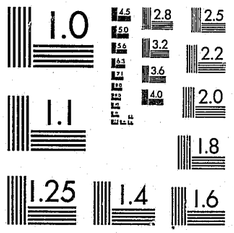

TA0021

Development of Methods and Programs To Promote Physical Fitness Among Police Officers

Report 1

Nature of Specific Exercise Programs

Prepared for the Law Enforcement Assistance Administration,
U. S. Department of Justice,
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Nature of Specific Exercise Programs

by

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INTRODUCTION

In recent years scientific interest and concern about the relationship of coronary heart disease (CHD) and physical fitness, and the relationship of other physiological and socio/psychological benefits of exercise, has increased significantly. Numerous population studies have been conducted on various age and occupational groups to determine the value of physical activity as a means of preserving or enhancing health. These would include studies of London transport employees,(1) Los Angeles City civil service employees,(2) farmers,(3) postal workers,(4) and railroad workers(5) to name a few. Additionally, studies to determine the physiological effects of exercise training have been conducted on sedentary men 49 to 65 years of age,(6) track athletes 40 to 75 years of age,(7) and numerous other individuals who voluntarily and individually participate in exercise training.(8)

As extensive as the general literature is on physical fitness, few references could be found regarding physical fitness and the police. This is unfortunate considering the fact that the sedentary nature of police work, coupled with shift work, job-related stress, and numerous other factors contribute to a high rate of coronary heart disease among police officers.(9) To a certain extent the police have been and are cognizant of the need for their members to be physically fit. In the year 1900, at the seventh annual convention of the Police Chiefs of the United States and Canada, the conference program contained information promoting physical fitness for police officers.(10) In 1924, the National Committee on Police Welfare conducted a nationwide survey to determine the types of sports and recreation programs and facilities existing in police

agencies.(11)

The related studies and past and present interest of the police, however, have not provided a systematic determination of what the fitness and programmatic needs of the police are. A clinical and analytical examination of the physiological fitness of police deputies was conducted by the Los Angeles County Sheriff's Department,(12) but the study did not include a consideration of the socio/psychological effects of exercise, nor did it consider different approaches to implement, organize and administer police fitness programs. The lack of much evidence concerning fitness standards and programs for the police indicated the need for further inquiry and provided the impetus for the undertaking of the research conducted.

The police are enigmatic in terms of their apparent attitudes and practices relative to physical fitness. There is universal agreement that there are times when on-the-job physical requirements are extremely high and that the patrol officer has to be capable of performing these physical feats when the occasion arises. Yet, available indicators point to the generalization that after the completion of recruit training, individual police officers show little initiative to keep themselves prepared to perform the varied physical requirements of the job. Furthermore, few police administrators have approached this problem programmatically.

Consequently, what is needed in the field of law enforcement is the systematic development and evaluation of programs and methods that can be used to ensure a high level of physical fitness among police personnel. This is the objective

of this project.

To accomplish the project objective, three broad areas relative to physical fitness and physical fitness programming were investigated. First, a variety of exercise programs were designed and conducted in controlled environments to assess the physiological effects of exercise on selected police personnel. Particular attention was given to the cardiovascular condition of the subjects since heart and circulatory diseases are two of the leading causes of non-accidental disability retirement among police officers.

Secondly, socio/psychological factors were assessed in terms of how these factors influence an individual's decision to participate in a fitness program, how they influence the degree of the individual's adherence to a fitness program, and how they influence the overall effectiveness of a fitness program.

The third area investigated in this study was a survey of the type and quality of physical fitness programs already in existence in various police departments. Information relative to the nature of the programs, methods of program organization and administration, levels of participation, legal aspects such as liability, and measures of effectiveness will be obtained. In conjunction with the national survey of police agencies, a survey of police officers was conducted for the purpose of obtaining individualistic responses to a number of questions which impact on the effectiveness of fitness programming and fitness program administration.

This is the first of four reports which will be produced in connection with this report, and deals specifically with the nature of specific exercise programs conducted by the Institute of Aerobics Research and attitude and perception studies administered by IACP. The subjects who participated in this study were volunteer members of the Dallas, Texas, Police Department, the Richardson, Texas, Police Department, and the Texas Department of Public Safety.

Other reports address the experience of police departments in relation to the issue of physical fitness and; measures police departments can use to determine the need for physical fitness programs and recommended program implementation. The final report will be a manual including program guidelines for police administrators concerning the relevance of fitness programs, their organization, implementation and evaluation.

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CHAPTER 1

PRINCIPLES OF EXERCISE AND TERMINOLOGY

In recent years, physical fitness has taken still another beneficial aspect to human health in its relationship to the prevention of coronary heart disease. Coronary heart disease involves the deposition of fatty plaques in the major vessels of the heart. These plaques compromise the blood flow to the heart muscle, and if this condition becomes severe, the heart can develop a fatal arrhythmia or heart attack. Coronary heart disease has been related to several risk factors. These include high serum lipids (cholesterol and triglycerides), excessive body fat, elevated blood pressure (hypertension), smoking, elevated blood sugar (glucose) and uric acid, excessive emotional stress, physical inactivity, and family history. (1,5,7,9-11)

Although there are some conflicting views, recent studies by Morris et al. (13), Paffenbarger and Hale (14), and Cooper et al. (4) have placed strong evidence in favor of the role that exercise plays in preventive medicine. Morris et al. (13), in studying the leisure-time habits of over 16,000 male executive grade civil servants from 40 to 64 years of age, concluded that vigorous exercise apparently protected them against sudden fatal heart attacks and other first clinical attacks of coronary heart disease. The study by Paffenbarger and Hale (14) on 6,351 longshoremen, 35 to 75 years of age, indicated that the workers classified in a high caloric output job task had significantly lower death rates from coronary heart disease than those in a low energy cost job. Cooper et al. (4) in a cross-sectional study on 3,000 men, found a significant relationship between level of cardiorespiratory fitness and selected risk factors and fitness variables (serum cholesterol, triglycerides,

glucose and uric acid, systolic blood pressure, percent body fat and weight, resting heart rate, and forced vital capacity). Thus, through the reduction of risk factors associated with coronary heart disease, an officer who exercises and becomes physically fit may be indirectly protecting himself from heart disease.

In the context of this report a police officer with good physical fitness is considered to be one who possesses an efficient cardiovascular-respiratory system (good aerobic capacity), moderate to low levels of body fat, and adequate muscular strength, endurance, and flexibility. With these characteristics an officer would possess the means to accomplish daily tasks, both occupational and recreational without undue fatigue or risk of injury.

There are three basic components of physical fitness: cardiorespiratory fitness (CR), body composition, and musculoskeletal fitness. CR fitness, or aerobic capacity, involves the body's ability to transport and utilize oxygen. One of the main objectives of an aerobics program is to increase the maximum amount of oxygen that the body can process within a given time. The aerobic process depends on the oxygen transport system, which includes the lung's ability to take in large amounts of air and diffuse it into the bloodstream, the heart's ability to pump large amounts of blood to the tissues, and the tissues' (cells') ability to utilize the oxygen. The magnitude of improvement in aerobic capacity depends upon the total work accomplished, i.e. the energy cost of the activity involved. The energy cost, however, is dependent upon several variables, namely the intensity, duration, and frequency of the work (15). Other factors such as the regularity of the work, the mode of the work, as well as the age of the individual doing the work all influence the improvement in CR fitness (16-18). With adequate intensity, duration, and frequency of training an officer will experience the "training

effect" (3), whereby the organ systems of the CR system collectively operate to provide more effective transportation and utilization of oxygen and elimination of waste products.

Intensity, duration, and frequency in relation to the total work done in an activity also have a direct influence on the body composition of an individual. Body composition is divided into two components: lean tissue (bone, muscle, and body fluids) and fat tissue. Percent fat is the percentage that the fat weight is of the total body weight.

Through the process of becoming physically fit, one can alter body composition (percent fat) (2). The major factor in this alteration is related to the number of calories expended (regardless of activity mode) in relation to the number consumed. Thus, by expending calories through some physical activity in addition to those expended to maintain body functions and by reducing the caloric intake, one can achieve a negative caloric balance. As a result, the body is forced to obtain the additional energy it requires from fat breakdown, thus reducing the fat content of the body.

Physical activity is a major factor in fat reduction in that it can maintain or even increase the lean tissue weight while fat weight is reduced. A study by Zuti and Golding (19) has shown that dieting alone can reduce body weight, but the net percent fat loss is reduced because of a decrease in muscle mass with the decrease in fat. (Muscle is catabolized by the body for energy as is fat.) Ideally, a reduced calorie intake should be combined with an exercise program to lose body fat as well as weight. After, a desired level of body fat is achieved, regular exercise coupled with a sensible diet can maintain satisfactory body composition.

The third component of physical fitness, musculoskeletal fitness (MS), encompasses two major areas: a) muscle strength and endurance and, b) flexibility. Muscle strength and endurance are interrelated and the development of either or both is dependent upon the training regimen involved. Muscular strength is the muscles' ability to generate a force against some resistance and is proportional to the cross-sectional area of the muscle or muscle group involved. Strength is developed through two major types of training: isotonic, which involves muscle shortening and lengthening with a corresponding movement of a related limb, and isometric, which involves muscular contractions but no movement of limb.

Muscular endurance is the ability of a muscle or muscle group to maintain repeated contractions of equal force until fatigue causes cessation. It is interrelated with strength in that the stronger muscle generally has more endurance.

With regard to the development of strength and endurance, isometric resistance training develops strength with little or no endurance improvements, while isotonic resistance training when done correctly (exercising through the full range of motion of the muscle groups involved) increases strength as well as endurance. Depending upon the combination of resistances and repetitions employed, isotonic training can develop strength or endurance. Generally, high resistance with low repetitions increases strength, while, conversely, greater repetitions and lower weights, increase endurance. Obviously, a compromise in approach will develop adequate strength and endurance.

When training for either strength or endurance, the overload principle is imperative for improvement. Simply, the overload principle involves increases in resistance and/or number of repetitions as the muscle adapts. However, once adequate strength and endurance are achieved, fewer workouts are necessary to maintain that level.

While muscular strength and endurance are critical to MS fitness, the ability of the MS system to move through a full range of motion is imperative. Flexibility can be defined as the ability of a joint or group of joints to move through a full range of motion. This range is affected by two factors: the boney structures comprising the joint and the extensibility of the surrounding ligaments, tendons, and muscles. It is obvious, therefore, that improvements in flexibility depend upon the development of the extensibility of these ligaments, tendons, and muscles.

Two types of stretching are employed to develop flexibility. These are static and ballistic. Ballistic stretching (stretching through momentum of movement) has its value primarily in warm-up of the entire body but could be harmful if not done properly. Static stretching (firm, steady stretch), however, involves less chance of muscle soreness and applies more specific stretching to a particular area. Research has shown (12) that flexibility reduces injury, enhances skill, and allows for more graceful movement.

In addition to stretching, several other factors have been associated with flexibility. These include the degree of activity, age, sex, and environmental temperature (6).

Two general principles that are important to consider when developing an exercise program include the warm-up and cool-down. A general warm-up program of several minutes involving calisthentics, jogging, and stretching provides several benefits. By warming-up, the internal temperature of the body is raised. This condition allows for an increased rate of biochemical reactions involving the production of energy for exercise. Also, circulation and respiration are stimulated. All of these factors not only accelerate the adaptive process of the CR system, but also render the MS system more flexible, stronger, and better prepared for work.

After physical activity has been completed, a gradual cool-down greatly benefits the recovery process. Walking or jogging during the cooling down period enables the body to better maintain uniform circulation, and thus more efficient removal of biochemical waste products, some of which are associated with muscle discomforts.

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CHAPTER 2

REVIEW OF LITERATURE CONCERNING EXERCISE AND PHYSICAL FITNESS

Cardiorespiratory Fitness

The overall determinant of endurance fitness is the ability of the body to transport oxygen from the atmosphere to the sites of biochemical activity in the working muscle. Aerobic capacity or maximum oxygen intake ($\dot{V}O_2$ max) is the parameter commonly used to evaluate the oxygen transport system of the body. Improvement in cardiorespiratory or endurance fitness is dependent upon the total work or energy cost of the exercise program. Energy cost can be measured by the number of calories expended and is dependent upon the intensity, duration, and frequency of the exercise program. In addition, improvement is related to the initial level of fitness, status of health, mode of exercise, regularity of exercise, and age. These factors should be considered in designing an exercise program to meet the needs, interests, and abilities of the police personnel involved in training regimens. How much exercise is needed and how much each of these factors contributes has been the topic of many studies (18,28,31,32,35,46,52,56,74,77,78,87,88) These factors will be discussed in relation to changes in $\dot{V}O_2$ max, body composition, and resting heart rate. Results concerning other changes in cardiorespiratory parameters are discussed elsewhere (56).

Intensity

Improvement in cardiorespiratory fitness is relative to the level of energy expenditure per minute or intensity of training. Because of the linear relationship between heart rate and oxygen intake, intensity can be expressed as either percentage of maximum heart rate or $\dot{V}O_2$ max (See Figure 1). Technique and calculation of intensity by heart rate are discussed in Chapter 4.

A certain level of intensity is required to elicit improvements in aerobic capacity. This level is generally referred to as threshold of intensity. The threshold varies according to age, level of fitness, health, etc. In general, however, activities low in intensity or energy expenditure such as golf, bowling, and other game activities which are too intermittent show little or no improvement in cardiorespiratory function, whereas, excellent improvements result from moderate to high intensity activities such as running, fast walking, bicycling, and swimming. More specific information on the energy cost of various activities is listed in Chapter 4 under exercise prescription.

Many studies have been conducted to determine the threshold of intensity. Karvonen et al. (35) found no significant improvement in $\dot{V}O_2$ max in a group of young men trained below 135 beats/min, but the group whose sustained heart rate was above 153 beats/min improved significantly. Hollmann and Venrath (32), in a similar study conducted on a bicycle ergometer, found that heart rate values of 130 beats/min or more were needed to stimulate a cardiorespiratory improvement. The data suggest that the threshold level for young men is at a heart rate equal to approximately 60 percent of their maximum heart rate.

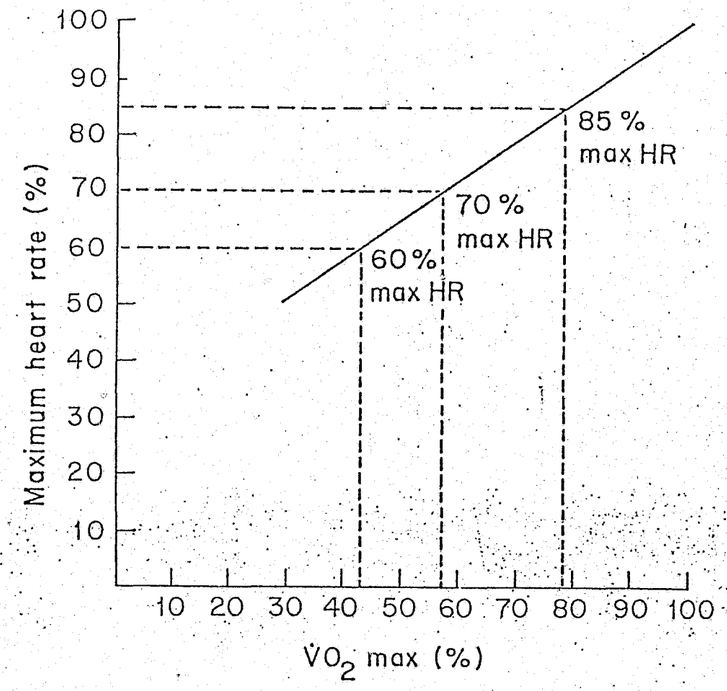


Figure 1. The relationship between percentages of maximum heart rate and oxygen intake ($\dot{V}O_2$ max).

In addition, a positive relationship exists between intensity of training and improvement in $\dot{V}O_2$ max. Sharkey and Holleman (75) walked young men on a treadmill three times per week for six weeks at heart rates of 120, 150, and 180 beats/min and found a direct relationship between the magnitude of improvement in $\dot{V}O_2$ max and intensity of training. Gledhill and Eynon (28) further substantiated the value of intensity as a stimulus for eliciting a training effect by training 36 college students on bicycle ergometers for 20 min, five days per week, for five weeks. The subjects maintained heart rates of 120, 135, or 150 beats/min. All groups improved in $\dot{V}O_2$ max, maximum performance, and heart rate at a workload of 1500 kpm/min. When the groups were subdivided into low and high fitness levels, the high fitness group showed no improvement in $\dot{V}O_2$ max and performance time at training heart rates of 120 beats/min, while the low fitness group did improve, emphasizing that training stimulus threshold has a wide range and is dependent on initial level of fitness. Thus, some improvement can be expected for low fitness groups who exercise at heart rates as low as 120 beats/min. More physically fit individuals usually must train harder to elicit improvement.

Duration

Duration is the amount of time that the prescribed intensity load should be performed to elicit the desired training response and, thus, is highly interrelated with intensity. Usually high intensity programs are of shorter duration and low to moderate intensity programs are of longer duration.

Improvements in $\dot{V}O_2$ max have been found with programs of very short duration. Shephard (77) found improvements in $\dot{V}O_2$ max after a training

program which lasted only ten minutes per day and Hollmann and Venrath (32) found improvements in ten subjects who did stationary running ten minutes per day.

Several investigations have shown a significant relationship between duration of training and magnitude of improvement in $\dot{V}O_2$ max. Olree et al. (52) trained young men for 20, 40, or 60 minutes on a bicycle ergometer and found the longer duration programs to produce significantly more improvements. Wilmore et al. (87) conducted a jogging program for middle-aged men of 12 or 24 minutes per day, three times per week for ten weeks. Both groups improved significantly in $\dot{V}O_2$ max with the 24 minute group showing more improvement than the 12 minute group. Recently Milesis et al. (46) trained men for 15, 30, or 45 minutes per day, three days per week at 85 to 90 percent of maximum. Figure 2 shows that all three exercise groups improved significantly in $\dot{V}O_2$ max with the magnitude of improvement related to duration of exercise. Yeager and Brynteson (89) trained young women on a bicycle ergometer for 10, 20, or 30 minutes per day, three days per week for six weeks and found similar results.

Sharkey (74) studied the interaction of intensity and duration of training on the development of cardiorespiratory endurance. Thirty-six college men were randomly assigned to programs which included three levels of training intensity (130, 150, and 170 beats/minute) and two levels of duration (7,500 and 15,000 kpm total work). The subjects trained on bicycle ergometers three days per week for six weeks. No significant intensity, duration, or interaction effects were revealed, possibly due to the fact that all groups performed exactly the same amount of work, thus showing the importance that total work output has on developing fitness.

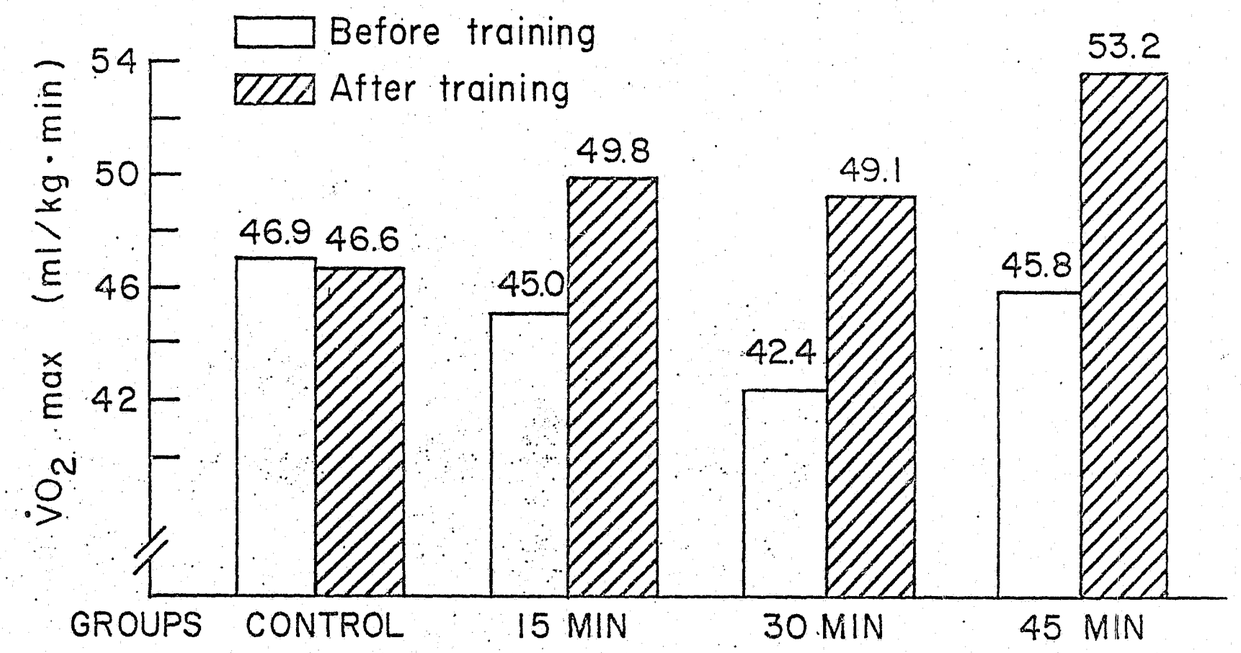


Figure 2. Effects of training duration on maximum oxygen intake ($\dot{V}O_2$ max) (46)

Shephard (77) investigated various combinations of intensity, duration, and frequency. A group of 39 sedentary men trained at 96, 79, and 39 percent of $\dot{V}O_2$ max, five, three, and one days per week, for 20, 10, and 5 minutes per session for ten sessions. The results indicated that the main factor influencing the extent of training achieved was the intensity of effort relative to the subject's initial $\dot{V}O_2$ max. Improvement was also influenced by the frequency of exercise and marginally by its duration. The most effective regime involved the combination of maximum intensity, frequency, and duration of exercise. Davies and Knibbs (18) trained young men at 80, 50, and 30 percent of $\dot{V}O_2$ max for eight weeks. Their results agreed with those of Shephard (77) in that greater improvement in $\dot{V}O_2$ max was achieved with the higher intensity programs. The groups working at or below 50 percent of $\dot{V}O_2$ max did not improve significantly.

Pollock et al. (58) trained 2 groups of men 45 min/day, two days per week, at 80 and 90 percent of maximum heart rate for 20 weeks. To equalize the total energy cost between the two groups, the 80 percent group exercised for a longer duration. Both groups improved significantly in cardiorespiratory function, but differences in intensity had little effect indicating that lower intensity work may achieve a similar result as higher intensity work if the total work or energy cost is equalized.

Frequency

How often one should train is dependent upon the needs and goals of that individual. Many athletes train twice a day, but exercising that often is not necessary for most individuals to reach an optimal level of fitness. Numerous studies have sought to evaluate frequency of training by attempting to

control the number of total training sessions in various programs and/or total work output. These investigations generally show no difference in improvement with frequency of training.

Hill (31) trained 24 men, 20 to 44 years of age for three or five days per week. At the end of eight weeks both groups were re-evaluated and showed a significant improvement in $\dot{V}O_2$ max. At this stage of the experiment, the five days per week group showed significantly more improvement. In an attempt to equalize total training sessions, the three days per week group continued to train another five weeks while the five day group stopped. Upon completion of this segment of training, the three day group's data equalled that of the five day group's program at the end of their eight weeks. Sidney et al. (78) found similar results for groups training two, or four days per week when total work was held constant. Another group training just one day per week showed little advantage over no training at all.

Because exercise should not terminate after a few weeks, but continue throughout life, frequency of training should be evaluated by equalizing the total number of weeks, not the total number of workouts. When weeks of training were held constant instead of total number of exercise sessions, results generally showed improvements in $\dot{V}O_2$ max with higher frequencies of training (59,62,63,67).

Pollock et al. (63) compared results of six running programs conducted two, three, or four days per week for 20 weeks. As shown in Table 1, the four days per week groups showed significantly more improvement than two and three days per week groups. There was no significant difference between the two and three days per week groups in improvement of $\dot{V}O_2$ max. A more recent investigation completed by Pollock et al.

(unpublished data) showed a three days per week program to have a greater improvement in $\dot{V}O_2$ max if compared to the two days per week groups in Table 1.

TABLE 1. Cardiorespiratory results of running frequency

Frequency (Days/Week)	VO_2 max (% Improved)	Resting Heart Rate (% Improved)
Control	0.0%	0.0%
2 days	17.0%	8.6%
3 days	16.0%	11.1%
4 days	22.0%	11.9%

Data on 148 previously sedentary men, ages 28-64. Subjects ran 30 to 45 minutes a day for 20 weeks (63).

Gettman et al. (27) trained men 20 to 35 years of age, one, three, or five days per week, 30 minutes per day for 20 weeks. Figure 3 shows significant improvements in $\dot{V}O_2$ max in direct proportion to frequency of training. The resting heart rate values showed the same relationship.

Thus, it can be concluded that exercising only one day per week shows minimal improvements in cardiorespiratory fitness. Two and three day programs elicit moderate improvements, while four and five day programs show a more significant improvement. Using this information, programs which emphasize exercising three to five times per week are recommended.

Regularity of Training

Closely related to frequency of training is the consistency of training and its subsequent effect on cardiorespiratory function. Cureton and Phillips (17), using equal eight-week periods of training,

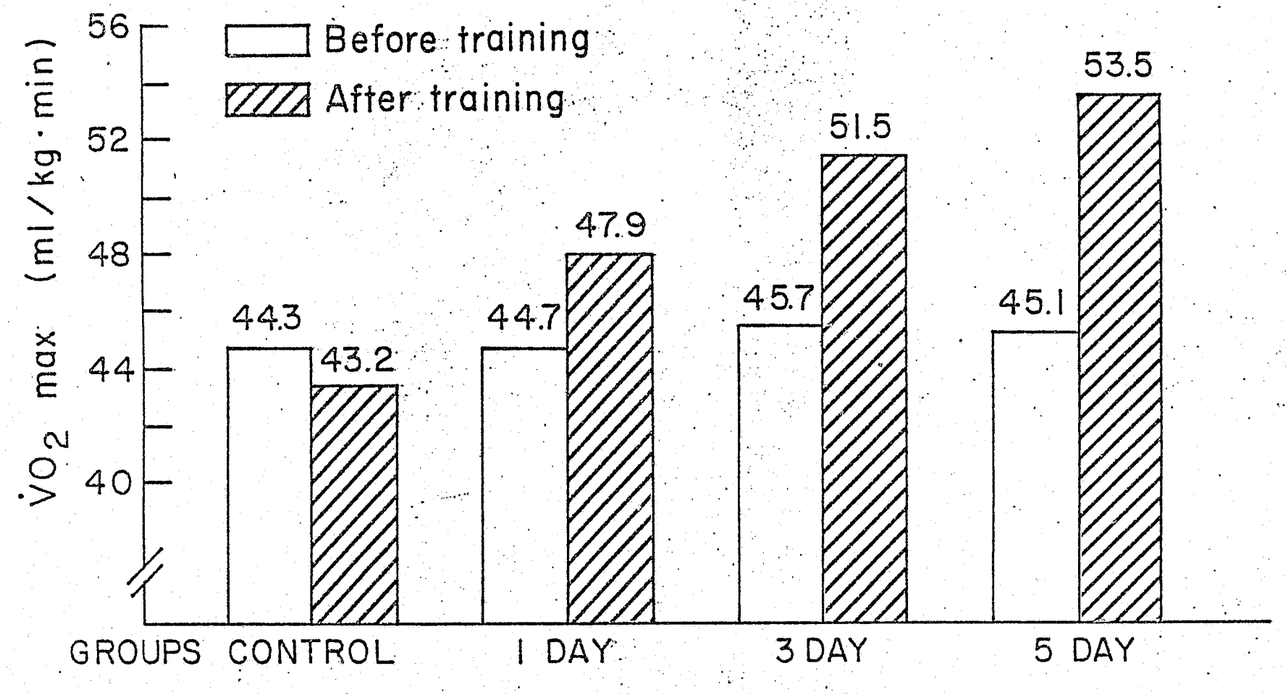


Figure 3. Effects of training frequency on maximum oxygen intake ($\dot{V}O_2$ max) (27)

nontraining, and retraining, found significant improvement, decrement, and improvement, respectively, in cardiorespiratory efficiency. Michael and Gallon (45) and Fardy (26) followed the training of college basketball and soccer players over the course of a season, with subsequent periods of nontraining. Both groups of athletes showed increases in efficiency during the season, followed by significant reductions during the nontraining period. Williams and Edwards (84) found similar results when studying the effect of variant training regimens on cardiorespiratory efficiency of young college men. Drinkwater and Horvath (21) studied female high school track athletes and found that after three months of nontraining, the cardiorespiratory fitness of the athletes decreased to the level of nonathletic girls of similar age.

Bed rest studies have shown decrements in physical working capacity and related cardiorespiratory parameters. Saltin et al. (72) confined five subjects to bed for 20 days, followed by a 60 day training period. Cardiorespiratory efficiency values decreased during bed rest and improved steadily with training. Heart rate response to a submaximal test increased up to 30 beats/minute after bed rest and decreased significantly with training.

Roskamm (71) trained 18 subjects daily for four weeks and showed a 20 percent increase in cardiorespiratory fitness. At this point one group (Group I) continued training every third day and the other group (Group II) stopped training. Group I maintained their level of fitness while Group II began to lose their level of working performance within two weeks. See Figure 4. It is apparent from this review that training effects are both gained or lost rather quickly, and regular, continual stimulation is necessary to maintain cardiorespiratory efficiency.

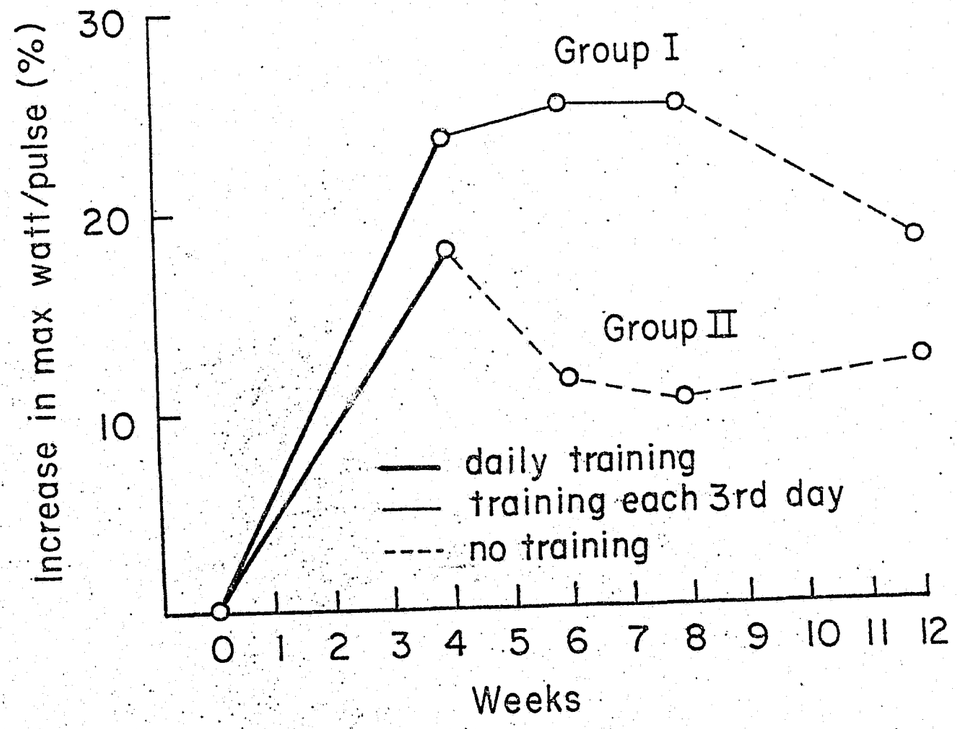


Figure 4. Increase in maximum watt/pulse compared with the initial value (71)

Maintenance of Fitness

Once an optimal level of fitness is reached, programs of lower frequency, intensity, or duration may be initiated to maintain a certain level of fitness. Roskamm (71) in the investigation reviewed above found that training every third day was enough to maintain cardiorespiratory fitness. Kendrick et al. (38), in an attempt to determine the effects of different magnitudes of nontraining, reevaluated 22 middle-aged men after a 12-week nontraining period. Subjects originally trained eight miles per week for 20 weeks, and were subsequently divided into the following three subgroups: group A continued to train eight miles per week, group B trained three miles per week, and group C was inactive. The results showed group A to maintain and/or improve their level of efficiency, while groups B and C regressed significantly. Group C lost approximately 50 percent of its original improvement. Siegel et al. (79) trained nine sedentary middle-aged men 12 minutes, three days per week for 15 weeks and found an increase in $\dot{V}O_2$ max of 19 percent. After completion of the program, five subjects continued to train once a week for another 14-week period. At this time their $\dot{V}O_2$ max had decreased to six percent above the initial control level. The remaining four subjects who abstained from training fell below their original control values. Kilbom (39), in a review of how physical fitness can be maintained, recommended that exercising at least two days per week is preferable.

Pollock et al. (57) in an effort to determine if cardiorespiratory fitness can be maintained through an exercise regimen of decreased intensity and increased duration trained 14 men for 30 minutes three days per week, for 20 weeks at a high intensity (94 percent of

maximum heart rate - 179 beats/minute) followed by six weeks of lower intensity work (84 percent of maximum heart rate - 166 beats/minute). Five of the 14 subjects stopped training during the last six weeks. The energy cost of the two phases was equalized by extending the duration of training during the latter six week period. The subjects improved significantly in $\dot{V}O_2$ max during the first 20 weeks. The nine subjects who continued training, but at a lower intensity for the six additional weeks maintained the level of fitness achieved during the first 20 weeks, but the five subjects who stopped training during the last six weeks decreased significantly. See Figure 5. This study supported the concept that cardiorespiratory fitness can be maintained by decreasing intensity and increasing the duration sufficiently to equalize the total calorie expenditure.

Modes of Training

Previous sections of this review have been concerned primarily with endurance activities such as running and cycling. However, other activities such as walking, swimming, skiing, dancing, and sports of varying degrees of intensity and aerobic demand may improve cardiorespiratory fitness. Many investigators have sought to determine the relative value of these other activities as well as jogging and cycling in producing cardiorespiratory fitness changes. As previously shown, certain quantities and combinations of intensity, duration, and frequency are necessary to produce and maintain a training effect.

In addition, the total amount of work or energy cost of an activity is an important consideration. Theoretically, the training effect

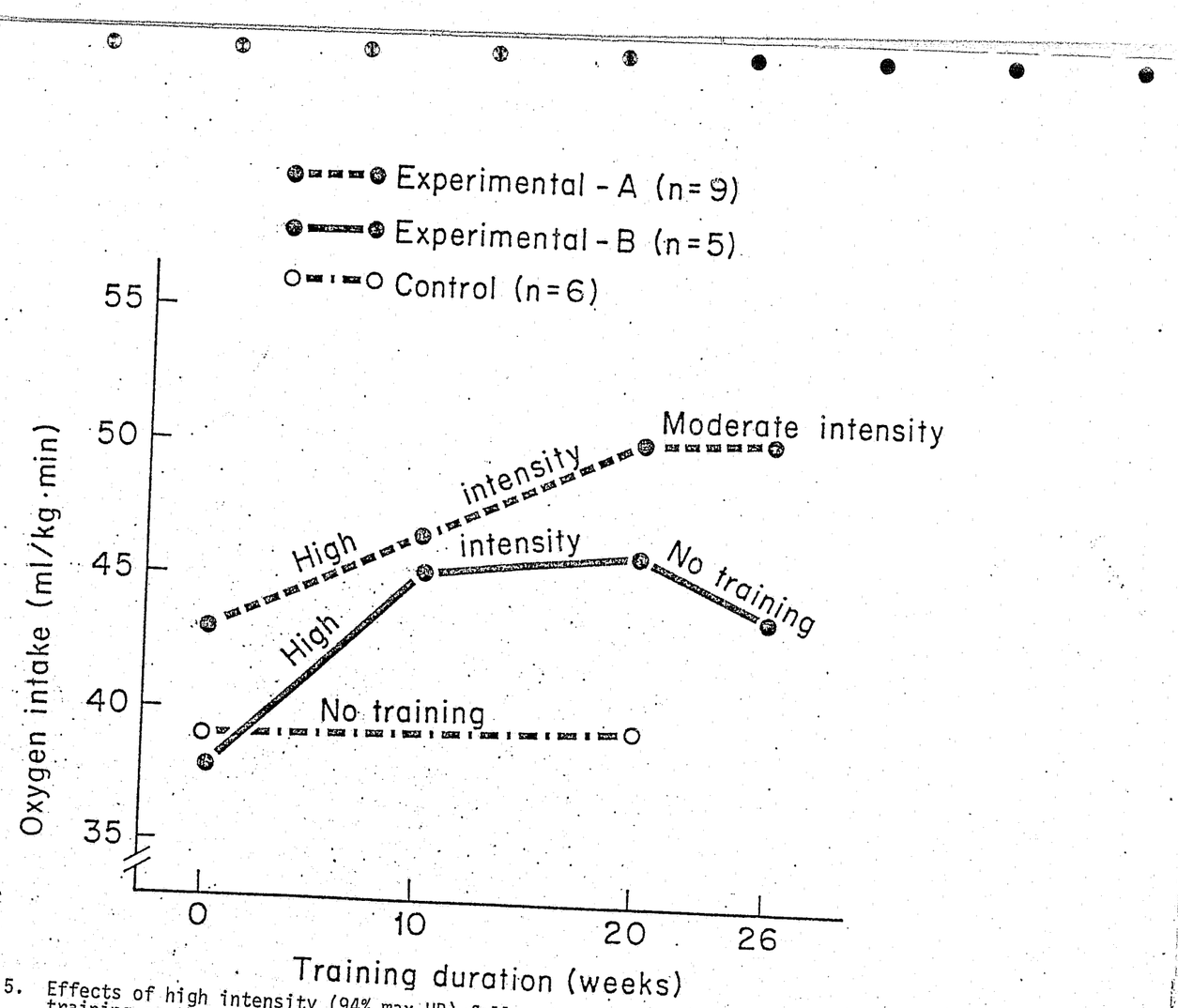


FIGURE 5. Effects of high intensity (94% max HR) followed by moderate intensity (84% max HR) training on the development and maintenance of maximum oxygen intake (57).

should occur equally if these factors are held constant. To investigate this, Corbin et al. (15) compared the effects of running, walking (treadmill), and bicycling (ergometer) training regimens on college men. Each group trained for 20 minutes, five days per week, for ten weeks, at heart rates of approximately 150 to 160 beats/minute. In general, they found running and bicycling to be superior training modes when compared to walking. Pollock et al. (61), Figure 6, in a similar experiment conducted with middle-aged men, found all three modes of training to be equally effective in producing a significant cardiorespiratory improvement. In this study, the subjects trained for 30 minutes, three days per week, for 20 weeks, at 85 to 90 percent of maximum heart rate (approximately 175 beats/minute). Wilmore et al. (86) compared the effect on aerobic capacity of tennis, bicycling, and jogging. Each group exercised three days/week for 45 min/day for 20 weeks at approximately 85 percent of maximum heart rate or 75 percent of $\dot{V}O_2$ max. All three groups improved significantly in cardiorespiratory fitness (jogging - 14.8%, bicycling - 13.3%, and tennis - 5.7%) with the jogging and bicycling groups improving substantially more than the tennis group.

Some people cannot exercise in the conventional manner of walking and running due to illness, injury, orthopedic problems, etc. Thus, exercise programs must be adjusted to meet these special needs. Pollock et al. (64) conducted a study with eight sedentary disabled men and 11 sedentary normal men and found that cardiorespiratory improvement could be achieved through arm pedalling on a modified bicycle ergometer.

In general, high energy cost activities, such as running, walking, bicycling, swimming, and cross-country skiing show significant increases

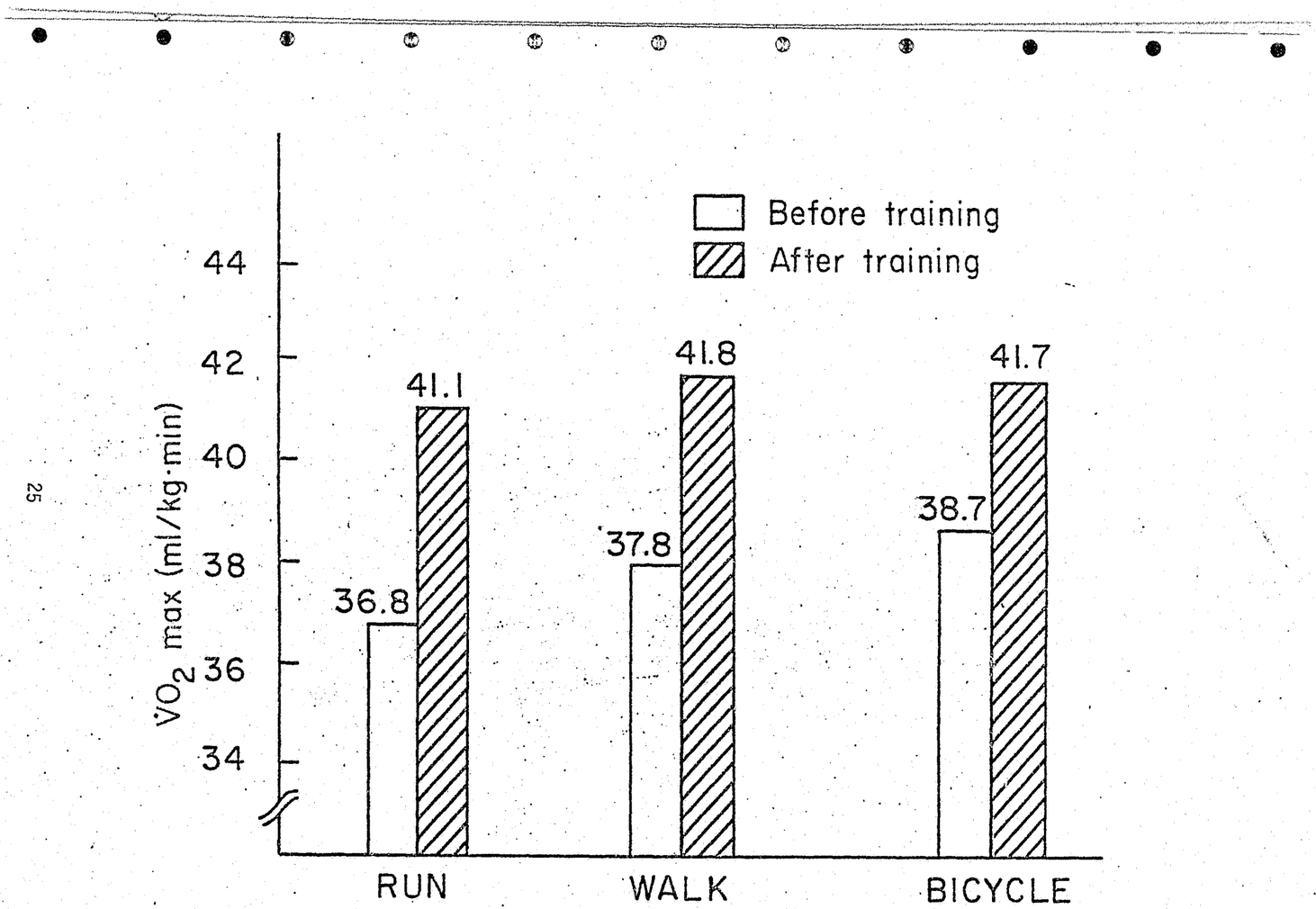


Figure 6. Effect of training mode on maximum oxygen intake ($\dot{V}O_2$ max) (61)

in cardiorespiratory efficiency. In contrast, low energy cost activities, such as moderate calisthenics, golf, and various organized game activities show little or no effect. Although weight lifting, per se, is a high energy cost activity, and phases of other sports such as baseball have high energy cost components (running), they are considered to have little or no effect on cardiorespiratory function. This results from the high energy cost component being too intermittent; thus, the total energy cost of the activity in relation to total time would be considered quite low. Other activities (55) producing significant cardiorespiratory effects include dancing, rope skipping, tennis, soccer, basketball, wrestling, football, handball, and a combination of sport activities and running. Cooper (13,14) has emphasized the concept regarding the variety of modes of training for eliciting a training response. He devised a system whereby activities are given point values in respect to their energy cost, thus a variety of activities may be interchanged within a fitness training program.

Types of Training Programs - Interval vs Continuous

Shephard lists four distinct types of training programs (76). These are: (1) Continuous Running in which the individual exercises at a moderate and relatively steady intensity for long periods (ranging from fifteen minutes to several hours); (2) Brief-interval Running in which the individual undertakes short bursts of maximum activity (approximately 30 sec to 1 min), interspersed with recovery periods of corresponding length when only light activity is allowed; (3) Prolonged-interval Running where the intervals are prolonged to 2 1/2 minutes and the recovery periods are correspondingly extended; and, (4) Circuit Training in which the individual moves around the circuit to various gymnasium exercises - pushups, running on the spot, etc.

The literature pertaining to the comparison of interval versus continuous running programs reveals conflicting results. To date, there is no good scientific evidence supporting one program over the other.

Initial Level of Fitness

The concept of percentage of improvement attained in certain physical fitness parameters being related to one's initial level of fitness was proposed in the early work of Muller (49). He conducted a series of experiments dealing with the improvement in strength and concluded that the percentage of improvement was directly related to initial strength and its relative distance from a proposed level of improvement. This concept has also been true in training studies dealing with cardiorespiratory parameters. Sharkey (74) noted that the magnitude of change was inversely related to the initial level of fitness.

Resting heart rate is reduced with training, with the magnitude of change dependent on the initial level. Most studies show a reduction in resting heart rate to the mid to lower 60's. The data for endurance athletes show average resting heart rates 10 to 15 beats/minute lower than for the moderately trained groups, although it is not clear whether this difference may be due to genetic factors, training, or both.

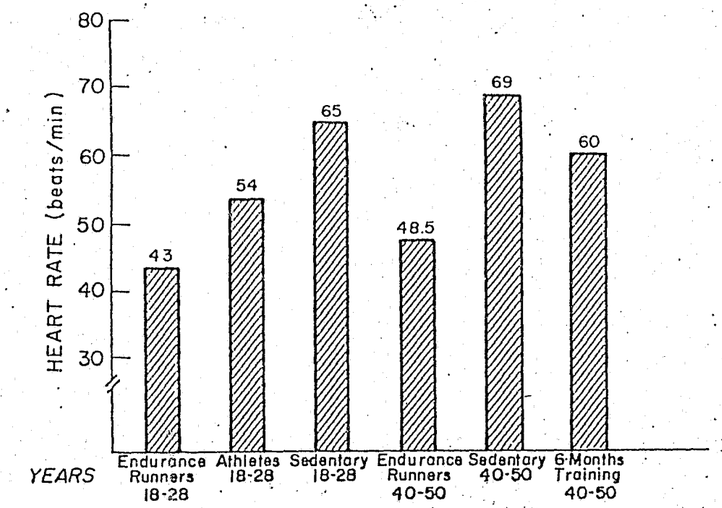
Age

Longitudinal and cross-sectional studies indicate that cardiorespiratory function decreases with age. Robinson (69) showed that men tend to peak in aerobic capacity between 17 and 20 years of age and steadily decrease over the subsequent years. At age 75, aerobic capacity is less than 50 percent of the original peak value. Robinson et al. (70) measured

$\dot{V}O_2$ max on a group of subjects at age 18 to 22 years; then again at ages 40 to 44 and 49 to 53 years. At age 40 to 44 $\dot{V}O_2$ max had declined 25 percent, and had continued to decrease when reevaluated at age 49 to 53. Skinner (80) has suggested an approximate 21 to 30 percent decrease in $\dot{V}O_2$ max over a 30 to 40 year range.

Many researchers have tried to determine if aging affects the trainability of persons as they get older. Saltin et al. (73) found improvement in $\dot{V}O_2$ max at ages 29 to 63 and concluded that although a training effect occurs as readily in middle-aged and old men as in young, the absolute change is less. Therefore, there appears to be some aging effect. Pollock et al. (60) trained 22 men, aged 49 to 65 years in a walk-jog program 30 min, three days per week for 20 weeks and found an 18 percent increase in $\dot{V}O_2$ max. These results are in agreement with those of Kasch et al. (36) with middle-aged men, 39-60 years. Benestad (3) found no change in cardiorespiratory function in older subjects who trained daily for five to six weeks. deVries (19) found improvements in subjects aged 52 to 88 years who participated in a low intensity exercise program, but the relative change was considered less when compared to younger subjects. Tzankoff et al. (82) found significant improvements in $\dot{V}O_2$ max with men aged 44-66 years.

The aerobic capacity of middle-aged and older endurance athletes is markedly superior in every age category to that of untrained individuals. Figure 7 shows the differences in $\dot{V}O_2$ max and resting heart rate among different athletes and sedentary men (55). The age reduction mentioned earlier also appears in the trained groups and becomes particularly evident after age 60. Can this reduction in $\dot{V}O_2$ max be explained by age



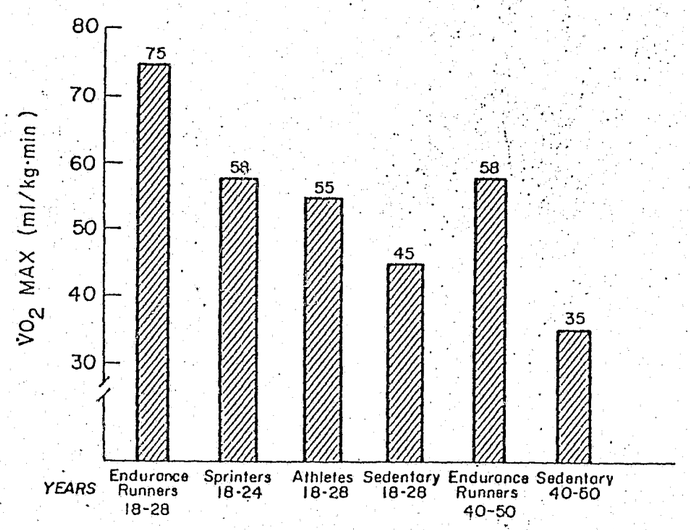


Figure 7. Comparison of resting heart rate and maximum oxygen intake ($\dot{V}O_2$ max) among young and middle-aged men with various fitness levels (55)

itself or are training factors also apparent? The evidence at hand supports both concepts. Young endurance runners will train 100 to 200 miles per week (sometimes less if purely interval training is used); whereas the middle-aged and older runners rarely accomplish this. In data collected from the 1971 National Master's AAU track and field meet and subsequent laboratory evaluations conducted by Pollock, Miller, and Wilmore (66) the average number of miles trained per week was 40, 40, 30, and 20 for the fourth, fifth, sixth, and seventh decades, respectively. In addition, most of these men were prior college athletes, but had not trained all their lives. Most of the older athletes had been sedentary for many years and had been back in training for only five to ten years. Grimby's and Saltin's (29) data on middle-aged and older athletes who had trained all their lives show them to be above the aging curve in $\dot{V}O_2$ max at all ages. Other data of Pollock *et al.* (65), on men who had been training for 5.5 years, show significantly higher $\dot{V}O_2$ max values than for men completing their first six months of training, but these are lower than for the aforementioned athletic groups. With the increase in Master's competition and the probability of men and women training for competition throughout their lifetime, future data should provide more insight into the aging process and its effects on fitness parameters.

Environmental Factors

Heat

When exposed to heat or during muscular work, the heat content of the body tends to increase. When the total heat load of the body exceeds the limit of thermoregulatory compensation, various incapacities occur such as heat cramps, heat exhaustion, and heat stroke. Optimal function requires that the body temperature be maintained between 36.5 and 39.5°C. The capacity to perform physical work in the heat varies

greatly among individuals. In general, the extent of the performance decrement is influenced by the capabilities and limitations of the individual, the level of thermal stress, and the specific demands of the task being performed. Caplan and Lindsay (10) found that in deep mine drilling operations, efficiency decreased 25 percent when the environmental heat load was increased from an effective temperature of 85°F to 91.5°F. At 96°F efficiency was 50 percent, and at 98.5°F output was reduced 75 percent. Brouha *et al.* (6,7) observed a progressively increasing cardiac cost during work as the environmental temperature increased. For a 15-minute work and 20-minute recovery period, the total number of heart beats more than doubled when the thermal load was increased from an effective temperature of 75°F to 90°F.

Acclimatization to heat and physical training greatly enhances the ability to tolerate work in heat (8). Improvement in heat tolerance is associated with increased sweat production and a lowered skin and body temperature (88). The increased sweat rate provides the possibility for a more effective cooling of the skin through evaporative heat loss, and the resultant lowered skin temperature provides for a better cooling of the blood through the skin. Buskirk and Bass (8) list the following characteristics of heat acclimatization:

1) Heat acclimatization begins with the first exposure, progresses rapidly with subsequent exposure, and is well developed in about seven days.

2) It can be induced by short intermittent bouts of exercise in the heat, e.g., of from two to four hours daily.

3) Athletes in good physical condition acclimatize more rapidly than nonconditioned people and are capable of more work in the heat.

4) Daily work, if progressively increased in the heat, leads to early development of maximal performance capacity. Overexertion on the first exposure may result in disability, which in turn inhibits the acclimatization process.

5) Acclimatization to warm conditions will facilitate acclimatization to hot conditions but will not confer complete acclimatization to hot conditions. Acclimatization to hot conditions will facilitate performance under warm conditions.

6) The general pattern of acclimatization is similar for work of different intensity and duration.

7) Acclimatization to hot dry climates enhances performance capability in hot, wet climates and vice versa.

8) Inadequate water and salt replacement can retard the acclimatization process.

9) Acclimatization to heat is retained for about two weeks with no exposure. Thereafter, loss of acclimatization is highly individual. Athletes who stay in good physical condition should retain heat acclimatization best.

When exercising in hot and humid environments, certain precautions should be followed. Buskirk and Bass (8) and Murphy and Ashe (50) make the following recommendations:

1) Wear light, loose porous clothing.
2) Take adequate amounts of water and salt.
3) Exercise during the cool part of the day.
4) Allow at least two weeks for acclimatization.
5) Reduce work load during periods of extreme thermal stress.

Cold

In general, few problems are posed by exercising in the cold other than the psychological disadvantage of being uncomfortable. When subjected to a cool environment, the first thermoregulatory response is a constriction of the skin blood vessels, thus reducing heat loss through the skin. As man becomes progressively colder, shivering is activated to increase metabolic heat production. Exercise further increases heat production and overrides the necessity to shiver. The combination of greatly increased heat production due to exercise and reduced heat loss due to excess clothing result in a positive heat load. Positive heat load can be reduced by removing layers of clothing during progressive exercise in the cold.

Altitude and Hypoxia

The Mexico Olympics in 1968 focused attention on the relationship between altitude (hypoxia) and physical performance. The Olympic stadium was 7,350 feet above sea level, with an average barometric pressure of 580 mmHg. The percentage composition of the atmosphere remains essentially unchanged over the range of altitudes and is approximately 20.93% oxygen, 0.03% carbon dioxide, and the balance nitrogen and other inert gases. There is a logarithmic decrement in the total ambient pressure with altitude, so that at eighteen thousand feet, the pressure is approximately halved (380 mmHg), and at 33,000 feet, it is only a little more than a quarter of the sea level reading (197 mmHg). This decline in total pressure reduces the partial pressure of oxygen in inspired gas. Within the alveoli, both water vapor and carbon dioxide remain at relatively fixed partial pressures (47 and 35-40 mmHg, respectively), and consequently the partial pressure of oxygen is reduced even more.

