THE EFFECTS OF A SELF-ADMINISTERING FITNESS PROGRAM ON ANXIETY, SELF-CONCEPT AND FITNESS

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THE EFFECTS OF A SELF-ADMINISTERING FITNESS PROGRAM ON ANXIETY, SELF-CONCEPT AND FITNESS

BY

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ABSTRACT

The purpose of the study was twofold. Firstly to study the effects of a six-week aerobic fitness program on self-concept, fitness and anxiety, and secondly to investigate the relationships between the three mentioned variables.

The sample used in this study was composed of 22 subjects from the staff and students of Memorial University of Newfoundland. The subjects were given a series of tests (both at the beginning and end of the experiment) to measure anxiety, self-concept and fitness levels. From the 22 subjects that volunteered for the six-week fitness program, 5 subjects failed to complete all of the posttests and were eliminated from all the analyses. One other subject missed only the post administration of the 16PF and therefore was retained for the other analyses.

The correlations between the three variables were calculated using Spearman's Rank Order Correlation. The correlation between self-concept and anxiety was significant at the $p. < .05$ level.

The results of the six-week fitness program were analyzed using the Mann-Whitney u statistics. Subjects who took part in the fitness program decreased in anxiety. Although the experimental group did not increase in fitness to a greater extent than the control group ($u = 52$, $p. > .05$), they did increase in fitness ($w = 5.5$, $p. < .05$), while the control group did not increase in fitness ($w = 10$, $p. > .05$). The fitness program had no significant effect ($u = 25$, $p. > .05$) on levels of self-concept.

Subjects who increased in fitness, decreased in anxiety to a greater extent than subjects who did not increase in fitness ($u = 42.5$, $p < .05$).

The study concluded that fitness training decreased anxiety. The data on the effects of the fitness program on fitness levels was inconclusive; while the experimental group did increase in fitness, they did not increase to a greater extent than the control group. The fitness program had no significant effect on self-concept levels. Fitness was not significantly correlated with either anxiety or self-concept.

To my family, with love and respect

for their support and caring.

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CHAPTER I

INTRODUCTION

The basic concept underlying this study was that the physical and psychological components of the human being are not separate entities, but are interrelated.

This concept represented a compromise between two extreme points of view, on the degree of integration between physical and psychological elements. At one extreme was the idea that body and mind are separate entities and that there was minimal interaction between them. While at the other extreme was the view expressed by Gestalt theory, that the human organism can only be understood, if it was viewed as a unified whole. Fadiman and Frager (1976) expressed the Gestalt viewpoint as follows: "The chief principle of the Gestalt approach is to suggest that an analysis of parts can never provide an understanding of the whole, since the whole is defined by the interaction and interdependencies of the parts" (p. 164).

The position taken in this study was that the physical and psychological components of the individual were interrelated and that changes in one area brought about corresponding changes in other areas. This idea was expressed by Breckenridge and Vincent (1955) in the following statement:

> The individual consists of many parts which act in an integrated fashion. His intellect is related to his physical well-being; his health is sharply affected by his emotions; his emotions are influenced by school success or failure, by his physical health and by his intellectual adequacy. (p. 20)

Statement of Purpose

The purpose of the study was twofold:

1. To investigate the effects of an individualized self-administered fitness program on aerobic fitness, self-concept and anxiety.

2. To investigate the relationship between aerobic fitness, and anxiety and self-concept.

The Rationale of the Study

The notion that physical fitness training has an important role to play in the development of personality and mental health has been supported by research evidence linking physical fitness and mental health (Buccola and Stone, 1975; Cutin, 1966; Hammer and Wilmore, 1973; Ismail and Trachtman, 1973; Sharp and Reilley, 1974). The results of these studies support the belief that good physical fitness is associated with such factors as: low anxiety, high self-concept, feelings of self-worth, self-confidence, good personal and social adjustment, and intelligence.

Similarly other researchers (Collingwood, 1972; Collingwood and Willett, 1971; Johnson, Fretz and Johnson, 1968; McPherson et al., 1966) found that physical conditioning was a useful therapy for selected populations. These studies and others are reviewed in Chapter II.

Despite what appears to be a solid research base for using physical fitness training as a means to achieve psychological growth, very little research has been conducted directly using fitness as a variable. The main area of application has been with the physically

and mentally handicapped.

The following are some of the possible reasons for the limited use of physical fitness training as an independent variable. First, it was outside the traditional role of those professions commonly referred to as the "helping professions," which deal with mental health and secondly, because people in the "helping professions" received little or no training in physiology or fitness training and they have ignored the use of fitness as a means of therapy. Thirdly, many people did not think they had the time or facilities to run fitness programs.

The present study focussed on a self-administered approach to aerobic conditioning. The program used in this study was based on a program developed by K. H. Cooper (1968, 1970). This program has several features that help it overcome many of the possible barriers which have prevented the widespread use of fitness training to enhance psychological growth. It was easily understood, self-administering and placed the responsibility for carrying out the program on the individual. These factors negated the need for elaborate training and training facilities on the part of members of the "helping professions."

In the past almost all the therapeutic physical fitness training programs used a very structured approach. The usual form was for the subjects to meet as a group a number of times each week and during these meetings the subjects were put through a series of exercises under the supervision of a therapist. Group training makes it very difficult to separate the possible effects of group interaction and interaction between therapist and subjects, from the actual effects of a fitness program. Massie and Shephard (1971) found that, although an

individual and group approach to aerobic conditioning yielded similar gains in fitness, the psychological changes brought about as the result of the programs are different. This indicated that psychological changes were the result of other factors such as group interaction, rather than being solely the result of a fitness change. In addition the majority of studies conducted have only used male subjects. Whereas, the present study used both male and female subjects and based the results on the total sample.

The two dependent variables of anxiety and self-concept were selected for this research for a number of reasons. Although there has been some research work done associating anxiety change to exercise programs, a number of researchers (Collingwood, 1976; Hammett, 1967 and Vitals, 1973) felt that it was not adequately explored or its efficacy well researched. The second variable, self-concept, was not used as a dependent variable in a fitness program. This variable along with the anxiety variable are considered to be two characteristics of the emotionally healthy person. Layman (1972) has stated that freedom from tension and a sense of self-worth are traits of an emotionally healthy person. This supported the selection of the two variables.

In summary, there was support both from a logical as well as a research base, that physical fitness conditioning can bring about psychological changes and can be used as a tool in the "helping professions." However, before physical fitness conditioning is accepted as a means to bring about psychological changes further research is needed. This study was designed to fill in some of the gaps in existing research and to explore a more practical method of fitness training for those in the "helping professions."

Definition of Terms

Aerobic Power

The component of physical fitness that is generally accepted as the most sensitive index of overall physical condition that is available to us today is maximal aerobic power. The parameter takes into consideration the oxygen transport system and may be defined as the highest oxygen uptake an individual can attain while performing physical work breathing air at sea level (Bailey, 1972, p. 15).

Self-concept

. . . the overall level of self esteem. Persons with high scores tend to like themselves, feel that they are persons of value and worth, have confidence in themselves, and act accordingly. People with low scores are doubtful about their own worth; see themselves as undesirable; . . . (Fitts, 1965, p. 2).

Anxiety

The person who scores high on this factor is high on anxiety as it is commonly understood. He need not be neurotic, since anxiety could be situational, but it is probable that he has some maladjustment, i.e. he is dissatisfied with the degree to which he is able to meet the demands of life and to achieve what he desires (Institute for Personality and Ability Testing, 1972, p. 26).

CHAPTER II

REVIEW OF LITERATURE AND HYPOTHESES

Review of Literature

The following section reviews the relevant literature and research findings. Although the primary concern of the study was the effect of a physical fitness program on anxiety and self-concept, a number of studies reviewed dealt with the effects of physical fitness on other personality traits. These have been reviewed for a number of reasons:

1. The basic premise underlying the study was the interrelation of all facets of the organism. Therefore, although only three variables were included in this study, it was necessary to include research relating fitness conditioning to other variables.

2. Cattell (1970) has at one end of his anxiety scale, adjustment. Therefore it seemed logical to consider the individual's total adjustment in all areas in the literature review.

3. LaBenne and Greene (1969) defined self-concept as: ". . . the person's total appraisal of his appearance, background and origins, abilities and resources, attitudes and feelings" (p. 10). This statement has indicated that various personality traits were related to self-concept and consequently they were included in the literature review.

This section is divided into five areas:

1. Introduction and background

2. Correlational studies relating physical and personality factors

3. The therapeutic use of physical fitness training with the physically and mentally handicapped

4. Physical fitness training as a change agent of the personality of normal subjects

5. Summary

Introduction and Background

Hammett (1967) stated, in his article on psychological changes with physical fitness training, that:

> Man's interest in physical psychological relationship is traceable at least as far back as the times of Hippocrates, Aristotle and Plato several centuries B.C. Yet in the more than two millennia since, there has been relatively little specific gain in our knowledge of these relationships. Without doubt man's inquiring mind did not altogether overlook this field in all this time, but the inquiries were speculative and hypothetical rather than experimental and psychological theories paid little attention to physiology and physical factors. (p. 764)

Hammett in the same article reviewed some of the literature, which dealt with the relationships between physical and psychological factors. He concluded his article with the following statement:

> Psychosomatic research has indicated that physical changes result from continued psychological states; it seems logical to assume the reverse, that psychological changes result from physical states, such as fitness. Although there is a general assumption that this is so and considerable claims rather vaguely documented, there are surprisingly few firmly validated data. (p. 767)

Although physical factors were often mentioned in personality theory, it was on a very superficial level and was not incorporated into the central theme of the theories. The most notable exceptions to this were the constitutional theories of Kretschmer (1926) and of

Sheldon (1942). Constitutional theories were concerned with the relationship between physical structure and personality, and there was no attempt to establish any causal relationships.

Another personality theorist, who considered physical factors in the formulation of his theory was Maslow (1970). The bases of Maslow's theory was a need hierarchy, which was arranged in the following order; physiological needs, safety needs, belonging and love needs, esteem needs and self-actualization needs. The individual's personality was determined by the degree to which these needs were satisfied. In order for an individual to advance to higher need levels the lower need levels must first be satisfied. The positioning of the physiological needs at the base of the hierarchy stressed their importance in the development of personality.

Although this theory provided an explanation of why physical factors affect personality, it did not offer any explanation as to why emotions affect physiological processes. While Maslow allowed for regression from higher need levels back to lower need levels, this regression was the result of not satisfying the more basic survival needs or because of disruptions at higher need levels.

Maslow's theory does provide an explanation of how physical factors affect psychological development; however, this theory is unable to explain how psychological factors affect physical factors. Therefore, it was of limited usefulness in explaining the two-way interaction between physical and psychological factors proposed in this study.

Carkhuff (1971) proposed a suitable model to explain the integrated view of personality. He believed that the individual was

composed of three spheres of functioning, which were; intellectual, emotional-interpersonal, and physical. Collingwood (1972) summarized Carkhuff's model by stating:

> The importance of physical functioning has been delinated in the Human Resource Development model with an emphasis upon the integration of a person's physical functioning with the intellectual and emotional-interpersonal spheres of functioning. A key tenet of the model is that an increment of functioning in one life sphere can have a positive effect on functioning in the other areas. (p. 583)

Physiological factors such as fitness traditionally played a very minor role in the development of personality theory. However, in the past ten years there has been a growing trend towards a more integrated theory of personality, which took into consideration all aspects of the individual; physical, social and emotional. A number of researchers (Ismail, 1972; Kane, 1972; Harris, 1973; Carkhuff, 1971) wrote articles supporting an integrated theory of personality and the necessity of including physical factors into personality theory.

The most recent trend in research dealing with the relationships between physical and psychological variables was to incorporate physical fitness training into a therapeutic role in the development of good mental health. A number of researchers (Collingwood, 1976; Collingwood and Willett, 1971; Vitalo, 1973) expressed the possible implications of physical training in the mental health professions and the necessity of the inclusion of physical fitness training programs in the training of these professions.

The growing concern for physical health by those working in the mental health field was reflected in a number of publications. In the last eight years the School Guidance Worker has devoted two complete issues to physical health, one in 1972 and another in 1976. Although

these issues did not deal specifically with physical fitness training, they did stress the need for those involved in counselling to promote physical health. The articles in these issues discussed a number of health topics, ranging from cigarette smoking and drug abuse to obesity and physical fitness. In addition proceedings of the National Conference on Fitness and Health (1972) and the National Conference on Employee Physical Fitness (1975) contained articles stressing the importance of physical fitness in developing good mental health. These publications emphasized the idea that physical fitness and physical health are related to mental health.

Correlational Studies Relating Physical and Personality Factors

Researchers have investigated the relationship of physical fitness to a wide variety of personality characteristics. The first group of studies discussed in this review have dealt with pre-adolescent children.

Rarick and McKee (1949) selected the ten most fit and ten least fit subjects from a sample of 172 grade five students. The fitness test battery used to select the groups focussed mainly on measures of strength and motor ability. They concluded that the high fitness group was better adjusted in school and personal relationships, and had a well integrated personality. Personal and social adjustment was measured by teacher ratings. Because this study selected the most fit and least fit students out of a large group, the results of the study cannot be generalized to moderate levels of fitness.

In a similar study using a sample of 28 nursery school children,

Smart and Smart (1963) found the following correlations (significant at the $p < .05$ level) between scores on the Krause-Weber test of muscular fitness and adjustment: happiness ($r = .51$); self-control ($r = .48$); dependability ($r = .48$); best liked ($r = .36$); and emotional adjustment ($r = .58$). Adjustment was determined by teacher ratings.

Alexander (1956) using the opposite procedure, selected two groups based on adjustment as measured by the Stout-Langden criteria of Well-Adjustment. He used a sample of 714 grade school children, 486 were placed in the well adjusted group and 228 in the non well adjusted group. The Krause-Weber Muscular Fitness Test was given to both groups. The results indicated that the well adjusted group was significantly more fit than the non well adjusted group.

