESTIONNAIRE

The Position Analysis Questionnaire (PAQ) was utilized to analyze the entry level police officer position under two sets of circumstances. During one analysis, five experienced job analysts described the total police officer position taking into consideration both the "routine" and the emergency and/or physical activities as they might occur in a typical work cycle. A second analysis with the PAQ was completed by the job analysts considering the police officer position just from the perspective of the emergency and physical nature of the job. This second PAQ analysis was deemed important because of the formal design of the PAQ.

More specifically, the PAQ was structured to focus on work behaviors in terms of their importance, extent of use, time, etc. Consequently, when considering the "total" police officer job, an analyst would not evaluate the physical demands of the position as being more important, or occurring more frequently, than the interpersonal or other aspects of the position that have little or no physical components. However, when only considering officer behaviors in emergency situations or when extensive physical activity is involved, then the PAQ results give a more accurate evaluation of the physical, psychomotor and sensory attribute requirements of the job. This situation is

analogous to evaluating fire fighters under routine conditions when most of their time is spent inside the fire station versus their behaviors when actually outside fighting fires.

As explained in detail in Volume IV, results from PAQ job analyses can be statistically analyzed to develop a set of attribute requirements for any given job. These results are presented in Volume IV, but are, in part, reproduced for this section of the report. More specifically, the significant *physical, psychomotor and sensory* attribute requirements that are established by the PAQ job analyses are included herein for the entry level police officer position. The definitions for each of these specific attributes are given in Appendix B.

The data presented in Table 9 indicate the level or amount of each physical, psychomotor, and sensory attribute required by the police officer position in comparison to the same attribute requirements for all jobs found throughout the world of work. For example, data in the first column in Table 9 indicates that 42 percent of all occupations require less explosive strength than the amount of explosive strength required of police officers under "routine conditions. Conversely, 58 percent of all jobs require more explosive strength. When the police officer job is analyzed just from the perspective of required emergency

TABLE 9

PHYSICAL, PSYCHOMOTOR AND SENSORY ATTRIBUTE REQUIREMENTS DETERMINED BY THE PAQ FOR THE ENTRY LEVEL POLICE OFFICER POSITION UNDER BOTH "ROUTINE" AND EMERGENCY/PHYSICALLY ACTIVE CONDITIONS

...IBUTES[2]	PERCENTILE[1] "ROUTINE" CONDITIONS	EMERGENCY/PHYSICALLY ACTIVE CONDITIONS
...losive Strength	42	66
...mic Strength	32	60
...tic Strength	36	61
...d of Limb Movement	35	63
... Control	50	67
...eptibility to Fatigue	61	83
...ina	56	81
... Orientation	37	64
...sthesis	35	62
...tial Orientation	51	69
...hand-foot Coordination	50	67
...le Reaction Time	72	86
...Visual Acuity	62	72
...ent Detection	62	69
...l Perception	54	64
...ry Alertness	65	79

... percentile is the level or amount of each attribute required by the ...y level police officer position in comparison to the attribute require-...ts for all jobs found throughout the world of work. Only attributes of ...hysical, psychomotor and sensory nature that are required more than ...rage under emergency conditions (i.e., the 60th percentile or above) are ...orted in this Table.

... attribute definitions are given in Appendix B.

and physical activities, then 66 percent of all jobs require less explosive strength, and 34 percent require more explosive strength.

When considering most of the attributes of a physical, psychomotor and sensory nature that are measured by the PAQ, Table 9 indicates that the entry level police officer position under "routine" conditions generally requires an average amount of each attribute relative to the physical, psychomotor and sensory requirements found throughout the world of work. Stated in another way, the routine entry level police officer position places an average amount of physical, psychomotor and sensory demand on job incumbents in comparison to the demands created by all other occupations. When the police officer job is considered from the perspective of emergency or physically active conditions, then *all* of the physical, psychomotor and sensory attributes reported in Table 9 place an above average demand on job incumbents.

A major purpose of this part of the research proje t has been to define and document the essential physical requirements demanded by the entry level police officer position, and subsequently to specify those characteristics or standards that should be utilized in the selection of individuals to perform the job. Clearly, the results from the PAQ job analysis procedure replicate and complement

the findings from the other job analysis techniques employed in this phase of the study. More specifically, when the entry level position is analyzed with the PAQ from the perspective of the behavioral demands placed on individuals in emergency or physically active situations, there are a variety of abilities required of job incumbents in the police officer role that equal or exceed the levels of physical, psychomotor and sensory abilities required throughout the world of work.

Consequently, this data has independently established the necessity for considering various strength, coordination, physical health, and sensory abilities of applicants during the selection process in order to ensure that these individuals are able to perform the duties required of the entry level police officer position, especially in emergency and physically active situations. Further, it is evident that these physical requirements for the police officer entry job are above the levels typically found throughout the spectrum of work (i.e., are above average in comparison to all other occupations) and that the minimum entrance standards should be established accordingly.

G. PHYSICAL TASK INVENTORY

The final and most comprehensive job analysis method for studying physical attributes was the PTI, Part I. The PTI was constructed to study tasks and subtasks by requesting

officers to respond directly about their performance of specific actions such as running, jumping, climbing, etc. While the Task Analysis Inventory used a somewhat comparable approach, it stressed broader tasks such as pursuit, restraint and subdue in general.

PTI booklets were distributed to over 400 patrol officers, and 386 were returned in time to be included in the analysis. The analysis of the PTI data consisted of calculating the percentage of officers who performed each activity within the last 12 months. As a general rule, an activity should have been performed by at least one-half of the 386 participating patrol officers during the past year for it to be "important". (A discussion of why this criterion was selected is presented in the next chapter, but it should suffice to state that the fiftieth percentile may be too stringent, considering the circumstances and type of actions involved.)

As might be expected, the criterion was satisfied by many different activities, including running with obstacles in one's path, running up and down stairs, climbing over barriers, climbing up ladders and through windows, lifting and carrying things, jumping over/across/down from obstacles, dragging people, forcing open doors, balancing on a narrow beam, pushing stalled automobiles, pulling oneself up by arm strength only, working extended shifts

TABLE 10

PHYSICAL TASK INVENTORY ACTIVITIES

Activities Occurring in Last 12 Months	Percent Officers Performing by Patrol Shift			
	I	II	III	TOTAL
A. RUNNING ACTIVITIES				
• Without Obstacles in Path	94%	98%	99%	98%
• With Obstacles in Path	83%	93%	96%	92%
• With/Without Obstacles in Path	97%	98%	99%	99%
• Up Stairs	64%	79%	77%	74%
• Down Stairs	53%	64%	66%	63%
B. CLIMBING ACTIVITIES				
• Barrier With Footholds	83%	93%	92%	92%
• Barrier Without Foodholds	75%	77%	85%	81%
• Up Ropes	3%	6%	6%	6%
• Up Ladders	61%	64%	76%	69%
• Through Windows	83%	94%	96%	93%
C. LIFTING AND/OR CARRYING ACTIVITIES				
• Objects Without Assistance	61%	49%	49%	50%
• Objects With Assistance	36%	43%	39%	40%
• Persons Without Assistance	61%	69%	62%	65%
• Persons With Assistance	58%	79%	76%	76%

PHYSICAL TASK INVENTORY ACTIVITIES (Continued)

Activities Occurring in Last 12 Months	Percent Officers Performing by Patrol Shift			
	I	II	III	TOTAL
D. JUMPING ACTIVITIES				
• Over Obstacles	75%	80%	81%	80%
• Across Obstacles	67%	72%	75%	73%
• Down from Heights	92%	85%	89%	88%
E. DRAGGING ACTIVITIES				
• Objects	39%	41%	36%	39%
• Individuals	64%	72%	76%	73%
F. FORCING OPEN DOORS	57%	49%	50%	50%
G. BALANCING ACTIVITIES				
• Narrow Ledge/Near Wall	17%	30%	32%	30%
• Beam/Fence/No Support	42%	47%	53%	49%
H. PUSHING STALLED AUTO	86%	94%	94%	93%
I. PULLING SELF UP USING ARMS ONLY	67%	70%	72%	71%
J. HANGING WITH ARMS FULLY EXTENDED	22%	31%	41%	35%
K. SWIMMING ACTIVITIES	5%	3%	2%	3%

PHYSICAL TASK INVENTORY ACTIVITIES (Continued)

Activities Occurring in Last 12 Months	Percent Officers Performing by Patrol Shift			
	I	II	III	TOTAL
L. WORKING TWO OR MORE CONSECUTIVE SHIFTS	69%	77%	84%	80%
M. ACTOR RESISTANCE WITH ASSAULT ON OFFICER				
• Unarmed Assault - 1 Actor	69%	76%	81%	78%
• Unarmed Assault - 2+ Actors	36%	50%	46%	47%
• Armed Assault	38%	42%	46%	43%
• Total Resistance with Assualt - Adult	78%	81%	87%	83%
N. ACTOR RESISTANCE BUT NO ASSUALT - ADULT				
• Restraining Fleeing Actor	86%	90%	90%	89%
• Handcuffing Resisting Actor	92%	96%	98%	96%
• Putting Resisting Actor in Car	92%	97%	97%	96%
• Total Non-Assault Resistance	97%	98%	100%	98%
O. OTHER RESTRAINT ACTIVITIES				
• Restraining Disturbed Person	83%	87%	84%	85%
• Restraing Drugged/Intoxicated Person	89%	97%	97%	96%
• Restraining 2 Fighting Persons	81%	95%	87%	90%
• Restraining/Prevent Injury	78%	87%	92%	88%
• Total Other Restraint Activities	97%	99%	99%	99%
P. NUMBER OF OFFICERS IN SAMPLE	36	172	178	386

in emergencies, handling actor assaults, restraining resistant actors, handcuffing resistant actors, and forcing resisting actors into patrol cars. Table 10 summarizes these findings, showing results separately for each shift. Although it is not surprising that PTI conclusions are comparable to those found for the other job analysis techniques, the reliability of percentages from shift to shift are quite impressive.

H. CONCLUSIONS

To summarize briefly, the various job analysis findings were very consistent regarding the physical activities performed by Houston Police Department officers. The activities which satisfy three stringent criteria of criticalness, percent of officers performing and reliability are the following:

- Running with or without obstacles in path
- Running up and down stairs
- Climbing over obstacles
- Climbing up ladders
- Climbing through windows
- Lifting and/or carrying things
- Jumping over or across obstacles
- Jumping down from a height
- Dragging individuals
- Forcing open doors
- Balancing on a beam/fence without support

- Pushing a stalled auto
- Pulling self up using arms only
- Handling actor resistance and assault
- Restraining actor trying to flee
- Handcuffing resisting actor
- Putting resisting actor in patrol car
- Restraining disturbed/drugged actors
- Working overtime shifts
- Pursuit driving
- Using firearms

Although this list may appear quite comprehensive, one must remember that it may be conservative. Only activities reported by the majority of officers are listed. Other critical tasks performed less frequently may erroneously have been omitted.

Based on the overwhelming strength of these findings, it is not difficult to conclude that the Houston Police Department entry level officer position does have many physical demands and the testing of such physical attributes is appropriate, if not necessary, for the proper screening of job applicants. The job analysis results by themselves do not specify minimum job requirements, but are the basis for developing such information. The actual establishment of minimum physical standards is discussed in the next section for medical considerations, in Section 3 for physical

strength/agility/ability requirements, and in Section 4 for physical size and vision requirements.

SECTION 2

MEDICAL REQUIREMENTS

Texas, as most other states, has enacted statutes which govern the selection of police officer applicants. As specified by the Texas Commission on Law Enforcement Standards and Education, Section 210.01, under the authority of Article 4413(29aa), V.T.C.S.:

"PHYSICAL EXAMINATION

" ... a peace officer must be physically sound and free from any defect which might adversely affect his performance of duty. His personal safety and the safety and lives of others will be endangered if he lacks these important physical qualifications.

"Requirements

1. "Medical examination administered by a licensed physician or surgeon.

    a. "Physical condition should be determined by the designated examining physician. Applicant should be in sound physical condition.

    b. "Applicant should be free from physical defects that could prevent the performance of duty.

2. "A medical history will be supplied by each applicant to the examining physician. The medical history will include information on past and present diseases, injuries, and operations.

3. "Vision and Hearing - The applicant shall possess normal hearing, normal color vision and functions, as determined by the appointing authority. Each eye must be free of any abnormal condition or disease which, in the opinion of the appointing authority, might adversely affect performance of the assigned duty."

In order to evaluate current practices and to detail specific medical requirements, John J. Costanzi, M.D. (see Appendix C for credentials) reviewed the job analysis results for entry level police officer positions. Based on this analysis he prepared the statement which follows, entitled "Evaluation of Medical Requirements".

EVALUATION OF HOUSTON POLICE DEPARTMENT MEDICAL REQUIREMENTS

BY JOHN J. COSTANZI, M.D.

1. Purpose

The following is an analysis of the medical requirements of a police officer. The analysis includes specific portions of the physical examination and essential medical history. This review and commentary will take into account the duties and responsibilities of law enforcement officers and the probability that a police officer will sometime in his or her career, have to perform all of the following activities:

a. Running with or without obstacles in path
b. Running up and down stairs
c. Climbing over obstacles
d. Climbing up ladders
e. Climbing through windows
f. Lifting and/or carrying things
g. Jumping over or across obstacles
h. Jumping down from a height
i. Dragging individuals
j. Forcing open doors
k. Balancing on a beam/fence without support
l. Pushing a stalled auto
m. Pulling self up using arms only

n. Handling actor resistance and assault

o. Restraining actor trying to flee

p. Handcuffing resisting actor

q. Putting resisting actor in patrol car

r. Restraining disturbed/drugged actors

s. Working overtime shifts

2. Height and Weight Requirements

a. Height requirements

There is no medical reason for establishing a minimum or maximum height without consideration of the applicant's weight.

b. Weight requirements

There is no medical reason for establishing a minimum or maximum weight without considering the applicant's height.

c. Height/Weight proportions

There are medical reasons for requiring an applicant's weight to be proportional to his/her height. Primary medical reasons include general health, physical condition and stamina, incidence of heart disease, etc.

Height-weight standards should be separate for males and females, since body build (i.e., slender, medium, heavy or obese) varies markedly between the sexes. Age also effects height-weight ratios and

should be considered. Standard height-weight normative charts published by Metropolitan Life Insurance Co. or the U. S. Air Force are recommended for use at the Houston Police Department (see Table 11).

3. Vision Requirements

a. Visual Acuity - General Comments

A visual acuity requirement of 20/20 means that the applicant must be able to see at a distance of 20 feet that which the "normal" person is able to see at 20 feet. A visual acuity requirement of 20/40 means that the applicant only perceives at 20 feet that which the "normal" person is able to see at 40 feet. Because of the officer's need to perceive license plates, identify suspects, engage in marksmanship and high speed driving activities, it is obvious that officers need good vision and should have at least normal visual acuity at time of application. Since visual acuity tends to deteriorate somewhat with age, it should be anticipated that applicants with poor vision at age 20 will have even poorer vision at age 30 or 40.

b. Corrected Visual Acuity

Unless an applicant has organic eye disease, his/her visual acuity should be correctable to 20/20. Since officers should have at least normal visual perception, applicants should either have an uncorrected vision

TABLE 11

U. S. AIR FORCE HEIGHT AND WEIGHT STANDARDS

AUGUST 14, 1968

WEIGHT TABLE

Height, inches	Minimum	Standard	Maximum					
			18-20	21-25	26-30	31-35	36-40	40 and over
			a. MALES					
60	100	122	146	150	153	157	160	164
61	102	124	149	153	155	159	163	166
62	103	126	151	155	158	161	165	169
63	104	128	155	158	160	164	168	171
64	105	181	159	160	164	168	171	175
65	106	135	163	165	169	173	176	180
66	107	139	166	170	174	178	181	185
67	111	143	171	175	179	183	186	190
68	115	147	176	180	184	188	191	195
69	119	151	181	185	189	193	196	200
70	123	155	186	190	194	198	201	205
71	127	159	191	195	199	203	206	210
72	131	164	196	201	205	209	213	216
73	135	169	201	208	211	215	219	223
74	139	174	206	214	218	221	225	229
75	143	179	211	220	224	228	231	235
76	147	184	216	226	230	234	238	241
77	151	189	221	232	236	240	244	248
78	153	194	226	239	242	246	250	254
79	157	199	231	245	248	252	256	259
80	161	204	236	251	254	258	262	265
			b. FEMALES					
60	99	115	121	123	127	129	132	135
61	101	116	123	125	128	131	134	139
62	103	118	125	128	130	133	138	143
63	106	122	130	132	134	138	142	146
64	108	125	132	135	138	141	145	150
65	111	129	135	139	142	146	151	155
66	113	133	139	143	146	151	155	158
67	116	137	142	146	151	155	160	163
68	121	141	147	152	155	160	164	168
69	124	145	152	156	160	164	168	173
70	129	149	157	160	164	168	173	177
71	132	153	162	165	168	173	176	179
72	136	157	166	169	173	176	179	182

NOTE: The standard weight for each height is considered the ideal weight to maintai: All Air Force personnel are encouraged to achieve this goal in order to assur: a high degree of physical fitness. Administrative actions, however, will be based on the maximum and minimum standards for height and age in the appropri. table above.

of 20/20 or corrective lenses to bring visual acuity to 20/20. Officers with corrective lenses should be required to have an extra pair on their possession in case of breakage or loss, and both pairs should be shatterproof.

c. Uncorrected Visual Acuity

In case an officer's corrective lenses are broken, lost or stolen, should there be a minimal level of eyesight required of all applicants. Although the probability of such occurrences is not high, it is important since the officer without glasses still might be required to drive a car, identify a suspect or shoot a weapon. Furthermore, because of normal deteriorization in acuity with age, uncorrected vision may continue to worsen.

At what level should this minimum be set? To avoid screening out otherwise qualified applicants, the minimum should be set as low as reasonable, at the point where the individual is still capable of functioning. Since legal blindness is established as 20/200, the applicant's vision should be better than this legal standard in each eye, i.e., he/she should not be legally blind in either eye. Thus, a requirement of 20/100 or 20/150 uncorrected in each eye appears to be a reasonable minimum standard.

d. Eye Disease

Active or progressive organic disease of the eye should always be disqualifying because an individual with this condition could, in a very short span of time, experience a very great deterioration of his/her visual acuity.

e. Color Blindness

Applicants should have normal color vision, since they may be required to identify persons or objects or testify in court about identifying items that are described in terms of color. Although only a small percentage of persons have any color blindness, certain types of color blindness will disqualify more males than females. Nevertheless, normal color vision should be required of all applicants.

f. Depth Perception and Peripheral Vision

Because they are critical to high speed driving and other law enforcement activities, all applicants should have at least normal depth perception and normal peripheral vision. The VTA-ND depth perception test is recommended, with no errors allowed for groups B, C or D. If the Verhoeff depth perception apparatus is used, there should be no errors in the eight presentations of the first trial.

g. Night Vision

Night vision is essential for police officers. Poor night vision is usually congenital but progressive organic eye disease can produce this defect. Though there is no standard test for it, the presence of defective night vision can be determined by a careful medical history.

4. Hearing

The applicant should be capable of normal hearing. A licensed physician who is familiar with the job requirements, demands, duties and responsibilities of the police officer position in the Houston Police Department should evaluate each applicant on an individual basis utilizing appropriate medical history and examination information to determine if a particular hearing defect should disqualify that applicant.

5. Skin

Severe facial acne and other plain diseases which can hinder the wearing of necessary headwear (hat, riot helmet and chin strap) or regulation uniforms should be disqualifying. A licensed physician who is familiar with the job requirements, demands, duties and responsibilities of the police officer position in the Houston Police Department should evaluate each applicant on an individual basis utilizing appropriate medical history and examination information to determine if a particular skin condition should disqualify that applicant.

6. Deformities

Most physical deformities should be disqualifying, i.e., loss of one eye, arm, leg, hand, thumb, big toe, index finger, etc. Minor deformities, such as loss of one digit of small finger or one minor toe need to be considered on an individual basis. A licensed physician who is familiar with the job requirements, demands, duties and responsibilities of the police officer position in the Houston Police Department should evaluate each applicant on an individual basis utilizing appropriate medical history and examination information to determine if a particular deformity should disqualify that applicant.

7. Illnesses

Any reoccurring illness or physical condition which can produce acute problems or incapacitations at any time, should be disqualifying. Conditions which are unequivocally disqualifying include a history of stomach or duodenal ulcer, convulsions, diabetes, migraine headaches, recurrent jaundice, chronic malaria, true arthritis, heart trouble, chronic or reoccurring acute anemia (e.g., bleeding), and asthma.

Other physical conditions need to be evaluated individually by a qualified medical expert. Some conditions which require careful consideration are the following:

a. Tuberculosis - This is a curable disorder that usually leaves no sequellae. If an individual had

TB and was treated with appropriate antibiotics for the prescribed length of time and the chest x-ray is normal or shows minimal scarring, he/she may be qualified.

b. Syphilis is a curable illness. If it was adequately treated, it should not be disqualifying.

c. Hayfever occurs in degrees. If an individual has a mild case and it only occurs seasonally, it should not be disqualifying.

d. Rheumatic Fever is treatable and usually leaves no sequellae. If an individual has a history of rheumatic fever and it was well treated and the heart exam is normal, the applicant should qualify.

e. Polio is disqualifying if some neurological sequellae are obvious. If an individual gives a history of polio, but the neurological exam is normal, the applicant should qualify.

f. Mental illness in family of the applicant. If an applicant has a family history of mental illness, the applicant's mental condition and predisposition toward mental illness should be evaluated by a qualified clinical psychologist or psychiatrist.

A licensed physician who is familiar with the job requirements, demands, duties and responsibilities of the police officer

position in the Houston Police Department should evaluate each applicant on an individual basis utilizing appropriate medical history and examination information to determine if a particular prior medical illness should disqualify that applicant.

8. Miscellaneous

If other medical conditions arise which might be incapacitating or disqualifying, the applicant should be examined by a licensed physician who is familiar with the job requirements, demands, duties and responsibilities of the police officer position in the Houston Police Department.

9. Existing Medical Forms

The Medical History Form used by the City of Houston Civil Service Department for the screening of job applicants is oriented toward obtaining the necessary medical information prior to a comprehensive medical examination.

SECTION 3

DEVELOPMENT OF WORK SAMPLE TESTS

CHAPTER 1

INTRODUCTION

The physiological criteria recommended in the last section should serve to disqualify applicants with medical problems and physical disabilities. Because medical standards only serve to eliminate applicants with clear medical liabilities, they do not necessarily disqualify persons incapable of performing each of the physically demanding tasks required of law enforcement officers. There are at least two accepted research approaches for establishing non-medical, physical ability standards: content validity and criterion-related validity.

For illustrative purposes, content validity can be referred to as a procedure for demonstrating that items in a work sample test adequately represent the task domain that must be performed by job incumbents. Work sample tests that are content valid, therefore, closely replicate actual job demands and rely heavily on job analysis data for their development. An example of a content valid work sample task for police officers might require all applicants to reach the patrol car communications equipment while driving a standard patrol vehicle at high speeds. This type of work sample testing would have eliminated the officer who was unable to reach the gas pedal or drive a patrol car (see critical incident example in Table 4). Another work sample task might consist of having each applicant "dry-fire" a regulation firearm. (Applicants not possessing sufficient strength

to squeeze the trigger of a firearm would be disqualified because of inability to perform an essential job component.) Furthermore, if proficiency with firearms is a job or Academy requirement, then a content valid marksmanship test, or achievement test, also could be constructed to insure adequate performance by cadets prior to being placed "on-the-street".

Most of the physical activities identified by the HPD job analyses are highly suited for conversion into work sample tests. More specific information about each critical task is necessary, however, before appropriate tests can be recommended for construction and implementation. That is, to develop a work sample task for running, one has to answer a series of questions: To what extent are officers required, in the line of duty, to run ten yards? Or one hundred yards? Or two miles? Are they required to run at high speeds, such as in a chase, or just to have the endurance to reach a distant point? Do they run in a straight line, or do they have to run over and around obstacles?

Once specific activity requirements are known, the next step in developing a work sample test is to define the requirements in operational terms for use in the screening of job applicants. This involves: 1) the transformation of requirements into work sample tasks suitable for job applicants, and 2) the establishment of minimum selection standards.

Criterion-related validity methods, on the other hand, investigate the empirical relationship between predictors and job

performance measures. One common type of predictor for law enforcement positions is the applicant's height and/or weight. If the rationale for using height and/or weight is that bigger officers are stronger and more able to successfully pursue and subdue combative actors, then the hypothesis can be tested by empirical criterion validity research designs.

A major benefit of using content valid work sample tests is that the methodology focuses on job functions and task requirements rather than on incumbents' abilities. Consequently, properly developed work sample tests will have both job relevancy and content validity, and furthermore, will be appropriate for use with all applicants regardless of age, sex, or race.

The remainder of this section discusses the development of work sample tests for screening entry level police officer job applicants on their ability to physically perform essential job tasks. Physical attributes which require criterion-related validity (i.e. height and weight) are discussed in Section IV of this Volume.

CHAPTER 2

PERTINENT ISSUES AND METHODOLOGY

There are many difficult and complex theoretical issues which need to be resolved before any job sample tests can be constructed and implemented. Foremost among these issues are the types of physical attributes that will be considered, the criteria for selecting the appropriate work sample tasks, and the method for operationalizing the results.

A. TYPES OF PHYSICAL ATTRIBUTES

By its very nature, the concept of a work sample test implies measuring the performance of an entire task. Therefore, physical task elements, such as arm strength, are not the focal point of this research. If activities requiring arm strength are necessary, then they will automatically be included in the work sample exercise which also allows body weight, sense of balance, etc. to aid in performing the "real life" task.

A second question in selecting types of attributes for study involves the issue of aptitude versus achievement, potential versus ability, or trainable versus untrainable activities. One viewpoint might be that the Houston Police Department has its own Academy and theoretically could train and condition almost anyone. With sufficient time and resources

most applicants' physical abilities could be improved to meet nearly any reasonable requirement. If carried to the extreme, this argument could suggest that all physical attributes are trainable and should not be considered in the selection process; the HPD Academy should have full responsibility for the physical training of cadets.

The other side of the argument would be that persons who are not in physical shape now probably have bad habits to begin with, and might revert back to them at the end of training. But even more importantly, proponents might ask, who is responsible for the applicant's physical training: the individual or the public? If an individual wants to be a police officer, that individual has the responsibility for demonstrating his/her physical fitness beforehand. The police department has limited resources for training, and the Academy has far too many topics to teach, i.e., first aid, handling irate citizens, administrative records and procedures, investigative techniques, marksmanship, pursuit driving, the penal code, and so on.

At the extreme, this viewpoint would hold that as a business necessity, police departments should not assume any responsibility at all for physical training. Using the business necessity argument, one might refer to the time and cost of training new officers, the possibility that all training

expenses will be wasted if the recruit drops out or fails out of the Academy because of physical limitations, the potential danger to the public if a physically unqualified applicant should become an officer, and the inefficient use of limited resources when more qualified individuals could be hired or additional cars and equipment purchased with the "physical training dollars".

In summary, it is reasonable to conclude that there must be a point between the above mentioned extreme viewpoints, whereby there are realistic requirements and limitations as to the amount of time and expense that can be devoted to the training of new recruits by the police academy. The Houston Police Department has resolved this issue further by only screening applicants for general physical conditioning and unskilled physical abilities. The Department's position is that activities requiring specialized skill or knowledge, like self-defense, should be the training responsibility of the Academy. But running, climbing, jumping, etc., are viewed as legitimate selection requirements because all applicants have the same opportunity to get themselves into shape to meet such selection standards. The Department's position in this matter seems well justified, and the researchers concur with the basic underlying philosophy. Therefore, work sample tests will consist of the more general agility and

strength requirements. Activities requiring specialized skill and training (i.e. self-defense, techniques for subduing resistant actors, etc.) will be excluded from the work sample measures.

B. DETERMINING CRITERIA FOR SELECTING WORK SAMPLE TASKS

Even if the job analysis had defined running as a critical and essential task, additional information and complex decisions are needed before running can be converted into a work sample test. How should the decision be made about how far to run, and under what conditions?

One viewpoint might be that if only one officer is required to perform a given critical task in the line of duty, i.e. chase a suspect for two hundred yards, then that is sufficient to justify that task as a requirement for all job applicants. This position, however, is too extreme. Based on critical incident data, it certainly should be possible to find one officer who ran two or more miles, or who moved a 350-pound person to safety, and so on. Having excessive physical requirements is not in the Department's best interest.