The reduced oxygen partial pressure in arterial blood decreases the quantity of oxygen transported to the working muscles, thus limiting the capacity for physical work. Maximal aerobic capacity shows a linear

decrease with increasing altitude amounting to approximately 3.2 percent in unconditioned men and 1.9 percent for conditioned men for every 1000 feet above 5,000 feet (9).

It has been proposed that the change associated with conditioning, training, and acclimatization in altitude would enhance aerobic capacity and improve performance times at sea level. Faulkner et al. reported on three investigations (23,24) where, 1) five well-conditioned male runners trained for ten days at an elevation of 7872 ft; 2) four well-conditioned male runners and 1 swimmer trained for 23 days at 7544 ft elevation; and 3) 15 male college swimmers trained at the altitude of 7380 ft for 14 days. These studies showed improved performance in two stages. The first improvement was observed after the first few days when the athlete had learned to adjust his pace to the new altitude conditions (acclimatization). The second improvement overlapped the first then tended to level off by the end of the second week. The amount of improvement in the second stage of adaptation appeared to depend in part on the degree to which the athlete was trained pre-altitude.

The compensatory mechanisms acquired in acclimatization to altitude are: 1) an increase in pulmonary ventilation; 2) an increased hemoglobin concentration in the blood; and 3) morphological and functional changes in the tissues (increased capillarization, myoglobin content, modified enzyme activity (2). The well-trained individual is not acclimatized to high altitude any sooner or any more effectively than the untrained individual.

Opinions differ concerning the question whether or not the performance capacity at sea level is improved following exposure to high altitude. Buskirk et al. (9) and Consolazio (12) state that their subjects who trained at high altitude for four weeks or more did not attain

any better $\dot{V}O_2$ max results than usual when they returned to sea level. Buskirk et al. (9) conclude that there is little evidence to indicate that performance on return from altitude is better than before going to high altitude, if training remains relatively constant.

When exercising at high altitude, a period of at least three weeks is necessary for acclimatization. There is no evidence to suggest that it is necessary to take it easy during the initial period of exposure to high altitude (2). However, due to the lower oxygen pressure, one is forced to accept a slower tempo, and the intensity and duration of training activities must be reduced.

Body Composition

Reduction in body weight and fat occurs in response to physical training and has been documented in numerous scientific investigations (5,27,46,47,63). The principle involved in reducing body fat is based on the increased number of calories the body burns during physical training. Continuous, moderate, rhythmic type activities, like running, burn a large number of calories (54) and place the body into negative caloric balance, i.e., more calories are expended than are input. The end result is that the body utilizes its stores of fat to make up the deficit, hence a reduction in body fat (weight). About 3500 calories are contained in a pound of body fat; therefore, 3500 calories must be expended through exercise to lose a pound of fat. An individual can lose a pound of fat in less than 12 days by expending an extra 300 calories per day through exercise. The speed with which the exercise is performed determines the amount of time required per day to burn 300 calories. For example, a moderate jog for most people would expend about 10 calories per minute; therefore, jogging about 30 minutes would expend 300 calories.

Dieting alone is not an effective way to reduce fatness as is shown in several investigations (4,53). Although dieting will cause a reduction in weight, 65 percent of the weight loss is from loss of muscle mass and only 35 percent from fat loss. Therefore, the percent body fat, which is the proportion of body weight that is fat tissue and is the true indicator of body leanness-fatness, can remain approximately the same in response to weight loss by dieting alone. In contrast, in exercise programs with food intake remaining constant, significant reductions in percent fat along with increases in muscle mass occur. The concurrent loss of fat and gain in muscle can balance each other and result in only a slight change in overall body weight, but a significant decrease in percent body fat. A calorie-restricted diet along with an exercise program is recommended when weight and fat reduction are desired.

The futility of diet alone is contrasted with the effectiveness of an exercise program in Figure 8. Several important points are noted therein (34). First, the sedentary free-eating animals, which represent the typical non-dieting physically inactive American adult, were the heaviest and the fattest. Second, the sedentary paired-weight animals, which were physically inactive, but restricted in food to match the body weight of the runners, were considerably fatter than the runners even though the body weight for both groups was the same.

When comparing trained and untrained individuals with the same average heights and weights, a greater proportion of the weight of the physically active individual is in the form of lean tissue. Welham and Behnke (83) compared a group of professional football players with a group of naval personnel and found that although the football players were heavier, most of them had less body fat than the naval personnel. Costill and Fox (16) measured six skinfold fat sites on a group of competitive

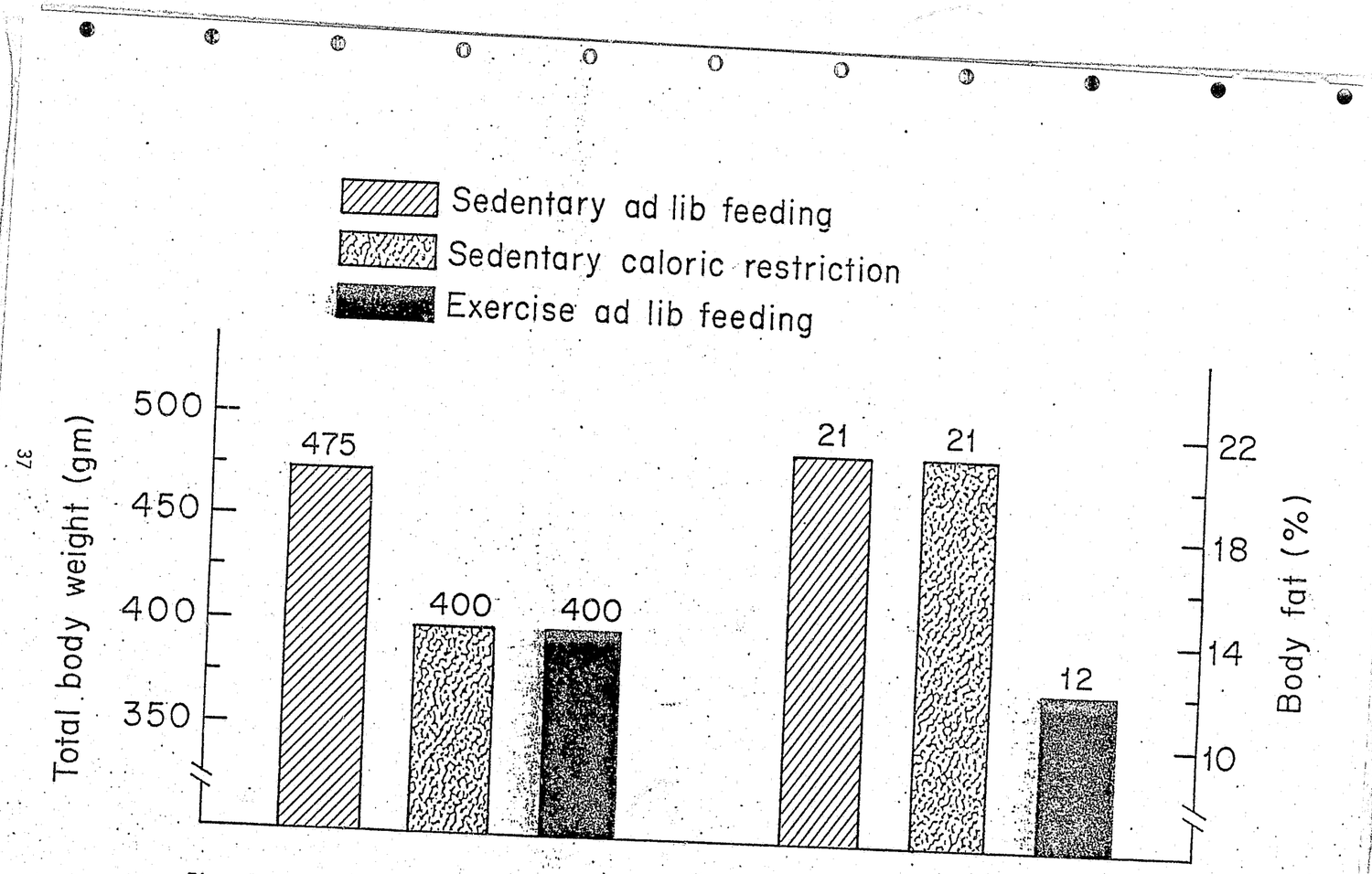


Figure 8. Effects of 15 weeks of daily exercise on body composition of adult male rats (34)

marathon runners and on a group of college professors who were the same age and weight. The sedentary faculty men had more than twice as much fat (16.3%) as the athletes (7.5%). Pollock et al. (68) found similar results in a comparison between a group of world class distance runners and a group of sedentary men matched for age and body weight.

Because changes in body weight and body fat are related to energy expenditure of a program, the regimens with greater combinations of frequency, duration, and intensity tend to show greater magnitude of change. Pollock (55) compared body weight and fat of young and middle-aged men of various fitness levels. As Figure 9 shows, the men involved in the highest energy cost programs, endurance runners, had the lowest body weight and fat.

Pollock et al. (63) combined data from studies conducted on middle-aged men training two, three, and four days per week and found that exercising approximately 30 minutes two times per week was not sufficient to reduce body fat and weight. However, training three and four days per week for 30 minutes caused significant reductions in body weight and body fat. Skinner et al. (81) found that exercising a minimum of three times per week, approximately 40 minutes per session, for a period of six months was effective in decreasing body fat in sedentary middle-aged men. Milesis et al. (46) found body fat reductions in groups training 15, 30, and 45 minutes per day, three days per week for 20 weeks. Wilmore et al. (87) investigated the body composition changes with a ten week jogging program on 55 men, aged 17 to 59. Small, but significant, reductions in body fat and weight resulted from this moderate exercise program. Therefore, it can be concluded that programs of at least 30 minutes, three days per week are necessary for losing body weight and fat.

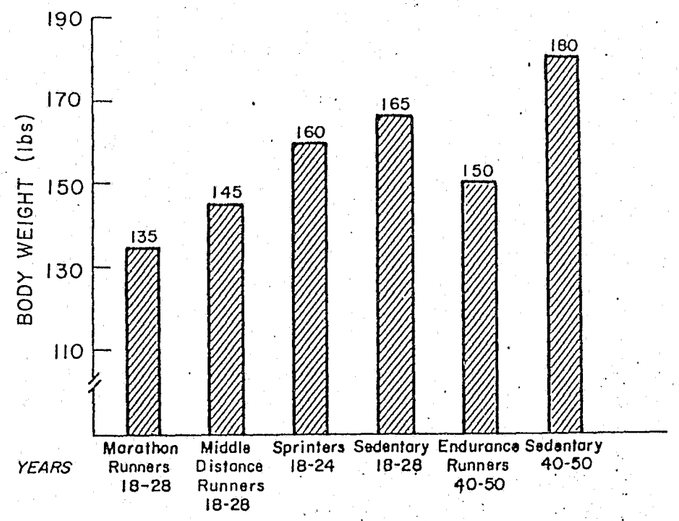


Figure 9. Comparison of body weight and fat among young and middle-aged men with various fitness levels (55)

Moody et al. (47) viewed the effects of exercise on overweight college women. Eleven females participated in a walk-jog program six days per week for an eight week period. No attempt was made to control diet. Energy expenditure was approximately 500 calories per day. Body weight and body fat as shown in Figure 10 decreased significantly.

Boileau et al (5) formed two groups of sedentary college men based on their relative fatness as follows: obese, 25-46 percent fatness (N=8), lean, 10-20 percent fatness (N=15). All subjects walked or ran on a treadmill 60 minutes per day, five days per week for nine weeks. The approximate energy expenditure was 600 calories per exercise session. Significant reductions in body fat were found for both groups with greater reductions in the obese subjects. Gwinup (30) exercised 11 obese women daily for one year or longer with no dietary restrictions. Periods of walking each day were progressively increased. No weight loss occurred until walking exceeded 30 minutes daily. Weight loss paralleled length of time spent walking.

Some investigators have used progressive weight training as the means of decreasing body fat. In an experiment by Wilmore (85), 47 women and 26 men volunteered to participate in a 10-week period of intensive weight training, with an average attendance of 40 minutes per session, two days per week. Both men and women increased in lean body weight and decreased their absolute and relative body fat. Significant reductions in five of the seven skinfolds occurred for the women, but only in one for the men. Mayhew and Gross (43) evaluated the effects of high resistance weight training on body composition of 17 college women training 40 minutes per session, three times weekly for nine weeks. Significant increases in lean body mass were found with relative body fat

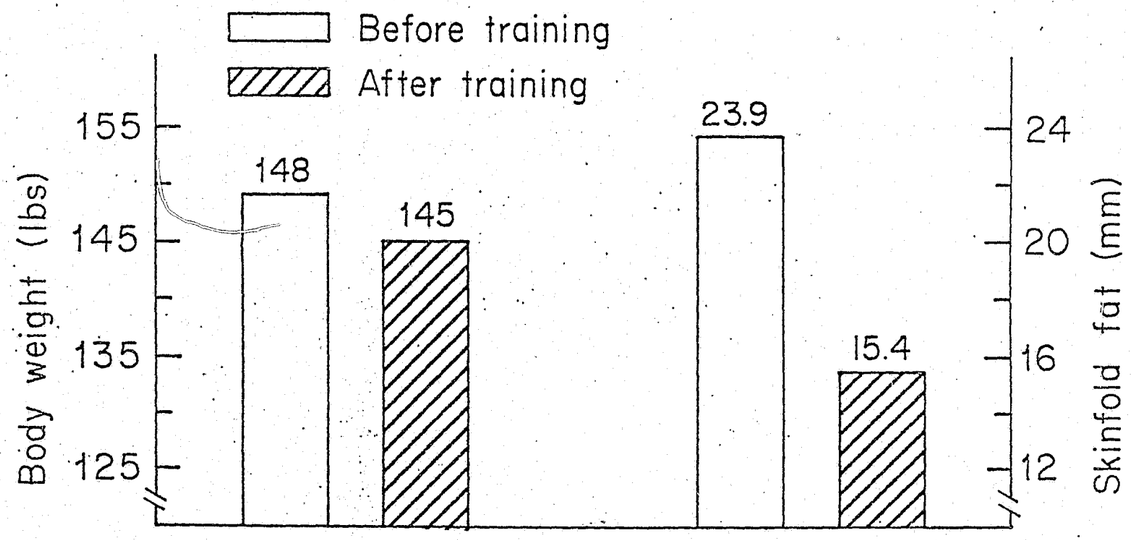


Figure 10. Effects of training on body weight and skinfold fat (47)

decreasing. Most weight training programs change percent body fat by increasing muscle weight rather than decreasing fat weight.

In summary, fat reduction results achieved from exercise programs depend on the frequency, duration, and intensity of exercise. Two days per week of exercise does not seem to be adequate in reducing fat. Reductions in fat have been found with three days per week programs, but exercising four or more days per week is desirable. The key to fat reduction seems to be in total energy cost, i.e., the number of calories burned during exercise. Activities of higher intensity such as jogging, cycling, or swimming burn more calories per minute and thus would be more desirable in fat reduction than low intensity activities. Duration is an important consideration. Research indicates that at least 30 minutes per exercise session is desirable for body weight and fat loss. Weight training is not as desirable for fat reduction as endurance activities because the fat weight changes only slightly.

Flexibility

Flexibility is defined as the range of possible motion in a joint or group of joints (20). For example, the flexibility of the elbow joint is movement from full flexion to full extension. The ability to touch one's toes primarily depends on the flexibility of the hip joint, spinal column, and rear leg muscles.

Joint range of movement is limited by two factors: (1) bony structures of the joint; and (2) extensibility of the surrounding ligaments, tendons, and muscles. The bony structure of a joint basically cannot be altered but the extensibility of ligaments, tendons, and muscles can be greatly affected by stretching exercises. Stretching these tissues gradually lengthens them and the joint range of movement is therefore improved.

Flexibility is specific to a joint, that is, good flexibility in the hip and spine does not necessarily imply good flexibility in any other joint. However, general stretching exercises will enhance both simple and complex movements of the body, thereby improving the flexibility of many joints.

Benefits derived from flexibility exercise are described by Melograno and Klinzing (44) and include:

1. Injury Reduction - the chance of overstretching and injuring a muscle is lessened when the muscle possesses great extensibility.
2. Muscle Relaxation - tight, stiff muscles from inactivity are relaxed by stretching.
3. Skill Enhancement - sufficient flexibility is needed in certain joints before skills can be mastered (e.g., shoulder flexibility is necessary for proper serving techniques in tennis).
4. Graceful movement - coordination of common movements is enhanced by having flexible joints. Individuals who lack flexibility move stiffly while walking, running, lifting, or reaching. This leads to inefficiency of movement.

There are two methods of stretching to promote flexibility in the body. The first, ballistic stretching, involves bouncy, jerky movements where a body part is put into motion and the momentum carries it through to the muscles' stretched limit. Ballistic stretching is often discouraged because it tends to cause soreness in the muscles the day following the stretch (20). There is some experimental evidence indicating that a "stretch reflex" occurs in the muscles from ballistic stretching. The "stretch reflex" causes the muscles to contract and resist the stretch thus resulting in small muscle spasms which eventually lead to soreness.

The second method, static stretching, is recommended because a firm, steady stretch inhibits the "stretch flex" in the muscles with its delayed soreness, yet improves muscle extensibility. In addition, if muscle soreness already exists, static stretching may be used to relieve it. The basic components of yoga involve static stretching and therefore flexibility training.

There is an advantage in using some ballistic stretching for warm-up purposes so long as the movements are slow and not fast or jerky. This should help prevent injury and excessive muscle soreness. Some soreness should be expected in the early stages of any conditioning program, but with the proper precautions and adaptation the soreness will disappear.

The notion that weight training decreases flexibility is not true. Many investigators have shown that there are no harmful effects of weight training on flexibility if the movements are performed through the joints' full range of movement (20). Also flexibility exercises should be integrated into the program. However, if the weight training involves a small range of motion and the exercises are performed incorrectly, flexibility can then actually be decreased.

Factors affecting flexibility have been summarized by deVries (20):

1. Activity - Active individuals tend to be more flexible than inactive individuals. Connective tissues shorten from disuse, thus, range of motion is decreased.
2. Age - Flexibility usually decreases with age partly because connective tissue shortens with age and partly because people become more sedentary.

3. Sex - Females are generally more flexible than males due to some joint structure differences (for example, in the hip) and greater muscle extensibility.
4. Temperature - Warming a muscle and joint will increase range of motion 10 to 20 percent.

Muscular Strength and Endurance

Strength is defined as the force a muscle group can exert against a resistance in one maximum effort (33). Muscular strength is proportional to the cross-sectional dimension of the muscle or muscle group being studied. The larger the muscle the greater the strength. There are basically two types of muscular contractions used when examining strength. One type is static or isometric contraction when the muscle may be contracting maximally but the limb does not move. The other type is dynamic or isotonic contraction. Here the length of the muscle changes during the contraction as the limb goes through a range of motion. Actually, there are two types of isotonic contractions: concentric and eccentric. Concentric contraction means the muscle shortens and usually positive work against gravity is done (example, biceps curl exercise). Eccentric contraction refers to the muscle lengthening and negative work is performed (example, letting the weight down from the biceps curl position).

Muscular endurance is defined as repeated contractions against the same resistance until local fatigue factors interfere with continuation. Performing situps or pushups until they can no longer be performed constitutes muscular endurance. Energy stores in the muscle cells plus the supply of blood to the muscles limit muscular endurance exercise.

Strength of the muscles is also inherent in the ability to perform muscle endurance activities. Generally, the stronger the muscle the better the muscle endurance also.

While isometric exercise (pushing against immovable objects) may improve strength at the specific angles of training, it does little or nothing for circulation, muscular endurance, or flexibility. Isometric training for developing strength generally involves one maximal (or near-maximal) muscle contraction held four to six seconds. However, six to ten repetitions of this procedure will result in the best development of strength for isometric training. Isotonic exercise involves repeated contractions through a full range of movement in the joints and promotes circulation through the muscles. Therefore, strength, muscular endurance, and flexibility are promoted through isotonic training.

Strength training of high intensity using both isometric and isotonic methods generally increases muscle mass. The stimulus of the large weight resistance causes muscle mass to increase. This is called hypertrophy and is due to the increase in muscle fiber size primarily from the increase in proteins deposited in the cells. In addition to the increase in muscle size, isotonic training causes an increased number of capillaries to be used in the muscle. More blood supply is therefore available to the cells. Energy stores inside the cells are also increased through isotonic training thereby improving the function of the muscles. The actual speed of muscle contraction is increased with strength training regimens, i.e., faster movements are possible. The power of the muscles is therefore improved since power is defined as the work of the muscles done at a high rate of speed. Thus, muscular endurance is improved through isotonic training, when there is a better blood supply and more

energy stores available for muscle cell use. There have been claims that traditional weight training programs do not improve the cardio-respiratory system and therefore do not affect aerobic capacity. However, this question is now open for further research, particularly if the strength training protocol calls for minimal rest between sets of exercises and the total workout time is performed in a continuous manner.

The converse to muscle hypertrophy is atrophy or wasting away. If muscles are not used regularly, their size and function diminish. A good example of this is the observable deterioration of muscles on a limb that has had a cast for several weeks. The muscle cells decrease in size (protein is lost), the energy stores inside the cells are reduced, and the blood supply to the muscle is lessened.

Weight training on an every other day basis will result in strength gains that average two to six percent each week (1,41). The day between weight training workouts is beneficial for recuperating from the strenuous work. Apparently, muscle proteins are built up during the day of rest and waste products from the workout are removed. The person is then adequately prepared to work hard the following day in a regular workout session.

In order to improve muscular strength and endurance, the principle of overload must be followed. Overload means that the amount of weight or resistance must be gradually increased each week. When this extra work is gradually introduced, the muscles respond physiologically by adding more protein, energy stores and blood supply. Thus, their function is improved. The introduction of the overload stress must be gradual to allow the muscles to adapt and improve. If the overload stress is too great, the muscles fatigue rapidly and performance is reduced.

In addition to the overload principle, a high intensity effort must be developed by the muscles in order to cause maximum improvements in muscular strength and endurance. To improve strength, the weight resistance must be very high and just a few repetitions of movement performed. To improve muscular endurance, the weight resistance must be low and many repetitions of the exercise performed. In both cases, the efforts are near maximum but in the strength emphasis program the muscles are required to produce great force in four to six repetitions. In the muscular endurance program, the muscles are required to release large amounts of energy in the cells for repeated contractions of 15 to 20 repetitions. If time permits, three sets of exercises will give better results than one or two.

Mathews and Fox (42) have made some interesting observations concerning strength training. Individual differences in body type influence the growth in muscle girth. Persons of the mesomorphic type (muscular, and large bones, with wide shoulders, and narrow hips) respond the most to muscular training. Ectomorphs (lean, small bones, with narrow shoulders, and hips) respond less. Ectomorphic types of people increase strength, however, without the large increases in muscle size. An obese person is generally classified as an endomorph (narrow shoulders and wide hips). Mesomorphs can also be heavy and obese. Through a strength training program it is possible for an obese person to improve in muscle strength without large increases in girth. This is partially due to a concomitant loss in fat.

Plateaus in strength gains occur during training programs. That is, there is a rise in strength through training, then a level is reached where strength stays the same for a while. This usually indicates that the muscles have adapted to the resistance being lifted. After

the adaptation and the introduction of a new overload resistance, another rise in strength occurs, and so on. Plateaus in training also may be due to fatigue and "going stale." The latter is a term used to describe psychological boredom of repetitive training and is best prevented by offering variety in the training. By just changing the workouts slightly or doing a few new exercises the boredom of the same day-after-day regimen is prevented.

After a certain level of strength is acquired, it may be maintained by fewer workouts. It is generally agreed that strength, once attained, subsides at slower rates than it develops (42). One or two workouts a week may be all that is needed to maintain strength levels. However, this area is open for further research.

Strength and Muscle Endurance Relationships

Clarke (11) has summarized relationships between strength and muscular endurance. These relationships are listed below:

1. The amount of weight resistance required to exhaust a muscle during repetitive contractions depends on the strength of the individual. In other words, stronger persons need to lift more weight when training for muscular endurance. Therefore, individuals with greatest muscular strength have greatest absolute muscular endurance also.
2. There appears to be a specific combination of load (weight resistance) and speed of movement which produces maximum work output. Slow contractions with high weight resistance result in great strength gains, whereas fast contractions with low weight resistance result in muscular endurance improvements. In order for the total work output to be the same in both conditions, the number of repetitions has to be much larger for the endurance situation.

3. Fatiguing a muscle reduces its ability to apply tension. Strength drops off rapidly with fatigue. There is a close relationship between strength and muscular endurance. The faster a person can recover from an exhaustive endurance exercise, the faster strength is recovered.

Types of Strength Training

There are generally five groups of strength or weight trainers. The first, weight lifters, comprise a small group of athletes interested in competing in two Olympic lifts - the snatch, and jerk. They train with maximal poundages and do not exceed three repetitions per exercise set.

Secondly, the power lifters are concerned with the development of brute strength. They compete in the bench press, squat, and dead lifts all of which involve large amounts of weight. Their training includes extremely heavy weights with low repetitions per set and many sets per exercise.

The third, body builders, are interested in physique. They develop great definition (how the muscles look) by performing several sets of an exercise with a high number of repetitions in each set. This engorges the muscles with blood increasing their size (the so called "pumping effect").

The fourth group, athletes, use specific weight training programs to develop strength in the movement characteristics of their sport.

Finally, there are those of us who simply use weight training programs to keep in good muscle tone and wish to derive a few benefits from all of the previous four groups. Lifting weight increases blood pressure and could be dangerous to perform for many middle-aged men. A weight training regimen is recommended as an adjunct to an aerobics program and used for long-term maintenance of muscular strength and endurance.

Warm-Up and Cool-Down

Warm-up

There are two classifications of warm-up to define: (1) specific - this includes practicing or rehearsing a specific event (such as swinging a baseball bat before batting); and (2) general - this usually includes exercise that is unrelated to the competitive event.

The latter classification (general warm-up) is most important in physical fitness programs. General body warm-up is just that - increasing the internal (or core) body temperature through various exercises such as stretching, calisthenics, jogging, etc. Specific warm-up exercises are described in Chapter 4.

Increasing the internal temperature of the body is very important to the metabolism of the muscles and nerves. The chemical reactions within the cells speed up. For each degree of increase in body temperature, the metabolic rate increases three percent (2). This means that nerve messages will travel faster and muscle fibers will contract and relax faster. The muscles are therefore stronger after warm-up and recover quicker after exertion.

Increasing internal temperature through warm-up exercises also affects circulation. The blood vessels in the muscles dilate allowing more blood to flow to the cells, thus more nutrients can be delivered to the cells and more waste products removed. Hemoglobin, the oxygen carrying compound in the blood, gives up more oxygen to the muscle cells when the blood temperature is increased. Myoglobin, the oxygen storing compound inside the muscle cell, also releases more oxygen when the surrounding temperature is increased.

During a general body warm-up, blood flow through the lungs is increased. The exchange of oxygen and carbon dioxide is enhanced, thus increasing the oxygen supply and carbon dioxide release. As a result, the efficiency of the cardiorespiratory system is increased.

The above physiological phenomena result when the body is actively warmed-up. That is, the body is actively moved and many muscles are used. This active warm-up is more desirable than passive warm-up where muscles are heated by means of hot baths, showers, towels, and diathermy. Although the latter are somewhat beneficial, they should not be confused with active warm-up. An external heating source actually diverts blood flow from the muscle to the skin to combat the additional heat being introduced to the local area. The decreased circulation to the muscle can result in weakness and fatigue. Active warm-up promotes circulation inside the muscle.

The optimal active warm-up time has been recommended by deVries (20) to be ten to 15 minutes. This should result in a rise of one to two degrees F in the muscles' internal temperature. The time factor can vary due to several factors, including the individual's level of fitness, the activity, the temperature and humidity of the environment, the clothes worn, and the intensity of warm-up. A rule of thumb to follow for intensity and duration of warm-up under normal environmental conditions is to exercise until perspiration is evident. Wearing warm clothing will speed up the warm-up and retain the heat for several minutes. Warm clothing (rubber suits, etc.) should be avoided in warm, humid environments.

Muscle injury and soreness often are the result of an improper warm-up. Strenuous exertion without previous warm-up, can cause muscle strains and in some cases a muscle tear. The muscles usually injured

are the antagonists (opposite) of the strong contracting muscles. These "cold" antagonistic muscles relax slowly and incompletely when the agonists (prime movers) contract and thus retard free movement (48).

Several studies have demonstrated that improvements in physical performance (such as running, jumping, and throwing) are significant following warm-up. These studies support the physiological principles explained previously and are summarized in an article by Neuberger (51).

Cool-down

Just as the warm-up serves to gradually increase the internal body temperature, the cool-down after a workout serves to gradually lower body temperature. An active cool-down (such as walking) prevents blood from pooling in the legs (14) and circulation back to the heart is promoted. This amplified circulation will rid muscles of the fluid build-up and metabolic wastes that result from the muscular contractions in the workout. The fluid build-up and metabolic wastes are primarily responsible for the muscle soreness that occurs after a very strenuous exertion. It is recommended that an active cool-down of walking and stretching be continued for five to ten minutes after a strenuous workout.

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CHAPTER 3

METHODOLOGY OF STUDIES CONDUCTED BY THE INSTITUTE FOR AEROBICS RESEARCH

Program Description

To evaluate the physical fitness needs of police officers various programs of fitness tests and exercises were designed. The fitness tests also served the purpose of documenting the physiological changes incurred with various physical training programs implemented for police officers of different ages and job descriptions. The various programs of physical training included the following:

1. Richardson Police Department (RPD) and Texas Department of Public Safety (TDPS) - a general aerobics program designed to evaluate the integration of physical training programs into small police units which have minimal equipment and facilities and little or no funds available for exercise and testing programs. Young police officers, ages 21 to 35 years, participated in this program.
2. Dallas Police Department (DPD) Running Program - comparison of interval running, continuous running and combined interval/continuous running to determine the mode of endurance exercise which best improves the physiological functioning of young police officers, ages 21 to 35 years.
3. Dallas Police Department Weight Training Program - an evaluation of a weight training regimen to determine its effect on cardiorespiratory function of young officers, ages 21 to 35 years.

4. Dallas Police Department Supervised/Unsupervised Program - a comparison of closely supervised aerobic training with one of minimal supervision for middle-aged (36 to 52 years) police officers.

Selection of Participants

Information describing the opportunity to participate in a physical fitness program was distributed to all officers in the Richardson Police Department, Texas Department of Public Safety, and Dallas Police Department. Interested officers were asked to complete an application form for the program (see Appendix A). The applications were screened for apparently healthy and sedentary officers. The volunteers then attended a briefing during which the testing and exercise programs were described in detail and informed consent obtained. The following criteria for selection of participants in the study were explained to the volunteer officers:

1. Health: Participants must be free from coronary heart disease or other serious health problems.
2. Age: 21-35 years for RPD, TDPS, and DPD young programs
   Age : 36-52 years for DPD middle-aged programs
3. Availability: Participants must be available for training for 20 consecutive weeks plus two weeks for evaluations prior to and following the training phase.
4. Vacations: Participants will take no vacations during the project that would necessitate missing more than four consecutive days.
5. Life Style; Participants will not change general living habits during the project, such as diet and smoking habits.
6. Sedentary: Participants should not have been involved in any type of regular physical activity for at least one year.

7. Other physical activities during project: Officers will not participate in physical activities other than the training project.
8. Volunteers: Officers will be asked to participate on a volunteer basis.
9. Random Sampling: Officers must be willing to participate in any of the exercise or control groups to be chosen.

The officers were required to complete various medical and physical fitness evaluations and attitude questionnaires before being allowed to participate in the exercise programs. The attitude questionnaires were designed to document feelings toward self and exercise and the possible changes that take place in attitudes through exercise programs. All officers completed a medical history questionnaire (see Appendix B) which was reviewed by a physician, attitude questionnaires (see Appendix C) and then were evaluated by a Bruce maximal treadmill stress test (5) monitored for electrocardiogram (ECG) and blood pressure. The test progressed in three minute stages until the individual reached a voluntary maximal endpoint. The following lists the stages used in the Bruce treadmill test:

Stage	Speed (mph)	Grade (%)
1	1.7	10
2	2.5	12
3	3.4	14
4	4.2	16
5	5.0	18
6	5.5	20

Guidelines for Graded Exercise Testing published by the American College of Sports Medicine (1) were followed. Officers who exhibited abnormal ECG or blood pressure results on this "screening" test as determined by the physician were asked to consult their private physician and were not selected for the study. Only healthy and previously sedentary officers were selected for subsequent fitness evaluations and exercise participation. Those officers who were selected were given a practice session of running on the treadmill attired with the metabolic equipment (see Photograph 1) used to determine maximum oxygen intake. This practice session allowed for the learning and familiarization process that takes place in a test of this nature. The following numbers of officers were selected for the studies:

1. 29 young officers from the Richardson Police Department
2. 3 young officers from the Texas Department of Public Safety
3. 130 young officers from the Dallas Police Department
4. 53 middle-aged officers from the Dallas Police Department

After completing the cardiovascular-respiratory fitness tests described in the next section, the participants were randomly assigned to specific groups within each study as follows:

1. RPD and TDPS Program
   - A. 20 officers assigned to Training Group
   - B. 12 officers assigned to Control Group
2. DPD Young Officer Running Programs
   - A. 30 officers assigned to Interval Running Group
   - B. 30 officers assigned to Continuous Running Group
   - C. 30 officers assigned to Combined Running Group
   - D. 20 officers assigned to Control Group

3. DPD Young Officer Weight Training Program
   - A. 20 officers assigned to Weight Training Group
4. DPD Middle-Aged Programs
   - A. 20 officers assigned to Supervised Group
   - B. 20 officers assigned to Unsupervised Group
   - C. 13 officers assigned to Control Group

The officers assigned to the control groups took part in the fitness testing but remained sedentary for the 20 week experimental period. All officers in both the exercise and control groups received a complete exercise uniform including running shoes, shorts, T-shirt, and sweat suit for their participation in the study. After the 20 week experimental period the control groups were provided the opportunity to exercise.

Two young female officers from the RPD and six young female officers from the DPD volunteered for the program. In the RPD program one officer each was assigned to the training and control groups and in the DPD program two officers each were assigned to the continuous, interval, and combined running groups.

Physical Fitness Testing

Prior to the first visit to the laboratory for testing, each participating officer was required to abstain from eating, drinking, and smoking for 14 hours. Upon arriving at the laboratory a 15 ml blood sample was drawn for analysis of serum lipids (cholesterol and triglycerides), glucose, and uric acid. A second sample was drawn on a separate day for comparison and if the two samples did not agree, a third analysis was required.

Resting cardiovascular (CV) function was assessed by seating each officer in a quiet room for a 10 minute period and then recording his

resting heart rate and blood pressure. Heart rate was counted for one minute using a stethoscope and blood pressure was measured using a mercury sphygmomanometer. Submaximal CV function was measured by heart rate recovery from a three minute step test (11). Each officer performed the three minute test by stepping up and down on a 12 inch bench at a rate of 24 trips per minute. Immediately after completing the three minutes of stepping, the officer was seated and his recovery heart rate was counted for one full minute (0:05 to 1:05 into recovery).

In addition to the initial screening test, maximum cardiovascular-respiratory function was assessed a second time by a treadmill test during which the individual was asked to perform "all out." The young officers, ages 21 to 35 years, were tested using a treadmill running protocol described by Åstrand (2) as modified by Pollock et al. (16). The speed of running for each individual remained the same throughout the test; the grade of the treadmill was 0% during the first three minutes and then increased 2.5% grade every two minutes thereafter. The middle-aged officers were tested a second time using the same Bruce treadmill test protocol (5) described previously. The maximum amount of time performed on the treadmill test is considered a measure of working capacity, i.e., the longer one performs in the standard protocol, the more fit the individual. During the second treadmill tests maximum oxygen intake ($\dot{V}O_2$ max), maximum heart rate (MHR), and maximal pulmonary ventilation ($\dot{V}_E$ max) measures were monitored. Metabolic procedures and calculations described by Consolazio et al. (7) were followed.

Body composition was analyzed by various measurements of body weight, girths, and skinfold fat. Body weight was measured to the nearest 10 grams on an Acme scale and later converted to pounds for

statistical analysis. Skinfold fat measures were determined to the nearest 0.5 mm with a Lange caliper and included the chest, axilla, triceps, abdomen, hip, and thigh locations. Recommendations published by the Committee on Nutritional Anthropometry of the Food and Nutrition Board of the National Research Council were followed in obtaining skinfold data (12). Girth measures were taken to the nearest 0.1 cm with a Lufkin steel tape at the shoulder, chest, abdomen, waist, gluteal, thigh, arm (biceps), and forearm locations. Specific recommendations on the exact locations for obtaining skinfold and girth measures are shown by Behnke and Wilmore (3). Body density was calculated for the young officers using the skinfold formula D = 1.08847 - (.007123 axilla) - (.004834 chest) - (.005513 triceps) reported by Pascale et al. (15). The formula D = 1.10185 - (.00072 chest) - (.00046 axilla) - (.001 gluteal girth) + (.00227 forearm girth) involving both skinfold and girth measures reported by Pollock et al. (18) was used to calculate body denstiy for the middle-aged officers. Body density was converted to percent body fat using the formula (fat = 4.95 ÷ D - 4.5) reported by Siri (19).

In addition to the above anthropometric determinations, body density was measured by the underwater weighing technique (9) and percent body fat calculated by the Brožek et al. formula (4) for young officers in the weight training, continuous running, and control groups of the DPD. This technique is the most accurate method of determining body composition and was used mainly to document more accurately the body fat levels of young officers and the body density changes through weight training.

Vital capacity (VC) of the lungs and forced expiratory volume of air expelled in one second (FEV_1) were measured using a rolling seal spirometer (Ohio Medical Model 842). The procedures outlined by Kory et al. (13) and W. E. Collins, Inc. (6) were followed. FEV_1 was expressed as percentage of VC in the results ($FEV_1 \div VC$).

Various motor ability field tests were administered to represent areas of physical fitness that may enhance the performance of a police officer when challenged physically. Flexibility of the lower back and legs was determined by the sit and reach test (14). The total number of pushups and the number of bent-knee situps performed in one minute were used as measures of muscular endurance (14). Power was measured by the vertical jump test (10) and agility was represented by the Illinois Agility Run (8).

Strength was measured by both isotonic and isokinetic techniques. The Universal Gym Apparatus was used to measure the one-repetition maximum bench press strength of all participating officers. For those officers in the weight training phase of the study, additional isokinetic strength measures were obtained using Cybex machinery. The isokinetic devices measured the dynamic tension produced in the muscles at every point in their shortening range and was recorded as torque in ft.lbs. Basic muscular strength was assessed during a slow contractile speed (30^0 per sec) and functional muscular strength was measured during a fast contractile velocity (180^0 per sec). Peak torque achieved was recorded for both the slow and fast techniques in the knee extension, leg press, and bench press modes of exercise.

In addition to some of the above field tests, participating officers in the Richardson Police Department (RPD) were asked also to perform the field test devised by that department. The field test had been used by the RPD for the past two years as a screening physical fitness test for applicants to the department. It consists of four parts each of which is timed separately and then added to obtain a total score for the

entire test. The first phase of the test is an obstacle course which included a three- and a six-foot wall to climb, utility poles to zig-zag around, a tunnel to crawl through, a six-inch beam to walk, and a 12 foot high horizontal ladder to cross using the hand-over-hand technique. The second phase is called the body drag and involves running 65 feet, picking up a 160 pound dummy and dragging it 65 feet back to the start. The third phase is a stair run which includes two trips up and down two flights of stairs. The final phase is termed a "street chase" and consists of running 440 yards around a grass field area. The RPD feels that these items relate to the job requirements of their patrolmen.

Physical Fitness Programs

The exercise programs for both the young and middle-aged officers were conducted over a 20 week period of time. All officers exercised 3 days per week for approximately 45 minutes per exercise session. The first 15 minutes of the workout was devoted to a standard warm-up period involving various stretching and calisthenic exercises completed in the following order:

1. Jumping Jacks (20 reps)
2. Pushups (20 reps)
3. Situps (30 reps)
4. Squats (10 reps)
5. Pullups (5 reps positive or negative)
6. Back stretch (30 sec)
7. Side stretch (5 reps each side)
8. Double arm circles and toe raise (20 reps)
9. Trunk rotation (5 reps each direction)
10. Forward bend (10 reps)
11. Front leg stretch (30 sec)
12. Hamstring stretch (30 sec)
13. Calf stretch (30 sec)

The above repetitions and/or times were recommended to the officers; however, each officer recorded his exact repetitions and/or time for each warmup exercise.

The remaining 30 minutes of each workout were devoted to the specific exercise prescribed for each group. The following describes each exercise program:

1. RPD and TDPS Program - The aerobic program consisted of walking and jogging on a 440 yard marked path on a grass field area. The path was located in one of the Richardson City Parks and traversed in and out of trees. Several turns were designed for the jogging path in an effort to avoid the monotony often encountered when training on oval tracks. Initially, the walking and jogging distances were equal but the training progressed throughout the 20 weeks in such a fashion that the individuals walked less and jogged longer distance; for example, jog one mile, walk 110 yards, jog one mile.

2. DPD Young Officer Running Programs - The aerobic programs consisted of either interval running, continuous running, or combined interval/continuous running on an oval 440 yard cinder track.

   A. Interval Program - This group alternated short periods of high intensity work (running) and low intensity work (walking). Essentially the training consisted of walking 220 yards and then running 220 yards at high speed.

   B. Continuous Program - This group walked and jogged equal distances initially but progressed throughout the 20 weeks in such a fashion that the individuals walked less and jogged longer distances. The final few weeks of training were essentially continuous jogging for the exercise period.

   C. Combined Program - This group alternated days of training in the interval program with those of the continuous program.

3. DPD Young Officer Weight Training Program - This group exercised in a program of weight training. The weights were adjusted so that each individual was working at approximately 50% of his one-repetition maximum strength and the repetitions progressed from 10 to 20 per set for the first six weeks and then reduced to 15 per set for the remaining 14 weeks. It was found that 20 repetitions per set was too uncomfortable for the officers. The individual moved in a continuous fashion from one exercise to another with a rest period between sets of 30 seconds for the first five weeks. Thereafter the rest period decreased to 25 and finally to 20 seconds between each set. The above protocol using relatively light weights, several repetitions and minimal rest between sets was designed to determine if cardiovascular-respiratory improvements could be elicited by such a program. The following weight training, stationary cycling, and calisthenic exercises were performed in each workout:

A. Cycling at 900 kpm/min for 2 minutes	F. Dips
B. Bench Press	G. Leg Press
C. Knee Extension	H. Situps
D. Hamstring Curl	I. Shoulder Press
E. Biceps Curl	J. Lat Pull
	K. Upright Rowing

4. DPD Middle-Aged Programs - The aerobic program consisted of a walking and jogging routine similar to that described for the RPD and TDPS program.

A. Supervised Program - This group exercised on an oval 440 yard cinder track under direct supervision of exercise leaders conducting this study.

B. Unsupervised Program - This group exercised under direct supervision for the first four weeks of the study and thereafter were required to train on their own at locations of their choice other than the central location where supervision was available. However, every two weeks this group was required to return to the central location for one exercise session under supervision to check training progress.

In order to estimate the intensity of exercise, all officers in the exercise programs were asked to record their heart rates by the palpation technique (17) at the middle (15 minutes) and end (30 minutes) of each workout. In order to quantify the training of the running programs, the distances and times of the walking and jogging segments were recorded for each workout (see Appendix D). For example, an individual may have recorded 0.75 mile walking in 12 minutes and 2.0 miles jogging in 18 minutes. In this way, the energy cost for the total workout could be calculated. In the DPD young officer running programs the distances and paces of running and walking were designed so that the total calorie cost for the three programs was approximately the same. The weight training program was quantified by recording the number of repetitions and weight used for each exercise. For example, a person may have recorded 2 sets of 15 repetitions in the bench press exercise using 120 pounds.

Data Processing

Means (averages) and standard deviations (variability) were calculated by computer on all the measurements taken before and after the 20 week training programs. Percentile norms for different age groups were calculated using the data obtained on all officers tested initially. Initial differences among the control and training groups were compared by analysis of variance (ANOVA). The analysis of covariance (ANCOVA) was used to determine the significant changes among the groups from before (T_1) to after (T_2) the training with T_1 scores being the covariates. A probability of 0.05 was used as the significance level in the statistical comparisons.

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CHAPTER 4

RESULTS AND DISCUSSION OF STUDIES CONDUCTED BY THE INSTITUTE FOR AEROBICS RESEARCH

The main purpose of this section is to report the results of the information collected on 213 members of the Dallas and Richardson Police Departments and the Texas Department of Public Safety. The information will be divided into two segments; 1) coronary heart disease risk and physical fitness levels of police officers, and 2) results of the various 20-week training programs. The latter portion of this chapter will deal with the results on drop-outs and attitudes toward the various exercise programs. The attitude information on this phase of the report was from a questionnaire shown in Appendix C.

Coronary Heart Disease Risk Factors and Physical Fitness Levels

Coronary heart disease is prevalent in most industrialized countries, and in the U.S. alone the annual death toll from coronary heart disease reaches approximately 600,000 (2). Certain risk factors are associated frequently with the development of coronary heart disease. Risk factors established by the American Heart Association include the following: high blood pressure, elevated blood fats (mainly cholesterol and triglycerides), cigarette smoking, obesity, physical inactivity, elevated blood sugar and uric acid, family history, and excessive emotional stress (2,8,13). Population investigations, such as the Framingham study, have shown not only that the manifestation of coronary heart disease is influenced by certain risk factors but also that the probability is increased drastically with added numbers of risk factors (8,15).

Several studies have indicated a relationship between physical activity and reduced susceptibility to coronary heart disease (7-10,12,15,21,24). Although there are some conflicting views, recent studies by Morris et al. (21), Paffenbarger and Hale (24), and Cooper et al. (7) have placed stronger evidence in favor of the role exercise plays in preventive medicine. Morris et al. (21) in studying the leisure-time habits of over 16,000 male, executive grade civil servants from 40 to 64 years of age, concluded that vigorous exercise apparently protected them against sudden fatal heart attacks and other first clinical attacks of coronary heart disease. The study by Paffenbarger and Hale (24) on 6,351 longshoremen, 35 to 75 years of age, found that the workers classified in a high caloric output job task had significantly lower death rates from coronary heart disease. Cooper et al. (7) in a cross-sectional study on 3,000 men, found a significant relationship between level of cardiorespiratory fitness and selected risk factors and fitness variables (serum cholesterol, triglycerides, glucose and uric acid, systolic blood pressure, percent body fat and weight, resting heart rate, and forced vital capacity).

What is the physical fitness level and risk factor profile of police officers? How do they compare with other occupational groups? What are the physical fitness needs of police officers? A review of the literature failed to provide sufficient information to give adequate answers to these questions. There is some evidence in the literature suggesting that policemen are average to below average in physical fitness and risk for coronary heart disease when compared to the general sedentary population (5,6,18,26,27,38).

Kaminski (14) reported the need for physical fitness programs for police officers. He stated that physical fitness for law enforcement purposes consists of two distinct but equally important areas; 1) the cardiorespiratory system (conditioning of the heart, lungs, and circulatory system); and, 2) motor ability (achievement abilities such as muscular strength and endurance, agility, and flexibility), that relate to the

skills necessary to perform the basic job-related tasks. Good cardiorespiratory fitness is indicative of the ability of the body to adapt and recover from periods of physical stress. This type of fitness results in a more efficient performance of duty, reduced probability of heart disease, and less frequent on or off duty injury due to overexertion (4,5,26). A recent survey conducted with firemen who were placed on an exercise regimen showed lower worker's compensation loss (23). A good fitness program should lead to a greater career expectancy rate as officers would not have to retire prematurely for medical reasons.

Thus there is a need to quantify better the physical fitness level and risk factor profile of police officers. It is felt that this information will provide evidence as to their need for physical fitness and other preventive medicine programs.

The sample consisted of 213 male volunteer police officers from Dallas and Richardson (Texas) Police Departments, and the Texas Department of Public Safety. The officers were between 21 and 52 years of age ($\bar{X}$ = 31.8 yr) and free from known cardiovascular or other serious diseases or disabilities. Several women were a part of the overall study but their sample was too small for inclusion in this report.

The data were averaged and standard deviations calculated. Then percentile score tables were constructed on each variable. To determine coronary risk the data were compared to the standards recommended by the American Heart Association (2) and the Cooper Clinic[a]. To compare the fitness levels of police officers, the data for the general population, Los Angeles County Sheriff's Department Personnel and Highway Patrolmen, and prison inmates were plotted on the norm scales developed for police officers.

[a] Cooper Clinic, 12100 Preston Road, Dallas, Texas 75230

Coronary Heart Disease Risk

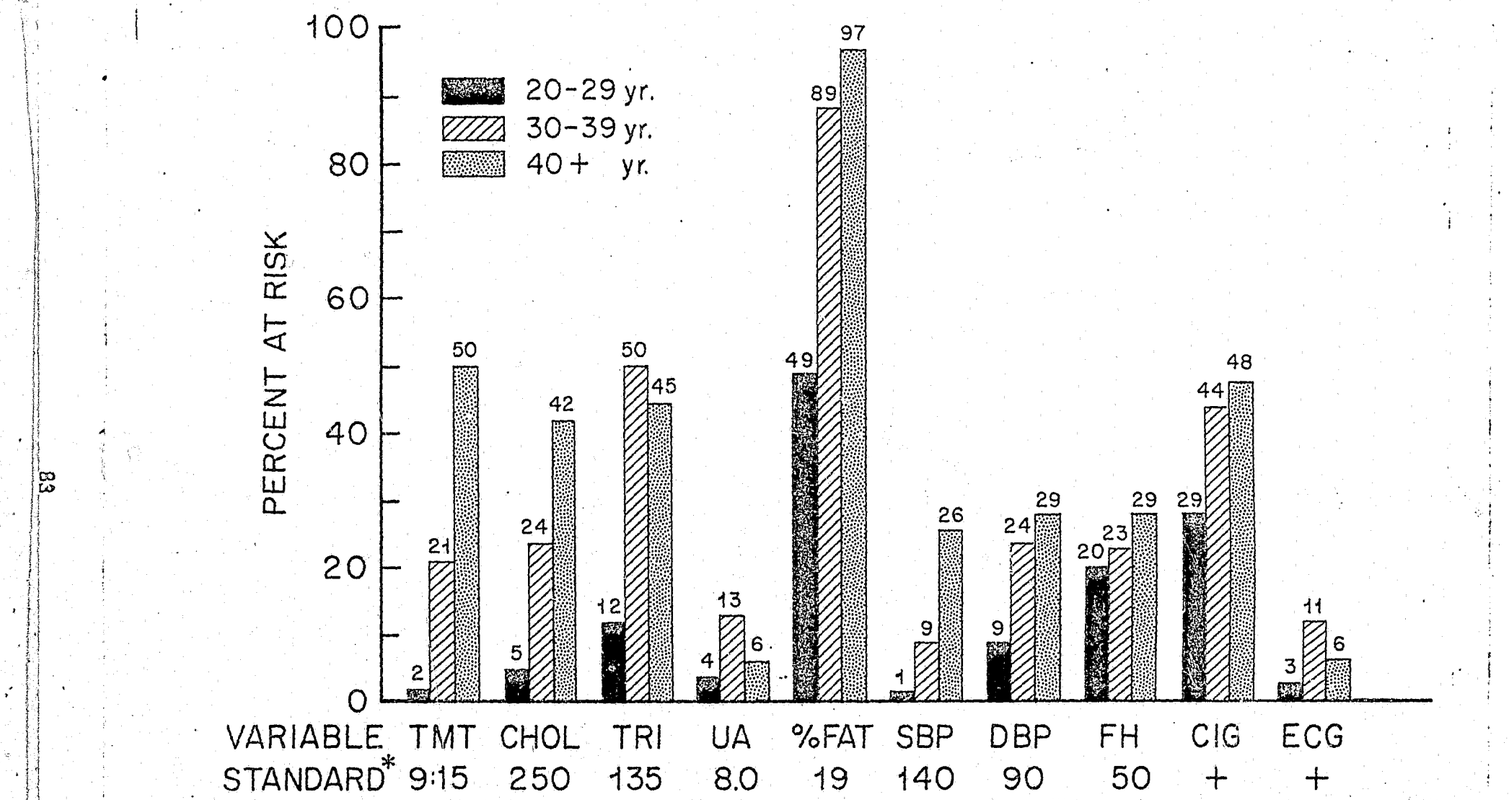
The data related to coronary heart disease risk for police officers are shown in Table 1 and Figure 1. These variables include performance time on the treadmill (TMT), cholesterol (CHOL), triglycerides (TRI), uric acid (UA), percent body fat (% FAT), systolic blood pressure (SBP), diastolic blood pressure (DBP), a blood relative less than 50 years of age having heart disease (FH), cigarette smoking (CIG), and abnormal exercise electrocardiogram (ECG). Data for smoking, family history of coronary heart disease, and abnormal exercise electrocardiogram were quantified as to a yes or no response. To quantify coronary risk for police officers the data were compared to the standards recommended by the Cooper Clinic. Figure 1 lists the criteria used to determine if an individual is at risk, and shows the percentage of police officers at risk for each of the age groups.

The results show a distinct increase in coronary risk with age. This relationship is well established in the literature (2,15,16). Compared to the general population, the police officers studied in this investigation were shown to be average in coronary risk in all variables except body fat in men 20-29 years of age; serum triglycerides and body fat in men 30-39 years of age; and treadmill performance, serum cholesterol, serum triglycerides, and body fat in the group aged 40-52. In comparison with 68 Los Angeles City Fire Fighters who were 40-50 years of age, the police scored significantly lower in cardiorespiratory endurance, and higher in serum cholesterol, diastolic blood pressure, percent fat, and percent of smokers (23). Overall the younger police officers seem to be of average risk and the older officers appear to be at higher than average risk.

Table 1. Coronary risk factor scores of police officers

Age Group		Coronary Risk Factor Variables*								
		TMT (min:sec)	CHOL (mg %)	TRI (mg %)	GLU (mg %)	UA (mg %)	% FAT	SBP (mmHg)	DBP (mmHg)	AGE (yr)
20-29	$\bar{X}$	10:46	188	92	81	6.2	20.9	122	81.2	25.8
(n=91)	SD	1:0	36	42	5.7	1.0	5.9	7.2	5.8	2.1
	Range	8-13:40	106-315	35-254	68-95	3.9-9.4	8-33	106-140	65-94	21-29
30-39	$\bar{X}$	10:00	219	146	84	6.5	24.1	123	83	33.4
(n=90)	SD	1:0	43	76	6.9	1.2	4.3	10.9	8.4	2.7
	Range	7:30-12:45	122-364	44-420	63-102	4.5-9.8	16-35	100-156	65-100	30-39
40-52	$\bar{X}$	9:06	242	164	85	6.2	25.0	123	84.1	44.0
(n=32)	SD	0:48	41	144	8.3	1.0	3.4	9.0	7.9	3.0
	Range	7:08-10:45	162-366	58-858	69-108	4.9-8.9	18-32	102-138	58-100	40-52

* TMT = Treadmill time, CHOL = Cholesterol, TRI = Triglycerides, GLU = Glucose, UA = Uric Acid, SBP = Systolic Blood Pressure, DBP = Diastolic Blood Pressure



CORONARY RISK FOR POLICE OFFICERS
20-52 YEARS OF AGE (n=213)

*Risk Factor Standards Used at Cooper Clinic, Dallas, Texas

FIGURE 1.