Sengstock (1966) analyzed the fitness of 30 educable mentally retarded boys and compared them to a sample of 30 normal boys matched for chronological age. The retarded group was screened to exclude brain damaged and handicapped boys. Fitness was measured by the AAPHER Youth Fitness Test. The normal boys scored higher on the fitness test than the retarded boys. In an almost identical study Howe (1959) also concluded that normal boys were more fit than retarded boys. The design of this study does not permit any reason or explanation to be made for the difference.

Clark and Clark (1961) investigated the relationship between social status and measures of strength in two groups of boys; one group consisted of boys nine to 11 years old and the second group was made up of boys 12 to 14 years old. In the nine to 11 age group, a sociogram was used to assess social status. The results showed that those boys who scored highest on the various measures of strength also had the

highest social status. Social status was measured by the Mental Health Analysis Inventory in the group containing the 12 to 14 year old boys. Although no difference was found between boys high and low on the strength measure, there was a tendency for high strength scores to be associated with high social status scores. The results of the study were not conclusive because of the different results in the two groups. The results in the two age groups were attributed to either an actual difference at different ages or the fact that different measuring instruments were used in the two groups. The results of this study were specific to the ages of the sample and were not generalizable to different ages.

A similar study was carried out by Cowley and Ismail (1962) using a sample of eighty-three, 10 to 12 year old boys. Social status was measured by the Cowell Personal Distance Scale and fitness was measured by the Purdue Motor Fitness Test. A significant correlation of .41 was found between fitness scores and social status scores. The significant relationship with this age group supported the earlier results of Clark and Clark (1961). However, it did not clarify whether this relationship applied to all ages or was specific to that age group.

McCraw and Tolbert (1953) also found that social status was related to athletic ability. Although a fitness test was given to the sample of 438 junior high school boys, athletic participation in inter-school and intermural sports, as well as judgments of athletic ability were also used to assess total ability. Some researchers, Vitalo (1973), found, believed that athletic ability and athletic participation were not good indicators of physical fitness. Therefore, the results obtained by McCraw and Tolbert were not attributed specifically to

physical fitness.

A number of studies investigated the relationship between physical fitness and intelligence in children. Ismail, Kane and Kirkendall (1969) selected a sample of 48 boys and 48 girls from a population of 130 British primary school children. The sample contained approximately equal numbers of low, middle and high academic achievement levels. Intelligence was assessed by; Otis IQ Test, Standard Academic Achievement Test, General Scholastic Ability Test and the NFER Test C_2, which measures English achievement. Fitness was determined by a test battery containing three general motor items, two kinesthetic items, seven coordination items and six balance items. In conclusion Ismail et al. stated: ". . . the evidence points to a positive relationship between some motor aptitude items, especially coordination and balance, and well established measures of intelligence and scholastic ability" (p. 91). Although the study provided support for a relationship between physical and intellectual factors, it was of limited usefulness in the present study because it did not measure endurance fitness, which was the main concern of the present study. In the same study Ismail et al. also investigated the relationship between neuroticism and extroversion, and the same physical factors. Neuroticism and extroversion were measured by the Junior Maudsley Personality Inventory. Ismail et al. concluded that: "Neuroticism and extroversion were found to load substantially on four of the extracted factors, but the extent and direction of the association varied with the factor and the sex of the children" (p. 91).

Clarke and Jarman (1961) used a sample of 217 male children, who were nine, twelve and fifteen years of age, to investigate the

relationship between physical and intellectual factors. Intelligence was measured by; the Otis Self-Administered Test of Mental Maturity, Iowa Silent Reading Test and Grade Point Average. While fitness was measured by the Roger's Strength Index. They found a consistent tendency for high strength subjects to have high scores on the standard achievement tests and grade point average; however, not all the correlations were significant at all ages. The 12 and 15 year olds had significant correlations between strength and grade point average and the nine year olds demonstrated a significant correlation between strength and scores on the achievement tests. The results failed to indicate a common relationship between strength and achievement at different ages and thus it may be that different factors may be involved at different age levels.

Burley and Anderson (1955) used a sample of 1013 secondary school boys to investigate the relationship between intelligence and power. Intelligence was measured by the Hermon-Nelson Intelligence Test and power was measured by a jump reach test. Their results indicated that no relationship existed between power and intelligence.

The studies with children in general supported the idea that physical and psychological factors are related, despite the fact that many of the studies reviewed obtained different results and that the relationships between factors varied with age. In the studies reviewed, fitness was measured mainly by strength or motor ability rather than by cardiovascular and endurance fitness, which is accepted as the best measure of total fitness (Cooper, 1970; Vitalo, 1973).

The next group of studies reviewed investigated the relationship between physical and psychological factors in high school students.

Jones (1946) used a series of strength measures to select the ten most fit and ten least fit boys from a sample of 78 male students. He then used a case study method to follow the boys over a period of five to eight years. Personality was assessed by the U. C. Reputation Test, Roger's Test of Personality Adjustment, information on cumulative records and teacher reports. His results indicated that at first there was no significant differences between the low and high fit groups on personality measures; however, by the end of the five to eight year period the high fit group were better socially adjusted, more popular and less tense than the low fit group.

Biddulph (1954) using a sample of 461 high school boys selected the 50 most fit and 50 least fit boys, based on a test consisting mainly of strength items. The personality characteristics were measured by the California Test of Personality, sociograms and teacher ratings. The findings indicated that the high fit group had better social adjustment, self adjustment and academic achievement. Biddulph selected the groups from a large sample and therefore the two groups represented two extreme levels of fitness. The results of the study were not generalizable to more moderate levels of fitness.

In a similar study Tillman (1965) selected two groups from a sample of 282 high school boys. One group consisted of the 15 percent of the boys who were most fit and the other group consisted of the 15 percent of the boys who were least fit. The fitness test used contained both strength and endurance items. The 16 PF was used to obtain the personality factors. Fitness was found to be positively related to Factors F (Sober-Happy-go-lucky) and Q_2 (group dependent - self-sufficient) and negatively related to Factor Q_4 (Relaxed-Tense). The groups

used in the study represent extreme levels of fitness and consequently the results were not generalizable to more moderate fitness levels.

One of the few studies that dealt with female subjects was conducted by Young (1971). She investigated the relationship between personal-social adjustment and physical fitness by socioeconomic levels. The measurement instruments used were the AAHPER Youth Fitness Test, the California Test of Personality and the socioeconomic level was determined by McCall's Scale. Her sample contained 114 eleventh grade girls. One of the conclusions reached was that:

> There is a significant positive correlation at the .05 level between physical fitness and personal adjustment and between physical fitness and personal-social adjustment within the middle socioeconomic group, but not within the high or low groups. There are no significant correlations between physical fitness and social adjustment. (p. 599)

Yarnall (1966) used a sample of 75 high-school boys to investigate the relationship between physical fitness and popularity. Fitness was determined by strength items and popularity was measured by a sociometric questionnaire. The results indicated that physical fitness was positively related to popularity. However, the fitness test used only considered strength rather than endurance measures, which were recognized as the best measure of total fitness (Vitalo, 1973; Cooper, 1970).

In a more recent study Neale, Sonstroem and Metz (1970) tested the relationship between physical fitness and self-esteem in a sample of 165 adolescent boys. The AAHPER Youth Fitness Test was used to measure fitness and a 10-item self-esteem scale was used to determine self-esteem. The study failed to find any difference between high and low fit boys on measures of self-esteem. Neale et al. wrote:

> Results of the study failed to support the hypothesized relationship. . . . One possible interpretation is that the measuring instruments employed in the study were not precise enough to detect the relationship. Nevertheless, the possibility exists that the hypothesized relationship does not, in fact, exist, or is very low. (p. 749)

The studies dealing with high school subjects tended to assess fitness mainly by strength rather than by endurance measures.

The final group of studies in this section were those which investigated the relationship between physical and psychological factors in adult and college age subjects.

Sharp and Reilly (1975) investigated the relationship between aerobic fitness and personality in a sample of 65 male college students. Personality factors were assessed by the MMPI and fitness was determined by a series of tests designed to measure aerobic capacity. They found that high fitness correlated with low depression, low paranoia and low social introversion. The study used only male subjects and therefore the results were not generalizable to female subjects.

In a similar study, Weber (1953) studied the relationship between fitness and personality in a sample of 246 male freshmen. Fitness was determined by the Iowa Physical Efficiency Profile and the MMPI was used to measure personality. The results showed that there was no significant relationship between the scores on the two tests. Although the results were just the opposite of those reported by Sharp and Rielly (1975), the studies were not totally contradictory because different tests were used to assess fitness. The test used by Weber (1953) concentrated mainly on strength and the test used by Sharp and Rielly (1975) concentrated on aerobic capacity.

Brunner (1969) in a related study investigated personality

differences in adult males who participated in physical activities and those who were inactive. A questionnaire was used to determine how active the men were and an adjective checklist was used to assess personality characteristics. The results indicated that participants were; more defensive, more dominant, more achievement oriented and more self-confident than non participants. The study did not measure fitness and therefore the results were not generalizable to fitness and personality.

Werner and Gottheil (1966) carried out a similar study using a sample of 456 males entering the United States Military College. On entry to the college all subjects were classified as athletes or as non participants in sports. Selection to the groups was based on participation in high school athletics. Personality traits were measured by the 16PF. The study concluded that athletes were; more sociable, more dominant, more enthusiastic, more adventurous, tougher, more group dependent, more sophisticated and more conservative than non participants. Although comparing active and inactive groups was a popular method of investigating the relationship between fitness and personality, Vitalo (1973) after reviewing the literature concluded that participation in athletics and sports was not always a good measure of fitness. The study stated that before any conclusions were made, further research was needed.

Harris (1963) investigated the relationship between fitness and personality in a sample of 79 college women. The 18 most fit and the 18 least fit women were compared on a number of personality measures. Fitness was tested by the Krause-Weber Test, Wells-Dillon Sit-Reach Test and the Scott Fitness Battery. The personality tests used were

the Taylor Manifest Anxiety Scale and the Edward's Personal Preference Survey. There was no significant difference in anxiety between the high and low fit groups. The high fit group scored higher on Endurance and Intraception and lower on Nurturance and Abasement on the EPPS than the low fit group. The study selected two extreme fitness groups and therefore the results were not generalizable to more moderate levels of fitness.

In an earlier study, Wells (1959) used a sample of 80 male college students to study the relationship between physical fitness and personality. The study yielded a total of 1330 correlations between a series of 38 fitness tests and personality factors measured by the 16PF and a psychiatric interview. This number of correlations was just too great to be adequately discussed here; however, the following were some of the consistent trends found in the correlation; high fitness scores were associated with low anxiety, low tension, more inhibition, more competent assertiveness and greater sensitivity.

Breen (1959) studied the relationship between fitness and personality in a sample of 48 college males. Fitness was determined by using brachial pulse wave variables. The results were that fitness was negatively related to measures of anxiety, neuroticism and cynicism. The method of measuring fitness by brachial pulse wave variables was not a widely used method and there was very little research evidence to support the reliability and validity of this measuring method.

One of the earliest studies which tested the relationship between fitness and intelligence was Johnson (1942). Fitness was assessed by a test of physical skill and intelligence was measured by a college freshmen examination. The results indicated that there was

no relationship between fitness and intelligence. However, in a later study using only female subjects Hart and Shay (1964) found a significant relationship between fitness and intelligence. They concluded that: "Although physical fitness is not a general predictor of academic success, it is high enough to be considered as a necessary factor for the improvement in the general education of the college student" (p. 445). The different results obtained by the two studies were possibly due to different samples and different measures of fitness and intelligence. Johnson used a test of physical skill and Hart and Shay used a battery of fitness measures.

Arnette (1968) investigated the relationship between fitness and academic achievement in a sample of female college students. Fitness was measured by a test battery consisting of both strength and endurance items. Academic achievement was measured by grade point average. The results indicated that fitness was positively related to academic grade point average.

Powell and Pihndorf (1971) investigated the relationship between intelligence and a number of physiological variables using a sample of older adult men. Intelligence was measured by the Culture Fair Intelligence Test and fitness was assessed by a battery of physiological measurements. The study indicated that fitness variables were related to intelligence.

The studies in this section analyzed the relationships between personality factors and a variety of physical factors. In general they indicated that fitness was related to a number of personality traits. However, this evidence was of limited usefulness in supporting fitness training as a means to enhance mental health because it was not a

causal relationship.

The Therapeutic Use of Physical Fitness Training with the Physically and Mentally Handicapped

A number of studies investigated the effects of physical fitness training on the personality of the physically and mentally handicapped.

Meyer (1955) studied the effects of a six month cardiovascular and strength endurance fitness training on ward behavior in schizophrenic patients. The results showed that the group, which received training improved in behavior more than did a matched control group which received no training. In a similar study Van Fleet (1950) assessed the impact of six months of physical training on the emotional interpersonal functioning of schizophrenic patients. Emotional interpersonal functioning was based on the evaluation of ward staff. The results indicated that the group, which received training, improved on a number of behavioral indices. A matched control group showed no change. Both studies failed to measure fitness before and after the training programs and therefore there was no evidence that a fitness change occurred or that the changes in behavior were the result of a fitness change.

Collingwood and Willett (1971) administered a program consisting of one hour a day in the gymnasium doing jogging and calisthenics, and one hour each day in the pool, swimming. The program was administered to five obese male teenagers and lasted for three weeks. In addition to the fitness training the subjects received one hour per week of group counselling. Subjects were administered fitness tests consisting

of; the Kraus-Weber Fitness Test, which measured strength and flexibility, weight, waist size, resting pulse rate and lung capacity, before and after their training program. Subjects improved on all fitness measures except waist size and lung capacity. Self-concept was measured by the Bill's Index of Adjustment and Values. The summary of the study stated:

> Ss demonstrated significant increases in physical fitness performance, positive body attitude, positive self-attitude, self-acceptance and significant decreases in real versus ideal self-discrepancy. (p. 412)

However, the implied effects of fitness training on self-concept were not justified for two reasons. Firstly, there was no control group used to assess the relative effects of fitness training, group interaction and interaction with the instructor and secondly, no mention was made of the possible effects of the group counselling.