The opposite viewpoint would be that job requirements consist only of those critical tasks performed routinely or very frequently by every officer. This, too, is illogical. As mentioned in the Job Analysis section, data relating to

frequency of performance is very conservative for non-routine tasks; any officer might at any time be required to fire a weapon or to run a half-mile in pursuit of a fleeing actor. Moreover, frequency of occurrence is partly related to job assignment. Officers assigned to late shifts and to high crime areas are frequently engaged in physical activity, while those on daytime shifts in low crime areas might rarely be so involved.

To maintain a balanced approach, the criteria for establishment of job requirements must lie somewhere between these two extreme viewpoints. To help clarify the researchers' position on this issue, it must be remembered that details for the work sample tests are provided by the Physical Task Inventory (PTI). Data from the PTI were analyzed by considering the percentage of officers performing each task, so the criteria should be phrased in similar terms. Since criteria had to be selected prior to analysis of the results, after much consideration the following five guidelines were developed for evaluating the non-routine physical activities of Houston Police Department officers:

1. The physical activity must have been shown to be critical by various job analysis techniques.

2. The activity should have been performed by about half (50 percent) of the officers within the last year.

Furthermore, to assure that the results are not a "fluke" and only performed on one occasion, it is important to demonstrate that some officers are performing the activity with some degree of frequency. Consequently, guidelines 3 and 4 were added:

3. The activity should have been performed more than once by about 25 percent of all subjects (or half of those who had performed it during the last year).

4. The activity should have been performed six times or more frequently during the past year by 12.5 percent of all subjects (half of those who performed it more than once).

Since criticality had already been demonstrated for each physical task selected, guidelines 2, 3, and 4 are very conservative, possibly too conservative. However, because such physical demands are to be the basis for establishing physical ability requirements for all applicants, both males and females, it is preferable to be absolutely certain that the requirement is reasonable. When making decisions regarding a specific physical activity, guidelines 2, 3, and 4 were considered together. They are not meant to be hard and fast rules, but were designed to be used rationally as general indicators of importance. The final guideline for evaluation of the PTI data is given below:

5. Whenever several specific activities satisfy the above guidelines, the most appropriate one will take priority. That is, if climbing over a two-foot wall and over a six-foot wall both meet the first four guidelines, the six-foot climb should be selected for the work sample test.

C. CONSIDERATIONS IN PHYSICAL TEST CONSTRUCTION

Three major issues involved in trying to convert the physical job requirements into selection requirements via a job sample test are 1) the separate testing of each physical activity versus the combining of activities into one event, 2) the development of time standards for the speeded work sample exercises, and 3) the selection of test specifics when a choice is possible.

The first of these issues is whether or not to combine several activities into one event such as run "x" yards, then continue by climbing over a barrier "x" feet high, then continue....Part II of the Physical Task Inventory was developed to answer this question by providing insight into the actual interactions of physical activities required on the job.

The second issue involves the establishment of time standards: how fast should one run the "x" yards required on essential

pursuit tasks? One approach to this issue is to select the best qualified applicants possible. Consequently, on those activities shown to be necessary and critical, the Department could have complete flexibility on establishing qualification levels, changing them to suit applicant flow. Or, the Department could process the applicants in sequence of work sample test performance, beginning with the best performers and gradually working downward. While the above approaches are valid ones, they may be impractical to implement. In order to maximize the number of qualified females and Hispanics (according to the Department's affirmative action plans), job requirements need to be based upon minimum job standards, rather than on excellence of physical ability.

Establishment of minimum time standards is a very tricky problem. On which group should the timed normative data be obtained? Once a norm group is found, what should be the basis for selecting the "minimum" time requirements?

The format for this work sample research has focused on establishing the job requirements for anyone desiring to become a police officer rather than on the abilities of current officers. Consequently, the "ideal" time standards would be established from observations of how long it should take an officer to perform his/her duty, i.e. to

run "x" yards, to climb "x" feet, etc. Obviously, this is an impossible task. Another appropriate procedure would be to sample the speed of those actors who required officers to physically perform certain tasks under timed conditions. Unfortunately, a number of these actors were never apprehended, and it would be impractical to test those who were apprehended.

A different approach would be to develop the time standards on current police officers and/or officer applicants. However, it could be argued that these groups are too skilled to serve as the normative sample. Because many individuals in the general population might never, under any circumstances, even attempt to climb over a six-foot wall, or run "x" distance, the normal population also is not appropriate. Nor would the entire imprisoned criminal population be suitable for the same reasons.

The most practical approach is to sample the abilities of persons similar to the actors causing physical activities on the part of the officer. By having officers record data on a special questionnaire (diary), actors' characteristics pertaining to age, sex, height, weight, and race were obtained whenever an officer was required to engage in pursuit and/or restraint activities. Based on these characteristics, the "typical" actor can be defined and appropriate published

norms selected for setting final standards. If necessary, special samples representing "typical" actors could be selected for study in order to develop necessary standards. (For specific details, see the latter part of this section.)

Another related issue involves the selection of specific time standards. The dilemma here is, at what "level" should applicants be required to perform; the mean (average) level, or one standard deviation above the mean, or some other level? One point of view could argue that the fiftieth (50th) percentile is certainly sufficient, especially considering that the Academy does provide some physical training to new recruits. Another viewpoint might argue that the fiftieth percentile is far too low. Applicants just meeting the cutoff level would succeed far less than one-half the time when pursuing a suspect, since officers need to be faster than actors to apprehend them. The public appears to be demanding more police protection; inability to catch over one-half the actors would likely be an unacceptable standard. Furthermore, officers are required to perform their runs and climbs while wearing regulation shoes and clothing, while wearing a cumbersome firearm and handcuffs, and sometimes while carrying a flashlight or night stick. Therefore, officers must be above average just to be comparable to the average actor.

This is obviously a difficult but multi-faceted problem, the solution of which must interrelate with the selection of a norm group. If it is assumed that norms for an appropriate sample are available and that these norms adequately represent the types of actors that an officer might encounter when in pursuit, then in keeping with the researchers' policy of leniency and moderation, what criterion should be selected Considering that Academy training should improve a cadet's physical skills, the following two-part criteria appears appropriate at this time, and until further data can be obtained.

First, the minimum score for applicants should initially be set at the 50th percentile, and all who pass this standard should receive further screening. Second, before a police cadet can satisfactorily complete the Academy, he/she should demonstrate a physical ability at the seventy-fifth (75th) percentile of such norms. (These two percentile cut-offs can be adjusted as necessary after initial Academy results have been studied.) Furthermore, it is recommended that all current officers in field assignments equivalent to the entry level position annually be required to meet at least the minimum levels established for job applicants.

The third operational issue involves decisions related to developing the job sample exercises. Naturally, the exercise

should be as close to reality as possible. But, some considerations must be made for the testing location, facilities, and environment. Another limiting factor is the prior existence of appropriate standards. If, for example, normative data exist for a 250-yard run, then it might be impractical to test groups of subjects just to install a 300-yard work sample test. Trade-offs probably will be necessary.

CHAPTER 3

WORK SAMPLE ACTIVITIES

The primary data source for developing work sample tests is the Physical Task Inventory (PTI). In reaching conclusions about PTI results and work sample specifics, four criteria were adhered to, as follows:

1. Each PTI activity must be essential and critical to successful police officer performance as determined by the various methods of job analysis.

2. Guideline percentages of police officers in the entry level position performing each PTI activity should approximate 50 percent performing it one or more times in the last year, 25 percent performing it two or more times during the past year and 12.5 percent performing it six or more times in the last year.

3. The percentage of police officers performing each PTI task should be reliable, at least across shifts two and three (i.e. the evening and night shifts).

4. Resulting work sample tests should stress general physical abilities and condition, rather than activities based on specialized skill and knowledge.

To illustrate fully the method of analysis, the activity of running is discussed first, in some detail. When appropriate,

insight from the critical incident analyses are added to clarify conclusions.

A. RUNNING ACTIVITIES

The research to determine minimum requirements for running addressed four pertinent questions: 1) should running be under speeded conditions, 2) should it be in a straight line or on an obstacle course, 3) how far should it be, and 4) if speed is important, how fast?

PTI results clearly indicate that substantial percentages of officers are engaged in both running at moderate speeds and running as fast as possible. As Table 12 indicates, the running of 100 yards or more, under each speed condition was performed one or more times by more than 50 percent of the officers during the past 12 months. Further, each running condition was performed by over 25 percent of the officers at least twice and by more than 12.5 percent of the officers on at least 6 occasions during the past year. *Since running under highly speeded conditions is the more typical occurrence, any running work sample test should be under timed conditions, if feasible.*

Critical incident results also support the need for a highly speeded running test. Nearly all of the reported running critical incidents involve the successful or unsuccessful ability of an officer to pursue and apprehend a fleeing actor.

TABLE 12

PHYSICAL TASK INVENTORY RESULTS FOR

RUNNING UNDER TWO SPEED CONDITIONS

ALL PATROL SHIFTS (N = 386)

Frequency of Performance	PTI Guideline	Percent of Officers Running 100 Yards or More	
		Moderate Speed	As Fast As Possible
Once or more/year	50%	63%	83%
Twice or more/year	25%	52%	71%
Six times or more/year	12.5%	28%	37%

The remaining analyses for PTI running activities are presented under highly speeded conditions only. Since a timed work sample test is recommended, moderate speed frequencies for running are omitted; consequently, the results for type of running path and distance traveled should be considered as rather conservative estimates. If a speeded work sample run is found to be impractical, then the findings which follow will be too conservative.

Type of running path was classified into two categories -- straight runs and runs over-around-under obstacles. As Table 13 indicated, *incidences for high speed runs of one hundred yards or more are sufficient to justify either an unimpeded run or an obstacle course.* (That is, both runs are performed more than once by 50 percent of the officers, more than twice by 25 percent and more than bimonthly by 12.5 percent of the officers.) Although PTI percentages slightly favor a straight run, critical incidents suggest an obstacle course. Critical incidents typically referred to running around building corners/people/trees/tables/chairs/etc., and over low objects such as shrubs, curbs and other miscellaneous things. Because these results support both types of running paths, administrative considerations such as availability of normative data and testing space constraints may become the final decision determinants.

TABLE 13

PHYSICAL TASK INVENTORY RESULTS FOR

HIGHLY SPEED RUNS

ALL PATROL SHIFTS (N = 386)

	Percent Officers Performing Minimum number times in last year:		
	Once	Twice	Bimonthly
Type of Path for Fast Runs, 100 Yards or More			
No Obstacles	77%	56%	22%
Obstacles in Path	62%	45%	16%
Distance for Fast Runs			
100 yards or more	83%	71%	37%
200 yards or more	59%	47%	19%
300 yards or more	40%	25%	9%
400 yards or more	24%	15%	2%
Run Upstairs Fast			
1 flight or more	63%	50%	26%
2 flights or more	45%	37%	16%
3 flights or more	30%	22%	11%
4 flights or more	24%	15%	-
Run Downstairs Fast			
1 flight or more	45%	34%	11%

The next question involves the distance for such speeded runs. Because the inclusion or omission of obstacles has little practical effect on distance run, Table 13 shows distance percentages for either type of path. The distance which satisfied the PTI guidelines is more than 200 yards, but less than 300 yards. Application of curve fitting techniques (see Graph 1) indicates distances of about 245 yards for guideline #2, 300 yards for guideline #3 and 265 yards for guideline #4. Hence, *a speeded work sample test of about 800 feet, or 270 yards, with or without obstacles, appears justified for use in screening job applicants.*

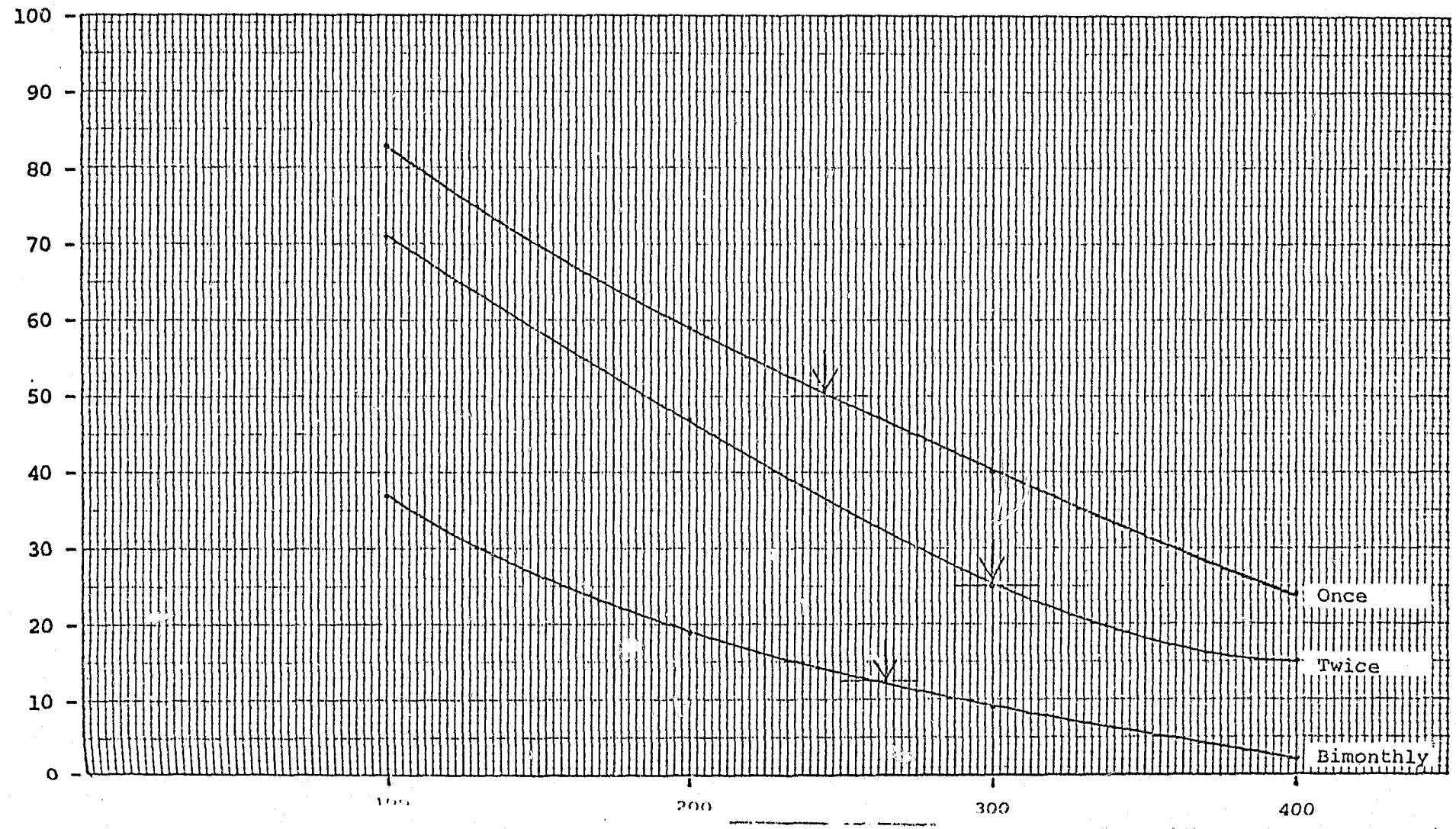
The critical incident data reveal that distances run vary greatly, from ten feet to four miles, with the maximum speeded run at about one mile. Thus, 265 yards, or less than one sixth of a mile (i.e. two city blocks) does not appear excessive.

Another type of running was researched, namely running up and down stairs. Data in Table 13 only show results for running at top speed. Although the PTI guidelines are not perfectly satisfied, the data sufficiently indicate that running up two flights of stairs and down one flight of stairs are in keeping with normal entry level police officer activities. Therefore, *ability to run up two flights and down one flight of stairs under speeded conditions can be judtified for inclusion in the applicant selection process.*

PART I

PTI RESULTS FOR RUNNING AS FAST AS POSSIBLE BY DISTANCE TRAVELLED (N = 386)

PTI GUIDELINE	DISTANCE
#2) 50%	245 yards
#3) 25%	300 yards
#4) 12½%	265 yards
Average	270 yards



As a check on all running conclusions, the data were separately analyzed for patrol shifts 1, 2 and 3. Comparison of the three shifts shows similar findings (nearly identical for the evening (2) and late (3) shifts), demonstrating high reliability and suggesting strong confidence in these conclusions (see Tables 14, 15 and 16).

The whole issue of establishing time standards for speeded activities is discussed in Chapter 5 in this section.

B. JUMPING ACTIVITIES

Table 17 shows the extent to which officers are required to engage in various types of jumping activities such as jumping horizontally across obstacles, up over barriers or down from ledges. Jumps were analyzed separately by two types of starting positions; standing starts and running starts. Results in accordance with the guidelines are the following:

- *From a running start jump over a barrier 3 1/2 feet high (see Graph 2)*
- *From a standing start jump over a barrier 2 feet high*
- *From a running start clear a distance of 5 feet 3 inches (see Graph 3)*

TABLE 14

PHYSICAL TASK INVENTORY RESULTS FOR

HIGHLY SPEEDED RUNS

PATROL SHIFT I (N = 36)

	Percent Officers Performing Minimum number times in last year:		
	Once	Twice	Bimonthly
Type of Path for Fast Runs, 100 Yards or More			
No Obstacles	61%	39%	14%
Obstacles in Path	55%	31%	3%
Distance for Fast Runs			
100 yards or more	72%	61%	22%
200 yards or more	44%	32%	11%
300 yards or more	28%	19%	
400 yards or more	6%	3%	
Run Upstairs Fast			
1 flight or more	55%	36%	22%
2 flights or more	31%	22%	6%
3 flights or more	22%	11%	
4 flights or more	14%		
Run Downstairs Fast			
1 flight or more	30%	14%	5%

CONTINUED

1 OF 4

TABLE 15

PHYSICAL TASK INVENTORY RESULTS FOR

HIGHLY SPEEDED RUNS

PATROL SHIFT II (N = 172)

	Percent Officers Performing Minimum number times in last year:		
	Once	Twice	Bimonthly
Type of Path for Fast Runs, 100 Yards or More			
No Obstacles	78%	53%	19%
Obstacles in Path	59%	44%	12%
Distance for Fast Runs			
100 yards or more	84%	70%	37%
200 yards or more	60%	47%	17%
300 yards or more	41%	26%	6%
400 yards or more	27%	14%	
Run Upstairs Fast			
1 flight or more	69%	52%	29%
2 flights or more	44%	37%	19%
3 flights or more	27%	18%	6%
4 flights or more	16%	9%	
Run Downstairs Fast			
1 flight or more	47%	35%	13%

TABLE 16

PHYSICAL TASK INVENTORY RESULTS FOR

HIGHLY SPEEDED RUNS

PATROL SHIFT III (N = 178)

	Percent Officers Performing Minimum number times in last year:		
	Once	Twice	Bimonthly
Type of Path for Fast Runs, 100 Yards or More			
No Obstacles	80%	63%	25%
Obstacles in Path	65%	48%	20%
Distance for Fast Runs			
100 yards or more	84%	73%	39%
200 yards or more	61%	48%	23%
300 yards or more	41%	26%	12%
400 yards or more	25%	19%	3%
Run Upstairs Fast			
1 flight or more	63%	51%	23%
2 flights or more	48%	39%	18%
3 flights or more	33%	27%	17%
4 flights or more	29%	23%	14%
Run Downstairs Fast			
1 flight or more	49%	37%	11%

TABLE 17

PHYSICAL TASK INVENTORY RESULTS FOR JUMPING

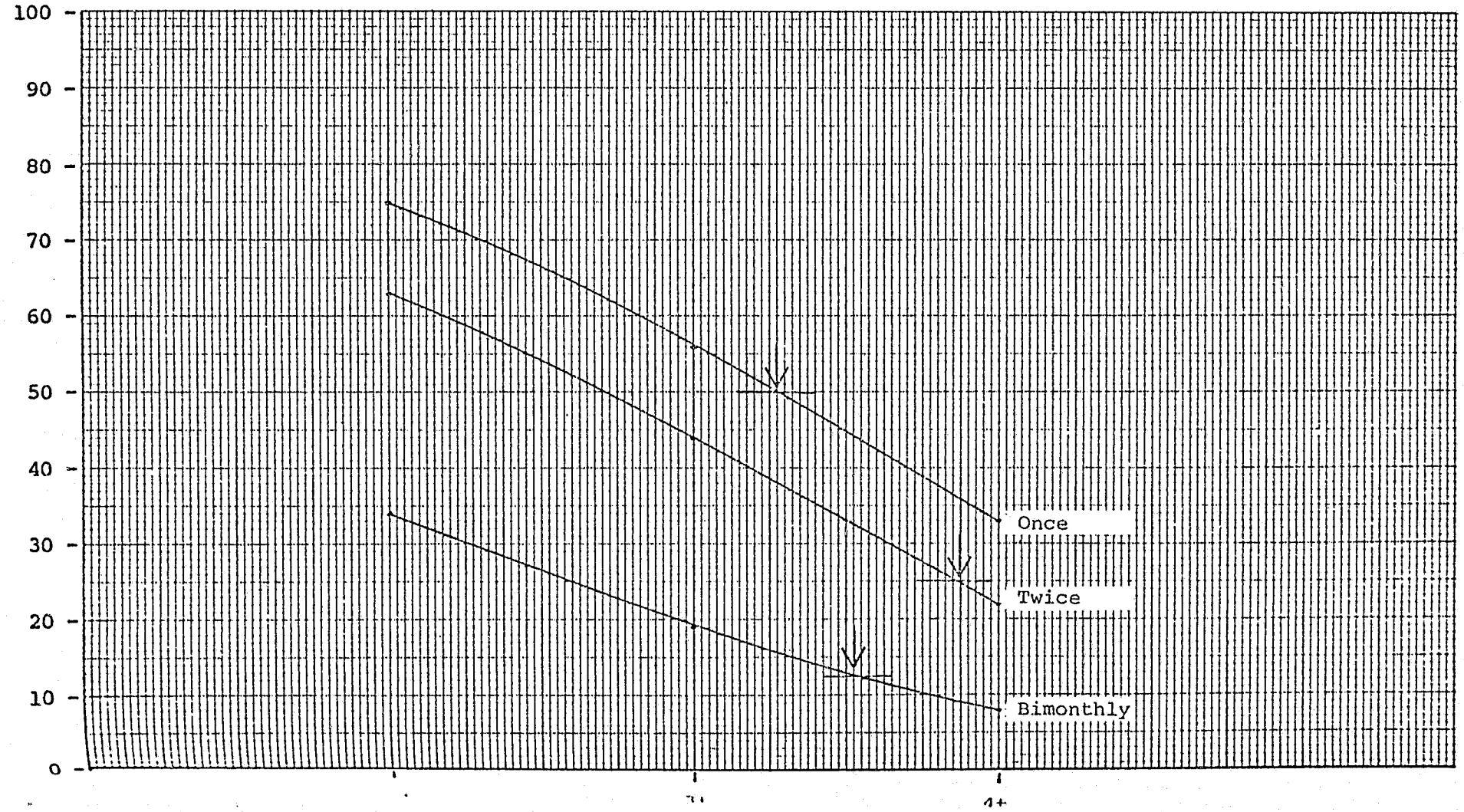
ALL PATROL SHIFTS (N = 386)

	Percent Officers Performing		
	Minimum number times in last year:		
JUMPING OVER OBSTACLES	Once	Twice	Bimonthly
• From running start			
2 feet or higher	75%	63%	34%
3 feet or higher	56%	44%	19%
4 feet or higher	33%	22%	8%
• From standing start			
2 feet or higher	41%	33%	16%
3 feet or higher	31%	26%	10%
4 feet or higher	20%	14%	5%
JUMPING ACROSS OBSTACLES			
• From running start			
Clear 4 feet	68%	57%	30%
Clear 5 feet	44%	35%	14%
Clear 6 feet	25%	19%	5%
Clear 7 feet	8%	4%	-
• From standing start			
Clear 4 feet	46%	37%	13%
Clear 5 feet	24%	17%	5%
Clear 6 feet	10%	7%	2%
Clear 7 feet	3%	2%	-
JUMPING DOWN			
4 feet or more	80%	70%	37%
7 feet or more	42%	33%	4%
10 feet or more	18%	10%	2%

GRAPH 2

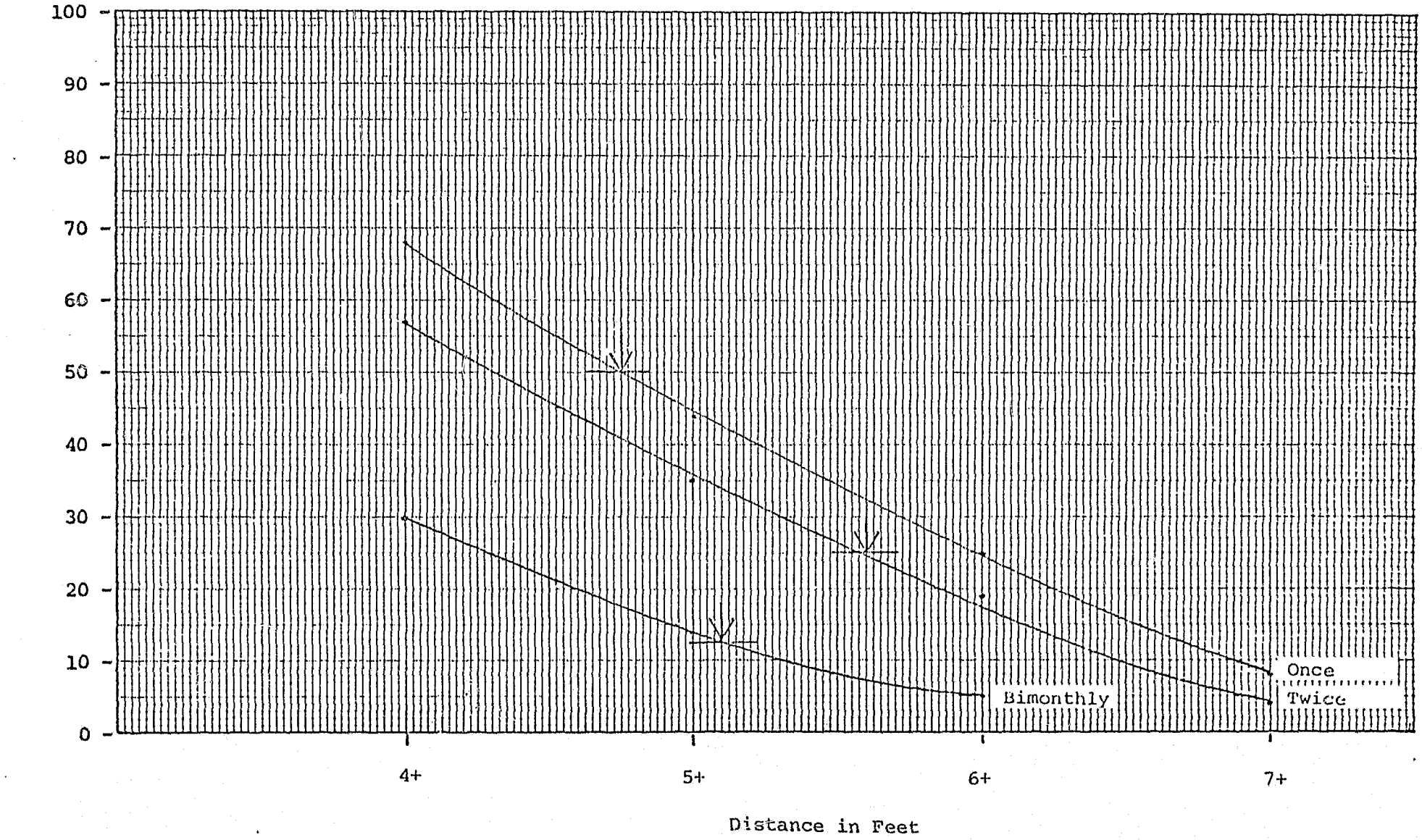
PTI RESULTS FOR HEIGHT (IN FEET) OF AN OBSTACLE JUMPED OVER FROM A RUNNING START (N = 386)

PTI GUIDELINE	DISTANCE
50%	39 inches
25%	46 inches
12½%	42 inches
Average	42 inches



PTI RESULTS FOR FEET JUMPED ACROSS AN OBJECT FROM A RUNNING START (N = 386)

PTI GUIDELINE	DISTANCE
50%	57 inches
25%	67 inches
12½%	61 inches
Average	62 inches



- *From a standing start clear a distance of 4 feet*

- *Jump down from a height of 6 1/2 feet (see Graph 4)*

When analyzed separately by patrol shift, the findings and conclusions were quite similar (see Appendix D).

Critical incidents from the PTI strongly indicate that most horizontal jumps are across ditches and that one half occur during the pursuit of an actor. Hence, horizontal jumps could be under timed conditions and added to an obstacle course, if such a course could be developed, given the practical and space considerations. Shrubs typified the type of object an officer has to jump over, while jumping down activities usually occurred from window ledges and rooftops.