The results showed that of the 213 police officers studied, 90% had at least one risk factor, 67% had two, 50% had three, 33% had four, and 18% had five. As mentioned earlier, an increase in coronary risk is significantly greater with each added risk factor (8,15,16). Thus, these data reflect the potential danger of coronary heart disease in these police officers.

Although much of the risk factor data found with police officers were considered average in relation to the general population in the United States, it must be remembered that Americans lead the world in deaths from coronary heart disease (2). The need for a good preventive medicine program for police officers is apparent.

Physical Fitness

Percentile tables were constructed for police officers and included data relating to working capacity, cardiorespiratory fitness, body composition, and motor ability. Tables 2 and 3 show data for police officers 21-35 years of age and Tables 10 and 11, 36-52 years of age. The 50th percentile on each table represents the mid point in the variable measured for each group of police officers with half scoring lower and half higher. For comparative purposes, data for the general population (3,22,32), inmates (35), Sheriff's Department Personnel (26) and Highway Patrolmen (38) are plotted on the various tables. Other percentile tables (Tables 4-9) which contain the same information as Tables 2,3,10, and 11 were developed by age decades: 20-29, Tables 4 and 7; 30-39, Tables 5 and 8; and, 40+ years, Tables 6 and 9.

Young Police Officers - Tables 2 and 3 show normative data on working capacity, cardiorespiratory endurance, pulmonary function, serum lipids, body compition, and motor ability of police officers aged 21-35 years. When compared to the

Table 2. Work capacity, cardiorespiratory and pulmonary function, and serum lipids of police officers 21-35 years of age.

Percentile Rankings	TMT (min:sec)	$\dot{V}O_2$ max (ml/kg•min)	HR max (bts/min)	Step Test (bts/min)	RHR (bts/min)	RSBP (mmHg)	RDBP (mmHg)	VC (L)	$FEV_1 \div VC$ (%)	Chol. (mg/100ml)	Tri. (mg/100ml)
99	13:00	50.0	213	76	47	106	65	7.99	91	122	42
95	12:15	48.0	210	81	51	108	70	7.26	88	138	46
90	12:00	47.0	204	88	52	112	74	6.88	86	152	54
85	11:30	45.5	204	93	55	114	75	6.50	85	157	60
80	11:15	44.8	202	97	58	116	76	6.39	85	163	63
75	11:00	44.0	200	98	59	116	78	6.28	84	169	69
70	11:00	43.2	199	99	60	118	78	6.16	84	178	74
65	10:45	42.4	198	101	60	118	80	6.05	83	184	76
60	10:45	42.0	196	103	62	120	80	5.94	83	188	80
55	10:30	41.6	194	105	63	122	82	5.83	82	190	88
50	10:30	40.7	194	108	64	122	82	5.72	82	195	94
45	10:25	40.1	193	109	66	124	83	5.61	81	202	100
40	10:15	39.5	192	111	66	124	84	5.49	80	207	110
35	10:15	38.6	192	114	68	126	84	5.34	79	211	116
30	10:02	37.7	190	116	69	126	86	5.20	79	216	124
25	10:00	37.1	188	119	70	128	86	5.05	77	224	150
20	9:50	36.7	186	121	71	128	88	4.90	76	228	162
15	9:45	36.0	183	125	73	130	90	4.75	76	238	178
10	9:25	35.2	180	129	74	132	92	4.60	73	251	200
5	8:45	34.2	177	138	76	137	94	4.27	67	266	236
1	8:00	30.8	168	153	85	143	98	3.65	14	332	384
N	154	153	153	152	153	153	153	154	154	154	154
$\bar{X}$	10:32	40.7	194	108	64	122	82	5.68	79	199	115
SD	1:01	4.5	10	16	8	8	7	.80	11	42	67

TMT = treadmill time; VO_2 max = maximum oxygen intake; HR max = maximum heart rate; Step Test = 3 min step test recovery heart rate; RHR = resting heart rate; RSBP = resting systolic blood pressure; RDBP = resting diastolic blood pressure; VC = vital capacity; $FEV_1 \div VC$ = forced expiratory volume for one second divided by vital capacity; Chol. = cholesterol; Tri. = triglycerides.

- - - Inmates
——— Sedentary average
------ Sheriff's Department and Highway Patrolmen

Table 3. Body composition and motor ability of police officers 21-35 years of age.

Percentile Rankings	Height (in)	Weight (lb)	Fat (%)	Skinfolds Sum of 6 (mm)	Waist (in)	Press[1] (lb)	Pushups (No.)	Situps (No.)	VJ[2] (in)	Agility[3] (sec)	Flex[4] (in)
99	77.2	140.9	9.8	36	29.4	245	46	49	26.1	16.5	24.3
95	75.2	146.9	12.1	60	30.6	195	38	44	23.3	16.8	23.0
90	74.2	150.4	14.9	79	32.0	180	32	43	22.2	17.0	22.1
85	73.6	153.4	16.4	91	32.6	180	30	41	21.1	17.3	21.3
80	73.0	155.7	17.8	96	33.0	165	27	40	20.4	17.5	20.9
75	72.4	161.1	19.0	101	33.7	165	25	39	19.7	17.7	20.4
70	71.9	166.2	20.0	110	34.8	165	23	38	19.2	17.9	20.0
65	71.5	170.4	20.5	119	35.2	165	22	37	18.8	18.0	19.5
60	71.1	174.3	20.9	124	35.5	165	22	35	18.5	18.2	18.9
55	70.8	177.2	21.2	126	35.9	145	20	35	18.2	18.3	18.4
50	70.5	180.5	22.5	129	36.3	145	20	34	17.9	18.5	18.0
45	70.1	184.1	23.3	132	36.9	145	20	34	17.6	18.7	17.6
40	69.8	186.1	23.8	136	37.4	145	19	33	17.3	18.8	17.2
35	69.4	191.1	24.2	140	37.8	135	18	32	17.0	18.9	16.9
30	69.1	196.2	24.7	144	38.5	135	16	31	16.6	19.1	16.5
25	68.7	201.6	25.4	155	39.0	135	15	30	16.3	19.2	15.9
20	68.4	205.8	26.7	163	39.4	135	15	29	15.9	19.4	15.2
15	68.1	210.0	27.5	173	40.1	130	15	28	15.5	19.6	14.3
10	67.8	218.0	30.0	180	41.4	115	12	26	15.0	19.9	13.4
5	67.3	231.3	30.9	185	42.9	115	10	25	14.5	20.3	11.9
1	66.6	250.7	32.8	242	44.1	100	7	18	11.9	21.1	8.9
N	154	154	66	154	154	144	143	145	144	135	145
$\bar{X}$	70.6	182.8	22.1	129	36.5	152	21	34	18.1	18.5	17.8
SD	2.4	26.5	5.4	40	3.6	27	8	6	3.2	1.0	3.4

[1] Press = maximum one repetition bench press; [2] VJ = vertical jump; [3] Agility = Illinois agility run; [4] Flex = flexibility sit and reach.

-·-·- Inmates
——— Sedentary average
····· Sheriff's Department and Highway Patrolmen

Table 4. Work capacity, cardiorespiratory and pulmonary function, and serum lipids of police officers 20-29 years of age.

Percentile Rankings	TMT (min:sec)	$\dot{V}O_2$ max (ml/kg•min)	HR max (bts/min)	Step Test (bts/min)	RHR (bts/min)	RSBP (mmHg)	RDBP (mmHg)	VC (L)	$FEV_1 \div VC$ (%)	Chol. (mg/100ml)	Tri. (mg/100ml)
99	13:40	53.6	215	76	49	106	65	8.20	92	106	35
95	12:30	48.7	211	80	51	110	72	7.38	88	134	46
90	12:00	47.7	208	87	52	112	74	7.01	87	145	50
85	12:00	47.2	204	91	55	114	76	6.64	86	153	55
80	11:35	46.7	203	94	57	116	76	6.43	85	155	59
75	11:15	45.5	202	97	58	118	78	6.32	85	163	62
70	11:15	44.9	200	98	59	118	78	6.21	84	168	64
65	11:00	44.3	200	99	60	120	80	6.11	83	174	70
60	11:00	43.5	198	101	60	120	80	6.00	83	180	73
55	10:45	42.7	197	104	62	122	80	5.89	82	184	76
50	10:45	42.2	195	106	63	122	82	5.78	82	186	78
45	10:30	41.8	194	108	64	124	82	5.67	81	188	85
40	10:30	41.2	194	109	64	124	82	5.56	80	193	89
35	10:30	40.5	194	110	66	126	84	5.44	79	202	96
30	10:23	39.9	192	113	67	126	84	5.29	78	207	103
25	10:15	39.2	192	115	69	128	84	5.14	77	211	110
20	10:05	38.2	190	119	69	128	86	4.99	76	216	116
15	10:00	37.3	186	121	71	128	88	4.84	73	225	123
10	9:50	36.4	183	127	74	132	88	4.70	72	240	154
5	9:20	34.6	177	132	76	134	92	4.55	66	250	175
1	8:00	30.9	167	159	88	140	94	3.80	9	316	254
N	89	88	88	87	88	88	88	89	89	89	89
$\bar{X}$	10:48	42.2	196	106	63	122	81	5.79	79	188	92
SD	1:00	4.5	9	16	8	7	6	.79	12	36	42

TMT = treadmill time; $\dot{V}O_2$ max = maximum oxygen intake; HR max = maximum heart rate; Step Test = 3 min step test recovery heart rate; RHR = resting heart rate; RSBP = resting systolic blood pressure; RDBP = resting diastolic blood pressure; VC = vital capacity; $FEV_1 \div VC$ = forced expiratory volume for one second divided by vital capacity; Chol. = cholesterol; Tri. = triglycerides.

Table 5. Work capacity, cardiorespiratory and pulmonary function, and serum lipids of police officers 30-39 years of age.

Percentile Rankings	TMT (min:sec)	$\dot{V}O_2$ max (ml/kg·min)	HR max (bts/min)	Step Test (bts/min)	RHR (bts/min)	RSBP (mmHg)	RDBP (mmHg)	VC (L)	$FEV_1 \div VC$ (%)	Chol. (mg/100ml)	Tri. (mg/100ml)
99	12:45	45.7	213	78	46	100	65	7.39	89	122	44
95	11:45	44.4	204	83	51	107	70	6.97	87	157	61
90	11:15	43.6	202	93	54	110	72	6.48	86	168	65
85	10:57	42.4	198	97	56	112	74	6.35	85	178	76
80	10:45	41.9	198	98	59	114	75	6.21	84	187	81
75	10:35	41.2	196	101	60	116	78	6.07	84	192	94
70	10:30	40.2	194	103	61	118	78	5.94	83	196	101
65	10:15	39.5	194	104	63	118	80	5.80	83	202	110
60	10:15	38.7	193	107	64	118	82	5.66	83	206	115
55	10:05	37.7	192	110	66	122	82	5.52	82	210	125
50	10:00	37.2	190	112	66	124	83	5.40	82	216	142
45	10:00	36.8	188	113	68	124	84	5.27	81	223	149
40	9:50	36.5	186	116	69	124	85	5.15	80	226	160
35	9:50	36.0	186	118	69	125	86	5.02	79	236	166
30	9:45	35.6	185	119	71	126	88	4.90	79	238	178
25	9:30	35.0	183	122	72	128	88	4.77	78	251	186
20	9:15	34.4	180	125	73	129	90	4.65	77	257	199
15	9:00	33.7	179	129	74	132	92	4.52	76	266	220
10	9:00	32.9	178	136	76	137	94	4.21	75	274	236
5	8:15	31.1	176	140	79	142	98	3.85	70	292	287
1	7:30	29.3	168	153	100	148	100	3.57	14	364	420
N	84	85	85	85	85	85	85	85	85	85	85
$\bar{X}$	10:02	37.8	190	112	66	122	83	5.38	80	220	150
SD	0:58	4.0	9	16	9	10	8	.81	9	43	77

TMT = treadmill time; $\dot{V}O_2$ max = maximum oxygen intake; HR max = maximum heart rate; Step Test = 3 min step test recovery heart rate; RHR = resting heart rate; RSBP = resting systolic blood pressure; RDBP = resting diastolic blood pressure; VC = vital capacity; $FEV_1 \div VC$ = forced expiratory volume for one second divided by vital capacity; Chol. = cholesterol; Tri. = triglycerides.

Table 6. Work capacity, cardiorespiratory and pulmonary function, and serum lipids of police officers 40+ years of age.

Percentile Rankings	TMT (min:sec)	$\dot{V}O_2$ max (ml/kg·min)	HR max (bts/min)	Step Test (bts/min)	RHR (bts/min)	RSBP (mmHg)	RDBP (mmHg)	VC (L)	$FEV_1 \div VC$ (%)	Chol. (mg/100ml)	Tri. (mg/100ml)
99	10:45	42.2	197	82	52	102	74	6.44	99	162	58
95	10:30	39.1	196	86	58	108	76	6.21	85	190	60
90	10:00	35.8	195	92	58	110	77	5.92	83	201	71
85	9:45	34.5	190	94	58	112	78	5.63	83	206	78
80	9:38	34.1	189	96	59	112	80	5.46	83	206	83
75	9:30	33.8	188	97	60	114	80	5.38	82	208	85
70	9:20	33.5	186	99	61	118	81	5.29	82	217	105
65	9:17	33.0	185	104	64	118	82	5.21	79	218	112
60	9:15	32.6	185	108	65	121	82	5.13	79	239	113
55	9:15	32.3	184	109	66	122	84	5.05	77	241	125
50	9:03	32.0	179	111	66	124	84	4.97	77	243	131
45	9:00	31.7	179	116	68	125	86	4.89	76	248	136
40	9:00	31.4	173	117	68	126	86	4.81	76	252	149
35	9:00	31.1	172	117	68	126	86	4.73	74	254	164
30	8:50	30.8	172	119	69	126	88	4.65	73	258	170
25	8:45	30.4	170	119	70	128	90	4.57	73	266	170
20	8:30	29.7	169	129	71	128	90	4.47	71	268	200
15	8:00	29.0	167	129	75	130	92	4.22	70	270	252
10	7:50	28.3	166	139	75	133	94	3.98	68	283	270
5	7:30	27.7	160	144	78	136	98	3.74	68	330	316
1	7:10	26.8	160	145	90	136	100	3.55	59	366	858
N	30	27	27	29	30	30	30	29	29	30	30
$\bar{X}$	9:04	32.4	179	112	67	122	85	4.92	77	242	165
SD	0:49	3.2	11	17	8	9	6	.57	7	41	147

TMT = treadmill time; $\dot{V}O_2$ max = maximum oxygen intake; HR max = maximum heart rate; Step Test = 3 min step test recovery heart rate; RHR = resting heart rate; RSBP = resting systolic blood pressure; RDBP = resting diastolic blood pressure; VC = vital capacity; $FEV_1 \div VC$ = forced expiratory volume for one second divided by vital capacity; Chol. = cholesterol; Tri. = triglycerides.

Table 7. Body composition and motor ability of police officers 20-29 years of age.

Percentile Rankings	Height (in)	Weight (lb)	Fat (%)	Skinfolds Sum of 6 (mm)	Waist (in)	Press[1] (lb)	Pushups (No.)	Situps (No.)	VJ[2] (in)	Agility[3] (sec)	Flex[4] (in)
99	77.0	135.3	9.7	32	27.7	245	46	50	25.7	16.6	24.7
95	75.3	146.8	10.4	52	30.0	215	39	45	23.5	16.7	22.5
90	74.2	148.8	12.2	61	31.3	180	35	44	22.8	16.9	21.5
85	73.7	151.3	14.6	79	32.0	180	32	43	22.1	17.1	21.1
80	73.1	153.7	15.4	87	32.5	180	30	41	21.3	17.3	20.8
75	72.6	154.9	17.0	92	32.8	165	28	41	20.5	17.5	20.4
70	72.0	157.4	17.9	98	33.2	165	25	41	19.5	17.6	20.1
65	71.4	162.1	18.5	101	34.1	165	25	40	19.2	17.8	19.7
60	71.2	166.7	19.9	112	34.6	165	23	38	18.8	17.9	19.3
55	70.9	168.8	20.3	121	35.1	165	22	38	18.5	18.0	18.8
50	70.6	174.2	20.8	124	35.3	145	21	37	18.1	18.2	18.2
45	70.3	181.8	21.2	126	35.4	145	20	36	17.8	18.3	17.5
40	69.9	185.1	22.9	130	35.9	145	20	35	17.4	18.4	17.2
35	69.4	188.3	24.1	136	38.9	145	19	34	17.1	18.6	16.9
30	69.1	197.6	24.8	145	37.9	145	18	34	16.9	18.8	16.6
25	68.7	204.8	25.3	152	38.7	135	16	33	16.6	19.0	16.0
20	68.3	207.9	26.1	162	39.4	135	15	32	16.2	19.2	15.1
15	68.1	212.0	27.0	175	40.3	130	15	31	15.8	19.3	14.2
10	67.8	228.4	28.1	180	42.1	120	12	30	15.4	19.6	13.0
5	67.4	242.6	30.7	195	43.3	115	10	28	14.8	20.1	11.9
1	66.4	261.5	31.3	247	48.3	90	2	15	11.3	20.8	7.3
N	89	89	34	89	89	81	79	81	80	75	81
$\bar{X}$	70.7	181.3	20.9	123	35.9	156	22	37	18.4	18.3	17.7
SD	2.5	30.3	5.89	46	4.1	30	9	6	2.9	0.9	3.4

[1] Press = maximum one repetition bench press; [2] VJ = vertical jump; [3] Agility = Illinois agility run; [4] Flex = flexibility sit and reach

Table 8. Body composition and motor ability of police officers 30-39 years of age.

Percentile Rankings	Height (in)	Weight (lb)	Fat (%)	Skinfolds Sum of 6 (mm)	Waist (in)	Press[1] (lb)	Pushups (No.)	Situps (No.)	VJ[2] (in)	Agility[3] (sec)	Flex[4] (in)
99	77.6	144.1	11.3	70	29.7	215	52	43	39.9	16.6	24.2
95	75.4	152.4	12.6	95	32.5	180	30	40	21.5	17.0	23.2
90	74.4	161.5	13.8	99	33.9	180	26	38	20.8	17.5	22.2
85	73.9	168.1	15.1	106	35.4	165	23	37	20.2	17.7	21.9
80	72.7	174.2	16.4	110	35.8	165	23	35	19.7	17.9	20.3
75	72.2	176.2	17.7	122	36.1	165	22	34	19.2	18.1	19.4
70	71.9	178.1	19.0	124	36.3	165	21	33	18.8	18.4	18.8
65	71.5	179.9	20.2	128	36.6	150	20	32	18.4	18.5	18.3
60	71.2	181.2	21.5	130	37.0	145	20	31	18.2	18.7	18.1
55	70.9	184.2	22.8	132	37.4	145	20	31	18.0	18.8	17.8
50	70.6	186.1	24.1	135	37.7	145	20	30	17.8	18.9	17.5
45	70.3	191.5	25.4	139	37.9	145	18	30	17.6	19.0	16.8
40	70.1	195.1	26.6	140	38.4	135	16	29	17.2	19.1	16.2
35	69.8	197.9	27.9	146	38.9	135	16	28	16.7	19.2	15.8
30	69.5	202.0	29.2	153	39.1	135	15	27	16.3	19.4	15.2
25	69.1	204.8	30.5	160	39.5	135	15	26	15.9	19.5	14.6
20	68.7	209.4	31.8	167	40.2	135	13	25	15.5	19.7	14.0
15	68.3	213.7	33.1	176	40.8	130	12	25	15.1	19.9	13.0
10	67.9	221.9	34.3	181	42.1	115	10	24	14.7	20.1	11.6
5	67.5	229.8	35.6	186	43.1	114	9	21	14.1	20.4	10.6
1	66.7	248.3	36.9	223	47.1	100	7	11	12.1	22.9	4.3
N	85	85	85	85	85	83	83	83	64	60	84
$\bar{X}$	70.7	190.3	24.1	138	37.9	147	19	30	17.7	18.8	16.8
SD	2.3	23.0	4.3	30	3.2	22	7	6	3.6	1.1	4.0

[1] Press = maximum one repetition bench press; [2] VJ = vertical jump; [3] Agility = Illinois agility run; [4] Flex = flexibility sit and reach

Table 9. Body composition and motor ability of police officers 40+ years of age.

Percentile Rankings	Height (in)	Weight (lb)	Fat (%)	Skinfolds Sum of 6 (mm)	Waist (in)	Press[1] (lb)	Pushups (No.)	Situps (No.)	Flex[2] (in)
99	77.2	164.6	14.7	98	34.6	180	35	34	21.4
95	74.0	165.9	15.8	103	35.4	165	22	32	20.8
90	73.0	168.7	16.8	112	36.0	165	21	32	19.1
85	72.4	171.4	17.8	113	36.7	165	19	27	18.3
80	72.1	173.1	18.8	114	36.9	165	18	26	17.2
75	71.8	176.4	19.9	116	37.1	145	18	26	16.5
70	71.6	177.5	20.9	119	37.4	145	18	25	16.0
65	71.3	180.8	21.9	120	37.6	145	17	25	15.6
60	71.1	185.2	23.0	127	37.8	145	14	25	14.9
55	70.9	187.4	24.0	137	37.9	145	12	24	14.3
50	70.7	190.7	25.0	139	38.5	135	12	24	13.8
45	70.5	193.4	26.0	143	38.7	135	12	21	13.4
40	70.3	195.1	27.1	146	38.9	135	12	20	13.2
35	70.1	198.4	28.1	147	39.1	135	11	20	12.9
30	69.9	201.7	29.1	154	40.0	135	11	17	12.6
25	69.7	202.8	30.1	158	40.2	117	10	14	12.3
20	69.4	207.2	31.2	166	40.4	115	10	13	11.9
15	69.1	209.4	32.2	173	41.2	115	10	12	11.6
10	68.8	217.1	33.2	175	41.5	115	8	10	7.3
5	66.9	221.0	34.2	180	43.7	100	8	9	6.2
1	65.8	229.7	35.3	219	45.0	100	7	8	5.6
N	29	30	30	30	30	28	28	28	28
X̄	70.5	191.2	25.0	141	38.8	138	14	21	13.9
SD	2.0	17.8	3.4	28	2.4	21	6	8	3.9

[1] Press = maximum one repetition bench press; [2] Flex = flexibility sit and reach.

normal sedentary population of similar age, the younger officers were about the same in all variables except body weight (+), body fat (+), waist circumference (+), vital capacity (+), and trunk flexion(+). Since the average person in the U.S. is considered below standards in physical fitness compared to many other industrialized countries, the standards should be thought of as inadequate for young police officers.

Data from the Sheriff's Department Personnel and Highway Patrolmen show similar results to the young policemen in cardiorespiratory fitness, but show them to have higher levels of serum cholesterol and triglycerides. The young police officers in this study were also fatter. Firemen (not shown in tables) have greater cardiorespiratory endurance and less body weight, fat, and waist circumference.

The question that should be considered is how fit should young police officers be? Is a standard that is average for a normal sedentary population acceptable? If a job requires physical effort, such as running, climbing, and jumping; if an officer needs to have endurance and the ability to handle his own body weight, then the answer is negative. Many positions on the police force do require some intense physical activity. Therefore, higher levels of fitness are necessary.

A recent study conducted on 100 inmates (35) showed them to be in better physical condition than police officers (Tables 2 and 3). This included a higher working capacity and cardiorespiratory endurance, and lower body weight, fat, waist circumference, diastolic blood pressure and serum cholesterol. This comparison to police officers has been shown elsewhere (6). The inmates' ability to expel air from their lungs

quickly ($FEV_1 \div VC$) was lower and was thought to be related to their heavy smoking habit. Although most inmates lose body weight while incarcerated, it was surprising to find them in such good cardiorespiratory fitness. Similar to the police officers tested, the inmates had had no endurance training prior to being tested. It is imperative that police officers be in better physical condition in order to cope with fit young persons who commit crimes in a variety of situations.

Middle-Aged Police Officers - Tables 10 and 11 show normative data on physiological and performance variables of middle-aged police officers 36-52 years of age. When compared to the normal sedentary population of similar age, they were considered below average in working capacity, cardiorespiratory fitness and body composition. Specifically, the results show middle-aged police officers low in treadmill performance, maximum oxygen intake, efficiency on a bench step test; and, high in body weight and fat, waist circumference, and serum lipids. When compared to the normal population the middle-aged police officer is in worse physical condition than the young police officer.

The data from the Sheriff's Department Personnel and Highway Patrolmen show similar body composition results to the police officers in this investigation, but were closer to the normal population in cardiorespiratory fitness. Thus, the low values for cardiorespiratory fitness found in this study may not be typical of police throughout the country. Even so, the need for further development in physical fitness and attention to factors related to risk of coronary heart disease in police officers is well documented in this investigation.

Table 10. Work capacity, cardiorespiratory and pulmonary function, and serum lipids of police officers 36-52 years of age.

Percentile Rankings	TMT (min:sec)	$\dot{V}O_2$ max (ml/kg•min)	HR max (bts/min)	Step Test (bts/min)	RHR (bts/min)	RSBP (mmHg)	RDBP (mmHg)	VC (L)	$FEV_1 \div VC$ (%)	Chol. (mg/100ml)	Tri. (mg/100ml)
99	12:00	44.0	200	82	51	100	70	6.44	99	162	58
95	10:35	41.3	196	90	52	102	70	6.19	85	187	63
90	10:15	39.1	196	94	58	110	73	5.89	84	195	80
85	10:00	36.5	194	96	58	112	76	5.58	83	202	84
80	10:00	35.3	189	97	60	112	78	5.44	83	206	99
75	9:45	34.4	188	101	61	114	78	5.36	83	210	106
70	9:39	34.1	186	104	62	117	80	5.28	83	217	112
65	9:30	33.8	186	106	64	118	82	5.19	82	222	118
60	9:25	33.5	185	108	65	121	82	5.11	81	237	125
55	9:17	33.2	184	111	66	122	82	5.03	79	240	132
50	9:15	32.9	184	111	67	124	84	4.95	79	243	143
45	9:15	32.5	181	116	68	124	84	4.87	78	248	149
40	9:00	32.1	179	117	68	124	86	4.79	77	251	160
35	9:00	31.7	179	118	69	126	86	4.70	76	254	170
30	9:00	31.3	178	119	70	126	88	4.62	74	258	172
25	9:00	31.0	173	121	72	128	90	4.54	73	266	178
20	8:40	30.6	172	129	74	128	90	4.39	72	269	200
15	30	29.8	170	136	76	130	92	4.17	71	272	234
10	8:00	29.1	167	139	77	133	94	3.95	70	283	268
5	7:50	28.2	166	144	82	136	98	3.72	68	301	316
1	7:10	27.0	160	152	100	142	100	3.54	54	366	858
N	49	47	47	49	50	50	50	49	49	50	50
$\bar{X}$	9:15	33.4	182	114	67	122	84	4.90	78	242	164
SD	0:53	3.6	10	17	9	10	7	.59	7	38	119

TMT = treadmill time; $\dot{V}O_2$ max = maximum oxygen intake; HR max = maximum heart rate; Step Test = 3 min step test recovery heart rate; RHR = resting heart rate; RSBP = resting systolic blood pressure; RDBP = resting diastolic blood pressure; VC = vital capacity; $FEV_1 \div VC$ = forced expiratory volume for one second divided by vital capacity; Chol. = cholesterol; Tri. = triglycerides.

——— Sedentary average
····· Sheriff's Department and Highway Patrolmen

Table 11. Body composition and motor ability of police officers 36-52 years of age.

Percentile Rankings	Height (in)	Weight (lb)	Fat (%)	Skinfolds Sum of 6 (mm)	Waist (in)	Press[1] (lb)	Pushups (No.)	Situps (No.)	Flex[2] (in)
99	77.0	158.4	17.7	96	34.7	180	35	39	21.3
95	75.8	165.5	18.3	103	35.7	180	23	34	19.4
90	73.3	170.5	20.8	105	36.0	179	22	32	18.9
85	72.7	175.3	21.6	113	36.5	165	20	30	18.4
80	72.3	177.1	21.8	113	36.9	165	20	30	17.2
75	72.0	178.9	22.1	116	37.1	165	20	28	16.3
70	71.7	180.8	22.4	119	37.3	145	18	26	15.9
65	71.4	184.1	23.5	122	37.7	145	18	26	15.5
60	71.3	185.9	23.8	127	37.8	145	17	25	15.1
55	71.1	190.8	24.0	137	38.4	145	15	25	14.6
50	70.9	193.6	24.3	141	38.7	145	14	25	14.0
45	70.8	197.7	24.7	147	38.9	145	12	24	13.4
40	70.6	199.1	26.0	148	39.2	135	12	24	13.1
35	70.4	202.4	27.0	154	40.0	135	12	23	12.8
30	70.2	207.2	27.7	154	40.2	135	11	21	12.4
25	69.9	209.5	28.2	163	40.9	135	10	20	11.9
20	69.7	214.5	29.5	167	41.5	134	10	17	11.3
15	69.4	220.5	30.3	178	42.4	115	9	13	10.1
10	68.9	225.5	31.2	180	43.1	115	8	11	7.4
5	67.9	242.0	32.2	203	44.9	100	8	10	6.2
1	66.0	248.6	35.0	223	47.2	100	7	8	4.0
N	49	50	50	50	50	48	47	47	48
$\bar{X}$	70.9	196.3	25.3	143	39.2	144	15	23	13.7
SD	2.0	22.1	4.2	31	2.9	21	6	7	4.0

[1] Press = maximum one repetition bench press; [2] Flex = flexibility sit and reach.

——— Sedentary average
····· Sheriff's Department and Highway Patrolmen

Summary

Two hundred thirteen male police officers between 21 and 52 years of age volunteered to participate in a physical evaluation and conditioning program. Information concerning risk of coronary heart disease and physical fitness status of police officers were shown. Younger police officers (< 30 years of age) tended to be of average risk for coronary heart disease and average in physical fitness compared to the normal population. Middle-aged police officers were shown to be at higher risk and lower in physical fitness than the normal population. The results from this investigation support the need for physical fitness and preventive medicine programs for police officers.

Physiological Test Results from Richardson Police Department and Texas Department of Public Safety Program

The purpose of this phase of the study was to evaluate the implementation of a general aerobics program into a small police unit with minimal equipment and facilities and little or no funds available for exercise and testing programs. A description in terms of average age, height, and weight of the participants in the control and training groups is presented in Table 12. The two groups were similar in age and height but the control group was heavier (8 pounds) than the training group.

The effects of the program on cardiovascular function, blood variables and pulmonary function are presented in Table 13. The training group significantly decreased their resting heart rate and recovery heart rate from the three minute step test. The lowering of resting heart rate and recovery heart rate from submaximal work through exercise programs of running has been shown in other studies (11,20,28-31,33,34,36). As a result of training the heart is stronger, pumps more blood per beat, is more efficient and therefore does not beat as rapidly at rest and during submaximal work. None of the other comparisons between the control and training groups in blood pressure, blood variables, or lung volumes was statistically significant. This is not surprising since other studies have shown no changes in these variables when initial values are normal as were the values for the control and training groups. Only when initial values are abnormally high for blood pressure and serum lipids are there signifcant reductions in these variables with endurance exercise. This was reported by Milesis (19) for serum lipids. Such was the case in the training group for one individual who had abnormally high triglycerides

Table 12. Description of Participants in Richardson Police Fitness Program.

Group	Age (yrs) $\bar{X}$ ± SD	Height (ins) $\bar{X}$ ± SD	Weight (lbs) $\bar{X}$ ± SD
Control (n=9)	29.9 ± 4.2	70.4 ± 3.8	182.6 ± 15.9
Training (n=11)	30.5 ± 2.0	69.0 ± 1.4	174.5 ± 22.1

Table 13. Effects of Richardson Police Fitness Program on cardiovascular function, blood variables, and pulmonary function.

Group	Variable	Initial $\bar{X} \pm SD$	Final $\bar{X} \pm SD$	Mean Difference	p value compared with Control Group
Control (n=8)	Rest HR[a] (beats/min)	66 ± 6	67 ± 6	+1	
	Rest SBP[b] (mmHg)	124 ± 9	119 ± 6	-5	
	Rest DBP[c] (mmHg)	85 ± 8	81 ± 6	-4	
	Step Test HR[d] (beats/min)	112 ± 12	111 ± 11	-1	
	Cholesterol (mg%)	189 ± 26	193 ± 29	+4	
	Triglycerides (mg%)	109 ± 51	112 ± 46	+3	
	Glucose (mg%)	82 ± 6	85 ± 10	+3	
	Uric Acid (mg%)	6.3 ± 0.6	5.7 ± 0.7	-0.6	
	VC[e] (L)	5.91 ± 1.28	5.38 ± 1.27	-0.53	
	$FEV_{1.0}$[f] (L)	4.44 ± 0.88	4.02 ± 0.92	-0.42	
	$FEV_{1.0}$[g] (%)	75.7 ± 6.4	75.1 ± 6.3	-0.6	
Training (n=10)	Rest HR (beats/min)	65 ± 11	60 ± 7	-5	.05
	Rest SBP (mmHg)	121 ± 8	119 ± 7	-2	NS[h]
	Rest DBP (mmHg)	80 ± 8	78 ± 6	-2	NS
	Step Test HR (beats/min)	112 ± 9	95 ± 11	-17	.01
	Cholesterol (mg%)	220 ± 62	225 ± 53	+5	NS
	Triglycerides (mg%)	142 ± 71	116 ± 42	-26	NS
	Glucose (mg%)	88 ± 5	85 ± 5	-3	NS
	Uric Acid (mg%)	7.3 ± 1.0	6.8 ± 1.2	-0.5	NS
	VC[e] (L)	5.30 ± 0.74	5.34 ± 0.99	+0.04	NS
	$FEV_{1.0}$ (L)	4.33 ± 0.59	4.38 ± 1.03	+0.05	NS
	$FEV_{1.0}$ (%)	81.7 ± 2.8	81.6 ± 4.6	-0.1	NS

a = Resting heart rate; b = systolic blood pressure; c = diastolic blood pressure; d = Step test recovery heart rate; e = Vital capacity; f = Forced expiratory volume for one second; g = $FEV_{1.0} \div VC \times 100$; h = Non-significant

initially and reduced them towards normal during the exercise program. The initial difference in triglycerides between the control and training groups was due to this one individual.

The results of the maximum cardiovascular-respiratory (CR) testing are presented in Table 14. Very significant improvements were seen in treadmill performance time (TMT), maximum oxygen intake ($\dot{V}O_2$ max), maximum pulmonary ventilation ($\dot{V}_E$ max), and maximum oxygen pulse (max O_2 pulse) for the training group. Initially, the $\dot{V}O_2$ max for the training group was in the "average" fitness category and through the 20 week program this group improved to a "good" level of fitness. It is well known that TMT and $\dot{V}O_2$ max are improved through programs of jogging (11,20,28-31,33,34,36) and are reflective of improvement in maximum CR function. Having an increased working capacity would be desirable for an officer since he would be able to run faster and longer if required to chase a suspect. Having an increased ability to take in and utilize oxygen is also a desirable outcome of training. This indicates that many functions of the body are enhanced and the individual is in a better state of total health. The maximum heart rate and blood lactic acid levels did not differ significantly between the groups; however, they are of sufficient magnitude to reflect a true maximum effort by the participants during the treadmill test.

The results of the body composition measures are shown in Table 15. Body weight did not change significantly for the training group but percent body fat, fat weight, and total skinfold fat (TSF) showed significant reductions. The slight gain in lean body weight by the training group was not significantly different when compared to the slight loss

Table 14. Effects of Richardson Police Fitness Program on maximum cardiovascular - respiratory function.

Group	Variable	Initial $\bar{X} \pm SD$	Final $\bar{X} \pm SD$	Mean Difference	p value compared with: Control Group
Control (n=9)	TMT[a] (min:sec)	7:07 ± 0:55	6:33 ± 0:56	-0:34	
	$\dot{V}O_2$ max[b] (L/min)	3.26 ± 0.27	3.16 ± 0.27	-0.10	
	$\dot{V}O_2$ max (ml/kg•min)	39.6 ± 4.0	37.6 ± 3.4	-2.0	
	$\dot{V}_E$max BTPS[c] (L/min)	104.5 ± 14.5	105.2 ± 16.8	+0.7	
	Max O_2 Pulse[d] (ml/beat)	16.9 ± 1.5	16.5 ± 1.6	-0.4	
	Max HR[e] (beats/min)	194 ± 12	192 ± 14	-2	
	Lactic Acid (mg%)	102 ± 24	101 ± 17	-1	
Training (n=11)	TMT (min:sec)	7:41 ± 0:38	9:54 ± 0:48	+2:13	.01
	$\dot{V}O_2$ max (L/min)	3.07 ± 0.23	3.42 ± 0.30	+0.35	.01
	$\dot{V}O_2$ max (ml/kg•min)	39.1 ± 3.2	44.2 ± 4.1	+5.1	.01
	$\dot{V}_E$max BTPS (L/min)	102.0 ± 12.0	110.4 ± 14.7	+8.4	.05
	Max O_2 Pulse (ml/beat)	16.1 ± 1.4	18.2 ± 1.7	+2.1	.01
	Max HR (beats/min)	191 ± 6	188 ± 4	-3	NS[f]
	Lactic Acid (mg%)	113 ± 14	114 ± 19	+1	NS

a = Treadmill time; b = Maximum oxygen intake; c = Pulmonary ventilation; d = Maximum oxygen pulse; e = Maximum heart rate; f = Non-significant.

Table 15. Effects of Richardson Police Fitness Program on body composition.

Group	Variable	Initial $\bar{X}$ ± SD	Final $\bar{X}$ ± SD	Mean Difference	p value compared with: Control Group
Control (n=9)	Body Weight (lb)	182.5 ± 15.9	181.2 ± 13.7	-1.3	
	Body Fat (%)	17.2 ± 2.8	18.0 ± 3.1	+0.8	
	Fat Weight (lb)	31.5 ± 5.7	32.8 ± 7.1	+1.3	
	Lean Weight (lb)	151.0 ± 14.8	148.4 ± 9.9	-2.6	
	TSF[a] (mm)	121 ± 26	127 ± 26	+6	
	Abdomen Girth (in)	34.9 ± 2.2	35.4 ± 2.5	+0.5	
	Waist Girth (in)	36.3 ± 1.9	36.9 ± 2.2	+0.6	
	Gluteal Girth (in)	38.7 ± 1.2	39.1 ± 1.5	+0.4	
Training (n=11)	Body Weight (lb)	174.6 ± 22.0	171.5 ± 4.4	-3.1	NS[b]
	Body Fat (%)	19.4 ± 2.9	17.4 ± 3.0	-2.0	.01
	Fat Weight (lb)	34.4 ± 9.0	30.2 ± 1.7	-4.2	.01
	Lean Weight (lb)	140.2 ± 14.3	141.3 ± 14.1	+1.1	NS
	TSF (mm)	138.2 ± 25.3	120.6 ± 25.5	-17.6	.01
	Abdomen Girth (in)	34.7 ± 2.1	33.9 ± 2.2	-0.7	.01
	Waist Girth (in)	36.2 ± 3.4	35.5 ± 2.8	-0.7	.01
	Gluteal Girth (in)	38.9 ± 2.4	38.3 ± 2.2	-0.6	.01

a = Total skinfold fat (sum of six skinfold measures: axilla, chest, triceps, abdomen, suprailiac, and thigh locations)

b = Non-significant

in lean weight by the control group. However, an important principle is demonstrated here by the training group; that is, while body fat is significantly reduced through programs of running, lean body weight may remain the same or increase slightly. Thus, total body weight may not change at all. This supports the important need for taking body composition measures when evaluating effects of exercise programs. Abdomen, waist, and gluteal girths of the training group showed statistically significant reductions when compared to the increases in the control group. It must be recognized that the variability (standard deviation) for the girth measures within the groups is quite large and the reductions by the training group are considered modest but significant.

Results of the various motor ability tests are presented in Table 16. The number of situps performed in one minute and the Illinois Agility Run results showed significant improvements for the training group. These reflect improved abilities for muscular endurance, speed and agility. Improvements in flexibility were expected particularly because stretching exercises were included in the warmup routine. However, as previously reported in the fitness norm section, the young officers had good levels of flexibility prior to program implementation. It is difficult to improve upon a fitness element that is already well-developed. The results from the Richardson Agility Course testing are presented as RAC 1-4 and RAC Total. Average times for each of the four parts of the test are presented along with the total time for the entire test. Although a definite trend in improvement was seen for the training group the only statistically significant changes observed were in the 440 yd run (RAC4) and total time (RAC-Total). The environmental temperature was significantly higher during the final testing session and could have affected the results. In any case, the specificity of running training

Table 16. Effects of Richardson Police Fitness Program on motor ability.

Group	Variable	Initial $\bar{X} \pm SD$	Final $\bar{X} \pm SD$	Mean Difference	p value compared with: Control Group
Control (n=8)	Flexibility (ins)	17.8 ± 3.1	19.1 ± 4.4	+1.3	
	Situps (reps/min)	32 ± 4	31 ± 6	-1	
	Pushups (reps)	20 ± 7	21 ± 6	+1	
	Bench Press (lbs)	141 ± 25	143 ± 22	+2	
	Vertical Jump (ins)	17.7 ± 1.2	17.6 ± 1.9	-0.1	
	Agility Run (sec)	18.1 ± 0.7	18.2 ± 0.7	+0.1	
	RAC1[a] (sec)	49.5 ± 6.3	53.9 ± 10.5	+4.4	
	RAC2 (sec)	22.7 ± 2.7	21.8 ± 3.4	-0.9	
	RAC3 (sec)	46.5 ± 3.8	46.9 ± 3.7	+0.4	
	RAC4 (sec)	118.2 ± 28.0	126.9 ± 22.4	+8.7	
	RAC - Total (sec)	236.9 ± 35.7	249.4 ± 35.5	+12.5	
Training (n=10)	Flexibility (ins)	17.5 ± 3.2	19.6 ± 3.9	+2.1	NS[b]
	Situps (reps/min)	31 ± 7	33 ± 8	+2	.01
	Pushups (reps)	23 ± 10	27 ± 9	+4	NS
	Bench Press (lbs)	144 ± 19	144 ± 27	0	NS
	Vertical Jump (ins)	17.4 ± 1.7	17.4 ± 2.0	0	NS
	Agility Run (sec)	18.4 ± 0.7	17.8 ± 0.6	-0.6	.05
	RAC1 (sec)	49.9 ± 10.0	46.3 ± 7.1	-3.6	NS
	RAC2 (sec)	24.5 ± 4.8	22.3 ± 4.6	-2.2	NS
	RAC3 (sec)	48.3 ± 5.0	45.1 ± 4.2	-3.2	NS
	RAC4 (sec)	103.1 ± 12.4	99.0 ± 15.0	-4.1	.01
	RAC - Total (sec)	225.8 ± 23.9	212.7 ± 20.8	-13.1	.01

a = Richardson Agility Course: 1 = Obstacle course; 2 = Body drag; 3 = Stair run; 4 = 440 yd run; Total = Total times for 1,2,3, and 4.
b = Non-significant

is reflected through improvement in the 440 yd running performance test. The obstacle course (RAC1), body drag (RAC2), and stair run (RAC3) items of the test require short bursts of intense activity. This type of training was not included in the Richardson training program. Perhaps the inclusion of weight training and sprinting or other specific exercises relating to the obstacle course, body drag, and stair run would have produced even more changes than were observed in those tests. If these items are considered highly related to job performance by the police departments, then specific exercises that affect these physical tasks should be provided. A comprehensive program of weight training, sprinting, and distance running would seem to be the optimal program for the young officer.

The walk/jog program completed by the training group is quantified in Table 17. Weeks 4, 8, 13, and 17 were chosen to represent the progression in training in terms of average distance per workout, total time of workout, calories of energy expended per workout, and heart rate intensity. As observed, these variables increased progressively throughout the 20 week period except for the heart rate intensity. The goal throughout the 20 week study was to maintain a heart rate intensity level of at least 85% of maximum during the training. The slight drop in heart rate intensity from 90% to 87% at week 17 was due to the increase in jogging distance and decrease in walking distance per workout. This, however, did not result in a longer total distance per workout for the participant. Nevertheless, the heart rate intensity and calorie expenditure during this time were sufficiently high to induce a "training effect" (improvement in physiological function). The quantification results are similar to those presented in the next section on running programs conducted in the Dallas Police Department.

Table 17. Quantification of training for Richardson Police Physical Fitness Program

Week	Distance (yards)	Distance (miles)	Total Time (min:sec)	Calories (per workout)	Calories (per week)	THR* (beats/min)	Intensity[a] (% max HR)
4	3813.3	2.17	23:54	276.1	828.4	178.3	90.5
8	4827.8	2.74	28:42	359.5	1078.5	177.7	90.1
13	5243.3	2.98	29:00	397.0	1191.1	178.0	90.4
17	5193.3	2.95	29:06	390.5	1171.4	173.3	86.9

* THR = Training heart rate

a = Intensity determined by the Karvonen (17) method: $\frac{\text{Train HR - Rest HR}}{\text{Max HR - Rest HR}} \times 100$

The exercise program implemented within this department was considered successful demonstrating that a general calisthenics and running program can significantly improve the fitness levels of police officers. Equipment and facilities need not be extensive except, perhaps, the inclusion of weight training apparata for improving strength.

Physiological Test Results from Dallas Police Department Young Officer Running Programs

The purpose of this particular phase of the project was to compare interval, continuous, and combined interval/continuous running programs to determine the mode of aerobic exercise which best improves the physiological functioning of young police officers. Descriptive information concerning the age, height, and weight of the participants in this study is presented in Table 18. The continuous and interval running groups were slightly younger in age, shorter in height, and lighter in body weight compared to the combined running and control groups. Only the differences in body weight are of physiological significance and this is considered when evaluating the test results.

Results from the resting and submaximal cardiovascular function tests are presented in Table 19. When compared to the control group, significant reductions were seen in resting heart rate and step test recovery heart rate for the continuous, interval, and combined running groups. These results are expected for running programs as previously reported in the Richardson results section. None of the small differences among the three training groups was statistically significant. Again, as previously reported, blood pressures are not expected to change when initial values are normal as in the case with these groups.

Table 18. Physical characteristics of young police officers, ages 21 to 35 years, in running programs.

Group	Age (yrs) $\bar{X} \pm SD$	Height (ins) $\bar{X} \pm SD$	Weight (lbs) $\bar{X} \pm SD$
Control (n=14)	30.0 ± 3.9	71.2 ± 2.7	186 ± 31
Continuous (n=16)	29.1 ± 3.5	70.6 ± 2.7	178 ± 23
Interval (n=10)	27.0 ± 3.2	70.3 ± 2.6	173 ± 18
Combined (n=11)	30.8 ± 2.9	71.5 ± 2.9	196 ± 24

Table 19. Effects of running programs on the cardiovascular function of young police officers, ages 21 to 35 years.

Group	Variable	Initial $\bar{X} \pm SD$	Final $\bar{X} \pm SD$	Mean Difference	Group Comparisons (Final p value): Continuous	Interval	Combined
Control (n=14)	Rest HR[a] (beats/min)	63 ± 6	65 ± 9	+2	.01	.05	.05
	Rest SBP[b] (mmHg)	123 ± 9	119 ± 8	-4	NS[e]	NS	NS
	Rest DBP[c] (mmHg)	82 ± 7	80 ± 8	-2	NS	NS	NS
	Step Test[d] (beats/min)	108 ± 19	110 ± 15	+2	.01	.01	.01
Continuous (n=16)	Rest HR (beats/min)	64 ± 9	57 ± 8	-7		NS	NS
	Rest SBP (mmHg)	121 ± 9	116 ± 8	-5		NS	NS
	Rest DBP (mmHg)	82 ± 8	76 ± 6	-6		NS	NS
	Step Test HR (beats/min)	108 ± 14	93 ± 9	-15		NS	NS
Interval (n=10)	Rest HR (beats/min)	64 ± 8	58 ± 8	-6			NS
	Rest SBP (mmHg)	120 ± 6	117 ± 6	-3			NS
	Rest DBP (mmHg)	81 ± 5	78 ± 7	-3			NS
	Step Test HR (beats/min)	112 ± 15	91 ± 10	-21			NS
Combined (n=11)	Rest HR (beats/min)	65 ± 8	60 ± 7	-5			
	Rest SBP (mmHg)	121 ± 7	120 ± 10	-1			
	Rest DBP (mmHg)	81 ± 7	79 ± 8	-2			
	Step Test HR (beats/min)	101 ± 15	90 ± 10	-11			

[a] = Resting heart rate
[b] = Resting systolic blood pressure
[c] = Resting diastolic blood pressure
[d] = Step test recovery heart rate
[e] = Non-significant

The maximum CR variables are shown in Table 20. An extremely large improvement of 3 minutes in treadmill performance time (TMT) was seen for the continuous running group. This was significantly greater than the changes made by the interval and combined groups as well as the control group. Likewise, the interval and combined groups improved significantly when compared to the control group. This clear superiority in TMT by the continuous group is somewhat surprising since the improvements in maximum oxygen intake ($\dot{V}O_2$ max) and other variables were similar for all three groups. In any case, highly significant improvements in TMT, $\dot{V}O_2$ max, and maximum oxygen pulse were seen for the three running groups which reflect an enhanced CR function. The continuous, interval, and combined groups improved 15%, 12%, and 10%, respectively, in $\dot{V}O_2$ max. Other 20 week studies on running programs have reported similar results (11,20,28,29,31,34-36). As reported in the Richardson results section, the maximum heart rate and blood lactic acid levels did not differ significantly among the groups; however, they are of sufficient magnitude to reflect a true maximum effort by the participants during the treadmill test. It is interesting to note the variable nature of maximum heart rate (MHR) among the groups. The continuous and combined groups showed reductions which agrees with previous findings by Pollock et al. (34-36) yet the interval group remained the same. Perhaps the specificity of training is operative here when it was observed that the interval group trained at a slightly higher heart rate intensity than the other two groups (see Table 24); thus stimulating an inducement of a near-maximal heart rate on a regular basis.

Body compositon measures are presented in Table 21. Significant reductions were made in percent body fat, fat weight, and total skinfold

Table 20. Effects of running programs on the maximum cardiovascular - respiratory function of young police officers, ages 21 to 35 years.

Group	Variable	Initial $\bar{X} \pm SD$	Final $\bar{X} \pm SD$	Mean Difference	Group Comparisons (Final p value): Continuous	Interval	Combined
Control (n=14)	TMT[a] (min:sec)	7:25 ± 0:48	7:13 ± 0:41	-0:12	.01	.01	.01
	$\dot{V}O_2$ max[b] (L/min)	3.34 ± 0.48	3.28 ± 0.48	-0.06	.01	.01	.01
	$\dot{V}O_2$ max (ml/kg•min)	39.5 ± 3.5	38.3 ± 3.8	-1.2	.01[f]	.01	.01
	$\dot{V}_E$ max BTPS[c] (L/min)	111.4 ± 14.7	114.1 ± 12.5	+2.7	NS	NS	NS
	Max O_2 Pulse[d] (ml/beat)	17.5 ± 2.9	17.3 ± 2.8	-0.2	.01	.01	.01
	Max HR[e] (beats/min)	192 ± 10	190 ± 7	-2	NS	NS	NS
	Lactic Acid (mg%)	118 ± 22	112 ± 22	-6	NS	NS	NS
Continuous (n=16)	TMT (min:sec)	7:51 ± 1:03	10:51 ± 1:20	+3:00		.01	.01
	$\dot{V}O_2$ max (L/min)	3.33 ± 0.47	3.81 ± 0.45	+0.48		NS	NS
	$\dot{V}O_2$ max (ml/kg•min)	41.3 ± 4.5	47.6 ± 5.6	+6.3		NS	NS
	$\dot{V}_E$ max BTPS (L/min)	115.6 ± 17.0	122.9 ± 18.0	+7.3		NS	NS
	Max O_2 Pulse (ml/beat)	17.0 ± 2.4	20.2 ± 2.2	+3.2		NS	NS
	Max HR (beats/min)	196 ± 6	189 ± 4	-7		.05	NS
	Lactic Acid (mg%)	106 ± 22	109 ± 16	+3		NS	NS
Interval (n=10)	TMT (min:sec)	7:46 ± 0:35	9:32 ± 1:07	+1:46			NS
	$\dot{V}O_2$ max (L/min)	3.37 ± 0.39	3.72 ± 0.33	+0.35			NS
	$\dot{V}O_2$ max (ml/kg•min)	42.2 ± 4.69	47.1 ± 4.7	+4.9			NS
	$\dot{V}_E$ max BTPS (L/min)	110.6 ± 10.4	118.1 ± 11.6	+7.6			NS
	Max O_2 Pulse (ml/best)	17.8 ± 2.9	19.6 ± 2.7	+1.8			NS
	Max HR (beats/min)	191 ± 13	191 ± 11	0			NS
	Lactic Acid (mg%)	108 ± 22	118 ± 19	+10			NS
Combined (n=11)	TMT (min:sec)	7:53 ± 0:38	9:41 ± 0:43	+1:48			
	$\dot{V}O_2$ max (L/min)	3.65 ± 0.49	4.02 ± 0.50	+0.37			
	$\dot{V}O_2$ max (ml/kg•min)	41.9 ± 3.2	46.0 ± 3.3	+4.1			
	$\dot{V}_E$ max BTPS (L/min)	111.8 ± 18.1	121.6 ± 18.2	+9.8			
	Max O_2 Pulse (ml/beat)	19.0 ± 2.5	21.5 ± 2.9	+2.5			
	Max HR (beats/min)	193 ± 10	187 ± 10	-6			
	Lactic Acid (mg%)	107 ± 18	112 ± 22	+5			

a = Treadmill time; b = Maximum oxygen intake; c = Pulmonary ventilation; d = Maximum oxygen pulse; e = Maximum heart rate; f = Non-significant.

Table 21. Effects of running programs on the body composition of young police officers, ages 21 to 35 years.