In a later study Collingwood (1972) investigated the effects of a physical fitness training program on self attitudes. His program consisted of jogging, sprints, calisthenics and agility drills. It lasted for four weeks. The sample tested consisted of 50 male rehabilitation clients, 25 who received the program and 25 who acted as a matched control. The study concluded that:

> Ss demonstrated greater significant increases, over a matched control group, in physical fitness performance, body attitude, positive self-attitude, self-acceptance and positive physical intellectual and emotional-interpersonal behaviors. (p. 585)

Fitness was measured by; pulse rate, sit-ups, push-ups and measures of strength and flexibility. Personality was assessed by the Bill's Index of Adjustment and Values, and by instructor ratings.

Corder (1966) used a sample of 24 grade school retardates to

investigate the possible effects of a physical training program on social status. At the end of the ten week physical fitness program it was found that there was no change in social status.

A study by McPherson et al. (1966) investigated the effects of a 24-week graduated exercise program on the personality of post heart attack adult males. Personality was measured by the 20-Item Manifest Anxiety Scale and the 16PF. No objective test of fitness was given before or after the training period. The study had a two by two design, normal and heart attack subjects, and exercisers and non exercisers. The study concluded that the cardiac exercise group experienced a greater number of favourable changes in personality than did any of the other groups. The main areas of improvement were; self-confidence, and a reduction in anxiety and tension. The study failed to assess fitness before and after the fitness program; therefore there was no evidence that fitness increased or that the changes in personality was the result of a fitness increase.

Buccola and Stone (1975) studied the effects of a 14-week cycling program and a 14-week walk-jog fitness programs on aged men. The 16PF was used to assess personality factors and a battery of fitness tests were used to determine fitness. This battery of tests included both strength and aerobic fitness items. The results showed that there was a significant increase in fitness in both the cycling and jogging groups. The cycling group did not change on any personality factors, but the jogger group became more self-sufficient and more serious. The fact that both groups increased in fitness, but only the joggers changed in personality, indicated that other factors were involved besides fitness.

The studies reviewed in this section all dealt with the effects of physical fitness training on the personality of various abnormal populations. The results obtained were not generalizable to normal subjects.

Physical Fitness Training as a Change Agent of the Personality of Normal Subjects

This section reviewed the literature on the effects of physical fitness programs on the personality of normal subjects.

Ismail and Trachtman (1973), while investigating the physiological changes that result from an exercise program in middle age businessmen, noticed that there seemed to be psychological changes as well. They went on to explore these psychological changes in greater detail. The fitness program used centered around a progressive running program and lasted four months. From the 60 subjects entering the program, two extreme groups were selected based on fitness levels. One group contained the 14 most fit men and the other group contained the 14 least fit men. Fitness was measured by oxygen intake, blood pressure and percent of lean body mass. Personality was assessed by the 16PF. Since the high fit group were expected to undergo relatively little fitness change, while having a similar psychological experience as the low fit group, they were used as a control group. The results showed that the high fit group changed very little psychologically. However, the low fit group became; more emotionally stable, more imaginative, more self-sufficient and more guilt-prone, during the fitness program. The low fitness group used in the study represented an extreme level of fitness. Therefore the results were not generalizable to

groups with more moderate levels of fitness.

In a similar study, Sharp and Reilly (1975), using a sample of college males, explored the effects of an aerobic fitness program on personality. The study pointed out a number of significant correlations between changes in physical fitness scores and changes in personality scores, as measured by the MMPI. Fitness was assessed by a series of aerobic fitness tests. Because there was no control group, personality changes cannot unbiasedly be attributed to the aerobic training program.

Werner and Gottheil (1966) carried out a study on the effects of four years of athletic participation on male subjects at the United States Military College. Subjects on entering the college were classified as either athletic participants or as non participants based on participation in high school athletics. As part of the program at the college all cadets were required to take part in athletics. It was hypothesized that the non participants would gain the most physically from participation in college athletics and become psychologically more similar to the athletic participants, who would change relatively little physically. The results indicated that at graduation the participants and non participants were no more alike in personality than when they started college. Since no fitness measures were taken, there was no evidence that the non participant group increased in fitness.

McPherson et al. (1966) in a study aimed mainly at a sample of post heart attack adult males, also investigated the effects of a fitness program on a group of normal males. The study concluded that a group of normal men, who did the fitness program, decreased in anxiety while a control group did not decrease in anxiety. The study did not assess fitness before and after the fitness program; therefore, there

was no evidence that a fitness increase occurred.

Hammer and Wilmore (1973) carried out an exploratory study on the effects of physiological changes on personality in a sample of adult males. Personality was assessed by the 16PF and fitness by a series of endurance type tests. The only personality changes that correlated with increased endurance were trusting and forthrightness. As no control group was used, the personality changes cannot be attributed solely to a physical fitness increase.

Lindsey (1970) used two groups of grade school children, to determine the effects of special physical education classes on personality. At the end of the two-year program the children in the experimental group showed a significant improvement in fitness, but did not show any significant change on the Blanchard Behavior Rating Scale. Although no significant changes occurred, there was a tendency for the children in the experimental group to improve in social and personal adjustment.

Ismail and Young (1976) divided an all male sample into four groups; high fit old, high fit young, low fit old, and low fit young. Fitness was based on oxygen intake and other cardiovascular measures. Personality factors were measured by the 16PF, the EPI and the anxiety scale of the Multiple Affect Adjective Check List. All subjects took part in a four-month fitness program, which consisted mainly of progressive running and calisthenics. Regardless of what group the subjects were in, they were more socially precise, more persistent and more controlled at the end of the fitness program. Since no control group was used, the results cannot solely be attributed to a fitness increase.

Another study by the same authors, Young and Ismail (1976), investigated the relationship between physiological factors and psychological factors before and after a four-month conditioning program. The conditioning program consisted of jogging, calisthenics, running and recreation activities. Personality was assessed by the Eysenck Personality Inventory and fitness was measured by a series of cardiovascular and endurance tests. In the sample of middle age men used in the study, they found that an increase in fitness was related to an increase in emotional stability. No control group was used to control for the effects of random outside variables, such as group interaction.

Using a sample of 101 male university professors, who volunteered for the study, Morgan et al. (1970) investigated the effects of a cardiovascular fitness program (circuit training, jogging, swimming, treadmill running) on depression. Depression was measured by the Zung Self-Rating Depression Scale both before and after the six-week training period. At the end of the six-week training period, the results indicated that the fitness program did not produce a significant reduction in depression. However, if the results of the 11 subjects, who were depressed at the beginning of the program, were analyzed separately, they demonstrated a significant decrease in depression. Since the 11 subjects were not severely depressed the results were probably not due to statistical regression. The study did not assess fitness at the end of the fitness program; therefore, there was no evidence that the subjects increased in fitness.

Gutin (1966) investigated the effects of an increase in physical fitness on mental ability following stress. The sample of 55 male college students was randomly divided into two groups. One group

received two periods of fitness classes per week for 12 weeks. The second group received no fitness classes. Fitness was assessed by the Indiana Motor Fitness Index II (push-ups, chin-ups, standing broad jumps). Mental ability was measured by the Employee Aptitude Survey. Both fitness and mental ability were tested before and after the training period. The results indicated that the experimental group increased in fitness to a greater extent than did the control group. The 12-week training program did not positively affect mental ability following stress. It was found that the degree of fitness improvement was significantly related to the degree of improvement in mental ability following stress. The fitness measure used in the study consisted of strength items. Vitalo (1973) and Cooper (1970) found that strength items alone were not the best measure of total fitness.

A study by Massie and Shephard (1971) was designed to compare the physiological and psychological effects of an individualized versus a group approach to fitness training. The individualized program was based on Cooper's (1970) fitness program and the group program was designed by the YMCA. The sample consisted of middle-aged businessmen. At the end of the 28-week fitness program the following conclusions were made.:

1. Both groups increased in aerobic power (14 percent in the individual program and 10 percent in the group program).

2. The men in the group program increased in extroversion and decreased in neuroticism.

3. The men in the individualized program only changed on one factor and that was a more favourable response towards sports.

4. The usefulness of the individualized program was questioned because of the high drop-out rate.

5. The change in extroversion in the group program was in interaction within the group.

The results of the study had several points of relevance to the present study. First, it pointed out the effects of group interaction, which was overlooked by a number of studies. Second, it showed that fitness can be increased using an individualized program and finally, it pointed out some of the problems associated with individual programs.

The studies in this section discussed the effects of physical fitness conditioning on various personality factors in the normal population. The research in general focussed on male subjects in group conditioning programs.

Summary

This section reviewed the literature to find a basis for the present research and support for its rationale.

There was a base for the present study in personality theory. Carkhuff (1971) proposed a model of personality composed of three spheres of influence; intellectual, emotional-interpersonal and physical. Carkhuff advocates that the three spheres interact to determine the behavior of the individual. Changes in one sphere of influence bring about changes in the other spheres. Although this model provided this study with a theoretical base, Carkhuff's research did not provide any concrete evidence that a relationship existed between physical and psychological factors or that physical fitness conditioning changes personality.

There was historical support for an interaction between physical and psychological factors. Many of the ancient philosophers believed that physical and mental health were related. Although this belief supported the idea of an interaction between physical and psychological factors, it also did not provide any concrete evidence that a relationship existed.

A great deal of the correlational research reviewed found significant correlations between various physical and psychological factors. However, because they were correlational, they did not make any causal statements. Therefore they cannot be used to support fitness training as an agent to promote psychological change. Harmett (1967) made the following statement concerning correlational studies:

> However, they cannot be regarded as valid indications of psychological change related to increasing physical fitness; it is equally possible that they reflect predilections; i.e. person with certain psychological characteristics may gravitate to physical-fitness programs. (p. 767).

A number of studies investigated the effects of a fitness conditioning program on the personality of various physically and mentally handicapped groups. In general these studies indicated that fitness conditioning programs promoted mental health in handicapped subjects. However, because handicapped subjects were used the results of these studies cannot be generalized to normal subjects.

The effects of physical conditioning programs on the personality of normal subjects were investigated by a number of studies. The results indicated that physical conditioning programs promoted personality changes in normal subjects. No female subjects were used in these studies; therefore the results cannot be generalized to females. Most of the studies used group conditioning programs and there was some

evidence (Massie and Shephard, 1971) that the personality changes were different in group and individual programs.

Although there was a vast amount of research on the interaction between physical and psychological factors, there was very little concrete evidence that an individual conditioning program promoted better mental health in normal functioning people.

Hypotheses

The following hypotheses have evolved from the rationale of the study presented in Chapter 1 and the previous review of the relevant research literature.

It is hypothesized that:

H_1 Persons who take part in a self-administered fitness program have greater gains in aerobic fitness than persons who have not been involved in the program.

H_2 Persons who take part in a self-administered fitness program have greater gains in levels of self-concept than persons who have not been involved in the fitness program.

H_3 Persons who take part in a self-administered fitness program have a greater reduction in levels of anxiety than persons who have not been involved in the fitness program.

H_4 Persons who increase in aerobic fitness have greater gains in levels of self-concept than persons who have not increased their aerobic fitness.

H_5 Persons who increase in aerobic fitness have greater reductions in anxiety than persons who have not increased in fitness.

H_6 There is a positive relationship between self-concept and aerobic fitness.

H_7 There is a negative relationship between anxiety and aerobic fitness.

CHAPTER III

METHODOLOGY

This chapter is divided into the following sections: (1) sample, (2) procedure, (3) aerobic fitness program, (4) aerobic fitness measure, (5) the Sixteen Personality Factor Questionnaire, (6) the Tennessee Self Concept Scale, and (7) design and analysis.

Sample

Thirty-five people responded to a poster campaign (see Appendix A) concerning a fitness program. After a discussion of the fitness program 22 of the 35 respondents decided to do the program. The sample consisted of five male and 17 female volunteers from the staff and students of Memorial University of Newfoundland. The female subjects had: a mean age of 23 with a range from 18 to 31, a mean weight of 130 pounds with a range from 98 pounds to 209 pounds and a mean height of 64 inches with a range of 58 inches to 68 inches. The male subjects had: a mean age of 25 with a range from 19 to 34, a mean weight of 165 pounds with a range of 142 pounds to 194 pounds and a mean height of 68 inches with a range of 66 inches to 70 inches. The sample contained eight staff members and 14 students.

Procedure

Subjects registered for the program at the university counselling centre and at that time were asked to make an appointment to meet

with the experimenter. At these meetings, a brief outline of the program was given, the subjects' weight and height were measured and it was explained that the program was being carried out as part of a research project. The subjects were told that because of the research nature of the program all subjects who did the program had to take psychological and fitness tests. No other information was given about the nature of the research.

The subjects who remained (22 of 35) were then administered the Sixteen Personality Factor Questionnaire (16PF) and the Tennessee Self Concept Scale (TSCS). The experimenter also scheduled times during the following week that the fitness test could be taken. All subjects were instructed not to eat for at least two hours before the fitness test. The subjects took the fitness test at the time that was most convenient for them. If none of the scheduled times were suitable, the subjects arranged with the experimenter to take the test at some other time.

The fitness test used was the 12 minute run developed by Cooper (1968). The test was carried out on an official 400 meter track. In order to facilitate measurement the track was divided into 25 yard sections. At the end of each 25 yard sections was a marker.

At the fitness testing session each subject had the following instructions read to him:

> Run and walk as far as you comfortably can in 12 minutes. If you get winded, slow down awhile until you get your breath back. Then run again for a stretch. The idea is to cover the greatest distance you can in those 12 minutes. (Cooper, 1970, p. 27)

The subjects were also instructed to start at the sound of a whistle and when the whistle sounded again they were to walk to the nearest marker and stop. The distance recorded was the total distance covered

when the subject stopped.

At the end of the fitness test each subject was told that a list of people assigned to the experimental and control groups would be posted at the counselling centre. Subjects were randomly assigned to two groups of equal size. Subjects in the control group were told that they would be contacted in approximately eight weeks to do the program. Subjects in the experimental group were told to make an appointment to meet individually with the experimenter.