C. CLIMBING AND RELATED ACTIVITIES

Activities involving climbing were analyzed by height of climb, speed of climb and availability of handholds and/or footholds to assist the climber (i.e. chain link fence versus a solid wall). Table 18 shows the percentage of officers climbing over a barrier by speed, by distance and by availability of climbing aids. Results which satisfy the guidelines for climbing barriers are summarized below:

1. *Under moderate speed conditions, climb over a 6 1/2 foot barrier, without hand/footholds.*

PTI RESULTS FOR HEIGHT JUMPED DOWN FROM (N = 386)

PTI GUIDELINE	DISTANCE
50%	75 inches
25%	93 inches
12½%	69 inches
AVERAGE	79 inches

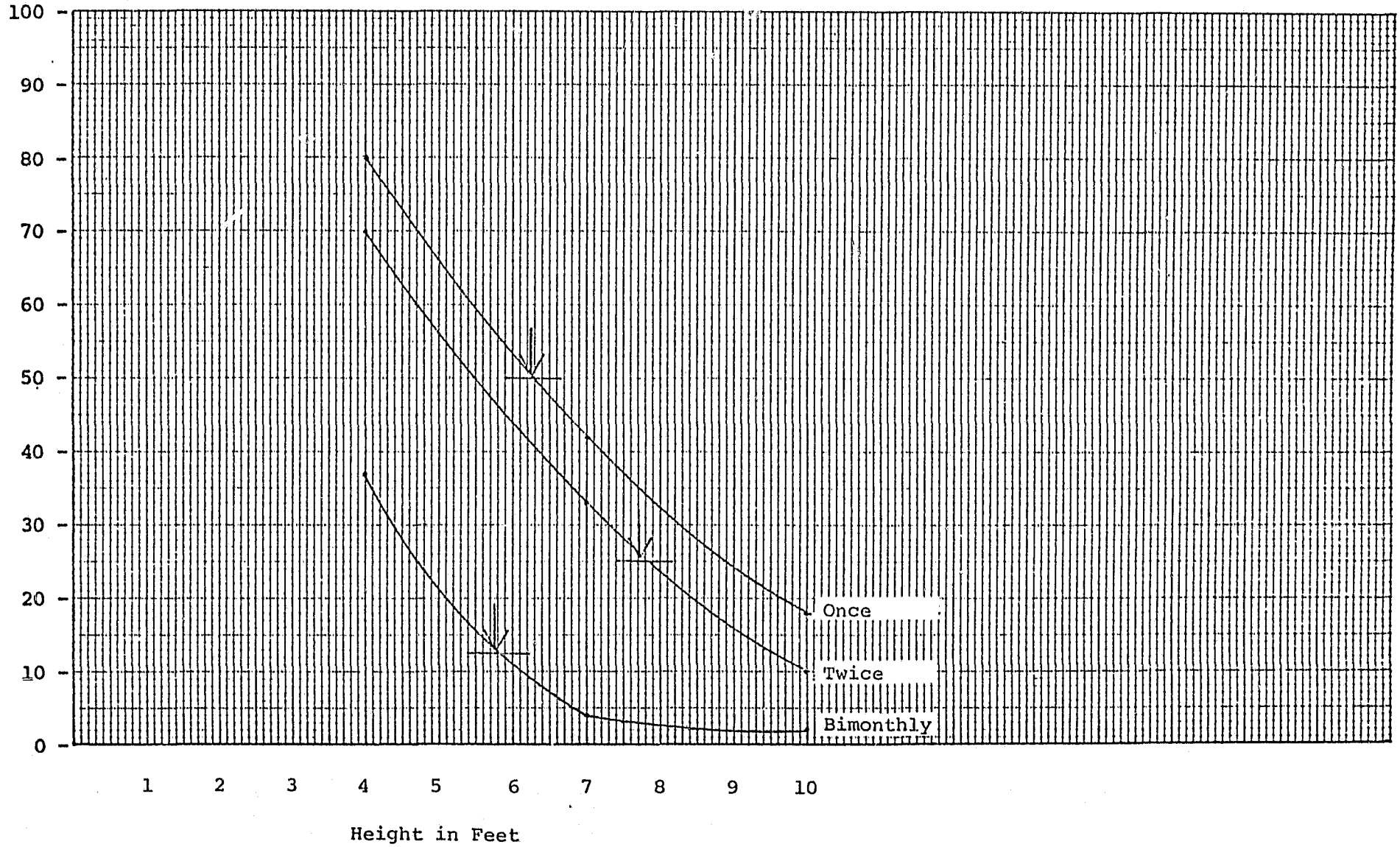


TABLE 18

PHYSICAL TASK INVENTORY RESULTS FOR

CLIMBING OVER BARRIERS

ALL PATROL SHIFTS (N = 386)

	Percent Officers Performing Minimum number times in last year: Once	Twice	Bimonthly
Climb at moderate speed or faster			
• Height without footholds			
4 feet or more	80%	71%	48%
5 feet or more	70%	60%	32%
6 feet or more	60%	48%	21%
7 feet or more	32%	23%	9%
8 feet or more	15%	11%	6%
9 feet or more	9%	5%	3%
• Height with footholds			
4 feet or more	91%	87%	65%
5 feet or more	81%	78%	55%
6 feet or more	74%	68%	44%
7 feet or more	46%	40%	23%
8 feet or more	33%	28%	16%
9 feet or more	17%	12%	6%
Climb as fast as possible only			
• Height without footholds			
4 feet or more	64%	55%	26%
5 feet or more	55%	40%	17%
6 feet or more	40%	28%	10%
7 feet or more	18%	10%	4%
8 feet or more	6%	4%	1%
• Height with footholds			
4 feet or more	67%	61%	29%
5 feet or more	55%	45%	25%
6 feet or more	47%	38%	16%
7 feet or more	27%	20%	9%
8 feet or more	17%	12%	5%
9 feet or more	9%	6%	2%

2. *Under moderate speed conditions, climb over a 7 1/2 foot barrier, with hand/footholds.*

3. *Under highly speeded conditions, climb over a 5 3/4 foot barrier without hand/footholds (see Graph 5).*

4. *Under highly speeded conditions, climb over a 6 1/4 foot barrier with hand/footholds.*

Another type of climbing was studied, namely, the climbing into windows at various heights off the ground. The results given in Table 19 and Graph 6 appear logical, indicating a window height from ground level of about 5 2/3 feet. Since barrier height and window height frequencies were not combined, the reported conclusions for climbing at various heights should be conservative.

It is important to note that the barrier heights which satisfied the research guidelines varied from 5 3/4 feet under pursuit conditions to 6 1/2 or 7 1/2 feet for exploratory situations. Since the typical picket fence is six feet high and typical retaining wall or rooftop is taller than six feet, the rationally selected guidelines of 50, 25, and 12 1/2 percent have empirical support.

Table 19 also shows the percentages of police officers who are required to climb up fire escapes and ladders. While *the climbing up of a fire escape or ladder is justified*

GRAPH 5

PTI RESULTS FOR CLIMB AS FAST AS POSSIBLE OVER BARRIER WITHOUT FOOT/HANDHOLDS (N = 386)

PTI GUIDELINE	DISTANCE
50%	65 inches
25%	74 inches
12½%	68 inches
Average	69 inches

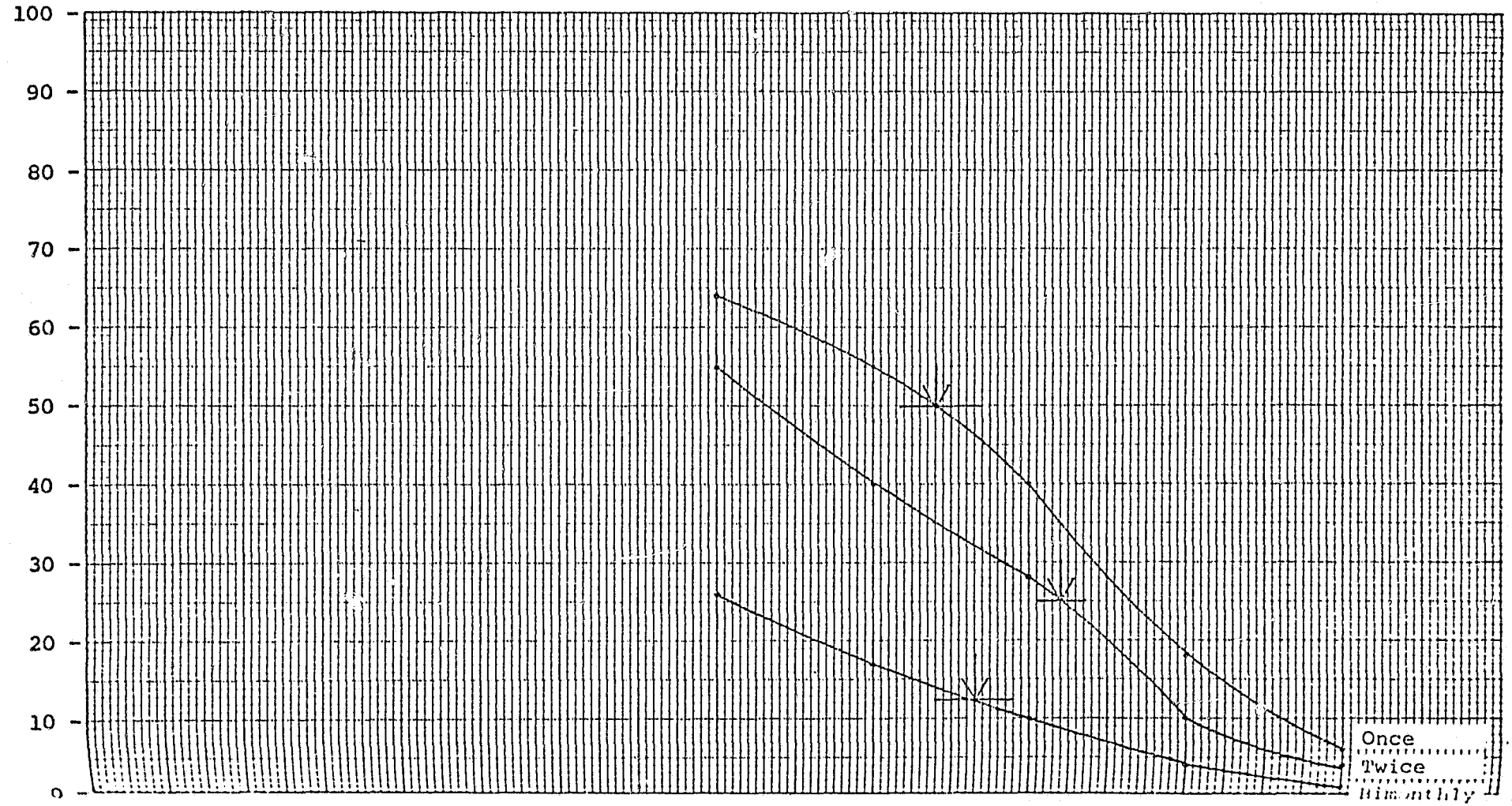


TABLE 19

PHYSICAL TASK INVENTORY RESULTS FOR

CLIMBING RELATED ACTIVITIES

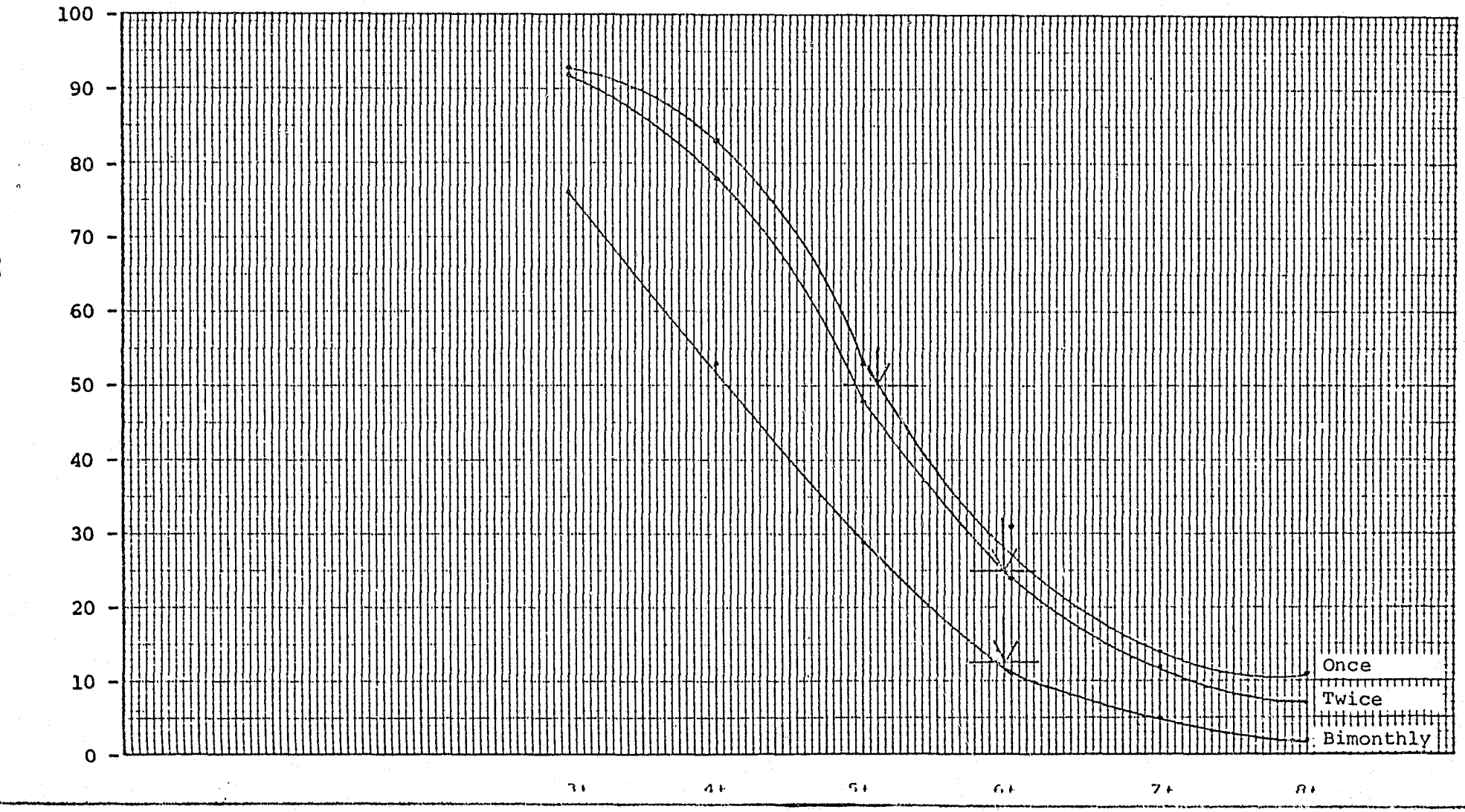
ALL PATROL SHIFTS (N = 386)

	Percent Officers Performing Minimum number times in last year:		
	Once	Twice	Bimonthly
Climb through a window at moderate speed or faster			
3 feet or higher	93%	92%	76%
4 feet or higher	83%	78%	53%
5 feet or higher	53%	48%	29%
6 feet or higher	31%	24%	11%
7 feet or higher	14%	12%	5%
8 feet or higher	11%	7%	2%
Climb up a standard ladder or fire escape (moderate speed)	69%	57%	25%
Pull up using arms only and hold for:			
1 second or more	70%	61%	25%
5 seconds or more	50%	45%	20%
10 seconds or more	34%	32%	15%
15 seconds or more	17%	16%	8%
20 seconds or more	12%	11%	5%

GRAPH 6

PTI RESULTS FOR CLIMBING INTO WINDOWS (N = 386)

PTI GUIDELINE	DISTANCE
50%	61 inches
25%	71 inches
12½%	71 inches
Average	68 inches



for work sample testing, it also indirectly adds additional support to prior findings for running up flights of stairs.

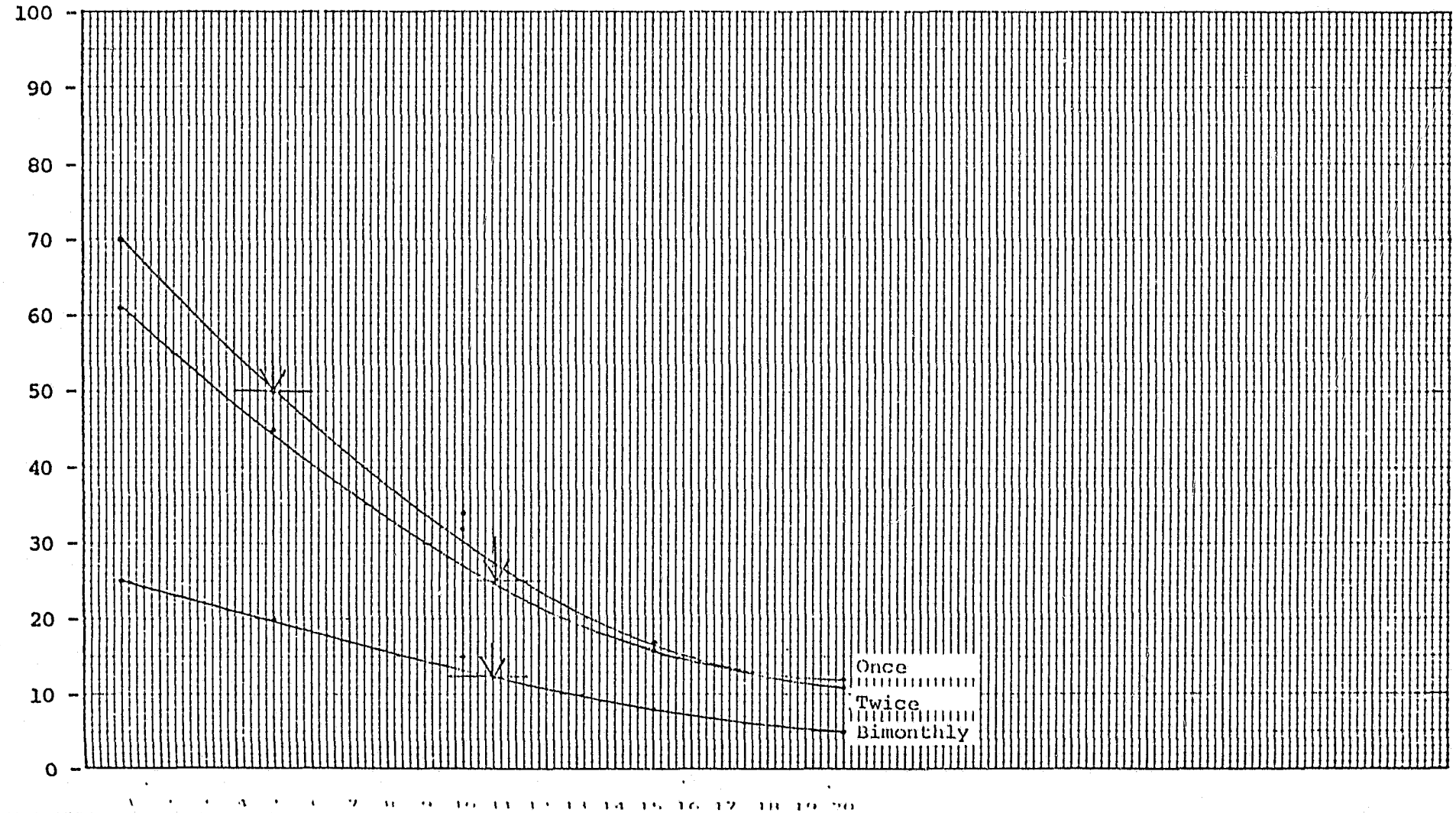
Results for pulling oneself up to a rooftop, ledge or fence-top and hanging there with arms bent also are presented in Table 19. As Graph 7 indicates, PTI guidelines are satisfied for "hangs" of from 5 to 10.9 seconds, with the average at 8.9 seconds. Therefore, *applicants should be able to pull themselves up, and with bent arms support their full body weight for nine seconds.*

When developing the PTI, it was assumed that a distance of 8 feet could represent the typical height of a fence, wall, attic, rooftop or other object that officers would be required to pull themselves up to and hold the position. Due to the obvious importance of this decision, it was later decided to establish the pull up height requirement through procedures consistent with the remainder of this investigation. Therefore, a short questionnaire was developed as a follow-up to the PTI. Only four items were included in this questionnaire: frequency of performing pull up and hold activities by object height; type of object pulled up to; and if a boost was received, type of boost and height of boost received. (See Appendix E for a copy of the questionnaire and instructions.) The questionnaire was sent to only those officers who had previously indicated

GRAPH 7

PTI RESULTS FOR PULL UP USING ARMS ONLY AND HOLD POSITION (N = 386)

PTI GUIDELINE	SECONDS
50%	5.0
25%	10.9
12½%	10.8
Average	8.9 seconds



on the PTI that they ever had performed such an activity (i.e. 71 percent of the sample). A total of 228 questionnaires were returned in time for analysis.

Overall, the officers reported 1,857 incidents of pulling up and holding, for an average of 8.14 incident per respondant, or an adjusted average of 5.78 for the entire PTI sample. (An adjustment is necessary to add back in the 29 percent who never performed the task and who were not sent questionnaires. The adjustment was calculated by multiplying the 8.14 incidences by .71 or the 71 percent represented by the questionnaire subsample.) By far, the majority of these incidents required pulling up on fences (1,146), but building roofs (196), walls (132), attics (99), ladders (87), and windows (77) also received substantial frequencies.

Heights of objects needed to pull up to ranged from about 6 feet to over 20 feet. As Table 20 indicates, 50 percent of the respondent subsample reported pulling up to a height of 8 1/2 feet, comparable to 8 feet for the adjusted PTI sample. Obviously, few officers are able to pull up to more than 10 feet without some type of boost or assistance. Analysis of the questionnaire responses revealed that 93 percent of the officers reported one or more "pull up and holds" without any type of assistance, while 53 percent

TABLE 20

HIGHEST HEIGHT OF OBJECT PULLED UP TO AND HELD[1]

Object Height	Percent Officers Performing Task During Last 12 Months: Percent in Subsample	Adjusted Percent (times .71)
6 feet	100%	71%
6½ feet	90%	64%
7 feet	86%	61%
7½ feet	75%	53%
8 feet	71%	50%
8½ feet	50%	36%
9 feet	46%	32%
10 feet	36%	25%
12 feet	18%	13%
15 feet or more	10%	7%

[1] Height of boosts are included in the object heights.

reported performing it one or more times with some type of assistance. The type of assistance received was often a boost by another officer. However, all types of objects also were used with the most frequent being automobiles (i.e. stood on fender, hood or roof), fences or walls (usually on the way to a rooftop), garbage cans, chairs, fence hinges, outside sheds, and anything else that was readily available. In addition, about 10 percent of the officers reported first climbing up a tree, drain pipe, wall, etc. before pulling up to a rooftop or high wall.

To establish a clearer understanding of the distances officer had to pull up to, a second analysis was performed which subtracted out the effects of any boost. That is, when an officer reported pulling up to a 12 foot wall with a 5 foot boost from his/her partner, the incident was coded as a 7 foot pull up. Results for this analysis are reported in Table 21, for the adjusted PTI sample. Inspection of Table 21 and Graph 8 indicate that a pull up height of about 7-1/2 feet satisfy the PTI guidelines. Thus, *an appropriate pull up and hold exercise would utilize a 7 1/2 foot wall.* As an option, the wall could be 8 feet high with a 6 inch object to stand on as a booster.

Since a number of incidents described the act of climbing in addition to pulling up, a pure upper body strength test

TABLE 21

HIGHEST HEIGHT PULLED UP TO AND HELD DURING LAST 12 MONTHS,

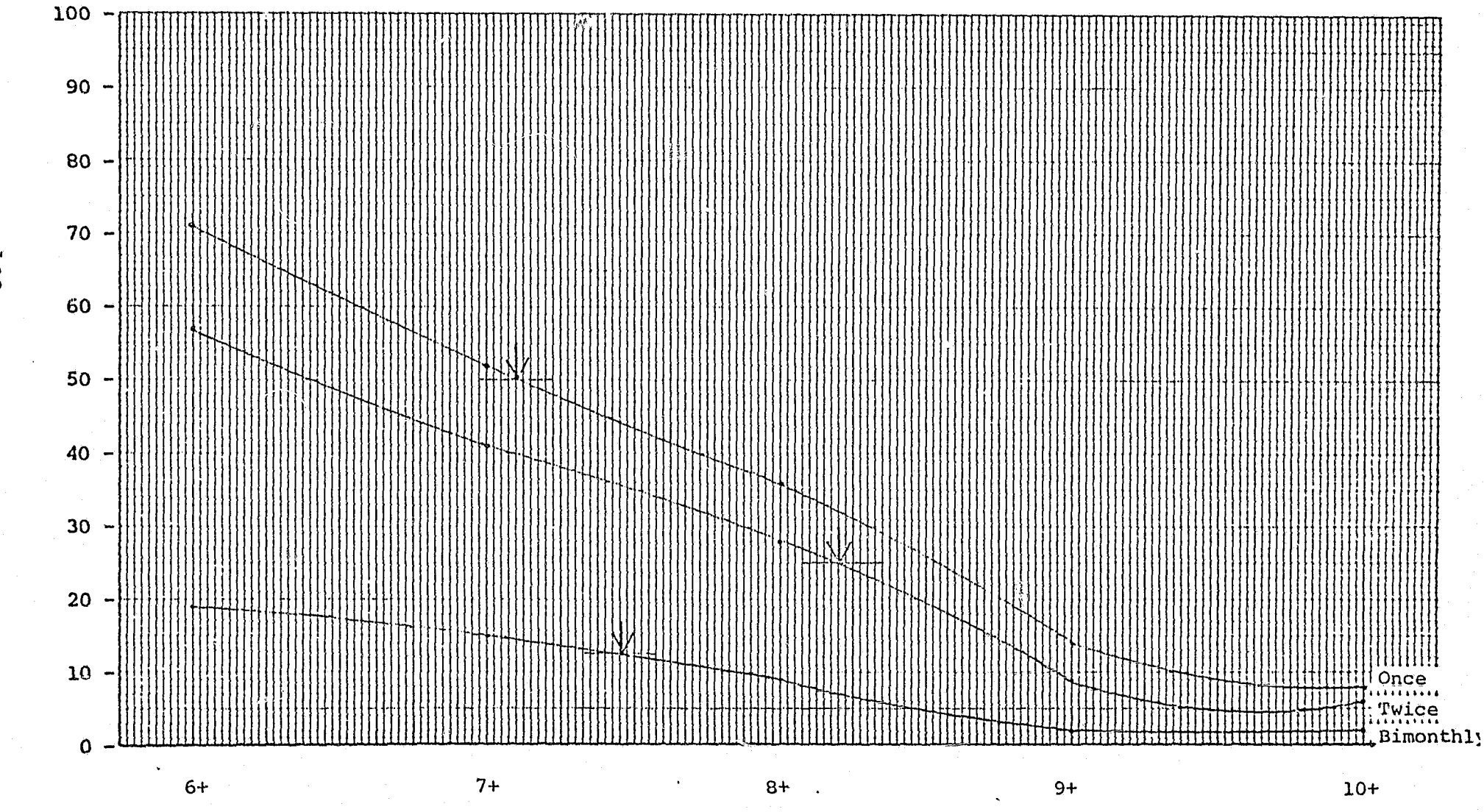
EXCLUDING HEIGHT OF ANY BOOST OR ASSISTANCE RECEIVED

	Adjusted Percent of Officers Performing Task[1] Times Performed in Last 12 Months		
Height	At Least Once	At Least Twice	At Least Bimonthly
6 feet	71%	57%	19%
7 feet	52%	41%	15%
8 feet	36%	28%	9%
9 feet	14%	9%	2%
10 feet or more	8%	6%	2%

(1) Adjusted figures account for task non-performers.

PTI RESULTS FOR NET ADJUSTED HEIGHT PULLED UP TO AND HELD, WITH HEIGHT OF BOOST BEING ELIMINATED (N = 386)

PTI GUIDELINE	ADJ. HEIGHT
50%	7'1"
25%	8'2"
12½%	7'6"
Average	7'6"



(i.e. pull up one's own body weight) also would be appropriate. In this case *height would vary with all applicants jumping to a chinning bar about 2 feet over their heads and then pulling up and holding the position for 9 seconds.* This latter task should be harder for taller persons who can more easily hook an arm over the 7 1/2 foot wall to aid their pull up. Its potential impact on shorter persons is unknown. On the one hand, it would almost guarantee that no applicant would be disqualified for failure to jump up to 7 1/2 feet. However, the use of a chinning bar, rather than a wall against which the feet or other body parts could be leveraged, might result in substantial disqualifications among all applicants.