Group	Variable	Initial $\bar{X} \pm SD$	Final $\bar{X} \pm SD$	Mean Difference	Group Comparisons (Final p value): Continuous	Interval	Combined
Control (n=11)	Body Weight (lb)	185.8 ± 31.3	187.8 ± 30.9	+2.0	NS[c]	NS	NS
	Body Fat[a] (%)	20.3 ± 3.9	20.7 ± 3.9	+0.4	.01	.01	.01
	Fat Weight (lb)	37.7 ± 12.3	39.7 ± 12.1	+2.0	.01	.01	.05
	Lean Weight (lb)	147.5 ± 20.5	148.1 ± 20.3	+0.6	NS	NS	NS
	TSF[b] (mm)	136 ± 34	141 ± 32	+5	.01	.01	.05
	Abdomen Girth (in)	35.4 ± 4.1	36.1 ± 3.9	+0.7	.01	.01	NS
	Waist Girth (in)	37.0 ± 4.1	37.6 ± 4.1	+0.6	.05	.01	.05
	Gluteal Girth (in)	38.3 ± 2.5	38.7 ± 2.2	+0.4	.05	NS	NS
Continuous (n=16)	Body Weight (lb)	178.5 ± 11.0	177.7 ± 21.2	-0.8		NS	NS
	Body Fat (%)	18.2 ± 4.5	16.3 ± 3.5	-1.9		NS	NS
	Fat Weight (lb)	33.1 ± 11	29.5 ± 8.8	-3.6		NS	NS
	Lean Weight (lb)	145.5 ± 14.3	148.1 ± 14.3	+2.6		NS	NS
	TSF (mm)	128 ± 38	110 ± 32	-18		NS	NS
	Abdomen Girth (in)	34.4 ± 2.6	33.9 ± 2.4	-0.5		NS	NS
	Waist Girth (in)	35.8 ± 3.2	35.4 ± 3.1	-0.4		NS	NS
	Gluteal Girth (in)	38.4 ± 2.3	37.7 ± 2.5	-0.7		NS	NS
Interval (n=9)	Body Weight (lb)	173.3 ± 18.5	171.3 ± 19.8	-2.0			NS
	Body Fat (%)	19.1 ± 5.3	17.1 ± 4.3	-2.0			NS
	Fat Weight (lb)	33.7 ± 12.3	29.8 ± 10.1	-3.9			NS
	Lean Weight (lb)	139.6 ± 9.7	141.5 ± 11.9	+1.5			NS
	TSF (mm)	128 ± 43	112 ± 37	-16			NS
	Abdomen Girth (in)	34.1 ± 2.3	33.4 ± 2.3	-0.7			NS
	Waist Girth (in)	35.3 ± 2.5	34.6 ± 2.6	-0.7			NS
	Gluteal Girth (in)	37.6 ± 2.2	37.2 ± 2.2	-0.4			NS
Combined (n=10)	Body Weight (lb)	196.4 ± 24.0	196.4 ± 24.5	0			
	Body Fat (%)	19.1 ± 3.2	17.7 ± 3.2	-1.4			
	Fat Weight (lb)	38.1 ± 8.6	35.1 ± 8.6	-3.0			
	Lean Weight (lb)	158.3 ± 17.2	161.4 ± 18.1	+3.1			
	TSF (mm)	130 ± 28	118 ± 25	-12			
	Abdomen Girth (in)	35.9 ± 2.3	35.7 ± 2.4	-0.2			
	Waist Girth (in)	37.6 ± 2.8	37.1 ± 2.8	-0.5			
	Gluteal Girth (in)	39.8 ± 2.2	39.5 ± 2.2	-0.3			

a = Calculated by Pascale (25) skinfold formula; b = total skinfold fat (sum of six skinfold measures: axilla, chest, triceps, abdomen, suprialiac, and thigh locations); c = Non-significant

fat by the three training groups when compared to the slight increases by the control group. None of the reductions among the three training groups was statistically different when compared to each other. As shown in the Richardson program, there was a trend for a slight increase in lean body weight with a slight reduction in total body weight for the exercise groups; however, the changes are not statistically different from those for the control group. These results emphasize the importance of running programs for reducing body fat while increasing or maintaining lean body weight. The abdomen, waist, and gluteal girth changes were similar to those observed in the Richardson program. The changes are considered modest but statistically significant.

The motor ability results in Table 22 showed significant improvements for all three running groups in situp performance and for the continuous and combined groups in pushup performance. These improvements are obviously due to the fact that situps and pushups were part of the daily warmup routine for the exercise groups. The improvements in pushups by the interval group and the improvements in bench press by all three running groups were marginal statistically when compared to the control group. These trends of improvement though reflect the importance of including calisthenics to supplement the daily aerobics program. Again, the lack of improvement in flexibility was thought to be due to the high values of the officers initially. Improvements in agility run time was not seen in these running groups as was observed in the Richardson program. Inconsistencies in data collection on this variable and the vertical jump test were observed in the Dallas program due to the large number of officers tested by different staff members.

The pulmonary function and blood variables for this study are presented in Table 23. All values are normal and the small changes

Table 22. Effects of running programs on the motor abilities of young police officers, ages 21 to 35 years.

Group	Variable	Initial $\bar{X}$ ± SD	Final $\bar{X}$ ± SD	Mean Difference	Group Comparisons (Final p value): Continuous	Interval	Combined
Control (n=11)	Flexibility (ins)	16.7 ± 2.7	15.2 ± 3.2	-1.5	NS[a]	NS	NS
	Situps (reps/min)	32 ± 8	29 ± 8	-3	.05	.01	.01
	Pushups (reps)	19 ± 5	20 ± 5	+1	.05	NS	.05
	Bench Press (lbs)	140 ± 14	141 ± 25	+1	NS	NS	NS
	Vertical Jump (ins)	17.4 ± 2.8	17.7 ± 3.2	+0.3	NS	NS	NS
	Agility Run (sec)	19.1 ± 1.6	19.7 ± 1.2	+0.6	NS	NS	NS
Continuous (n=16)	Flexibility (ins)	17.0 ± 2.8	16.6 ± 2.9	-0.4		NS	NS
	Situps (reps/min)	37 ± 7	38 ± 5	+1		NS	NS
	Pushups (reps)	21 ± 7	29 ± 7	+8		NS	NS
	Bench Press (lbs)	151 ± 22	170 ± 31	+19		NS	NS
	Vertical Jump (ins)	17.5 ± 2.9	16.5 ± 3.7	-1.0		NS	NS
	Agility Run (sec)	18.2 ± 0.9	18.9 ± 1.1	+0.7		NS	NS
Interval (n=10)	Flexibility (ins)	19.2 ± 3.6	16.2 ± 5.9	-3.0			NS
	Situps (reps/min)	38 ± 6	40 ± 7	+2			NS
	Pushups (reps)	21 ± 9	28 ± 12	+7			NS
	Bench Press (lbs)	154 ± 18	170 ± 23	+16			NS
	Vertical Jump (ins)	18.4 ± 1.9	17.1 ± 3.1	-1.3			NS
	Agility Run (sec)	18.6 ± 1.1	18.7 ± 1.3	+0.1			NS
Combined (n=11)	Flexibility (ins)	17.5 ± 3.2	16.7 ± 3.4	-0.8			
	Situps (reps/min)	32 ± 7	37 ± 6	+5			
	Pushups (reps)	21 ± 9	30 ± 10	+9			
	Bench Press (lbs)	158 ± 10	169 ± 11	+11			
	Vertical Jump (ins)	17.4 ± 1.9	18.1 ± 3.1	+0.7			
	Agility Run (sec)	18.7 ± 0.8	18.9 ± 1.0	+0.2			

a = Non-significant

Table 23. Effects* of running programs on pulmonary function and blood variables of young police officers, ages 21 to 35 years.

Group	Variable	Initial $\bar{X} \pm SD$	Final $\bar{X} \pm SD$	Mean Difference	Group Comparisons (Final p value): Continuous	Interval	Combined
Control (n=11)	VC[a] (L)	5.78 ± 0.63	5.58 ± 0.61	-0.20	NS[d]	NS	NS
	$FEV_{1.0}$[b] (L)	4.70 ± 0.52	4.58 ± 0.56	-0.12	NS	NS	NS
	$FEV_{1.0}$[c] (%)	81.5 ± 3.1	82.1 ± 4.6	+0.6	NS	NS	NS
	Cholesterol (mg%)	201 ± 42	208 ± 36	+7	NS	NS	NS
	Triglycerides (mg%)	148 ± 90	158 ± 84	+10	NS	NS	NS
	Glucose (mg%)	82 ± 6	85 ± 6	+3	NS	NS	NS
	Uric Acid (mg%)	6.5 ± 1.2	6.9 ± 1.1	+0.4	NS	NS	NS
Continuous (n=16)	VC (L)	5.70 ± 1.09	5.46 ± 0.96	-0.24		NS	NS
	$FEV_{1.0}$ (L)	4.64 ± 0.82	4.49 ± 0.78	-0.15		NS	NS
	$FEV_{1.0}$ (%)	81.6 ± 4.2	82.3 ± 4.0	+0.7		NS	NS
	Cholesterol (mg%)	194 ± 51	198 ± 53	+4		NS	NS
	Triglycerides (mg%)	104 ± 54	102 ± 56	-2		NS	NS
	Glucose (mg%)	82 ± 5	87 ± 6	+5		NS	NS
	Uric Acid (mg%)	6.0 ± 1.1	6.1 ± 1.0	+0.1		NS	NS
Interval (n=9)	VC (L)	5.65 ± 0.46	5.38 ± 0.64	-0.27			NS
	$FEV_{1.0}$ (L)	4.58 ± 0.36	4.34 ± 0.49	-0.25			NS
	$FEV_{1.0}$ (%)	81.3 ± 6.6	80.8 ± 5.1	-0.5			NS
	Cholesterol (mg%)	188 ± 30	191 ± 34	+3			NS
	Triglycerides (mg%)	93 ± 46	87 ± 48	-6			NS
	Glucose (mg%)	81 ± 4	86 ± 3	+5			NS
	Uric Acid (mg%)	6.2 ± 1.2	6.6 ± 0.8	+0.4			NS
Combined (n=10)	VC (L)	5.77 ± 0.80	5.54 ± 0.59	-0.23			
	$FEV_{1.0}$ (L)	4.70 ± 0.69	4.51 ± 0.50	-0.19			
	$FEV_{1.0}$ (%)	81.4 ± 3.6	81.4 ± 3.3	0			
	Cholesterol (mg%)	189 ± 40	184 ± 33	-5			
	Triglycerides (mg%)	123 ± 70	121 ± 59	-2			
	Glucose (mg%)	83 ± 7	85 ± 3	+2			
	Uric Acid (mg%)	5.8 ± 0.7	6.4 ± 1.2	+0.6			

* None of the differences among the running or control groups was statistically significant.
a = Vital capacity
b = Forced expiratory volume for one second
c = $FEV_{1.0} \div VC \times 100$
d = Non-significant

observed from initial to final testing sessions were non-significant. With regard to the blood variables, other research has shown that serum lipids are reduced by exercise programs only when values are abnormally high initially (11,19,29,35).

The training for the various types of running programs is quantified in Table 24. An effort was made to design the three programs so that the calorie cost was similar throughout the 20 week period. This was accomplished remarkably well for the continuous and interval groups (see calories per workout); however, the calorie expenditure for the combined group was higher. This was due to the fact that the combined group was 18 and 23 pounds heavier than the continuous and interval groups, respectively (see Table 18). Body weight is used in the formula for calculating calorie expenditure from speed and distance run.

Because of the considerable amount of walking involved in the interval program in comparison to the continuous program during the latter weeks of training (walk 220 yards, run 220 yards), the total time per workout and total distance were increased considerably over the continuous program to achieve a similar calorie expenditure. The heart rate intensity of the interval program was higher than the others presumably because of the very fast running speeds required of those officers.

In summary, there was no clear superiority of one running program over another with the exception of the three minute improvement in TMT by the continuous group. When total calorie expenditure is similar, all three training regimens resulted in similar physiological improvements. It appears, then, that any of the three modes would be successful for improving the physical fitness of police officers. However, when officers in the combined group were asked for their preference of running mode, most (80%) chose the continuous workouts (see Adherence section of results).

Table 24. Quantification of training for young police officers, ages 21 to 35 years, in running programs.

Combined	Week	Distance (yards)	Distance (miles)	Total Time (min:sec)	Calories (per workout)	Calories (per week)	THR* (beats/min)	Intensity[a] (% max HR)
Combined (n=11)	4	4336.7	2.46	26:36	326.4	979.1	165.0	78.0
	8	4547.3	2.58	26:00	356.4	1069.3	175.9	86.5
	13	4686.0	2.66	28:00	347.4	1042.2	173.6	85.1
	17	5546.0	3.15	31:48	410.2	1230.7	171.1	83.2
Continuous (n=16)	4	4412.6	2.51	26:54	308.3	924.9	175.0	84.4
	8	4400.0	2.50	26:12	323.7	971.2	175.8	85.1
	13	4345.0	2.47	23:24	336.8	1010.3	176.9	85.8
	17	5280.0	3.00	26:36	378.6	1106.0	171.7	81.8
Interval (n=10)	4	4407.0	2.50	26:30	304.0	911.9	171.3	84.3
	8	4796.0	2.73	29:54	320.8	962.4	182.0	93.0
	13	4744.0	2.70	29:24	316.9	950.7	182.9	93.7
	17	5580.7	3.17	35:12	360.3	1080.9	184.3	94.9

* THR = Training heart rate

a = Intensity determined by the Karvonen (17) method: $\frac{\text{Train HR - Rest HR}}{\text{Max HR - Rest HR}} \times 100$

Less discomfort, fewer injuries, and lower dropout rates were experienced by the continuous program; thus it is recommended as the preferred running program for young police officers.

Physiological Test Results from Dallas Police Department Young Officer Weight Training Program

The purpose of this program was to evaluate the effects of a weight training regimen on the cardiovascular-respiratory (CR) function and muscular strength levels of young police officers. The intent was to elicit both CR and strength gains by designing a weight training program using relatively light weights lifted several times and with minimal rest between sets. Although the major purpose of this phase of the study was to examine specifically the physiological effects of a weight training program, the results from the previous section on the continuous running program and control group are reported here for comparative purposes. A description of these three groups is presented in Table 25. Age and height were similar among the three groups but the continuous running group was 8 to 10 pounds lighter in body weight.

Resting and submaximal cardiovascular function results are shown in Table 26. A trend for reducing step test recovery heart rate was seen for the weight training group but the change was not significant with respect to the control group. The continuous running group improved signifcantly in resting heart rate and step test recovery heart rate when compared to both the weight training and control groups. Thus, the weight training program used in this study did not affect significantly resting or submaximal cardiovascular function. Blood pressures are normal for all groups and were not expected to change.

Table 25. Physical characteristics of young police officers, ages 21 to 35 years, in weight training and running programs.

Group	Age (yrs) $\bar{X} \pm SD$	Height (ins) $\bar{X} \pm SD$	Weight (lbs) $\bar{X} \pm SD$
Control (n=14)	30.0 ± 3.9	71.2 ± 2.7	186 ± 31
Weight Training (n=11)	28.9 ± 3.6	70.9 ± 1.0	188 ± 26
Continuous Running (n=16)	29.1 ± 3.5	70.6 ± 2.7	178 ± 23

Table 26. Effects of weight training and running programs on the cardiovascular function of young police officers, ages 21 to 35 years.

Group	Variable	Initial $\bar{X} \pm SD$	Final $\bar{X} \pm SD$	Mean Difference	Group Comparisons (Final p value): Weight Training	Continuous Running
Control (n=14)	Rest HR[a] (beats/min)	63 ± 6	65 ± 9	+2	NS[e]	.01
	Rest SBP[b] (mmHg)	123 ± 9	119 ± 8	-4	NS	NS
	Rest DBP[c] (mmHg)	82 ± 7	80 ± 8	-2	NS	NS
	Step Test HR[d] (beats/min)	108 ± 19	110 ± 15	+2	NS	.01
Weight Training (n=11)	Rest HR (beats/min)	64 ± 10	63 ± 9	-1		.05
	Rest SBP (mmHg)	125 ± 7	119 ± 6	-6		NS
	Rest DBP (mmHg)	84 ± 3	82 ± 4	-2		NS
	Step Test HR (beats/min)	107 ± 27	103 ± 23	-4		.05
Continuous Running (n=16)	Rest HR (beats/min)	64 ± 9	57 ± 8	-7		
	Rest SBP (mmHg)	121 ± 9	116 ± 8	-5		
	Rest DBP (mmHg)	82 ± 8	76 ± 6	-6		
	Step Test HR (beats/min)	108 ± 14	93 ± 9	-15		

[a] = Resting heart rate

[b] = Resting systolic blood pressure

[c] = Resting diastolic blood pressure

[d] = Step test recovery heart rate

[e] = Non-significant

The weight training group improved significantly when compared to the control group in treadmill performance time (TMT), maximum oxygen intake ($\dot{V}O_2$ max), and maximum oxygen pulse (max O_2 pulse) (Table 27). This statistical significance occurred because the control group decreased 12 seconds in TMT, 1.2 ml/kg•min in $\dot{V}O_2$ max, and 0.2 ml/beat in max O_2 pulse while the weight training group increased 43 seconds in TMT, 1.4 ml/kg•min in $\dot{V}O_2$ max, and 0.9 ml/beat in max O_2 pulse from initial to final results. The changes in these variables for the weight training group represent 10%, 3.5%, and 5% improvements, respectively, over the 20 week period. These are minimal changes when compared to the improvements made by the continuous running group; 38% in TMT, 15% in $\dot{V}O_2$ max, and 19% in max O_2 pulse. Only the 10% improvement in TMT by the weight training group approaches physiological significance. The improved running performance is partially explained by the increased leg strength gained through the weight training. Little evidence is available showing the effects of weight training on cardiorespiratory function. Wilmore and Davis (38) reported small but statistically significant improvements in $\dot{V}O_2$ max (+6%) during 10 weeks of weight training (3 sets of unlimited repetition in 30 sec) for women which agrees with our findings. On the other hand, Allen et al. (1) found no changes in heart rate, blood pressure, cardiac output, stroke volume or $\dot{V}O_2$ max with a 12 week program of weight training (3 sets of 8 repetitions). Differences exist between our study and those of Wilmore and Davis (38) and Allen et al. (1) in length of study, repetitions per set, number of sets, and rest interval between sets. However, these studies all indicate that cardiorespiratory changes are questionable in weight training programs as conducted in this experiment, i.e., using light weights with high repetitions and little rest between exercises.

Table 27. Effects of weight training and running programs on the maximum cardiovascular - respiratory function of young police officers, ages 21 to 35 years.

Group	Variable	Initial $\bar{X} \pm SD$	Mid-Term $\bar{X} \pm SD$	Final $\bar{X} \pm SD$	Group Comparisons (Final p value): Weight Training	Continuous Running
Control (n=14)	TMT[a] (min:sec)	7:25 ± 0:48	- -	7:13 ± 0:41	.05	.01
	$\dot{V}O_2$ max[b] (L/min)	3.34 ± 0.48	- -	3.28 ± 0.48	.05	.01
	$\dot{V}O_2$ max (ml/kg•min)	39.5 ± 3.5	- -	38.3 ± 3.8	.05[f]	.01
	$\dot{V}_E$ max BTPS[c] (L/min)	111.4 ± 14.7	- -	114.1 ± 12.5	NS[f]	NS
	Max O_2 Pulse[d] (ml/beat)	17.5 ± 2.9	- -	17.3 ± 2.8	.05	.01
	Max HR[e] (beats/min)	192 ± 10	- -	190 ± 7	NS	NS
	Lactic Acid (mg%)	118 ± 22	- -	112 ± 22	NS	NS
Weight Training (n=11)	TMT (min:sec)	7:22 ± 0:52	7:37 ± 1:03	8:05 ± 1:09		.01
	$\dot{V}O_2$ max (L/min)	3.38 ± 0.37	3.55 ± 0.35	3.48 ± 0.37		.01
	$\dot{V}O_2$ max (ml/kg•min)	40.0 ± 4.9	41.5 ± 4.2	41.4 ± 4.5		.01
	$\dot{V}_E$ max BTPS (L/min)	108.6 ± 13.2	113.2 ± 12.8	110.1 ± 14.6		NS
	Max O_2 Pulse (ml/beat)	17.3 ± 2.0	18.4 ± 1.9	18.2 ± 1.9		.01
	Max HR (beats/min)	195 ± 10	194 ± 10	191 ± 11		NS
	Lactic Acid (mg%)	104 ± 20	98 ± 22	96 ± 21		NS
Continuous Running (n=16)	TMT (min:sec)	7:51 ± 1:03	9:23 ± 1:04	10:51 ± 1:20		
	$\dot{V}O_2$ max (L/min)	3.33 ± 0.47	3.61 ± 0.45	3.81 ± 0.45		
	$\dot{V}O_2$ max (ml/kg•min)	41.3 ± 4.5	44.5 ± 4.8	47.6 ± 5.6		
	$\dot{V}_E$ Max BTPS (L/min)	115.6 ± 17.0	114.2 ± 17.3	122.9 ± 18.0		
	Max O_2 Pulse (ml/beat)	17.0 ± 2.4	19.2 ± 2.2	20.2 ± 2.2		
	Max HR (beats/min)	196 ± 6	188 ± 6	189 ± 4		
	Lactic Acid (mg%)	106 ± 22	102 ± 18	109 ± 16		

[a] = Treadmill time
[b] = Maximum oxygen intake
[c] = Pulmonary ventilation
[d] = Maximum oxygen pulse
[e] = Maximum heart rate
[f] = Non-significant

The weight training and continuous running groups were administered mid-term tests after 10 weeks to ascertain the magnitude of change halfway through the training. These results are also presented in Table 27. After 10 weeks the weight training group had improved 3%, 3.75%, and 6% in TMT, $\dot{V}O_2$ max, and max O_2 pulse, respectively. Essentially, this group reached its magnitude of change in $\dot{V}O_2$ max and max O_2 pulse at 10 weeks but not in TMT. Most of the improvement in TMT occurred during the latter 10 weeks of training. The continuous running group, on the other hand, had improved 20% in TMT, 8% in $\dot{V}O_2$ max, and 13% in max O_2 pulse after the first 10 weeks of training. These represented more than half of their total improvements for the 20 week period.

No significant changes among the three groups were seen with maximum pulmonary ventilation, maximum heart rate or blood lactic acid levels. This concurs with the findings in the other studies on the Richardson and Dallas Police Department young officer running programs. The values are sufficiently high to verify the maximum effort by the participants.

The effects of weight training and running programs on body composition are demonstrated in Table 28. Statistically significant reductions in body fat, total skinfold fat, and abdomen, waist and gluteal girths occurred in the weight training group over the 20 week period when compared to the control group. As with some of the cardiorespiratory findings, the significances were a result of the combination effect of the control group increasing slightly in the variables while the weight training group decreased slightly. After 20 weeks of training, changes in percent body fat, fat weight, and total skinfold fat represented 6%, 5%, and 10% reductions, respectively. The running group reduced 10%, 11%, and 14%, respectively, in these variables. Mid-term test results in the three variables indicated 1%, 1%, and 2% reductions in the weight training

Table 28. Effects of weight training and running programs on the body composition of young police officers, ages 21 to 35 years.

Group	Variable	Initial $\bar{X} \pm SD$	Mid-Term $\bar{X} \pm SD$	Final $\bar{X} \pm SD$	Group Comparisons (Final p value): Weight Training	Continuous Running
Control (n=11)	Body Weight (lb)	185.8 ± 31.3	- -	187.8 ± 30.9	NS[e]	NS
	Body Fat[a] (%)	20.3 ± 3.9	- -	20.7 ± 3.9	.01	.01
	Body Fat[b] (%)	23.4 ± 4.4	- -	24.5 ± 4.2	.01	.01
	Fat Weight[c] (lb)	37.7 ± 12.3	- -	39.7 ± 12.1	.05	.01
	Lean Weight (lb)	147.5 ± 20.5	- -	148.1 ± 20.3	NS	NS
	TSF[d] (mm)	136 ± 34	- -	141 ± 32	.01	.01
	Shoulder Girth (in)	46.1 ± 3.5	- -	47 ± 3.6	NS	.05
	Abdomen Girth (in)	35.4 ± 4.1	- -	36.1 ± 3.9	.01	.01
	Waist Girth (in)	37.0 ± 4.1	- -	37.6 ± 4.1	.05	.05
	Gluteal Girth (in)	38.3 ± 2.5	- -	38.7 ± 2.2	.05	.05
Weight Training (n=11)	Body Weight (lb)	188.5 ± 28.0	192 ± 31.3	189.2 ± 30		NS
	Body Fat (%)	18.3 ± 5.7	18.1 ± 5.8	17.2 ± 5.4		NS
	Body Fat (%)	23.0 ± 6.4	- -	21.2 ± 6.9		NS
	Fat Weight (lb)	35.9 ± 16.5	36.4 ± 17.9	34.0 ± 16.3		NS
	Lean Weight (lb)	152.6 ± 13.2	155.6 ± 14.6	155.2 ± 16.8		NS
	TSF (mm)	132 ± 50	129 ± 50	119 ± 48		NS
	Shoulder Girth (in)	46.9 ± 2.4	47.7 ± 2.9	47.7 ± 2.6		NS
	Abdomen Girth (in)	35.2 ± 3.3	35.1 ± 3.9	34.9 ± 3.3		NS
	Waist Girth (in)	36.9 ± 4.1	36.4 ± 4.8	36.4 ± 4.2		NS
	Gluteal Girth (in)	40.0 ± 2.8	39.6 ± 3.1	39.4 ± 3.0		NS
Continuous Running (n=16)	Body Weight (lb)	178.5 ± 11.0	180.1 ± 22.3	177.7 ± 21.2		
	Body Fat (%)	18.2 ± 4.5	17.1 ± 3.8	16.3 ± 3.5		
	Body Fat (%)	21.4 ± 4.0	- -	19.0 ± 3.9		
	Fat Weight (lb)	33.1 ± 11	31.5 ± 9.7	29.5 ± 8.8		
	Lean Weight (lb)	145.5 ± 14.3	148.6 ± 14.6	148.1 ± 14.3		
	TSF (mm)	128 ± 38	118 ± 34	110 ± 32		
	Shoulder Girth (in)	45.8 ± 2.0	46.4 ± 2.0	46.0 ± 1.8		
	Abdomen Girth (in)	34.4 ± 2.6	34.3 ± 2.6	33.9 ± 2.4		
	Waist Girth (in)	35.8 ± 3.2	35.7 ± 3.3	35.4 ± 3.1		
	Gluteal Girth (in)	38.4 ± 2.3	38.1 ± 2.3	37.7 ± 2.5		

a = Calculated by Pascale (25) skinfold formula; b = calculated by underwater weighing technique; c = based on skinfold formula; d = total skinfold fat (sum of six skinfold measures: axilla, chest, triceps, abdomen, suprailiac, and thigh locations); e = Non-significant

group while the running group improved 6%, 5%, and 8%, respectively. Although the trend for reducing fat in the weight training group was evident, the changes are of lesser physiological significance when compared to the running group. The variability (standard deviation) in the weight training group was much higher than the other two groups which further complicates the interpretation of statistical vs physiological significance. This latter concept is particularly evident in the abdomen, waist and gluteal girth measures where modest reductions were observed.

Lean body weight increased 2% in both training groups which was not significantly different from the slight increase in the control group. No significant changes in total body weight were observed among the three groups. The principle demonstrated here is that while body fat is reduced with exercise, lean body weight increases slightly so that total body weight remains essentially the same.

The principle of specificity of training is quite evident when examining the results in Tables 29 and 30. The situp and pushup performance of both the weight training and running groups improved significantly over that of the control group primarily because these two calisthenic exercises were included in the warmup routine. Changes in flexibility, vertical jump, and agility run were not significant and those reasons have been discussed previously in the Richardson and running program sections. Highly significant improvements in bench press and leg press strength were observed for the weight training group when compared to both the control and running groups (see Table 29). Changes of 33%, 43%, 26%, and 39% were seen for the weight training group in isotonic bench press, isokinetic leg press-slow, isokinetic bench press-slow, and isokinetic bench press-fast, respectively. In contrast, the changes for the running group were 13%, 35%, 14%, and 25% and 1%, 25%, 13%, and 20%,

Table 29. Effects of weight training and running programs on the muscular strength of young police officers, ages 21 to 35 years.

Group	Variable	Initial $\bar{X}$ ± SD	Final $\bar{X}$ ± SD	Mean Difference	Group Comparisons (Final p value): Weight Training	Continuous Running
Control (n=11)	Bench Press[a] (lb)	140 ± 14	141 ± 25	+1	.01	NS
	Knee Ext. Slow[b] (ft lb)	178 ± 35	164 ± 32	-14	.01	NS
	Leg Press Slow[c] (ft lb)	605 ± 142	757 ± 160	+152	.01	.05
	Bench Press Slow[d] (ft lb)	166 ± 48	187 ± 38	+21	.01	NS
	Bench Press Fast[e] (ft lb)	108 ± 38	130 ± 29	+22	.01	NS
Weight Training (n=11)	Bench Press (lb)	153 ± 27	203 ± 48	+50		.01
	Knee Ext. Slow (ft lb)	180 ± 40	189 ± 40	+9		.01
	Leg Press Slow (ft lb)	649 ± 154	930 ± 195	+281		NS
	Bench Press Slow (ft lb)	175 ± 42	221 ± 45	+46		.05
	Bench Press Fast (ft lb)	113 ± 30	158 ± 36	+45		.01
Continuous Running (n=16)	Bench Press (lb)	151 ± 22	170 ± 31	+19		
	Knee Ext. Slow (ft lb)	175 ± 26	153 ± 25	-22		
	Leg Press Slow (ft lb)	636 ± 116	859 ± 125	+223		
	Bench Press Slow (ft lb)	176 ± 22	201 ± 28	+25		
	Bench Press Fast (ft lb)	113 ± 23	141 ± 28	+28		

a = Bench press strength determined by maximum one-repetition isotonic technique

b = Knee extension strength determined by peak torque development on isokinetic machine set at 30^{o} per second rotation speed.

c = Leg press strength determined by peak torque development on isokinetic machine set at 30^{o} per second rotation speed.

d = Bench press strength determined by peak torque development on isokinetic machine set at 30^{o} per second rotation speed.

e = Bench press strength determined by peak torque development on isokinetic machine set at 180^{o} per second rotation speed.

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Table 30. Effects of weight training and running programs on the motor ability of young police officers, ages 21 to 35 years.

Group	Variable	Initial $\bar{X} \pm SD$	Final $\bar{X} \pm SD$	Mean Difference	Group Comparisons (Final p value): Weight Training	Continuous Running
Control (n=11)	Flexibility (ins)	16.7 ± 2.7	15.2 ± 3.2	-1.5	NS[a]	NS
	Situps (reps/min)	32 ± 8	29 ± 8	-3	.05	.05
	Pushups (reps)	19 ± 5	20 ± 5	+1	.05	.05
	Vertical Jump (ins)	17.4 ± 2.8	17.7 ± 3.2	+0.3	NS	NS
	Agility Run (sec)	19.1 ± 1.6	19.7 ± 1.2	+0.6	NS	NS
	Bench Press (lbs)	140 ± 14	141 ± 25	+1	.01	NS
Weight Training (n=8)	Flexibility (ins)	19.4 ± 2.8	18.0 ± 3.2	-1.4		NS
	Situps (reps/min)	35 ± 7	38 ± 6	+3		NS
	Pushups (reps)	22 ± 8	32 ± 11	+10		NS
	Vertical Jump (ins)	17.1 ± 2.4	17.1 ± 2.6	0		NS
	Agility Run (sec)	18.7 ± 1.2	19.6 ± 1.7	+0.9		NS
	Bench Press (lbs)	153 ± 27	203 ± 48	+50		.01
Continuous Running (n=16)	Flexibility (ins)	17.0 ± 2.8	16.7 ± 2.8	-0.3		
	Situps (reps/min)	37 ± 7	38 ± 5	+1		
	Pushups (reps)	21 ± 7	29 ± 7	+8		
	Vertical Jump (ins)	17.5 ± 2.9	16.5 ± 3.7	-1.0		
	Agility Run (sec)	18.2 ± 0.9	18.9 ± 1.1	+0.7		
	Bench Press (lbs)	151 ± 22	170 ± 31	+19		

[a] = Non-significant

respectively for the control group. The differences between the running and control groups were non-significant except for the isokinetic leg press-slow test where the running group changes were significantly greater. The improvements by the control group are explainable by the learning process in strength testing. The learning process is operative in the running and weight training results also, thus demonstrating the need for a control group in comparative studies of this nature. The improvements due to familiarization of strength testing techniques are assumed to be constant among the groups; therefore the improvements seen above and beyond the learning process (represented by the control group) are physiological improvements in strength. The reductions in isokinetic knee extension-slow results for the control and running groups and the small improvement for the weight training group are unexplainable. Because of the improvements in other strength measures, it is theorized that problems existed in this particular isokinetic machinery at the final testing session. Several precautions were taken though to insure equipment calibration and consistency in testing procedures.

The pulmonary function and blood variables for this study are presented in Table 31. All values are normal and the small changes observed from initial to final testing sessions were non-significant. With regard to the blood variables, other research has shown that serum lipids are reduced by exercise programs only when values are abnormally high initially (11,19,29,35).

One important facet of evaluating the effects of a weight training program is the quantification of the work performed. A form of this quantification is presented in Tables 32 and 33. Representative weeks

Table 31. Effects* of weight training and running programs on blood variables and pulmonary function of young police officers, ages 21 to 35 years.

Group	Variable	Initial $\bar{X} \pm SD$	Final $\bar{X} \pm SD$	Mean Difference	Group Comparisons (Final p value): Weight Training	Continuous
Control (n=11)	VC[a] (L)	5.78 ± 0.63	5.58 ± 0.61	-0.20	NS[e]	NS
	$FEV_{1.0}$[b] (L)	4.71 ± 0.52	4.58 ± 0.56	-0.13	NS	NS
	$FEV_{1.0}$[c] (%)	81.5 ± 3.1	82.1 ± 4.6	+0.6	NS	NS
	RV[d] (L)	1.38 ± .30	1.47 ± .29	+0.09	NS	NS
	Cholesterol (mg%)	201 ± 42	208 ± 36	+7	NS	NS
	Triglycerides (mg%)	148 ± 90	158 ± 84	+10	NS	NS
	Glucose (mg%)	82 ± 6	85 ± 6	+3	NS	NS
	Uric Acid (mg%)	6.5 ± 1.2	6.9 ± 1.1	+.4	NS	NS
Weight Training (n=11)	VC (L)	5.93 ± 0.75	5.71 ± 0.76	-0.22		NS
	$FEV_{1.0}$ (L)	4.68 ± 0.44	4.57 ± 0.39	-0.11		NS
	$FEV_{1.0}$ (%)	79.3 ± 5.0	80.6 ± 6.1	+1.3		NS
	RV (L)	1.31 ± .30	1.32 ± .36	+0.01		NS
	Cholesterol (mg%)	189 ± 13	184 ± 16	-5		NS
	Triglycerides (mg%)	84 ± 22	99 ± 38	+15		NS
	Glucose (mg%)	83 ± 7	87 ± 8	+4		NS
	Uric Acid (mg%)	6.1 ± 0.9	6.5 ± 1.4	+.4		NS
Continuous Running (n=16)	VC (L)	5.70 ± 1.09	5.46 ± 0.96	-0.24		
	$FEV_{1.0}$ (L)	4.64 ± 0.82	4.49 ± 0.78	-0.15		
	$FEV_{1.0}$ (%)	81.6 ± 4.2	82.3 ± 4.0	+0.7		
	RV (L)	1.34 ± .40	1.31 ± .39	-0.03		
	Cholesterol (mg%)	194 ± 51	198 ± 53	+4		
	Triglycerides (mg%)	104 ± 64	102 ± 56	-2		
	Glucose (mg%)	82 ± 5	87 ± 6	+5		
	Uric Acid (mg%)	6.0 ± 1.1	6.1 ± 1.0	+0.1		

* None of the differences among the groups was statistically significant

a = Vital capacity; b = Forced expiratory volume for one second; c = $FEV_{1.0} \div VC \times 100$; d = Residual volume; e = Non-significant

Table 32. Quantification of training in the circuit weight training program for young police officers* ages 21 to 35 years.

Week	Body Weight lbs (kg) $\bar{X}$	Workout Total Time (min:sec) $\bar{X}$	Rest Time Interval (sec)	Repetitions per Set	Exercise Heart Rate[a] (% max) $\bar{X}$	Training Resistance[b] (lbs/workout) $\bar{X}$	Trn Resistance[c] (% max strength) $\bar{X}$
5	191.00 (86.64)	29:21	:25	20	79	2144	41.5
8	189.75 (86.07)	24:17	:25	15	79	1953	47.9
10	190.25 (86.30)	23:24	:25	15	79	2141	49.8
13	190.25 (86.30)	22:46	:20	15	79	2355	52.3
15	190.75 (86.52)	23:02	:20	15	84	2497	53.0
18	190.50 (86.41)	22:59	:20	15	84	2720	55.9

* n= 11

a = Intensity determined by the Karvonen (17) method: $\frac{\text{Train HR - Rest HR}}{\text{Max HR - Rest HR}} \times 100$

b = Training resistance represented as total number of pounds for eight weight training exercises

c = Training resistance represented as percentage of maximum one-repetition strength for eight weight training exercises = (training resistance ÷ max strength) X 100.

have been chosen to demonstrate the progression in training. As shown in Table 32, the rest time interval between sets decreased from 30 seconds, initially, to 25 and later to 20 seconds. Thus the total time of each workout progressively decreased from 29 to 23 minutes. It was discovered during the fifth and sixth weeks that 20 repetitions per set was too difficult for the individuals to perform when training resistance was regulated at 40 to 50% of maximum strength. Therefore, the repetitions were reduced to 15 per set. The heart rate intensity remained fairly high and compares favorably with that in the running programs presented previously. Of notable significance is the progressive increase in the amount of weight resistance used in the training and the officers' abilities to train at a progressively higher percentage of maximum strength throughout the study. The improvements in one-repetition maximum strength for each of the eight weight training exercises are specifically demonstrated in Table 33. Also shown are the specific progressions in training resistance and percentage of maximum strength for each of the eight exercises.

In summary, the results from the weight training study indicated that cardiovascular-respiratory (CR) function was not significantly improved as originally intended. However, treadmill performance time, body composition, strength, and muscular endurance measures were significantly improved. The specificity of training principle is demonstrated here, i.e., strength gains are evident primarily from a weight training program and CR gains are evident primarily from running programs. Thus, a combination of running and weight training is recommended to the young police officer for attaining both CR and strength improvements.

Table 33. Progression of strength and training resistance in the circuit weight training program for young police officers,* ages 21 to 35 years.

Exercise/Variable	Week 5 $\bar{X}$	Week 8 $\bar{X}$	Week 10 $\bar{X}$	Week 13 $\bar{X}$	Week 15 $\bar{X}$	Week 18 $\bar{X}$
Bench Press						
Max Strength[a] (lbs)	155	161	173	192	192	200
Training Resistance[b] (lbs)	91	97	109	119	119	127
Trn. Res[c] (% max str)	58.7	60.2	58.0	61.8	61.8	63.5
Knee Extension						
Max Strength (lbs)	129	141	143	147	150	150
Training Resistance (lbs)	37	47	55	67	73	82
Trn. Res (% max str)	28.7	33.3	38.5	45.6	48.7	54.7
Hamstring Curl						
Max Strength (lbs)	75	84	88	93	100	100
Training Resistance (lbs)	29	35	39	46	46	51
Trn. Res (% max str)	38.7	41.7	44.3	49.5	46.0	51.0
Biceps Curl						
Max Strength (lbs)	71	73	78	85	86	88
Training Resistance (lbs)	36	40	45	46	46	51
Trn. Res (% max str)	50.7	54.8	57.7	54.1	53.5	58.0
Leg Press						
Max Strength (lbs)	484	550	570	606	623	640
Training Resistance (lbs)	263	306	334	375	406	453
Trn. Res (% max str)	54.3	55.6	58.6	61.9	63.2	68.0
Shoulder Press						
Max Strength (lbs)	135	145	153	166	168	175
Training Resistance (lbs)	67	70	74	80	85	91
Trn. Res (% max str)	49.6	48.3	48.4	48.2	50.6	52.0
Rowing						
Max Strength (lbs)	84	87	95	101	105	111
Training Resistance (lbs)	35	40	43	48	59	55
Trn. Res (% max str)	41.6	46.0	45.3	47.5	46.7	49.5
Lat Pull						
Max Strength (lbs)	167	181	186	195	200	206
Training Resistance (lbs)	64	78	88	97	103	104
Trn. Res (% max str)	38.3	43.1	47.3	49.7	51.5	50.5

* n = 11; a = strength determined by maximum one-repetition technique; b = average amount of weight resistance used during the training for the week presented; c = ratio of training resistance to maximum strength expressed as percentage = (training resistance ÷ max strength) x 100

Physiological Test Results from Dallas Police Department Supervised/ Unsupervised Programs

The physical characteristics of the middle-aged police officers in this study are presented in Table 34. The three groups were very similar in age, height, and weight.

Both the supervised (SV) and unsupervised (US) groups improved significantly in resting heart rate and step test recovery heart rate as compared to the control group (see Table 35). No differences were seen in these variables between the SV and US programs. The changes in heart rates among the exercise groups and normality of blood pressures agree with findings reported in the Richardson and Dallas running programs.

The improvements in maximum cardiovascular-respiratory (CR) function also concur with the findings from the Richardson and Dallas running programs (see Table 36). Both the SV and US improved significantly in treadmill performance time (TMT), maximum oxygen intake ($\dot{V}O_2$ max), and maximum oxygen pulse (max O_2 pulse); 13%, 20%, and 19%, respectively for the SV group and 12%, 22%, and 22%, respectively for the US group. Initially, the $\dot{V}O_2$ max level for the middle-aged officers was lower than average. After the exercise program had been completed, the officers in the two training groups had improved to high average and above average fitness levels. Unlike the young officers in the exercise programs, the middle-aged officers in the SV and US groups showed significant reductions in maximum heart rate (-5 beats/min) in comparison to the increase of 5 beats/min in the control group. This finding agrees with previous studies by Pollock et al. (28,29,31,33,34,36) on middle-aged men in training programs. The maximum pulmonary ventilation and blood lactic acid levels were not significantly different among the groups. This was also seen in the young running study.

Table 34. Physical characteristics of middle-aged police officers, aged 36 to 52 years, in running programs.

Group	Age (yrs) $\bar{X} \pm SD$	Height (ins) $\bar{X} \pm SD$	Weight (lbs) $\bar{X} \pm SD$
Control (n=7)	39.9 ± 3.8	71.0 ± 2.4	202 ± 21
Supervised (n=11)	41.3 ± 5.0	70.8 ± 1.2	198 ± 24
Unsupervised (n=11)	41.3 ± 4.7	71.7 ± 1.9	207 ± 22

Table 35. Effects of running programs on the cardiovascular function of middle-aged police officers, ages 36 to 52 years.

Group	Variable	Initial $\bar{X} \pm SD$	Final $\bar{X} \pm SD$	Mean Difference	Group Comparisons (Final p value): Supervised	Unsupervised
Control (n=6)	Rest HR[a] (beats/min)	64 ± 8	65 ± 9	+1	.01	.05
	Rest SBP[b] (mmHg)	132 ± 6	127 ± 10	-5	NS[e]	NS
	Rest DBP[c] (mmHg)	86 ± 8	87 ± 11	+1	NS	NS
	Step Test HR[d] (beats/min)	114 ± 23	111 ± 16	-3	.01	.05
Supervised (n=11)	Rest HR (beats/min)	71 ± 10	63 ± 13	-8		
	Rest SBP (mmHg)	123 ± 5	120 ± 10	-3		NS
	Rest DBP (mmHg)	87 ± 7	83 ± 10	-4		NS
	Step Test HR (beats/min)	115 ± 13	94 ± 11	-21		NS
Unsupervised (n=10)	Rest HR (beats/min)	64 ± 6	58 ± 10	-6		NS
	Rest SBP (mmHg)	120 ± 5	119 ± 7	-1		
	Rest DBP (mmHg)	82 ± 4	79 ± 6	-3		
	Step Test HR (beats/min)	114 ± 15	101 ± 14	-13		

a = Resting heart rate; b = Resting systolic blood pressure; c = Resting diastolic blood pressure; d = Step test recovery heart rate; e = Non-significant.

Table 36. Effects of running programs on the maximum cardiovascular - respiratory function of middle-aged police officers, ages 36 to 52 years.

Group	Variable	Initial $\bar{X} \pm SD$	Final $\bar{X} \pm SD$	Mean Difference	Group Comparisons (Final p value): Supervised	Unsupervised
Control (n=7)	TMT[a] (min:sec)	10:03 ± 1:02	10:24 ± 0:57	+0:21	.05	.05
	$\dot{V}O_2$ max[b] (L/min)	3.12 ± 0.43	3.16 ± 0.46	+0.14	.05	.01
	$\dot{V}O_2$ max (ml/kg•min)	34.1 ± 4.7	35.8 ± 4.2	+1.7	.05[f]	.01
	$\dot{V}_E$ max. BTPS[c] (L/min)	107.5 ± 14.8	113.1 ± 9.9	+5.6	NS	NS
	Max O_2 Pulse[d] (ml/beat)	17.3 ± 2.3	17.7 ± 2.7	+0.4	.01	.01
	Max HR[e] (beats/min)	180 ± 11	185 ± 10	+5	.01	.01
	Lactic Acid (mg%)	81 ± 26	94 ± 20	+13	NS	NS
Supervised (n=9)	TMT (min:sec)	9:46 ± 0:35	11:05 ± 0:47	+1:19		NS
	$\dot{V}O_2$ max (L/min)	3:03 ± 0.47	3.49 ± 0.64	+0.46		NS
	$\dot{V}O_2$ max (ml/kg•min)	33.6 ± 2.2	40.2 ± 3.8	+6.6		NS
	$\dot{V}_E$ max BTPS (L/min)	110.9 ± 16.1	113.3 ± 17.6	+2.4		NS
	Max O_2 Pulse (ml/beat)	16.6 ± 2.8	19.7 ± 3.4	+3.1		NS
	Max HR (beats/min)	182 ± 3	177 ± 4	-5		NS
	Lactic Acid (mg%)	88 ± 17	96 ± 22	+8		NS
Unsupervised (n=10)	TMT (min:sec)	9:38 ± 1:12	10:51 ± 0:53	+1:11		
	$\dot{V}O_2$ max (L/min)	3.13 ± 0.52	3.69 ± 0.50	+0.56		
	$\dot{V}O_2$ max (ml/kg•min)	32.7 ± 3.9	39.8 ± 3.3	+7.1		
	$\dot{V}_E$ max BTPS (L/min)	107.3 ± 17.1	115.6 ± 14.9	+8.3		
	Max O_2 Pulse (ml/beat)	17.0 ± 2.2	20.7 ± 2.4	+3.7		
	Max HR (beats/min)	183 ± 11	178 ± 10	-5		
	Lactic Acid (mg%)	87 ± 18	94 ± 19	+7		

a = Treadmill time; b = Maximum oxygen intake; c = Pulmonary ventilation; d = Maximum oxygen pulse; e = Maximum heart rate; f = Non-significant.

As presented in Table 37, the SV group was the only exercise group among the police officer studies to show a statistically significant reduction in total body weight. A trend in this direction was seen for the US group but the change did not reach statistical significance. The greater loss of body weight in the SV group was probably due to the significantly greater attendance record ($\bar{X}$ = 54 workouts/subject in 20 weeks, 2.7 workouts/week) compared to the US group ($\bar{X}$ = 43 workouts/subject in 20 weeks, 2.15 workouts/week). Thus the total number of calories expended over the 20 week period was greater for the SV group.

The loss of body weight by these groups was due mainly to the loss in body fat. Percent body fat, fat weight, and total skinfold fat losses averaged 12%, 15%, and 13%, respectively for the SV group and 10%, 11%, and 11%, respectively for the US group. All of these changes were statistically significant. Because of the large variability (standard deviation) among the groups in lean body weight the small changes observed were non-significant. It was previously explained that the reduction in waist girth for the young exercise groups was modest but statistically significant when compared to the slight increase in the control group. The same was true for the middle-aged officers in the SV and US groups except that the waist girth reductions were very significant (-1.4 inches).

Trends of improvement were seen in situp and pushup performance and bench press strength for the SV and US groups but the changes did not reach statistically significant levels (see Table 38). Improvements in flexibility were expected but did not occur even though the initial levels were below average.

The pulmonary function and blood variables for the middle-aged officers showed the same results as the young officers (see Table 39); none of the differences among the groups was statistically significant.

Table 37. Effects of running programs on the body composition of middle-aged police officers, ages 36 to 52 years.

Group	Variable	Initial $\bar{X} \pm SD$	Final $\bar{X} \pm SD$	Mean Difference	Group Comparisons (Final p value): Supervised	Unsupervised
Control (n=7)	Body Weight (lb)	202.6 ± 21.2	201.7 ± 23.8	-0.9	.05	NS[c]
	Body Fat[a] (%)	20.6 ± 3.9	20.8 ± 3.9	+0.2	.01	.05
	Fat Weight (lb)	41.9 ± 11.2	42.3 ± 11.9	+0.4	.01	.01
	Lean Weight (lb)	160.7 ± 14.3	159.4 ± 15.9	-1.3	NS	NS
	TSF[b] (mm)	145 ± 40	148 ± 39	+3	.01	.01
	Waist Girth (in)	39.9 ± 3.8	40.0 ± 3.8	+0.1	.01	.05
	Gluteal Girth (in)	40.6 ± 1.9	40.4 ± 1.9	-0.2	NS	NS
Supervised (n=11)	Body Weight (lb)	198.4 ± 23.6	190.5 ± 23.8	-7.9		NS
	Body Fat (%)	20.2 ± 4.6	17.8 ± 4.8	-2.4		NS
	Fat Weight (lb)	40.8 ± 14.1	34.8 ± 13.7	-6.0		NS
	Lean Weight (lb)	157.6 ± 9.0	155.6 ± 12.1	-2.0		NS
	TSF (mm)	135 ± 33	117 ± 35	-18		NS
	Waist Girth (in)	39.2 ± 3.4	37.8 ± 3.5	-1.4		NS
	Gluteal Girth (in)	40.2 ± 2.6	39.6 ± 2.7	-0.6		NS
Unsupervised (n=10)	Body Weight (lb)	207.4 ± 22.0	202.6 ± 21.4	-4.8		
	Body Fat (%)	22.5 ± 3.0	20.2 ± 2.7	-2.3		
	Fat Weight (lb)	47.2 ± 10.1	41.2 ± 8.8	-5.0		
	Lean Weight (lb)	160.3 ± 14.1	161.4 ± 14.3	+1.1		
	TSF (mm)	164 ± 28	146 ± 27	-18		
	Waist Girth (in)	40.4 ± 2.8	39.0 ± 2.6	-1.4		
	Gluteal Girth (in)	41.1 ± 2.2	40.5 ± 2.0	-0.6		

a = Body fat calculated by skinfold and girth formula reported by Pollock et al. (37); b = Total skinfold fat (sum of six measures including the axilla, chest, triceps, abdomen, suprailiac, and thigh locations; c = Non-significant.

Table 38. Effects*of running programs on the motor ability of middle-aged police officers, ages 36 to 52 years.

Group	Variable	Initial $\bar{X} \pm SD$	Final $\bar{X} \pm SD$	Mean Difference	Group Comparisons (Final p value): Supervised	Unsupervised
Control (n=7)	Flexibility (ins)	13.8 ± 5.8	14.9 ± 5.0	+1.1	NS[a]	NS
	Situps (reps/min)	28 ± 8	30 ± 7	+2	NS	NS
	Pushups (reps)	14 ± 5	16 ± 7	+2	NS	NS
	Bench Press (lbs)	151 ± 18	154 ± 15	+3	NS	NS
Supervised (n=11)	Flexibility (ins)	13.7 ± 3.7	14.3 ± 3.4	+0.6		NS
	Situps (reps/min)	23 ± 7	31 ± 5	+8		NS
	Pushups (reps)	15 ± 7	21 ± 7	+6		NS
	Bench Press (lbs)	146 ± 13	158 ± 19	+12		NS
Unsupervised (n=8)	Flexibility (ins)	10.8 ± 3.5	11.8 ± 3.6	+1.0		
	Situps (reps/min)	19 ± 9	27 ± 8	+8		
	Pushups (reps)	16 ± 7	21 ± 5	+5		
	Bench Press (lbs)	153 ± 20	164 ± 28	+11		

* None of the differences among the running or control groups was statistically significant

a = Non-significant

Table 39. Effects* of running programs on pulmonary function and blood variables of middle-aged police officers, ages 36 to 52 years.

Group	Variable	Initial $\bar{X} \pm SD$	Final $\bar{X} \pm SD$	Mean Difference	Group Comparisons (Final p value): Supervised	Unsupervised
Control (n=7)	VC[a] (L)	4.73 ± 0.50	5.19 ± 0.50	+0.46	NS[d]	NS
	$FEV_{1.0}$[b] (L)	3.84 ± 0.46	4.24 ± 0.42	+0.40	NS	NS
	$FEV_{1.0}$[c] (%)	81.2 ± 3.1	81.7 ± 1.5	+0.5	NS	NS
	Cholesterol (mg%)	225 ± 24	214 ± 21	-11	NS	NS
	Triglycerides (mg%)	128 ± 29	146 ± 31	+18	NS	NS
	Glucose (mg%)	82 ± 5	87 ± 5	+5	NS	NS
	Uric Acid (mg%)	6.2 ± 1.5	7.5 ± 1.1	+0.3	NS	NS
Supervised (n=11)	VC (L)	4.71 ± 0.65	5.27 ± 0.58	+0.56		NS
	$FEV_{1.0}$ (L)	3.77 ± 0.58	4.16 ± 0.53	+0.39		NS
	$FEV_{1.0}$ (%)	80.1 ± 7.9	79.0 ± 6.0	-1.1		NS
	Cholesterol	264 ± 53	219 ± 37	-45		NS
	Triglycerides (mg%)	215 ± 220	146 ± 104	-69		NS
	Glucose (mg%)	85 ± 10	85 ± 7	0		NS
	Uric Acid (mg%)	7.5 ± 1.2	6.6 ± 1.3	+0.1		NS
Unsupervised (n=10)	VC (L)	5.08 ± 0.62	5.40 ± 0.70	+0.32		
	$FEV_{1.0}$ (L)	3.94 ± 0.57	4.34 ± 0.66	+0.40		
	$FEV_{1.0}$ (%)	77.4 ± 5.4	80.2 ± 5.0	+2.8		
	Cholesterol (mg%)	234 ± 39	213 ± 50	-21		
	Triglycerides (mg%)	148 ± 81	135 ± 73	-13		
	Glucose (mg%)	85 ± 9	88 ± 6	+3		
	Uric Acid (mg%)	6.9 ± 1.6	6.8 ± 1.2	-0.1		

* None of the differences among the running or control groups was statistically significant.
a = Vital capacity; b = forced expiratory volume for one second; c = $FEV_{1.0} \div VC \times 100$; d = Non-significant.

It appears that the cholesterol and triglyceride levels in the SV and US groups showed significant reductions; however, further examination revealed that two individuals had extremely high values initially and reduced them towards normality in the 20 week program. This created extremely high variance measurements for these tests and confounded the statistical comparisons. Milesis (19) has shown that serum lipids are reduced by exercise in those individuals with abnormally high levels initially.

It is interesting to note in Table 40 that although the US group had a significantly lower attendance record (43 workouts/subject) than the SV group (54 workouts/subject) their average calorie expenditure per workout was slightly higher. This was partly due to the fact that the US group was slightly heavier in body weight and weight is involved in the calculation of the energy cost of walking and jogging. The average distance, total time per workout and training heart rate intensities were similar for the two exercise groups. As previously mentioned the total calorie cost over the entire 20 week period was greater for the SV group due to the higher attendance record.

In summary, no significant differences were found between the SV and US training programs in eliciting CR and body composition improvements even though the SV group had a higher attendance record. It was concluded that endurance training elicited significant improvements in the physical fitness of middle-aged police officers regardless of supervision.

Summary of Physiological Findings

The various exercise programs implemented within the police departments significantly affected the participating officers. The RPD and TDPS exercise program was successful in eliciting improvements in resting and

Table 40. Quantification of training for middle-aged police officers, ages 36 to 52 years, Supervised vs Unsupervised.

Group	n	Week	Distance (yards)	Distance (miles)	Total Time (min:sec)	Calories (per workout)	Calories (per week)	THR* (beats/min)	Intensity[a] (% max HR)
Supervised	11	4	3956.3	2.25	28:06	308.2	924.6	159.0	80.0
	11	8	4400.0	2.50	26:36	341.7	1025.2	170.6	90.5
	11	13	4174.5	2.37	24:48	358.6	1075.7	168.9	88.9
	9	17	4359.3	2.48	24:12	347.4	1003.1	170.7	90.5
Unsupervised	10	4	4330.7	2.46	28:18	326.0	910.9	155.1	75.9
	10	8	4297.3	2.44	26:30	361.8	1025.6	165.5	85.7
	9	13	4400.0	2.50	25:12	386.9	1036.0	165.4	85.5
	5	17	4312.0	2.45	24:01	363.7	1023.4	168.0	89.8

* THR = Training heart rate

a = Intensity determined by the Karvonen (17) method: $\frac{\text{Train HR} - \text{Rest HR}}{\text{Max HR} - \text{Rest HR}} \times 100$

submaximal cardiovascular function, maximal cardiovascular-respiratory function, body composition, muscular endurance and agility. It proved that a general calisthenics and running program using little or no equipment produced desirable results in physical fitness. If possible, the inclusion of weight training would help to improve the strength of the participating officers.