At these individual meetings the experimenter explained the fitness program to the subjects and answered any questions they had about the program. The fitness program was based on an aerobic fitness program developed by Cooper (1968). This program is discussed more thoroughly in the next section.

The core of the program was a point system, which was based on the energy requirements of various activities (see Appendix B). Although some of the more common sports were used to obtain points, the most common methods of obtaining points was by walking, running, cycling and swimming. The subjects were each given a copy of the point system and shown how to use it. Subjects in consultation with the experimenter were assigned a set number of points to obtain during the first week of the program, based on their fitness levels. The number of points obtained by each subject per week was to gradually increase until they obtained the minimum number of points needed to maintain good fitness, which was 30 for males and 24 for females. Although the starting point was set with the help of the experimenter, it was the individual's responsibility to judge his/her rate of progress. To help the subjects monitor their own progress, each subject was given a

record sheet (see Appendix C) on which they could record their points. After the initial meeting each subject was left to monitor his/her own progress. No further contact was made between the experimenter and subjects until the conclusion of the six to eight week program.

After six weeks elapsed the subjects in both the experimental and control groups were contacted by mail or telephone and asked to meet with the experimenter and do the TSCS, 16PF and the fitness test again. When the control group completed the tests, they were assigned times to meet with the experimenter to receive instruction on the fitness program.

Aerobic Fitness Program

Cooper's (1968) fitness program incorporated a number of components designed to motivate the individual to change his fitness behavior. First, the point system provided the individual with a means to reinforce himself/herself for desirable behaviors. After a review of some of the relevant research Watson and Sharp (1972) concluded that self-reinforcement was an effective method of increasing the reinforced behavior. Second, the program helped to structure fitness activities and set target goals, which provided the individual with additional reinforcement, as these goals were reached. Third, the program was self-administering in the sense that each subject recorded and altered his own behavior and provided his own reinforcement for behavior change. Kazdin (1974) after a review of the literature concluded that self-monitoring did effect behavior both by itself and also when it was compounded with other procedures (contingent social reinforcement, therapeutic instructions and suggestions).

Cooper (1968) stated that a number of subjects of both sexes and a wide range of ages used his program successfully. Although this conclusion was based on subjective data obtained mainly by letters, it still provided additional support for the program. The program was a rational method of increasing fitness both from a research base as well as a logical one based on a number of behavior modification techniques.

Aerobic Fitness Measure

The instrument used to test fitness was the 12 minute walk-run test developed by Cooper (1968). The test assessed aerobic fitness by measuring the distance a person can travel in 12 minutes. Cooper (1972) used a sample of 115 Air Force men and found a correlation of 0.89 between distance run in 12 minutes and maximum oxygen intake values on a treadmill. Wyndham (Larson, 1974) using a sample of 25 males similar in size and weight to the subjects used by Cooper, found a correlation of 0.94 between distance run in 12 minutes and maximum oxygen intake as measured in the laboratory by the treadmill method. Maksud, Cannistra and Dublinski (1976) compared distance run in 12 minutes with maximum oxygen intake using the treadmill method, in a sample of 26 female athletes. They obtained a correlation of 0.70. Katch et al. (1973) in a similar study using a sample of undergraduate females obtained a correlation of 0.67.

The correlation of the 12 minute walk-run test of fitness with the actual measurement of a physiological factor (the treadmill method of measuring oxygen intake) in the laboratory has been used to establish the validity and reliability of this test. Cooper (1970) stated that: "Despite their simplicity and ease of administration these field

tests are almost as accurate and reliable as laboratory measures made on the treadmill" (p. 28).

The 12 minute walk-run test was judged to be a suitable measuring instrument for this study based on the ease of administration and its correlation to actual laboratory measurements of oxygen intake.

The Sixteen Personality Factor Questionnaire (16PF)

The Sixteen Personality Factor Questionnaire (16PF) was devised as an objectively scorable test, which Cattell advocates gives the most complete coverage of personality factors possible in the least amount of time. The average time for completion of the test is 45 minutes. The test can be administered either individually or in groups. The administration procedure is simple and the test administrator needs no special training to administer the test. The results are scorable by hand or by machine. It was designed to be used by subjects who were at least 16 and had a high school education. There are a number of forms of the test, but only form A was used in this study.

The test is well established and widely used. Lorr (Buros, 1970) in his review stated that: "Although at present it appears to be the best factor-based personality inventory available, it is the reviewer's view that the 16PF is still primarily a research instrument" (p. 1173).

Reliability

Reliability was defined by Cattell, Eber and Tatsuoka (1970) as the agreement of two different administrations of a test. The Institute for Personality and Ability Testing (1972) using a sample of

243 Canadian high school males and females reported that the reliability of the 16 primary factors ranged from 0.72 to 0.92. In another study by the same organization using a sample of 67 employment counsellors the range of reliabilities was from 0.58 to .83. Both studies used form A and the time between administrations was from two to seven days.

The present study used form A to measure the second order factor QII. The Handbook for the 16PF does not provide test-retest reliability for the second order factors; however, it did give the reliabilities of the primary factors from which the QII score is obtained. The following is a summary of the reliabilities of those factors which contribute to the QII score; C = 0.82, H = 0.92, L = 0.78, O = 0.83, Q_3 = 0.80 and Q_4 = 0.72. These reliabilities were based on a sample of 243 Canadian high school students (IPAT, 1972). Although no reliability was given for factor QII, the reliability of QII is at least as great as the reliability of its component first order factors. Ferguson (1974) stated that reliability in part is a function of test length, if the test length is increased its reliability increases. Since the QII score is based on a larger number of items than each of its component scores, it is more reliable than these scores. Eysenck (1972) stated:

> Practically all the information contained unreliably in the primary factors was contained reliably in the second-order factors and very little information was left over for contribution by the primaries. (p. 267)

Validity

The validity of the QII score as a measure of anxiety was assessed in a number of ways.

First, it was compared to other measures of anxiety. Reiter

(1972) obtained a correlation of 0.73 between QII and scores on the Taylor Manifest Anxiety Scale, using a sample of 76 college men and women. Hundleby and Connor (1968) found a correlation of 0.56 between factor QII and the Manifest Anxiety Scale of the MMPI, and a correlation of 0.60 between QII and the Neuroticism (N) scale on the Maudsley Personality Inventory (MPI). The sample used in the study consisted of 267 airmen.

Secondly, the ability of Factor QII to detect anxiety change as the result of therapy or other life changes was tested. Cattell and Scheier (1960) found that anxiety stimuli increased the QII score of the 16PF. Subjects who attended therapy showed a reduction in QII scores over the course of their therapy (Cattell et al., 1966). These factors provide support for the validity of the QII score as a measure of anxiety.

Finally, the factor's ability to distinguish between groups was tested. Cattell and Scheier (1963) found that almost all clinical groups were above average on the QII score, especially those who were neurotic or were anxiety reaction cases. These findings were in the predicted direction and tend to support the validity of this measure of anxiety.

Summary

The 16PF is an easily administered test, which covers a wide range of personality variables in a short time. The sample used in this study met the educational and age criteria suggested for the test group. Research has established the reliability and validity of factor QII as a measure of anxiety. Based on the literature reviewed the 16PF

was judged to be a suitable testing instrument to obtain a measure of anxiety.

The Tennessee Self Concept Scale (TSCS)

The Tennessee Self Concept Scale (TSCS) was constructed by the Tennessee Department of Mental Health as a scale: ". . . which is simple for the subject, widely applicable, well standardized, and multi-dimensional in its description of the self concept" (Fitts, 1965, p. 1). The TSCS is designed to be used with subjects 12 years of age and older who have at least a grade six reading level. The administration time of the test is 10-20 minutes. The TSCS is multi-dimensional, but also provides a total measure of self concept. Suinn (Buros, 1970) stated that: "The Tennessee Self Concept Scale ranks among the better measures, combining group discrimination with self-concept information" (p. 369).

Reliability

The only test score used in the present study was the Total Positive Score; therefore only the reliability of that factor was reviewed. Fitts (1965) reported a test-retest reliability coefficient of 0.92 for Total Positive Score, based on a sample of 60 college students over a two-week period. Congdon (Fitts, 1965) used a short form of the TSCS and a sample of psychiatric patients, obtained a reliability coefficient of 0.88 for the Total Positive Score.

Validity

The technical manual for the TSCS provided evidence of content validity by; correlation with other personality measures, detection of

personality changes under particular conditions and by group discrimination.

Content validity can be described as the degree to which the test samples a population of behaviors. The items on the TSCS came from two main sources. The first source was from items on other self concept tests and the second source was from written self description of patients and non patients. Items were selected from these sources based on the unanimous agreement of seven clinical psychologists. Fitts (1965) concluded his discussion of the TSCS by stating: "Thus we may assume that the categories used in the scale are logically meaningful and publicly communicable" (p. 17).

Validity was also assessed by the instruments ability to distinguish between groups. Fitts (1965) used a sample of 369 psychiatric patients and 626 non patients to test the ability of the TSCS to predict differences between the two groups. He concluded that the results "demonstrate highly significant (mostly at the .001 level) differences between patients and non patients for almost every score that is utilized on this Scale" (p. 27). In the second part of the experiment (Fitts, 1965) compared the normal group to a group of subjects judged to be high on personality integration. The results indicated that the well integrated group differed from the normal group in the opposite direction than did the psychiatric group.

Another method of assessing validity was to compare the TSCS to other measures of personality and determine if the relationship was in the predicted direction. Fitts (1965) compared the scores on the TSCS and Minnesota Multiphasic Personality Inventory based on a sample of 102 psychiatric patients and concluded that: "it is apparent that most

of the scores of the scale correlate with the MMPI scores in ways one would expect from the nature of the scores" (p. 24).

The final method of determining validity was its ability to detect personality change brought about as the result of therapy or other life experiences. Fitts (1965) predicted that a number of TSCS scores would change as the result of thefapy on six female patients. Of the 88 changes predicted, 60 were correct ($p = .001$). Ashcraft and Fitts (1964) carried out a similar study using an experimental and control group in a test-retest design. The experimental group, which consisted of 30 patients, were given the TSCS before and after six months of therapy. The control group, which consisted of 24 patients waiting for therapy, were given the TSCS before and after a six month waiting period. The study found that the experimental group changed in the predicted directions on almost all of the variables studied. The control group only changed on two variables.

Summary

The research evidence reviewed in this section indicated that the TSCS was a valid and reliable test of self concept. The test also had a number of features which were desirable in the present study. Testing time was short and the test was self-administering. The results were also hand scorable and provided a total score measuring a person's overall self-esteem.

Design and Analysis

The design used in this study was a test-retest method to determine if the experimental and control groups changed to different

degrees on the dependent variables during the experiment. The subjects were randomly assigned to either the experimental or control group.

The data obtained in the study was analyzed by nonparametric analysis. Ferguson (1974) stated that:

> Many tests of significance involve assumptions about the nature of the distributions of the variables in the populations from which the samples are drawn. . . . In experimental work, situations arise where either little is known about the population distribution of the dependent variable or this distribution is known to depart appreciably from the normal form. In such situations nonparametric tests may be appropriately used. (p. 321)

There was little evidence available describing the population distribution of the population from which the sample for this study was drawn. Therefore, it was inappropriate to use parametric analysis. Siegel (1956) concluded that for studies with groups of from six to ten subjects, there was no alternative to using a nonparametric test unless the nature of the population was known. In the present study the sizes of the various groups ranged from seven to 11 subjects. Based on these factors it was decided that nonparametric analysis was not only the best method, but probably the only type of analysis.

The results were analyzed by the Mann-Whitney u test. This method of analysis was chosen because; (1) it is widely accepted as one of the best nonparametric tests of significance (Ferguson, 1974), (2) it is one of the most powerful nonparametric tests and a good alternative to parametric tests (Siegel, 1956), and (3) it was an appropriate test to use with small samples (Siegel, 1956).

Although the main focus of the study was experimental, there was some correlational data collected. The relationship of the three dependent variables (fitness, anxiety and self-concept) was analyzed

using the Spearman's Rank Order Correlation method. This method was selected because it is one of the best nonparametric tests of correlation and a good alternative to parametric testing methods (Siegel, 1956).

The researcher adopted the rule that the null hypothesis would be rejected if the Mann-Whitney u statistic was significant at a probability level of $\alpha \leq .05$. Similarly the level of significance for the acceptance of correlation coefficients was $\alpha \leq .05$.

The study used a test-retest design to compare the changes in the experimental and control groups. As previously indicated nonparametric procedures were deemed the most appropriate method of analysis in the present study. The Mann-Whitney u test was used to test the experimental hypotheses and the Spearman's Rank Order statistic was used to test the significance of the correlational hypotheses.

CHAPTER IV

RESULTS AND DISCUSSION

This chapter provides an account of the results and interprets the data.

Descriptive Data

The descriptive data is presented in the following series of tables.

The distribution is described using nonparametric statistics for each of the results presented in Tables I, II and III. For descriptive purposes the sample was broken down into a number of groups. These groups were classified as follows; "total" refers to all subjects who completed the experiment, "experimental" refers to those subjects who did the fitness program, "control" refers to those subjects who did not do the fitness program, "fitness increase" refers to all subjects who increased in fitness during the study, and "no fitness increase" refers to those subjects who did not increase in fitness during the study. From the 22 subjects that started the program, 5 subjects failed to complete all of the posttests and were thus eliminated from the analyses. One other subject only missed the post administration of the 16PF and therefore was retained for the other analyses.

Table I presents a description of the distribution of sten scores for factor QII on the 16PF. The average level of anxiety in the general population is 5.5. The experimental group had a higher level

of anxiety (6.2) than the control group (5.7) at the beginning of the study. The experimental group had the greatest decrease in anxiety from pretest (6.2) to posttest (5.4). The fitness increase group also decreased in anxiety from pretest (5.7) to posttest (5.4). The control group increased in anxiety from pretest (5.7) to posttest (6.1). The no fitness increase group also increased in anxiety from pretest (5.7) to posttest (6.1). Although not reported in the table, subjects who did not take the posttest administration of the 16Pf had the highest median level of anxiety (6.3) on the pretest. The high anxiety levels of the subjects who did not take the posttest reduced the possibility of regression being a factor in the results. Also, it lessened any biasing effects which may be caused by higher anxiety levels.