General support for the conclusions reached for climbing was obtained from the critical incident reports which divide climbing into two types of activities, those in pursuit of an actor and those which are investigative in nature. Pursuit frequently involved the climbing of fences, both large and small, and brick walls. Investigative tasks, on the other hand, usually involved climbing up drain pipes or ropes, scaling walls, pulling up to look over fences, pulling up to ceiling openings, climbing up to rooftops and climbing up into windows or trees. Some of these investigative actions involved the pulling up to an attic and holding while looking for actors who might be hiding, or pulling up to the top of a fence and holding the position to witness activities

occurring on the other side. Investigative tasks did not appear to be highly speeded.

Results by patrol shift were basically consistent and add support to the reliability of these conclusions (see Appendix E).

D. LIFTING ACTIVITIES

As revealed by the job analysis, officers are often required to lift and/or carry both persons and objects without assistance. Critical incident reports described the lifting of all types of heavy objects, including various automobile parts, damaged motorcycles, tree limbs, motor blocks, pieces of metal, furniture, T.V.'s, signs, concrete blocks, utility poles, machinery, crates, boxes, etc. (see Table 22).

Overall, lifting persons should require less force than lifting similarly weighted objects. Cooperative or "dead weight" persons, with elongated shaped bodies and many grasping positions, are relatively easy to lift and carry. The aboved mentioned objects, on the other hand, vary greatly in size, bulkiness, weight, availability of hand holds and force required to lift them.

To maintain conservatism, incidence of lifting objects and persons were combined, but conclusions for work sampling will only refer to lifting persons, or "humanoid shaped"

TABLE 22

PHYSICAL TASK INVENTORY CRITICAL INCIDENTS

TYPES OF OBJECTS LIFTED AND/OR CARRIED WITHOUT ASSISTANCE

ALL PATROL SHIFTS (N = 386)

	Frequency Mentioned by Weight			
Types of Objects	50-99 lbs	100-149 lbs	150-199 lbs	200+ lbs
T.V.'s and Stero Equipment	23	4	1	
Auto Parts and Pieces	18	11	3	3
Furniture	13	3	1	
Tree Limbs, Wood	12	5	3	
Bikes, Motorcycles and Parts	10	5	1	6
Warehouse Crates, Boxes, Drums	8	1	2	
Machines, Typewriters, Refrigerators, Motor Blocks, Generators, Industrial Equipment, Batteries	8	6	3	1
Concrete Blocks	6	2	1	
Utility Poles, Pipes, Steel Beams, Pieces of Metal, Guard Rails, Signs	4	6	3	3
Toolboxes, Tools and Equipment	3	1	2	
Miscellaneous (dead animals, barbells, tombstone, manhole covers, steel door, etc.)	3	1	1	3

objects. This decision is even more conservative than one might realize, because resistant actors are not "dead" weights. Whenever officers are required to lift, carry, or drag resisting actors, these actors may be trying their best to impede the officers' progress, requiring much more force from the officers to simultaneously move and control the resisting actors.

Table 23 shows the incidence of officers reporting the need to lift a person or object by amount of the weight lifted. Results are shown only when the officer performed the task without assistance. Graph 9 indicates that lifted weights between 145 and 172 pounds satisfy the PTI guidelines, with the average weight being about 163 pounds. Again, these conclusions are very consistent across work shifts (see Appendix D).

This finding of 163 pounds is very logical and is supported by statistics obtained to characterize those actors who resisted HPD officers carrying out their duties. As presented later, the average resisting actor is 5 feet, 10 inches tall and weighs 160 pounds. This empirical validation also supports the principles underlying the initial selection of PTI guideline percentages, suggesting that the guidelines are indicative of typical levels of job performance.

Critical incident reports, observations and discussions

TABLE 23

PHYSICAL TASK INVENTORY RESULTS

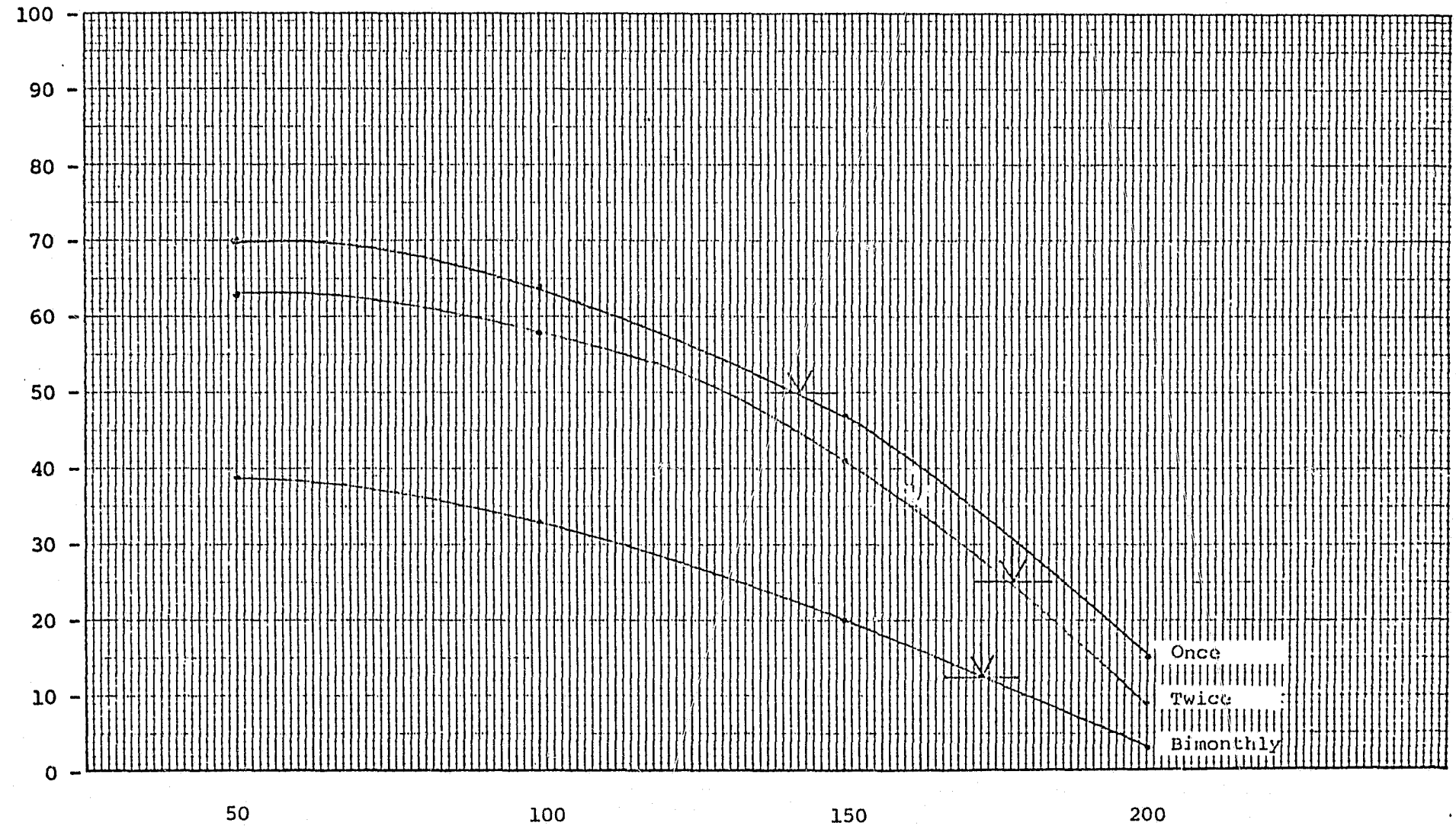
FOR LIFT ONLY, PERSON OR OBJECT, WITHOUT ASSISTANCE

ALL PATROL SHIFTS (N = 386)

	Percent Officers Performing Minimum number times in last year:		
Weight Lifted	Once	Twice	Bimonthly
50 pounds or more	70%	63%	39%
100 pounds or more	64%	58%	33%
150 pounds or more	47%	41%	20%
200 pounds or more	15%	9%	3%

PTI RESULTS FOR LIFTING PERSONS OR OBJECTS WITHOUT ASSISTANCE (N = 386)

PTI GUIDELINE	WEIGHT
50%	142 lbs.
25%	176 lbs.
12½%	173 lbs.
Average	163 lbs.



with officers reveal that lifting usually occurs when:

1) preparing to carry a person or object,

2) helping an injured, unconscious, drunk or otherwise incapacitated individual, and

3) lifting a struggling or resistant actor to his/her feet after being subdued and/or handcuffed.

The process of lifting a person usually begins with the person in a prone position. Therefore, *all applicants should be able to lift a "humanoid dummy" of 163 pounds from a horizontal to standing position.* The "dummy" should be clothed to provide more opportunity for handholds.

E. CARRYING ACTIVITIES

Job demands requiring the carrying of persons and objects were studied by the amount of weight carried, distance carried and availability of assistance when performing the task. The force exerted to carry something depends on assumptions made about the persons and objects, and about the assistance obtained. Therefore, two primary analyses were performed: one for carrying persons and objects without assistance and one for carrying persons only with or without assistance.

The first analysis was for carrying persons and objects

without any assistance. Two different weight levels were studied: carrying 50 pounds or more and carrying 100 pounds or more. As Table 24 shows, the average weight and distance carried by officers, without assistance, are: 50 pounds carried for 17 feet, and 100 pounds carried for 7 feet. *Therefore, all applicants should have the ability to lift and carry 50 pounds for a distance of 17 feet, and 100 pounds for a distance of 7 feet.*

A review of PTI data and critical incident reports revealed that two officers were typically involved in the carrying of heavy objects or persons and that weights over 150 pounds were usually actors. The first analysis, therefore, is probably too conservative because it excludes many incidences of carrying the heaviest of weights. Consequently, a second analysis was performed, this time considering weights carried with or without assistance.

Because of different shapes and properties, it is not correct to assume that similar forces are required to carry similarly weighted objects and persons. Most heavy objects are sufficiently symmetrical to allow two officers to share equally the burden. But, contrary to popular belief, the force required by two officers to carry a 150 pound person is not 75 pounds each. Because of body weight distribution, center of gravity, location of grip positions, etc., one officer

TABLE 24

PHYSICAL TASK INVENTORY RESULTS

FOR CARRYING PERSONS OR OBJECTS, WITHOUT ASSISTANCE

ALL PATROL SHIFTS (N = 386)

	Percent Officers Performing Minimum number times in last year for:					
	50 Pounds			100 Pounds		
Distance	Once	Twice	Bimonthly	Once	Twice	Bimonthly
Lift only	70%	63%	39%	64%	58%	33%
*Carry some distance	56%	41%	20%	44%	31%	12%
10 yards or more	33%	22%	10%	24%	15%	6%
20 yards or more	20%	14%	7%	14%	7%	2%
30 yards or more	15%	8%	4%	10%	5%	2%
40 yards or more	11%	5%	3%	7%	3%	1%
Plotted Guideline Distances in feet	10	23	19	3	13	6

*Carry some distance assumed to be minimum of one body length, or six feet.

carries the majority of the weight.

The officer carrying the individual's upper body (i.e. under actor's arm pits and across chest) is actually exerting a carrying force of at least 76 percent of the person's weight, or 114 pounds for a 150 pound person. The officer holding the actor's knees exerts a carrying force of at least 26 percent, or 39 pounds. (Note: These forces are conservative by assuming the carried body is in nearly an "L" shaped position. Total poundage carried is more than the original weight because of body angles, lifting and carrying forces. See Appendix F for details.)

To minimize confounding of objects and persons, the second analysis was only performed for carrying individuals, with or without assistance. In order to remain conservative, all conclusions assume that assistance was provided.

According to PTI guidelines, HPD officers are expected to carry 150 pound persons, with or without assistance, for distances of from 10 to 21 1/2 feet, with an average distance of 14 feet (see Table 25 and Graph 10). Therefore, *all applicants should have the ability to lift a 150 pound person or "dummy" and with assistance carry it for 14 feet.* Any work sample test should be performed with the instructor (or another person) at the knees and the applicant being tested at the head and shoulders.

TABLE 25

PHYSICAL TASK INVENTORY RESULTS

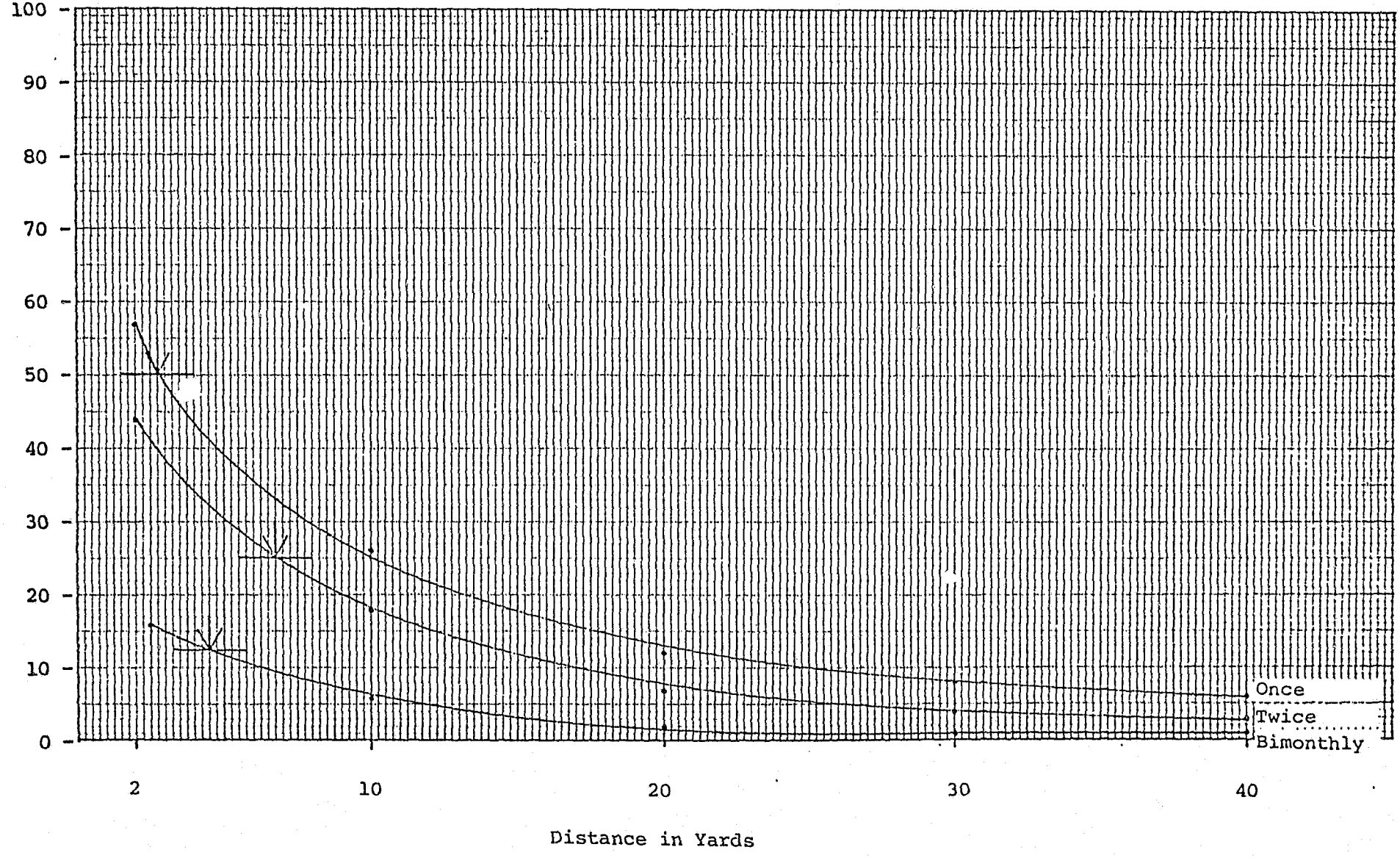
FOR LIFT AND CARRY PERSON WEIGHING 150 POUNDS WITH OR WITHOUT ASSISTANCE

ALL PATROL SHIFTS (N = 386)

Distance	Percent Officers Performing Minimum number times in last year: Once	Twice	Bimonthly
2 yards or more	57%	44%	16%
10 yards or more	26%	18%	6%
20 yards or more	12%	7%	2%
30 yards or more	8%	4%	1%
40 yards or more	6%	3%	1%

PTI RESULTS FOR LIFT AND CARRY A 150-POUND PERSON WITH OR WITHOUT ASSISTANCE - ALL PATROL SHIFTS (N = 386)

PTI GUIDELINE	DISTANCE
50%	8¼ feet
25%	21 feet
12½%	13½ feet
AVERAGE	14¼ feet



The results for this second analysis are also very conservative because they assume that carried actors are passive, that carrying forces are minimal and that all carries are assisted. Since the typical residential street is 20 feet wide, 14 feet seems a minimal distance for carrying actors with assistance.

F. DRAGGING ACTIVITIES

Frequencies for dragging individuals without assistance, during the last year, are reported in Table 26 by weight and distance. Objects have been omitted because "laws of friction" are too complex to assume that equal forces are required to drag persons and objects of equal weight. As indicated by Graph 11, *PTI guidelines are satisfied for dragging a 150 pound person for 18 feet without assistance.* These findings are quite reliable, especially for shifts 2 and 3 (see Appendix D).

Again, it should be noted that these conclusions are conservative; results for dragging heavy objects and for dragging heavy persons with assistance have been omitted from the analyses. Furthermore, the "dragged" persons are assumed to behave as "dead" weights, not uncooperative or resistant actors.

TABLE 26

PHYSICAL TASK INVENTORY RESULTS

FOR DRAGGING INDIVIDUALS

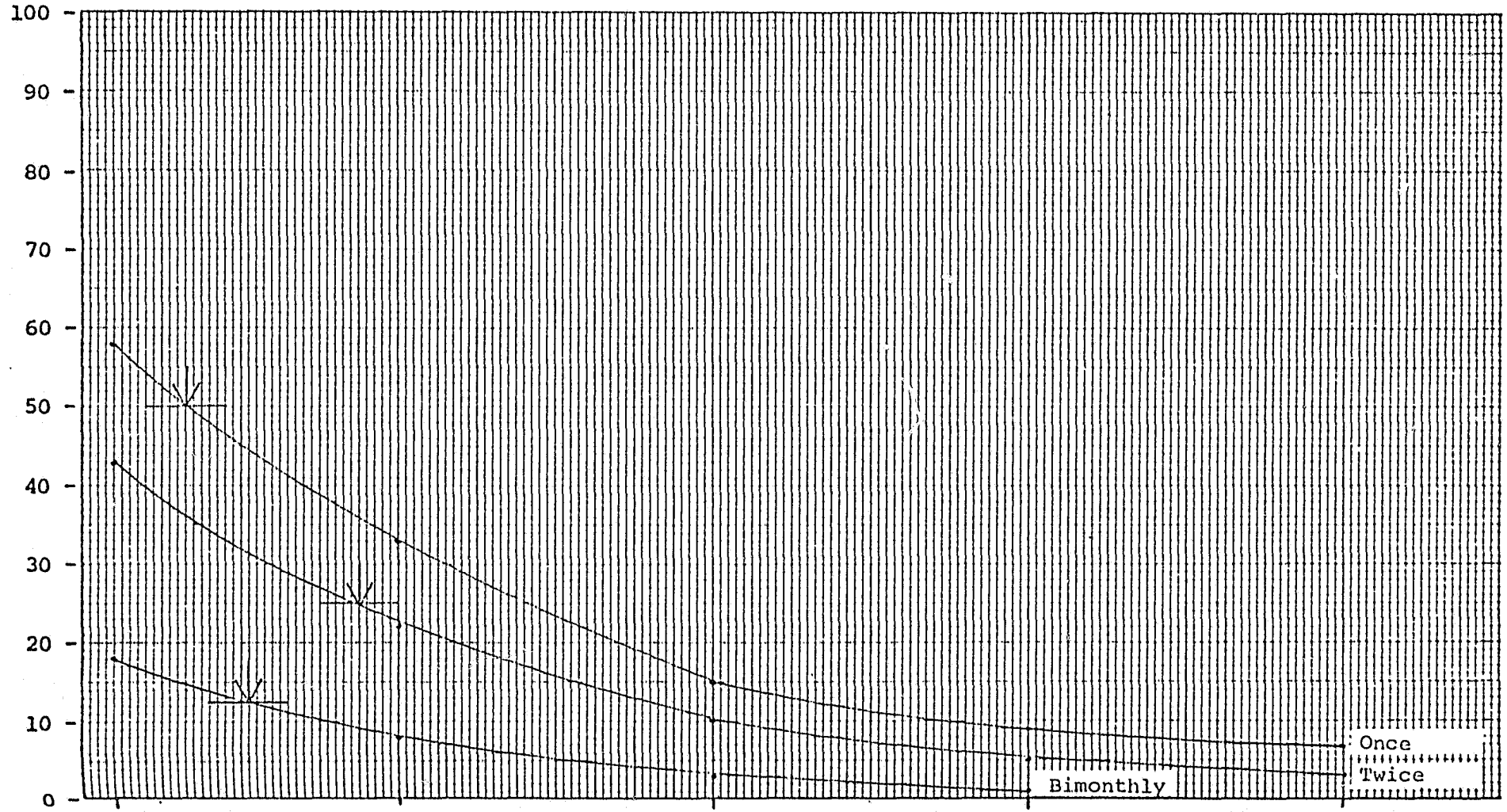
ALL PATROL SHIFTS (N = 386)

Distance Dragged	Percent Officers Performing Weight of individual: 100 pounds+	150 pounds+	200 pounds+
Percentage Performing One or More Times			
Any distance	71%	58%	23%
10 yards or more	40%	33%	10%
20 yards or more	20%	15%	6%
30 yards or more	12%	9%	4%
40 yards or more	9%	7%	3%
Percentage Performing Two or More Times			
Any distance	59%	43%	13%
10 yards or more	29%	22%	7%
20 yards or more	11%	10%	4%
30 yards or more	7%	5%	2%
40 yards or more	5%	3%	1%
Percentage Performing Six or More Times			
Any distance	29%	18%	3%
10 yards or more	11%	8%	2%
20 yards or more	5%	3%	1%
30 yards or more	3%	1%	-
40 yards or more	1%	-	-

GRAPH 11

PTI RESULTS FOR DRAGGING A 150-POUND PERSON WITHOUT ASSISTANCE - ALL SHIFTS (N = 386)

PTI GUIDELINE	DISTANCE
50%	9-3/4 feet
25%	26-1/4 feet
12½%	15-1/4 feet
AVERAGE	17 feet



G. COMBINATION OF DRAGGING AND CARRYING ACTIVITIES

In reality, the tasks of carrying and dragging are often confounded. If an officer has to forcibly put a heavy, resisting or unconscious actor into a patrol car without assistance, the officer will probably drag the actor out of necessity. If another officer is available, they will have the choice of either dragging or carrying that actor. Thus, for some number of assisted carrying incidents, if assistance had not been available, the situation could have become one of an officer dragging a person or object. And conversely, some unassisted drags would have been an assisted carry if assistance was available.

A work sample exercise comprised of two persons carrying an object or person are difficult to control, i.e. the second parties could purposely or unknowingly vary their participation in the carrying process causing some applicants to fail and others to pass. To eliminate any possibilities of this occurrence, standardization is necessary or the carrying event could be combined with the dragging work sample test.

Combining the findings for dragging and carrying activities result in the following requirement: *all applicants should be able to grasp a 150 pound "humanoid dummy" under the arm pits and drag it for a distance of about 32 feet* (arrived at by summing the 18 feet for dragging and the 14 feet for

carrying 150 pounds). For practical considerations, it would be useful to employ the same "dummy" as referred to in the lifting work sample test. An alternative work sample test, therefore, would be for *applicants to drag a 163 pound humanoid for a distance of about 20 feet.*

H. SUBDUE AND RESTRAIN

As clearly demonstrated by the job analysis data, one of the major functions of police officers in the entry level position is the handling and subduing of resisting actors. Combat situations are frequent occurrences, with 44 percent of the officers being assaulted and 89 percent encountering some type of physical resistance at least six times per year, see Table 27. These findings are very reliable, especially across shifts 2 and 3 (see Appendix D).

Critical incident data describe many of these combat encounters as "knock out, drag out" fights which involve hand-held weapons, use of fists, kicking, wrestling and almost every type of struggle imaginable. When resistance is encountered, but without mention of assault, the officer usually was required to grab and hold an actor trying to flee, to handcuff an actor not wanting to be handcuffed, and to push, pull, or carry a resisting actor into and out of a patrol car.

Because of the great variety of combat and restraint encounte

TABLE 27

PHYSICAL TASK INVENTORY RESULTS

FOR FREQUENCY OF SELECTED RESTRAIN AND SUBDUE ITEMS

ALL PATROL SHIFTS (N = 386)

Actor Response	Percent Officers Performing Minimum number times in last year: Once	Twice	Bimonthly
Assault on an Officer			
• Active resistance and assault on officer (unarmed and armed assaults by one or more actors)	83%	71%	44%
Actor Resistance But No Assault Specified			
• Restrain fleeing actor	89%	82%	46%
• Handcuff resisting actor	96%	91%	54%
• Put resisting actor into patrol car	96%	91%	55%
• Total resistance/no assault	98%	97%	89%

it seemed impractical to delve into more depth through "questionnaire type" data. Consequently, details for combat encounters were obtained through a review of critical incident reports, interviews with officers and self-defense trainers, and observations of job performance. Based on these sources, the following information about physical confrontations was obtained:

1. Each confrontation is different, with the officer's approach depending on the actor's size and mental state. Any type of skill or strength movements could be and are required; from pushing the actor off when the officer is pinned to the ground, to lifting the actor after he/she is handcuffed or knocked out, to holding onto one handcuff as the actor wildly swings one manacled hand, etc. Consequently, it may be impossible to define a typical assault situation and the typical response required of the officer.

2. Self-defense tactics are very important in the subduing and handcuffing of resisting actors. However, there are many occasions when such techniques alone will not accomplish the task; some strength very definitely is required when handling struggling actors.

3. According to the critical incident data, about one half of the actors who assault police officers are either drugged, intoxicated or mentally unbalanced. These actors

are extremely dangerous because they are not rational at the time of confrontation. Moreover, many officers report that drugged, or "doped up" actors have twice the strength they normally have and are exceedingly difficult to control. Furthermore, drugged actors may not be sensitive to pain, so many self-defense techniques (i.e. use of pressure points) may have little or no effect on them. More than one officer may be required to subdue "doped up" actors.

4. Officers carry weapons and must, at all times during a struggle, protect access to their loaded firearms. This positioning may impede their mobility during a struggle.

5. When wrestling on the ground or engaged in active fighting, officers report that technique disappears, knowledge of self-defense may be forgotten and they may revert to "street fighting" and wrestling tactics. These comments indicate that more intensive follow-up in self-defense training is needed.

6. Officers are trained to use only the minimum amount of force required to subdue an actor. The minimal amount changes, however, depending on the size of the actor and officer. Some HPD self-defense experts admitted that a number of techniques would be impractical if they personally faced a much larger opponent. When attacked

by a much larger actor, a small officer might have to resort to a great deal of force to incapacitate the actor, while a larger officer might be able to handle the actor differently. In any case, officers are expected to apply minimal force.

7. A critical, but very difficult, part of the subduing process is the handcuffing of actors. All applicants must have the minimal amount of strength required to perform this critical function.

Based on the frequency of combat situations it would be easy to conclude that each officer must be physically strong to survive the assaults typically encountered. General strength and survival, however, interact with self-defense knowledge and skills-areas of training that should be provided by the Academy. In order to focus on minimum job requirements, many strength activities have been eliminated under the assumption that self-defense training should teach the officer how to win the encounter through use of minimal force and strength.

In a variety of combat situations certain types of strength seem to be required, regardless of training. Foremost among these common strength activities are lifting, carrying, dragging, pushing, gripping, and the ability to control an actor's arm. Findings for lifting, carrying, and dragging were discussed previously and will not be repeated. Only

major conclusions for pushing, grip strength and arm control are discussed below. This list is not necessarily complete; other types of physical strength may be necessary to perform normal self-defense activities.

1. Pushing Activities

Pushing actors occurs in various ways, including pushing actors off when the officer is pinned to the ground, pushing actors through doorways and into patrol cars when the actor braces against the door frame, and pushing actors away when struggling in upright positions. During a struggle officers should have the body strength to push or shove actors away so that the actors cannot get to the officers' revolvers or other weapons. Similarly, officers need the strength to push or shove actors away from them so the officers may draw their weapons if appropriate to the situation. All *applicants should at least have the ability to push the typical struggling actor to arm's length.* Due to momentum and balance factors, however, the required pushing force may be difficult to calculate. Other types of non-actor pushing are also important, such as the need to push a stalled automobile as noted earlier.