The DPD Young Officer Running Program showed that continuous running, interval running, and combined continuous/interval running programs were remarkably similar in improving physical fitness. So long as the total calorie expenditure is similar, the three programs are of equal value in eliciting physiological improvements. The continuous running program is recommended based on the personal preference of the participating officers and the fewer problems of injury and dropout experienced in that program.

Results from the DPD Weight Training Program indicated that cardiovascular-respiratory function was not affected. However, treadmill performance time, body composition, strength, and muscular endurance measures were significantly improved. The specificity of training principle showed that the weight training program resulted primarily in strength gains while the running programs resulted in CR improvements. Therefore, a combination of running and weight training is recommended to achieve both CR and strength improvements.

The physiological changes observed on the DPD middle-aged runners were in desirable directions resulting in improved physical fitness. These changes were observed regardless of supervision after the initial orientation to exercise. This indicates that fitness programs can be decentralized successfully. Several programs based on individual preference can be conducted in police substations located throughout a metropolitan area. The major consideration is to initially provide close supervision for each participant and then rely on the continuing personal program.

Adherence and Attrition Analyses

To evaluate the attrition rate of the various exercise programs, a questionnaire (see Appendix E) was mailed to all officers who dropped out of the programs. The adherence to the programs was evaluated by a questionnaire (see Appendix F) given to all officers who finished the programs. A summary of the participant adherence and attrition rate for all programs is presented in Table 41. The overall attrition rate (45%) for the exercise groups in all programs was much higher than previously reported for similar exercise programs (19,34). Of particular note is the extremely high dropout rates for the interval and combined running groups; 60% and 58%, respectively. In order to evaluate factors associated with these high dropout rates, an analysis of injuries was made and the results are summarized in Table 42. An injury was defined in this study as a musculoskeletal trauma (such as shin splints, ankle, and knee involment) resulting in a modification of an individual's training program for a period of one week or more. As shown in Table 42, injury was not a significant attrition factor for the interval and combined groups; only 8% and 12%, respectively, dropped out of those groups due to injuries. The RPD/TDPS program was the only group showing a significantly high dropout rate (31%) due to injury.

In addition, injury was not a particularly significant factor for those who finished the exercise programs. Only the Richardson training group and the Dallas combined running group indicated a relatively high injury rate (19%) among the finishers (see Table 42).

Table 41. Adherence and attrition rate for police physical fitness programs

Group	Starters (n)	Finishers (n)	Dropouts (n)	Attrition Rate[a] (%)
RPD/TDPS[b] Training	16	11	5	31
RPD/TDPS Control	12	10	2	17
DPD[c] Continuous Running	26	16	10	38
DPD Interval Running	25	10	15	60
DPD Combined Running	26	11	15	58
DPD Weight Training	17	11	6	35
DPD Young Control	20	14	6	30
DPD Supervised Training	20	11	9	45
DPD Unsupervised Training	17	11	6	35
DPD Middle-Aged Control	10	7	3	30
TOTAL	189	112	77	41

a = Number of dropouts ÷ Number of Starters

b = Richardson Police Department/Texas Department of Public Safety

c = Dallas Police Department

Table 42. Analysis of injury and attrition in exercise programs for young police officers, ages 21-35

Group	Starters (n)	Finishers with Injury (n)	(%)	Finishers without Injury (n)	(%)	Dropouts with Injury (n)	(%)	Dropouts without Injury (n)	(%)
RPD/TDPS[a] Training	16	3	19	8	50	5	31	0	0
DPD[b] Continuous Running	26	3	12	13	50	2	8	8	31
DPD Interval Running	25	2	8	8	32	2	8	13	52
DPD Combined Running	26	5	19	6	23	3	12	12	46
DPD Weight Training	17	1	6	10	59	0	0	6	35
TOTAL	110	14	13	45	41	12	11	39	35

a = Richardson Police Department/Texas Department of Public Safety

b = Dallas Police Department

In the Dallas running programs, most (42%) of the injuries occurring among both the dropouts and finishers were located at the anterior lower leg site (shin splints). Those were confined primarily to the combined running group and a few to the interval and continuous running groups. Apparently, alternating days of short sprints with days of long jogging in the combined group affected mainly the anterior lower leg when problems occurred. The shin splint problem was not apparent in the RPD/TDPS program. In that program 4 of the 5 dropouts reported associated knee problems. Perhaps the grass field surface used in that program provided enough cushion to prevent shin splints but the unevenness and multiple turns induced some knee problems. Of the other injuries reported among all exercise groups, 21% involved the ankle and 8% the foot.

Other factors influencing the attrition rate were analyzed and the results are summarized in Tables 43 to 49. Questions were asked concerning whether or not the dropouts enjoyed the training, enjoyed their group assignment, had a second job, and went to school. Average number of training weeks completed, distance from home and work to exercise center, number of trips from home and work to exercise center, and specific reasons for dropping were also tabulated (see Appendix E). Of the total number (n=66) of dropouts from the exercise programs, 57 or 86% responded to the attrition questionnaire.

Only a few of the respondents were totally dissatisfied with the training (7%) and/or their group assignment (14%). Most of the officers not enjoying their group assignment were from the Dallas interval running program which was apparently one of the most unpopular of the programs. Only 30% of the dropouts had a second job and only 30% attended school

Table 43. Analysis of Attrition in Richardson Police Fitness Program

Questions	Response (%)[a] Yes	No	No Answ.	Comments
Enjoy training?	100	0	0	
Enjoy group assign?	100	0	0	
Second job?	38	37	25	Average = 14 hours per week
Attending school?	38	62	0	Average = 9 hours per week
Other questions:				
Fixed Shift	75			
Rotating Shift	12			
Own hours	13			
Weeks of Training Completed				Average = 7.3 weeks
Distance from home to exercise center				Average = 9.7 miles
Distance from work to exercise center				Average = 7.9 miles
Trips from home to exercise center				Average = 82.6%
Trips form work to exercise center				Average = 17.4%
Reasons for dropping:				
Interferes with school	12			
Interferes with job	12			
Interferes with second job	12			
Interferes with family life	25			
Injury of knee	63			
Broken toe	12			
Other:	25			"Under personal stress" and "Too many work hours"

[a] Total n = 8

Table 44. Analysis of Attrition in Continuous Running Program.

Questions	Response (%)[a] Yes	No	No Answ.	Comments
Enjoy training?	83	0	0	17% answered "yes and no"
Enjoy group assign?	50	0	0	17% answered "not as much as others" 17% answered "unknown" 16% answered "yes and no"
Second job?	50	50	0	Average = 25 hours/week
Attending school?	17	50	33	Average = 10 hours/week
Other questions:				
Fixed Shift	67			
Rotating Shift	33			
Weeks of Training Completed				Average = 10.7 weeks
Distance from home to exercise center				Average = 11.9 miles
Distance from work to exercise center				Average = 4.3 miles
Trips from home to exercise center				Average = 78.8%
Trips from work to exercise center				Average = 21.2%
Reasons for dropping:				
Too much time involved	17			
Interferes with school	17			
Interferes with job	17			
Interferes with second job	33			
Interferes with family life	17			
Injury of:				
Back	33			
Ankle & Foot	17			
Other	50			Sickness in family; court; inflexible training time

[a] Total n = 6

Table 45. Analysis of Attrition in Interval Running Program.

Questions	Response (%)[a] Yes	No	No Answ.	Comments
Enjoy training?	80	6	0	7% answered "partly" 7% answered "somewhat"
Enjoy group assign?	47	33	0	7% answered "not especially" 7% answered "indifferent" 6% answered "yes-no"
Second job?	20	80	0	Average = 20 hours/week
Attending school?	47	53	0	Average = 11 hours/week
Other questions:				
Fixed Shift	67			
Rotating Shift	33			
Weeks of Training Completed				Average = 7.5 weeks
Distance from home to exercise center				Average = 17.5 miles
Distance from work to exercise center				Average = 6.6 miles
Trips from home to exercise center				Average = 67.2%
Trips from work to exercise center				Average = 32.8%
Reasons for dropping:				
Too much time involved	33			
Interferes with school	33			
Interferes with job	20			
Interferes with second job	13			
Interferes with family life	20			
Injury of:				
Knee	7			
Ankle & Foot	13			
Shin	7			
Boring	13			
Not satisfied with group assignment	20			
Training schedule too rigid	13			
Personal rewards not up to expectations	7			
Other	53			Inconvenient location; illness; distance; not enough time

[a] Total n = 15

Table 46. Analysis of Attrition in Combined Running Program.

Questions	Response (%)[a] Yes	No	No Answ.	Comments
Enjoy training?	79	7	7	7% answered "very much so"
Enjoy group assign?	65	14	7	7% answered "sometimes" 7% answered "very much so"
Second job?	36	64	0	Average = 18 hours/week
Attending school?	43	57	0	Average = 11 hours/week
Other questions:				
Fixed Shift	64			
Rotating Shift	36			
Weeks of Training Completed				Average = 8.3 weeks
Distance from home to exercise center				Average = 16.2 miles
Distance from work to exercise center				Average = 8.8 miles
Trips from home to exercise center				Average = 65.8%
Trips from work to exercise center				Average = 34.2%
Reasons for dropping:				
Too much time involved	50			
Interferes with school	29			
Interferes with job	21			
Interferes with second job	21			
Interferes with family life	21			
Injury of:				
Ankle & Foot	7			
Shin	11			
Back	7			
Boring	7			
Lack of Interest	7			
Training schedule too rigid	7			
Other	62			Illness; extra Dec. job; training facilities; cost to get to Cobb; court; new baby

[a] Total n = 14

Table 47. Analysis of Attrition in Circuit Weight Training Program

Questions	Response (%)[a] Yes	No	No Answ.	Comments
Enjoy training?	66	17	0	17% answered "very much"
Enjoy group assign?	83	17	0	
Second job?	33	67	0	Average = 15 hours/week
Attending school?	0	83	17	
Other questions:				
Fixed Shift	83			
Rotating Shift	17			
Weeks of Training Completed				Average = 5.5 weeks
Distance from home to exercise center				Average = 14.7 miles
Distance from work to exercise center				Average = 5.2 miles
Trips from home to exercise center				Average = 72.5%
Trips from work to exercise center				Average = 27.5%
Reasons for dropping:				
Interferes with second job	17			
Boring	33			
Training schedule too rigid	17			
Personal rewards not up to expectations	33			
Other	100			Distance; ECG; time; illness; court; new baby

[a] Total n = 6

Table 48. Analysis of Attrition in Supervised Fitness Program for Middle-Aged (36-52 years) Police Officers.

Questions	Response (%)[a] Yes	No	No Answ.	Comments
Enjoy training?	80	0	0	20% answered "yes and no"
Enjoy group assign?	100	0	0	
Second job?	20	80	0	Average = 25 hours/week
Attending school?	0	100	0	
Other questions:				
Fixed Shift	40			
Rotating Shift	60			
Weeks of Training Completed				Average = 7.6 weeks
Distance from home to exercise center				Average = 12.6 miles
Distance from work to exercise center				Average = 4.4 miles
Trips from home to exercise center				Average = 29.2%
Trips from work to exercise center				Average = 70.8%
Reasons for dropping:				
Too much time	20			
Interferes with job	20			
Interferes with second job	20			
Lack of interest	20			
Headaches	20			
Family illness	20			
Other				Didn't push self to improve; court & flu; gas too expensive

[a] Total n = 5

Table 49. Analysis of Attrition in Unsupervised Fitness Program for Middle-Aged (36-52 years) Police Officers

Questions	Response (%)[a] Yes	No	No Answ.	Comments
Enjoy training?	67	33	0	
Enjoy group assign?	67	0	33	
Second job?	0	67	33	
Attending school?	0	67	33	
Other questions:				
Fixed Shift	100			
Rotating Shift	0			
Weeks of Training Completed				Average = 6.0 weeks
Distance from home to exercise center				Average = 9.5 miles
Distance from work to exercise center				Average = 2.0 miles
Trips from home to exercise center				Average = 0%
Trips from work to exercise center				Average = 100%
Reasons for dropping:				
Interferes with job	67			
Too much time	67			
Interferes with family life	67			
Other	33			Tired

[a] Total n = 3

Yet the most commonly checked reason for dropping was "too much time involved" in the exercise program. Rotating shift was apparently not a problem since only 30% of all the dropouts were on that schedule.

A variety of reasons combined to account for the rather high dropout rate (46%) for the young officers in the various exercise programs. Those reasons included the following: personal reasons (5%), too many work hours (7%), illness in family (2%), personal illness (mainly colds and flu) (5%), extensive court appearances (7%), new babies in family (4%), poor training facilities (2%), distance too far (9%), and gas too expensive (4%). Many of the young officers estimated that two or three hours of their day were required to travel to the exercise center, work out, shower, dress and go to work or return home. Even though the program was conducted only three days per week, the dropouts felt the program required too much of their personal time.

The dropout rate (41%) for the middle-aged officers in the exercise programs was slightly lower compared to the young officers (46%). The middle-aged dropouts also had a variety of reasons for dropping including too much time, lack of interest, family illness, personal problems, and interferes with job. Several of the middle-aged officers were transferred to other divisions during the study and many dropped the program claiming that their new job required too much time. This observation was made by the investigators and is not well-documented in Tables 48 and 49 because only eight of the 15 exercise dropouts responded to the questionnaire.

The factor of travel in attrition and adherence to the exercise programs is analyzed in Table 50. The average distances traveled from home to the exercise center were 14.0 miles and 14.3 miles for the young

Table 50. Analysis of travel in attrition and adherence to exercise programs

Group	Distance: Home to Ex. (mi) Dropouts	Finishers	Distance: Work to Ex. (mi) Dropouts	Finishers	Trips: Home to Ex. (%) Dropouts	Finishers	Trips: Work to Ex. (%) Dropouts	Finishers
RPF/TDPS Training	9.7	8.0	7.9	3.6	83	90	17	10
DPD Continuous Running	11.9	14.2	4.3	8.4	79	54	21	46
DPD Interval Running	17.5	16.6	6.6	6.4	67	47	33	53
DPD Combined running	16.2	15.5	8.8	6.4	66	53	34	47
DPD Weight Training	14.7	17.4	5.2	10.2	73	73	28	27
TOTAL FOR YOUNG OFFICERS	14.0	14.3	6.6	7.0	74	63	27	37
DPD Supervised Training	12.6	17.8	4.4	3.7	29	20	71	80
DPD Unsupervised Training	9.5	19.1	2.0	2.9	0	19	100	81
TOTAL FOR MIDDLE-AGED OFFICERS	11.0	18.4	3.2	3.3	14	20	86	80

dropouts and finishers, respectively. However, the young dropouts traveled a few more times from home to the exercise center (74% vs. 63%). This could have been a factor in the attrition rate since the distance from work to the exercise center was shorter for both young dropouts and young finishers (6.6 miles vs 7.0 miles) and the finishers traveled more times from work to exercise than the young dropouts (37% vs 27%).

The travel results for the middle-aged officers were just the opposite, i.e., more of the dropouts (86% vs 80%) traveled from work to exercise than the finishers. The distance was small for both groups (3.2 miles and 3.3 miles), yet the program experienced a relatively high dropout rate (41%) as previously mentioned. Thus, distance did not seem to be a dropout factor.

Summaries of adherence to the exercise programs appear in Tables 51 to 57. Similar to the dropouts only a few (3%) of the finishers were totally dissatisfied with the training and/or their group assignment (9%). The groups showing slight unpopularity with the finishers were the combined running, weight training, and unsupervised programs. As previously reported, the unpopular program among the dropouts was the interval running. To gain further insight into this aspect, the finishers in the combined group were asked which training they preferred, continuous or interval running. Most (80%) preferred the continuous running, 10% preferred the interval, and 10% enjoyed both. Of the three programs (continuous, interval, or combined), it appears that the continuous running is the preferred regimen.

Table 51. Evaluation of Richardson Police Fitness Program

Questions	Response (%)[a] Yes	No	Comments
Enjoy training?	90	10	
Enjoy group assign?	100	0	
Second job?	30	70	Average = 12 hours per week
Attending school?	20	80	Average = 8 hours per week
Worthwhile program?	100	0	
Do you sleep better?	70	20	10% answered "sometimes"
Better sense of well-being	80	0	20% answered "sometimes"
Feel less tense?	80	10	10% answered "sometimes"
Recommend program?	100	0	
Plan to continue on own?	90	0	10% answered "maybe"
Sufficient communication?	100	0	
Other Questions:			
Fixed shift?	80%		
Rotating shift?	20%		
Distance from home to exercise center			Average = 8.0 miles
Distance from work to exercise center			Average = 3.6 miles
Trips from home to exercise center			Average = 90.5%
Trips from work to exercise center			Average = 9.5%
Why volunteer?			"Get in shape" and "Need discipline of program to lose weight"
Why continue?			"Enjoyed exercise" and "Finish what I start"

[a] Total n = 10

Table 52. Evaluation of Continuous Running Program for Young Police Officers (21-35 years)

Questions	Response (%)[a] Yes	No	No Answ.	Comments
Enjoy training?	100	0	0	
Enjoy group assignment?	88	6	0	6% answered "yes and no"
Second job?	39	61	0	Average = 11.9 hours/week
Attending school?	11	89	0	Average = 10 hours/week
Worthwhile program?	100	0	0	18% answered "very affirmative"
Do you sleep better?	61	17	0	12% answered "unknown" 5% answered "not necessarily" 5% answered "sometimes"
Better sense of well-being?	88	0	0	6% answered "somewhat" 6% answered "at times"
Feel less tense?	72	11	0	12% answered "unknown" 5% answered "sometimes"
Recommend program?	100	0	0	
Plan to continue on own?	100	0	0	
Sufficient communication?	94	0	6	
Other Questions:				
Fixed shift?	61			
Rotating shift?	39			
Distance from home to exercise center				Average = 14.2 miles
Distance from work to exercise center				Average = 8.4 miles
Trips from home to exercise center				Average = 54.5%
Trips from work to exercise center				Average = 45.5%
Why volunteer?				"Need exercise"; "get in better shape"; and "lose weight"
Why continue?				"Finish what I start"; "enjoyed it"; and "saw improvement"

[a] Total n = 18

Table 53. Evaluation of Interval Running Program for Young Police Officers (21-35 years)

Questions	Response (%)[a] Yes	No	No Answ.	Comments
Enjoy training?	91	9	0	9% answered "no, at first it was painful"
Enjoy group assignment?	82	0	0	9% answered "yes, but prefer continuous" 9% answered "yes, but later prefer continuous"
Second job?	45	55	0	Average = 11 hours/week
Attending school?	36	64	0	Average = 7 hours/week
Worthwhile program?	100	0	0	27% answered "very affirmative"
Do you sleep better?	73	9		9% answered "no change" 9% answered "unknown"
Better sense of well-being?	91	9	0	
Feel less tense?	46	27	0	9% answered "unknown" 18% answered "no change"
Recommend program?	100	0	0	
Plan to continue on own?	100	0	0	
Sufficient communication?	91	9	0	
Other Questions:				
Fixed shift?	73			
Rotating shift?	27			
Distance from home to exercise center				Average = 16.6 miles
Distance from work to exercise center				Average = 6.4 miles
Trips from home to exercise center				Average = 46.8%
Trips from work to exercise center				Average = 53.2%
Why volunteer?				"Need supervised exercise program" & "get in shape"
Why continue?				"Finish what I start"; "enjoyed it"; and "saw improvement"

[a] Total n = 11

Table 54. Evaluation of Combined Running Program for Young Police Officers (21-35 years)

Questions	Response (%)[a] Yes	No	No Answ.	Comments
Enjoy training?	73	0	0	27% answered "sometimes"
Enjoy group assignment?	73	27	0	
Second job?	36	64	0	Average = 6.6 hours/week
Attending school?	18	73	9	Average = 8 hours/week
Worthwhile program?	64	0	0	36% answered "very affirmative"
Do you sleep better?	73	27	0	
Better sense of well-being?	82	9	0	9% answered "much better"
Feel less tense?	64	27	0	9% answered "never was tense"
Recommend program?	100	0	0	
Plan to continue on own?	100	0	0	
Sufficient communication?	91	0	0	9% no answer
Other Questions:				
Fixed shift?	82			
Rotating shift?	18			
Distance from home to exercise center				Average = 15.5 miles
Distance from work to exercise center				Average = 6.4 miles
Trips from home to exercise center				Average = 53.3%
Trips from work to exercise center				Average = 46.7%
Why volunteer?				"Get in better shape"; "need supervised program"
Why continue?				"Enjoyed it"; "Didn't want to be a quitter"; and "felt better"

[a] Total n = 11

Table 55. Evaluation of Circuit Weight Training Program for Young Police Officers (21-35 years)

Questions	Response (%)[a] Yes	No	No Answ.	Comments
Enjoy training?	92	0	0	8% answered "partially"
Enjoy group assignment?	67	17	0	16% answered "yes and no"
Second job?	17	83	0	Average 20 hours/week
Attending school?	17	83	0	Average 9 hours/week
Worthwhile program?	92	8	0	
Do you sleep better?	75	17	0	8% answered "unknown"
Better sense of well-being?	92	8	0	
Feel less tense?	58	34	0	8% answered "undecided"
Recommend program?	92	0	0	8% answered "with some reservation"
Plan to continue on own?	100	0	0	
Sufficient communication?	92	0	8	
Other Questions:				
Fixed shift?	83			
Rotating shift?	17			
Distance from home to exercise center				Average = 17.4 miles
Distance from work to exercise center				Average = 10.2 miles
Trips from home to exercise center				Average = 72.9%
Trips from work to exercise center				Average = 27.1%
Why volunteer?				"Need a supervised exercise program to get in shape"
Why continue?				"Could see improvement"; and "finish what I started"

[a] Total n = 12

Table 56. Evaluation of Supervised Fitness Program for Middle-Aged (36-52 years) Police Officers

Questions	Response (%)[a] Yes	No	No Answ.	Comments
Enjoy training?	93	0	0	7% answered "sometimes"
Enjoy group assign?	100	0	0	
Second job?	15	85	0	
Attending school?	0	100	0	
Worthwhile program?	93	0	7	
Do you sleep better?	39	39	7	15% answered "unknown"
Better sense of well-being?	71	15	7	7% answered "so-so"
Feel less tense?	71	29	0	
Recommend program?	100	0	0	
Plan to continue on own?	100	0	0	
Sufficient communication?	93	7	0	
Other Questions:				
Fixed shift?	77			
Rotating shift?	23			
Distance from home to exercise center				Average = 17.8 miles
Distance from work to exercise center				Average = 3.7 miles
Trips from home to exercise center				Average = 20.1%
Trips from work to exercise center				Average = 79.9%
Why volunteer?				"Get in shape" & "Improve health"
Why continue?				"Improve physical condition" and "enjoy it"

[a] Total n = 13

Table 57. Evaluation of Unsupervised Fitness Program for Middle-Aged (36-52 years) Police Officers

Questions	Response (%)[a] Yes	No	No Answ.	Comments
Enjoy training?	82	9	0	9% answered "sometimes"
Enjoy group assign?	64	18	0	18% answered "so-so"
Second job?	9	91	0	Average = 12.5 hours/week
Attending school?	18	82	0	Average = 6 hours/week
Worthwhile program?	91	0	0	9% answered "very much"
Do you sleep better?	64	36	0	
Better sense of well-being?	82	9	0	9% answered "same"
Feel less tense?	73	18	0	9% answered "same"
Recommend program?	100	0	0	
Plan to continue on own?	100	0	0	
Sufficient communication?	91	9	0	
Other Questions:				
Fixed shift?	64			
Rotating shift?	36			
Distance from home to exercise center				Average - 19.1 miles
Distance from work to exercise center				Average = 2.9 miles
Trips from home to exercise center				Average = 19.3%
Trips from work to exercise center				Average = 80.7%
Why volunteer?				"Get in good physical shape"
Why continue?				"Improve physical condition"

[a] Total n = 11

Also similar to the dropouts were the number of finishers on a rotating shift (27%) and holding a second job (28%). However, only 16% of the finishers attended school compared to the 30% of the dropouts. This could explain some of the "time demanding" reasons expressed by the dropouts. Virtually all of the finishers felt that the programs were worthwhile. Regarding other questions, 64% felt that they slept better, 84% had a better sense of well-being, and 66% felt less tense as a result of the various exercise programs. Virtually all of the finishers indicated that there was sufficient communication with the exercise program staff and all said that they would recommend the programs to others and planned to continue exercising on their own at the completion of the study.

In order to gain some insight on the motivational factors involved in the exercise programs, questions were asked relative to why the finishers volunteered for the program and why they continued. After reviewing Tables 51 through 57 it is obvious that the officers recognized the need for a regular exercise program to "get in shape" and "lose weight." Also evident was the recognition of the need for a supervised program which indicates that future programs for police officers should seriously consider some form of supervised exercise. Many of the finishers enjoyed the exercise and saw improvements within themselves. They also displayed a strong commitment to the program in indicating that they "finish what they start."

Comments by the control groups were also evaluated and are summarized in Tables 58 to 60. Sixty-six percent of the control groups were not happy with their group assignment which contributed to the overall 26%

Table 58. Comments by Control Group in Richardson Police Fitness Program

Questions	Response (%)[a] Yes	No	No Answ.	Comments
Enjoy group assign?	29	43	28	
Second job?	29	71	0	Average 25 hours per week
Attending school?	43	57	0	Average 10 hours per week
Worthwhile program?	86	0	14	
Sufficient communication?	86	0	14	
Other Questions:				
Fixed shift Rotating shift	57% 43%			
Why volunteer?				"Improve fitness" and need structured exercise program"
Why continue to be Control?				"Commitment to project" and "Finish what I start"

[a] Total n = 7

Table 59. Comments by Control Group in Young (21-35 years) Police Fitness Program

Questions	Response (%)[a] Yes	No	No Answ.	Comments
Enjoy group assign?	13	73	7	7% answered "didn't have one"
Second job?	20	73	0	7% answered "sometimes" Average = 14 hours/week
Attending school?	27	66	7	Average = 5 hours/week
Worthwhile program?	86	0	0	7% answered "hope it will be" 7% answered "not yet"
Sufficient communication?	80	0	7	7% answered "questionable" 7% answered "unknown"
Other Questions:				
Fixed shift	87			
Rotating shift	13			
Why volunteer?				"To get back in shape"
Why continue to be Control?				"Recognize need for controls"; "Control group easy to stay in"

[a] Total n = 15

Table 60. Comments by Control Group in Middle-Aged (36-52 years) Police Fitness Program

Questions	Response (%)[a] Yes	No	No Answ.	Comments
Enjoy group assign?	0	71	14	14% answered "Not particularly"
Second job?	57	29	0	14% answered "Not regularly" Average = 14 hours/week
Attending school?	29	71	0	Average = 4 hours/week
Worthwhile program?	72	0	0	14% answered "Unknown" 14% answered "Possibly"
Sufficient communication?	29	14	14	14% answered "Such as it was in controls" 14% answered "none" 14% answered "unknown "
Other Questions:				
Fixed shift	100			
Rotating shift	0			
Why volunteer?				"Improve health through exercise"
Why continue to be Control?				"No answer"; and "Waiting for exercise program"

[a] Total n = 7

dropout rate from the control groups. The control groups were similar to the exercise groups in officers holding a second job (31%) and attending school (31%). Most felt that the program was worthwhile (83%) and that there was sufficient communication with the staff (69%). Their reasons for volunteering were the same as the exercisers and they also exemplified their commitment to "finish what they start."

In summary, the major factor accounting for the high attrition rate involved "too much time" for the programs. Several reasons contributed to this factor and included holding second jobs, attending school, distance to exercise center, family and personal illness, several court appearances, new babies in family, expense of traveling to exercise center, lack of interest, and some injuries. No one reason stood out as being significant but all combined to result in "too much time" required for the exercise programs even though they were held only three days per week. This situation is somewhat perplexing since a similar number of officers who finished the exercise programs held second jobs, attended school, traveled the same distance, incurred the same expenses, had court appearances, and experienced some injuries. Neither the dropouts nor the finishers were critical of the programs yet the high dropout rate occurred. Not explained in the previous results was the fact that many of the middle-aged executive-type officers exercised during on-duty time even though all officers were told to exercise on their own time. The younger officers (mainly patrolmen) did not have this option and thus were forced to exercise on their own time which could have contributed to a higher dropout rate. Several young officers felt that exercise programs should be mandatory and that on-duty time should be allowed for

such exercise since it is a vital part of an officer's job. Even though several middle-aged officers exercised on duty, the dropout rates were similar for the middle-aged and young officers (41% and 46%, respectively). Thus the "too much time" attrition factor involved many reasons other than not having on-duty time available for exercising. Providing motivation to exercise on one's own time is an extremely important consideration for enhancing adherence to an exercise program.

As mentioned previously in the summary of physiological findings, fitness programs can be decentralized successfully. Several programs based on individual preference can be conducted in police substations located throughout a metropolitan area. This would make the exercise facilities closer to the individual and reduce the amount of time involved which was the major dropout factor in this study.

Officers completing the exercise programs indicated that it was worthwhile and that they slept better, felt better, had a better sense of well-being, would recommend the program to others, and had planned to continue exercise on their own after completion of the study. Officers volunteering for the program recognized the need for regular, <u>supervised</u> exercise to "get in shape" and "lose weight." The finishers enjoyed the exercise and exemplified strong commitments to "finish what they start."

Recommendations

Based on the results of these studies the following recommendations are made:

1. There is a definite need for a preventive medicine program for police officers of all ages. Educational information on good health habits, exercise programs, and proper diet is required. Suggestions on implementing a preventive medicine program are presented in Report 2.
2. The needs of young and middle-aged officers clearly differ. The young patrolman needs adequate strength and endurance to meet the physical challenges presented during his daily tasks. A combination weight training and running program is recommended for young officers. On the other hand, the needs of the middle-aged executive police officer fall more into the preventive health category. A general aerobics program is recommended for them to reduce the risk of coronary heart disease and improve total health.
3. Where facilities, equipment, and budgets are limited it is recommended that a program similar to that in the RPD and TDPS be implemented. Extensive facilities, equipment, and budgets are not needed to successfully test physical fitness and implement a fitness program in a small department.
4. Where facilities, equipment, and budgets are relatively unlimited, a combination of weight training and continuous running is recommended for young police officers to improve both strength and cardiovascular-respiratory fitness.

5. If continual supervision of exercise is not available, it is recommended that complete indoctrination of exercise principles and practices be practiced for at least four weeks before an individual is released to his own personal program.
6. It is recommended that fitness programs be decentralized to substations throughout a metropolitan area. This would make the facilities more convenient to the officers and alleviate some of the time problems expressed in the adherence/attrition analyses.

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CHAPTER 5

PSYCHOLOGICAL CORRELATES OF PHYSICAL FITNESS TRAINING

Previous chapters have described the administration of the various physical fitness training programs and discussed the results of these programs in physiological terms. The present chapter addresses the definition of psychological correlates of physical fitness as they appeared in this study.

A great variety of psychological benefits have been attributed to improved health and physical fitness in both popular and scientific literature. The objective of this segment of the research project was the determination of psychological factors relating specifically to both aerobic training and the police environment and the identification of any changes in those factors that occurred across the 20 weeks of training. Due to the unique nature of the police job, a variety of areas were deemed applicable for examination.

Perceptions of self and others are integral parts of an individual's psychological make up. The present study examines a great deal of perceptual data, including general physical health and specific physical abilities of self in relation to an appropriate peer group (i.e., other police officers of the same age) as well as the perceived physical fitness of other police officers. Since the stress and tension associated with police work is seen as relevant to the overall physical and mental well being of officers doing that work, perceptions of sources of such stress were also examined. Additionally, perceptions of significant others, in this case the officers' wives, relative to change in their husbands' conditions at the completion of the training

programs were documented.

Attitudes toward physical fitness may also play a role in terms of affinity for exercise and adherence to particular programs. Such attitudes were explored here in relation to physical activity, health in general, and heart attacks, often thought to be a hazard of police work.

Finally, personal and family background data were collected as indications of an officer's experiences with physical activity and exercise.

Questionnaire Development

Nine separate psychological and attitudinal instruments were administered to the participating experimental and control group police officers at three points in time during the 20-weeks programs. These instruments, which are presented in Appendix C , are briefly described below:

1. Medical History Questionnaire (MHQ) - This standard IAR form is used to evaluate various personal and family health related issues. Although it is primarily concerned with specific medical conditions, it also includes information on sports and other physical fitness activities and preferences.
2. Background Information Report Form (BIRF) - This questionnaire provides additional information in the areas of personal and job related identification, medical problems, experience with formal physical fitness activities, and family patterns of exercising.
3. Self-Evaluation Questionnaire (SEQ) - One of two standard psychological instruments used, this test examines anxiety levels, yielding two scores, i.e., state anxiety ("how I feel right now") and trait anxiety ("how I generally feel"). Each score is generated by the indicated degree to which each of 20 statements is applicable to the individual.
4. Attitude Questionnaire (AQ) - This second standardized psychological instrument consists of 100 statements of attitudes and interests to which the individual responds with "true" or "false,"

depending upon the perceived applicability of each statement. Two scores result from the responses to certain of the items. An "estimation" score reveals perception of self relative to an appropriate peer group, while an "attitude" score indicates degree of favorable reaction to physical fitness activities.

5. Physical Fitness and Job Relatedness Questionnaire Part I (PFJRQ-I) - Perceptions of physical abilities in the performance of specific police tasks and attitude toward physical fitness programs are the subject of this questionnaire.
6. Physical Fitness and Job Relatedness Questionnaire Part II (PFJRQ-II) - This lengthy questionnaire was borrowed in part from work by Kroes examining various sources and degrees of stress and tension relative to specific police functions.
7. Health Opinion Questionnaire (HOQ) - Attitudes toward health, particularly in relation to heart attacks, have been examined with this instrument in previous studies by Heinzlemann.
8. Project Participation Questionnaire (PPQ) - Two different participation instrument forms were used. The pre-test form examined reasons for volunteering for the experimental program, as well as expectations of the participants; the post-test form examined self-reported results.
9. Spouse Questionnaire (SQ) - Evaluations of program results from the viewpoint of the participant's husband or wife are provided by this instrument. Since the sample of women officers was very small, the spouse questionnaire will reflect the opinion of the male officers' wives.

Questionnaire Administration

With the exception of the medical history questionnaire and the spouse questionnaire, all instruments were administered in a package to participating officers at three times during the 20-week programs. Pre-test questionnaires were completed during initial orientation and medical/stress testing. Mid-test forms were administered following the tenth week of training. Post-test data on participants were collected when the officers reported for their final medical/stress testing; the spouse questionnaires were mailed individually to the officers' homes. Table 1 indicates the questionnaire forms which were used at each test administration.

Data Analysis

Results of all questionnaires were translated to computer coding systems and analyzed with the SPSS (Statistical Package for the Social Sciences) computer program using the services of the American Management Systems and Control Data Center.

TABLE 1. Psychological and attitudinal instruments administered to experimental and control group subjects at pre, mid, and post program times.

INSTRUMENTS	PROGRAM TIMES		
	Pre-Test	Mid-Test	Post-Test
Medical History Questionnaire	X[a]		
Background Information Report Form	X	Y[b]	X
Self-Evaluation Questionnaire	X	X	X
Attitude Questionnaire	X	X	X
Physical Fitness and Job Relatedness Questionnaire Part I	X	Y	X
Physical Fitness and Job Relatedness Questionnaire Part II	X	Y	X
Health Opinion Questionnaire	X	Y	X
Project Participation Questionnaire	X		Z[c]
Spouse's Questionnaire			X

[a] X indicates that the questionnaire was given at this time.

[b] Y indicates that a different, shortened form of the questionnaire was used.

[c] Z indicates that a completely different questionnaire was used.

RESULTS

Several types of problems which bear upon data collection and presentation are typically encountered in a study of this nature. Since they affect the way in which the results are presented, these problems warrant some discussion here.

First, the physical fitness training programs utilized volunteer participants. Of the 213 police officers on whom pre-test background and psychological data were collected, 88 officers dropped out of the training programs during the 20 weeks. The remaining 125 officers provide the basis for the present discussions. Complete data across the three testing times is not available on some of these officers, however, and therefore the specific numbers indicated will vary.

Second, a careful review of the nine questionnaires will reveal the large amount of data collected on each subject. It is not possible to discuss all of the data in this report. The present analysis, then, will be confined to results in a few specific areas.

Due to the high drop out rate, a separate analysis of data to determine the predictability of adherence to physical fitness programs is warranted. In addition, since many of the attitudinal and background questions asked of this small sample were also included in a much larger national survey of police officers, comparisons between these two groups should yield interesting results. Both of these analyses will be presented in a later report.

Discussion of the data in this chapter will proceed in the following manner.

First, a general description of the participating officers at the beginning of the program will be presented. This description relates various demographic data which were collected primarily with the Medical History Questionnaire and

the Background Information Report Form.

Second, pre, mid, and post-test differences on the two Job Relatedness Questionnaires and the Health Opinion Questionnaire will be examined.

Third, results of the Project Participation Questionnaire and the Spouse Questionnaire will be reviewed.

Analysis of the results from the two psychological instruments, i.e., the Self-Evaluation Questionnaire and the Altitude Questionnaire, are presented in Chapter 6 of this report.

General Description of Participants

Preliminary analysis of the data contained in the Medical History Questionnaire and the Background Information Report Form revealed no real differences between experimental and control group officers. Combining these training and control groups, then, results in the most efficient presentation of data. For the purposes of this section, data are presented for the following three groups:

Group I - all officers from the Richardson Police Department and the Texas Department of Public Safety.

Group II - younger officers in the Dallas Police Department (i.e., those in the running and weight lifting programs as well as the control group).

Group III- older officers in the Dallas Police Department (i.e., those in the supervised and unsupervised training programs as well as the control group).

Again, data are discussed for those officers who remained with the program for 20 weeks and who completed most of the questionnaires.

Tables 2 through 8 present general background information on participating police officers.

Table 2 presents information on the marital status, educational level, and military experience of the officers in the three groups identified above. It can be seen that while the majority of officers in all three groups are married, the younger Dallas officers (Group II) are more likely to be single (16.4%) or divorced (12.3%) than officers in either Group I (single = 4.8%; divorced = 9.5%) or Group III (single = 3.3%; divorced = 6.7%). Richardson and Public Safety Department officers (Group I) are more likely than Dallas officers to have some college training less than a four-year degree (61.9%), but the majority of officers in each group have either some college or a four-year degree. Finally, fewer younger Dallas officers (43.1%) have served in the military than either Richardson/DPS officers (76.2%) or older Dallas officers (75.9%).

Table 3 presents information on the current rank and assignment of officers as well as on the number of participants who currently attend college or hold a part-time job. Over 80% of the Richardson/DPS participants are patrol officers, most of whom (61.9%) are assigned to the patrol function. Younger Dallas participants are primarily patrol officers (49.3%), investigators (19.2%) or sergeants (23.3%); the majority of these officers are assigned to patrol (58.9%), investigation (20.5%) or traffic (11.0%) functions. As expected, older Dallas participants are generally of higher rank (sergeant = 34.5%; lieutenant = 27.6%; captain = 6.9%) and more evenly distributed assignment.

Proportionately more Group I participants currently attend college (33.3% of Richardson/DPS participants compared to 17.8% and 13.8% of Dallas younger and older participants, respectively). A follow-up question on the BIRF revealed that most of these officers spend six hours or less per week in class. In

TABLE 2. Marital Status, Education, and Military Service of Participating Officers in Groups I, II, and III

	Group I		Group II		Group III	
	N	%	N	%	N	%
Marital Status						
Single	1	4.8	12	16.4	1	3.3
Married	18	85.7	43	58.9	25	83.3
Divorced	2	9.5	9	12.3	2	6.7
Education						
Less than High School	0	0	4	5.5	2	6.9
High School Diploma	5	23.8	8	11.0	2	6.9
Some College	13	61.9	25	34.2	10	34.5
4 Year College Degree	3	14.3	24	32.9	11	37.9
Military Experience	16	76.2	31	43.1	22	75.9

TABLE 3. Current Rank, Assignment, and Outside Educational and Work Activities of Participating Officers in Groups I, II, and III

	Group I		Group II		Group III	
	N	%	N	%	N	%
Rank						
Police/Patrol Officer	17	81.0	36	49.3	4	13.8
Investigator	1	4.8	14	19.2	5	17.2
Sergeant	1	4.8	17	23.3	10	34.5
Lieutenant	2	9.5	4	5.5	8	27.6
Captain	0	0	2	2.7	2	6.9
Assignment						
Administration	2	9.5	5	6.8	7	24.1
Patrol	13	61.9	43	58.9	4	13.8
Traffic	1	4.8	8	11.0	7	24.1
Investigation	1	4.8	15	20.5	9	31.0
Juvenile	1	4.8	2	2.7	2	6.9
Courts	2	9.5	0	0	0	0
Staff	1	4.8	0	0	0	0
Currently Attend College	7	33.3	13	17.8	4	13.8
Hold Second Job	6	28.6	20	27.8	7	24.1

addition, more than 25 percent of all participants in the three groups hold a second job; a similar follow-up question revealed that 45% of these officers work 10 hours a week or less and 42% work between 11 and 20 hours per week on their second jobs.

Information concerning sports activities is presented in Table 4. A majority of officers in all three groups participated in one or more varsity sports during their high school and/or college years; younger Dallas officers participated at a lower rate than officers in Groups I and III. Of those who participated in sports in school, similar percentages of the three groups lettered in these sports. Only five of the 124 officers had any previous experience with employer-sponsored sports or other physical fitness programs.

Richardson/DPS officers are more likely than Dallas officers to have tried a "new" sport (i.e., something they did not participate in during their school years) and to engage in sports activities at the present time. Younger Dallas officers have the lowest participation rate in both of these areas.

TABLE 4. Sports Related Activities During and Since High School/College of Participating Officers in Groups I, II, and III

	Group I		Group II		Group III	
	N	%	N	%	N	%
Participated in High School/College Sports	16	76.2	42	59.2	23	76.7
Lettered in High School/College Sports	10	62.5	26	61.9	15	65.2
Previous Employers Sponsored Sports	1	4.8	3	4.1	1	3.4
Previous Employers Sponsored Physical Fitness/Weight Maintenance Program	1	4.8	0	0	0	0
Tried New Sports Since School	8	38.1	20	27.4	10	34.5
Engage in Sports Now	8	40.0	20	28.2	11	37.9

This is an interesting result from the standpoint of adherence to programs. In looking at the results for the total initial group of officers (i.e., N=213), the younger Dallas officers had the highest rate of participation in sports at the present time.

Most of the officers who currently participate in sports indicated greatest frequencies for tennis, bowling, and golf. When asked to indicate preferences for regular exercise programs, however, the three groups produced the rank orders provided in Table 5. It can be seen that officers in Groups I and II are very similar in their exercise preferences, while the Group III older officers provide variations in rank orders.

Table 6 consists of personal and family health related information on those officers who completed the 20 week programs. Relatively few of the officers had parents who died of heart attacks. Younger officers have had the least experience with this situation.

Large differences in smoking and drinking patterns can be found among the three groups of officers. While 93.3% of older Dallas officers and 76.2% of the Group I officers reported having smoked at some time in their lives, only 49.3% of the younger Dallas officers reported having smoked at all, and only 18.3% reported that they smoke now (compared to 53.0% and 44.8% for Groups I and III, respectively). Of those who quit smoking, most of the Group I and II officers have quit within the past five years, while older Dallas officers most often quit between eleven and fifteen years ago.

Similar patterns can be seen with respect to the data on drinking. Younger Dallas officers reported the lowest drinking rate, but a majority of

TABLE 5. Rank Order of Preferences for Regular Exercise Programs Among Officers in Groups I, II, and III

	Group I	Group II	Group III
Walking and/or running	1	1	1
Tennis	2	2	4
Bicycling (outdoors)	3.5	3	5
Swimming	3.5	4.5	2
Handball, basketball, or squash	5	4.5	3
Jumping rope	6	6	7
Stationary running	7	8	8
Stationary cycling	8	7	6

TABLE 6. Medical Information on Participating Officers in Groups I, II, and III

	Group I		Group II		Group III	
	N	%	N	%	N	%
Father Died of Heart Attack	3	14.3	6	8.2	5	16.7
Mother Died of Heart Attack	1	4.8	0	0	2	6.7
Smoke Ever	16	76.2	35	49.3	28	93.3
Smoke Now	11	53.0	13	18.3	13	44.8
Drink Now	20	95.2	65	69.0	22	73.3
Beer - None	0	.0	6	9.2	0	0
Occasional	16	80.0	44	67.7	15	68.2
Often	4	20.0	15	23.1	7	31.8
Wine - None	5	25.0	22	33.8	4	18.2
Occasional	8	40.0	22	33.8	12	54.5
Often	0	0	6	9.2	0	0
Liquor - None	0	0	18	27.7	0	0
Occasional	16	80.0	28	43.1	16	72.7
Often	1	5.0	4	6.2	3	13.6
Doctor Recommended Exercise	1	4.8	6	8.2	1	3.4
Amount of Sleep						
5 or 6 Hours per day	7	33.3	13	18.1	5	17.2
7 or 8 Hours per day	13	61.9	46	63.9	22	75.9

all three groups reported that they do drink. Most of these officers reportedly drink beer and liquor occasionally.

Younger Dallas officers have also engaged in exercise programs recommended by doctors to a greater extent than Group I or Group III officers. Most of these cases occurred following traffic or home accidents. Finally, most of the officers in all groups report sleeping for 7 or 8 hours during each 24-hour period.

Additional health related questions on the BIRF revealed information about the use of certain medications and the frequency of lower back pain. Not surprisingly, the most frequently used medication was found to be aspirin, which is taken on occasion by over 50% of the officers. Vitamins are taken on a daily basis by about 10% of the officers.

Data on the occurrence of lower back pain are presented in Table 7. It is clear that younger Dallas officers report suffering from lower back pain less frequently than either Group I or Group III officers; the percentage of Group II officers indicating "never" are highest for each of the five situations. There are also indications that the older Dallas officers have the greatest experience with back pain. The combination of "frequently" and "occasionally" is largest in Group III for four of the five situations; the exception is driving where Group I (42.9%) is slightly higher than Group III (41.3%).

Perhaps more important than these individual figures, however, is the indication that a fairly large proportion of all officers experience lower back pain at some time. If the figures for "frequently" and "occasionally" are combined for the total group of participating officers, the following data result:

TABLE 7. Frequency of Experiencing Lower Back Pain in Five Situations for Participating Police Officers in Groups I, II, and III

	Group I		Group II		Group III		Total	
	N	%	N	%	N	%	N	%
Waking Up								
Frequently	0		1	1.4	1	3.4	2	1.6
Occasionally	1	4.8	4	5.5	2	6.9	7	5.7
Rarely	12	57.1	19	26.0	12	41.4	43	35.0
Never	8	38.1	49	67.1	14	48.3	71	57.7
Driving								
Frequently	1	4.8	3	4.1	3	10.3	7	5.7
Occasionally	8	38.1	18	24.6	9	31.0	35	28.4
Rarely	8	38.1	19	26.0	10	34.5	37	30.1
Never	4	19.0	33	45.2	7	24.1	44	35.8
Sitting								
Frequently	1	4.8	2	2.8	1	3.4	4	3.3
Occasionally	2	9.5	14	19.4	4	13.8	20	16.4
Rarely	12	57.1	19	26.4	16	55.2	47	38.4
Never	6	28.6	37	51.4	8	27.6	51	41.8
Lifting Objects								
Frequently	1	4.8	0		1	3.4	2	1.6
Occasionally	2	9.5	13	18.0	4	13.8	19	15.6
Rarely	12	57.1	25	34.7	15	51.7	52	42.6
Never	6	28.6	34	47.2	9	31.0	49	40.2
Walking or Standing								
Frequently	1	4.8	3	4.1	1	3.4	5	4.1
Occasionally	2	9.5	14	19.2	7	24.1	23	18.7
Rarely	12	57.1	21	28.8	14	48.3	47	38.2
Never	6	28.6	35	47.9	7	24.1	48	39.0

Driving	42	34.1%
Walking/Standing	28	22.8%
Sitting	24	19.7%
Lifting	21	17.2%
Waking Up	9	7.3%

Over one-third of all the officers completing these 20 week programs experience lower back pain while driving their cars, while approximately 20% have some back pain when walking/standing and sitting. Although no officer reported that back pain occurred daily, these figures do indicate the prevalence of some back pain for this sample of officers.

Finally, Table 8 presents data on the patterns of exercising reported for officers and their families. It is obvious that few officers participated in any regular exercise program at home at the beginning of this training experiment; younger Dallas officers exhibited somewhat greater exercise rate (9.6%) than either of the other two groups of officers (Group I = 4.8%; Group II = 3.4%). It is interesting to note that the pattern for spouses (wives) is nearly the same as for their husbands.

A majority of married officers indicated that their wives comment on the physical condition of their husbands; most of these comments were reported to be negative in nature. On the other hand, officers comment on their wives' physical condition with somewhat less frequency and nearly all indicated that their comments were positive in nature.

Among those officers who are parents, sports activities connected with school were cited most frequently as the primary source of exercise for their children. The lower response rate among younger Dallas officers is due at least in part to the fact that many of their children are younger, i.e., not of

TABLE 8. Family Exercising Patterns for Participating Officers in Groups I, II, and III

	Group I		Group II		Group III	
	N	%	N	%	N	%
Officer Exercises at Home	1	4.8	7	9.6	1	3.4
Officer's Spouse Exercises at Home	1	5.0	6	9.7	2	7.4
Spouse Comments on Officer's Physical Condition	11	61.1	27	62.8	18	72.0
Officer Comments on Spouse's Physical Condition	7	38.9	25	58.1	18	72.0
Children Engage in Formal Sports Programs	7	58.3	16	32.6	21	80.8
Children Exercise at Home	1	8.3	4	8.2	5	19.2
Believe Children Get Enough Exercise	12	100.0	29	59.2	18	69.2

school age. Most officers believe their children get enough exercise through school and/or play activities.

Summary of Descriptive Data

The majority of police officers participating in these 20 week programs are married, college-educated veterans currently assigned to patrol or investigation. Younger Dallas officers are more often single or divorced and have less frequently served in the military, while older Dallas officers are of higher rank and more varied assignments. Approximately 20% currently attend college and 25% hold a part-time job.

Although most of the officers participated in sports while in school (some 60% of these having lettered in their respective sports), less than one-third engage in sports activities at the present time. Very few officers have any previous experience in physical fitness training programs or currently practice any regular exercise program at home. Neither wives nor children of these officers engage in regular exercise at home, and wives generally have negative comments about their husband's physical condition.

Little personal experience with heart attacks in the officer's immediate family has been found. Although diversity in smoking and drinking patterns was reported, the majority of officers reportedly drink beer and liquor occasionally, while approximately one-third smoke at the present time. Nearly 70% of the officers sleep seven or eight hours during every 24-hour period. Few take any medications other than aspirin. Over one-third of the officers experience some lower back pain while driving their cars; older Dallas officers indicated greater occurrence of back pain than younger Dallas officers.

Job Perceptions and Health Opinions of Participants

This section will examine in detail three of the questionnaires administered to the experimental (training) and control group officers. The questionnaires to be discussed are the Physical Fitness and Job Relatedness Questionnaire, Parts I and II, and the Health Opinion Questionnaire (refer to Appendix C). Taken together, these instruments reveal perceptions of the physical and emotional demands of the officers' jobs, as well as their own abilities to meet these demands.

Data will be presented for those officers in each of the following five groups who completed the 20-week programs:

1. Richardson Department and Texas Department of Public Safety officers in the working/jogging training group (N=12).
2. Richardson and Texas Public Safety officers in the control group (N=9).
3. Younger Dallas officers in all training programs, i.e., interval, continuous, combination, and weight training (N=61).
4. Younger Dallas officers in the control group (N=11).
5. Older Dallas officers in the supervised and unsupervised training groups (N=26).

Inasmuch as only two of the original ten officers in the older Dallas control group completed the various psychological questionnaires at the post-testing time, little can be gained from examination of results of this group. Although these data are available, they will not be reported here.

In addition, some 27 officers failed to complete the post-test psychological instruments although they did complete the 20-week programs. To avoid misleading data, all percentages reported have been calaculated on the basis

of the number of officers in each group at the pre-test stage, i.e., those numbers reported above.

Part I of the Physical Fitness and Job Relatedness Questionnaire provides an indication of how physically fit the participating officers feel they are. Table 9 presents data on the reported frequency of performance of nine job-related activities requiring certain physical skills; these data have been collapsed from the complete responses for all participating officers. It can be seen that the majority of every group reported performance of these activities "rarely" or "never " at both pre-test and post-test administrations. Among those activities most frequently performed "very often" or "often" were struggling with a resistant suspect, running up flights of stairs, and lifting a heavy object or a person.

Even though these physical activities are infrequently performed, most officers feel they have the necessary physical skills and abilities required for the activities. When asked to rate specific physical skills in comparison to other officers of the same age, nearly all officers in every group rated themselves at least average, even before the training programs began. Data for ratings of "very high" or "above average" on pre- and post-tests are presented in Tables 10, 11, and 12.

In Table 10, it can be seen that nearly 42% of the Richardson and Public Safety officers in the training group rated their physical agility as above average at the beginning of the 20-week program; 25% gave similar ratings for speed. At least 22% of the R/DPS Control group officers rated themselves above

TABLE 9. Total Group Frequencies of Combined Physical Activities

	Very Often		Often		Rarely		Never	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
1. R/DPS Experimental	1.8	0	16.7	9.7	75.0	76.4	6.5	13.9
2. R/DPS Control	1.2	8.3	13.8	12.5	78.8	55.6	6.2	23.6
3. Dallas Younger Experimental	1.5	0.4	17.3	13.4	66.7	75.9	14.5	10.2
4. Dallas Younger Control	0	0	21.2	19.2	55.6	52.5	23.2	28.3
5. Dallas Older Experimental	0.9	0.6	5.7	5.6	62.9	63.3	30.6	30.6

TABLE 10. Pre and Post Test Ratings of "Above Average" on Five Physical Abilities for Richardson and Department of Public Safety Officers in Experimental and Control Groups

	R/DPS Experimental				R/DPS Control			
	Pre		Post		Pre		Post	
	N	%	N	%	N	%	N	%
Speed	3	25.0	5	41.7	2	22.2	2	22.2
Endurance	1	8.3	6	50.0	2	22.2	1	11.1
Agility	5	41.7	5	41.7	2	22.2	2	22.2
Strength	1	8.3	2	16.7	3	33.3	3	33.3
Combat Skills	2	16.7	5	41.7	3	33.3	4	44.4

TABLE 11. Pre and Post Test Ratings of "Above Average" on Five Physical Abilities for Younger Dallas Officers in Experimental and Control Groups

Ratings	Dallas Young Experimental				Dallas Young Control			
	Pre		Post		Pre		Post	
	N	%	N	%	N	%	N	%
Speed	18	29.6	31	50.8	2	18.2	3	27.3
Endurance	17	27.9	37	60.6	4	36.4	4	36.4
Agility	25	41.0	34	55.7	5	45.4	6	54.5
Strength	14	23.0	22	36.1	0	0	1	9.1
Combat Skills	13	21.3	25	41.0	3	27.3	3	27.3

CONTINUED

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TABLE 12. Pre and Post Test Ratings of "Above Average" on Five Physical Abilities for Older Dallas Officers in Experimental Groups

Ratings	Dallas Older Experimental			
	Pre		Post	
	N	%	N	%
Speed	5	19.2	12	46.2
Endurance	4	15.4	13	50.0
Agility	8	30.8	15	57.7
Strength	9	34.6	10	38.5
Combat Skills	10	38.5	12	46.2

average on all five physical skills at the pre-test administration. By the end of the training program, however, better than 40% of the experimental group rated themselves above average on four of the five skills, while little change is noted among control group officers. Not surprisingly, largest gains are found in ratings of endurance; while only one officer rated his endurance above average on the pre-test, six officers so rated endurance on the post-test.