TABLE I

DISTRIBUTION OF ANXIETY (QII) STEN SCORES ON THE 16PF

Group	Number	Median		Quartile Deviation	
		Pretest	Posttest	Pretest	Posttest
Total[a]	16	6.0	5.9	1.1	1.3
A. Experimental	7	6.2	5.4	1.2	1.6
Control	9	5.7	6.1	.9	2.0
B. Fitness increase	8	5.7	5.4	2.1	1.6
No fitness increase	7	5.7	6.1	.9	1.0

[a]Sixteen of the original 22 subjects completed the posttest administration of the 16PF.

Table II presents a nonparametric description of the distribution of total positive scores on the TSCS. The mean level of total positive self concept scores in the general population is 345 with a standard deviation of 30. The experimental group had the lowest median level of self concept of any of the groups both in the pretest (316) and the posttest (314). The control group had the highest median level of self concept of any of the groups both in the pretest (343) and the posttest (345). The experimental group and the control group made negligible changes from pretest to posttest (experimental pretest 316 to 314 posttest, control pretest 343 to 345 posttest).

TABLE II

DISTRIBUTION OF TOTAL SELF-CONCEPT RAW SCORES ON THE TSCS

Group	Number	Median		Quartile Deviation	
		Pretest	Posttest	Pretest	Posttest
Total[a]	17	333	340	29	27
A. Experimental	8	316	314	33	34
Control	9	343	345	22	19
B. Fitness increase	8	322	329	41	37
No fitness increase	8	337	344	28	27

[a]Seventeen of the original 22 subjects completed the posttest administration of the TSCS.

Table III presents a nonparametric description of the distances covered on the twelve minute walk-run fitness test. In order to equate the distances covered by male and female subjects and different age

groups, correctional factors suggested by Larson (1974) were used. The distances in Table III have been adjusted so that the distance covered by the various groups are equated with the distances covered by male subjects in the 20 to 30 age range.

There was no normative data available for the 12 minute walk-run test. However, Cooper (1970) has established a number of fitness levels based on distance covered, age and sex. The following are the ranges in yards of each fitness level based on a sample of male subjects 20 to 30 years of age; very poor <1760 yards, poor 1760 yards - 2200 yards, fair 2200 yards - 2640 yards, good 2640 - 3080 yards, and excellent >3080 yards.

TABLE III

DISTRIBUTION OF DISTANCES IN YARDS ON THE TWELVE MINUTE RUN FITNESS TEST[a]

Group		Number	Median		Quartile Deviation	
			Pretest	Posttest	Pretest	Posttest
Total[b]		17	2294	2294	352	365
A.	Experimental	9	2723	2765	213	323
	Control	8	2060	1818	242	328
B.	Fitness increase	9	2503	2613	306	362
	No fitness increase	8	2184	2068	262	297

[a]Distances covered have been corrected for age and sex based on factors suggested by Larson (1974).

[b]Seventeen of the original 22 subjects completed the posttest administration of the 12 Minute Run Fitness Test.

The experimental group had the highest median level of fitness as indicated by the amount of yardage covered, of any of the groups both in the pretest (2723) and the posttest (2765). The control group had the lowest median distance covered of any of the groups both in the pretest (2060) and posttest (1818). The experimental group increased the median distance covered from pretest (2723) to posttest (2765). The control group decreased the median distance covered from pretest (2060) to posttest (1818).

Table IV outlined the Spearman rank order correlation between the three dependent variables; fitness, anxiety and self-concept. The correlations were based on the results of the 22 subjects in the pretests. The pretests' results were used to eliminate any possible biasing effects caused by the fitness program. Fitness was not significantly related to either anxiety or self-concept. There was a significant negative correlation between self-concept and anxiety (p. <.01).

TABLE IV

CORRELATIONAL MATRIX OF THE VARIABLES IN THE STUDY

	Fitness	Anxiety	Self-Concept
Fitness	--	.07	.17
Anxiety	--	--	-.70*
Self-Concept	--	--	--

*n = 22

Significant at .01 level.

Hypotheses

Hypothesis 1

Persons who take part in a self-administered fitness program have greater gains in aerobic fitness than persons who have not been involved in the program.

The changes in aerobic capacity for both the experimental group, which did the fitness program and the control group, which did not do the fitness program, were compared using the Mann-Whitney u test. The value obtained ($u = 52$) was not significant ($p. > .05$). There was no evidence that the experimental group increased in fitness to a greater extent than did the control group and therefore the hypothesis was rejected.

Hypothesis 2

Persons who take part in a self-administered fitness program have greater gains in levels of self-concept than persons who have not been involved in the fitness program.

The changes in self-concept in the experimental and control groups were compared using the Mann-Whitney u test. The value obtained ($u = 25$) was not significant ($p. > .05$). There was no evidence that the fitness program increased levels of self-concept. Therefore the hypothesis was rejected.

Hypothesis 3

Persons who take part in a self-administered fitness program have a greater reduction in levels of anxiety than persons who have not been involved in the fitness program. The reduction in anxiety in the

experimental and control groups were compared using the Mann-Whitney u test. The value obtained ($u = 49$) was significant ($p. < .05$). The fitness program decreased anxiety and therefore the hypothesis was accepted.

Hypothesis 4

Persons who increase in aerobic fitness would have greater gains in levels of self-concept than persons who have not increased their aerobic fitness.

The changes in levels of self-concept in those persons that increased in fitness and those persons that did not increase in fitness were compared using the Mann-Whitney u test. The value obtained ($u = 37$) was not significant ($p. > .05$). There was not a greater increase in self-concept in those persons who increased in fitness than in those persons who did not increase in fitness. Therefore the hypothesis was rejected.

Hypothesis 5

Persons who increase in aerobic fitness would have greater reductions in anxiety than persons who have not increased in fitness.

The changes in levels of anxiety in the group that increased in fitness and the group that did not increase in fitness were compared using the Mann-Whitney u test. The value obtained ($u = 42.5$) was significant ($p. < .05$). Those subjects who increased in aerobic fitness decreased in anxiety to a greater extent than subjects who did not increase in aerobic fitness and therefore the hypothesis was accepted.

Hypothesis 6

There is a positive relationship between self-concept and aerobic fitness.

The relationship was tested using the Spearman Rank Order test. The value obtained (r_s = .17) was not significant (p. >.05). There was not a positive relationship between self-concept and aerobic capacity. Therefore the hypothesis was rejected.

Hypothesis 7

There is a negative relationship between anxiety and aerobic fitness.

The relationship was tested using the Spearman Rank Order Correlation testing procedure. The value (r_s = -.07) was not significant. There was not a relationship between anxiety and aerobic fitness and therefore the hypothesis was rejected.

Discussion

In this section the results of the study are discussed in greater detail. The section was divided into the following subject areas: (1) anxiety, (2) fitness program, (3) self-concept, and (4) summary.

Anxiety

The subjects who took part in the fitness program decreased in anxiety. Those subjects who increased in fitness regardless of whether they did the fitness program or not, decreased in anxiety. These results were in agreement with the results of other researchers (McPherson et al., 1966; Vitalo, 1973). Although these results indi-

cated that there was a relationship between a fitness increase and reduction in anxiety, the study failed to find a significant correlation ($r = -.07$, $p. > .05$) between these variables.

These apparent contradictory results were explained by using the theoretical base of this study. If the development of personality was seen as the result of the interaction of various personal elements such as intellectual, emotional-interpersonal and physical components, then the same personality traits can be the result of different combinations of these elements. Breckenridge and Vincent (1965) stated:

> There are an infinite number of ways in which these forces combine. It is, therefore, often difficult to find relationships because of their complexity. It is possible for the same behavior to stem from different conditions. (p. 14)

Therefore, although fitness training was sufficient to cause a reduction in anxiety, fitness was not necessarily a good indicator of anxiety levels.

Fitness Program

Although Cooper (1970) has equated various ranges of distances covered in the 12 minute walk-run test with categories of fitness, this does not necessarily mean that aerobic fitness increases in a series of jumps. Cooper (1970) maintains that fitness gradually increases during a fitness conditioning program and therefore the distance on the 12 minute walk-run gradually increases. Based on Cooper's belief that aerobic fitness increases gradually, the author felt that Cooper (1970) used the categories of fitness as levels on a continuum rather than a number of exclusive categories of fitness (i.e. an increase of 100 yards on the 12 minute walk-run represents an increase in fitness whether it places the subject in another fitness category or not).

Although the experimental group did not increase in fitness to a greater extent than the control group, there was evidence that the fitness program had some effect on fitness levels. The Mann-Whitney u test yielded a value (u = 52) which approached significance (p. = .06). The fact that seven of the nine subjects in the experimental group increased in fitness and only two out of eight subjects increased in fitness in the control group. Further analysis using the Wilcoxon Matched Pairs Signed Rank test found a significant increase in fitness in the experimental group (w = 5.5, p. <.05) and a non significant decrease in fitness in the control group (w = 10, p. >.05).

The relatively small increase in fitness in members of the experimental group was due at least in part to the length of the program (six weeks). A longer program was not feasible because of the various commitments of the participants and researcher. Cooper (1968) stated that: ". . . you should begin getting solid results within eight weeks and you should be in good condition within 16 weeks . . ." (p. 6). The preceding quotation from Cooper (1968) coupled with his belief that fitness increases gradually indicated two factors. Firstly, if good solid results are expected within eight weeks, then there should be noticeable improvements by six weeks. Secondly, although the program was of sufficient length to have an effect on fitness, a longer program would have had a greater effect on fitness.

Self-Concept

The subjects who took part in the fitness program and the subjects who increased in fitness did not increase on levels of self-concept. There was not a significant correlation between self-concept

and fitness ($r = .17$, $p. > .05$). These findings were contradictory to those of Collingwood and Willett (1971). However, the subjects used in that study were obese teenagers and the results were not generalizable to normal subjects. The results of this study found that the fitness program used and the size of the fitness increase did not affect self-concept.

Summary

The results indicate that physical fitness training decreases anxiety and that subjects who increased in fitness also decreased in anxiety. The experimental group did not increase in fitness to a greater extent than the control group. However, there was evidence in the results that the experimental group did increase in fitness. The fitness program did not effect self-concept levels. The only significant correlation between the three variables was between anxiety and self-concept ($r = -.70$, $p. < .01$).

Limitations of the Study

1. Fitness in the present study meant aerobic fitness and the results cannot be generalized to other indices of fitness, such as strength, motor ability and athletic participation.

2. The sample used was made up of volunteers from the staff and students of a university. Both male and female subjects were used. The age range of the subjects was 17 years to 34 years. The results and conclusions of this study can only be generalized to a similar population.

3. The study used a sample which contained a cross section of

self-concept, anxiety and fitness levels. The results are not generalizable to a sample composed entirely of subjects with extremely high or low scores on any of these variables.

4. The fitness program was carried out during the summer and the results of the program cannot be generalized to programs carried out at other times of the year.

CHAPTER V

SUMMARY, IMPLICATION AND RECOMMENDATIONS

This chapter gives a summary of the study, implications of the data collected, recommendations based on the findings of the study and areas where further research is needed.

Summary

The purpose of the study was; (1) to study the effects on an aerobic fitness training program on physical fitness, anxiety and self-concept, (2) to investigate the relationship of physical fitness to anxiety and self-concept.

The subjects used in the study were volunteers from the staff and students of Memorial University of Newfoundland. The sample contained both male and female subjects. Subjects were randomly assigned to either an experimental or control group. The experimental group received a six week aerobic fitness program based on a program developed by Cooper (1968), while the control group did not do the fitness program until after the conclusion of the study. Subjects were tested on the three dependent variables (fitness, anxiety, self-concept) both at the beginning and end of the experiment.

The results indicate that physical fitness training reduced anxiety and that subjects who increased in fitness, also decreased in anxiety. The fitness program had no effect on levels of self-concept. The experimental group did not increase in fitness to a greater extent

than the control group; however, there was evidence that the fitness program had an effect on fitness levels. No significant correlation was found between aerobic fitness, and anxiety and self-concept.

Implications

This section discusses the possible implications of the study. The section is divided into three subject areas; (1) fitness program, (2) anxiety, (3) self-concept, and (4) summary.

Fitness Program

The two major findings of the study in terms of the fitness program were: (1) Although the experimental group did not increase in fitness to a greater extent than the control group, there was evidence that the fitness program had some effect on fitness. (2) Those subjects who took the fitness program decreased in anxiety. These findings supported the view that an individual physical fitness program can be used to increase fitness and decrease anxiety.

The fitness program used in the study was selected partly because it was a relatively simple method of increasing fitness and partly because it enabled the effects of a fitness increase to be isolated from possible contamination from other variables such as group interaction and interaction with the instructor. The fitness program was designed to be a simple practical method of increasing fitness for use by members of the helping professions.

Anxiety

The results of the study indicated that although physical fitness training and increased fitness were sufficient to cause a

reduction in anxiety, fitness levels were not good predictors of anxiety levels. The explanation for this apparent contradictory finding is that physical fitness was only one of a number of factors which influenced anxiety levels.

The use of fitness training in therapy to reduce anxiety was supported by other research. There was evidence that the influence of fitness training on personality traits was affected by other variables. McPherson et al. (1966) found that fitness training was an extremely good method of reducing anxiety and tension in post heart attack victims, but had relatively little effect on normal subjects. Ismail and Tracktman (1973) found that high fit men showed little psychological changes compared to low fit men during a fitness program.

The evidence indicated that the effects of fitness training on anxiety were influenced by variables such as the fitness level of the subjects, anxiety levels and general health. These variables should be considered if fitness training is to be used most effectively in reducing anxiety.