2. Controlling Actor's Arm

In addition to normal wrestling activities, officers are

often forced to: 1) wrestle with an actor holding a knife, gun or other weapon, 2) pull the actor's arm behind his/her back for handcuffing, and 3) hold onto one end of the handcuffs when the actor wildly swings a manacled hand. To illustrate the type of activities that might be involved in controlling an actor's arm, the process of handcuffing a resisting actor is discussed below.

There are two major approaches to handcuffing a resisting actor, one based on pure strength and the other on self-defense tactics. The pure strength movement obviously varies with the situation, but typically involves the pulling of an actor's hand downward and backward behind the actor's back, while the actor resists the movement by keeping his/her arm rigid and forward. Usually officers apply this technique when they are on top of or behind the actor. To maximize their efforts, officers usually use their dominant hand to pull the actor's arm back, and place their non-dominant hand on the actor's shoulder or upper arm to leverage their pulling movement (i.e. left hand pushes as right hand pulls).

Because of the high frequency of resistance to handcuffing because this is such an important and dangerous task, and because pure strength appears to be a normal approach,

all *applicants should have the ability to pull the typical resisting actor's arm backward and downward, using one arm to pull and the other to push or leverage his/her force.*

This push/pull ability should also satisfy the requirements for another handcuffing problem: actors often resist having their hands cuffed behind their back by grasping their hands together in front, by holding onto their belt or pants, or by grabbing onto a railing or any other convenient object. This type of resistance is often countered by forcibly separating the actor's hands. Since simpler techniques are usually available to accomplish this separation, it is not featured in this report. It is only mentioned, however, to further demonstrate that push/pull movements are frequent occurrences.

3. Gripping

Some hand grip strength is needed to hold actors trying to flee, to execute self-defense actions and to apply the wrist bend method of handcuffing taught by the Academy. Once the officer is able to bend the actor's wrist, the actor's resistance to being handcuffed is quickly dissipated and his/her arm quickly follows his bent wrist. However, the bending of a wrist requires some hand and grip strength. Usually officers minimize the required

force by hooking one hand around the actor's arm and using it as a fulcrum to twist the wrist downward with their other hand (see Diagram 1). Because of the frequency and importance of handcuffing activities and because of the Academy's simple method for handling a resistant actor, all *applicants should have the ability to twist the typical actor's wrist, using one arm as a fulcrum.*

I. MISCELLANEOUS PTI ACTIVITIES

Table 28 shows other types of physical activities that were performed by half of the officers during the past year. Forcing open a locked door without assistance does occur, but does not meet the criteria established earlier in this part of the report. Changing a flat tire without assistance nearly satisfied the guidelines. Due to the results for lift and carry, it may not be necessary to develop a work sample test for changing a tire.

Pushing a stalled automobile is another frequent occurrence. Although it does approximate PTI guidelines when performed alone, it is usually performed with assistance. Since there are many ways for an officer to obtain assistance, the need to push an automobile alone would be too stringent and an unnecessary requirement.

DIAGRAM 1

FULCRUM FOR BENDING ACTOR'S WRIST

TO INITIATE HANDCUFFING PROCEDURE

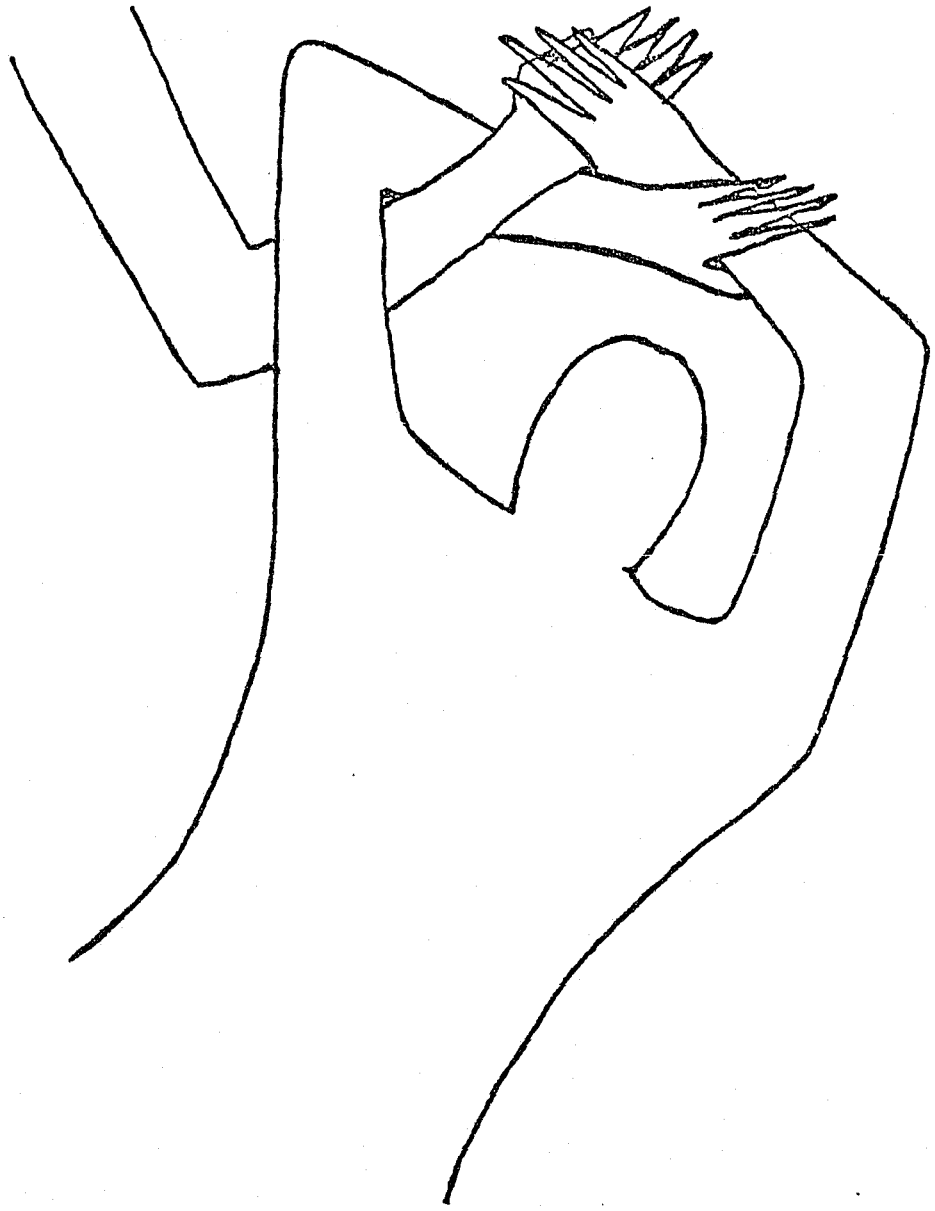


TABLE 28

PHYSICAL TASK INVENTORY RESULTS

FOR MISCELLANEOUS ACTIVITIES

ALL PATROL SHIFTS (N = 386)

	Percent Officers Performing Minimum number times in last year:		
	Once	Twice	Bimonthly
Force Open Locked Door			
Alone	33%	20%	2%
Assisted	35%	21%	3%
Push Stalled Auto			
Alone	48%	35%	5%
Assisted	88%	83%	30%
Change a Flat Tire			
Alone	41%	26%	3%
Assisted	22%	13%	2%
Balance on a Beam Without Support	50%	39%	10%

Balancing activities also meet the PTI guidelines. Percentages are only reported for balancing without support, referring to balancing and walking along two-by-four's in attics, on rafters, on the tops of fences, or on restraining walls. Since many respondents had difficulty estimating the number of seconds, percentage of officers performing by time was not an appropriate statistic. Therefore, the mean response time for respondents was calculated and found to be 5.3 seconds. Thus, *a balance beam should be used to determine the applicant's ability to maintain his/her balance for at least five seconds while crossing the beam.*

J. OTHER POTENTIAL SELECTION TESTS

Until now, discussion has centered on actual tasks performed by officers, not on specific incumbent abilities or attribute requirements. Many physical psychomotor and sensory attributes are also important, as demonstrated by the PAQ results and inferred from other job analysis data. Primary physical psychomotor and sensory attribute abilities determined by the PAQ analyses which should be considered as predictors in any future validation research include:

- Explosive Strength (restraint, forced entry, combat, etc.)
- Dynamic Strength (resistant, forced entry, combat, etc.)

- Static Strength (restraint, lifting, etc.)
- Speed of Limb Movement (restraint, pursuit, pursuit driving, etc.)
- Rate Control (pursuit, pursuit driving, etc.)
- Susceptibility to Fatigue (extra long work periods, stake outs, etc.)
- Stamina (pursuit, restraint, extra long work periods, etc.)
- Body Orientation (pursuit, restraint, combat, etc.)
- Kinesthesis (pursuit, restraint, combat, climbing, etc.)
- Spatial Orientation (pursuit driving, search, stake outs, etc.)
- Eye-Hand-Foot Coordination (pursuit driving, restraint etc.)
- Simple Reaction Time (pursuit driving, observation, restraint, etc.)
- Far Visual Acuity (pursuit driving, observation, etc.)
- Movement Detection (pursuit driving, observation, criminal investigation, etc.)
- Depth Perception (pursuit driving, observation, etc.)
- Sensory Alertness (observation, criminal investigation etc.)

CHAPTER 4

INTERACTION OF ACTIVITIES

The purpose of this section is to provide information about how job activities interrelate and which, if any, work sample tests should be combined into one examination. Highly speeded tests are particularly suited for concolidation whenever field data support the validity of such integration.

Interviews with officers indicated that combat activities frequently do not occur until after the officer successfully catches a fleeing actor. Officers also reported that stamina is very essential, a finding supported by the PAQ results. To test the possibility of integrating work sample tests, PTI critical incidents were categorized by reported activities; then the percentage of officers performing each combination was calculated.

In Part II of the PTI, officers were requested to mention up to three recent critical incidences involving physical activity. Percentage of respondents mentioning a particular combination, therefore, does not mean the percentage of officers performing that combination during the last 12 months. It only indicates the percentage who performed it recently and who felt it noteworthy of special mention. There is no sure way to attach absolute meaning to the obtained percentages. However, because of the "open end" format, if 25 percent of the officers noted a

particular combination of activities, that combination should be quite meaningful. (In attitude surveys a response rate of 25 percent to an "open end" question is very significant.)

When completing the PTI, some officers failed to answer Part II or answered it incorrectly. Some officers only related one critical incident, while others related two or three. Only the data from officers who reported at least one usable incident were included in this analysis. Of the 318 subjects, each officer averaged 2.37 incidents. Percentages in Table 29, therefore, are the percent of officers noting each combination regardless of how many incidents they related in total.

As suspected, there is a great deal of interaction between each of the activities. Although many combinations are possible, the most practical combination seems to be run, jump and climb, reported by 29 percent of the officers and exceeding the 25 percent guideline. The advantage for using run, climb and jump together in one exercise is that all activities can be administered under timed conditions, with one time standard for the entire event. Jumping activities easily can be incorporated into the obstacle course, or added to a straight run. Since running and climbing recommendations are both for highly speeded or pursuit situations, they, at least, should be combined into one event.

TABLE 29

PHYSICAL TASK INVENTORY CRITICAL INCIDENT INTERACTIONS

Activity	Percentage of Respondents Mentioning
Run	87%
Climb	62%
Jump	53%
Lift/Carry/Drag	67%
Restrain	86%
Run and Climb	49%
Run and Jump	49%
Run and Lift/Carry/Drag	26%
Run and Restrain	64%
Run and Climb and Jump	29%
Run and Climb and Restrain	30%
Run and Jump and Restrain	30%
Run and Lift/Carry/Drag and Restrain	28%
Run and Climb and Jump and Restrain	17%
Run and Climb and Jump and Lift/Carry/Drag	7%
Run and Climb and Jump and Restrain and Lift/Carry/Drag	5%

CHAPTER 5

SAMPLE CHARACTERISTICS FOR DEVELOPING SPEED STANDARDS

The ideal (but impractical) method for determining how fast officers are required to run in order to apprehend fleeing actors is to measure the actor's speed when he/she is pursued by officers. As previously discussed, the most feasible method for determining position speed requirements is by sampling actor speed or the speed of persons similar to those actors who require officers to engage in speeded pursuit activities.

Using actors or a simulated actor sample for establishing speed standards may be too lenient because: 1) pursued actors are highly motivated for escape, so an actor simulation sample will not run as fast; 2) officers need to run faster than actors to catch them; 3) officers are handicapped by having to run in regulation uniforms and shoes, with cumbersome sidearms, handcuffs and night sticks. To minimize these deficiencies, it was recommended that applicants should be able to perform at least at the 50th percentile of "actors", while cadets by the end of Academy training should be able to perform at least at the 75th percentile. Regardless of the potential leniency of such standards, using an "actor" or "simulated actor" sample is the only practical metnod for studying speeded physical requirements. Otherwise, an imperfect method of testing the skills of current officers and

applicants whould have to be used to establish minimum position requirements.

To determine the relevant characteristics of actors who require police officers to engage in pursuit and/or subdue activities, a specialized questionnaire or work diary was developed. For one week during the beginning of October 1976, each patrol officer (or team) was requested to note any incident in which they were required in the line of duty to either chase or subdue an actor. Whenever officers did engage in such pursuit and/or restraint activities, whether or not an arrest was effected, they were asked to note (or estimate) the actor's age, race, sex, height and weight. All data were recorded on the "Daily Physical Activity Requirements" form (see copy in Appendix G).

A total of 249 completed forms were returned by patrol officers and officer teams. Of these 249 forms, 102 or 41 percent noted from one to ten incidents of physical activities. Fifty-nine percent of the forms indicated no pursuit or restraint activities during the short time period.

As a check on data consistency, the results were analyzed separately for pursuit and subdue categories. Results are presented in Table 30. As the table shows, the average actor requiring pursuit and/or restraint has the following characteristics: a male, aged 23 to 25, weighing between 156 and 165 pounds and standing five feet, ten inches tall. Whites, Blacks

TABLE 30

CHARACTERISTICS OF TYPICAL ACTORS

Actor Percentile	Height		Weight		Age
	Pursue	Subdue	Pursue	Subdue	
30%	5'8"	5'8"	146-150	141-145	20
45%	5'10"	5'10"	156-160	156-160	23
50%	5'10"	5'10"	156-160	156-160	24
55%	5'10"	5'10"	161-165	161-165	25
70%	5'11"	5'11"	171-175	171-175	30

Race		Sex	
Whites	40%	Males	89%
Blacks	34%	Females	11%
Latin	26%		

Hispanics were almost equally represented, being 40 percent, 34 percent and 26 percent respectively. It is very noteworthy that height and weight results were nearly identical for the separate categories of pursuit and restraint.

As a further check on the accuracy of these results, another brief analysis was made using the PTI critical incident data. In over 100 cases the PTI critical incident reports cited the actor's height and weight when physical activity was required which involved actors. Analysis of these reports yielded a median pursued actor height of five feet, ten inches and a median weight of 175 pounds. Median weight of restrained actors was in a similar range, but varied with the specific restraint activity and conditions. For example, when assistance was not available, the median weight of actors who were dragged and carried was between 160 and 165 pounds. When assistance was available, median actor weight increased to 180 pounds for dragging and 185 pounds for carrying activities.

The average actor who causes physical activity on the part of an officer, therefore, is a 24 year old, five feet, ten inch male weighing at least 160 pounds. Consequently, selection of subjects for an "actor simulation" sample should consist primarily of males, five feet, ten inches tall (possibly including some at five feet, nine inches and five feet, eleven inches), weighing between 156 and 175 pounds, between 23 and 25 years of

age, and close to the following racial proporations: 40 percent White, 34 percent Black and 26 percent Hispanic.

CHAPTER 6

SUMMARY OF POTENTIAL WORK SAMPLE ACTIVITIES

A number of the work sample tasks identified by this research have overlapping content and are unnecessary or redundant. Further, several of the validated work sample tests may be impractical to implement because of time, work space considerations, administrative procedures, and so on. Rather than limit the Department to a given set of work sample tests, all content valid tasks are summarized in this chapter, with references to similar or overlapping tasks as appropriate.

The validated work sample tasks are grouped into three categories: 1) conclusions which can be immediately converted into job sample tests, 2) conclusions which require some speed standards before they can be implemented, and 3) activities which require additional research. The reader should remember that each conclusion cited below has consistently been identified as important by various job analysis methodologies and has been found to be job related and content valid.

A. TASKS IMMEDIATELY CONVERTIBLE TO WORK SAMPLE TESTS

1. Running

Applicants should be able to traverse an 800 foot obstacle course under highly speeded conditions. If an obstacle course is not practical, the run should consist of a

straight path for 800 feet or its equivalent perhaps via a treadmill. If speed standards are not developed on the recommended actor sample, then the time standard should be conservative.

2. Stairs

Applicants should be able to run up two flights of stairs and/or down one flight of stairs under highly speeded conditions. If this event is not combined with other obstacle course events, and if actor norms are not developed, then the time standard should be conservative.

3. Jumping Over and Across

Although jumping seems to be most appropriate as part of a running speed test, it could be administered without time limits. The test under either timed or untimed conditions should consist of a running start and require the applicant to jump across a five foot, three inch wide ditch and/or over a three and one-half foot high barrier (the use of hands should permissible). Whereas running jumps are recommended, unspeeded broad jumps could be used instead. If so desired, the broad jumps should be over a two foot high barrier and across a four foot wide obstacle.

4. Jumping Down

Applicants should be able to jump down from a height of six and one-half foot. If recommendations concerning climbing are followed, then a separate jump down work sample test would be redundant.

5. Climb Over

The climbing work sample test should consist of a five and three-fourths foot climb over a solid barrier without hand or footholds under highly speeded conditions. If hand and/or footholds are provided, the speeded climb should be over a six and one-fourth foot barrier. (Since most fences are six feet high, it also would be appropriate to use a six foot wall with either speeded climbs.)

If speed is not desired, then the applicant should be able to climb over a seven and one-half foot high barrier with hand and footholds, or a six and one-half foot barrier without hand or footholds, or into a five and two-thirds foot high window.

6. Pull Up and Hold

Applicants should be able to jump up to a seven and one-half foot wall, pull themselves up using arm and body

strength and hold that position for nine seconds. The wall should be constructed with a ledge so that applicants can grab hold of or hook their arm over the wall, to aid their pull up.

As an alternative, applicant upper body strength could be tested with a chinning bar. This exercise would vary bar height to about two feet over the applicant's head to require the applicant to jump up, pull up to the bar and hold the position for nine consecutive seconds.

7. Climb Fire Escape Ladder

Each applicant should be able to climb up a one-story fire escape ladder. If work samples for running up flights of stairs and climbing over barriers are installed, then climbing fire escape ladders may be redundant.

8. Lift Person

All applicants should be able to lift a 163 pound person or "humanoid dummy" from a flat floor position to a standing position. The "dummy" should be fully dressed to aid the process.

9. Carry and Drag

Without assistance, applicants should be able to drag a 163 pound "humanoid dummy" for a distance of twenty feet. Applicants should be able to drag the "dummy" in a non-violent manner as if it were an unconscious or injured person (i.e. dragging by one or more arms or legs should not be permitted). Typically, applicants would be extected to drag the "dummy" by holding it under the arm pits and across the chest and walking backwards. If they desire, applicants should be permitted to carry the "dummy" by any means possible.

Alternative carry and drag work sample tests include the following activities: a) carry or drag a 150 pound "humanoid" for a distance of 32 feet; b) carry a 100 pound person or object without assistance for a distance of seven feet or carry a 150 pound "dummy" with assistance for a distance of fourteen feet *and* drag a 150 pound "dummy" for a distance of eighteen feet.

10. Balance Beam

Applicants should be able to balance themselves for at least five seconds on a balance beam while walking across it without falling off. The beam should be six feet high, the height of a typical fence.

11. Change a Spare Tire

Applicants should be able to lift a spare automobile tire out of a car trunk and replace it. The lifting of a tire test may be redundant if other lifting and carrying work sample tests are implemented.

B. ACTIVITIES WHICH REQUIRE SPEED STANDARDS

If speed standards are developed using a "simulated actor sample" as described in the previous chapter, then the following activities could be combined into one event or standardized separately.

1. Running

Applicants should be able to traverse an 800 foot obstacl course under highly speeded conditions. If an obstacle course is not practical, the speeded run could consist of a straight path for 800 feet, or its equivalent.

2. Stairs

Applicants should be able to run up two flights of stairs and/or down one flight under highly speeded conditions.

3. Jumping

Speeded jumping tests should consist of a running start and require the applicant to traverse a five foot, three inch wide ditch and a three and one-half foot high barrier. Use of hands should be permissible when jumping over the barrier.

4. Climbing

Applicants should be able to climb over and down a five and three-fourth foot high barrier, without hand or foot-holds, under speeded conditions. A higher barrier (six and one-fourth foot) should be used if hand and footholds are provided.

C. ACTIVITIES REQUIRING ADDITIONAL RESEARCH

Some of the attributes identified by the PAQ job analysis method and found in physical combat are not now possible to convert into selection tests. If selection tests are desired for evaluating these attributes, then additional research will be required. Two types of research methodologies are recommended - criterion-related validity and work sample testing.

Criterion-related validity research would be highly appropriate for studying the attributes identified by the PAQ

results. In addition, other strength measures to tap grip strength, body lifting, arm control, etc., could be added into a predictive test battery. Good criteria would need to be developed, and should include carefully developed self-defense scores obtained at the end of the Academy training program. This research would probably require several Academy classes and should be conducted over a span of two or more years.

Work sample tests could be developed for activities such as pushing actor to arms' length, twisting actor's wrist, pulling actor's arm behind his/her back, and so on. In keeping with prior philosophy, these tasks should be related to position requirements, rather than officer abilities. Consequently, the first step in this procedure would be to estimate the force *exerted by the typical actor* when he/she pushes against an officer, holds his/her wrist stiff or holds his/her arm out to avoid being handcuffed. Probably a physiologist will be needed to develop stress devices capable of measuring the actor's force at points of resistance. Once the typical actor's resistance is known, then appropriate work sample tests could be constructed.

SECTION IV

CRITERION RELATED VALIDITY RESEARCH

CHAPTER 1

INTRODUCTION

Criterion-related validity research was used to investigate the relationships between certain physical characteristics and on-the-job performance criteria. Although many of the Houston Police Department's job requirements were studied by content validity (i.e., developing work sample tasks) other selection requirements were not amenable to being analyzed by that approach. For example, an officer's height apparently is related to such job behaviors as pursuit driving and directing traffic. While one could conduct the laborious pursuit driving research to establish minimum arm length, leg length, eye-seat distances, etc., another could argue for changing the patrol vehicle design to accommodate smaller persons. Furthermore, patrol vehicle models change periodically, necessitating frequent updating of measurement standards.

In many cases, however, physical stature is not directly linked to job performance, but is inferred to have a relationship to job behaviors. Examples of such inferred relationships include the officer's ability to pursue and apprehend on foot a fleeing actor, to subdue resisting or violent actors and to thwart public asocial behaviors and rebelliousness by the officer's physical "presence" and stature. Criterion-related validity is the proper design to test the assumptions that height, weight and ratio of height to weight , in fact,

are related to these critical job behaviors.

At this time the Department's height requirement for both sexes is 66 inches. The minimum weight allowed for men is 140 pounds and, for women, 118 pounds. A further standard requires the applicant's weight to be proportional to his/her height.

Two different types of research projects were conducted to determine the validity of these height and/or weight standards. The first research design focused on the "officer presence" hypothesis by investigating the relationship between officer size and incidence of actor resistance (results are presented in Chapter 2). The second research effort investigated the relationship between officer stature and on-the-job performance as determined by supervisory ratings (see Chapter 3).

Although vision requirements were not intensively studied, some preliminary research findings for visual acuity and depth perception are presented in Chapter 4.

CHAPTER 2

RELATIONSHIP OF OFFICER SIZE TO ACTOR RESISTANCE

A. INTRODUCTION

Quite often, arguments supporting height and weight requirements are based on the theory of "officer impact" or "officer presence", that is, the assumption that an officer's physical size influences an actor's decision either to resist or submit to the arrest procedures. Thus, it is expected that an officer standing 6'3" will experience fewer incidents of physical resistance than an officer standing 5'4". Factors entering into the actor's choice of resisting versus not resisting may extend well beyond the height and weight of the arresting officer to include such variables as the psychological condition of the actor, the physical condition of the actor, the presence of witnesses, the severity of the offense and the perceived costs (or benefits) of resisting. A research program expanding the scope of this validation study would be necessary to determine if an officer's physical composition actually *causes* an actor to physically resist and to specify the relative importance of this variable in the actor's decision. However, if it can be demonstrated that the size of an officer is related in some systematic way to the frequency of actor resistance, then the attributes of height, weight and weight:height ratio would constitute valid selection criteria.

The purpose of the following investigation was to determine if such a relationship exists for entry level officers in the Houston Police Department. Specifically, the height, weight and weight:height ratio of certain HPD officers were examined in relation to the frequency with which these officers reported various forms of physical resistance.

B. METHODOLOGY

Sample: Researching the effects of "officer presence" requires a homogeneous sample with regard to job functions, expecially those functions relating to public exposure and opportunities for arresting actors. Consequently, this investigation was limited to officers assigned to the Patrol Division, i.e., those positions with the highest probabilities for confrontation. Criteria for selecting these officers included the following:

1. Current assignment was in the Patrol Division, with at least one year experience in the position,
2. Job tenure did not exceed five years, and
3. Patrol assignment was on either shift 2 or 3. (The evening and night shifts have higher incidences of physical confrontations.)

A total of 335 officers across all patrol locations met the sample selection criteria, and each officer was included in

the study. Because of the homogeneity of experience, time constraints and focus on patrol, no female officers were included in the sample.

Data Collection Procedures: The incidents of actor resistance which an officer experienced during the last 12 months were obtained from the self-report Physical Task Inventory (P.T.I.). While this questionnaire contained items pertaining to a variety of physical activity, one section was devoted specifically to the restraint and combat experiences of the officer. Responses to eight items in this section were used in the analysis. Each officer estimated the number of times he was personally involved in the following events during the last twelve months:

1. Attempt to restrain *fleeing actor* by holding on to him/her until individual is subdued.
2. Attempt to subdue one *unarmed* actor who is assaulting you.
3. Attempt to handcuff *resisting actor*.
4. Attempt to put *resisting actor* in patrol car.
5. Attempt to *disarm* one or more actor(s) assaulting you with knife, club, stick, or weapon other than firearm.
6. What was the total number of times you were assaulted in the last twelve months?

7. How many times did you receive minor injuries from direct person-to-person assault (i.e., exclude injuries from thrown material or gunshot)?
8. How many times did you receive major injuries from direct person-to-person assaults (i.e., exclude injuries from thrown material or gunshot)?

Officer estimates for the first five items were given for two different conditions: with assistance and without assistance. The following analyses used only those estimates given for "without assistance".

Officers recorded their weights and heights in the first section of the PTI. Weight:height ratios were computed subsequently by the researchers.

C. RESULTS

Table 31 presents the means, standard deviations, ranges and other summary statistics calculated from the responses to the eight PTI items. Similar statistics for the heights, weights and weight:height ratios of the 335 officers are also shown in Table 32. It should be noted that the ranges for height and weight were very restricted. No data were available for individuals shorter than 67 inches (five feet, seven inches) or individuals weighing less than 135 pounds.