Similarly, in Table 11, more than 20% of the younger Dallas experimental group officers rated themselves above average on all five physical skills at the beginning of the program. On the post-test, however, more than 36% rated themselves above average on all five physical abilities. Again, endurance made gains among the largest number of officers (from 17 on the pre-test to 37 on the post-test), but substantial increases are also found on the other four specific skills. Little change appeared among the control group officers.

Older Dallas officers followed the same pattern, as indicated in Table 12. Substantial pre- to post-test increases in the number of officers who rated themselves above average can be seen for the endurance (from 4 to 15 officers), agility (from 8 to 15), and speed (from 5 to 12 officers) factors. Slight increases are also found on the other two physical abilities of strength and combat skills.

Looking at these questions from the standpoint of below average self-ratings yields further interesting data. Table 13 presents data on the pre- to post-test changes in ratings of below average among the three training groups. It is obvious that nearly all of those officers who saw themselves as below average

TABLE 13. Pre and Post Test Ratings of "Below Average" on Five Physical Abilities for the Three Experimental Groups

Ratings	R/DPS Experimental				Dallas Younger Experimental				Dallas Older Experimental			
	Pre		Post		Pre		Post		Pre		Post	
	N	%	N	%	N	%	N	%	N	%	N	%
Speed	1	8.3	0	0	8	13.1	0	0	5	19.2	1	3.8
Endurance	2	16.7	0	0	10	16.4	1	1.6	4	15.4	0	0
Agility	0	0	0	0	3	4.9	0	0	2	7.7	0	0
Strength	0	0	0	0	11	18.0	0	0	5	19.2	0	0
Combat Skills	0	0	0	0	15	24.6	0	0	2	7.7	0	0

on the pre-test rated themselves as at least average by the end of the training programs. Only two officers provided self-ratings below average at the end of the programs.

Table 14 presents the mean pre- and post-test ratings of participants in all five groups for the five physical abilities. Mean differences were tested for significance using the t-test for correlated samples. As can be seen, the increases in self-ratings of endurance were significant at the .002 level for all three training groups. Younger Dallas officers provided significantly higher post-test self-ratings on all five of the physical abilities, while older Dallas officers rated themselves significantly higher on speed and agility in addition to endurance. It should be remembered that these ratings are made in comparison "to other officers your age." No mean differences were significant among control group officers.

Summarizing these five tables, it is apparent that perceptions of physical abilities increased after completion of the training programs. Perceived endurance increased to the greatest extent, which is expected as the result of an aerobics program. It is difficult to determine the amount of natural inflation of self-ratings at the pre-test stage, but feedback provided to the participants by IAR lends credence to the post-test judgments.

Opinions about current medical and physical standards required of applicants and recruits were also obtained on this questionnaire. Data concerning these opinions are found on the next six tables. "Don't know" responses have been eliminated to facilitate discussion.

TABLE 14. Year Ratings of Physical Ability Self Evaluations for Officers in Five Groups

	R/DPS Experimental		R/DPS Control		Dallas Younger Experimental		Dallas Younger Control		Dallas Older Experimental	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Speed	2.9	2.5	3.0	2.8	2.8	2.3*	2.9	2.7	3.0	2.4*
Endurance	3.2	2.2*	3.1	2.9	2.9	2.2*	2.7	2.5	3.0	2.4*
Agility	2.5	2.4	2.6	2.6	2.7	2.2*	2.5	2.5	2.9	2.2*
Strength	3.0	2.8	2.6	2.8	2.9	2.5*	3.1	2.8	2.8	2.5
Combat Skills	2.9	2.4	2.9	2.8	2.9	2.4*	2.9	2.7	2.7	2.4

*p < .002

Tables 15 through 17 present data on the opinions of officers in the five groups concerning entrance level medical exams. At the pre-test stage, R/DPS officers rated the entrance level medical exams as easy (58.3% of the training group; 100% of the control group); nearly all officers felt capable of passing these standards at the current time (91.7% of the training group; 100% of the control group); over two-thirds of the officers considered these medical standards important in their current jobs (66.7% and 77.8%). By the post-test, however, while few changes can be seen among control group officer opinions, experimental group officers' opinions had changed. Only 25% now considered the entrance level medical examinations easy and only two-thirds felt they could pass these examinations. Interestingly, the importance attached to these standards decreased as well; only 42% rated these standards as important to their current positions.

Among younger Dallas officers beginning the program, less than half of the experimental and control groups rated current medical standards easy, but over 70% of both groups felt they could still comply with the standards and that these standards were important considerations in their current jobs. Post-test data on the experimental group show decreases in ratings of both "easy" (19.7%) and "could pass now" (70.5%), as well as a slight increase in importance (75.4%). Some differences are noted on the opinions of the control group officers as well, but these are minor.

Few older Dallas officers felt the entrance medical standards were easy at either pre-test (N=2 or 7.7%) or post-test (N=2 or 7.7%) administrations. While 18 officers felt they could pass those standards at the beginning of the program, only 17 so indicated at the end of the program; at the same time, the number indicating "no" increased from 1 to 2. In addition, ratings of "important" decreased slightly from beginning (65.4%) to end (57.7%) of the program.

TABLE 15. Opinions of Richardson and Department of Public Safety Officers in Experimental and Control Groups Concerning Current Entrance Medical Standards

	R/DPS Experimental				R/DPS Control			
	Pre		Post		Pre		Post	
	N	%	N	%	N	%	N	%
1. Rate present entrance medical standards								
Easy	7	58.3	3	25.0	9	100	7	77.8
Difficult	1	8.3	1	8.3	0	0	1	11.1
2. Could you pass them now?								
Yes	11	91.7	8	66.7	9	100	8	88.9
No	0	0	0	0	0	0	0	0
3. How important are they?								
Important	8	66.7	5	41.7	7	77.8	7	77.8
Unimportant	2	16.7	2	16.7	0	0	1	11.1

TABLE 16. Opinions of Younger Dallas Officers in Experimental and Control Groups Concerning Current Entrance Medical Standards

	Dallas Younger Experimental				Dallas Younger Control			
	Pre		Post		Pre		Post	
	N	%	N	%	N	%	N	%
1. Rate present entrance medical standards								
Easy	25	41.0	12	19.7	5	45.4	4	36.4
Difficult	10	16.4	9	14.8	2	18.2	0	0
2. Could you pass them now?								
Yes	48	78.7	43	70.5	8	72.8	7	63.6
No	3	4.9	1	1.6	1	9.1	1	9.1
3. How important are they?								
Important	44	72.1	46	75.4	8	72.8	8	72.7
Unimportant	4	6.6	1	1.6	0	0	1	9.1

TABLE 17. Opinions of Older Dallas Officers in Experimental Groups Concerning Current Entrance Medical Standards

	Dallas Older Experimental			
	Pre		Post	
	N	%	N	%
1. Rate present entrance medical standards				
Easy	2	7.7	2	7.7
Difficult	7	26.9	5	19.2
2. Could you pass them now?				
Yes	18	69.2	17	65.4
No	1	3.8	2	7.7
3. How important are they?				
Important	17	65.4	15	57.7
Unimportant	4	15.4	3	11.5

Turning to the related issue of physical standards, Tables 18 through 20 present similar information on both the entrance level physical (agility) test and the physical standards required at the completion of the recruit training academy.

While at the beginning of the program only 50% of the R/DPS experimental group officers considered the entrance level physical tests easy, all twelve felt they could pass them and nearly all considered these standards important to current positions. Similarly, more than half stated the recruit academy physical standards were easy, and again, all twelve said they could pass them now. By the end of the 20 weeks, however, all of these ratings had decreased. In each case, fewer officers provided the "positive" response. Control group officers retained their opinions with some consistency, with the exception of the importance attached to physical standards, which decreased from 100% to 66.7% positive answers.

Younger Dallas officers were somewhat less inclined to give similar ratings to either entrance or academy physical requirements, but over 63% of both training and control groups at the pre-test indicated they could pass both. A substantial decrease is seen in the experimental group ratings of "easy" for the entrance requirements from the pre-test (44.3%) to the post-test (26.2%); a slight decrease occurred with the ratings of "easy" for academy requirements (26.2% to 18.0%). Over 73% of these officers felt they could pass both sets of standards by the end of the training program; this figure represents a slight decrease from the pre-test for the entrance standards and a fair increase from the pre-test for the academy requirements. Control group officers also decreased their ratings of "easy" and "could pass" in relation to the entrance requirements.

TABLE 18. Opinions of Richardson and Department of Public Safety Officers in Experimental and Control Groups Concerning Current Entrance and Recruit School Physical Standards

	R/DPS Experimental				R/DPS Control			
	Pre		Post		Pre		Post	
	N	%	N	%	N	%	N	%
1. Rate present entrance physical standards								
Easy	6	50.0	3	25.0	6	66.7	7	77.8
Difficult	1	8.3	2	16.7	1	11.1	0	0
2. Could you pass them now?								
Yes	12	100	8	66.7	7	77.8	8	88.9
No	0	0	0	0	0	0	0	0
3. How important are they?								
Important	10	83.3	7	58.3	9	100	6	66.7
Unimportant	1	8.3	0	0	0	0	1	11.1
4. Rate present recruit school physical standards								
Easy	7	58.3	4	33.3	7	77.8	7	77.8
Difficult	2	16.7	2	16.7	1	11.1	1	11.1
5. Could you pass them now?								
Yes	12	100	8	66.7	8	88.9	8	88.9
No	0	0	0	0	1	11.1	0	0

TABLE 19. Opinions of Younger Dallas Officers in Experimental and Control Groups Concerning Current Entrance and Recruit School Physical Standards

	Dallas Younger Experimental				Dallas Younger Control			
	Pre		Post		Pre		Post	
	N	%	N	%	N	%	N	%
1. Rate present entrance physical standards								
Easy	27	44.3	16	26.2	6	54.5	4	36.4
Difficult	12	19.7	6	9.8	1	9.1	0	0
2. Could you pass them now?								
Yes	46	75.4	45	73.8	10	90.9	8	72.7
No	2	3.3	0	0	0	0	1	9.1
3. How important are they?								
Important	48	78.7	45	73.8	8	72.7	9	81.8
Unimportant	8	13.1	1	1.6	0	0	1	9.1
4. Rate present recruit school physical standards								
Easy	16	26.2	11	18.0	4	36.4	3	27.3
Difficult	26	42.6	21	34.4	4	36.4	4	36.4
5. Could you pass them now?								
Yes	39	63.9	45	73.8	8	72.7	7	63.6
No	12	19.7	1	1.6	1	9.1	1	9.1

TABLE 20. Opinions of Older Dallas Officers in Experimental Groups Concerning Current Entrance and Recruit School Physical Standards

	Dallas Older Experimental			
	Pre		Post	
	N	%	N	%
1. Rate present entrance physical standards				
Easy	6	23.1	3	11.5
Difficult	7	26.9	7	26.9
2. Could you pass them now?				
Yes	18	69.2	17	65.4
No	1	3.8	2	7.7
3. How important are they?				
Important	21	80.8	18	69.2
Unimportant	2	7.7	1	3.8
4. Rate present recruit school physical standards				
Easy	2	7.7	2	7.7
Difficult	10	38.5	9	34.6
5. Could you pass them now?				
Yes	11	42.3	15	57.7
No	6	23.1	1	3.8

These trends are reversed somewhat for the older Dallas officers, who indicated more frequently at both pre- and post-test times that both entrance and academy physical requirements were difficult. By the end of the program, these standards were seen as easy by only 11.5% and 7.7% of the officers. Nevertheless, some 69.2% indicated at the pre-test that they could pass the entrance requirements; 65.4% gave a similar answer at the post-test. With regard to the academy standards, however, only 42.3% felt confident about passing them at the beginning of training; this figure rose to 57.7% by the end of training. A decrease is seen in the rating of importance of the entrance standards.

While departmental differences in specific examinations, as well as group differences in the number of "don't know" responses must be taken into account, similarities in response patterns are apparent across these six tables. Generally, physical requirements associated with recruit training are seen as more difficult (or at least less easy) than entrance standards. Older officers were more inclined to rate both entrance and academy physical standards as difficult. However, after 20 weeks of physical fitness training, fewer officers considered medical and physical tests easy and fewer officers were certain they could still pass those tests. In addition, the importance attached to both medical and physical standards in terms of current job or position declined across the training period.

These changes may result from a number of factors. Pre-test ratings were probably inflated in many cases, simply because most people feel they are

physically fit. By the post-test administration, a more realistic self-appraisal can be made, because of experience with both the actual fitness training and the medical examinations. The decrease in perceived importance of ability to comply with entrance medical and physical standards may result from a more thoughtful consideration of the specific requirements themselves, i.e., results here may be reflecting opinions about the quality of the requirements rather than the notion of being medically and/or physically fit.

The final questions on Part I of this instrument deal with additional opinions about physical fitness. Data are presented in the same format in Tables 21 through 23.

The percentage of officers who favored mandatory medical exams and/or mandatory physical fitness programs decreased from pre-test to post-test in each of the three experimental groups; the decline was greatest among the R/DPS officers. The control groups remained constant for the most part.

A variety of changes can be seen on the question of age exclusion, i.e., who should be excluded from a mandatory physical fitness program? R/DPS experimental group officers generally favored excluding officers above 50 (the middle choice on the questionnaire, not included in the tables). while the majority of both younger and older Dallas officers favored age 55 as the cut-off. The number of officers selecting an age cut-off below 50 increased among younger Dallas officers, but decreased among older Dallas officers.

These results may be indicative of some amount of realization that physical

TABLE 21. Opinions of Richardson and Department of Public Safety Officers in Experimental and Control Groups Concerning Mandatory Programs and the Physical Condition of Fellow Officers

	R/DPS Experimental				R/DPS Control			
	Pre		Post		Pre		Post	
	N	%	N	%	N	%	N	%
1. Favor mandatory medical exam								
Yes	11	91.7	6	50.0	8	88.9	8	88.9
No	0	0	1	8.3	0	0	0	0
2. Favor mandatory physical fitness program								
Yes	12	100	8	66.7	7	77.	7	77.8
No	0	0	0	0	0	0	1	11.1
3. Age exclusion								
Less than 50 years	2	16.7	2	16.7	0	0	2	22.2
More than 55 years	2	16.7	4	33.3	8	88.9	3	33.3
4. Ratings of co-workers								
High	1	8.3	1	8.3	1	11.1	1	11.1
Low	2	16.7	2	16.7	1	11.1	1	11.1
5. Ratings of all sworn personnel								
High	0	0	1	8.3	0	0	2	22.2
Low	3	25.0	2	16.7	1	11.1	1	11.1

TABLE 22. Opinions of Younger Dallas Officers in Experimental and Control Groups Concerning Mandatory Programs and the Physical Condition of Fellow Officers

	Dallas Younger Experimental				Dallas Younger Control			
	Pre		Post		Pre		Post	
	N	%	N	%	N	%	N	%
1. Favor mandatory medical exam								
Yes	51	83.6	46	75.4	8	72.7	9	81.8
No	2	3.3	0	0	1	9.1	1	9.1
2. Favor mandatory physical fitness program								
Yes	51	83.6	48	78.7	11	100	11	100
No	0	0	1	1.6	0	0	0	0
3. Age exclusion								
Less than 50 years	2	3.3	8	13.1	1	9.1	1	9.1
More than 55 years	35	57.4	35	57.4	9	81.8	8	72.7
4. Ratings of co-workers								
High	3	4.9	2	3.3	1	9.1	1	9.1
Low	38	62.3	20	32.8	5	45.4	5	45.4
5. Ratings of all sworn personnel								
High	0	0	1	1.6	0	0	0	0
Low	38	62.3	32	52.4	5	45.4	5	45.4

TABLE 23. Opinions of Older Dallas Officers in Experimental Group Concerning Mandatory Programs and the Physical Condition of Fellow Officers

	Dallas Older Experimental			
	Pre		Post	
	N	%	N	%
1. Favor mandatory medical exam				
Yes	23	88.5	19	73.1
No	1	3.8	0	0
2. Favor mandatory physical fitness program				
Yes	25	96.2	20	76.9
No	1	3.8	0	0
3. Age exclusion				
Less than 50 years	2	7.7	1	3.8
More than 55 years	15	57.7	17	65.4
4. Ratings of co-workers				
High	4	15.4	2	7.7
Low	11	42.3	9	34.6
5. Ratings of all sworn personnel				
High	1	3.8	0	0
Low	12	46.2	10	38.5

fitness is an important factor in anyone's life, regardless of age; but the age exclusion selected most frequently generally reflects the traditional age of retirement. The decline in percent of officers favoring mandatory medical exams and physical fitness programs is also difficult to explain. It is felt that this decrease may reflect an awareness of the difficulties involved in establishing mandatory programs, as well as some sense of "fear of not doing well." Having completed a voluntary program in which discovery of real abilities replaces belief in assumed abilities, some officers may feel threatened by the implementation of a mandatory program.

This sense of realization seems to be carried over to the relative ratings which participants provided for other officers in the department; these are also found in Tables 21, 22, and 23. While R/DPS officers generally were disinclined to rate fellow officers either high or low on physical condition at both pre-test and post-test, over one-third of the Dallas officers utilized the low end of the scale. Over 60% of the younger Dallas officers in the training program rated both co-workers and the general department low on physical condition on the pre-test; by the post-test, however, these percentages had fallen, particularly for co-workers (low = 32.8%). A similar trend is found among older Dallas officers; some decrease in percentage of low ratings is noted. As stated above, these results probably reflect an increased realism among participants, i.e., whereas, at the beginning of the program they rated themselves high and others low, by the end of the training program, these extreme ratings had moderated somewhat.

An examination of perceived stress and tension provides additional insight into those factors that may bear upon an officer's medical and emotional well-being. Stress is the basic subject matter addressed in Part II of the Physical Fitness and Job Relatedness Questionnaire.

As can be seen in Table 24, the participating police officers see their job as a dangerous one, both physically and emotionally. The ratings provided for all four questions are based upon a six-point scale with defined anchor points. For the first two questions, 1 represents "much less dangerous" and 6 represents "much more dangerous" than other occupations. Officers across all five groups view their jobs as at least slightly more dangerous (i.e., 4.0) than other occupations. All of the mean ratings are high with slight and inconsistent changes across time.

Management awareness of and willingness to help officers cope with the physical demands of the job are also sources of some stress for the participants. For these two questions, 1 represents "extremely unaware or unconcerned" while 6 represents "extremely aware or concerned." Many of the mean ratings appear to be at the low end of the scale, i.e., less than 4.0 or "slightly aware/concerned." Younger officers in Dallas tend to give much lower ratings than older officers, while officers in the Richardson and Public Safety departments give management higher marks, particularly in the area of concern about helping officers cope with the job demands.

When asked to indicate the amount of perceived tension associated with a variety of specific police calls, participating officers responded with great

TABLE 24. Mean Ratings of Five Groups of Officers Concerning Perceptions of Danger and Management Awareness

	Richardson/DPS Experimental	Richardson/DPS Control	Dallas Younger Experimental	Dallas Younger Control	Dallas Older Experimental
1. How physically dangerous is police work?					
Pre Test	5.0	5.0	4.5	4.9	4.6
Mid Test	5.4	4.3	4.8	4.7	4.7
Post Test	5.1	4.6	4.8	4.9	4.8
2. How emotionally dangerous is police work?					
Pre Test	5.1	5.4	4.8	5.4	5.0
Mid Test	4.9	5.3	4.7	5.3	5.0
Post Test	5.0	5.1	5.0	5.4	5.3
3. How aware is management of the physical demands of your job?					
Pre Test	4.4	4.0	4.0	3.3	4.4
Post Test	4.1	4.8	3.7	3.2	4.0
4. How concerned is management about helping you cope with these demands?					
Pre Test	4.5	4.7	3.1	2.1	3.9
Post Test	4.5	4.6	2.8	3.3	3.6

consistency across department, group assignment, and time. Because of these similarities, results are presented in terms of rank order by mean rating for the total group at the pre-test administration only (see Table 25). Eleven of the eighteen situations were given ratings of at least "slightly tense;" many of these situations involve on-going activities which are highly volatile and therefore dangerous. On the other hand, situations in which officers reportedly feel somewhat relaxed are more frequently "after the fact" activities in which the action has already taken place. Officers tend to feel most relaxed during routine patrol when no specific calls for service are being received.

Participating officers also expressed rather strong feelings about other segments of the criminal justice system and about their communities. Table 26 presents the pre- and post-test mean ratings of agreement with six statements about the courts for all five groups. While some changes are noted across time, they are rather small and do not reflect overall group changes from agree to disagree or vice versa. Generally, all five groups agree (i.e., mean ratings of 4.0 to 6.0) with statements 2, 3, 4, and 6 and disagree (i.e., mean ratings of 1.0 to 3.0) with statements 1 and 5. Older Dallas officers tend to give somewhat lower ratings on statements 1, 5, and 6. By the post-test, Richardson and Public Safety Department officers come close to agreeing with statement 5.

Participating officers, then, generally feel that while judges and juries are fair, their decisions are not always the most desirable and, in addition, that lawyers do not treat officers with respect.

TABLE 25. Overall Rank Order of Perceived Tension During the Performance of Various Police Duties

Rank Order	Police Duty
1 (Moderately Tense)	Officer needs assistance
2	Robbery in progress
3	High speed auto chase
4	Person with gun
5	Mentally disturbed person
6	Shooting
7	Child beating
8	Family fights/disturbances
9	Possible homicide
10	Unknown nature of call
11 (Slightly Tense)	Delivering death messages
12 (Slightly Relaxed)	Silent alarms
13	Sudden death/DOA
14	Prowler
15	Taking rape reports
16	Burglary
17	Auto accidents
18 (Moderately Relaxed)	Routine patrol

TABLE 26. Mean Ratings of Agreement with Six Court-Related Statements for the Five Groups of Officers

	R/DPS Experimental		R/DPS Control		Dallas Younger Experimental		Dallas Younger Control		Dallas Older Experimental	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
1. I have to spend too many hours in court.	2.2	2.9	1.9	2.3	2.4	2.5	2.7	2.6	1.8	1.9
2. The courts are often too lenient with offenders.	5.3	5.3	5.0	4.9	4.8	5.0	5.4	4.8	5.0	5.2
3. Many lawyers try to make officers look foolish.	4.9	4.4	4.3	4.6	4.4	4.5	5.3	4.8	4.9	5.2
4. Most judges treat officers with respect.	5.0	4.6	4.9	4.8	4.2	4.5	5.1	4.3	4.8	4.9
5. Juries are often prejudiced against officers.	3.1	3.8	3.3	3.2	3.0	3.1	3.4	3.0	2.8	2.8
6. There is a big difference between whether a person is really guilty and whether the court says he or she is.	4.2	4.1	4.3	4.5	4.0	4.2	4.9	4.8	3.6	3.9

Interestingly, these officers tend to spend little time in court. Over 50% of the officers indicated that, on the average, they spend no time (either on-duty or off-duty) in court during a normal week. An additional 25% indicated that they average one hour or less of on-duty and/or off-duty time in court per week.

Eight possible effects of the job of police officer on the incumbent are listed in Table 27 with the mean ratings for the five groups of participants. These mean ratings are based on a four-point scale ranging from "not at all" (1.0) to "to a great deal" (4.0). Officers reported having become slightly more cynical, slightly less respectful of the criminal justice system, and slightly angrier toward community leaders as a result of their experiences as police officers. Ratings on the other five statements are generally less than 2.0 ("to a slight degree"), with "problems with your sex life" being given the lowest numerical rating. Again, small and inconsistent changes from pre-test to post-test are found.

The effects of the job on the employee are further explored in Tables 28 and 29 which present pre- and post-test mean ratings of the effects of working hours on various aspects of personal life. Again, a six-point scale ranging from "very negative" (1.0) to "very positive" (6.0) is used. It can be seen that most of the ratings tend toward the negative end of the scale (i.e., 1.0 to 3.0) for all five groups at the pre-test stage.

TABLE 27. Mean Ratings of Extent to Which Certain Feelings Have Been Experienced by the Five Groups of Officers

	R/DPS Experimental		R/DPS Control		Dallas Younger Experimental		Dallas Younger Control		Dallas Older Experimental	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
1. Increased feelings of isolation from your community	1.7	1.9	1.9	1.4	2.1	1.9	2.2	2.4	1.8	2.0
2. A more cynical attitude.	2.2	1.9	1.9	2.3	2.3	2.3	2.4	2.8	2.3	2.3
3. Increased feeling of "I don't care."	1.3	1.3	1.2	1.4	1.8	1.8	1.5	2.2	1.4	1.6
4. Becoming insensitive to your wife and/or family.	1.3	1.5	1.4	1.6	1.4	1.3	1.5	1.8	1.4	1.2
5. A loss of respect for the criminal justice system.	2.2	2.0	1.3	1.7	2.4	2.2	2.2	2.4	2.1	2.1
6. Anger against community leaders.	1.8	1.8	2.1	1.6	2.3	2.2	2.4	2.5	2.1	2.1
7. Problems with your sex life.	1.0	1.3	1.2	1.3	1.6	1.2	1.4	1.3	1.1	1.1
8. Poor social interactions with your neighbors.	1.3	1.5	1.3	1.4	1.6	1.7	2.1	2.0	1.6	1.8

TABLE 28. Mean Ratings of Effect of Work Hours on Various Aspects of Life for Richardson and Department of Public Safety Officers in Experimental and Control Groups

	Richardson/DPS Experimental		Richardson/DPS Control	
	Pre	Post	Pre	Post
Recreation	3.9	3.1	3.4	3.6
Family life	4.2	3.1	4.0	3.5
Sleep	3.8	3.4	4.2	3.6
Friendships with other police officers	4.7	4.0	4.7	4.1
Friendships with non-police officers	3.8	3.2	4.0	4.0
Eating habits	3.5	3.2	3.7	4.0
Ability to stay alert	4.2	4.0	4.6	4.6
Holidays	3.1	3.1	3.9	3.0
Social life	3.7	3.1	3.9	3.8
Digestion	3.8	3.4	3.8	3.8
General energy level	3.9	4.0	4.0	3.9
Ability to deal with household chores	4.2	3.9	4.1	4.0
Ability to perform personal errands	3.9	4.1	4.2	4.1
Ability to hold a second job	3.8	3.8	4.1	3.1
Ability to go to school	4.0	3.6	3.1	3.5

TABLE 29. Mean Ratings of Effect of Work Houses on Various Aspects of Life for Younger Dallas Officers in Experimental and Control Groups and Older Dallas Officers in Experimental Group

	Dallas Younger Experimental		Dallas Younger Control		Dallas Older Experimental	
	Pre	Post	Pre	Post	Pre	Post
Recreation	3.2	3.6	3.4	3.3	3.9	3.9
Family life	3.1	3.9	3.9	3.6	4.0	4.1
Sleep	3.2	4.1	3.6	3.6	3.8	4.1
Friendships with other police officers	3.9	4.0	3.7	3.6	4.2	4.4
Friendships with non police officers	3.0	3.6	2.8	4.0	3.5	4.0
Eating habits	2.9	4.0	3.6	3.7	3.8	4.2
Ability to stay alert	3.5	4.4	3.5	4.2	4.0	4.2
Holidays	2.6	3.4	3.4	3.4	3.8	4.2
Social life	2.7	3.6	3.5	3.4	3.7	4.0
Digestion	3.0	4.2	3.7	3.8	3.8	4.0
General energy level	3.4	4.3	3.5	3.7	3.7	4.0
Ability to deal with household chores	3.6	4.4	3.6	3.7	3.7	3.8
Ability to perform personal errands	3.5	4.4	3.7	4.1	3.7	4.1
Ability to hold a second job	3.8	4.0	3.0	3.4	3.9	3.4
Ability to go to school	3.7	4.1	3.5	4.3	3.8	3.8

Consistent pre- to post-test decreases in mean ratings are apparent for the R/DPS experimental group; ratings of work hour effect become more negative across time for eleven of the fifteen factors. Similar changes resulted for the R/DPS control group, in which ratings become more negative for nine factors.

Among Dallas police officers, however, the pattern is just the opposite. All fifteen factors increased in mean value (i.e., ratings became more positive) from pre- to post-test in the younger Dallas experimental group, while nine factors increased in positive value for the younger Dallas control group. Similarly older Dallas officers provided more positive ratings on twelve of the factors.

Such a wide divergence in response patterns is difficult to explain. Many of the changes are numerically small and may, therefore, be statistical artifacts resulting from small samples. Among the Dallas officers, however, some very large numerical increases toward the positive end of the scale are found. It is felt that these changes may largely be explained by the fact that in January of 1976, after the programs had begun, permanent shift hours replaced monthly shift rotation schedules for the Dallas patrol officers. Working permanent hours undoubtedly has a stabilizing effect on personal and family life and, therefore, should result in more positive assessments of the factors listed.

Other questions concerning problems in family life provided indications that families may be a source of stress for some officers. Some 16% of the participating officers indicated that their wives/girlfriends are "displeased" (N=15) or "extremely displeased" (N=5) about their husbands working as police

officers; 84% indicated their wives/girlfriends are "pleased" (N=80) or "extremely pleased" (N=22). In addition, while 68 (or 75%) of those officers who are parents felt that the police job had a positive effect on their children, 23 of the officers (or 25%) rated the job as having a negative effect on their children, mostly because of lack of time and of the expectations or reactions of others to the job of police officer. Finally, in connection with personal family problems, 28% (N=34) of the officers reported having had serious problems in their marriages; 76% (N=26) believed that the police job had a great deal to do with these problems; and 56% (N=19) of these marriages ended in divorce.

Problems which other police officers have encountered may also be a source of stress to the individual, particularly if these officers are personal friends or at least acquaintances. Tables 30 and 31 present the results of two questions in this area; since no real differences existed between training and control groups, data are presented for the three groups defined in the previous section.

Officers were asked to indicate how many of the five officers whom they knew best had had problems with alcohol, marriage, children, finances, drugs, and neighbors. It can be seen in Table 30 that at least half of the officers in all three groups have known one or more officers who have had marital and financial problems. Younger Dallas officers are less likely to have known police families in which children were a problem (33%) than either R/DPS officers (52%) or older Dallas officers (57%). While over half of the R/DPS officers have some familiarity with alcohol and neighbor problems among their closest friends, these two factors have caused problems among police friends

TABLE 30. Number and Percent of Participants in Each Group with Knowledge of Six Types of Personal Problems Among Five Closest Co-workers

	Group I		Group II		Group III	
	N	%	N	%	N	%
Alcohol						
0	9	42.8	55	76.4	20	71.4
1	11	52.4	14	19.4	5	17.9
2 or more	0	-	3	4.2	3	10.7
Marriage						
0	5	23.8	32	44.4	14	50.0
1	8	38.1	16	22.2	7	25.0
2 or more	7	33.3	24	33.3	7	25.0
Children						
0	9	42.8	48	66.7	12	42.9
1	9	42.8	12	16.7	12	42.9
2 or more	2	9.5	12	16.7	4	14.3
Finances						
0	3	14.3	34	47.2	12	42.9
1	4	19.0	8	11.1	8	28.6
2 or more	13	61.9	30	41.7	8	28.6
Drugs						
0	12	57.1	70	97.2	28	100.0
1	8	38.1	2	2.8	0	-
2 or more	0	-	0	-	0	-
Neighbors						
0	8	38.1	45	62.5	18	64.3
1	9	42.8	15	20.8	6	21.4
2 or more	3	14.3	12	16.7	4	14.3

TABLE 31. Number and Percent of Participants in Each Group with Knowledge of Suicide Attempts and Heart Attacks Among Fellow Officers

	Group I		Group II		Group III	
	N	%	N	%	N	%
Suicide Attempts						
0	17	81.0	58	80.6	11	39.3
1	2	9.5	12	16.7	10	35.7
2 or more	2	9.5	2	2.8	7	25.0
Heart Attacks						
0	13	61.9	15	20.8	0	-
1 to 5	7	33.3	41	56.9	13	46.4
6 or more	1	4.8	15	20.8	13	46.4

of approximately one-third and one-fourth, respectively, of the Dallas participants. While few Dallas officers indicated any of their police friends had problems with drugs, over one-third of the R/DPS officers so indicated. It appears then that substantial numbers of the participating officers have some knowledge of the problems which may be caused by five of the six factors listed, the exception being drugs.

Finally, Table 31 presents data on the extent to which participating officers have knowledge of attempted suicides and severe or fatal heart attacks among fellow officers. As is expected because of longer police careers, older Dallas officers are much more likely to have known one or more officers who have either attempted suicide (60.7%) or have suffered severe/fatal heart attacks (92.8%). However, 20% of both R/DPS and younger Dallas officers know of attempted suicides; nearly 40% of R/DPS officers and over 75% of younger Dallas officers have known police officers who suffered severe/fatal heart attacks. Since Dallas is a much larger department than Richardson, larger number of heart attacks are to be expected.

In all cases, the majority of officers indicated that the effects of the police job probably played a major role in the suicides and that the known heart attacks occurred while the victims were on-duty.

Reviewing all of the data from Part II of the Physical Fitness and Job Relatedness Questionnaire provides clear indications of a variety of perceived sources of stress and tension for the police officers participating in this study.

These perceptions may be summarized as follows:

1. The job of police officer <u>in general</u> is seen as both physically and emotionally dangerous. Police department management is neither sufficiently aware nor sufficiently concerned with the physical demands placed on police officers.
2. A variety of <u>specific</u> calls for police service are sources of stress and tension. Among the most stressful are officer needs assistance, robbery in progress, and high speed auto chases; least stressful situations include burglaries, auto accidents, and routine patrol.
3. Although these police officers do not spend a large amount of time in court, courts nevertheless present a certain amount of frustration, particularly in the behavior of lawyers and in the final outcome of court cases.
4. Many of the attitudinal changes traditionally associated with the police job, i.e., cynicism, anger, isolation, and lack of caring, are reported only "to a slight degree" by the participants. These officers, then, perceive themselves as little changed from when they first joined their respective departments.
5. Working hours have divergent effects on the officers in this study. While initially viewed as having an almost neutral effect on a variety of aspects of personal life, the topic of hours worked generally decreased in positive effect for the Richardson and Public Safety Department officers and increased in positive effect for the Dallas officers. Results among Dallas participants may reflect movement from rotating to permanent shifts.

6. Family life has also been affected by the job for many of the participants. A negative effect on children was reported by one-fourth of the officer-parents; and in the majority of cases where serious marital problems were reported, the effects of the job were said to be definitive.
7. Finally, in the area of personal relationships, it was found that substantial numbers of participants have had close officer friends who have had problems with alcohol, marriage, finances, children and neighbors. In addition, most of the participants have known officers who attempted suicide or suffered heart attacks.

It might be hypothesized that familiarity with heart attacks and health-related problems in others as well as the experiences gained through participation in the physical fitness training programs would increase one's own concern about health. Attitudes toward personal health and physical fitness were explored in the Health Opinion Questionnaire (see Appendix C).

Tables 32 through 34 present data on the self-ratings of participants on a variety of health-related questions. No significant pre- to post-test differences are seen for the R/DPS experimental group, although there are indications that these officers become slightly less concerned about both their health and their ability to control it, slightly less concerned about the possibility of heart attacks, and slightly more sure of their physical fitness over the 20-week program. R/DPS control group officers also reported feeling more physically fit at the post-test administration but showed a significant decrease in concern over their general health.

TABLE 32. Mean Ratings of Self Evaluations of Physical Fitness for Richardson and Public Safety Department Officers in Experimental and Control Groups

	Richardson/DPS Experimental			Richardson/DPS Control		
	Pre	Mid	Post	Pre	Mid	Post
1. Compared to other officers your age, would you say that your own health is poor, fair, or good?	2.9	3.0	2.9	2.7	3.0	2.6
2. How concerned are you over your general state of health?	3.5	3.4	3.4	3.6	3.4	2.9 *
3. To what extent do you feel you can control the general state of your health?	3.8	4.0	3.5	4.0	3.6	3.8
4. How physically fit do you feel you are at present?	2.4	3.4	3.3	2.3	2.9	2.8
5. If you count both work and play, would you say the amount of physical activity you get is little, moderate, or a great deal?	1.6	--	2.0	1.7	--	1.9
6. In your free time, how much exercise such as walking, sports, gardening, etc. do you get?	1.6	--	2.0	1.8	--	2.0
7. How likely do you think it is that a person your age will have a heart attack?	2.8	2.9	3.1	3.0	3.9	3.1
8. How likely do you think it is that you will have a heart attack in the next 10 years?	3.2	3.8	3.4	3.3	4.0	3.5

* $p < .02$

TABLE 33. Mean Ratings of Self Evaluations of Physical Fitness for Younger Dallas Officers in Experimental and Control Groups

	Dallas Younger Experimental			Dallas Younger Control		
	Pre	Mid	Post	Pre	Mid	Post
1. Compared to other officers your age, would you say that your own health is poor, fair, or good?	2.7	3.0	2.9	2.6	2.7	2.5
2. How concerned are you over your general state of health?	3.3	3.7	3.4	3.5	3.3	3.2
3. To what extent do you feel you can control the general state of your health?	3.8	4.0	3.8	3.9	3.7	3.7
4. How physically fit do you feel you are at present?	2.6	3.2	3.3*	2.4	2.4	2.2
5. If you count both work and play, would you say the amount of physical activity you get is little, moderate, or a great deal?	1.8	--	2.1*	1.4	--	1.6
6. In your free time, how much exercise such as walking, sports, gardening, etc. do you get?	1.6	--	2.1*	1.6	--	1.6
7. How likely do you think it is that a person your age will have a heart attack?	3.3	3.3	3.3	3.3	3.3	3.1
8. How likely do you think it is that you will have a heart attack in the next 10 years?	3.5	2.7	3.6	3.4	3.4	3.2

* $p < .002$

TABLE 34. Mean Ratings of Self Evaluations of Physical Fitness for Older Dallas Officers in Experimental Group

	Dallas Older Experimental		
	Pre	Mid	Post
1. Compared to other officers your age, would you say that your own health is poor, fair, or good?	2.7	2.8	2.9
2. How concerned are you over your general state of health?	3.3	3.4	3.4
3. To what extent do you feel you can control the general state of your health?	3.8	3.7	4.0
4. How physically fit do you feel you are at present?	2.3	3.1	3.1*
5. If you count both work and play, would you say the amount of physical activity you get is little, moderate, or a great deal?	1.7	--	2.2*
6. In your free time, how much exercise such as walking, sports, gardening, etc. do you get?	1.8	--	2.5*
7. How likely do you think it is that a person your age will have a heart attack?	2.8	2.7	2.4
8. How likely do you think it is that you will have a heart attack in the next 10 years?	2.9	2.5	3.4**

*p < .002

**p < .01

Among Dallas police officers, the patterns of response are clearer. While younger control group officers remained consistent in their self-evaluations of health and physical fitness, younger officers in the experimental group felt significantly more physically fit (Question 4) at the end of the training program. In addition, ratings of the amount of physical activity and exercise ordinarily obtained (Questions 5 and 6) also increased significantly. Other changes in mean ratings are slight.

Mean self evaluations for older Dallas officers in the experimental group increased significantly on four of the eight items. By the end of the experimental program, these officers felt significantly more physically fit and were significantly less concerned about having a heart attack within the next ten years. Ratings of physical activity and exercise increased significantly as well.

It would appear, then, that training programs increased participants' feelings of well being in terms of perceived physical fitness and, to a lesser extent, fear about possible heart attacks. It should be noted that certain of these self-ratings were high for all groups of officers at all test administrations. For example, all officers rated their health as better than fair in comparison to other officers their own age (Question 1). All officers except the R/DPS control group maintained higher than moderate concern over their general state of health (Question 2). Finally, all officers exhibited moderate to high perceptions of personal control over health (Question 3).

These attitudes are reflected in responses to the fifteen questions of opinion concerning a variety of health related issues which were included on the Health Opinion Questionnaire. Data on the number and percent of officers in each of the five groups who agree and disagree with each statement are presented in Tables 35 through 39.

Detailed examination of these five tables reveals a high degree of consistency of opinion across both groups and time. Numerical changes are the result of missing data on certain of the officers and do not reflect overall group changes in agree/disagree opinions.

The majority of responding officers in all groups agreed with four of the statements and disagreed with eight of the statements at all three test administrations. Officers agreed with the following:

1. Doctors today know a lot more about how to prevent and treat sickness than doctors did 25 years ago.
2. More tax money should be spent on medical research.
3. It is quite possible to prevent many kinds of heart attacks.
4. By taking certain health actions, a person can generally prevent a heart attack.

At the same time, officers generally disagreed with the following:

1. Good health is more a matter of luck than what a person does about his health.
2. Most often, it's not possible to prevent sickness - if you are going to be sick - you will be sick.

TABLE 35 Opinions on a Variety of Health Related Issues for Richardson and Department of Public Safety Officers in Experimental Group

	Pre Test				Mid Test				Post Test			
	Agree		Disagree		Agree		Disagree		Agree		Disagree	
	N	%	N	%	N	%	N	%	N	%	N	%
Good health is more a matter of luck than what a person does about his health.	1	8.3	11	91.7	1	8.3	8	66.7	1	8.3	7	58.3
Most often, it's not possible to prevent sickness - if you are going to be sick - you will be sick.	4	33.3	8	66.7	2	16.7	7	58.3	3	25.0	5	41.7
A person's health is more a matter of what is born into him than what he does about his health.	1	8.3	10	83.3	1	8.3	8	66.7	0	-	8	66.7
In general, doctors today take more interest in their patients than doctors did 25 years ago.	4	33.3	8	66.7	2	16.7	7	58.3	2	16.7	6	50.0
Doctors today know a lot more about how to prevent and treat sickness than doctors did 25 years ago.	12	100	0	0	9	75.0	0	-	8	66.7	0	-
Most people are satisfied with the care and treatment they receive from their doctors.	10	83.3	2	16.7	5	41.7	4	33.3	5	41.7	3	25.0
Most people feel that enough is being done in this country to discover the causes of disease.	6	50.0	6	50.0	3	25.0	6	50.0	2	16.7	6	50.0
Most people feel that enough is being done at present to discover new cures for disease.	7	58.3	5	41.7	3	25.0	6	50.0	3	25.0	5	41.7
More tax money should be spent on medical research.	10	83.3	2	16.7	8	66.7	1	8.3	8	66.7	0	-
If you're going to have a heart attack, there is nothing you can really do to prevent it.	1	8.3	11	91.7	1	8.3	8	66.7	1	8.3	7	58.3
Heart attacks are more a matter of bad luck than what a person does or doesn't do to prevent them.	0	-	12	100	0	-	9	75.0	0	-	8	66.7
Heart attacks are caused more often by something born into a person than by what he does about his own health.	1	8.3	11	91.7	1	8.3	8	66.7	1	8.3	7	58.3

	Pre Test				Mid Test				Post Test			
	Agree		Disagree		Agree		Disagree		Agree		Disagree	
	N	%	N	%	N	%	N	%	N	%	N	%
There may be some things that you can do to prevent a heart attack but it really isn't worth the effort it takes.	3	25.0	9	75.0	0	-	9	75.0	0	-	8	66.7
It is quite possible to prevent many kinds of heart attacks.	11	91.7	1	8.3	9	75.0	0	-	8	66.7	0	-
By taking certain health actions, a person can generally prevent a heart attack.	12	100	0	-	9	75.0	0	-	7	58.3	0	-

TABLE 36 Opinions on a Variety of Health Related Issues for Richardson and Department of Public Safety Officers in Control Group

	Pre Test				Mid Test				Post Test			
	Agree		Disagree		Agree		Disagree		Agree		Disagree	
	N	%	N	%	N	%	N	%	N	%	N	%
Good health is more a matter of luck than what a person does about his health.	0	-	9	100	1	11.1	6	66.7	1	11.1	7	77.8
Most often, it's not possible to prevent sickness - if you are going to be sick - you will be sick.	1	11.1	8	88.9	1	11.1	6	66.7	0	-	7	77.8
A person's health is more a matter of what is born into him than what he does about his health.	1	11.1	8	88.9	1	11.1	6	66.7	1	11.1	7	77.8
In general, doctors today take more interest in their patients than doctors did 25 years ago.	1	11.1	8	88.9	1	11.1	6	66.7	2	22.2	6	66.7
Doctors today know a lot more about how to prevent and treat sickness than doctors did 25 years ago.	9	100	0	-	7	77.8	0	-	8	88.9	0	-
Most people are satisfied with the care and treatment they receive from their doctors.	9	100	0	-	4	44.4	3	33.3	6	66.7	2	22.2
Most people feel that enough is being done in this country to discover the causes of disease.	3	33.3	6	66.7	6	66.7	1	11.1	5	55.6	3	33.3
Most people feel that enough is being done at present to discover new cures for disease.	4	44.4	5	55.6	5	55.6	2	22.2	5	55.6	3	33.3
More tax money should be spent on medical research.	7	77.8	2	22.2	5	55.6	2	22.2	7	77.8	1	11.1
If you're going to have a heart attack, there is nothing you can really do to prevent it.	0	-	9	100	1	11.1	6	66.7	0	-	8	88.9
Heart attacks are more a matter of bad luck than what a person does or doesn't do to prevent them.	0	-	9	100	1	11.1	6	66.7	1	11.1	7	77.8
Heart attacks are caused more often by something born into a person than by what he does about his own health.	1	11.1	8	88.9	0	-	7	77.8	0	-	8	88.9

	Pre Test				Mid Test				Post Test			
	Agree		Disagree		Agree		Disagree		Agree		Disagree	
	N	%	N	%	N	%	N	%	N	%	N	%
There may be some things that you can do to prevent a heart attack but it really isn't worth the effort it takes.	0	-	9	100	0	-	7	77.8	0	-	8	88.9
It is quite possible to prevent many kinds of heart attacks.	8	88.9	1	11.1	7	77.8	0	-	8	88.9	0	-
By taking certain health actions, a person can generally prevent a heart attack.	9	100	0	-	5	55.6	1	11.1	8	88.9	0	-

TABLE 97 Opinions on a Variety of Health Related Issues for Younger Dallas Officers in Experimental Group

	Pre Test				Mid Test				Post Test			
	Agree		Disagree		Agree		Disagree		Agree		Disagree	
	N	%	N	%	N	%	N	%	N	%	N	%
Good health is more a matter of luck than what a person does about his health.	11	18.0	49	80.3	9	14.8	52	85.2	3	4.9	45	73.8
Most often, it's not possible to prevent sickness - if you are going to be sick - you will be sick.	10	16.4	50	82.0	6	9.8	48	78.7	4	6.6	44	72.1
A person's health is more a matter of what is born into him than what he does about his health.	5	8.2	55	90.2	2	3.3	45	73.8	2	3.3	46	75.4
In general, doctors today take more interest in their patients than doctors did 25 years ago.	16	26.2	45	73.8	24	39.3	29	47.5	14	23.0	34	55.7
Doctors today know a lot more about how to prevent and treat sickness than doctors did 25 years ago.	51	83.6	4	6.6	41	67.2	4	6.6	47	77.0	1	1.6
Most people are satisfied with the care and treatment they receive from their doctors.	34	55.7	27	44.3	30	49.2	24	39.3	33	54.1	15	24.6
Most people feel that enough is being done in this country to discover the causes of disease.	30	49.2	31	50.8	20	32.8	34	55.7	26	42.6	22	36.1
Most people feel that enough is being done at present to discover new cures for disease.	25	41.0	29	47.5	24	39.3	29	47.5	27	44.3	21	34.4
More tax money should be spent on medical research.	38	62.3	22	36.1	33	54.1	20	32.8	40	65.6	8	13.1
If you're going to have a heart attack, there is nothing you can really do to prevent it.	6	9.8	55	90.2	11	18.0	40	65.6	3	4.9	45	73.8
Heart attacks are more a matter of bad luck than what a person does or doesn't do to prevent them.	6	9.8	55	90.2	11	18.0	43	70.5	2	3.3	46	75.4
Heart attacks are caused more often by something born into a person than by what he does about his own health.	13	21.3	48	78.7	12	19.7	40	65.6	2	3.3	46	75.4

	Pre Test				Mid Test				Post Test			
	Agree		Disagree		Agree		Disagree		Agree		Disagree	
	N	%	N	%	N	%	N	%	N	%	N	%
There may be some things that you can do to prevent a heart attack but it really isn't worth the effort it takes.	7	11.5	54	88.5	9	14.8	41	67.2	4	6.6	44	72.1
It is quite possible to prevent many kinds of heart attacks.	50	82.0	11	18.0	46	75.4	3	4.9	44	72.1	4	6.6
By taking certain health actions, a person can generally prevent a heart attack.	43	70.5	18	29.5	45	73.8	5	8.2	47	77.0	1	1.6

TABLE 38 Opinions on a Variety of Health Related Issues for Younger Dallas Officers in Control Group

	Pre Test				Mid Test				Post Test			
	Agree		Disagree		Agree		Disagree		Agree		Disagree	
	N	%	N	%	N	%	N	%	N	%	N	%
Good health is more a matter of luck than what a person does about his health.	1	9.1	10	90.9	1	9.1	10	90.9	2	18.2	9	81.8
Most often, it's not possible to prevent sickness - if you are going to be sick - you will be sick.	2	18.2	9	81.8	1	9.1	10	90.9	1	9.1	10	90.9
A person's health is more a matter of what is born into him than what he does about his health.	0	-	11	100	0	-	11	100	1	9.1	10	90.9
In general, doctors today take more interest in their patients than doctors did 25 years ago.	4	36.4	6	54.5	3	27.3	8	72.7	4	36.4	7	63.6
Doctors today know a lot more about how to prevent and treat sickness than doctors did 25 years ago.	9	81.8	1	9.1	11	100	0	-	10	90.9	1	9.1
Most people are satisfied with the care and treatment they receive from their doctors.	8	72.7	2	18.2	7	63.6	4	36.4	10	90.9	1	9.1
Most people feel that enough is being done in this country to discover the causes of disease.	6	54.5	5	45.4	8	72.7	3	27.3	4	36.4	7	63.6
Most people feel that enough is being done at present to discover new cures for disease.	8	72.7	3	27.3	5	45.4	6	54.5	5	45.4	6	54.5
More tax money should be spent on medical research.	9	81.8	2	18.2	10	90.9	1	9.1	9	81.8	2	18.2
If you're going to have a heart attack, there is nothing you can really do to prevent it.	1	9.1	10	90.9	1	9.1	10	90.9	1	9.1	10	90.9
Heart attacks are more a matter of bad luck than what a person does or doesn't do to prevent them.	3	27.3	8	72.7	0	-	11	100	1	9.1	10	90.9
Heart attacks are caused more often by something born into a person than by what he does about his own health.	1	9.1	10	90.9	0	-	11	100	1	9.1	10	90.9

	Pre Test				Mid Test				Post Test			
	Agree		Disagree		Agree		Disagree		Agree		Disagree	
	N	%	N	%	N	%	N	%	N	%	N	%
There may be some things that you can do to prevent a heart attack but it really isn't worth the effort it takes.	1	9.1	10	90.9	0	-	11	100	3	27.3	8	72.7
It is quite possible to prevent many kinds of heart attacks.	10	90.9	1	9.1	11	100	0	-	10	90.9	1	9.1
By taking certain health actions, a person can generally prevent a heart attack.	10	90.9	1	9.1	11	100	0	-	10	90.9	1	9.1

TABLE 39 Opinions on a Variety of Health Related Issues for Older Dallas Officers in Experimental Group

	Pre Test				Mid Test				Post Test			
	Agree		Disagree		Agree		Disagree		Agree		Disagree	
	N	%	N	%	N	%	N	%	N	%	N	%
Good health is more a matter of luck than what a person does about his health.	2	7.7	24	92.3	0	-	24	92.3	0	-	20	76.9
Most often, it's not possible to prevent sickness - if you are going to be sick - you will be sick.	2	7.7	24	92.3	1	3.8	23	88.5	1	3.8	19	73.1
A person's health is more a matter of what is born into him than what he does about his health.	2	7.7	24	92.3	1	3.8	21	80.8	1	3.8	19	73.1
In general, doctors today take more interest in their patients than doctors did 25 years ago.	7	26.9	19	73.1	5	19.2	19	73.1	3	11.5	17	65.4
Doctors today know a lot more about how to prevent and treat sickness than doctors did 25 years ago.	24	92.3	1	3.8	21	80.8	3	11.5	18	69.2	2	7.7
Most people are satisfied with the care and treatment they receive from their doctors.	22	84.6	4	15.4	19	73.1	5	19.2	16	61.5	4	15.4
Most people feel that enough is being done in this country to discover the causes of disease.	10	38.5	16	61.5	13	50.0	10	38.5	9	34.6	11	42.3
Most people feel that enough is being done at present to discover new cures for disease.	10	38.5	16	61.5	12	46.2	11	42.3	9	34.6	11	42.3
More tax money should be spent on medical research.	20	76.9	6	23.1	16	61.5	7	26.9	18	69.2	2	7.7
If you're going to have a heart attack, there is nothing you can really do to prevent it.	4	15.4	22	84.6	3	11.5	19	73.1	0	-	20	76.9
Heart attacks are more a matter of bad luck than what a person does or doesn't do to prevent them.	3	11.5	23	88.5	2	7.7	21	80.8	0	-	20	76.9
Heart attacks are caused more often by something born into a person than by what he does about his own health.	3	11.5	23	88.5	4	15.4	19	73.1	1	3.8	19	73.1

	Pre Test				Mid Test				Post Test			
	Agree		Disagree		Agree		Disagree		Agree		Disagree	
	N	%	N	%	N	%	N	%	N	%	N	%
There may be some things that you can do to prevent a heart attack but it really isn't worth the effort it takes.	1	3.8	25	96.2	2	7.7	21	80.8	0	-	20	76.9
It is quite possible to prevent many kinds of heart attacks.	24	92.3	2	7.7	22	84.6	1	3.8	20	76.9	0	-
By taking certain health actions, a person can generally prevent a heart attack.	25	96.2	1	3.8	22	84.6	1	3.8	20	76.9	0	-

3. A person's health is more a matter of what is born into him than what he does about his health.
4. In general, doctors today take more interest in their patients than doctors did 25 years ago.
5. If you're going to have a heart attack, there is nothing you can really do to prevent it.
6. Heart attacks are more a matter of bad luck than what a person does or doesn't do to prevent them.
7. Heart attacks are caused more often by something born into a person than by what he does about his own health.
8. There may be some things that you can do to prevent a heart attack but it really isn't worth the effort it takes.

The remaining three of these fifteen opinion questions drew mixed reactions across both time and groups. These questions deal with "what most people believe." Although most of the responding officers tended to agree that "Most people are satisfied with the care and treatment they receive from their doctors," Richardson and Public Safety Department officers exhibited a greater tendency to increase in disagreement across time than did Dallas officers. Fewer R/DPS officers agreed with this statement by the end of the 20-week program.