Self-Concept

The results indicated that fitness training had no effect on levels of self-concept. The possibility exists, however, that with a longer fitness program and a larger fitness increase there may be some effect. The study gave no justification for using physical fitness training to enhance self-concept.

Summary

The results of this study were based on a small sample. The data collected did not conclusively support the interaction of the

physical and psychological components of the human being.

The data supported the belief that fitness training can reduce anxiety; however, it does not support the belief that fitness training enhances self-concept. The present data did not justify the use of physical fitness training as a means to promote the total psychological well-being of the individual. Before practitioners in the field of mental health can judge the usefulness of physical fitness training as an agent to enhance personal growth further research is needed.

Recommendations

The following recommendations are made based on the findings of the study:

1. It is recommended that training programs designed to increase aerobic fitness be used as a therapeutic tool in the reduction of anxiety.

2. The fitness increases in the present study were small due at least in part to the length of the fitness program and therefore it is recommended that the length of the fitness program be increased.

3. The present study found that the physical fitness program used in the study had no effect on levels of self-concept; therefore it is recommended that further research be carried out before fitness training is used to enhance self-concept.

4. The results indicated that fitness training decreases anxiety and therefore it is recommended that professionals who are involved in the treatment of anxiety be informed of the possible benefits of fitness training on anxiety.

Areas for Research

This section discusses the areas where further research is needed.

1. There is evidence that the effect of fitness training on personality varies with other factors (Ismail and Tracktman, 1973; Morgan et al., 1970). Research is needed to determine when fitness training can be used most effectively.

2. Although fitness training does decrease anxiety, its effectiveness has not been compared to other treatment methods such as biofeedback, chemotherapy and muscle relaxation training. Research is needed to determine the relative merits of each method.

3. If fitness programs are to be used by people in the "helping professions," research is needed to develop practical and effective fitness programs.

4. The results of the study can only be generalized to a sample similar to the one used in the study. Therefore research is needed using different samples, if the results are to be more widely applied.

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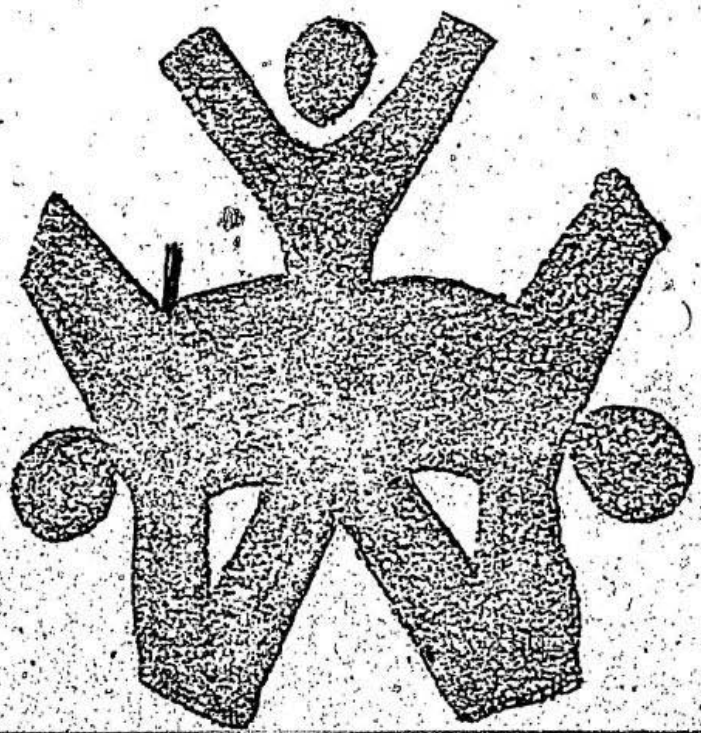
APPENDICES

FITNESS POSTER CAMPAIGN

"Fitness Programme"

A 6 to 8 week self-monitoring individualized fitness programme is to be run by the counselling centre. All those interested can register now by dropping into the counselling centre or by calling 753-1200 Ext: 2383.

Last day to register — Wednesday 25th May '77.



APPENDIX B

THE POINT SYSTEM EXPANDED, WITH THE ADDITION OF ENDURANCE POINTS*

1. Walking/Running

(at 1/10 mile increments)

In measuring a course that starts and finishes in front of their home, many people have found that it is impossible to end on an even mile or half-mile. Consequently, hundreds have asked for a chart that gives the point value for walking and running distances measured in 1/10 miles. The following special chart is in response to this request and gives the point value for walking and running one to five miles at 1/10 mile increments.

1.0 Mile	
19:59 - 14:30 min.	1
14:29 - 12:00 min.	2
11:59 - 10:00 min.	3
9:59 - 8:00 min.	4
7:59 - 6:31 min.	5
6:30 - 5:45 min.	6
under 5:45 min.	7

1.1 Miles	
21:59 - 15:57 min.	1 1/8
15:56 - 13:12 min.	2 1/4
13:11 - 11:00 min.	3 1/3
10:59 - 8:48 min.	4 1/2
8:47 - 7:09 min.	5 1/2
7:08 - 6:20 min.	6 2/3
under 6:20 min.	7 3/4

1.2 Miles	
23:59 - 17:24 min.	1 1/4
17:23 - 14:24 min.	2 1/2
14:23 - 12:00 min.	3 2/3
11:59 - 9:36 min.	5
9:35 - 7:48 min.	6
7:47 - 6:55 min.	7 1/3
under 6:55 min.	8 1/2

1.3 Miles	
28:59 - 18:51 min.	1 3/8
18:50 - 15:36 min.	2 3/4
15:35 - 13:00 min.	4
12:59 - 10:24 min.	5 1/2
10:23 - 8:27 min.	6 1/2
8:26 - 7:30 min.	8
under 7:30 min.	9 1/4

1.4 Miles	
27:59 - 20:18 min.	1 1/2
20:17 - 16:48 min.	2 3/4
16:47 - 14:00 min.	4 1/2
13:59 - 11:00 min.	6
10:59 - 9:06 min.	7
9:05 - 8:05 min.	8 2/3
under 8:05 min.	10

1.5 Miles	
29:59 - 21:45 min.	1 1/2
21:44 - 18:00 min.	3
17:59 - 15:00 min.	4 1/2
14:59 - 12:00 min.	6
11:59 - 9:45 min.	7 1/2
9:44 - 8:40 min.	9
under 8:40 min.	10 1/2

1.6 Miles	
31:59 - 23:12 min.	1 5/8
23:11 - 19:12 min.	3 1/4
19:11 - 16:00 min.	4 2/3
15:59 - 12:48 min.	6 1/2
12:47 - 10:24 min.	8
10:23 - 9:15 min.	9 2/3
under 9:15 min.	11 1/4

1.7 Miles	
33:59 - 24:39 min.	1 3/4
24:38 - 20:24 min.	3 1/2
20:23 - 17:00 min.	5
16:59 - 13:36 min.	7
13:35 - 11:03 min.	8 1/2
11:02 - 9:50 min.	10 1/3
under 9:50 min.	12

*Cooper, K. The New Aerobics. New York: Bantam Books, 1970.

...continued

1. Walking/Running (continued)

1.8 Miles

35:59 - 26:06 min.	1 7/8
26.05 - 21.36 min.	3 3/4
21:35 - 18:00 min.	5 1/3
17:59 - 14:24 min.	7 1/2
14:23 - 11:42 min.	9
11:41 - 10:25 min.	11
under 10:25 min.	12 3/4

1.9 Miles

37:59 - 27:33 min.	1 7/8
27:32 - 22:48 min.	3 3/4
22:47 - 19:00 min.	5 2/3
18:59 - 15:12 min.	7 1/2
15:11 - 12:21 min.	9 1/2
12:20 - 11:00 min.	11 1/2
under 11:00 min.	13 1/2

2.0 Miles

40:00 min. or longer	1*
39:59 - 29:00 min.	2
28:59 - 24:00 min.	4
23:59 - 20:00 min.	7
19:59 - 16:00 min.	9
15:59 - 13:00 min.	11
12:59 - 11:30 min.	13
under 11:30 min.	15

2.1 Miles

42:00 min. or longer	1*
41:59 - 30:27 min.	2 1/8
30:26 - 25:12 min.	4 1/4
25:11 - 21:00 min.	7 1/2
20:59 - 16:48 min.	9 2/3
16:47 - 13:39 min.	11 3/4
13:38 - 12:05 min.	13 3/4
under 12:05 min.	16

2.2 Miles

44:00 min. or longer	1*
43:59 - 31.54 min.	2 1/4
31:53 - 26:24 min.	4 1/2
26:23 - 22:00 min.	7 3/4
21:59 - 17:36 min.	10
17:35 - 14:18 min.	12 1/4
14:17 - 12:40 min.	14 1/2
under 12:40 min.	16 2/3

2.3 Miles

46:00 min. or longer	1*
45:59 - 33:21 min.	2 3/8
33:20 - 27:36 min.	4 3/4
27:35 - 23:00 min.	8 1/3
22:59 - 18:24 min.	10 2/3
18:23 - 14:57 min.	13
14:56 - 13:15 min.	15 1/3
under 13:15 min.	17 2/3

2.4 Miles

48:00 min. or longer	1*
47:59 - 34:48 min.	2 1/2
34:47 - 28:48 min.	4 3/4
28:47 - 24:00 min.	8 2/3
23:59 - 19:12 min.	11
19:11 - 15:36 min.	13 1/2
15:35 - 13:50 min.	16
under 13:50 min.	18 1/4

2.5 Miles

50:00 min. or longer	1*
49:59 - 36:15 min.	2 1/2
36:14 - 30:00 min.	5
29:59 - 25:00 min.	9
24:59 - 20:00 min.	11 1/2
19:59 - 16:15 min.	14
16:14 - 14:20 min.	16 1/2
under 14:20 min.	19

2.6 Miles

52:00 min. or longer	1*
51:59 - 37:42 min.	2 5/8
37:41 - 31:12 min.	5 1/4
31:11 - 26:00 min.	9 1/4
25:59 - 20:48 min.	12
20:47 - 16:54 min.	14 1/2
16:53 - 15:00 min.	17
under 15:00 min.	19 1/2

2.7 Miles

54:00 min. or longer	1*
53:59 - 39:09 min.	2 3/4
39:08 - 32:24 min.	5 1/2
32:23 - 27:00 min.	9 1/2
26:59 - 21:36 min.	12 1/2
21:35 - 17:33 min.	15

*Exercise of sufficient duration to be of cardiovascular benefit. At this speed, ordinarily no training effect would occur. However, the duration is of such extent that a training effect does begin to occur.

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1. Walking/Running (continued)

2.7 Miles (cont.)

17:32 - 15:35 min.	18
under 15:35 min.	20 1/4

2.8 Miles

56:00 min. or longer	1*
55:59 - 40:36 min.	2 7/8
40:35 - 33:36 min.	5 3/4
33:35 - 28:00 min.	10
27:59 - 22:24 min.	13
22:23 - 18:12 min.	15 1/2
18:11 - 16:10 min.	18 1/2
under 16:10 min.	21

2.9 Miles

58:00 min. or longer	1*
57:59 - 42:03 min.	2 7/8
42:01 - 35:48 min.	5 3/4
34:47 - 29:00 min.	10 1/2
28:59 - 23:12 min.	13 1/4
23:11 - 18:51 min.	16 1/4
18:50 - 16:45 min.	19
under 16:45 min.	22

3.0 Miles

1 hr. or longer	1 1/2*
59:59 - 43:30 min.	3
43:29 - 36:00 min.	6
35:59 - 30:00 min.	11
29:59 - 24:00 min.	14
23:59 - 19:30 min.	17
19:29 - 17:15 min.	20
under 17:15 min.	23

3.1 Miles

1 hr. 2:00 min. or longer	1 1/2*
1 hr. 1:59 - 44:47 min.	3 1/8
44:56 - 37:12 min.	6 1/4
37:11 - 31:00 min.	11 1/2
30:59 - 24:48 min.	14 1/2
24:47 - 20:10 min.	17 2/3
20:09 - 17:50 min.	20 3/4
under 17:50 min.	24

3.2 Miles

1 hr. 4:00 min. or longer	1 1/2*
1 hr. 3:59 - 46:24 min.	3 1/4
46:23 - 38:24 min.	6 1/2
38:23 - 32:00 min.	11 3/4
31:59 - 25:36 min.	15
25:35 - 20:49 min.	18 1/2
20:48 - 18:25 min.	21 3/4
under 18:25 min.	24 2/3

3.3 Miles

1 hr. 6 min. or longer	1 1/2*
1 hr. 5:59 - 47:51 min.	3 3/8
47:50 - 39:36 min.	6 3/4
39:35 - 33:00 min.	12
32:59 - 26:24 min.	15 1/2
26:23 - 21:28 min.	19
21:27 - 19:00 min.	22 1/2
under 19:00 min.	25 1/3

3.4 Miles

1 hr. 8:00 min. or longer	1 1/2*
1 hr. 7:59 - 49:18 min.	3 3/8
49:17 - 40:48 min.	6 3/4
40:47 - 34:00 min.	12 1/2
33:59 - 27:12 min.	16
27:11 - 22:07 min.	19 1/2
22:06 - 19:35 min.	23
under 19:35 min.	26

3.5 Miles

1 hr. 10:00 min. or longer	1 1/2*
1 hr. 9:59 - 50:45 min.	3 1/2
50:44 - 42:00 min.	7
41:59 - 33:00 min.	13
34:59 - 28:00 min.	16 1/2
27:59 - 22:45 min.	20
22:44 - 20:10 min.	23 1/2
under 10:10 min.	27

*Exercise of sufficient duration to be of cardiovascular benefit. At this speed, ordinarily no training effect would occur. However, the duration is of such extent that a training effect does begin to occur.