SUMMARY STATISTICS FOR RESPONSES TO INVENTORY ITEMS PERTAINING TO ACTOR RESISTANCE

(PATROL DIVISION N = 335)

INVENTORY ITEM	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	RANGE
1. Attempt to restrain fleeing actor by holding on to him/her until individual is subdued	3.59	6.17	0.0	50.00	50.00
2. Attempt to subdue one unarmed actor who is assaulting you	2.19	4.58	0.0	45.00	45.00
3. Attempt to handcuff resisting actor	4.68	15.38	0.0	250.00	250.00
4. Attempt to put resisting actor in patrol car	4.05	8.58	0.0	50.00	50.00
5. Attempt to disarm one or more actor(s) assaulting you with knife, club, stick, or weapon other than firearm	0.51	2.45	0.0	40.00	40.00
6. Total number of times assaulted in the last 12 months	4.80	7.57	0.0	71.00	71.00
7. Number of times received minor injuries from direct person-to-person assault	1.66	2.76	0.00	30.00	30.00
8. Number of times received major injuries from direct person-to-person assault	0.09	0.32	0.00	2.00	2.00
PHYSICAL ATTRIBUTES					
1. Height	70.99	2.12	67.00	77.00	10.00
2. Weight	184.99	22.08	135.00	275.00	140.00
3. Weight:Height Ratio	2.60	0.27	2.00	3.62	1.62

TABLE 32

COEFFICIENTS OBTAINED FROM CORRELATING RESPONSES TO INVENTORY ITEMS WITH AN OFFICER'S HEIGHT, WEIGHT AND WEIGHT:HEIGHT RATIO

(PATROL DIVISION N = 335)

	INVENTORY ITEMS*							
	1	2	3	4	5	6	7	8
Height	-0.00	-0.02	0.03	0.01	0.02	-0.01	0.03	-0.04
Weight	-0.05	0.00	-0.04	-0.02	-0.07	0.01	0.04	-0.11
Weight/Ratio	-0.05	0.01	-0.06	-0.02	-0.09	0.02	0.04	-0.12

* ITEM DESCRIPTION:

1. Attempt to restrain fleeing actor by holding on to him/her until individual is subdued
2. Attempt to subdue one unarmed actor who is assaulting you
3. Attempt to handcuff resisting actor
4. Attempt to put resisting actor in patrol car
5. Attempt to disarm one or more actor(s) assaulting you with knife, club, stick, or weapon other than firearm
6. Total number of times assaulted in the last 12 months
7. Number of times received minor injuries from direct person-to-person assault
8. Number of times received major injuries from direct person-to-person assault .

This research, therefore, only investigated the relationship between actor behaviors and officer presence for taller officers (above five feet, six inches) and those weighing more than 134 pounds. If significant relationships are found, then the results would indicate the need for minimum height requirements above five feet, seven inches and weight limitations of over 135 pounds. The failure to obtain significant results, however, would not adequately test the Department's current height and weight requirements.

The relationship between "officer presence" and actor resistance was examined first by a correlational procedure. The weight, height and weight:height ratio of officers were correlated with their responses to each of the eight PTI items. The 24 Pearson product-moment correlation coefficients obtained from this analysis appear in Table 32.

None of these coefficients are large enough to reflect a significant linear relationship between the physical variables and the estimates of actor resistance. On the basis of these coefficients alone there is no support for the hypothesis that the shorter or lighter officers experienced more actor resistance than the taller or heavier officers.

It is important to emphasize, however, that correlation

coefficients are highly sensitive to skewness and the influence of extreme scores on either variable. When the officers' responses to the PTI items were plotted against their physical characteristics, it was evident that certain items were highly skewed. For example, nearly all officers did not attempt to handcuff a resisting actor more than 50 times in the past twelve months. However, a few officers reported attempting the task 250 times during the same time period. Similar instances of extreme scores appeared for Items 5, 6 and 7. As a rule, extreme scores such as these tend to yield a correlation coefficient which underestimates the "true" relationship between the variables being correlated.

In order to remove the influence of extreme scores, a second type of statistical analysis was performed for those items relating to assault or direct resistance, i.e., items 2 through 8. The means for weight, height, and the ratio of weight to height for two groups of officers were compared: 1) those who reported no occurrence of an event, and 2) those who reported one or more occurrences. Table 33 contains the means and standard deviations for each group by PTI item. The results of the t tests used to compare these means confirmed the findings of the correlational analysis. For most events, the physical characteristics of the officers who reported instances of actor resistance were

TABLE 11

COMPARISON OF MEAN HEIGHT, WEIGHT AND WEIGHT:HEIGHT RATIO BETWEEN OFFICERS REPORTING AT LEAST ONE OCCURRENCE AND OFFICERS REPORTING NO OCCURRENCES

(PATROL DIVISION N = 335)

TASK INVENTORY ITEM**	REPORTED OCCURRENCE	# OF OFFICERS	HEIGHT(H) MEAN INCHES	HEIGHT(H) STAND DEV	HEIGHT(H) t-VALUE	WEIGHT(W) MEAN POUNDS	WEIGHT(W) STAND DEV	WEIGHT(W) t-VALUE	W:H RATIO MEAN LBS/IN	W:H RATIO STAND DEV	W:H RATIO t-VALUE
2	At least once	192	71.03	2.08	.46	185.57	22.09	.55	2.61	.28	.56
	Never	143	70.92	2.19		184.22	22.13		2.59	.26	
3	At least once	226	71.06	2.04	.90	185.16	22.10	.21	2.60	.28	.04
	Never	109	70.83	2.29		184.63	22.14		2.60	.26	
4	At least once	202	71.07	2.04	.89	184.54	21.66	-.46	2.59	.27	-.07
	Never	133	70.86	2.25		185.67	22.78		2.62	.27	
5	At least once	72	71.00	2.24	.07	185.79	23.62	.35	2.61	.30	.40
	Never	263	70.98	2.10		184.77	21.68		2.60	.26	
6	At least once	268	70.95	2.14	-.58	184.00	22.46	-1.65	2.59	.28	-1.73
	Never	67	71.12	2.06		188.97	20.16		2.65	.23	
7	At least once	209	70.86	2.10	-1.43	182.22	19.95	-2.84*	2.57	.25	-2.93*
	Never	126	71.20	2.16		189.58	24.63		2.66	.29	
8	At least once	25	70.80	1.98	-.45	177.00	20.43	-1.89	2.50	.25	-2.05
	Never	310	71.00	2.14		185.64	22.11		2.61	.27	

* $P < .05$

** ITEM DESCRIPTIONS:

2. Attempt to subdue one unarmed actor who is assaulting you
3. Attempt to handcuff resisting actor
4. Attempt to put resisting actor in patrol car
5. Attempt to disarm one or more actor(s) assaulting you with knife, club, stick, or weapon other than firearm
6. Total number of times assaulted in the last 12 months
7. Number of times received minor injuries from direct person-to-person assault
8. Number of times received major injuries from direct person-to-person assault

CONTINUED

2 OF 4

not significantly different from the characteristics of officers who did not report such events.

The only exception to this rule appeared in the comparisons for "minor injuries". Officers who had received at least one minor injury tended to weigh slightly less (mean weight = 182.22 pounds) and have a slightly lower weight:height ratio (mean ratio = 2.57) than officers who had received no minor injuries (mean weight = 189.58 pounds; mean ratio = 2.66). However, a test of the strength of these relationships[1] indicated that only 3 percent of the variance in the estimates for minor injuries could be explained by either the officer's weight or weight:height ratio.

As a final check on the potential effect of an officer's height, item responses were compared for seven groups of officers formed on the basis of height: five feet, seven inches to five feet, eight inches; five feet, nine inches; five feet, ten inches; five feet, eleven inches; six feet; six feet, one inch; and six feet, two inches to six feet, five inches. The mean responses for items 2 through 8 appear in Table 34 for each height category. Analyses of variance comparing frequency estimates for each item detected no differences among the seven groups. Reports

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[1] ω^2 or omega squared, see Hays (1973, p. 417).

TABLE 34

MEAN FREQUENCY OF OCCURRENCE COMPARED AMONG HEIGHT CATEGORIES

(PATROL DIVISION N = 335)

Item 2: Attempt to subdue one unarmed actor who is assaulting you

		REPORTED OCCURRENCE		
HEIGHT CATEGORY	NUMBER OF OFFICERS	MEAN	SDEV	F VALUE
1. 5'7" through 5'8"	51	1.94	4.67	.47
2. 5'9"	40	3.03	6.92	
3. 5'10"	45	1.62	2.61	
4. 5'11"	64	2.31	3.58	
5. 6'	49	2.57	6.66	
6. 6'1"	44	2.02	2.58	
7. 6'2" through 6'5"	42	1.86	3.39	

TABLE 34 (continued)

MEAN FREQUENCY OF OCCURRENCE COMPARED AMONG HEIGHT CATEGORIES

(PATROL DIVISION N = 335)

Item 3: Attempt to handcuff resisting actor

HEIGHT CATEGORY	NUMBER OF OFFICERS	REPORTED OCCURRENCE MEAN	SDEV	F VALUE
1. 5'7" through 5'8"	51	3.14	6.70	.92
2. 5'9"	40	4.55	9.16	
3. 5'10"	45	3.96	7.71	
4. 5'11"	64	4.02	7.47	
5. 6'	49	9.33	38.81	
6. 6'1"	44	3.48	4.38	
7. 6'2" through 6'5"	42	4.26	9.48	

TABLE 34 (continued)

MEAN FREQUENCY OF OCCURRENCE COMPARED AMONG HEIGHT CATEGORIES

(PATROL DIVISION N = 335)

Item 4: Attempt to put resisting actor in patrol car

HEIGHT CATEGORY	NUMBER OF OFFICERS	REPORTED OCCURRENCE MEAN	SDEV	F VALUE
1. 5'7" through 5'8"	51	3.63	8.28	.43
2. 5'9"	40	5.38	11.92	
3. 5'10"	45	2.53	3.39	
4. 5'11"	64	4.16	8.53	
5. 6'	49	4.39	9.56	
6. 6'1"	44	4.23	7.60	
7. 6'2" through 6'5"	42	4.21	9.19	

TABLE 34 (continued)

MEAN FREQUENCY OF OCCURRENCE COMPARED AMONG HEIGHT CATEGORIES

(PATROL DIVISION N = 335)

Item 5: Attempt to disarm one or more actor(s) assaulting you with knife, club, stick, or weapon other than firearm

			REPORTED OCCURRENCE		
	HEIGHT CATEGORY	NUMBER OF OFFICERS	MEAN	SDEV	F VALUE
1.	5'7" through 5'8"	51	.35	.87	1.41
2.	5'9"	40	.60	1.19	
3.	5'10"	45	.22	.60	
4.	5'11"	64	.28	.60	
5.	6'	49	.41	.06	
6.	6'1"	44	.32	.67	
7.	6'2" through 6'5"	42	.41	.94	

TABLE 34 (continued)

MEAN FREQUENCY OF OCCURRENCE COMPARED AMONG HEIGHT CATEGORIES

(PATROL DIVISION N = 335)

Item 6: Total number of times assaulted in the last 12 months

HEIGHT CATEGORY	NUMBER OF OFFICERS	REPORTED OCCURRENCE MEAN	SDEV	F VALUE
1. 5'7" through 5'8"	51	3.88	5.68	.73
2. 5'9"	40	4.80	5.31	
3. 5'10"	45	5.24	8.12	
4. 5'11"	64	6.30	11.62	
5. 6'	49	4.74	5.50	
6. 6'1"	44	4.34	4.42	
7. 6'2" through 6'5"	42	3.74	7.80	

TABLE 34 (continued)

MEAN FREQUENCY OF OCCURRENCE COMPARED AMONG HEIGHT CATEGORIES

(PATROL DIVISION N = 335)

Item 7: Number of times received minor injuries from direct person-to-person assault

		REPORTED OCCURRENCE		
HEIGHT CATEGORY	NUMBER OF OFFICERS	MEAN	SDEV	F VALUE
1. 5'7" through 5'8"	51	1.39	1.94	1.04
2. 5'9"	40	2.13	2.36	
3. 5'10"	45	1.42	2.09	
4. 5'11"	64	1.66	2.04	
5. 6'	49	1.16	1.41	
6. 6'1"	44	2.34	3.90	
7. 6'2" through 6'5"	42	1.64	4.66	

TABLE 34 (continued)

MEAN FREQUENCY OF OCCURRENCE COMPARED AMONG HEIGHT CATEGORIES

(PATROL DIVISION N = 335)

Item 8: Number of times received major injuries from direct person-to-person assault

HEIGHT CATEGORY	NUMBER OF OFFICERS	REPORTED OCCURRENCE MEAN	SDEV	F VALUE
1. 5'7" through 5'8"	51	.06	.24	.77
2. 5'9"	40	.18	.50	
3. 5'10"	45	.11	.38	
4. 5'11"	64	.08	.32	
5. 6'	49	.06	.24	
6. 6'1"	44	.09	.29	
7. 6'2" through 6'5"	42	.05	.22	

of actor resistance occurred about as often for one height category as for any of the others.

D. DISCUSSION AND CONCLUSIONS

If the physical characteristics (i.e., height, weight, weight:height ratio) of current officers is related to the number of times they encounter actor resistance, the foregoing study failed to identify such a relationship. Therefore, there is no support from the "officer presence" theory to justify an increase in height and/or weight requirements. Because of methodological limitations, however, this investigation could not study current standards; consequently, the results neither refute nor support current requirements.

Since the "officer presence" theory might be validated when female officers and male officers less than five feet, seven inches are included in a study, it would be appropriate for the Department to conduct additional research once the height range broadens and a number of female officers have sufficient experience in patrol functions. Therefore, it is recommended that the Department develop data collection forms to record incidences of actor resistance and assault behaviors by the actor's and assaulted officer's physical characteristics. With this type of data any future research should nullify

the two major limitations of this investigation: a greatly restricted range and use of estimated frequencies of resistance.

CHAPTER 3

RELATIONSHIP OF OFFICER SIZE TO JOB PERFORMANCE

A. INTRODUCTION

Another approach to studying the relationship of a police officer's height and his/her ability to handle the physical demands of the entry level job is to compare supervisory evaluations of officer job performance to officer height. In another phase of this project, Sergeants in the Patrol and Traffic Divisions evaluated officers on 18 dimensions critical to job performance. (See Volume VII for details on methodology and a description of the behaviorally anchored scales.) One of the 18 behavioral dimensions was "Physical Ability", defined as the "ability to handle all physical demands which are encountered on the job" (see Figure 1).

It was expected that if taller officers handle the physical aspects of the job better than shorter officers, then the Sergeants' evaluations of "Physical Ability" should reflect these differences. A proper study of this relationship would encompass the full spectrum of height. However, in this investigation only females five feet, two inches to five feet, nine inches and males five feet, eight inches and over could be studied because of

FIGURE 1
PHYSICAL ABILITY

Ability to handle all physical demands which are encountered on the job.

List in the area to the right those officers who are:

In excellent physical condition and are able to handle all of the physical demands of the job. They should be among the most physically fit officers in the department. It might be expected, for example, that these officers would: *Be able to physically apprehend an actor of average size after catching up with him/her after a one mile chase.*	
Physically able to handle the demands of the job. They should be as capable as most other officers in any situation. Examples include: *Being able to subdue a struggling actor of average size.* *Being able to pull an unconscious man out of a burning car.* *Being able to run as fast as an actor of average speed and catching up with him in a chase.* *Being able to lift and carry an unconscious woman from a burning apartment.*	
Physically able to handle most situations, but on occasion have not been able to handle a situation that most other officers could have handled. They probably do not handle the physical demands of the job as well as most other officers. Examples include: *Being unable to run as fast as an actor of average speed and losing him in the chase.* *Being too tired to physically apprehend an actor of average size after catching up with him after a five block chase.*	
Not able to handle a number of the physical demands of the job. They are not as physically able as most other officers. Examples include: *Being unable to climb over a back yard fence while chasing an actor.*	

prior Departmental selection standards and current requirements. Therefore, the ranges for height are restricted at the lower extreme, eliminating the heights where a relationship might be most evident.

B. METHODOLOGY

Sergeants from selected Patrol and Traffic Divisions evaluated officers under their supervision who had been hired between 1971 and 1975 and who had been in their current position for at least six months. Prior to rating the officers, participating Sergeants were required to attend a training session where they were, first, trained in general problems that supervisors encounter when evaluating employees and, second, trained in how to complete the 18 behavioral rating scales.

Instructions for the "Physical Ability" dimension were similar to those for the other scales. That is, Sergeants were first provided with a list of officers in their division who were to be rated and then requested to cross off the name of any officer they did not personally feel qualified to evaluate. The 18 rating scales contained descriptions of between three to five levels of performance. The four levels for "Physical Ability" are approximate ratings of above average, average, below average and very poor. Sergeants rated each officer

by writing the officer's name next to the description which best fit. Any number of officers' names could be written beside any of the descriptions for each dimension.

Height measures were collected from officers when they completed the Physical Task Inventory Questionnaires. Out of a possible total of 116 officers with reliable evaluations, complete data was available only for 58 of whom were males and 21 females. This sample was comprised of 69 White officers, seven Black officers and three Hispanic officers.

C. RESULTS

Although the "Physical Ability" performance dimension was of primary importance to this analysis, the other 17 dimensions were included in the analysis to clarify interpretation of any significant findings. Presented in Table 35 are the significant correlations for the total group as well as for male and female officers. (Numerical signs for correlations were reversed for clarity). The Physical Ability height correlations for the total group were extremely high and statistically significant (.788 uncorrected and .881 corrected for rating unreliability). In addition, taller officers received higher ratings on effectiveness in emergency/stressful

TABLE 35

CORRELATION OF HEIGHT WITH EIGHTEEN PERFORMANCE DIMENSIONS

	Corrected Correlations[1]			Original Correlations		
	Total[2]	Males[3]	Females[4]	Total[2]	Males[3]	Females[4]
Conscientiousness to Duty	-.208*			-.186*		
Perceptual Vigilance						
Safety Consciousness						
Thoroughness in Reporting	-.249**			-.222**		
Concern for Others	-.353****			-.316****		
Professional Conduct	-.287***			-.257***		
Judgment and Decision Making						
Physical and Emotional Restraint	-.237**			-.212*		
Relationships with Peers						
Effectiveness in Emergency/Stressful Situations	.235**			.211*		
Willingness to Risk Personal Safety - Courage	.499****			.446****		
Ability to Act Independently	.195*					
Investigative Thoroughness						
Honesty						
Physical Ability	.681****	.436****		.788****	.390****	
Interpersonal Effectiveness						
Job Knowledge						
Overall Rating						

[1]Original Pearson product-moment correlation coefficients were corrected for unreliability of performance ratings; reliability coefficient was .80; sign of all correlations was reversed for clarity.

[2]Number = 79.

[3]Number = 58.

[4]Number = 21.

*Significant at .05 level.

**Significant at .025 level.

***Significant at .01 level.

situations, willingness to take risks, and the ability to act independently. Taller officers also received lower ratings on conscientiousness to duty, thoroughness in reporting, concern for others, professional conduct, and physical and emotional restraint.

However, when male and female officers were analyzed separately, the significant relationships disappeared on all dimensions except for Physical Ability in the male sample: taller male officers were still rated higher on physical ability than shorter male officers. (The validity coefficient corrected for unreliable ratings was .436). Examining the "Physical Ability" performance dimension in more detail, Table 37 shows the distribution of evaluation scores for male and female officers as well as for Whites, Blacks and Hispanics. Table 38 lists height statistics for the same groups.

Significant differences were found between the Sergeants' evaluation of "Physical Ability" for male officers versus female officers. That is, female officers were rated significantly lower than male officers in their ability to handle the physical demands of the job (Table 36). As expected, significant differences also were obtained when male and female officers were compared on height (Table 37). No significant differences were found when White and Black officer evaluation scores or

TABLE 36

"PHYSICAL ABILITY" RATINGS

BY OFFICER SEX AND RACE

		Rating[1]	t test Value[2]
SEX OF OFFICER			
Male (N=95)	Mean	1.98	
	Standard Deviation	.50	
Female (N=21)	Mean	3.61	-14.536****
	Standard Deviation	.24	
RACE OF OFFICER			
White (N=102)	Mean	2.28	
	Standard Deviation	.77	
Black (N=9)	Mean	2.16	.434
	Standard Deviation	1.06	
Hispanic (N=5)	Mean	2.40	-.344
	Standard Deviation	.55	

[1]Lower ratings denote positive direction, i.e., better physical abilities.

[2]t tests compared Whites to Blacks and Whites to Hispanics.

****Significant at .005 level of confidence.

TABLE 37

HEIGHT STATISTICS BY OFFICER SEX AND RACE

		Height in Inches	t test Value[1]
SEX OF OFFICER			
Male (N=58)	Mean	71.36	
	Standard Deviation	2.16	
Female (N=21)	Mean	64.76	12.367****
	Standard Deviation	1.90	
RACE OF OFFICER			
White (N=69)	Mean	69.64	
	Standard Deviation	3.43	
Black (N=7)	Mean	69.57	.049
	Standard Deviation	5.06	
Hispanic (N=3)	Mean	69.00	.310
	Standard Deviation	5.29	

[1]t test compared Whites to Blacks and Whites to Hispanics.
****Significant at .005 level of confidence.

TABLE 38

PHYSICAL ABILITY EVALUATIONS

BY SEX AND TENURE LEVELS

Tenure Years		Ratings[1] Males	Females	t test Value
1	Mean	1.665	3.583	-8.47****
	Standard Deviation	.474	.218	
	Number	2	6	
2	Mean	2.064	3.601	-10.46[2]****
	Standard Deviation	.503	.256	
	Number	15	14	
3	Mean	2.023		
	Standard Deviation	.507		
	Number	10		
4	Mean	1.860		
	Standard Deviation	.484		
	Number	26		
5	Mean	1.914		
	Standard Deviation	.584		
	Number	14		

[1] Lower ratings denote positive direction, i.e., better physical abilities.

[2] Standard deviations for the groups were significantly different at the .05 level; therefore, t test was based on the separate variance estimate for σ^2_D, rather than the normal pooled-variance estimate.

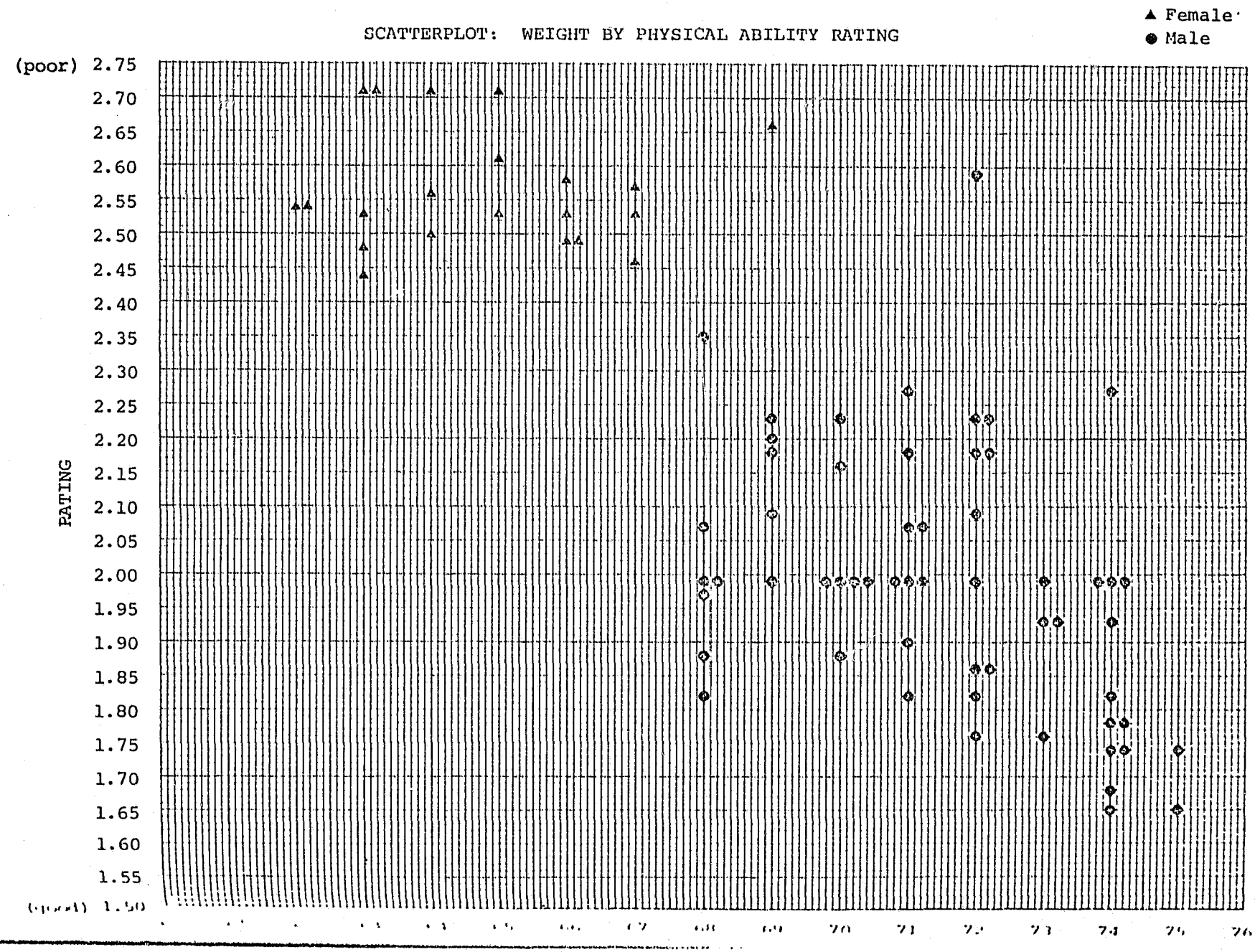
****Significant at .005 level.

White and Hispanic officer evaluation scores were compared (Table 36). Further, neither Black nor Hispanic officers differed significantly from White officers regarding height (Table 37).

Examining the difference in male and female officer "Physical Ability" evaluations by tenure, the data in Table 38 show that six female officers were in the one-year tenure group while 14 females were in the two-year group. No significant mean differences were found in ratings when these two female tenure groups were compared. Males were divided into five tenure categories and no significant mean differences were found between these groups. Comparison of mean ratings for male and female officers in equivalent tenure groups, however, showed significant differences in the evaluation of male and female officers. Male officers were evaluated as having more physical ability than female officers. Since tenure level did not appear to influence the evaluation of "Physical Ability", further analysis combined all male and all female tenure groups.

Figure 2 describes the relationship between height and "Physical Ability" evaluations for males, females and the total group. Each mark in Figure 2 represents an officer. Female officers are indicated by triangles and males by circles. It is clear from the scatterplot that

FIGURE 2


SCATTERPLOT: WEIGHT BY PHYSICAL ABILITY RATING
▲ Female
● Male
(poor) 2.75
2.70
2.65
2.60
2.55
2.50
2.45
2.40
2.35
2.30
2.25
2.20
2.15
2.10
2.05
2.00
1.95
1.90
1.85
1.80
1.75
1.70
1.65
1.60
1.55
RATING

when males and females are combined, there is a strong relationship between height and "Physical Ability" ratings (uncorrected correlation of .788). When females are analyzed separately, however, no clear relationship exists between height and performance ratings, because all females received relatively low ratings for Physical Ability. When males are considered separately (circles), a moderate relationship between height and physical ratings is evident (uncorrected correlation of .39). Since the data is obviously restricted (there were no male officers under five feet, eight inches in this investigation), the "true" relationship between the height of potential male officers and their performance of physical job duties is larger than obtained in this study. (Restriction in range data were not readily available because of applicant self screening, so a correction factor was not applied to these results.)

D. DISCUSSION AND CONCLUSIONS

For the total sample, officers' height was significantly related to Sergeant ratings of "Physical Ability". When males were studied independently, the results indicated that height was significantly related to Sergeant evaluations of "Physical Ability". This relationship was not evident for female officers, however. This does not necessarily mean that a significant relationship does

not exist for females, but only that the present study did not find one. A serious problem with the female sample was the small sample size. Twenty-one females is too small a sample from which to draw any final conclusions. A much larger sample of female officers with a wider range of heights is needed before a thorough research study can be made of this topic.

Another potential problem with the study is the use of subjective rating scales as the criteria for job performance. That is, the possibility exists that Sergeants may have assumed that shorter officers cannot handle the physical job duties and rated them accordingly. However, the careful development of the research scales, the use of job related behavioral anchors and the rater training procedures were designed to minimize such possibilities.

In conclusion, there is some evidence to support a height requirement for male applicants, but this conclusion was not affirmed by research with more objective criteria, i.e., the "officer presence" criteria reported in Chapter 2 of this section. Furthermore, neither study supported a height requirement for females. Because of research limitations and small sample sizes, this research cannot support the Department's current height requirements, but neither does the evidence refute such selection practices.

Therefore, it is recommended that current minimum height and minimum weight requirements be waived until such time as future research can be conducted with a more appropriate and broader based sample.

Furthermore, the resolution of this issue through research may become a moot point once the Supreme Court of the United States rules on the height requirement for police officers, which is anticipated in early 1977.

CHAPTER 4

VISUAL REQUIREMENTS

A. INTRODUCTION

Current vision standards of the Houston Police Department require that applicants' visual acuity be correctable to 20/20[1] with corrective lenses and that their uncorrected visual acuity be at least 20/100 in both eyes. It was initially intended to use supervisory ratings of officer pursuit driving and marksmanship abilities as criteria for studying visual acuity. Most Sergeants, however, did not feel qualified to make such evaluations, eliminating the use of ratings for this part of the project. As a pilot study, therefore, it was decided to investigate the feasibility of researching visual acuity, depth perception, peripheral vision and glare vision by studying cadet driving behaviors while in the Academy.