Opinions were fairly evenly divided on the questions "Most people feel that enough is being done in this country to discover the causes of disease" and "Most people feel that enough is being done at present to discover new cures for disease." Decreases in agreement are seen in four of the five groups for the first question (all except R/DPS Control) and three of the five groups for the second question (all except R/DPS Control and Dallas Younger Experimental).

While there are no right or wrong answers to opinion questions, it is apparent that even at the pre-test stage the officers participating in these training programs were aware of the many factors relating to health in general and heart attacks in particular, as well as of the possibilities of personal preventive care. These officers generally feel, then, that health must be actively sought and maintained and that heart attacks result at least in part from lack of attention to personal condition.

To examine officers' perceptions of the causes of heart attacks, the final questions on this instrument called for ratings of the importance of five factors in preventing heart attacks. Mean ratings based upon a four-point scale ranging from "very important" (1.0) to "not really important at all" (4.0) are presented in Tables 40 through 42.

It can be seen that at the pre-test administration, officers in all five groups viewed all five factors as being of some importance in preventing heart attacks. Generally, "the amount of physical activity and exercise" and "the amount of stress and tension" are seen as more important than other factors (i.e., they have the lowest mean ratings), and these two factors remain more important from pre-test to post-test for many of the participants. On the other hand, the least important factor (i.e., highest mean rating) varies from group to group and from pre-test to post-test.

Only three of the pre- to post-test mean rating changes were significant. By the end of the 20-week programs, R/DPS officers in the experimental group viewed the "amount of food" eaten as being significantly less important, while

TABLE 40 . Mean Ratings of the Importance of Five Factors in Preventing Heart Attacks for Richardson and Public Safety Officers in Experimental and Control Groups

	Richardson/DPS Experimental			Richardson/DPS Control		
	Pre	Mid	Post	Pre	Mid	Post
1. Kind of food you eat	1.9	1.8	2.0	2.0	2.3	2.1
2. Amount of food you eat	2.1	1.8	2.3*	2.0	2.2	2.0
3. Amount of sleep and rest you get	2.0	2.0	2.0	2.2	2.5	2.4
4. Amount of stress and tension in your life	1.8	1.7	1.7	2.1	1.7	1.8
5. Amount of physical activity and exercise you get	1.4	1.3	1.6	1.6	2.0	1.4

*p <.05

TABLE 41. Mean Ratings of the Importance of Five Factors in Preventing Heart Attacks for Younger Dallas Officers in Experimental and Control Groups

	Dallas Younger Experimental			Dallas Younger Control		
	Pre	Mid	Post	Pre	Mid	Post
1. Kind of food you eat	2.3	2.2	1.9*	2.1	2.4	2.2
2. Amount of food you eat	2.2	2.9	1.7*	2.2	1.8	2.1
3. Amount of sleep and rest you get	2.3	1.9	2.1	1.9	1.9	1.7
4. Amount of stress and tension in your life	1.9	2.1	1.8	1.7	1.6	1.6
5. Amount of physical activity and exercise you get	1.6	1.6	1.5	1.5	1.4	1.5

*p <.05

TABLE 42. Mean Ratings of the Importance of Five Factors in Preventing Heart Attacks for ~~Older~~ Dallas Officers in Experimental Group

	Dallas Older Experimental		
	Pre	Mid	Post
1. Kind of food you eat	2.1	2.0	1.7
2. Amount of food you eat	2.0	2.8	1.8
3. Amount of sleep and rest you get	2.1	1.6	1.8
4. Amount of stress and tension in your life	1.7	1.5	1.5
5. Amount of physical activity and exercise you get	1.7	1.7	1.5

younger Dallas experimental group officers provided significantly higher mean ratings for both the kind and the amount of food eaten.

Summary of Job Perceptions and Health Opinions

A great deal of specific information was collected on the participating police officers with these three questionnaires. It may be helpful at this point to summarize these results in a more general way.

After 20 weeks of physical fitness training, participating police officers gave significantly higher self-evaluations of physical ability. Younger Dallas officers in the running and weight training programs rated themselves significantly higher in speed, endurance, agility, strength, and combat skill. Older Dallas officers in supervised and unsupervised training programs saw themselves as significantly improved in speed, endurance, and agility. Richardson and Texas Department of Public Safety officers rated their endurance significantly higher. A more general question concerning overall physical fitness yielded significant mean rating increases from pre- to post-test for younger and older Dallas experimental group officers; Richardson and Department of Public Safety officers exhibited a non-significant trend toward higher self-evaluations on this question.

A trend toward what may be termed more realistic appraisals of self in relation to generalized others accompanied these significant increases in perceptions of physical fitness. Decreases in ratings of "easy" and "could pass now" occurred on items concerning entrance level medical examinations and physical agility tests as well as recruit academy physical standards for officers in the training groups. At the same time, the importance of these tests in relation to

current position also declined from pre- to post-tests. The tendency to rate fellow officers low on general physical fitness decreased across time as well, as participants perhaps became more aware of their own limitations.

No significant changes from pre- to post-test occurred with respect to either perceptions of the police job or general attitudes about health. Participants across all groups perceive their jobs as physically and emotionally more dangerous than other occupations in both general and situation-specific terms. Stress and tension result from a variety of sources, including perceived lack of awareness and concern on the part of departmental management, frustrating contacts with the judicial system, the effects of working hours on personal life (particularly in terms of marital problems and children), and associations with other officers who have suffered from a diversity of problem situations (e.g., alcohol, finances, marriage, children, neighbors, suicide, and heart attacks). While Dallas officers indicated an increase in positive effects of working hours from pre- to post-test administrations, it is felt that these changes are more the result of the institution of permanent hours than of the training program.

Initial awareness of the importance of personal attention to health was quite high among participants, and this attitude was maintained across the 20 weeks of training. Generally, officers in all groups exhibited feelings of concern over their health and heart destinies, but such concern was coupled with a high sense of control, in terms of being able to prevent illness. Participants considered the amount of physical activity/exercise and the amount of stress/tension as most imprtant factors in preventing heart attacks, but

food and sleep were also rated as important.

It can be concluded, then, that these officers are aware of both the stress associated with their occupation and their own ability to control their health. That these perceptions are not translated into actions is obvious from the lack of self-initiated exercise programs. Although officers have a history of participation in sports during their educational years, few have maintained regular exercise on their own. Many of the officers indicated opposition to the establishment of mandatory exercise and/or testing programs in their police agencies. These results seem to reflect the common situation existing in society as a whole, i.e., although personal experience leads to knowledge of the value of exercise, and while voluntary participation is preferable to mandatory programs, regular physical activity is simply not a part of many people's lives.

Evaluation of Program Participation

The final instruments to be examined in this chapter are the project participation questionnaires completed by the participating officers and their wives at the conclusion of the various 20-week training programs. Items on these two questionnaires (see Appendix C) addressed both the administration and the results of the programs.

The two participation questionnaires were completed by a total of 95 officers and 79 wives; individual group totals are indicated below:

	Officers	Wives
R/DPS Experimental	8	9
R/DPS Control	7	3
Dallas Younger Experimental	49	38
Dallas Younger Control	11	8
Dallas Older Experimental	20	21
	95	79

Unlike results presented in the previous section, percentages reported here will be based upon the number of actual respondents in each group, as identified above.

Tables 43 and 44 present evaluations of various aspects of physical condition provided by the officers and their wives. It can be seen the majority of officers in each of the three training groups reported favorable change in amount of fatigue or tiredness, general activity level, and general physical fitness as a result of the various aerobics programs. These figures are highest for general physical fitness, for which all officers in the R/DPS and Dallas older groups and 46 of the 49 younger Dallas officers reported favorable change. Favorable changes in weight were reported by 62.5% of the R/DPS officers, 42.9% of the younger Dallas officers, and 95.0% of the older Dallas officers in the

TABLE 43. Post-Test Self-evaluation of Participating Officers in Five Groups on Six Aspects of Physical Condition

	R/DPS Experimental		R/DPS Control		Dallas Younger Experimental		Dallas Younger Control		Dallas Older Experimental	
	N	%	N	%	N	%	N	%	N	%
Weight										
Favorable Change	5	62.5	0	-	21	42.9	0	-	19	95.0
No Change	2	25.0	5	71.4	24	49.0	0	-	0	-
Unfavorable Change	1	12.5	1	14.3	4	8.2	0	-	1	5.0
Ability to Sleep										
Favorable Change	5	62.5	0	-	22	44.9	1	9.1	7	35.0
No Change	3	37.5	6	85.7	27	55.1	9	81.8	13	65.0
Unfavorable Change	0	-	0	-	0	-	1	9.1	0	-
Amount of Fatigue or Tiredness										
Favorable Change	5	62.5	0	-	44	89.8	6	54.5	18	90.0
No Change	3	37.5	6	85.7	5	10.2	5	45.4	2	10.0
Unfavorable Change	0	-	0	-	0	-	0	-	0	-
General Activity Level										
Favorable Change	5	62.5	0	-	42	85.7	0	-	14	70.0
No Change	3	37.5	6	85.7	5	10.2	7	63.6	6	30.0
Unfavorable Change	0	-	0	-	2	4.1	4	36.4	0	-
Sex Life										
Favorable Change	3	37.5	0	-	13	26.5	0	-	5	25.0
No Change	5	62.5	6	85.7	35	71.4	10	90.9	15	75.0
Unfavorable Change	0	-	0	-	1	2.0	1	9.1	0	-
General Physical Fitness										
Favorable Change	8	100.0	0	-	46	93.9	0	-	20	100.0
No Change	0	-	6	85.7	2	4.1	8	72.7	0	-
Unfavorable Change	0	-	0	-	1	2.0	3	27.3	0	-

TABLE 44. Post-Test Evaluations of Participants' Wives on Six Aspects of Their Husbands' Physical Condition

	R/DPS Experimental		R/DPS Control		Dallas Younger Experimental		Dallas Younger Control		Dallas Older Experimental	
	N	%	N	%	N	%	N	%	N	%
Weight										
Favorable Change	9	100.0	0	-	20	52.6	1	12.5	14	66.7
No Change	0	-	1	33.3	14	36.8	7	87.5	7	33.3
Unfavorable Change	0	-	2	66.7	4	10.5	0	-	0	-
Ability to Sleep										
Favorable Change	2	22.2	0	-	14	36.8	1	12.5	10	47.6
No Change	7	77.8	3	100.0	23	60.5	6	75.0	11	52.4
Unfavorable Change	0	-	0	-	1	2.6	1	12.5	0	-
Amount of Fatigue or Tiredness										
Favorable Change	7	77.8	0	-	21	55.3	1	12.5	12	57.1
No Change	2	22.2	3	100.0	12	31.6	6	75.0	7	33.3
Unfavorable Change	0	-	0	-	5	13.2	1	12.5	2	9.5
General Activity Level										
Favorable Change	7	77.8	0	-	27	71.0	3	37.5	14	66.7
No Change	2	22.2	3	100.0	9	23.7	5	62.5	6	28.6
Unfavorable Change	0	-	0	-	2	5.3	0	-	1	4.8
Sex Life										
Favorable Change	3	33.3	0	-	14	36.8	0	-	4	19.0
No Change	6	66.7	3	100.0	20	52.6	8	100.0	16	76.2
Unfavorable Change	0	-	0	-	4	10.5	0	-	1	4.8
General Physical Fitness										
Favorable Change	9	100.0	0	-	36	94.7	3	37.5	19	90.5
No Change	0	-	2	66.7	2	5.3	5	62.5	2	9.5
Unfavorable Change	0	-	1	33.3	0	-	0	-	0	-

experimental groups. Similarly, ability to sleep changed favorably for 62.5%, 44.9%, and 35.0% of the officers in these three groups. Twenty-five percent or more of each experimental group also reported favorable change in their sex lives. Control group data are presented for comparative purposes.

These very positive results are echoed in the evaluations of officers provided by their wives (Table 44). The majority of wives of training group officers reported favorable changes in their husbands' condition for four of the six factors listed, i.e., weight, amount of fatigue or tiredness, general activity level, and general physical fitness. Ability to sleep and sex life were also viewed as having changed in a favorable way for between approximately 20% and 48% of wives in the three experimental groups.

Similar data are presented for six aspects of mental condition in Tables 45 and 46. The majority of officers in each training group report favorable changes in worry about health, self-confidence, ability to relax, and tenseness. Perhaps more surprising, however, are the rather large percentages reporting favorable change in overall job satisfaction and worry about non-health related matters, things which might not be considered as being affected by physical fitness.

Wives of officers in the experimental groups provided somewhat more moderate evaluations of these factors. Approximately 30% or more of each group, however, indicated favorable change had occurred on five of the six factors. Worry about non-health related matters was viewed as having favorably changed by only 22.2% and 7.9% of the wives of officers in R/DPS and Dallas younger groups and by 33.3% of wives of older Dallas officers.

TABLE 45. Post-Test Self-evaluation of Participating Officers in Five Groups on Six Aspects of Mental Condition

	R/DPS Experimental		R/DPS Control		Dallas Younger Experimental		Dallas Younger Control		Dallas Older Experimental	
	N	%	N	%	N	%	N	%	N	%
Worry About Health										
Favorable Change	5	62.5	3	42.9	27	55.1	0	-	12	60.0
No Change	2	35.0	2	28.6	22	44.9	11	100.0	8	40.0
Unfavorable Change	1	12.5	1	14.3	0	-	0	-	0	-
Self-Confidence										
Favorable Change	6	75.0	1	14.3	34	69.4	1	9.1	11	55.0
No Change	2	25.0	5	71.4	15	30.6	10	90.9	9	45.0
Unfavorable Change	0	-	0	-	0	-	0	-	0	-
Job Satisfaction										
Favorable Change	4	50.0	1	14.3	30	61.2	1	9.1	6	30.0
No Change	4	50.0	5	71.4	19	38.8	10	90.9	14	70.0
Unfavorable Change	0	-	0	-	0	-	0	-	0	-
Ability to Relax										
Favorable Change	5	62.5	1	14.3	33	67.3	1	9.1	12	60.0
No Change	3	37.5	5	71.4	16	32.6	9	81.8	8	40.0
Unfavorable Change	0	-	0	-	0	-	1	9.1	0	-
Tenseness										
Favorable Change	5	62.5	1	14.3	26	53.1	1	9.1	14	70.0
No Change	3	37.5	5	71.4	23	46.9	10	90.9	6	30.0
Unfavorable Change	0	-	0	-	0	-	0	-	0	-
Worry About Non-Health Related Matters										
Favorable Change	4	50.0	1	14.3	21	42.8	0	-	6	30.0
No Change	4	50.0	5	71.4	28	57.1	11	100.0	14	70.0
Unfavorable Change	0	-	0	-	0	-	0	-	0	-

TABLE 46. Post-Test Evaluations of Participants' Wives on Six Aspects of Their Husbands' Mental Condition

	R/DPS Experimental		R/DPS Control		Dallas Younger Experimental		Dallas Younger Control		Dallas Older Experimental	
	N	%	N	%	N	%	N	%	N	%
Worry About Health										
Favorable Change	8	88.9	0	-	16	42.1	2	25.0	11	52.4
No Change	1	11.1	3	100.0	22	57.9	4	50.0	10	47.6
Unfavorable Change	0	-	0	-	0	-	2	25.0	0	-
Self-Confidence										
Favorable Change	7	77.8	0	0	20	52.6	2	25.0	9	42.9
No Change	2	22.2	3	100.0	18	47.4	5	62.5	12	57.1
Unfavorable Change	0	-	0	-	0	-	1	12.5	0	-
Job Satisfaction										
Favorable Change	4	44.4	0	0	11	28.9	1	12.5	7	33.3
No Change	5	55.6	3	100.0	27	71.0	6	75.0	13	61.9
Unfavorable Change	0	-	0	-	0	-	1	12.5	1	4.8
Ability to Relax										
Favorable Change	6	66.7	0	0	15	39.5	1	12.5	12	57.1
No Change	3	33.3	3	100.0	23	60.5	7	87.5	9	42.9
Unfavorable Change	0	-	0	-	0	-	0	-	0	-
Tenseness										
Favorable Change	6	66.7	0	0	14	36.8	0	-	9	42.9
No Change	3	33.3	3	100.0	24	63.2	7	87.5	12	57.1
Unfavorable Change	0	-	0	-	0	-	1	12.5	0	-
Worry About Non-Health Related Matters										
Favorable Change	2	22.2	0	0	3	7.9	1	12.5	7	33.3
No Change	7	77.8	3	100.0	35	92.1	6	75.0	13	61.9
Unfavorable Change	0	-	0	-	0	-	1	12.5	1	4.8

Tables 47 and 48 present data from several questions concerning overall evaluations of the value of the training programs. It is obvious that nearly all of the participating officers in all five groups provided affirmative answers to these questions; the same is true for the views of these officers. Almost all officers and wives are in favor of continuation of this or a similar physical fitness training program. Control group officers were in favor of continuation provided they could participate actively. Wives indicated they would like to participate in such a fitness training program themselves.

Both officers and wives further responded that the program was well worth the time required, and overall they were pleased or very pleased with their experiences with the program. Increased interest in and/or concern for physical fitness in relation to self and family members was also reported by the great majority of both groups of respondents. Nearly all respondents believed that institution of such a fitness training program would be beneficial for all police officers.

The final two tables present officers' and wives' opinions of specific aspects of the program itself. Feedback information provided by the Institute for Aerobics Research was viewed as "complete and understandable," and "helpful in understanding the program" by both officers and wives. Wives more frequently indicated that this feedback was cause for "some peace of mind" than did officers.

Generally favorable ratings were provided for amount of orientation, quality of instruction, and results, in addition to feedback information. No clear differential trends are apparent among the responses for officers and wives, with the exception that officers tended to rate quality of instruction higher

TABLE 47. General Reactions to Training Programs Provided by Officers in Five Groups

	R/DPS Experimental		R/DPS Control		Dallas Younger Experimental		Dallas Younger Control		Dallas Older Experimental	
	N	%	N	%	N	%	N	%	N	%
Would like to continue participation in this or similar program.	7	87.5	5	71.4	48	98.0	11	100	20	100
Believe institution of this or similar program would be good for all officers.	7	87.5	7	100	49	100	11	100	20	100
Considering the amount of time, it was worth it.	8	100	7	100	46	93.9	8	72.7	20	100
Program has increased interest in or concern for physical fitness in relation to self and/or family.	8	100	6	85.7	48	98.0	10	90.9	20	100
Am pleased with overall experiences with this program.	8	100	6	85.7	49	100	8	72.7	20	100

TABLE 48. General Reactions to Training Programs Provided by Wives of Officers in Five Groups

	R/DPS Experimental		R/DPS Control		Dallas Younger Experimental		Dallas Younger Control		Dallas Older Experimental	
	N	%	N	%	N	%	N	%	N	%
Would like husbands to continue participation in this or similar program	9	100	3	100	36	94.7	8	100	21	100
Believe institution of this or similar program would be good for all officers.	9	100	3	100	36	94.7	8	100	20	95.2
Considering the amount of time, it was worth it.	9	100	2	66.7	37	97.4	5	62.5	19	90.5
Program has increased interest in or concern for physical fitness in relation to self and/or family.	9	100	3	100	37	97.4	7	87.5	21	100
Am pleased with overall experiences with this program.	9	100	2	66.7	38	100	5	62.5	21	100
Would like to participate in this or similar program.	8	88.9	3	100	25	65.8	8	100	15	71.4

TABLE 49. Specific Reactions to Various Aspects of Training Programs Provided by Officers in Five Groups

	R/DPS Experimental		R/DPS Control		Dallas Younger Experimental		Dallas Younger Control		Dallas Older Experimental	
	N	%	N	%	N	%	N	%	N	%
Feedback Information										
Was complete and understandable.	6	75.0	7	100	35	71.4	4	36.4	13	65.0
Was incomplete and inadequate.	0	0	1	14.3	4	8.2	2	18.2	1	5.0
Caused me to worry.	2	25.0	0	-	0	-	2	18.2	0	-
Gave me some peace of mind.	4	50.0	3	42.9	12	24.5	0	-	10	50.0
Was helpful in understanding the program	3	37.5	5	71.4	23	46.9	6	54.5	14	70.0
Didn't tell me anything	0	-	0	-	0	-	0	-	0	-
Ratings										
Amount of Orientation										
Great	2	25.0	3	42.9	22	44.9	2	18.2	8	40.0
OK	6	75.0	3	42.9	24	49.0	9	81.8	12	60.0
Lousy	0	-	0	-	1	2.0	0	-	0	-
Quality of Instruction										
Great	5	62.5	5	71.4	30	61.2	3	27.3	14	70.0
OK	3	37.5	2	28.6	17	34.7	8	72.7	6	30.0
Lousy	0	-	0	-	2	4.1	0	-	0	-
Feedback Information										
Great	2	25.0	4	57.1	26	53.1	2	18.2	9	45.0
OK	5	62.5	3	42.9	21	42.9	8	72.7	10	50.0
Lousy	1	12.5	0	-	1	2.0	0	-	1	5.0
Results										
Great	4	50.0	3	42.9	25	51.0	1	9.1	11	55.0
OK	4	50.0	4	57.1	23	46.9	8	72.7	9	45.0
Lousy	0	-	0	-	1	2.0	1	9.1	0	-

TABLE 50. Specific Reactions to Various Aspects of Training Programs Provided by Wives of Officers in Five Groups

	R/DPS Experimental		R/DPS Control		Dallas Younger Experimental		Dallas Younger Control		Dallas Older Experimental	
	N	%	N	%	N	%	N	%	N	%
Feedback Information										
Was complete and understandable.	9	100	3	100	21	55.3	4	50.0	18	85.7
Was incomplete and inadequate.	1	11.1	0	-	1	2.6	2	25.0	1	4.8
Caused me to worry.	1	11.1	0	-	0	-	1	12.5	0	-
Gave me some peace of mind.	5	55.6	3	100	17	44.7	3	37.5	18	85.7
Was helpful in understanding the program	6	66.7	1	33.3	20	52.6	2	25.0	14	66.7
Didn't tell me anything.	0	-	0	-	2	5.3	1	12.5	1	4.8
Ratings										
Amount of Orientation										
Great	6	66.7	0	-	16	42.1	0	-	9	42.9
OK	3	33.3	2	66.7	21	55.3	4	50.0	11	52.4
Lousy	0	-	0	-	1	2.6	1	12.5	1	4.8
Quality of Instruction										
Great	8	88.9	1	33.3	19	50.0	3	37.5	7	33.3
OK	1	11.1	1	33.3	19	50.0	2	25.0	13	61.9
Lousy	0	-	0	-	0	-	0	-	1	4.8
Feedback Information										
Great	5	55.6	1	33.3	16	42.1	3	37.5	7	33.3
OK	3	33.3	2	66.7	17	44.7	1	12.5	12	57.1
Lousy	0	-	0	-	5	13.2	1	12.5	2	9.5
Results										
Great	6	66.7	0	-	24	63.2	1	12.5	11	52.4
OK	2	22.2	2	66.7	13	34.2	2	25.0	10	47.6
Lousy	0	-	0	-	1	2.6	1	12.5	1	4.8

than did the wives. Since officers were directly involved in the program, it is expected that their ratings reflect more specific opinions of the administration of the programs.

Summary of Project Participation Evaluations

Results from these two questionnaires clearly indicate a high degree of satisfaction among both officers and wives with these physical fitness training programs. Both groups of respondents in the experimental groups reported that favorable changes on six factors of physical condition and six factors of mental condition had occurred as a result of participation in these programs.

Favorable change in physical condition was indicated by the greatest number of officers for amount of fatigue, general activity level, and general physical fitness. It should also be noted that 95% of the older Dallas officers reported favorable change in their weight after the 20-week program. Wives confirmed these results in their high ratings of favorable change in their husbands' conditions on these same factors. In addition, sex life improved for over 25% of both officers and wives. Control group officers and wives indicated no change as expected, although in some cases unfavorable changes were cited.

Favorable changes were indicated by a majority of experimental group officers on four factors of mental condition, i.e., worry about health, self-confidence, ability to relax, and tenseness. In addition, particularly among younger officers, favorable change was noted in job satisfaction and worry over non-health matters. Again, these results were echoed by the wives, although responses here were somewhat more moderate.

These results are important for several reasons. Feelings of increased physical and mental fitness parallel the actual physiological improvements discussed in the previous chapter. Thus, officers are more fit and feel more fit. Perceived psychological improvement is as important an incentive to participation in a fitness training program as actual physical improvement. The increased job satisfaction noted among younger officers may also be an important incentive for participation in voluntary fitness programs. Increased self-confidence and ability to relax and decreased tenseness are widely thought to be correlates of increased physical fitness; the results reported in this study tend to confirm this belief.

While self perceptions of increased physical fitness are of primary importance, perceptions of what have been termed "significant others" are of at least secondary importance. In this study, the significant other consisted of the participating officer's wife. That responses from wives parallel those of their husbands indicates a high degree of visibility for improvement in both physical and mental condition. Thus officers are more fit, feel more fit, and are seen as more fit by their wives. Appreciation of increased physical and mental condition by the officer's spouse could be a powerful incentive for continued participation in fitness programs.

Equally important are the results from both officers and wives concerning the fitness training programs themselves. Both groups of respondents overwhelmingly indicated desire for continued participation. Officers in control groups and wives across all groups indicated a desire to participate themselves in such a fitness training program. Nearly all officers and wives in all five groups felt

that this or a similar physical fitness training program would be beneficial for all police officers and further indicated that participation had increased their interest in fitness in relation to themselves, as well as other members of their families. The benefits of participation in a physical fitness training program, then, are viewed as having applicability not only to oneself, but also to families and to the larger law enforcement community.

CHAPTER 6

INFLUENCE OF CHRONIC PHYSICAL ACTIVITY ON SELECTED PSYCHOLOGICAL STATES AND TRAITS OF POLICE OFFICERS

Over View

Previous chapters of this report have discussed the details of the exercise programs and the results of a variety of physiological and psychological measures collected on the participating police officers. The present chapter is limited to discussion of two specific psychological tests dealing with anxiety levels and attitudes toward physical fitness.

Before presentation of the results, it is necessary to consider once again the effect of the drop out rate among participants on the data to be examined.

It was not possible to include an evaluation of the psychological data collected in the study carried out in Richardson, Texas, because of the inadequate adherence rate. Only twenty-five percent of the experimental (training) group officers completed the study in this city. Sixty-seven percent of the control group officers in this cohort finished the study as compared with only 29% of the "unsupervised" control group officers from the Dallas study. Neither of these control groups was included in the final analysis because of the lack of an experimental group for comparative purposes in the first case and the high drop out or mortality rate in the second instance. Also, an older group of officers in the Dallas study "participated" in the exercise program on an "unsupervised" basis, and they are not included in the present analysis since

it was not possible to portray accurately their level of involvement. Hence, only six of the original ten groups are considered in the present narrative, and these are summarized in Table 1 along with their respective adherence rates. The adherence rates ranged from a low of 29% for the interval training group to a high of 61% for older officers in the supervised group. The mean adherence rate was 45% (S.D. = 14.29) and this is somewhat lower than the 50-70% values commonly reported in the literature. The various factors responsible for this excessive mortality are elaborated upon in other chapters of this report.

The officers completed a series of physiological and psychological tests at the beginning of the investigation and again at the tenth (mid-term) and twentieth (post-test) weeks of the study. The drop-out rate across time was linear as depicted in Figure 1. The mortality rate was so excessive (55%) by the twentieth week that certain of the analyses presented in this narrative will be limited to the first ten weeks. The sample size had decreased so greatly by the close of the study that systematic and logical comparisons were simply not possible for the full twenty week span in every instance.

Procedure

Prior to initiation of the study and again at the tenth and twentieth weeks, the participating police officers completed the State-Trait Anxiety Inventory (STAI) (Spielberger et al., 1970) and the Physical Estimation and Attraction Scale (PEAS) (Sonstroem, 1974). The STAI is designed to measure both state (transitory) and trait (enduring) anxiety, whereas the PEAS assesses estimation

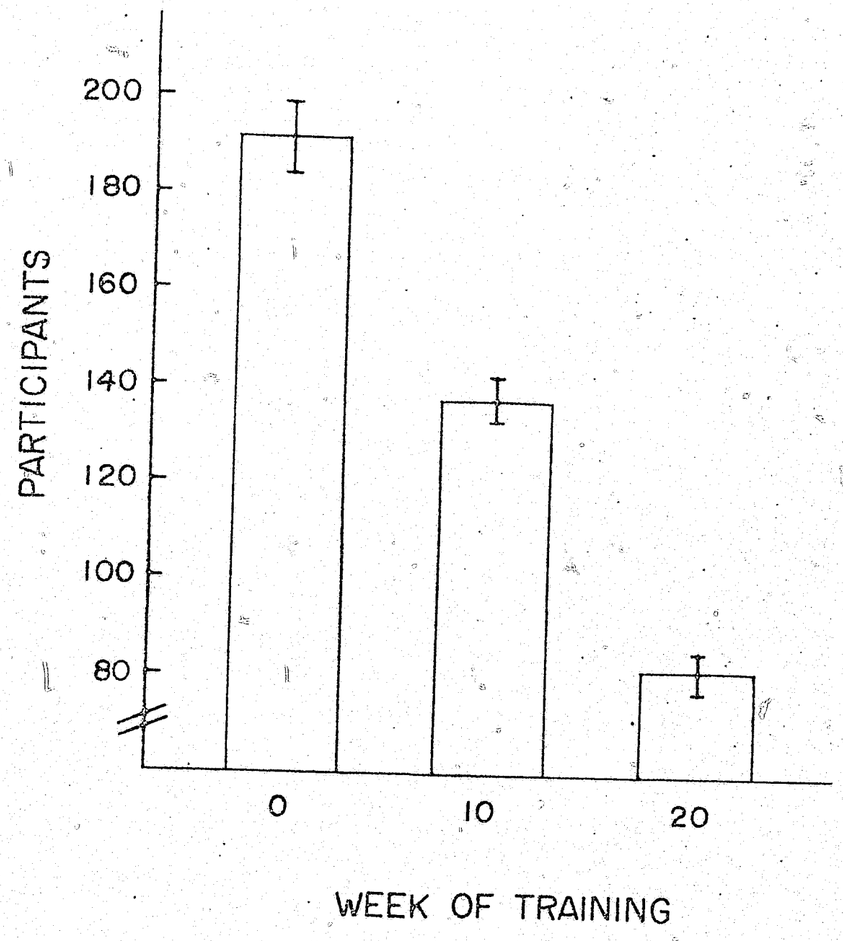
TABLE 1. Percent Adherence of the Six Groups of Officers Included in the Psychological Test Analyses

Group Number*	Category	Adherence (%)
3	Interval Training	29
4	Continuous Training	54
5	Combination Training	36
6	Weight Training	50
7	Control	42
8	Supervised (older Ss)	61

*Groups 1, 2, 9, and 10 were deleted because of various methodological problems.

FIGURE 1

INCIDENCE OF DROP-OUT ACROSS TRIALS



of physical ability, or self esteem, and attraction or attitude toward physical activity. The rationale for utilizing these measures in the present study was described earlier in a similar training study involving prisoners (Morgan and Pollock, 1976).

At an intuitive level one would expect volunteers who possessed a high attitude toward physical activity to be more likely to adhere to an exercise program than those with low attraction scores. There are fewer intuitive reasons, however, to argue that anxiety or estimation of physical ability would necessarily convary with either adherence or mortality. At any rate, of the 123 police officers studied (those on whom complete data was available), 77 completed the full twenty weeks and 47 dropped out of the program. This permitted a comparison to be made of drop-outs and those who continued in the study for each of the psychological variables from the outset. These data are summarized in Table 2. Inspection of these data reveals that those officers who continued in the programs did not differ psychologically from the drop-outs.

This finding is somewhat surprising since one would expect the adherence group to possess more favorable attitudes toward physical activity from the outset. However, the initial mean values were nearly identical. Previous work with prisoners (Morgan and Pollock, 1976) and soldiers (Morgan and Vogel, 1976) suggests that the initial mean values of these volunteers were extremely high. In other words, the drop-outs apparently decided to discontinue for reasons other than attraction toward physical activity. Interestingly, therefore, attitude toward physical activity would be of little use in predicting adherence or mortality in the current study.

TABLE 2. Means, Standard Deviations, and Standard Errors for Officers who Continued (N = 77) and Officers who Dropped Out (N = 47) on Each of the Psychological Variables

State Anxiety	Continued (N = 77)	Dropped Out (N = 47)	P
Mean	31.08	30.89	> .05
S.D.	6.76	6.71	
S.E.	0.77	0.98	
Trait Anxiety			
Mean	32.16	32.94	> .05
S.D.	6.38	6.55	
S.E.	0.73	0.97	
Attraction			
Mean	39.20	39.13	> .05
S.D.	6.79	6.41	
S.E.	0.77	0.93	
Estimation			
Mean	21.48	21.30	> .05
S.D.	5.92	6.92	
S.E.	0.67	1.01	

It was hypothesized that involvement in one of the exercise programs[1], in contrast to participation in the non-exercise control group, would be associated with a decrement in state anxiety and an increase in estimation of physical ability, and, further, that trait anxiety and attraction toward physical activity would remain the same across the twenty week period. Prior to proceeding with an analysis of these data, however, the test-retest reliability of the selected instruments was examined. This was done by comparing the pre-test and mid-term scores of the control group officers, and therefore, a period of ten weeks intervened between the two testing sessions. The means, standard deviations, standard errors, t-tests, and correlation coefficients are presented in Table 3. This analysis revealed that each of the instruments possessed adequate reliability, with the eception of the test-retest correlation for state anxiety (r = .41). However, this has been reported previously (Spielberger et al., 1970), and it is due to the actual lability of this state. The remaining correlations ranged from .73 to .83, which are quite acceptable considering that a period of ten weeks had elapsed. Also, it will be noted that the mean values in each instance were quite similar across time, and none of the t-tests was significant. These results indicate that each of the measures was stable across ten weeks, and any differences seen in the experimental groups

[1]The actual intensity, frequency, and duration of exercise performed by members of the various exercise groups are described in the physiological sections of the report.

TABLE 3. Means, Standard Deviations, Standard Errors, t-Tests, and Correlation Coefficients for the Control Group Officers (N = 17) Across Ten Weeks

	State Anxiety		Trait Anxiety		Attraction		Estimation	
	Pre	Mid	Pre	Mid	Pre	Mid	Pre	Mid
Mean	29.53	31.12	31.41	30.88	40.76	40.06	24.18	22.71
S.D.	6.40	7.00	8.32	6.68	6.62	6.92	5.40	6.55
S.E.	1.55	1.70	2.02	1.62	1.61	1.68	1.31	1.59
t	0.69*		0.20*		0.30*		0.71*	
r	.41*		.81*		.83*		.81*	

*P > .05
**P < .01

could be regarded as being associated with the training program, since this was the only known way in which the experimental and control group officers differed across the twenty week period.

The means and standard deviations for each of the variables at the beginning, middle, and conclusion of the study are presented in Tables 4 through 7 for each of the groups. The number of officers in each group is constant for a given variable, but the number of officers across variables differs because of missing or uninterpretable data in certain cases.

Inspection of Table 4 reveals that none of the groups experienced a reduction in state anxiety which contradicts the hypothesis that exercise would decrease tension. While there is evidence that acute physical activity decreases state anxiety (Morgan, 1973; Morgan and Horstman, 1976), there is not a convincing body of literature which demonstrates the same to occur with chronic exercise. On the other hand, all of the groups in this study scored rather low on state anxiety in contrast to published norms (Spielberger et al., 1970); and therefore, it is conceivable that decrements in anxiety were not possible in these relatively "low anxious" subjects. For this reason a subsequent analysis will be made of "high anxious" and "low anxious" officers independent of group affiliation.

Inspection of Table 5 reveals that trait anxiety also remained stable across time with the exception that Group 5 (Combination) experienced a decrement of approximately six raw score units. Since the pre- and post-test standard deviations were 5.05 and 4.30 respectively, this can be regarded as a decrement

TABLE 4. Means and Standard Deviations for State Anxiety (STAI) in Each Group Across Trials

Group	N	Pre-Test		Mid-Term		Post-Test	
		Mean	S.D.	Mean	S.D.	Mean	S.D.
3-Interval	8	32.38	8.48	32.38	11.06	28.75	10.18
4-Continuous	8	33.75	9.35	33.38	8.78	31.63	9.23
5-Combination	8	29.13	7.36	31.38	10.58	28.13	6.98
6-Weights	8	31.88	5.59	34.38	8.35	29.88	6.98
7-Control	8	28.50	5.71	31.38	7.23	28.00	8.47
8-Supervised	8	29.38	6.63	28.25	6.04	28.50	6.16

TABLE 5. Means and Standard Deviations for Trait Anxiety (STAI) in Each Group Across Trials

Group	N	Pre-Test		Mid-Term		Post-Test	
		Mean	S.D.	Mean	S.D.	Mean	S.D.
3-Interval	9	32.56	8.09	29.56	7.43	30.00	9.62
4-Continuous	9	34.67	8.00	31.56	9.32	33.44	8.41
5-Combination	9	33.44	5.05	29.78	9.28	27.56	4.30
6-Weights	9	32.78	6.08	32.22	5.38	30.00	5.10
7-Control	9	33.44	9.59	32.56	7.73	32.11	8.71
8-Supervised	9	29.11	4.96	29.22	4.74	28.33	3.08

of practical significance. However, this may well reflect chance since none of the other exercise groups evidenced such a change.

It was hypothesized that attraction or attitude toward physical activity would not change across time, and inspection of Table 6 confirms this prediction. These volunteers scored substantially higher on this scale, however, than a group of 300 soldiers who were required to take part in an aerobics program (Morgan and Vogel, 1976), and they also scored higher than volunteers in a similar study carried out recently with prisoners. Therefore, since these volunteers possessed high positive attitudes toward physical activity from the outset, it is understandable that increments did not occur; and it is also reassuring that involvement in the various exercise programs did not produce a decrease in attitude. It is noteworthy, in this context, that the soldiers referred to above actually had a significant decrease in attitude toward physical activity following required physical training.

A different picture emerges when estimation of physical ability is examined. It will be noted in Table 7 that each of the exercise groups had increases in their estimates of self, and these increments ranged from a low of 3.5 raw score units (older supervised group) to a high of 5.2 raw score units (weight group). The mean increase for the five exercise groups was 4.5 in comparison to the control group which did not change. These results are illustrated in Figure 2 and a composite is presented for all of the exercise groups since they all had the same response.

TABLE 6. Means and Standard Deviations for Attraction toward Physical ACtivity (PEAS) in Each Group Across Trials

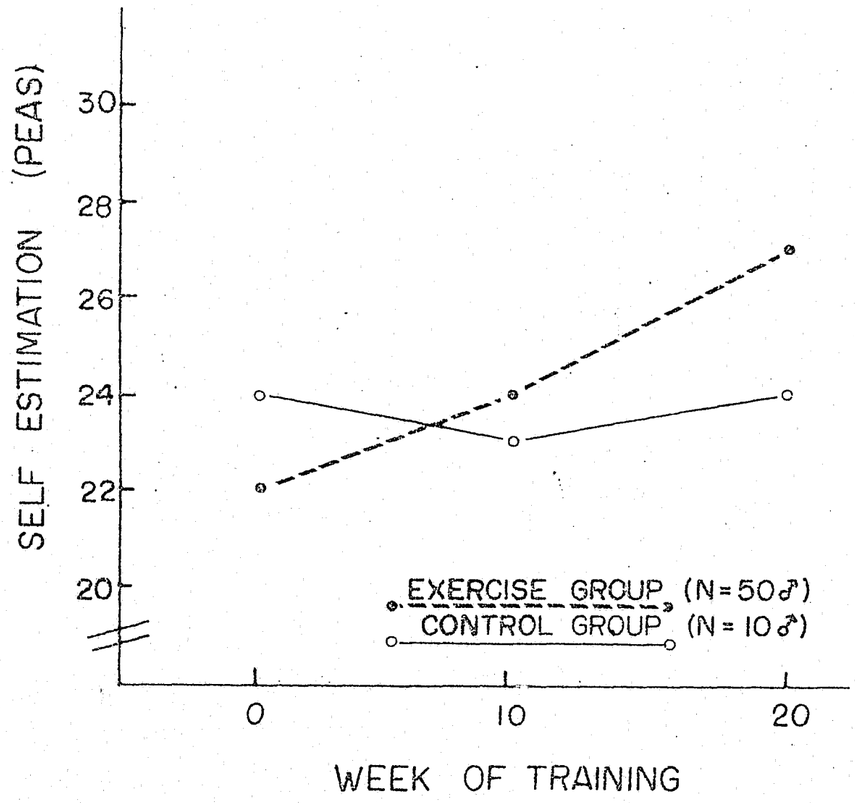
Group	N	Pre-Test		Mid-Term		Post-Test	
		Mean	S.D.	Mean	S.D.	Mean	S.D.
3-Interval	10	39.30	8.92	39.60	5.82	41.50	6.70
4-Continuous	10	38.70	5.23	37.10	6.28	38.70	5.91
5-Combination	10	41.00	5.85	41.50	7.63	43.80	3.77
6-Weights	10	43.00	6.29	41.70	5.38	42.90	5.78
7-Control	10	38.10	6.66	37.50	7.55	40.20	8.39
8-Supervised	10	38.30	4.35	39.50	6.49	42.20	6.00

TABLE 7. Means and Standard Deviations for Estimation of Physical Ability (PEAS) in Each Group Across Trials

Group	N	Pre-Test		Mid-Term		Post-Test	
		Mean	S.D.	Mean	S.D.	Mean	S.D.
3-Interval	10	22.90	6.28	26.00	4.50	28.00	3.65
4-Continuous	10	22.40	4.43	25.00	4.76	27.20	4.69
5-Combination	10	20.80	7.45	22.60	6.42	24.60	6.02
6-Weights	10	23.70	4.16	24.70	3.30	28.90	3.48
7-Control	10	24.10	5.59	23.00	7.04	24.00	5.70
8-Supervised	10	21.80	5.85	23.10	6.59	25.30	5.77

FIGURE 2

CHANGES IN ESTIMATION OF PHYSICAL ABILITY (PEAS) ACROSS TWENTY WEEKS IN THE EXERCISE (N = 50) AND CONTROL Ss (N = 10).



These data were also analyzed by means of a repeated measure ANOVA for multifactor experiments (Winer, 1962). This analysis yielded F ratios of 0.67 ($P > .05$) for groups; 27.67 ($P < .01$) for trials; and 1.27 ($P > .05$) for the groups by trials interaction. A further probe using the Newman-Keuls procedure revealed that Trial 3 (post-test) was significantly higher than Trial 1 (pre-test), but neither of these differed from Trial 2 (mid-test). The apparent trend for the Control Group not to increase was not strong enough to create a significant F for groups. This lack of significance is due to the variability of the control and exercise groups at each test point.

An improved estimate of physical ability would certainly be regarded as a positive change in affect since the way in which one views his or her own body influences his/her self-concept and self-esteem. Stability of attraction and increased estimation of physical ability was also demonstrated in the earlier studies involving prisoners (Morgan and Pollock, 1976).

Several additional analyses were carried out in order to evaluate the extent to which initial levels of anxiety, estimation, and attraction influenced change. In these analyses the alteration of state anxiety in officers scoring high (40 or more) were compared with officers scoring low (23 or less) on state anxiety (STAI). This analysis, as well as those for trait anxiety and the PEAS items, was carried out only for the pre-test and mid-term evaluation. It was not possible to extend this analysis to the twentieth week because of the excessive drop-out rate. The data resulting from the first such analysis is presented in Table 8.

TABLE 8. Means, Standard Deviations, and t-Tests for High State-Anxious (N = 12) and Low State-Anxious (N = 12) Officers Before and Following Ten Weeks of Physical ACtivity

Statistic	High Anxious Group N = 12		Low Anxious Group N = 12	
	Pre	Mid	Pre	Mid
Mean	42.83	37.42	21.92	23.67
S.D.	3.13	8.16	1.08	3.52
t	2.15*		1.64	
P	<.05		>.05	

*One-tailed test

First of all, it will be noted that each group experienced about a threefold increase in the variability across the ten week period (i.e., the standard deviation values increased from 3.13 to 8.16 and from 1.08 to 3.52). However, this increased variability was accounted for by one or two officers in both cases. This is quite understandable when one considers the numerous stressors to which many police officers are exposed on a daily basis. Evaluation of individuals in high-stress occupations creates various problems when investigating behavioral states as opposed to traits. At any rate, the pre- to mid-test decrement seen in state anxiety for the high-anxious group was statistically significant ($P < .05$), whereas the mean value for the low-anxious group did not change across time ($P > .05$).

There was also a significant decrement ($P < .005$) in the trait anxiety of high trait-anxious officers following ten weeks of physical training; and it is reassuring to note in Table 9 that low anxious officers did not change, i.e., regression effects were presumably not responsible for the observed change. In some respects it might be reasonable to expect changes in state anxiety with acute and chronic exposures and changes in trait anxiety only with chronic interventions. While trait anxiety is felt to be a stable, enduring, psychological dimension, it can be changed as evidenced by the present results. However, the changes in both state and trait anxiety observed in this study took place only in high-anxious officers. In other words, vigorous physical activity was associated with anxiety reduction in anxious individuals. This same finding was also observed in the earlier investigation dealing with prisoners (Morgan and Pollock, 1976).

TABLE 9. Means, Standard Deviations, and t-Tests for High Trait-Anxious (N = 11) and Low Trait-Anxious (N = 11) Officers Before and Following Ten Weeks of Physical Activity

Statistic	High Anxious Group N = 11		Low Anxious Group N = 11	
	Pre	Mid	Pre	Mid
Mean	42.27	36.91	22.73	23.09
S.D.	2.05	5.45	1.19	2.21
t	3.62*		0.48	
P	<.005		>.05	

*One-tailed test

Inspection of Table 10 reveals that physical training did not differentially influence officers scoring in the extremes for the attraction or "attitude toward physical activity" measure. Individuals with high scores on the attraction measure of the PEAS remained high, and those with low scores remained low, following physical training. These findings are also in agreement with the recent report involving prisoners (Morgan and Pollock, 1976).

Similarly, those officers who possessed a high estimation of physical ability at the outset maintained these high scores across the ten weeks of training. However, those officers who scored low on the estimation scale of the PEAS at the outset experienced a significant ($P < .01$) increase in their self estimates following ten weeks of training. These results are summarized in Table 11.

It is quite possible that all of the significant changes described above would have become more pronounced were a comparison at twenty weeks made, but the drop-out rate (see Figure 1) was so substantial following ten weeks that such a comparison was not feasible. On the other hand, it is also well recognized that the major physiological benefits occur during the first two months of training, and the same may very well be the case for psychological gains. From a clinical standpoint, however, it is clear that enormous individual differences exist with respect to training responses--both psychological and physiological.

TABLE 10. Means, Standard Deviation, and t-Tests for Officers with High (N = 14) and Low (N = 14) Attraction Before and Following Ten Weeks of Training

Statistic	High Attraction Group N = 14		Low Attration Group N = 14	
	Pre	Mid	Pre	Mid
Mean	48.21	47.07	29.43	32.93
S.D.	2.72	3.71	3.84	6.93
t	0.93		1.65	
P	>.05		>.05	

TABLE 11. Means, Standard Deviations, and t-Tests for Officers with High (N = 15) and Low (N = 15) Estimation of Physical Ability Before and Following Ten Weeks of Training

Statistic	High Estimation Group N = 15		Low Estimation Group N = 15	
	Pre	Mid	Pre	Mid
Mean	30.47	29.73	14.13	18.53
S.D.	1.36	2.46	2.29	5.80
t	1.01		2.73*	
P	>.05		<.01	

*One-tailed test

Summary

This chapter represents a summary of the major psychological findings resulting from the physical fitness intervention program carried out with police officers. In many respects this study was similar to the earlier investigation dealing with prisoners (Morgan and Pollock, 1976), and for the most part the findings of the present investigation were comparable to those reported for the prisoners. The present analyses considered only five of the exercise groups and one of the control groups from the Dallas Police Department because of various methodological problems.

One of the major findings of this investigation was that a substantial number of these volunteer police officers withdrew from the training program by the tenth week, and an equal number dropped out during the following ten weeks. Inspection of Figure 1 suggests that had the study continued for another ten weeks, there would not have been any officers remaining in the study! This is quite important since other investigators have often reported adherence rates of 50% to 70% in long term trials. It is important to emphasize here that adherence-mortality rates were not associated with initial psychological indices selected for use in this investigation. Interestingly, for example, attitude toward physical activity from the outset was not useful in discriminating between those officers who dropped out and those who continued.

Police officers who participated in any of the physical activity training programs experienced a significant increase in their estimation of physical ability following the twenty weeks of involvement. This must be regarded as a

desirable and positive change since the way one feels about his or her own body is known to influence self-concept. It was also noted that control group officers from the same population did not experience such a change (see Figure 2).

The various psychological analyses carried out for all groups across the twenty week period revealed that, with the exception of the above-mentioned change, alterations in psychological states and traits did not occur. However, when officers scoring in the extremes for various variables such as anxiety were evaluated, it was noted that significant alterations did occur. For example, both state and trait anxiety decreased in high-anxious officers across ten weeks of training, whereas low-anxious officers in the various exercise groups and sedentary control group officers remained unchanged. Therefore, anxiety was reduced in participants who scored high on anxiety from the outset, and this supports the common view held in the exercise sciences that such an intervention is efficacious in the management of anxiety and depression (Morgan and Pollock, 1976).

As a result of these analyses, it appears that the major challenge for administrators concerned with the physical fitness of police officers is twofold. First, the necessity of devising strategies which will facilitate involvement in physical activity is quite apparent. This might be achieved in numerous ways using a variety of intervention techniques. Second, and perhaps more crucial, improvement of our understanding of adherence is necessary to prevent the catastrophic drop-out or mortality rates associated with exercise intervention programs.

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APPENDIX A.

APPLICATION FOR AEROBIC PHYSICAL FITNESS PROGRAM

APPLICATION FOR AEROBICS PHYSICAL FITNESS PROGRAM

Please Print: Date _____

Name _____ Age _____ Sex _____

Street Address _____

City _____ State _____ Zip ____

Home Phone _____ Business Phone _____

Business Address _____

Date of Birth _____ Marital Status _____ No. of Depend. ____

Check one: Dallas Police Department
Richardson Police Department
Department of Public Safety

Work Schedule: _____

_____

What time of day would be most convenient for you to exercise?

7:30 to 9:30 am _____ 12:00 am - 1:00 pm _____ 3:30 to 5:30 pm _____

EXERCISE HABITS

Are you currently involved in a regular exercise program? yes ____ no _____

Do you regularly walk or run one or more miles continuously? yes ____ no ____
don't know ____

If yes, average no. of miles you cover per workout or day: _____

What is your average time per mile? _____(min:sec) don't know _____

Do you practice weight lifting or home calisthenics? yes _____ no _____

Do you frequently participate in competitive sports? yes _____ no _____

If yes, which one or ones?

_____Golf _____Bowling _____Tennis _____Handball _____Soccer

_____Basketball _____Volleyball _____Football _____Baseball _____Track

Other _____

Average number of times per month _____

(Please complete page 2 also)

APPLICATION FOR AEROBICS PHYSICAL FITNESS PROGRAM (Con't)

PRESENT HEALTH HISTORY

Check the space in front of those questions to which your answer is yes. Leave others blank

_____Has a doctor every said that your blood pressure was too high or too low?

_____Has a doctor ever said that you had or have heart trouble, an abnormal electrocardiogram (ECG or EKG), heart attack, or coronary?

_____Has a doctor ever told you your blood cholesterol level was high?

If yes is answered in any of the above, please explain further _____

_____

_____

Please rate your own general health:

Excellent_____ Good_____ Fair_____ Poor_____

PAST HEALTH HISTORY

_____Diseases of the arteries

_____Diabetes or abnormal bood sugar test

_____Epilepsy or fits

_____Strokes

_____Anemia

_____Abnormal chest x-ray

_____Asthma

_____Other lung diseases

If yes is answered in any of the above, please explain further _____

_____

APPENDIX B

MEDICAL HISTORY QUESTIONNAIRE

AND

INFORMED CONSENT FORM

MEDICAL HISTORY QUESTIONNAIRE

Institute for Aerobics Research
11811 Preston Road
Dallas, Texas 75230

This is your medical history form for your visit to The Institute for Aerobics Research. All information will be kept confidentail. The doctor or exercise physiologist you see at the Institute will use this information in his evaluation of your health. You will want to make it as accurate and complete as possible, yet free of meaningless details. Please fill out this form carefully and thoroughly. Then check it over to be sure you haven't left out anything.

Note: Please **print** all responses so that your data will be compatible with computer storage and analysis.

THE AEROBICS CENTER DALLAS, TEXAS

Name _____ Exam Date _____ ,19 ____

When dates are required, please use numbers to represent the months as follows:

January 01	May 05	September 09
February 02	June 06	October 10
March 03	July 07	November 11
April 04	August 08	December 12

For addresses, please use the official Post Office two-letter abbreviations listed below.

Abbreviations for States (and Territories)

AL	Alabama	NE	Nebraska
AK	Alaska	NV	Nevada
AZ	Arizona	NH	New Hampshire
AR	Arkansas	NJ	New Jersey
CA	California	NM	New Mexico
CZ	Canal Zone (Panama)	NY	New York
CO	Colorado	NC	North Carolina
CT	Connecticut	ND	North Dakota
DE	Delaware	OH	Ohio
FL	Florida	OK	Oklahoma
GA	Georgia	OR	Oregon
GU	Guam	PA	Pennsylvania
HI	Hawaii	PR	Puerto Rico
ID	Idaho	RI	Rhode Island
IL	Illinois	SC	South Carolina
IN	Indiana	SD	South Dakota
IA	Iowa	TN	Tennessee
KS	Kansas	TX	Texas
KY	Kentucky	UT	Utah
LA	Louisiana	VT	Vermont
ME	Maine	VA	Virginia
MD	Maryland	VI	Virgin Islands
MA	Massachusetts	WA	Washington (state)
MI	Michigan	DC	Washington, D. C.
MN	Minnesota	WV	West Virginia
MS	Mississippi	WI	Wisconsin
MO	Missouri	WY	Wyoming
MT	Montana		

Institute for Aerobics Research
11811 Preston Road
Dallas, Texas 75230

ient Medical History Form

DO NOT WRITE IN THIS SPACE; FOR OFFICE USE ONLY.

PATIENT NUMBER	VISIT	CARD	FORM	CLINIC
		0 1	M 0 2	B

All information is private and confidential. Please Print.

I. GENERAL INFORMATION

☐ Mr. ☐ Ms. ☐ Miss ☐ Mrs. ☐ Dr. NAME (FIRST / MIDDLE / LAST)

ADDRESS

NUMBER AND STREET

02 CITY / STATE / ZIP CODE

COUNTRY (IF OUTSIDE U.S.A.)

HOME PHONE ( ) AREA CODE

SOCIAL SECURITY NUMBER

DATE OF BIRTH 03 MONTH DAY YEAR

TODAY'S DATE MONTH DAY YEAR

FAMILY PHYSICIAN

Dr. FIRST NAME, IF KNOWN / INITIAL / LAST NAME

DOCTOR'S ADDRESS (if known)

NUMBER AND STREET

PHONE

04 CITY / STATE / ZIP CODE / AREA CODE

May we send a copy of your consult to your physician? Yes ☐ No ☐

MARITAL STATUS

Single ☐ Married ☐ Divorced ☐ Widowed ☐ Separated ☐

SEX

Male ☐ Female ☐ PRESENT AGE

EDUCATION (Check highest level attained)

☐ Grade School ☐ Junior High School ☐ High School ☐ Two-year College (or 4-year college; degree not comp) ☐ College Graduate ☐ Postgraduate School

OCCUPATION

FOR OFFICE USE ONLY
OCCUP CODE ☐

EMPLOYER (use abbreviations if necessary)

05

EMPLOYER'S ADDRESS

NUMBER AND STREET

BUSINESS PHONE

06 CITY / STATE / ZIP CODE / AREA CODE

What is/are your purpose(s) in coming to the Institute?