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1. Walking/Running (continued)

3.6 Miles	
1 hr. 12:00 min. or longer	1 1/2*
1 hr. 11:59 - 52:12 min.	3 5/8
52:11 - 43:12 min.	7 1/4
43:11 - 36:00 min.	13 1/2
35:59 - 28:48 min.	17
28:47 - 23:24 min.	20 1/2
23:23 - 20:45 min.	24 1/4
under 20:45 min.	27 3/4

3.7 Miles	
1 hr. 14:00 min. or longer	1 1/2*
1 hr. 13:59 - 53:39 min.	3 3/4
53:38 - 44:24 min.	7 1/2
44:23 - 37:00 min.	14
36:59 - 29:36 min.	17 1/2
29:35 - 24:03 min.	21
24:02 - 21:15 min.	25
under 21:15 min.	28 1/2

3.8 Miles	
1 hr. 16:00 min. or longer	1 1/2*
1 hr. 15:59 - 55:06 min.	3 7/8
55:05 - 45:36 min.	7 3/4
45:35 - 38:00 min.	14
37:59 - 30:24 min.	18
30:23 - 24:42 min.	21 3/4
24:41 - 21:50 min.	25 3/4
under 21:50 min.	29 1/4

3.9 Miles	
1 hr. 18:00 min. or longer	1 1/2*
1 hr. 17:59 - 56:33 min.	3 7/8
56:32 - 46:48 min.	7 3/4
46:47 - 39:00 min.	14 1/2
38:59 - 31:12 min.	18 1/2
31:11 - 25:21 min.	22 1/2
25:20 - 22:25 min.	26 1/4
under 22:45 min.	30

4.0 Miles	
1 hr. 20:00 min. or longer	4*
1 hr. 19:59 - 58:00 min.	7
57:59 - 48:00 min.	11
47:59 - 40:00 min.	15
39:59 - 32:00 min.	19
31:59 - 26:00 min.	23
25:59 - 23:00 min.	27
under 23:00 min.	31

4.1 Miles	
1 hr. 22:00 min. or longer	4*
1 hr. 21:59 - 59:27 min.	7
59:26 - 49:12 min.	11 1/4
49:11 - 41.00 min.	15 1/3
40:59 - 32:48 min.	19 1/2
32:47 - 26:39 min.	23 1/2
26:38 - 23:35 min.	27 1/2
under 23:35 min.	31 3/4

4.2 Miles	
1 hr. 24:00 min. or longer	4*
1 hr. 23:59 - 60:54 min.	7 1/3
60:53 - 50:24 min.	11 1/2
50:23 - 42.00 min.	15 2/3
41:59 - 33.36 min.	20
33:35 - 27:18 min.	24
27:17 - 24:10 min.	28
under 24:10 min.	32 1/2

4.3 Miles	
1 hr. 26:00 min. or longer	4*
1 hr. 25:59 - 1 hr. 2:21 min.	7 1/2
1 hr. 2:20 - 51:36 min.	11 3/4
51:35 - 43:00 min.	16
42:59 - 34:24 min.	20 1/2
34:23 - 27:57 min.	24 1/2
27:56 - 24:45 min.	28 3/4
under 24:45 min.	33 1/4

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1. Walking/Running (continued)

4.4 Miles

1 hr. 28:00 min. or longer	4*
1 hr. 27:59 - 1 hr. 3:48 min.	7 3/4
1 hr. 3:47 - 52:48 min.	12
52:47 - 44:00 min.	16 1/2
43:59 - 35:12 min.	21
35:11 - 28:36 min.	25 1/4
28:35 - 25:20 min.	29 1/2
under 25:20 min.	34

4.5 Miles

1 hr. 30:00 min. or longer	4 1/2*
1 hr. 29:59 - 1 hr. 5:15 min.	8
1 hr. 5:14 - 54:00 min.	12 1/2
53:59 - 45:00 min.	17
44:59 - 36:00 min.	21 1/2
35:59 - 29:15 min.	26
29:14 - 25:55 min.	30 1/2
under 25:55 min.	35

4.6 Miles

1 hr. 32:00 min. or longer	4 1/2*
1 hr. 31:59 - 1 hr. 6:42 min.	8 1/4
1 hr. 6:41 - 55:12 min.	12 3/4
55:11 - 46:00 min.	17 1/2
45:59 - 36:48 min.	22
36:47 - 29:54 min.	26 1/2
29:53 - 26:30 min.	31
under 26:30 min.	36

4.7 Miles

1 hr. 34:00 min. or longer	4 1/2*
1 hr. 33:59 - 1 hr. 8:09 min.	8 1/4
1 hr. 8:08 - 56:24 min.	13
56:23 - 47:00 min.	18
46:59 - 37:36 min.	22 1/2
37:35 - 30:33 min.	27

4.7 Miles (cont.)

30:32 - 27:00 min.	31 1/2
under 27:00 min.	37

4.8 Miles

1 hr. 36:00 min. or longer	4 1/2*
1 hr. 35:59 - 1 hr. 9:36	8 1/2
1 hr. 9:35 - 57:36 min.	13 1/4
57:35 - 48:00 min.	18
47:59 - 38:24 min.	23
38:23 - 31:12 min.	27 1/2
31:11 - 27:35 min.	32
under 27:35 min.	38

4.9 Miles

1 hr. 38:00 min. or longer	4 1/2*
1 hr. 37:59 - 1 hr. 11:03 min.	8 3/4
1 hr. 11:02 - 58:48 min.	13 1/2
58:47 - 49:00 min.	18 1/2
48:59 - 39:12 min.	23 1/2
39:11 - 31:51 min.	27 1/2
31:50 - 28:10 min.	33
under 28:10 min.	38

5.0 Miles

1 hr. 40:00 min. or longer	5*
1 hr. 39:59 - 1 hr. 12:30 min.	9
1 hr. 12:29 - 1 hr. 59:59 - 50:00 min.	14 19
49:59 - 50:00 min.	24
39:59 - 32:30 min.	29
32:29 - 28:45 min.	34
under 28:45	39

5.5 Miles

1 hr. 50:00 min. or longer	5 1/2*

*Exercise of sufficient duration to be of cardiovascular benefit. At this speed, ordinarily no training effect would occur. However, the duration is of such extent that a training effect does begin to occur.

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1. Walking/Running (continued)

5.5 Miles (cont.)

1 hr. 49:59 - 1 hr. 19:45 min.	10
1 hr. 19:44 - 1 hr. 6:00 min.	15 1/2
1 hr. 5:59 - 55:00 min.	21
54:59 - 44:00 min.	26 1/2
43:59 - 35:45 min.	32
35:44 - 31:35 min.	37 1/2
under 31:35 min.	43

6.0 Miles

2 hrs. or longer	6*
1 hr. 59:59 - 1 hr. 27:00 min.	11
1 hr. 26:59 - 1 hr. 12:00 min.	17
1 hr. 11:59 - 1 hr.	23
59:59 - 48:00 min.	29
47:59 - 39:00 min.	35
38:59 - 34:30 min.	41
under 34:30 min.	47

6.5 Miles

2 hrs. 10:00 min. or longer	6 1/2*
2 hrs. 9:59 - 1 hr. 34:15 min.	12
1 hr. 34:14 - 1 hr. 18:00 min.	18 1/2
1 hr. 17:59 - 1 hr. 5:00 min.	26
1 hr. 4:59 - 52:00 min.	32 1/2
51:59 - 42:15 min.	39
42:14 - 37:22 min.	45 1/2
under 37:22 min.	52

7.0 Miles

2 hrs. 20:00 min. or longer	7*
2 hrs. 19:59 - 1 hr. 41:30 min.	13
1 hr. 41:29 - 1 hr. 24:00 min.	20
1 hr. 23:59 - 1 hr. 10 min.	27

7.0 Miles (cont.)

1 hr. 9:59 - 56:00 min.	34
55:59 - 45:30 min.	41
45:29 - 40:15 min.	48
under 40:15 min.	55

7.5 Miles

2 hrs. 30:00 min. or longer	7 1/2*
2 hrs. 29:59 - hr. 48:45 min.	14
1 hr. 48:44 - 1 hr. 30:00 min.	21 1/2
1 hr. 29:59 - 1 hr. 15:00 min.	29
1 hr. 14:59 - 60:00 min.	36 1/2
59:59 - 48:45 min.	44
48:44 - 43:10 min.	51 1/2
under 43:10 min.	59

8.0 Miles

2 hrs. 40:00 min. or longer	8*
2 hrs. 39:59 - 1 hr. 56:00 min.	15
1 hr. 55:59 - 1 hr. 36:00 min.	23
1 hr. 35:59 - 1 hr. 20:00 min.	31
1 hr. 19:59 - 1 hr. 4:00 min.	39
1 hr. 3:59 - 52:00 min.	47
51:59 - 46:00 min.	55
under 46:00 min.	63

8.5 Miles

2 hrs. 50:00 min. or longer	8 1/2*
2 hrs. 49:59 - 2 hrs. 3:15 min.	16
2 hrs. 3:14 - 1 hr. 42:00 min.	24 1/2
1 hr. 41:59 - 1 hr. 25:00 min.	33
1 hr. 24:59 - 1 hr. 8:00 min.	41 1/2

*Exercise of sufficient duration to be of cardiovascular benefit. At this speed, ordinarily no training effect would occur. However, the duration is of such extent that a training effect does begin to occur.

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1. Walking/Running (continued)

8.5 Miles (cont.)	
1 hr. 7:59 - 55:15 min.	50
55:14 - 48:50 min.	58 1/2
under 48:50 min.	67

9.0 Miles	
3 hrs. or longer	9*
2 hrs. 59:59 - 2 hrs. 10:30 min.	17
2 hrs. 10:29 - 1 hr. 48:00 min.	26
1 hr. 47:59 - 1 hr. 30:00 min.	35
1 hr. 29:59 - 1 hr. 12:00 min.	44
1 hr. 11:59 - 58:30 min.	53
58:29 - 51:45 min.	62
under 51:45 min.	71

9.5 Miles	
3 hrs. 10:00 min. or longer	9*
3 hrs. 9:59 - 2 hrs. 17:45 min.	18
2 hrs. 17:44 - 1 hr. 54:00 min.	27 1/2
1 hr. 53:59 - 1 hr. 35:00 min.	37
1 hr. 34:59 - 1 hr. 16:00 min.	46 1/2
1 hr. 15:59 - 1 hr. 1:45 min.	56
1 hr. 1:44 - 54:40 min.	65 1/2
under 54:40 min.	75

10.0 Miles	
3 hrs. 20:00 min. or longer	10*
3 hrs. 19:59 - 2 hrs. 25:00 min.	19
2 hrs. 24:59 - 2 hrs.	29
1 hr. 59:59 - 1 hr. 40:00 min.	39
1 hr. 39:59 - 1 hr. 20:00 min.	49

10.0 Miles (cont.)	
1 hr. 4:59 - 1 hr. 5:00 min.	59
1 hr. 4:59 - 57:30 min.	69
under 57:30 min.	79

12.5 Miles	
3 hrs. 1:15 - 2 hrs. 30 min.	36 1/2
2 hrs. 29:59 - 2 hrs. 5:00 min.	49
2 hrs. 4:59 - 1 hr. 40:00 min.	61 1/2
1 hr. 39:59 - 1 hr. 21:15 min.	74
under 1 hr. 21:15 min.	86 1/2

15 Miles	
3 hrs. 37:28 min. - 3 hrs.	44
2 hrs. 59:59 - 2 hrs. 30:00 min.	59
2 hrs. 29:59 - 1 hr. 37:30 min.	89
under 1 hr. 37:30 min.	104

20.0 Miles	
4 hrs. 49:59 min. - 4 hrs.	59
3 hrs. 59:59 - 3 hrs. 20:00 min.	79
3 hrs. 19:59 - 2 hrs. 40:00 min.	99
2 hrs. 39:59 - 2 hrs. 10:00 min.	119
under 22 hrs. 10:00 min.	139

25.0 Miles	
6 hrs. 2:25 min. - 5 hrs.	74
4 hrs. 59:59 - 4 hrs. 10:00 min.	99
4 hrs. 9:59 - 3 hrs. 20:00 min.	124

*Exercise of sufficient duration to be of cardiovascular benefit. At this speed, ordinarily no training effect would occur. However, the duration is of such extent that a training effect does begin to occur.

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1. Walking/Running (continued)

25.0 Miles (cont.)

3 hrs. 19:59 - 2 hrs. 42:30 min.	149
under 2 hrs. 42:30 min.	174

Marathon (26 Miles, 385 Yards)

Less than 2 hrs. 30 min. 45 sec.	209
2 hrs. 30:45 - 2 hrs. 50:25 min.	182
2 hrs. 50:26 - 3 hrs. 29:45 min.	156
3 hrs. 29:46 - 4 hrs. 22:12 min.	130
4 hrs. 22:13 - 5 hrs. 14:40 min.	104
5 hrs. 14:41 - 6 hrs. 20:12 min.	78
6 hrs. 20:13 - 8 hrs. 40:25 min.	51

2. Cycling

Instructions:

1. Points determined considering equal uphill and downhill course.
2. Points determined considering equal time with and against the wind.
3. For cycling a one-way course constantly against a wind exceeding 5 mph, add ½ point per mile to the total point value.

2.0 Miles	
12 min. or longer	0
11:59 - 8:00 min.	1
7:59 - 6:00 min.	2
under 6:00 min.	3

3.0 Miles	
18 min. or longer	0
17:59 - 12:00 min.	1 1/2
11:59 - 9:00 min.	3
under 9:00 min.	4 1/2

4.0 Miles	
24 min. or longer	0
23:59 - 16:00 min.	2
15:59 - 12:00 min.	4
under 12:00 min.	6

5.0 Miles	
30 min. or longer	1*
29:59 - 20:00 min.	2 1/2
19:59 - 15:00 min.	5
under 15:00 min.	7 1/2

6.0 Miles	
36 min. or longer	1*
35:59 - 24:00 min.	3
23:59 - 18:00 min.	6
under 18:00 min.	9

7.0 Miles	
42 min. or longer	3 1/2*
41:59 - 28:00 min.	5 1/2
27:59 - 21:00 min.	9
under 21:00 min.	12 1/2

*Exercise of sufficient duration to be of cardiovascular benefit. At this speed, ordinarily no training effect would occur. However, the duration is of such extent that a training effect does begin to occur.