Since the medical review (see Section II of this Volume) justified the correctable to 20/20 acuity requirement, this project focused on the 20/100 uncorrected reuqirement. The primary reason an uncorrected vision requirement is necessary is because the officer's job requires a great

---

[1] If an individual has a visual acuity level of 20/50, he/she must be 20 feet from an object to see it, whereas someone with normal vision could see the object from 50 feet away.

deal of physical activity (see Section I of this Volume and the Job Analysis report in Volume IV). These activities include running, jumping and apprehending resistant actors. Consequently, it is very possible for an officer to lose or break a pair of glasses or have a contact lens knocked out when engaging in these physical activities. An example of a typical situation for an officer might be the following. An officer attempts to arrest an actor and a struggle begins. During the struggle the officer throws off, loses or breaks his/her glasses. The actor manages to get loose, jumps into a car and drives away. The better an officer's uncorrected vision, the better are his/her chances of reading the actor's vehicle license number. Further, if the officer's uncorrected vision is extremely poor, it may be impossible for him/her to drive a patrol vehicle in pursuit of the actor. (It cannot be assumed that officers will always have a spare pair of glasses or contact lenses. If officers carried a spare pair on their person, the spare also could be broken or lost during a struggle. If the spare pair were kept in the car, and a struggle and chase were in an alley, the spare set would not be of any use.)

In summary, there does appear to be job relevant justification for an uncorrected vision requirement; the

question is at what level of visual acuity is an officer's job performance seriously hampered?

B. METHODOLOGY

The sample included in this study all 72 cadets from the Houston Police Academy Class Number 74. Each of these cadets had recently passed the visual acuity uncorrected requirement of 20/100 in each eye. Therefore, this study had the limitation of not being able to investigate individuals with vision worse than 20/100. Nevertheless, since all cadets had recent eye examination scores in their records and each had to complete the driving test as part of the Academy training, the researchers continued with the study in full recognition of the "restricted" sample problem. This research was considered a preliminary study, with the intention that eventually a more thorough study could be carried out by including older officers whose vision is worse than the present requirement.

Vision Tests: In addition to studying visual acuity, the vision scores for four other tests were collected from cadets' records. These tests had been administered by the Civil Service Department nurse or an HPD officer after the cadet was in the Academy. Since these additional tests had not been used in the pre-employment selection process, visual scores for these tests included both

good and bad vision. However, because various kinds of vision problems also may affect visual acuity in some way, the percentage of cadets scoring low on these tests may be smaller than the normal population (i.e., there may be restriction in range due to the visual acuity requirement). The additional vision tests included the following:

1. a stereo depth examination which tested depth perception and was administered by the nurse,
2. a field of vision examination which tested peripheral vision and was administered by an Academy training officer,
3. a distance judgment test which measured depth perception was administered by an officer, and
4. a glare vision examination which tested the effect of glare on vision and was administered by an officer.

Driving Tests: Driving course skills were considered appropriate criteria for evaluating vision, because driving is a very important part of an officer's job. Not only must an officer have excellent driving skills at normal speeds, but especially when pursuing another vehicle in traffic. Although the four Academy driving courses used in this study were only a small sample of the driving skills an officer must have, the courses were very technical and designed to simulate typical

problem situations officers encounter while driving in the Houston area.

During the fifteenth (15th) week of training at the Academy, cadets began a fifteen-hour pursuit driving course which included three hours of lecture and twelve hours of driving practice during three practice sessions.

Four driving courses (two *driving* ranges and two *turning* ranges) were outlined by setting up orange fluorescent cones on a large black top parking lot (see Appendix H for diagrams of courses). Each of the four courses had a car and an instructor. Cadets practiced each course during each practice period. On the third day cadets drove each course twice, a practice run and a timed run. Cadets wearing corrective lenses then drove the course without their lenses. Three scores were recorded for each course: 1) the actual time it took to complete the course driving through it in forward and then in reverse gear, 2) the number of cones knocked over and 3) the final score which equalled the actual time (number one) plus five seconds for each overturned cone (number two). For example, a 32 second time plus two mistakes equals a total score of 42 seconds.

The three scores (total, time and number of mistakes) for the two turning courses (deadend and double driveway)

were combined, resulting in three scores for the turning simulation. The same procedure was used for combining the offset alley and serpentine courses, resulting in three driving scores.

C. RESULTS

Table 39 lists the number of cadets at each vision level as well as their total scores on the driving and turning courses. The small number of cadets with vision worse than 20/20 suggested that caution be used when interpreting the results. Any generalizations from such small numbers are tenuous.

The cadets with vision 20/25 or poorer drove no worse than cadets with normal or near normal vision. Even cadets with 20/50 vision or poorer tended to drive no worse than those with normal vision. Chi-square tests showed no significant differences between the total driving scores of cadets with normal vision versus those with poor vision. In addition, the time it took to complete the courses and number of mistakes (cones knocked over) also were analyzed, and no significant differences were found between cadets with normal and poor vision (see Appendix I for detailed statistics).

Additional Vision Tests: Scores on four additional vision tests, stereo depth, field of vision, distance

TABLE 39

FAR VISUAL ACUITY LEVELS OF CADETS VERSUS TOTAL DRIVING SCORES

	Total Number of Cadets	Turning Courses (Good) 72 sec. or faster (Number)	Turning Courses (Poor) 73 sec. or slower (Number)	Driving Courses (Good) 55 sec. or faster (Number)	Driving Courses (Poor) 56 sec. or slower (Number)
20/20 or better	32	14	18	21	11
20/22	14	7	7	7	7
20/25	3	2	1	2	1
20/30	3	1	2	1	2
20/35	3	2	1	3	0
20/40	1	1	0	1	0
20/50	3	1	2	3	0
20/70	0	0	0	0	0
20/100	5	2	3	1	4

judgment and glare vision, were each compared to driving ability. Table 40 shows that the two tests that measure depth perception, stereo depth and distance judgment may have some relationship to scores on the driving courses but not necessarily to the turning courses. However, glare vision was significantly related to the ability to drive the turning courses. Field of vision was not related to the ability to drive either the turning or driving courses.

D. DISCUSSION AND CONCLUSIONS

When visual acuity of HPD cadets was compared to their scores from an Academy driving course, cadets with good vision drove no better than cadets with poor vision. However, the small number of cadets with vision between 20/40 and 20/100, made it impossible to study adequately the "true" relationship. It is logical that at some level poor visual acuity would impair driving ability. However, with only 18 cadets with poor vision and none with extremely poor vision, it was impossible to analyze the point at which poor visual acuity affects driving skills.

Scores from four additional vision tests were compared to driving skills. The results suggested that depth perception might be related to skill on a driving course, while glare vision might be related to skill on a turning

course. More research on these vision tests is needed before any definite conclusions can be drawn or standards suggested.

In conclusion, because of the small number of individuals with poor visual acuity in the present sample, this study can neither support nor refute the present uncorrected visual acuity requirement used by the Houston Police Department. A research project designed to further test this requirement with a broader range of visual acuity scores is recommended in Appendix J. Although there is some evidence that depth perception and glare vision are related to driving skills, these conclusions need to be substantiated before they should be established as job requirements. To attain this goal; the present research can be contained with additional cadet classes, or extended to cover present officers.

TABLE 40

CHI-SQUARES COMPARING VISION TESTS TO TOTAL DRIVING SCORES

Vision Test	Turning Course χ^2 Value	Driving Course χ^2 Value
Tested by Nurse		
Far Vision 20/20		
20/22 or better vs. 20/25 or worse	-	-
20/30 or better vs. 20/35 or worse	-	-
Stereo Depth	-	3.18*
Tested by Officer		
Distance Judgment	-	5.07**
Glare Vision	4.54**	-
Field of Vision	-	-

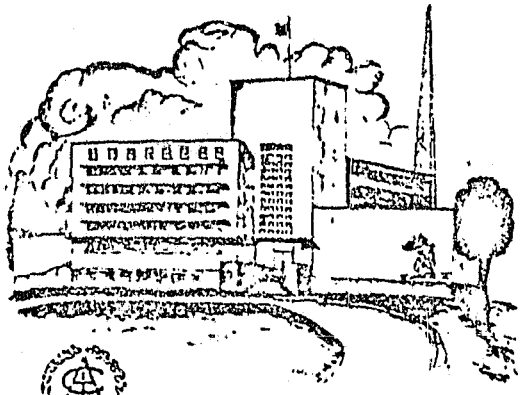
*Significant at .10 level.
**Significant at .05 level.

LIST OF REFERENCES

A comprehensive bibliography that includes all reference sources reviewed during the conduct of the study and cited in this volume, is presented in Volume I of this report.

APPENDIX A

PHYSICAL TASK INVENTORY (PTI)



B. G. BOND
CHIEF OF POLICE

CITY of HOUSTON
FRED HOFHEINZ, MAYOR

POLICE DEPARTMENT

61 RIESNER STREET
HOUSTON, TEXAS 77002

TELEPHONE [illegible] • RADIO [illegible] • TELETYPE [illegible]

April 26, 1976

Dear fellow officer:

One of the most important aspects of the "Validation of Selection Criteria and Promotion Procedures" study is to identify the physical requirements necessary for becoming a police officer. As you are aware, this is an extremely important but difficult part of our research.

To help us answer some of the critical questions, we are asking officers hired since 1970 to complete the enclosed survey. You should have been an officer for a least six (6) months (past probation) to receive these materials. If you have been with the Houston Police Department for less than one year (including probation), please so note and return this booklet to your superior.

Included in this booklet are instructions, some background questions and a series of physical activity questions. Instructions are provided which should clarify any questions you might have. Please read them carefully before you begin.

It will be greatly appreciated if you could complete these materials within the next five (5) working days. When finished, please return the questionnaire in the envelope provided to the Planning and Research Division via Departmental mail. Upon receipt, your answers, along with those of numerous others, will be key-punched and computer analyzed in terms of groups of officer personnel performing similar jobs rather than in terms of the performance of any specific officer.

Thanks for your assistance and cooperation..

Yours truly,

T. D. Mitchell

T. D. Mitchell, Deputy Chief
Special Investigations Bureau

TDM/bp

HOUSTON POLICE DEPARTMENT

SURVEY OF PHYSICAL JOB REQUIREMENTS

The purpose of this questionnaire is to collect information pertaining to your job and its physical demands. It will be used to help document the requirements for police officers, so please try to be accurate.

The questionnaire is divided into two parts with specific instructions at the beginning of each part. In the first part, you will be asked to estimate how many times in the past twelve months you performed certain activities. Some of these activities will be performed frequently, and others rarely, if at all. In the second part, you will be asked to describe in detail three recent incidents in which you were involved that required some physical activity.

Before starting the questionnaire, please complete the following information:

NAME_____ DATE_____

AGE _____ SEX _____ RACE _____

CADET CLASS # _____ HEIGHT _____ WEIGHT _____

CURRENT POSITION:

DIVISION: Patrol_____; Traffic Enforcement_____; Accident Investigation_____; Safety _____; Foot Point Control_____; Motorized Point Control_____.

POSITION_____ RANK _____ LOCATION_____

SHIFT _____ TIME IN POSITION_____ IMMEDIATE SUPERVISOR _____

LAST POSITION:

DIVISION: Patrol_____; Traffic Enforcement_____; Accident Investigation_____; Safety_____; Foot Point Control_____; Motorized Point Control_____.

POSITION_____ RANK_____ LOCATION_____

SHIFT _____ TIME IN POSITION _____ IMMEDIATE SUPERVISOR_____

If you have any questions, please contact Dr. Jerry Dubin or Dr. Dave Finley at 529-3015.

PART I

On the following pages are statements describing various types of physical activities (running, lifting, restraining actors, etc.) that may be performed by police officers. For each statement, you are asked to indicate in the spaces provided:

> "How many times in the *past twelve months you have needed to* perform this activity as part of your job"

If you have any doubts, please count situations which required the activity whether or not you were able to perform it (i.e., you were unable to apprehend the actor on foot, so you stayed in the patrol car and radioed for additional support.) You should still count this as a time that you needed to run on foot.

Below is an example of how responses are to be made to each of the questions in Part I.

	# of times in past 12 months	
	As fast as possible	At a moderate pace
Run a distance of 200 yards.	3	2

In this illustration the officer indicated that there were 5 times in the past twelve months when he/she needed to run a distance of 200 yards. Three of these times he/she needed to run 200 yards at full speed (for example, in pursuit of actor), and twice when full speed was not necessary.

Each activity is stated in a very specific and detailed manner. Be sure to read each item carefully before responding. Do not mark an item unless the activity is, in fact, the activity you needed to perform.

Most emergency or non-routine incidents will involve several physical activities, and each *activity* should be counted separately. For example, an incident requiring both pursuit and restraint of a suspect should be counted as one pursuit activity and also as one restraint activity.

We realize that you cannot remember every activity that occurred in the last year. Occasionally you will have to estimate the number of occurrences, but please try to be as precise as possible.

ACTIVITY: RUN

The following statements refer to situations where you have been required to run. Examples include running in pursuit of an actor, running in an emergency, running to be in a position to observe something, etc.

	# of times in past 12 months	
	As fast as possible	At a moderate pace
Run with no obstacles in path for:		
50 yards or less	____	____
100 yards	____	____
200 yards	____	____
300 yards	____	____
400 yards or more	____	____
Run while going over or around obstacles in path for:		
50 yards or less	____	____
100 yards	____	____
200 yards	____	____
300 yards	____	____
400 yards or more	____	____
Run up stairs (5 steps or more):		
1 flight	____	____
2 flights	____	____
3 flights	____	____
4 flights or more	____	____
Run down stairs (5 steps or more):		
1 flight	____	____
2 flights	____	____
3 flights	____	____
4 flights or more	____	____

ACTIVITY: CLIMB

	# times in past 12 months: As fast as possible	# times in past 12 months: At a moderate pace
Climb over solid barrier that has no footholds: (retaining wall, board fence, etc.)		
4 feet in height	____	____
5 feet in height	____	____
6 feet in height	____	____
7 feet in height	____	____
8 feet in height	____	____
9 feet or more	____	____
Climb over barrier that has handholds and footholds: (chain-link fence, decorative concrete block wall, etc.)		
4 feet in height	____	____
5 feet in height	____	____
6 feet in height	____	____
7 feet in height	____	____
8 feet in height	____	____
9 feet or more	____	____
Climb up a ladder or fire escape:	____	____
Climb down a ladder or fire escape:	____	____
Climb up a rope:	____	____
Climb down a rope:	____	____
Enter a building by climbing through a window:		
Height of window from surface:		
3 feet or less	____	____
4 feet	____	____
5 feet	____	____
6 feet	____	____
7 feet	____	____
8 feet or more	____	____
Climb or crawl through a tight space: (culvert, attic, under fence, through a car window, etc.)	____	____

ACTIVITY: RESTRAINT & COMBAT

	# of times in past 12 months	
	By yourself	With assistanc
Acting alone or with assistance, but without the use of weapons:		
Attempt to prevent an injured individual in distress from moving or causing further injury to self	____	____
Attempt to restrain a severely disturbed individual who acts suicidal or homocidal	____	____
Physically attempt to prevent unruly or intoxicated/drugged individual from causing injury or damage	____	____
Physically attempt to keep two individuals apart who are fighting or threatening each other	____	____
Attempt to restrain fleeing actor by holding on to him/her until individual is subdued	____	____
Attempt to subdue one unarmed actor who is assaulting you	____	____
Attempt to handcuff resisting actor	____	____
Attempt to put resisting actor in patrol car	____	____
Attempt to subdue two or more unarmed actors who are assaulting you	____	____
Attempt to disarm one or more actor(s) assaulting you with knife, club, stick, or weapon other than firearm	____	____

	# of times in past 12 months
What was the total number of times you were assaulted in the last 12 months?	____
How many times did you receive minor injuries from direct person-to-person assault (i.e., exclude injuries from thrown material or gunshot)?	____
How many times did you receive major injuries from direct person-to-person assaults (i.e., exclude injuries from thrown material or gunshot)?	____

ACTIVITY: JUMP

	# of times in past 12 months	
	From running start	From standing start
Jump over an obstacle		
2 feet in height	_____	_____
3 feet in height	_____	_____
4 feet or more in height	_____	_____
Jump to clear a horizontal distance of:		
4 feet	_____	_____
5 feet	_____	_____
6 feet	_____	_____
7 feet	_____	_____
8 feet or more	_____	_____
Jump down from a height of:		
4 to 6 feet	_____	_____
7 to 9 feet	_____	_____
10 feet or higher	_____	_____

ACTIVITY: DRAG

Without assistance, drag an unconscious, semi-conscious or passive resistant individual:

	# times in past 12 months individuals weight in pounds				
Distance	Under 50 lbs.	50-100 lbs.	100-150 lbs.	150-200 lbs.	200 lbs.+
Under 10 yds	_____	_____	_____	_____	_____
10-19 yds	_____	_____	_____	_____	_____
20-29 yds	_____	_____	_____	_____	_____
30-39 yds	_____	_____	_____	_____	_____
40 or more yds	_____	_____	_____	_____	_____

Without assistance, drag an object(other than person):

	Weight in pounds				
Distance	Under 50 lbs.	50-100 lbs.	100-150 lbs.	150-200 lbs.	200 lbs.+
Under 10 yds	_____	_____	_____	_____	_____
10-19 yds	_____	_____	_____	_____	_____
20-29 yds	_____	_____	_____	_____	_____
30-39 yds	_____	_____	_____	_____	_____
40 or more yds	_____	_____	_____	_____	_____

Describe the objects: _____

_____

_____

ACTIVITY: LIFT AND/OR CARRY

Number of times in past 12 months

1. Lift/carry a person without assistance:

	Person's weight in pounds				
	0-49	50-99	100-149	150-199	200+
Just lift, not carry	____	____	____	____	____
Carry a distance of:					
• under 10 yds	____	____	____	____	____
• 10-19 yds	____	____	____	____	____
• 20-29 yds	____	____	____	____	____
• 30-39 yds	____	____	____	____	____
• 40 or more yds	____	____	____	____	____

2. Lift/carry a person with assistance:

	Person's weight in pounds				
	0-49	50-99	100-149	150-199	200+
Just lift, not carry	____	____	____	____	____
Carry a distance of:					
• under 10 yds	____	____	____	____	____
• 10-19 yds	____	____	____	____	____
• 20-29 yds	____	____	____	____	____
• 30-39 yds	____	____	____	____	____
• 40 or more yds	____	____	____	____	____

3. Lift/carry an object without assistance:

	Object's weight in pounds				
	0-49	50-99	100-149	150-199	200+
Just lift, not carry	____	____	____	____	____
Carry a distance of:					
• under 10 yds	____	____	____	____	____
• 10-19 yds	____	____	____	____	____
• 20-29 yds	____	____	____	____	____
• 30-39 yds	____	____	____	____	____
• 40 or more yds	____	____	____	____	____

Describe the objects: _____ _____

ACTIVITY: LIFT AND/OR CARRY (Continued)

Number of times in past 12 months

4. Lift/carry an object with assistance:

	Object's weight in pounds				
	0-49	50-99	100-149	150-199	200+
Just lift, not carry	____	____	____	____	____
Carry a distance of:					
• under 10 yds	____	____	____	____	____
• 10-19 yds	____	____	____	____	____
• 20-29 yds	____	____	____	____	____
• 30-39 yds	____	____	____	____	____
• 40 or more yds	____	____	____	____	____

Describe the objects: _____ _____

_____ _____

_____ _____

	# times in past 12 months	
	With assistance	Without assistance
Remove and unconscious or semi-conscious individual from a tight space (car, attic, etc.)	____	____

ACTIVITY: MISCELLANEOUS

	# times in past 12 months: Without assistance	With assistance
Push a stalled automobile at least 10 feet.	_____	_____
Break down a locked door.	_____	_____
Pull in order to bend or break a fixed object (car fender, steering wheel, car door, burning seat cushion, etc.)	_____	_____
Change a flat tire on an automobile or truck.	_____	_____
Operate equipment which requires strength or stamina.	_____	_____

Describe the type of equipment and duration of operation: _____

_____

	# times in past 12 mos	Estimated # of seconds required to perform
Hang by hands with arms fully extended	_____	_____

Describe what you were hanging from: _____

Pull yourself up on something using only your hands and arms and then hold with arms bent. (For example, pulling up to look over a high fence.)	_____	_____
Balance on narrow ledge next to wall.	_____	_____
Balance on beam, fence rail, roof edge, etc.	_____	_____
Swim at least ten feet.	_____	_____

ACTIVITY: MISCELLANEOUS (Continued)

	# times in past 12 mos.
Draw firearm from holster	_____
Use firearms	_____
Engage in pursuit driving	_____
Engage in high speed driving (non-pursuit)	_____
Have an automobile accident when you were driving which resulted in:	
• minor damage/injuries	_____
• major damage/injures	_____

Required to perform job duties for extended periods of time:

Work 2 shifts (14-16 hours) continuously	_____
Work 2½ shifts (18-20 hours) continuously	_____
Work 3 shifts (22-24 hours) continuously	_____

	# times in past 12 mos.	Estimated # of seconds required to perform
Other physical activities not mentioned above.		
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

PART II

Although we have just asked for information about very specific physical activities you might perform, we realize that usually you do a combination of several physical activities during one incident. Therefore in the second part of this questionnaire we would like you to describe the details and the sequence of activities for incidents which you have performed.

On the next page, you will find an example of how to describe a physical incident.

> *First*, write a brief narrative description telling what happened.
>
> *Second*, using the box at the bottom of the page, break the incident down into the different activities performed (see the example).

After you have studied the example, please describe three incidents in the same manner on the pages provided.

EXAMPLE

PHYSICAL INCIDENT DESCRIPTION

Describe a recent incident which required the use of your physical abilities. Please be specific about the details and sequence of what happened.

I arrived at scene of vehicle accident and discovered automobile fender lying in roadway. After stopping traffic, I lifted small end of fender by gripping it with both hands and dragged it to shoulder of road. When accident investigation was completed, I assisted another officer in loading car fender into back of pick-up truck.

CATEGORY		DESCRIPTION	ASSISTED BY OTHERS?
RUN	Distance? Obstacles? Max or moderate speed?		
CLIMB	What? Height?		
JUMP	What? Distance? Up, down or across?		
RESTRAINT & COMBAT	Duration? Type actor? Height actor? Weight actor?		
LIFT	Who or what? Weight? Distance? # of repetitions?	*120 lb. car fender lifted from ground to height of approximately 3 feet.*	*Yes*
CARRY	Who or what? Weight? Distance? # of repetitions?	*120 lb. car fender carried approximately 5 feet*	*Yes*
DRAG	Who or what? Weight? Distance? # of repetitions?	*120 lb. car fender dragged approximately 10 feet*	*No*

PHYSICAL INCIDENT DESCRIPTION

Describe a recent incident which required the use of your physical abilities. Please be specific about the details and sequence of what happened.

CATEGORY		DESCRIPTION	ASSISTED BY OTHERS?
RUN	Distance? Obstacles? Max or moderate speed?		
CLIMB	What? Height?		
JUMP	What? Distance? Up, down or across?		
RESTRAINT & COMBAT	Duration? Type actor? Height actor? Weight actor?		
LIFT	Who or what? Weight? Distance? # of repetitions?		
CARRY	Who or what? Weight? Distance? # of repetitions?		
DRAG	Who or what? Weight? Distance? # of repetitions?		

APPENDIX B

DEFINITIONS OF PHYSICAL, PSYCHOMOTOR AND SENSORY ATTRIBUTES EVALUATED BY THE POSITION ANALYSIS QUESTIONNAIRE (PAQ)

ATTRIBUTE DEFINITIONS

Explosive strength: ability to expend a maximum amount of energy in one or a series of explosive or ballistic acts (as in throwing, pounding, etc.)

Dynamic strength: ability to make repeated, rapid, flexing movements in which the rapid recovery from muscle strain is critical.

Static strength: ability to maintain a high level of muscular exertion for some minimum period of time.

Speed of limb movement: this ability involves the speed with which discrete movements of the arms or legs can be made. The ability deals with the speed with which the movement can be carried out after it has been initiated; it is not concerned with the speed of initiation of the movement.

Rate control: ability to make continuous anticipatory motor adjustments, relative to change in speed and direction of continuous moving objects.

Susceptibility to fatigue: diminished ability to do work, either physical or mental, as a consequence of previous and recent work done.

Stamina: this ability involves the capacity to maintain physical activity over prolonged periods of time. It is concerned with the resistance of the cardio-vascular system to breakdown.

Body orientation: ability to maintain body orientation with respect to balance and motion.

Kinesthesis: ability to sense position and movement of body members.

Spatial orientation: the ability to maintain one's orientation with respect to objects in space or to comprehend the position of objects in space with respect to the observer's position.

Eye-hand-foot coordination: ability to move the hand and foot coordinately with each other in accordance with visual stimuli.

Simple reaction time: the period of time elapsing between the appearance of any stimulus and the initiation of an appropriate response.

Far visual acuity: ability to perceive detail at distances beyond normal reading distance.

Movement detection: ability to detect physical movement of objects and to judge their direction.

Depth perception: ability to estimate depth of distances or objects or to judge their physical relationships in space).

Sensory Alertness: alertness over expanded periods of time.

APPENDIX C

JOHN J. COSTANZI, M.D.

NAME: John J. Costanzi

PRESENT POSITION: Associate Professor of Medicine
University of Texas Medical Branch Hospitals
Galveston, Texas 77550

ACTIVE RESERVE STATUS: Flight Surgeon and Commander, 924th Medical Unit,
U.S. Air Force

BIOGRAPHICAL:

Date of Birth:	April 25, 1936
Place of Birth:	Old Forge, Pennsylvania
Marital Status:	Married
Children:	Five
Home Address:	15535 Pleasant Valley Rd. Houston, Texas 77058

EDUCATION:

1953	*Old Forge High School, Old Forge, Pennsylvania*
1957	*B.S.: University of Scranton: Scranton, Pennsylvania*
1961	*M.D.: Georgetown University School of Medicine: Washington, D.C.*
1961-1962	*Intern, Walter Reed General Hospital: Washington, D.C.*
1962-1965	*Resident, Internal Medicine, Wilford Hall USAF Medical Center*
1965-1966	*Fellow, Hematology-Oncology, Wilford Hall USAF Medical Center*
1968	*Graduate, Primary Course in Aerospace Medicine,Brooks AFB,Texas*
1966	*ACP Course in "Medical Genetics," Johns Hopkins University School of Medicine*
1967	*ACP Course in "Medical Oncology," M.D. Anderson Hospital, Houston, Texas*
1971	*ACP Course "Advances in Medical Oncology," M.D. Anderson Hospital, Houston, Texas*

PROFESSIONAL AND TEACHING EXPERIENCE:

1966-July 1972	*Assistant Chief, Hematology-Oncology Service: Wilford Hall USAF Medical Center*
1967-July 1972	*Director, Intern Education, Wilford Hall USAF Medical Center*
1969-July 1972	*Clinical Assistant Professor of Medicine, University of Texas Medical School at San Antonio, Texas*
1972-Aug 1973	*Assistant Professor of Medicine, Department of Internal Medicine, University of Texas Medical Branch,Galveston,Texas.*
Aug 1973-Present	*Associate Professor of Medicine, Department of Internal Medicine University of Texas Medical Branch at Galveston, Texas*
Aug 1972-1975	*Program Director, Clinical Cancer Center Planning Grant*
June 1975-Present	*Principle Investigator, Immunotherapy Program Project Grant*
June 1975-Present	*Program Director, Cancer Center*
December 1975-Pres.	*Principle Investigator, Southwest Oncology Group Grant*

RESEARCH ACTIVITIES: (1969-Present)

(1) Phase I,II, and III Studies of Anticancer Drugs through the Southwest Oncology Group.