☐ To participate in a research study.
☐ To determine my current level of physical fitness and to receive recommendations for an exercise program.
☐ Other (please explain):

07

PLEASE PRINT

edical History

DO NOT WRITE IN THIS SPACE; FOR OFFICE USE ONLY.

PATIENT NUMBER	VISIT	CARD	FORM	CLINIC
		1 0	M 0 2	B

2

PRESENT HISTORY

Check the box in front of those questions to which your answer is yes. Leave others blank.

0
- ☐ Has a doctor ever said that your blood pressure was too high or too low?
- ☐ Do you ever have pain in your heart or chest?
- ☐ Are you often bothered by a thumping of the heart?
- ☐ Does your heart often race like mad?
- ☐ Do you ever notice extra heart beats or skipped beats?
- ☐ Are your ankles often badly swollen?
- ☐ Do cold hands or feet trouble you even in hot weather?
- ☐ Has a doctor ever said that you had or have heart trouble, an abnormal electrocardiogram (ECG or EKG), heart attack, or coronary?
- ☐ Do you suffer from frequent cramps in your legs?
- ☐ Do you often have difficulty breathing?
- ☐ Do you get out of breath long before anyone else?
- ☐ Do you sometimes get out of breath when sitting still or sleeping?
- ☐ Has a doctor ever told you your cholesterol level was high?

Comments:

11

12

13

Do you now have or have you recently had:

4
- ☐ A chronic, recurrent or morning cough?
- ☐ Any episode of coughing up blood?
- ☐ Increased anxiety or depression?
- ☐ Problems with recurrent fatigue, trouble sleeping or increased irritability?
- ☐ Migraine or recurrent headaches?
- ☐ Swollen or painful knees or ankles?
- ☐ Swollen, stiff or painful joints?
- ☐ Pain in your legs after walking short distances?
- ☐ Back pain?
- ☐ Kidney problems such as passing stones, burning, increased frequency, decreased force of stream of difficulty in starting or stopping your stream?
- ☐ Prostate trouble (men only)?
- ☐ Any stomach or intestinal problems such as recurrent heartburn, ulcers, constipation or diarrhea?
- ☐ Any significant vision or hearing problem?
- ☐ Any recent change in a wart or mole?
- ☐ Glaucoma or increased pressure in the eyes?
- ☐ Exposure to loud noises for long periods?

Comments:

15

WOMEN ONLY answer the following:

6
- ☐ Do you have any menstrual period problems?
- ☐ Do you have problems with recurrent itching or discharge?
- ☐ Did you have any significant childbirth problems?
- ☐ Do you have any breast discharges or lumps?
- ☐ Do you sometimes lose urine when you cough, sneeze or laugh?

Please give number of: Pregnancies ☐☐ Living children ☐☐ First day of last menstrual period ☐☐ MONTH ☐☐ DAY ☐☐ YEAR

Date of last pelvic exam and/or Paps smear: month ☐☐ year 19☐☐ Results: Normal ☐ Abnormal ☐

Comments:

17

PLEASE PRINT

DO NOT WRITE IN THIS SPACE: FOR OFFICE USE ONLY.

PATIENT NUMBER	VISIT	CARD	FORM	CLINIC
		4 0	M 0 2	B

4

FAMILY MEDICAL HISTORY

FATHER: Alive ☐ Deceased ☐ Current age ____ Age at death ____ General health now: excellent ☐ good ☐ fair ☐ poor ☐ don't know ☐ Cause of death or reason for poor health now: ____

MOTHER: Alive ☐ Deceased ☐ Current age ____ Age at death ____ General health now: excellent ☐ good ☐ fair ☐ poor ☐ don't know ☐ Cause of death or reason for poor health now: ____

SIBLINGS: No. of brothers ____ No. of sisters ____ Age range ____ – ____ Health Problems: ____

FAMILIAL DISEASES: Have any of your blood relatives had any of the following?
Include grandparents, aunts, and uncles, but exclude cousins, relatives by marriage, and half relatives.

- ☐ Heart attacks under age 50
- ☐ Strokes under age 50
- ☐ High blood pressure
- ☐ Elevated cholesterol
- ☐ Diabetes
- ☐ Asthma or hay fever
- ☐ Congenital heart disease
- ☐ Heart operations
- ☐ Glaucoma
- ☐ Obesity (20 or more lbs. overweight)
- ☐ Leukemia or cancer under age 60

Comments: ____

OTHER HEART DISEASES RISK FACTORS

SMOKING

Have you ever smoked cigarettes, cigars or a pipe? yes ☐ no ☐
If no, skip to Diet section.
Do you smoke presently? yes ☐ no ☐
If you did or do smoke cigarettes, how many per day? ____ Age you started: ____
If you did or do smoke cigars, how many per day? ____ Age you started: ____
If you did or do smoke a pipe, how many pipefuls per day? ____ Age you started: ____
If you have quit smoking, when was it? ____ MONTH 19 ____ YEAR

DIET

What do you consider a good weight for yourself? ____ pounds
What is the most you have ever weighed? (including when pregnant) ____ lbs. At what age? ____ yrs.
Weight: Now ____ lbs. One year ago ____ lbs. At age 21 ____ lbs.
Number of meals you usually eat per day. ____
Average number of eggs you usually eat per week: ____ (Do not count those in cooking and baking, cakes, casseroles, etc.)
Number of times per week you usually eat:

Beef		Fish		Desserts	
Pork		Fowl		French fried foods	

Number of servings (cups, glasses or containers) per week you usually consume of:

Homogenized (whole) milk		Buttermilk	
Skim (non-fat) milk		Tea (iced or hot)	
Two percent (2% fat) milk		Coffee	

Do you ever drink alcoholic beverages? yes ☐ no ☐
If yes, what is your approximate intake of these beverages?

	None	Occasional	Often	If often, how many drinks per week?
Beer	☐	☐	☐	
Wine	☐	☐	☐	
Hard Liquor	☐	☐	☐	

At any time in the past were you a heavy drinker (consumption of 6 oz. of hard liquor per day or more)? yes ☐ no ☐

Comments: ____

PLEASE PRINT

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PATIENT NUMBER	VISIT	CARD	FORM	CLINIC
		2 5	M 0 2	B

3

MEN and WOMEN answer the following:

List any prescribed medications you are now taking: 25 ____

List any self-prescribed medications or dietary supplements you are now taking: 26 ____

Date of last complete physical examination: ____ month 19 ____ year ☐ never ☐ can't remember ☐ Normal ☐ Abnormal ☐

Date of last chest x-ray: 27 ____ month 19 ____ year ☐ never ☐ can't remember ☐ Normal ☐ Abnormal ☐

Date of last electrocardiogram: ____ month 19 ____ year ☐ never ☐ can't remember ☐ Normal ☐ Abnormal ☐

Date of last dental check-up: ____ month 19 ____ year ☐ never ☐ can't remember ☐ Normal ☐ Abnormal ☐

List any other medical or diagnostic test you have had in the past two years: 28 ____ 29 ____

List hospitalizations including dates of and reasons for hospitalization: 30 ____ 31 ____ 32 ____

List any drug allergies: 33 ____

PAST HISTORY

Have you ever had:

- ☐ Heart Attack, how many years ago?____
- ☐ Rheumatic Fever
- ☐ Heart murmur
- ☐ Diseases of the arteries
- ☐ Varicose veins
- ☐ Arthritis of legs or arms
- ☐ Diabetes or abnormal blood sugar test
- ☐ Phlebitis
- ☐ Dizziness or fainting spells
- ☐ Epilepsy or fits
- ☐ Strokes
- ☐ Diphtheria
- ☐ Scarlet fever
- ☐ Infectious mononucleosis
- ☐ Anemia
- ☐ Thyroid problems
- ☐ Pneumonia
- ☐ Bronchitis
- ☐ Asthma
- ☐ Abnormal chest x-ray
- ☐ Other lung diseases
- ☐ Injuries to back, arms, legs or joints
- ☐ Broken bones
- ☐ Jaundice or gallbladder problems
- ☐ Polio
- ☐ Urinary tract infections, kidney stones, or prostate problems.
- ☐ Any nervous or emotional problems

Comments: 35 ____

PLEASE PRINT

Medical History

DO NOT WRITE IN THIS SPACE: FOR OFFICE USE ONLY.

PATIENT NUMBER	VISIT	CARD	FORM	CLINIC
		5 0	M 0 2	B

EXERCISE

50 Are you currently involved in a regular exercise program? yes ☐ no ☐

Do you regularly walk or run one or more miles continuously? yes ☐ no ☐ don't know ☐

If yes, average no. of miles you cover per workout or day: [ ] miles

What is your average time per mile? [ ] minutes: seconds don't know ☐

Do you practice weight lifting or home calisthenics? yes ☐ no ☐

Are you now involved in the Aerobics program? yes ☐ no ☐

If yes, your average Aerobics points per week: [ ]

Have you taken in the past 6 months: ☐ 12 minute test ☐ 1.5 mile ☐ neither

If yes, your miles in 12 minutes: [ ] or your time for 1.5 miles: [ ] minutes : seconds

Do you frequently participate in competitive sports? yes ☐ no ☐

If yes, which one or ones?

☐ Golf ☐ Bowling ☐ Tennis ☐ Handball ☐ Soccer
☐ Basketball ☐ Volleyball ☐ Football ☐ Baseball ☐ Track
☐ Other [ ]

Average number of times per month [ ]

51 In which of the following high school or college athletics did you participate?

☐ None ☐ Football ☐ Basketball ☐ Baseball ☐ Soccer
☐ Track ☐ Swimming ☐ Tennis ☐ Wrestling ☐ Golf
☐ Other [ ]

In which of the following high school or college athletics did you earn a varsity letter?

☐ None ☐ Football ☐ Basketball ☐ Baseball ☐ Soccer
☐ Track ☐ Swimming ☐ Tennis ☐ Wrestling ☐ Golf
☐ Other [ ]

52 What activity or activities would you prefer in a regular exercise program for yourself?

☐ Walking and/or running ☐ Bicycling (outdoors) ☐ Swimming
☐ Stationary running ☐ Stationary cycling ☐ Tennis
☐ Jumping rope ☐ Handball, basketball or squash
☐ Other [ ]

53 Comments: [ ]

Explain any other significant medical problems that you consider important for us to know:

55 [ ]

56 [ ]

57 [ ]

58 [ ]

59 [ ]

60 [ ]

61 [ ]

PLEASE PRINT

INFORMED CONSENT FOR EXERCISE TESTING

INSTITUTE FOR AEROBICS RESEARCH
11811 Preston Road
Dallas, Texas 75230

The undersigned hereby voluntarily consents to engage in a maximum exercise test to determine maximum oxygen intake and cardiovascular function. The test will be monitored continuously by an electrocardiogram recording and oscilloscope. This test will facilitate evaluation of cardiopulmonary function and assist the physician or exercise physiologist in prescribing or evaluating exercise programs. It is my understanding that I will be questioned and examined by a physician prior to taking the test and will be given a resting electrocardiogram to exclude contraindications to such testing.

Exercise testing will be performed by running, walking, swimming or riding a bicycle, with the workload increasing every few minutes until fatigue or breathlessness or other symptoms dictate cessation of the test. Blood pressure and electrocardiogram will be monitored by a physician or trained exercise physiologist. In the latter case, a physician will be readily available in case of emergency.

There exists the possibility that certain changes may occur during the progress of the test. These changes could include abnormal heart beats, abnormal blood pressure and in rare instances a "heart attack". Professional care in selection and supervision of individuals provides appropriate precaution against such problems.

The benefits of such testing are the scientific assessment of working capacity and the clinical appraisal of health hazards which will facilitate prescription of conditioning-rehabilitative exercise. Records will be held in strict confidence from non-medical people (such as employers and insurance agents) unless consent is obtained. The welfare of persons being tested is safeguarded by professional care and by the availability of emergency treatment should it be necessary.

Finally, I permit registration of my name for possible follow-up purposes in the future.

Further, the undersigned releases and discharges the Institute for Aerobics Research and the International Association of Chiefs of Police, their officers, agents, staff, faculty, physicians, technicians and any others connected therewith from all claims or damages whatsoever that the undersigned or his representatives may have arising from, or incident to this test.

Signed_____

Witness_____

Date_____

Physician or Exercise Physiologist Supervising Test

_____

APPENDIX C.

ATTITUDE QUESTIONNAIRES

Informed Consent
Attitudes and Concepts Phase
IACP Physical Fitness Study

The main purpose of this study is to evaluate the effects of different types of physical training programs, that can be used to ensure a high level of physical fitness among police personnel. We are also interested in your personal attitudes toward physical activity and your estimation of your present physical condition, and how these attitudes and personal estimations may be modified during the course of the study. For these reasons, we are asking you to complete a series of inventories which will require about 60 minutes of your time. Your participation in this phase of the study is completely voluntary, and we wish to emphasize that all responses will be treated in a confidential manner. You are invited to raise any questions you may have concerning these questionnaires or the purpose of completing them.

I have been informed of the nature and purpose of this phase of the physical fitness study; I understand that I will be required to complete the questionnaires now, at mid-point, and at the end of the study; I volunteer to take part in this phase of the physical fitness study.

Date

Name - please print

Signature

Department

Witness

NAME _____
DEPARTMENT _____
DATE _____

BACKGROUND INFORMATION REPORT FORM

The purpose of this questionnaire is to obtain biographical information in addition to what you have provided on other forms. Please answer all questions as completely as possible.

I. IDENTIFICATION INFORMATION

1. What is your height? _____

2. What is your race? _____

3. On what date did you join the police department in which you are currently employed? _____

4. What is your present rank? _____

5. a) What is your present assignment? _____

   b) For how many months have you been employed in this assignment?

   _____

6. a) Do you work on a permanent shift or a rotating shift? _____

   b) If you work on a permanent shift, what are your duty hours? _____
   _____ (Skip to Question 7)

   c) If you work on a rotating shift, how often does your shift rotate?

   _____

   d) If you work on a rotating shift, what are your present duty hours?

   _____

   e) If you work on a rotating shift, what were the duty hours on your previous shift? _____

7. a) Are you presently attending college or another educational institution?
   _____Yes _____No (Skip to Question 8)

   b) If "yes" answered in (a), how many hours per week do you spend in class? _____

8. a) Do you have a part-time job at the present time?
   _____Yes _____No (Skip to Question 9)

   b) If "yes" answered in (a), what is your part-time job? _____

   _____

   c) If "yes" answered in (a), how many hours per week do you work in your part-time job? _____

9. How many dependent children live with you? _____

10. a) Did you ever serve in the Armed Forces?
    _____Yes _____No (Skip to Question 11)

    b) If "yes" answered in (a), in what branch of the Armed Forces did you serve?

    _____

    c) If "yes" answered in (a), what were your rank and major assignment in the Armed Forces?
    Rank _____
    Major Assignment _____

    d) If "yes" answered in (a), what was your date of discharge from the Armed Forces? _____

    e) If "yes" answered in (a), did any formal exercise or physical fitness program exist for military personnel?
    _____No
    _____Yes Please describe this program and indicate whether or not you participated in it.

    _____
    _____
    _____
    _____

II MEDICAL INFORMATION

11. Please indicate how frequently you use the following medications and supplements (Check one column per item)

	Daily	Frequently	Occasionally	Rarely	Never
a. aspirin	____	____	____	____	____
b. antacids	____	____	____	____	____
c. allergy medications	____	____	____	____	____
d. cold medicines	____	____	____	____	____
e. laxatives	____	____	____	____	____
f. vitamins	____	____	____	____	____
g. other (Please specify)	____	____	____	____	____

_____

12. a) How many hours of sleep do you normally get in a 24-hour period? _____

b) During what hours do you normally sleep (e.g., 12 to 6)? _____

13. a) Have you ever quit smoking?
_____Yes _____No (Skip to Question 14)

b) If "yes" answered in (a), why did you quit smoking? _____

c) If "yes" answered in (a), did you start smoking again after you quit?
_____Yes _____No (Skip to Question 14)

d) If "yes" answered in both (a) and (c), what caused you to start smoking again? _____

14. Has a doctor ever recommended some form of exercise or physical fitness program for you?
_____No _____Yes. Please explain _____

15. Please indicate how frequently you experience lower back pain under the following circumstances. (Check one column per item)

	Daily	Frequently	Occasionally	Rarely	Never
a) on waking up	___	___	___	___	___
b) while driving	___	___	___	___	___
c) while sitting	___	___	___	___	___
d) while lifting objects	___	___	___	___	___
e) while working or standing	___	___	___	___	___

16. For how many more years do you expect to live? _____

III: PREVIOUS EMPLOYMENT

17. a) Did any of your previous employers (other than the military) sponsor sports programs for their employees?

_____Yes _____No (Skip to Question 18)

b) If "yes" answered in (a), please provide the name and address of this company or business. _____

18. a) Did any of your previous employers (other than the military) sponsor formal physical fitness and/or weight reduction programs for their employees?

_____Yes _____No (Skip to Question 19)

b) If "yes" answered in (a), please provide the name and address of this company or business. _____

c) If "yes" answered in (a), please describe this physical fitness/weight reduction program. _____

d) If "yes" answered in (a), did you participate?

_____Yes _____No. Why not? _____

IV. EXERCISE AT HOME

19. a) Do you engage in any regular exercise program at home?

_____Yes _____No (Skip to 19e)

b) If "yes" answered in (a), how frequently do you exercise at home? _____

c) If "yes" answered in (a), during what time of day do you usually exercise? _____

d) If "yes" answered in (a), who developed this exercise program (e.g., yourself, the military, a television program, etc.)? _____

e) If "no" answered in (a), why do you not engage in an exercise program at home? _____

20. a) Have you become involved in any new sports or exercise programs since the completion of your formal education (i.e., things in which you were not involved in school)?

_____Yes _____No (Skip to 20e)

b) If "yes" answered in (a), what types of sports or exercise programs are these? _____

c) If "yes" answered in (a), how often do you participate in these programs?

d) If "yes" answered in (a), what prompted your interest in these programs?

e) If "no" answered in (a), why have you not become involved in any new sports or exercise programs?

21. a) Have you ever engaged in karate, jujitsu, or similar programs?
_____Yes _____No (Skip to Question 22)

b) If "yes" answered in (a), please describe the nature of the program.

c) If "yes" answered in (a), please indicate the extent of your participation.

d) If "yes" answered in (a), what, if any, benefits did you derive from this experience?

22. a) Have you ever engaged in yoga or similar forms of transcendental meditation?
_____Yes _____No (Skip to Question 23)

b) If "yes" answered in (a), please describe the nature of the program.

c) If "yes" answered in (a), please indicate the extent of your participation.

d) If "yes" answered in (a), what, if any, benefits did you derive from this experience?

ANSWER QUESTIONS 23, 24, and 25 IF YOU ARE MARRIED

23. a) Does your husband/wife engage in any regular exercise program at home?
_____Yes _____No (Skip to 23e)

b) If "yes" answered in (a), how frequently does your husband/wife exercise at home?

c) If "yes" answered in (a), during what time of day does your husband/wife exercise at home?

d) If "yes" answered in (a), who developed your husband's/wife's exercise program (e.g., himself/herself, the military, a television program, etc.)?

e) If "no" answered in (a), why does your husband/wife not engage in an exercise program at home?

24. a) Does your husband/wife ever comment on your overall physical condition?
_____Yes _____No (Skip to Question 22)

b) If "yes" answered in (a), are his/her comments generally positive or negative?

25. a) Do you ever comment on your husband's/wife's overall physical condition?
_____Yes _____No (Skip to Question 26)

b) If "yes" answered in (a), are your comments generally positive or negative?

ANSWER QUESTIONS 26, 27 and 28 IF YOU HAVE CHILDREN

26. a) Do your children regularly engage in any formal physical/sports program?
_____Yes _____No (Skip to Question 27).

b) If "yes" answered in (a), please describe the nature of the formal physical/sport program.

27. a) Do your children exercise regularly at home?
_____Yes _____No (Skip to Question 25)

b) If "yes" answered in (a), please describe the nature of this exercise.

28. Do you think your children get enough exercise or physical activity?
_____Yes _____No

V. RETIREMENT PLANS

29. At what age do you plan to retire from the police department?_____

30. Suppose you are considering leaving the police department before you reach the mandatory retirement age. What would be the most important reasons and/or incentives for you to leave?_____

31. At the present time, what do you think you would like to do after you retire from the police department? List as many things as apply._____

32. Suppose that you have just retired from the police department. What types of employment, if any, would you seek? Please be as specific as possible.

Name_____ Unit_____

Date_____ Service Number_____

ATTITUDE QUESTIONNAIRE

Directions. The statements below reflect certain attitudes and interests of persons. Read each statement and decide whether it is true or false as applied to you. Indicate your answer by placing a circle around the T (TRUE) or F (FALSE). In some cases you may have difficulty deciding which response is best, but please make some decision and answer every item. Please do not make an attempt to be consistent in your answers during the test, but respond to each item individually. Even if an item asks about things you haven't experienced, answer it as best you can on the basis of what you have heard, seen, or read.

T F 1. I would rather see a play than a movie.

T F 2. I prefer exercising to reading.

T F 3. I generally prefer talking with friends to playing a family table game such as monopoly.

T F 4. I would much rather play softball than go for a ride in a car.

T F 5. Most of my friends work harder than I do.

T F 6. My body is strong and muscular compared to other men my age.

T F 7. I would be interested in learning to play a musical instrument.

T F 8. Most sports require too much time and energy to be worthwhile.

T F 9. I would have made a good accountant.

T F 10. I am in better physical condition than most men my age.

T F 11. The mechanical properties of motors interest me a great deal.

T F 12. On a Sunday afternoon, I would prefer to go to a movie rather than to go on a picnic.

T F 13. I am quite limber and agile compared to others my age.

T F 14. I often stick up for my own point of view even when no one agrees with me.

T F 15. I enjoy people who talk a great deal.

T F 16. I prefer team sports to individual sports because of the experience of playing with different people.

T F 17. I like to be in sports that don't require a great amount of running.

T F 18. I know that my health improves when I exercise.

T F 19. I just don't have the coordination necessary to look like a graceful skier.

T F 20. I prefer woodworking to tinkering with a motor.

T F 21. One of my favorite interests is listening to music.

T F 22. I would enjoy participating in activities such as cross-country skiing, and channel swimming.

T F 23. Music, art, or intellectual pursuits are more refreshing to me than physical activity.

T F 24. I would rather visit an amusement park than watch a tennis match.

T F 25. I like the social opportunities afforded by physical activity programs.

T F 26. I am better coordinated than most people I know.

T F 27. I would enjoy difficult mountain climbing.

T F 28. I love to go to jazz or rock concerts.

T F 29. I don't think that I'd enjoy participating in a judo program.

T F 30. I enjoy the feeling of physical well-being one gets after a day's tramp in the woods.

T F 31. I would rather watch a good movie than a hockey match.

T F 32. I would like to belong to some type of exercise group.

T F 33. I am a good deal stronger than most of my friends.

T F 34. I would rather play poker than softball.

T F 35. Compared to other people I am somewhat clumsy.

T F 36. I enjoy hard physical work.

T F 37. I like to engage in recreational exercise rather than in organized, competitive athletics.

T F 38. I am stronger than a good many of my friends.

T F 39. Most people I know think I have very good physical skills.

T F 40. My friends seem to be more physically active than I am.

T F 41. I would rather walk than run through an open meadow or field.

T F 42. Sports provide me with a welcome escape from the pressures of present-day life.

T F 43. I like the rough and tumble of athletic competition.

T F 44. I prefer to watch an exciting basketball game to playing it myself.

T F 45. I rather enjoy the physical risk involved when I play football.

T F 46. I would enjoy participating in a vigorous weight-lifting program.

T F 47. Long distance running would seem to be an enjoyable activity.

T F 48. I doubt that I could ever get into good physical condition.

T F 49. My legs have as much spring as those of champion high jumpers.

T F 50. I don't enjoy doing things that get me sweaty and dirty.

T F 51. I prefer not to participate in physical activities that involve risk of injury.

T F 52. I would enjoy belonging to a whitewater canoe club.

T F 53. When tensions are high, I prefer to lie down and rest rather than to absorb myself in physical activity.

T F 14. I often stick up for my own point of view even when no one agrees with me.

T F 15. I enjoy people who talk a great deal.

T F 16. I prefer team sports to individual sports because of the experience of playing with different people.

T F 17. I like to be in sports that don't require a great amount of running.

T F 18. I know that my health improves when I exercise.

T F 19. I just don't have the coordination necessary to look like a graceful skier.

T F 20. I prefer woodworking to tinkering with a motor.

T F 21. One of my favorite interests is listening to music.

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T F 47. Long distance running would seem to be an enjoyable activity.

T F 48. I doubt that I could ever get into good physical condition.

T F 49. My legs have as much spring as those of champion high jumpers.

T F 50. I don't enjoy doing things that get me sweaty and dirty.

T F 51. I prefer not to participate in physical activities that involve risk of injury.

T F 52. I would enjoy belonging to a whitewater canoe club.

T F 53. When tensions are high, I prefer to lie down and rest rather than to absorb myself in physical activity.

T F 54. If I wanted to, I could become an excellent tennis player.

T F 55. I enjoy performing gymnastic stunts because of the coordinated movements involved.

T F 56. It makes no difference to me how strong or fit I am.

T F 57. I would like to meet more people by engaging in various types of physical activities.

T F 58. After a day at work, I prefer to take it easy instead of participating in vigorous sport activities.

T F 59. It is difficult for me to catch a thrown ball.

T F 60. With a fair amount of practice I could maintain a high bowling average.

T F 61. I enjoy the discipline of long and strenuous physical training.

T F 62. I can run faster than most of my friends.

T F 63. Watching an athletic contest provides a welcome relief from the cares of life.

T F 64. With practice I could become a very good golfer.

T F 65. I have more important things to do than to spend time on developing and maintaining physical fitness.

T F 66. I would rather run in a track meet than play badminton.

T F 67. I could do better at long distance hiking than the average man of my age.

T F 68. I exhibit a fair amount of leadership in a sports situation.

T F 69. I lack confidence in performing physical activities.

T F 70. Even with practice I doubt that I could learn to do a hand-stand well.

T F 71. Playing tennis appeals to me more than does golfing.

T F 72. I can run for longer distances than most men of my age.

T F 73. I'm a natural athlete.

T F 74. The thought of getting sweaty and dirty often keeps me from exercising.

T F 75. I love to run.

T F 76. Getting into good physical shape takes too much effort to be really worth it.

T F 77. I have a strong throwing arm for baseball or softball.

T F 78. Karate competition must be fun.

T F 79. It would be very difficult for me to learn to do a back dive.

T F 80. I would prefer to listen to a concert than to watch a gymnastics match.

T F 81. I am well-equipped to excel at physical activities.

T F 82. Being strong and highly fit is not really that important to me.

T F 83. Absorbing myself in a good sport activity provides an escape from the routine of a work day.

T F 84. Even with practice I doubt that I could ever learn to do a cartwheel well.

T F 85. Exercise relieves me of emotional strain.

T F 86. I would play sports more often if I didn't get so tired.

T F 87. I could probably get into good physical condition faster than most men my age.

T F 88. I often doubt my physical abilities.

T F 89. I would rather play touch football than go to an amusement park.

T F 90. Participation in physical activity improves me as a social person.

T F 91. I'm not very good at most physical skills.

T F 92. I enjoy the exhilarated feeling one gets after doing calisthenics.

T F 93. I'm not able to meet many worthwhile people through participation in sports.

T F 94. Poor timing handicaps me in certain physical activities.

T F 95. I am a natural leader in sport activities.

T F 96. I would rather play active sports like soccer and basketball than participate in activities like badminton and softball.

T F 97. I believe it is important that a person belongs to a group that participates in sport activities together.

T F 98. I would rather watch either a baseball or basketball game than visit a museum or art gallery.

T F 99. Target archery appeals to me more as an activity than does tennis.

T F 100. I believe one of the greatest values of physical activity is the thrill of competition.

NAME _____
DEPARTMENT _____
DATE _____

PHYSICAL FITNESS AND JOB RELATEDNESS QUESTIONNAIRE - PART I

For each of the following items, please check the single space which corresponds to your opinion about physical fitness and its relationship to the performance of police duties.

1. In your present assignment, how often do you perform the following activities?

	Very Often	Often	Rarely	Never
Chasing a fleeing suspect on foot	☐	☐	☐	☐
Climbing a fence in pursuit of a suspect	☐	☐	☐	☐
Running up flights of stairs	☐	☐	☐	☐
Pushing a stalled car by hand	☐	☐	☐	☐
Lifting a sick or injured person	☐	☐	☐	☐
Struggling with a resistant suspect	☐	☐	☐	☐
Separating two or more fighters	☐	☐	☐	☐
Climbing a ladder	☐	☐	☐	☐
Lifting a heavy object	☐	☐	☐	☐

2. In chasing a suspect on foot or running up a flight of stairs, how would you rate your speed compared to other officers your age?

☐ Very Fast ☐ Faster than Average ☐ About Average ☐ Slower than Average ☐ Slow

3. In chasing a suspect on foot or running up flights of stairs, how would you rate your endurance compared to other officers your age?

☐ Very Good ☐ Better than Average ☐ About Average ☐ Less than Average ☐ Limited

4. In climbing a fence or ladder, how would you rate your agility?

☐ Very High ☐ Better than Average ☐ About Average ☐ Less than Average ☐ Low

5. In pushing a stalled car and lifting people or objects, how would you rate your physical strength compared to other officers your age?

☐ Very High ☐ Better than Average ☐ About Average ☐ Less than Average ☐ Low

6. In struggling with a resistant suspect or separating two or more fighters, how would you rate your physical combat skills compared to other officers your age?

☐ Very High ☐ Better than Average ☐ About Average ☐ Less than Average ☐ Low

7. How would you rate the present medical standards required for original entrance into your department?

☐ Very Easy ☐ Easy ☐ Don't Know ☐ Difficult ☐ Very Difficult

8. Could you now pass the present medical standards required for original entrance into your department?

☐ Definitely Yes ☐ Probably Yes ☐ Don't Know ☐ Probably No ☐ Definitely No

9. How important is it in the performance of your job that you are up to the required medical standards?

☐ Definitely Important ☐ Important ☐ Don't Know ☐ Probably Unimportant ☐ Definitely Unimportant

10. How would you rate the present physical standards required for original entrance into your department?

☐ Very Easy ☐ Easy ☐ Don't Know ☐ Difficult ☐ Very Difficult

11. Could you now pass the present physical standards required for original entrance into your department?

☐ Definitely Yes ☐ Probably Yes ☐ Don't Know ☐ Probably No ☐ Definitely No

12. How important is it in the performance of your job that you are up to the required physical standards?

☐ Definitely Important ☐ Probably Important ☐ Don't Know ☐ Probably Unimportant ☐ Definitely Unimportant

13. How would you rate the present physical standards required for successful completion of recruit training for new officers in your department?

☐ Very Easy ☐ Easy ☐ Don't Know ☐ Difficult ☐ Very Difficult

14. Could you now pass the present physical standards required for successful completion of recruit training for new officers in your department?

☐ Definitely Yes ☐ Probably Yes ☐ Don't Know ☐ Probably No ☐ Definitely No

15. Would you favor mandatory examinations of your physical condition at periodic intervals of time by a department physician?

☐ Definitely Yes ☐ Probably Yes ☐ Undecided ☐ Probably No ☐ Definitely No

16. Would you favor a mandatory physical fitness program in your department?

☐ Definitely Yes ☐ Probably Yes ☐ Undecided ☐ Probably No ☐ Definitely No

17. If your department had a mandatory physical fitness program, personnel over what age should be excluded?

☐ 40 years ☐ 45 years ☐ 50 years ☐ 55 years ☐ 60 years

18. How would you rate the general physical condition of those officers with whom you work most closely?

☐ Very High ☐ High ☐ Moderate ☐ Low ☐ Very Low

19. How would you rate the general physical condition of all sworn personnel in your department?

☐ Very ☐ High ☐ Moderate ☐ Low ☐ Very Low

NAME_____
DEPARTMENT_____
DATE_____

PHYSICAL FITNESS AND JOB RELATEDNESS QUESTIONNAIRE - PART II

1. Compared to other occupations, how physically dangerous is police work? (Circle one number).

Much Less Dangerous	Less Dangerous	Slightly Less Dangerous	Slightly More Dangerous	More Dangerous	Much More Dangerous
1	2	3	4	5	6

2. Compared to other occupations, how emotionally dangerous is police work? (Circle one number).

Much Less Dangerous	Less Dangerous	Slightly Less Dangerous	Slightly More Dangerous	More Dangerous	Much More Dangerous
1	2	3	4	5	6

3. How tense or relaxed would you feel in handling the following situations or duties? (Circle one number per item).

	Very Tense	Moderately Tense	Slightly Tense	Slightly Relaxed	Moderately Relaxed	Very Relaxed
family fights/ disturbances	6	5	4	3	2	1
silent alarms	6	5	4	3	2	1
officer needs assistance	6	5	4	3	2	1
person with gun	6	5	4	3	2	1
possible homicide	6	5	4	3	2	1
child beating	6	5	4	3	2	1
robbery in progress	6	5	4	3	2	1
delivering death messages	6	5	4	3	2	1
taking rape reports	6	5	4	3	2	1
auto accidents	6	5	4	3	2	1
prowler	6	5	4	3	2	1
sudden death/DOA	6	5	4	3	2	1
shooting	6	5	4	3	2	1
unknown nature of call	6	5	4	3	2	1
high speed auto chase	6	5	4	3	2	1
mentally disturbed person	6	5	4	3	2	1
burglary	6	5	4	3	2	1
routine patrol	6	5	4	3	2	1

4. To what extent is management aware of the physical demands you must meet in your job? (Circle one number)

Extremely Aware	Moderately Aware	Slightly Aware	Slightly Unaware	Moderately Unaware	Extremely Unaware
6	5	4	3	2	1

5. To what extent is management concerned about helping you meet the physical demands you face in your job? (Circle one number)

Extremely Concerned	Moderately Concerned	Slightly Concerned	Slightly Unconcerned	Moderately Unconcerned	Extremely Unconcerned
6	5	4	3	2	1

6. What kind of effect do your work hours have on the following aspects of your life? (Circle one number per item)

	Very Positive	Moderately Positive	Slightly Positive	Slightly Negative	Moderately Negative	Very Negative
recreation	6	5	4	3	2	1
family life	6	5	4	3	2	1
sleep	6	5	4	3	2	1
friendships with other police officers	6	5	4	3	2	1
friendships with non-police officers	6	5	4	3	2	1
eating habits	6	5	4	3	2	1
ability to stay alert	6	5	4	3	2	1
holidays	6	5	4	3	2	1
social life	6	5	4	3	2	1
digestion	6	5	4	3	2	1
general energy level	6	5	4	3	2	1
ability to deal with household chores	6	5	4	3	2	1
ability to perform personal errands	6	5	4	3	2	1
ability to hold a second job	6	5	4	3	2	1
ability to go to school	6	5	4	3	2	1

7. How do you generally feel when you get up? (Circle one number)

Completely Rested	Somewhat Rested	Somewhat Tired	Very Drowsy
1	2	3	4

8. a) In the past year have you had any vehicular accidents while off-duty?

_____Yes _____No (Skip to Question 9)

b) If "yes" in (a), how many off-duty vehicular accidents have you had? _____

c) If "yes" in (a), in how many of these accidents were you found to be legally at fault? _____

9. a) On the average, how many regular on-duty hours do you spend in court per week?

_____

b) On the average, how many hours per week do you spend in court during which you are not on duty? _____

0. Please indicate the extent to which you agree or disagree with the following statements. (Circle one number per item)

	Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree
I have to spend too many hours in court	6	5		3	2	1
The courts are often too lenient with offenders	6	5	4	3	2	1
Many lawyers try to make officers look foolish	6	5	4	3	2	1
Most judges treat officers with respect	6	5	4	3	2	1
Juries are often prejudiced against officers	6	5	4	3	2	1
There is a big difference between whether a person is really guilty and whether the court says he or she is.	6	5	4	3	2	1

1. How does your spouse (if not married, girlfriend or boyfriend) feel about your working as a police officer? (Circle one number)

Extremely Pleased	Pleased	Displeased	Extremely Displeased
4	3	2	1

12. a) Have you ever had serious personal problems with your spouse (if not married, girlfriend or boyfriend) since becoming or deciding to become a police officer? (Check one)

_____Yes _____No

b) If yes, do you think your job had: (Check one)

_____1. great deal to do with the problems

_____2. something to do with the problems

_____3. very little to do with the problems

c) If yes, (if you have had serious problems) what were the outcomes: (Check one)

_____reconciliation _____divorce _____separation

IF YOU HAVE CHILDREN, PLEASE ANSWER QUESTION 13

13. a) What effect do you think your job has (or has had) on your children? (Circle one number)

Very Positive	Moderately Positive	Slightly Positive	Slightly Negative	Moderately Negative	Very Negative
1	2	3	4	5	6

b) If a negative effect, is this because: (Check any that apply)

_____1. you bring the tension of the job home and take it out on your children?

_____2. you have become too strict with your children?

_____3. you and your family are expected to be beyond reproach?

_____4. other children make fun of your children or "give them a hard way to go" because of your job?

_____5. you have had too little time to devote to the upbringing of your children because of your work hours?

_____6 other _____

Specify

14. Since becoming a police officer, to what extent have you experienced the following? (Circle one number per item)

	Not at All	To a Slight Degree	To a Moderate Degree	To a Great Degree
a. increased feelings of isolation from your community	1	2	3	4
b. a more cynical attitude	1	2	3	4
c. increased feeling of "I don't care"	1	2	3	4
d. becoming insensitive to your wife and/or family	1	2	3	4
e. a loss of respect for the criminal justice system	1	2	3	4
f. anger against community leaders	1	2	3	4
g. problems with your sex life	1	2	3	4
h. poor social interactions with your neighbors	1	2	3	4

15. Of the 5 people on the department you work with most often, how many have serious problems with the following? (Circle one number per item)

a. alcohol	0	1	2	3	4	5
b. marriage	0	1	2	3	4	5
c. children	0	1	2	3	4	5
d. finances	0	1	2	3	4	5
e. drugs	0	1	2	3	4	5
f. neighbors	0	1	2	3	4	5

16. a) In your career as a police officer, how many officers have you known personally who have attempted or successfully committed suicide? _____

b) In how many of these cases do you think the effects of the job on the individual played a major role? _____

17. a) In your career as a police officer, how many officers have you known who have had a severe or fatal heart attack? _____

b) If you have known officers who have had heart attacks, how many officers had attacks during regular duty hours? _____

18. In your job as a police officer, what one thing causes you the most tension?

_____

_____

_____

19. What are the most exciting things about your job as a police officer? _____

_____

_____

_____

20. What are the most boring things about your job as a police officer? _____

_____

_____

_____

21. What do you like most about your job as a police officer? _____

_____

_____

_____

22. What do you like least about your job as a police officer? _____

_____

_____

_____

NAME _____
DEPARTMENT _____
DATE _____

HEALTH OPINION QUESTIONNAIRE

The International Association of Chiefs of Police is interested in finding out how police officers your age think and feel about a number of health matters. This information will be very useful in developing physical fitness programs suited to the needs of the police.

In the three questions below, check (✓) the one answer which best describes your opinion or belief. Please answer each question.

1. Compared to other police officers your age, would you say that your own health is poor, fair, or good?

☐ Poor ☐ Fair ☐ Good ☐ Don't Know

2. How concerned are you over your general state of health. Little? Moderately? or A great deal?

☐ Not at all ☐ Little ☐ Moderately
☐ Great deal ☐ Don't know

3. To what extent do you feel you can control the general state of your health through your own actions? Little? Moderately? or A great deal?

☐ Not at all ☐ Little ☐ Moderately
☐ Great deal ☐ Don't know

4. Please read each of the items listed below. Write number 1 next to the item which you feel has the most important effect on the health of a person your age. Write number 2 next to the item which you feel has the second most important effect on the health of a person your age. Number the other items 3, 4 and 5 in terms of how important you feel they are in affecting your health.

_____ The kind of food a person eats and drinks.

_____ The amount of food a person eats and drinks.

_____ The amount of sleep and rest a person gets.

_____ The amount of stress and tension in a person's life.

_____ The amount of physical activity and exercise a person gets.

5. In what ways, if any, do you feel you should take better care of your health than you do at present? _____

In each question below, check (✓) the one answer which best describes your opinion or belief. Please answer each question.

6. How physically fit do you feel you are at present? (Check one)

☐ Not really at all ☐ A little ☐ Moderately so
☐ Very much

7. If you count both work and play, would you say that the amount of physical activity you get is little, moderate, or a great deal?

☐ Little ☐ Moderate ☐ Great deal ☐ Don't know

8. In your free time, how much exercise such as walking, sports, gardening, etc., do you get? Would you say only a little, a moderate amount, or a great deal?

☐ Little ☐ Moderate ☐ Great deal ☐ Don't know

9. Did you ever get regular physical exercise at any point in your life?

☐ Yes ☐ No
(Go to Question 10)

9a. Was this only a little, a moderate amount, or a great deal?

☐ Little ☐ Moderate ☐ Great deal ☐ Don't know

GENERAL HEALTH OPINIONS

10. Good health is more a matter of luck than what a person does about his health.

☐ Strongly agree ☐ Agree ☐ Disagree.
☐ Strongly disagree

11. Most often, it's not possible to prevent sickness - if you are going to be sick - you will be sick.

☐ Strongly agree ☐ Agree ☐ Disagree
☐ Strongly disagree

12. A person's health is more a matter of what is born into him than what he does about his health.

☐ Strongly agree ☐ Agree ☐ Disagree ☐ Strongly disagree

13. In general, doctors today take more interest in their patients than doctors did 25 years ago.

☐ Strongly agree ☐ Agree ☐ Disagree ☐ Strongly disagree

14. Doctors today know a lot more about how to prevent and treat sickness than doctors did 25 years ago.

☐ Strongly agree ☐ Agree ☐ Disagree ☐ Strongly disagree

15. Most people are satisfied with the care and treatment they receive from their doctors.

☐ Strongly agree ☐ Agree ☐ Disagree ☐ Strongly disagree

16. Most people feel that enough is being done in this country to discover the causes of disease.

☐ Strongly agree ☐ Agree ☐ Disagree ☐ Strongly disagree

17. Most people feel that enough is being done at present to discover new cures for disease.

☐ Strongly agree ☐ Agree ☐ Disagree ☐ Strongly disagree

18. More tax money should be spent on medical research.

☐ Strongly agree ☐ Agree ☐ Disagree ☐ Strongly disagree

19. How often do you get voluntary medical checkups even though you are feeling well?

☐ Every year ☐ Every 2 years ☐ 3 years or longer ☐ Never

OPINIONS ABOUT HEART ATTACKS

20. How likely do you think it is that a person your age will have a heart attack?

☐ Very likely ☐ Likely ☐ Fairly likely ☐ Not really likely at all

21. How likely do you think it is that you will have a heart attack in the next 10 years?

☐ Very likely ☐ Likely ☐ Fairly likely ☐ Not really likely at all

22. If you were to have a heart attack, what kinds of problems do you feel this would cause for yourself and your family? _____

23. If you're going to have a heart attack, there is nothing that you can really do to prevent it.

☐ Strongly agree ☐ Agree ☐ Disagree ☐ Strongly disagree

24. Heart attacks are more a matter of bad luck than what a person does or doesn't do to prevent them.

☐ Strongly agree ☐ Agree ☐ Disagree

25. Heart attacks are caused more often by something born into a person than by what he does about his own health.

☐ Strongly agree ☐ Agree ☐ Disagree ☐ Strongly disagree

26. There may be some things that you can do to prevent a heart attack but it really isn't worth the effort it takes.

☐ Strongly agree ☐ Agree ☐ Disagree ☐ Strongly disagree

27. It is quite possible to prevent many kinds of heart attacks.

☐ Strongly agree ☐ Agree ☐ Disagree ☐ Strongly disagree

28. By taking certain health actions, a person can generally prevent a heart attack.

☐ Strongly agree ☐ Agree ☐ Disagree ☐ Strongly disagree

29. How important do you feel the kind of food you eat is in preventing you from having a heart attack?

☐ Very important ☐ Important ☐ A little important ☐ Not really important at all

30. How important do you feel the amount of food you eat is in preventing you from having a heart attack?

☐ Very important ☐ Important ☐ A little important ☐ Not really important at all

31. How important do you feel the amount of sleep and rest you get is in preventing you from having a heart attack?

☐ Very important ☐ Important ☐ A little important ☐ Not really important at all

32. How important do you feel controlling the amount of stress and tension in your life is in preventing you from having a heart attack?

☐ Very important ☐ Important ☐ A little important ☐ Not really important at all

33. How important do you feel the amount of physical activity and exercise you get is in preventing you from having a heart attack?

☐ Very important ☐ Important ☐ A little important ☐ Not really important at all

Thank you for your cooperation.

NAME _____

DEPARTMENT _____

DATE _____

PROJECT PARTICIPATION QUESTIONNAIRE

1. How would you describe your physical condition as a result of your participation in this program? (Check one column for each factor listed.)

	Favorable Change	No Change	Unfavorable Change
Weight			
Ability to sleep			
Amount of fatigue or tiredness			
General activity level			
Sex life			
General physical fitness			

2. How would you describe your mental outlook as a result of your participation in this program? (Check one column for each factor listed.)

	Favorable Change	No Change	Unfavorable Change
Worry about health			
Self-confidence			
Job satisfaction			
Ability to relax			
Tenseness			
Worry about non-health related matters			

3. Have there been any other positive results of your participation in this program? (Please describe briefly.)

_____

_____

_____

4. Have there been any other negative results of your participation in this program? (Please describe briefly.)

_____

_____

_____

5. Did you experience any problems or hardships in your family life due to your participation in this project? (Please describe briefly.)

_____

_____

_____

6. Did you experience any problems or hardships in your job due to your participation in this project? (Please describe briefly.)

_____

_____

_____

7. Would you like to continue to participate in this or a similar program?

_____Yes

_____No

8. Do you think it would be a good idea to institute a program like this one for all police officers?

_____Yes

_____No

9. What is your opinion of the specific feedback information provided to you during this program? (Check all that apply.)

_____It was complete and understandable.

_____It was incomplete and inadequate.

_____It caused me to worry.

_____It gave me some peace of mind.

_____It was helpful in understanding the program.

_____It didn't tell me anything.

_____Other (Please specify.)_____

10. How would you rate the following aspects of this program? (Check one column for each factor listed.)

	Great	O.K.	Lousy
Amount of orientation	_____	_____	_____
Quality	_____	_____	_____
Feedback information	_____	_____	_____
Results	_____	_____	_____

11. Considering the amount of time you put into this program, do you think it was worth it?

_____Yes

_____No

12. In what specific ways did this program live up to your expectations?

13. In what specific ways did this program fail to live up to your expectations?

14. What changes or improvements would you suggest for this program?

15. Has this program increased your interest in or concern for physical fitness in relation to yourself and/or other members of your family?

_____Yes

_____No

16. Overall, how would you describe your experiences with this program?

_____Very pleased.

_____Pleased

_____Neither pleased nor displeased.

_____Displeased.

_____Not pleased at all.

SPOUSE'S QUESTIONNAIRE

PHYSICAL FITNESS PROJECT PARTICIPATION

1. What is your name? _____

2. What is your age? _____

3. How long have you been married? _____

4. Do you exercise at home?

_____Yes (Answer Question 5)

_____No (Answer Question 6)

5. What type of exercise program do you follow? (e.g., one I developed myself; one on a television program; etc.)

6. Why do you not exercise at home?

7. Did you exercise at home before your husband/wife entered this physical fitness program?

_____Yes

_____No

8. How would you describe the physical condition of your husband/wife as a result of his/her participation in this program? (Check one column for each factor listed).

	Favorable Change	No Change	Unfavorable Change
Weight	_____	_____	_____
Ability to sleep	_____	_____	_____
Amount of fatigue or tiredness	_____	_____	_____
General acitivity level	_____	_____	_____
Sex life	_____	_____	_____
General physical fitness	_____	_____	_____

9. How would you describe the mental outlook of your husband/wife as a result of his/her participation in this program? (Check one column for each factor listed)

	Favorable Change	No Change	Unfavorable Change
Worry about health	_____	_____	_____
Self-confidence	_____	_____	_____
Job satisfaction	_____	_____	_____
Ability to relax	_____	_____	_____
Tenseness	_____	_____	_____
Worry about non-health related matters	_____	_____	_____

10. Were there any other positive results of your husband's/wife's participation in this program? (Please describe briefly.)

_____

_____

_____

11. Were there any other negative results of your husband's/wife's participation in this program? (Please describe briefly.)

_____

_____

12. Would you be in favor of continued participation in this or a similar program?

_____ Yes

_____ No

13. Do you think this or a similar program should be instituted for all police officers?

_____ Yes

_____ No

14. Would you like to participate in this or a similar program?

_____ Yes

_____ No

15. What is your opinion of the specific feedback information provided during this program concerning your husband's/wife's physical and medical condition? (Check all that apply.)

_____ It was complete and understandable.

_____ It was incomplete and not adequately explained.

_____ It caused me to worry.

_____ It gave me some peace of mind.

_____ It was helpful in understanding the program.

_____ It didn't tell me anything.

_____ Other. (Please specify) _____

16. How would you rate the following aspects of this program? (Check one column for each factor listed.)

	Great	O.K.	Lousy
Amount of orientation	_____	_____	_____
Quality of instruction	_____	_____	_____
Feedback information	_____	_____	_____
Results	_____	_____	_____

17. Considering the amount of time your husband/wife put into this program, do you think it was worth it?

_____Yes

_____No

18. From your standpoint, what changes or improvements would you suggest for this program?

_____

_____

_____

19. Has this program increased your own interest in or concern for physical fitness in relation to yourself and/or other members of your family?

_____Yes

_____No

20. Overall, how would you describe your experiences with this program?

_____Very pleased.

_____Pleased.

_____Neither pleased nor displeased.

_____Displeased.

_____Not pleased at all.

APPENDIX D

AEROBICS EXERCISE LOG

AEROBICS EXERCISE LOG

The Aerobics Center / 12100 Preston Rd. / Dallas, Tx. 75230

NAME: (LAST NAME, FIRST NAME)

SEX Male ☐ Female ☐

Identification Number

ACTIVITY CODES:	ALLOWABLE UNITS:	CODES:	UNITS:	CODES:
01 = JOGGING/RUNNING	MI, YD	11 = BADMINTON (SINGLES)	SE, GM	21 = LACROSSE
02 = WALKING	MI, YD	12 = BADMINTON (DOUBLES)	SE, GM	22 = FOOTBALL
03 = STATIONERY RUNNING	SM (STEPS PER MIN)	13 = STAIR CLIMBING	RT (ROUND TRIPS)	23 = SKIING
04 = CYCLING	MI	14 = WALK/JOG	MI, YD	24 = VOLLEYBALL
05 = STATIONERY CYCLING	(ENTER BODY WT. IN DISTANCE, LOAD IN UNITS)	15 = TREADMILL	(ENTER MPH IN DISTANCE & ELEVATION IN UNITS)	25 = HANDBALL
06 = SWIMMING	MI, YD	16 = GOLF	HO	26 = BASKETBALL
07 = TENNIS (SINGLES)	SE, GM	17 = CALISTHENICS		27 = SQUASH
08 = TENNIS (DOUBLES)	SE, GM	18 = ROPE SKIPPING		28 = WRESTLING
09 = AERIAL TENNIS (SINGLES)	SE, GM	19 = HOCKEY		
10 = AERIAL TENNIS (DOUBLES)	SE, GM	20 = SOCCER		

ACTIVITY CODES 17 - 28 REQUIRE DURATION ONLY

** CURRENT MONTH: (JAN. = 01 . . . DEC. = 12) ☐☐ CURRENT YEAR: 19☐☐ CURRENT WEIGHT ☐☐☐ **

Month	Day	Activity	Distance	Units	Duration (HRS : MINS : SECS)	Month	Day	Activity	Distance	Units	Duration (HRS : MINS : SECS)

(CONTINUE ON REVERSE SIDE)

354

Month	Day	Activity	Distance	Units	Duration (HRS : MINS : SECS)	Month	Day	Activity	Distance	Units	Duration (HRS : MINS : SECS)

APPENDIX E.

QUESTIONNAIRE CONCERNING ATTRITION RATE

QUESTIONNAIRE CONCERNING ATTRITION RATE
POLICE PHYSICAL TRAINING PROGRAM

NAME _____ DEPARTMENT _____

AGE _____ HEIGHT _____ WEIGHT _____ GROUP _____

MALE _____ FEMALE _____

1. How many weeks of training did you complete? _____
2. Did you enjoy the training? _____
3. Did you enjoy your group assignment? _____
4. If answer to 3 is no, what group or type of program would you prefer?

   _____

   _____

5. List reason(s) for discontinuing the program:

a. Too much time involved _____
b. Interferes with school _____
c. Interferes with job _____
d. Interferes with second job _____
e. Interferes with family life _____
f. Injury of: Ankle & Foot _____
   Shin _____ Knee _____
   Other (please explain) _____

   _____

g. Lack of interest _____
h. Boring _____
i. Not satisfied with group assignment _____
j. Training schedule too rigid _____
k. Personal rewards not up to expectation _____

L. Other (please explain) _____

   _____

6. Do you have a second job? _____ How many hours/week? _____
7. Are you going to school? _____ Where? _____
   How many hours per week? _____
8. Are you on a fixed or rotating shift? _____
9. What shift do you work? _____
10. Staff supervision was good _____ average _____ unsatisfactory _____
11. Other comments concerning program _____

    _____

    _____

APPENDIX F.

EVALUATION OF AEROBICS EXECISE PROGRAM

EVALUATION OF AEROBICS EXERCISE PROGRAM

Please answer the following questions in relation to your personal experience with the exercise program.

NAME_____ DEPARTMENT_____

AGE_____ HEIGHT_____ WEIGHT_____ GROUP_____

MALE_____ FEMALE_____

1. Did you enjoy the training?_____
2. Did you enjoy your group assignment?_____
3. If answer to #2 is no, what group would you prefer? _____
4. What type of exercise program would you prefer? _____
5. (Answer only if you were in the Combined group) Which type of workouts did you prefer - Interval or Continuous?_____
6. Do you have a second job?_____How many hours per week?_____
7. Are you going to school?_____If so, where?_____
   How many hours per week?_____
8. Are you on a fixed or rotating shift?_____
   What hours do you work?_____
9. Do you feel that the Aerobics program was a worthwhile undertaking?
   _____
10. As a result of the program do you feel that you sleep better?_____
11. Do you have a better sense of well-being?_____
12. Do you feel less tense?_____
13. Would you recommend the program to others?_____
14. Do you plan to continue a personal exercise program?_____
15. Was there sufficient communication with the Aerobics Staff?_____
    Staff supervision was Good_____ Average_____ Unsatisfactory_____

EVALUATION OF AEROBICS EXERCISE PROGRAM (con't)

16. Please state briefly why you volunteered for the Aerobics program?

17. Please state briefly why you continued in the program and completed it?

18. Other comments you may want to make.

END