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2. Cycling (continued)

8.0 Miles	
48 min. or longer	3 1/2*
47:59 - 32:00 min.	6 1/2
31:59 - 24:00 min.	10 1/2
under 24:00 min.	14 1/2

9.0 Miles	
54 min. or longer	5*
55:59 - 36:00 min.	7 1/2
35:59 - 27:00 min.	12
under 27:00 min.	16 1/2

10.0 Miles	
1 hr. or longer	5 1/2*
59:59 - 40:00 min.	8 1/2
39:59 - 30:00 min.	13 1/2
under 30:00 min.	18 1/2

11.0 Miles	
1 hr. 6 min. or longer	6 1/2*
1 hr. 5:59 min. - 44:00 min.	9 1/2
43:59 - 33:00 min.	15
under 33:00 min.	20 1/2

12.0 Miles	
1 hr. 12 min. or longer	7*
1 hr. 11:59 min. - 48:00 min.	10 1/2
47:59 - 36:00 min.	16 1/2
under 36:00 min.	22 1/2

13.0 Miles	
1 hr. 18 min. or longer	8*
1 hr. 17:59 min. - 52:00 min.	11 1/2
51:59 - 39:00 min.	18
under 39:00 min.	24 1/2

14.0 Miles	
1 hr. 24 min. or longer	8 1/2*
1 hr. 23:59 min. - 56:00 min.	12 1/2
55:59 - 42:00 min.	19 1/2
under 42:00 min.	26 1/2

15.0 Miles	
1 hr. 30 min. or longer	9 1/2*
1 hr. 29:59 min. - 1 hr.	13 1/2
59:59 - 45:00 min.	21
under 45:00 min.	28 1/2

16.0 Miles	
1 hr. 36 min. or longer	10*
1 hr. 35:59 min. - 1 hr. 4:00 min.	14 1/2
1 hr. 3:59 min. - 48:00 min.	22 1/2
under 48:00 min.	30 1/2

17.0 Miles	
1 hr. 42:00 min. or longer	11*
1 hr. 41:50 min. - 1 hr. 8 min.	15 1/2
1 hr. 7:59 min. - 51:00 min.	24
under 51:00 min.	32 1/2

18.0 Miles	
1 hr. 48:00 min. or longer	11 1/2*
1 hr. 47:59 min. - 1 hr. 12 min.	16 1/2
1 hr. 11:59 min. - 54:00 min.	25 1/2
under 54:00 min.	34 1/2

19.0 Miles	
1 hr. 54:00 min. or longer	12 1/2

*Exercise of sufficient duration to be of cardiovascular benefit. At this speed, ordinarily no training effect would occur. However, the duration is of such extent that a training effect does begin to occur.

....continued

2. Cycling (continued)

19.0 Miles (cont.)	
1 hr. 53:59 min. - 1 hr. 16 min.	12 1/2
1 hr. 15:59 min. - 57:00 min.	27
under 57:00 min.	36 1/2

20.0 Miles	
2 hrs. or longer	13*
1 hr. 59:59 min. - 1 hr. 20 min.	18 1/2
1 hr. 19:59 min. - 1 hr.	28 1/2
under 1 hr.	38 1/2

25.0 Miles	
2 hrs. 30:00 min. or longer	17*
2 hrs. 29:59 min. - 1 hr. 40 min.	23 1/2
1 hr. 39:59 min. - 1 hr. 15 min.	36
under 1 hr. 15:00 min.	48 1/2

30.0 Miles	
3 hrs. or longer	20 1/2*
2 hrs. 59:59 min. - 2 hrs.	28 1/2
1 hr. 59:59 min. - 1 hr. 30 min.	43 1/2
under 1 hr. 30:00 min.	58 1/2

3. Swimming

200 Yards	
6:40 min. or longer	0
6:39 - 5:00 min.	1
4:59 - 3:20 min.	1 1/2
under 3:20 min.	2 1/2

250 Yards	
8:20 min. or longer	0
8:19 - 6:15 min.	1 1/4
6:14 - 4:10 min.	2
under 4:10 min.	3

300 Yards	
10:00 min. or longer	1*
9:59 - 7:30 min.	1 1/2
7:29 - 5:00 min.	2 1/2
under 5:00 min.	3 1/2

350 Yards	
11:40 min. or longer	1*
11:39 - 8:45 min.	2
8:44 - 5:50 min.	3
under 5:50 min.	4 1/2

400 Yards	
13:20 min. or longer	1*
13:19 - 10:00 min.	2 1/2
9:59 - 6:40 min.	3 1/2
under 6:40 min.	5

450 Yards	
15:00 min. or longer	1*
14:59 - 11:15 min.	3
11:14 - 7:30 min.	4
under 7:30 min.	5 1/2

500 Yards	
16:40 min. or longer	1*
16:39 - 12:30 min.	3
12:29 - 8:20 min.	4
under 8:20 min.	6

550 Yards	
18:20 min. or longer	1*
18:19 - 13:45 min.	3 1/2
13:44 - 9:10 min.	4 1/2
under 9:10 min.	7

*Exercise of sufficient duration to be of cardiovascular benefit. At this speed, ordinarily no training effect would occur. However, the duration is of such extent that a training effect does begin to occur.

....continued

3. Swimming (continued)

600 Yards	
20:00 min. or longer	1 1/2*
19:59 - 15:00 min.	4
14:59 - 10:00 min.	5
under 10:00 min.	7 1/2

650 Yards	
21:40 min. or longer	1 1/2*
21:39 - 16:15 min.	4
16:14 - 10:50 min.	5 1/2
under 10:50 min.	8

700 Yards	
23:20 min. or longer	1 1/2*
23:19 - 17:30 min.	4 1/2
17:29 - 11:40 min.	6
under 11:40 min.	8 1/2

750 Yards	
25:00 min. or longer	1 1/2*
24:59 - 18:45 min.	4 3/4
18:44 - 12:30 min.	6 1/2
under 12:30 min.	9 1/2

800 Yards	
26:40 min. or longer	2 1/4*
26:39 - 20:00 min.	5 3/4
19:59 - 13:10 min.	7 1/4
under 13:20 min.	10 3/4

850 Yards	
28:20 min. or longer	2 1/2*
28:19 - 21:15 min.	6 1/4
21:14 - 14:10 min.	8
under 14:10 min.	11 1/2

900 Yards	
30:00 min. or longer	3 1/4*
29:59 - 22:30 min.	6 3/4
22:29 - 15:00 min.	8 3/4
under 15:00 min.	12 1/2

950 Yards	
31:40 min. or longer	4*
31:39 - 23:15 min.	7 1/4
23:14 - 15:50 min.	9 1/2
under 15:50 min.	13 1/2

1000 Yards	
33:20 min. or longer	4*
33:19 - 25:00 min.	8 1/4
24:59 - 16:40 min.	10 1/2
under 16:40 min.	14 1/2

1100 Yards	
36:40 min. or longer	4 1/2*
36:39 - 27:30 min.	9 1/2
27:29 - 18:20 min.	11 1/2
under 18:20 min.	16 1/4

1200 Yards	
40:00 min. or longer	5 1/2*
39:59 - 30:00 min.	10 1/2
29:59 - 20:00 min.	13
under 20:00 min.	18

1300 Yards	
43:20 min. or longer	6*
43:19 - 32:30 min.	11 1/2
32:29 - 21:40 min.	14 1/2
under 21:40 min.	19 3/4

1400 Yards	
46:40 min. or longer	6 1/2*
46:39 - 35:00 min.	12 3/4
34:59 - 23:20 min.	15 1/2
under 23:20 min.	21 1/2

1500 Yards	
50:00 min. or longer	7 1/2*
49:59 - 37:30 min.	14
37:29 - 25:00 min.	17
under 25:00 min.	23 1/4

1600 Yards	
53:20 min. or longer	8*
53:19 - 40:00 min.	15
39:59 - 26:40 min.	18 1/4
under 26:40 min.	25

*Exercise of sufficient duration to be of cardiovascular benefit. At this speed, ordinarily no training effect would occur. However, the duration is of such extent that a training effect does begin to occur.

. . . continued

3. Swimming (continued)

1700 Yards		1900 Yards	
56:40 min. or longer	9 3/4*	1 hr. 3:20 min. or longer	10*
56:39 - 42:30 min.	17 1/4	1 hr. 3:19 - 47:30 min.	18 1/2
42:29 - 28:20 min.	20 3/4	47:29 - 31:40 min.	22 1/4
under 28:20 min.	28		
1800 Yards		**2000 Yards**	
1 hr. or longer	9 1/2*	1 hr. 6:40 min. or longer	10 1/2
59:59 - 45:00 min.	17	1 hr. 6:39 - 50:00 min.	19 1/2
44:59 - 30:00 min.	21	49:59 - 33:20 min.	23 1/2
under 30:00 min.	28 1/2	under 33:20 min.	32

*Exercise of sufficient duration to be of cardiovascular benefit. At this speed, ordinarily no training effect would occur. However, the duration is of such extent that a training effect does begin to occur.

Additional Comments:
Points calculated on overhand crawl, i.e., 9.0 Kcal per min. Breaststroke is less demanding: 7.0 Kcal per min. Backstroke, a little more: 8.0 Kcal per min. Butterfly, most demanding: 12.0 Kcal per min.

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4. Point Value for Stationary Running

Time	*60-70 Steps/Min.	Points	*70-80 Steps/Min.	Points	*80-90 Steps/Min.	Points	*90-100 Steps/Min.	Points	*100-110 Steps/Min.	Points
2:30			175-200	3/4	200-225	1	225-250	1 1/4	250-275	1 1/2
5:00	300-350	1 1/4	350-400	1 1/2	400-450	2	450-500	2 1/2	500-550	5
7:30			525-600	2 1/4	600-675	3	675-750	3 3/4	750-825	4 1/2
10:00	600-700	2 1/2	700-800	3	800-900	4	900-1000	5	1000-1100	6
12:30			875-1000	3 3/4	1000-1125	5	1125-1250	6 1/4	1250-1375	7 1/2
15:00	900-1050	3 3/4	1050-1200	4 1/2	1200-1350	6	1350-1500	7 1/2	1500-1650	9
17:30			1225-1400	6 3/4	1400-1575	8 1/2	1575-1750	10 1/2	1750-1925	12
20:00	1200-1400	7	1400-1600	8	1600-1800	10	1800-2000	12	2000-2200	14
22:30			1575-1800	9 1/4	1800-2025	11 1/2	2025-2250	13 3/4	2250-2475	16
25:00	1500-1750	9 1/4	1750-2000	10 1/2	2000-2250	13	2250-2500	15 1/2	2500-2750	18
27:30			1925-2200	11 3/4	2200-2475	14 1/2	2475-2750	17 1/4	2750-3025	20
30:00	1800-2100	11 1/2	2100-2400	13	2400-2700	16	2700-3000	19	3000-3300	22

*Count only when the left foot hits the floor. Knees must be brought up in front raising the feet at least eight inches from the floor.

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5. Handball/Basketball/Squash

Duration*	Points	Duration*	Points
10 min.	1 1/2	1 hr. 10 min.	10 1/2
15 min.	2 1/4	1 hr. 15 min.	11 1/4
20 min.	3	1 hr. 20 min.	12
25 min.	3 1/4	1 hr. 25 min.	12 3/4
30 min.	4 1/2	1 hr. 30 min.	13 1/2
35 min.	5 1/4	1 hr. 35 min.	14 1/4
40 min.	6	1 hr. 40 min.	15
45 min.	6 3/4	1 hr. 45 min.	15 3/4
50 min.	7 1/2	1 hr. 50 min.	16 1/2
55 min.	8 1/4	1 hr. 55 min.	17 1/4
1 hr.	9	2 hrs.	18
1 hr. 5 min.	9 3/4		

*Continuous exercise. Do not count breaks, time-outs, etc.

6. Additional Exercises

Exercise	Duration	Points*	Comments
Badminton	1 game	1 1/2	Singles, players of equal ability, and a duration per game of 20 minutes.
	2 games	3	
	3 games	4 1/2	
Fencing	10 min.	1	
	20 min.	2	
	30 min.	3	
Football	30 min.	3	Count only the time in which you are actively participating.
	60 min.	6	
	90 min.	9	
Golf	9 holes	1 1/2	No motorized carts!
	18 holes	3	
Hockey	20 min.	3	Count only the time in which you are actively participating.
	40 min.	6	
	60 min.	9	
	80 min.	12	
Lacrosse and Soccer	20 min.	3	Count only the time in which you are actively participating.
	40 min.	6	
	60 min.	9	

*Points based on caloric requirements expressed in the scientific literature.

....continued.

6. Additional Exercises (continued)

Exercise	Duration	Points*	Comments
Rope skipping	5 min.	1 1/2	Skip with both feet together or step over the rope alternating one foot at a time.
	10 min.	3	
	15 min.	4 1/2	
Rowing	6 min.	1	2 oars, 20 strokes a minute, continuous rowing.
	18 min.	4	
	36 min.	8	
Skating	15 min.	1	Either ice or roller skating. For speed skating triple the point value.
	30 min.	2	
	60 min.	4	
Skiing	30 min.	3	Water or snow skiing. For cross-country snow skiing triple the point value.
	60 min.	6	
	90 min.	9	
Tennis	1 set	1 1/2	Singles, players of equal ability, and duration per set of 20 minutes.
	2 sets	3	
	3 sets	4 1/2	
Volleyball	15 min.	1	
	30 min.	2	
	60 min.	4	
Wrestling	5 min.	2	
	10 min.	4	
	15 min.	6	

*Points based on caloric requirements expressed in the scientific literature.

7. Target Heart Rates to be Used During Stress Testing to Determine the Presence or Absence of Heart Disease

Age (years)	Heart Rate (beats per minute)
under 30	175
30-34	170
35-39	165
40-44	160
45-49	155
50-54	150
55-59	145
60-64	140
65 and up	135

APPENDIX C

PERSONAL PROGRESS CHART

Date	Exercise	Distance	Duration	Points	Cumulative Points