(2) Role of complement activation associated with a monoclonal cryoglobulin

(3) Effects of oral contraceptives on serum Vitamin B_{12} and B_{12} binding proteins

(4) *Development of a hemagglutination inhibition techniqu for measuring serum and urine erythropoietin.*
(5) *Prospective study on the clinical significance of the peripheral blood buffy coat supravital LE cell test.*
(6) *Development of an immunologic profiles to determine immunocompetency of cancer patients.*
(7) *Immune reconstitution in cancer patients using an act lymphokine of fraction and thymosin.*
(8) *Chemoimmunotherapy in adults with acute leukemia in remission utilizing thoracic duct cannulation for T-c protection.*
(9) *Double blind study-Butorphanol verses Morphine for pain in cancer patients.*

COMMITTEE RESPONSIBILITIES:

1972-Present	*Program Director, Clinical Cancer Center Planning Committe The University of Texas Medical Branch*
1973-Present	*Member, Curriculum Committee, The University of Texas Medi Branch*
1973-Present	*Member, Department of Medicine MSRDP Committee, The Univer of Texas Medical Branch*
1973-Present	*Faculty Advisory Committee - SAMA - UTMB - National Studen Research Forum, The University of Texas Medical Branch*
1973-Present	*Member, University of Texas System Cancer Committee on Edu*
1973-Present	*Board of Directors, American Cancer Society, Galveston Cou*
Southwest Oncology Group	
1973-Present	*Chairman, Melanoma Committee*
1972-1973	*Chairman, Peer Review Committee*
1972-1973	*Member, Constitution and By-Laws Committee*
1973-Present	*Member,Membership Committee*
1969-1972	*Member, Chronic Leukemia*
1972-1973	*Member, Immunotherapy Committee*
1975-Present	*Member, Executive Committee*
1974-Present	*Member, Department of Medicine, House Staff Evaluation Com The University of Texas Medical Branch*
1974-Present	*Member, Committee on Liason, American Cancer Society, Galveston County.*
1974-Present	*Chairman, Professional Education Committee, American Cance Society, Galveston, County*
1974-Present	*Chairman, Cancer Committee of Medical Staff, University of Texas Medical Branch*
1974-Present	*Member, Executive Committee of Medical Staff, University of Texas Medical Branch, Galveston, Texas*
1974-Present	*Member, Ad Hoc Coordinating Committee for Basic Science Core, University of Texas Medical Branch, Galveston, Texas*

TEACHING RESPONSIBILITIES AT UTMB

(1) *Lecture Freshmen in Biochemistry*
(2) *Work in Cell Biology Lab with Freshmen*
(3) *Work in I.C.M. as Group leader and class lecturer*
(4) *Lecturer- Jr. Core Curriculum - Hematology-Oncology*
(5) *Weekly Oncology Teaching Sessions*
(6) *Bi-monthly Oncology Pathology Conferences*
(7) *Multidisciplinary Conferences such as Head and Neck Tumor Conference and OB-Gyn Conferences*
(8) *Staff Teaching-Internal Medicine Wards*
(9) *Staff Teaching-Hematology Consult Service*
(10) *Staff Teaching-Oncology Consult Service*
(11) *Oncology Staff Clinic*
(12) *Numerous Intramural and Extramural Post Graduate Courses Teaching and Lecturing.*

MEMBERSHIP IN SCIENTIFIC SOCIETIES:

*Fellow, American College of Physicians
*Member, American Society of Clinical Oncology
*Member, American Association for Cancer Research
*Member, American Society of Hematology
Member, American Federation for Clinical Research(AFCR)
*San Antonio Research Club (Affiliate AFCR) - Vice President,
*Member, Southwest Cancer Chemotherapy Study Group
(Member, Chronic Leukemia Committee)
(Member, Immunotherapy Committee)
(Chairman, Melanoma Committee)
(Membership Committee)
*(Member-Executive Committee)
Member, Texas Medical Association
Member, Galveston County Medical Association
Board of Directors, American Cancer Society, Galveston Count
Member, Senior, Society of Air Force Physicians
Member, American Medical Association
Member, Active, New York Academy of Sciences
Board of Governors, Lawrence Rotondi Loan Fund
Georgetown Medical School, Washington, D.C.
Member, Southern and Western Head and Neck Oncology Group
Member, Gynecology-Oncology Group

HONORS:

1956	Who's Who in American Colleges and Universities
1956	Alpha Sigma Nu National Honor Society
1961	Jacobi Award in Pediatrics (Georgetown Medical School)
1969	Air Force Commendation Medal
1969	Surgeon General's Award (USAF) for Scientific Achievement
1969	Aerospace Medical Division (AMD) Award--Teacher of the Year
1971	Research and Development Award(USAF): Clinical Medical Rese
1973	Who's Who in Texas

ADDITIONAL INFORMATION:

1960-1972	Military Service: United States Air Force, Lt. Colonel
	Medical Licensure: Diplomate, National Board of Medical Examiners, State of Pennsylvania: State of Texas
	Specialty Boards: Certified, American Board of Internal Medicine: Certified, Medical Oncology

*MEMBERSHIP ELECTED

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3. Panettiere, Costanzi, J.J.: Adjunctive hypertransfusion in the surgical management of sickle cell disease. (Abstract for ACP Regional, Biloxi, Miss, Feb 1971)

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APPENDIX D

ANALYSIS OF PHYSICAL ACTIVITIES BY PATROL SHIFT

TABLE D1

JUMPING OVER OBSTACLE

STANDING OR RUNNING START

	PERCENT OFFICERS PERFORMING		
	Minimum Number Times in Last Year:		
	Once	Twice	Bi-Monthly
Four Feet or Higher			
Patrol Shift I	33%	25%	8%
Patrol Shift II	36%	26%	9%
Patrol Shift III	39%	31%	15%

TABLE D2

JUMPING ACROSS OBSTACLES

FROM RUNNING OR STANDING START

Distance Cleared	PERCENT OFFICERS PERFORMING Minimum Number Times in Last Year: Once	Twice	Bi-Monthly
Patrol Shift I			
4 Feet or More	67%	58%	31%
5 Feet or More	42%	33%	14%
6 Feet or More	25%	17%	6%
7 Feet or More	8%	6%	-
Patrol Shift II			
4 Feet of More	71%	64%	37%
5 Feet or More	42%	37%	18%
6 Feet or More	26%	20%	6%
7 Feet or More	8%	-	-
Patrol Shift III			
4 Feet or More	75%	65%	46%
5 Feet or More	47%	40%	22%
6 Feet or More	26%	21%	10%
7 Feet or More	8%	-	-

TABLE D3

JUMPING DOWN FROM HEIGHTS

	PERCENT OFFICERS PERFORMING Minimum Number Times in Last Year:		
	Once	Twice	Bi-Monthly
Jumping Down Height			
Patrol Shift I			
4 Feet or More	67%	42%	17%
7 Feet or More	25%	17%	-
10 Feet or More	8%	-	-
Patrol Shift II			
4 Feet or More	77%	64%	30%
7 Feet or More	37%	28%	10%
10 Feet or More	17%	8%	2%
Patrol Shift III			
4 Feet or More	84%	80%	48%
7 Feet or More	52%	42%	18%
10 Feet or More	17%	9%	-

TABLE D4

CLIMBING OVER BARRIERS

WITHOUT FOOTHOLDS AS FAST AS POSSIBLE

	PERCENT OFFICERS PERFORMING Minimum Number Times Last Year:		
	Once	Twice	Bi-Monthly
Height of Climb			
Patrol Shift I			
4 Feet or More	64%	53%	19%
5 Feet or More	47%	36%	11%
6 Feet or More	36%	22%	-
7 Feet or More	14%	-	-
8 Feet or More	-	-	-
Patrol Shift II			
4 Feet or More	60%	51%	24%
5 Feet or More	52%	35%	16%
6 Feet or More	37%	25%	9%
7 Feet or More	17%	10%	3%
8 Feet or More	7%	3%	-
Patrol Shift III			
4 Feet or More	68%	59%	30%
5 Feet or More	60%	45%	19%
6 Feet or More	44%	31%	13%
7 Feet or More	20%	11%	5%
8 Feet or More	7%	5%	3%

TABLE D5

CLIMBING OVER BARRIERS WITH FOOTHOLDS

AS FAST AS POSSIBLE

Height of Climb	PERCENT OFFICERS PERFORMING Minimum Number Times Last Year: Once	Twice	Bi-Monthly
Patrol Shift I			
4 Feet or More	58%	50%	28%
5 Feet or More	53%	36%	19%
6 Feet or More	44%	36%	11%
7 Feet or More	25%	14%	6%
8 Feet or More	11%	8%	-
Patrol Shift II			
4 Feet or More	70%	60%	31%
5 Feet or More	53%	41%	19%
6 Feet or More	44%	33%	13%
7 Feet or More	23%	17%	6%
8 Feet or More	15%	9%	3%
Patrol Shift III			
4 Feet or More	67%	65%	44%
5 Feet or More	57%	51%	33%
6 Feet or More	51%	43%	20%
7 Feet or More	31%	23%	12%
8 Feet or More	20%	15%	8%

TABLE D6

PULL UP USING ARMS ONLY AND HOLD POSITION

	PERCENT OFFICERS PERFORMING Minimum Number Times in Last Year:		
	Once	Twice	Bi-Monthly
Seconds Held Position			
Patrol Shift I			
1 Second or More	67%	53%	17%
5 Seconds or More	36%	33%	8%
10 Seconds or More	25%	25%	6%
Patrol Shift II			
1 Second or More	70%	58%	20%
5 Seconds or More	49%	45%	14%
10 Seconds or More	31%	28%	8%
Patrol Shift III			
1 Second or More	71%	65%	38%
5 Seconds or More	54%	47%	31%
10 Seconds or More	38%	33%	25%

TABLE D7

LIFT ONLY - 150 POUNDS OR MORE

	PERCENT OFFICERS PERFORMING Minimum Number Times in Last Year:		
	Once	Twice	Bi-Monthly
Patrol Shift I (With Assistance)			
Persons	33%	25%	3%
Objects	14%	3%	3%
(Without Assistance)			
Persons	28%	8%	-
Objects	17%	8%	3%
Patrol Shift II (With Assistance)			
Persons	49%	44%	13%
Objects	13%	12%	4%
(Without Assistance)			
Persons	46%	37%	8%
Objects	11%	7%	3%
Patrol Shift III (With Assistance)			
Persons	53%	45%	14%
Objects	12%	7%	2%
(Without Assistance)			
Persons	43%	34%	8%
Objects	7%	6%	2%

TABLE D8

CARRYING PERSONS OR OBJECTS WITHOUT ASSISTANCE

PERCENT OFFICERS PERFORMING

Minimum Number Times in Last Year for:

	50 POUNDS			100 POUNDS		
Distance	Once	Twice	Bi-Monthly	Once	Twice	Bi-Monthly
Patrol Shift I						
Lift Only	69%	61%	31%	53%	42%	17%
Carry Some Distance	64%	42%	14%	36%	19%	8%
10 Yds. or More	39%	25%	8%	17%	8%	6%
20 Yds. or More	28%	17%	8%	14%	6%	3%
30 Yds. or More	19%	11%	6%	6%	3%	3%
40 Yds. or More	11%	6%	3%	6%	3%	3%
Patrol Shift II						
Lift Only	73%	66%	43%	70%	66%	34%
Carry Some Distance	61%	45%	22%	53%	41%	10%
10 Yds. or More	35%	24%	12%	26%	15%	5%
20 Yds. or More	22%	14%	10%	15%	7%	2%
30 Yds. or More	15%	8%	4%	11%	5%	2%
40 Yds. or More	11%	5%	2%	8%	2%	1%
Patrol Shift III						
Lift Only	72%	60%	37%	60%	52%	34%
Carry Some Distance	49%	37%	19%	40%	27%	13%
10 Yds. or More	29%	19%	9%	20%	11%	6%
20 Yds. or More	17%	12%	5%	13%	8%	3%
30 Yds. or More	13%	8%	3%	10%	6%	1%
40 Yds. or More	10%	5%	3%	8%	3%	1%

TABLE D9

LIFT AND CARRY PERSON WITH OR WITHOUT ASSISTANCE

Weight of Person Carried	PERCENT OFFICERS PERFORMING Minimum Number Times in Last Year: Once	Twice	Bi-Monthly
Patrol Shift I			
50 Pounds or More	72%	58%	39%
100 Pounds or More	72%	56%	36%
150 Pounds or More	67%	47%	14%
200 Pounds or More	25%	22%	3%
Patrol Shift II			
50 Pounds or More	85%	82%	60%
100 Pounds or More	84%	81%	59%
150 Pounds or More	75%	70%	49%
200 Pounds or More	37%	31%	14%
Patrol Shift III			
50 Pounds or More	81%	79%	56%
100 Pounds or More	81%	79%	56%
150 Pounds or More	75%	70%	45%
200 Pounds or More	28%	22%	10%

TABLE D10

PHYSICAL TASK INVENTORY RESULTS

FOR DRAGGING INDIVIDUALS WITHOUT ASSISTANCE ONE OR MORE TIMES

	PERCENT OFFICERS PERFORMING		
	Weight of Individual:		
	100 Pounds+	150 Pounds+	200 Pounts+
Patrol Shift I			
Any Distance	58%	47%	11%
10 Yds. or More	42%	28%	6%
20 Yds. or More	19%	8%	6%
30 Yds. or More	11%	6%	6%
40 Yds. or More	8%	6%	6%
Patrol Shift II			
Any Distance	70%	57%	22%
10 Yds. or More	38%	32%	13%
20 Yds. or More	16%	13%	5%
30 Yds. or More	7%	6%	3%
40 Yds. or More	5%	4%	1%
Patrol Shift III			
Any Distance	74%	62%	26%
10 Yds. or More	42%	35%	9%
20 Yds. or More	25%	17%	7%
30 Yds. or More	17%	13%	6%
40 Yds. or More	14%	10%	4%

TABLE D11

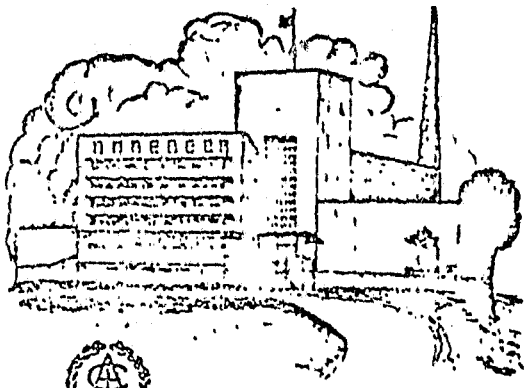
PHYSICAL TASK INVENTORY RESULTS

FOR RESTRAINT AND COMBAT - ALL PATROL (N = 7)

	PERCENT OFFICERS PERFORMING		
	Minimum Number of Times in Last Year:		
Total Resistance with Assault	Once	Twice	Bi-Monthly
• Patrol I	78%	56%	28%
• Patrol II	81%	71%	43%
• Patrol III	87%	76%	49%
• All Patrols	83%	71%	44%
Restrain Fleeing Actor			
• Patrol I	86%	72%	25%
• Patrol II	90%	81%	45%
• Patrol III	90%	87%	51%
• All Patrols	89%	82%	46%
Handcuff Resisting Actor			
• Patrol I	92%	86%	31%
• Patrol II	96%	91%	55%
• Patrol III	98%	94%	59%
• All Patrols	96%	91%	54%
Put Resisting Actor in Car			
• Patrol I	92%	83%	39%
• Patrol II	97%	91%	50%
• Patrol III	98%	95%	64%
• All Patrols	96%	91%	55%
Total Resistance without Assault			
• Patrol I	97%	94%	75%
• Patrol II	98%	98%	88%
• Patrol III	100%	98%	94%
• All Patrols	98%	97%	89%

APPENDIX E

COPY OF "PULL UP AND HOLD" QUESTIONNAIRE



B. G. BOND
CHIEF OF POLICE

CITY of HOUSTON
FRED HOFHEINZ, MAYOR
POLICE DEPARTMENT
61 RIESNER STREET
HOUSTON, TEXAS 77002

TELEPHONE (713) 222-3011 • RADIO KKD 490 • TELETYPE 1 713 571 1012

January 18, 1977

Dear Officer

Recently you participated in the "Validation of Selection Criteria and Promotion Procedures" study being conducted for the Department by the firm of Lifson, Wilson, Ferguson, and Winick. Your involvement included completing the "Physical Task Inventory" which requested information regarding the physical activities required to perform your job for the prior 12 month period. It has been determined that more specific information concerning one area is needed to complete the study.

One item requested that you indicate the number of times during the last 12 months you were required, in the line of duty, to "pull yourself up on something using only your arms and then hold with arms bent." On your questionnaire you responded that you had engaged in such activity times.

The form attached requests that you provide information regarding the heights of the various objects or structures on which you had to pull up and whether you received assistance in pulling up to that height by standing on some object or by being boosted by another person. If you received any assistance, it is also requested that you indicate the height of the object which aided you or the height of the boost you received from the individual. NOTE: Please provide the data for the same 12 month period as indicated in the original questionnaire.

Your additional participation is greatly appreciated and is vital to the successful completion of the study. Please complete the attached form and return it to the Planning and Research Division, c/o LWFW by Tuesday, January 25, 1977.

Yours truly,

T. D. Mitchell

T. D. Mitchell, Assistant Chief
"Validation Study"
Project Director

TDM/SRL/bp
attachment

NUMBER OF TIMES YOU PULLED YOURSELF UP ON SOMETHING USING ONLY YOUR HANDS AND ARMS AND THEN HELD YOURSELF UP WITH ARMS BENT (I.E., PULLING UP TO LOOK OVER A HIGH FENCE, PULLING UP TO INVESTIGATE ATTIC OR ROOF, ETC.):

			DID YOU RECEIVE A BOOST OR AID?	
HEIGHT PULLED UP TO	# TIMES	TYPE OBJECT PULLED UP ON	PERSON OR TYPE OBJECT	HEIGHT OF BOOST OR OBJECT'S HEIGHT
6 feet or less				
6 1/2 feet				
7 feet				
7 1/2 feet				
8 feet				
8 1/2 feet				
9 feet				
9 1/2 feet				
10 feet				
11 feet				
12 feet				
13 feet				
14 feet				
15 feet				
16 feet				
17 feet				
18 feet				
19 feet				

APPENDIX F

COMPUTATION OF CARRYING AND LIFTING FORCES

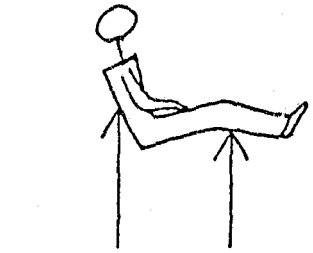
CALCULATION OF LIFTING REQUIREMENTS

WHEN TWO OFFICERS LIFT AND CARRY AN ACTOR

Based on the feedback obtained from the Physical Task Inventory, it was determined that Officers (in pairs) were frequently required to lift and carry actors as part of their assignments. By recognizing that the human body is not symmetrical, the following method of calculation was utilized to approximate the greater lifting demands placed on one of the two officers. The actor was assumed to be "average," that is, 5'10" and 150 pounds (male). The problem was simplified to a "free-body diagram" common to engineering principles of force determination. The assumptions used to set up the problem were:

- Actor was not struggling;
- Carrying points of contact were under the arms and at the knees;
- The actor was "average;" and
- Trial studies reflected that the body would assume an approximate "L" shape with the back exhibiting an 80 degree angle with the reference surface (street, floor, ground, etc.)

By referring to the above assumptions, the position used in the calculation was as follows:

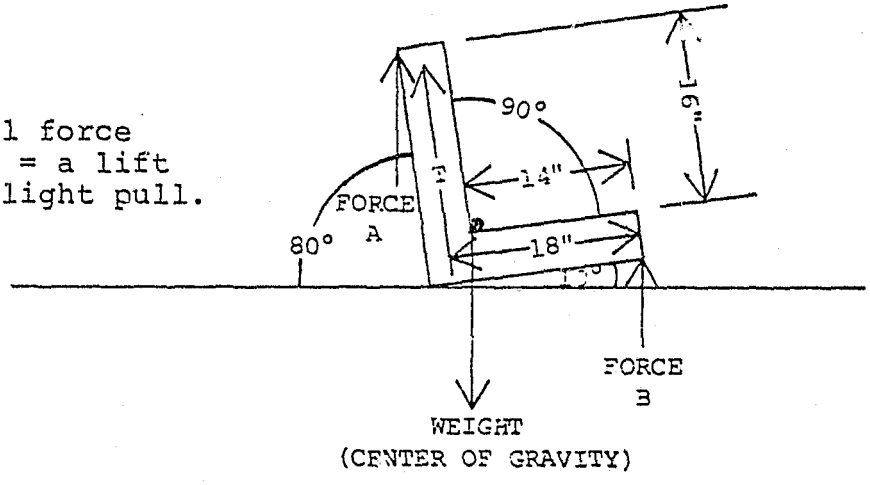


CARRY POSITION A

CARRY POSITION B

By utilizing the "average" male anthropometrics the "free body diagram" would be as follows:

T = total force required = a lift plus a slight pull.



Of interest to this calculation is the maximum force required to lift and carry this actor. That position would be Officer A because the trunk of the body is the heaviest. To solve the equations the forces required to maintain the body in *EQUILIBRIUM* must be calculated. In other words, one can

only *lift* as much as the body *weighs* and the lifting *forces* must be *balanced* to avoid a "cartwheel" effect. Therefore, two equations were set up to describe these conditions; 1) is the sum of the moments (M) around position B (moments = forces acting through a distance); and 2) is the sum of the listing forces must equal the weight (W).

$$\Sigma M_B = 0 = W \times (14") \times (\text{COS } 10°) - T(18")$$

$$\Sigma \text{Force} = 0 = \text{Force B} + \text{Force A} - W$$

In solving the simultaneous equations, we have

$$T_A = \frac{W(14")(\text{COS } 10°)}{18} = .76W$$

Lift = .74W(F#1)
Pull = .13W

$$\text{Force B} = W - .76W(\text{Sin } 80°) = .26W$$

Officer A will exert a force equivalent to 76 percent of the "average" actor's weight and Officer B will exert a force of 26 percent of the weight to lift and carry the "average" actor. It should be noted that the *total forces* add up to be more than 150 pounds. This is caused by the slight pull required by Officer A.

Example: 5;10", 150 Pound Actor

Officer A exerts 150 pounds (.76) = 114 pounds of force

Officer B exerts 150 pounds (.26) = 39 pounds of force

APPENDIX G

DAILY PHYSICAL ACTIVITY REQUIREMENTS FORM

DAILY PHYSICAL ACTIVITY REQUIREMENTS

STRUCTIONS: The information requested on the following form concerns the physical activities involved in detaining or arresting an individual as well as the physical characteristics of that person. Please check or complete the appropriate inquiry regardless of whether an arrest was effected. If more than one individual is involved in an incident, complete one column for each *individual*. However, the "Incident Number" boxes should reflect the same number for each person involved in that incident. (Example: If the *first* incident involved three individuals, the first three columns would contain "Incident Number" 1.)

TE: Only *one* officer on a two-man unit should provide information regarding an individual.

ficer _____

e-day period during which this form was completed: from _____ 76 to _____ 76

___ No physical activities were experienced in detaining or arresting an individual during the above time period. (Please check if appropriate.)

NCIDENT NUMBER										
ATE										
FFICER'S ACTIVITIES (check one) Actively pursued actor (chase/jump/climb/etc.)										
Actively subdued and/or restrained actor										
Both pursued and subdued (and/or restrained) actor										
CTOR'S CHARACTERISTICS nswer each item; estimate necessary) Age										
Race										
Sex										
Height										
Weight										

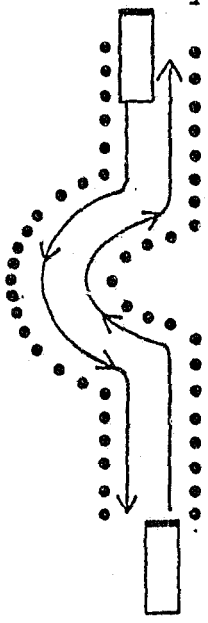
APPENDIX H

FOUR DRIVING COURSES

FOUR DRIVING COURSES

DRIVING COURSES

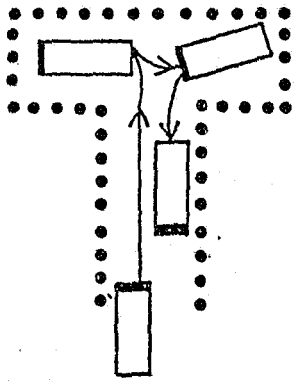
Offset Alley



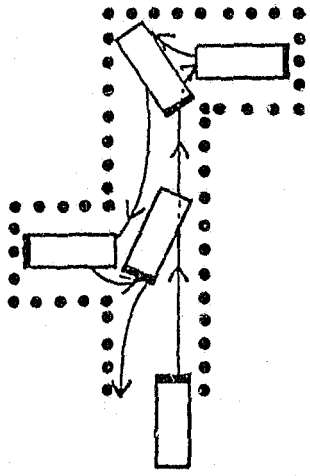
Serpentine

TURNING COURSES

Dead End



Double Driveway



APPENDIX I

VISUAL ACUITY TECHNICAL REPORT

VISUAL ACUITY TECHNICAL REPORT

Analysis

Chi-square tests showed no significant differences in the driving ability of cadets with normal vision compared to those with poor vision (see Table I-1). Table I-1 reports frequency distributions for visual acuity versus the total scores, time and number of mistakes. When computing chi-square tests it was not possible to analyze just cadets with 20/100 vision because of the small number at that level; all chi-squares had to be computed by combining individuals with at least 20/40 vision or worse in one group.

Table I-2 shows the chi-square tests computed for the three additional vision tests that were significantly related to driving ability. These statistics were included in case any additional research is done on these vision tests. Stereo depth (showing two cutoffs) and distance judgment were compared to driving courses, and glare vision was compared to the turning and driving courses.

CONTINUED

3 OF 4

TABLE I-1

FREQUENCY TABLES FOR CHI-SQUARE TESTS

VISUAL ACUITY BY TOTAL SCORE

Driving Course

Visual Acuity	Seconds 55 or less	Seconds 56 or more
20/30 or better	31	21
20/35 or worse	8	4

$\chi^2 = .015$

Turning Course

Visual Acuity	Seconds 72 or less	Seconds 73 or more
20/30 or better	24	28
20/35 or worse	6	6

$\chi^2 = .006$

VISUAL ACUITY BY TIME

Driving Course

Visual Acuity	Seconds 52 or less	Seconds 53 or more
20/30 or better	35	17
20/35 or worse	8	4

$\chi^2 = .09$

Turning Course

Visual Acuity	Seconds 67 or less	Seconds 68 or more
20/30 or better	31	21
20/35 or worse	7	5

$\chi^2 = .00$

VISUAL ACUITY BY NUMBER OF MISTAKES

Driving Course

Visual Acuity	Mistakes 0	Mistakes 1 or more
20/30 or better	29	23
20/35 or worse	6	6

$\chi^2 = .002$

Turning Course

Visual Acuity	Mistakes 0	Mistakes 1 or more
20/30 or better	19	33
20/35 or worse	3	9

$\chi^2 = .178$

TABLE I-2

FREQUENCIES FOR SIGNIFICANT VISION TESTS[1]

DRIVING COURSE BY

Distance Judgment

Vision Score	Seconds 55 or less	Seconds 56 or more
1-3 (good)	33	17
4-5 (poor)	5	9

$\chi^2 = 5.07^{**}$

Stereo Depth

Vision Score[2]	Seconds 55 or less	Seconds 56 or more
1-2 (poor)	10	12
5-9 (good)	21	9

$\chi^2 = 3.176^{*}$

Stereo Depth

Vision Score[2]	Seconds 62 or less	Seconds 63 or more
1-2 (poor)	16	6
5-9 (good)	28	2

$\chi^2 = 4.140^{**}$

GLARE VISION BY

Turning Courses

Vision Score	Seconds 72 or less	Seconds 73 or more
1-3 (good)	14	15
4-5 (poor)	8	27

$\chi^2 = 4.542^{**}$

Driving Courses

Vision Score	Seconds 52 or less	Seconds 53 or more
1-3 (good)	15	14
4-5 (poor)	12	23

$\chi^2 = 1.98$

[1]Total scores only.
[2]No 3's or 4's were recorded.
*Significant at .10 level.
**Significant at .05 level.

APPENDIX J

SUGGESTED RESEARCH TO STUDY VISUAL REQUIREMENTS

SUGGESTED VISUAL ACUITY RESEARCH

The following is an outline for a more thorough examination of the Houston Police Department's uncorrected visual acuity requirement.

Methodology

The study would involve testing a large number of older officers and sergeants from the Patrol and Traffic Divisions. Older officers and sergeants would be chosen because visual acuity often grows worse over time, and this group should have a relatively large percentage of individuals with poor vision.

All individuals would be tested without corrective lenses. Testing sessions would be scheduled with four to eight individuals in a session. During the first half of the session everyone would be given a visual acuity exam. During the second half of the session they would be presented slides of license plates and asked to identify the license plate numbers by writing their perceptions on an answer sheet. Lighting in the room and seating position would be standardized for all individuals.

The license plate identification task was chosen because it has been shown by the job analysis that license plate identification is a critical aspect of the job (see Job Analysis report in Volume IV). The lighting in the slides and distances could

be varied to simulate typical situations.

After all testing is completed, scores would be randomly divided, so there would be two groups of officers and sergeants. One group would be the original sample, the other a hold-out sample. Visual acuity scores for the original sample would be compared to scores from the "slide test." Results from the original sample would be applied to the hold-out group as a check on the original results.

Results which were validated on both groups could then be used in setting standards for the applicant selection process.

END