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THE UNIVERSITY OF OKLAHOMA
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THE EFFECTS OF A CARDIOVASCULAR CONDITIONING PROGRAM
ON SELECTED PSYCHOLOGICAL RESPONSES OF COLLEGE MALES

A DISSERTATION
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THE EFFECTS OF A CARDIOVASCULAR CONDITIONING PROGRAM
ON SELECTED PSYCHOLOGICAL RESPONSES OF COLLEGE MALES

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TABLE OF CONTENTS

	Page
APPROVAL PAGE	ii
ACKNOWLEDGMENTS	iii
LIST OF TABLES.	vi
CHAPTER	
I. INTRODUCTION	1
Statement of the Problem.	1
Importance of the Problem	2
Limitations of the Study.	6
Definitions of Terms.	8
II. REVIEW OF RELATED LITERATURE	10
Hypotheses.	59
III. METHODOLOGY.	64
Design.	64
Subjects.	65
Description of Training Program	66
Description of Tests.	67
Administration of Tests	79
IV. RESULTS.	83
Cardiovascular Fitness.	84
Need for Achievement.	86

CHAPTER	Page
Self Concept.	88
V. DISCUSSION	104
VI. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS . . .	109
Conclusions	111
Recommendations	113
REFERENCES.	115
APPENDIX.	122

LIST OF TABLES

Table		Page
1.	Distribution of Subjects on Twelve Minute Test.	67
2.	Summary of Analysis of Variance for Ohio State University Step Test	85
3.	Summary of Scheffé Test for Ohio State University Step Test	85
4.	Summary of Analysis of Variance for Need for Achievement	87
5.	Summary of Analysis of Variance for Self-Criticism Scores.	89
6.	Summary of Analysis of Variance for Total P Scores	90
7.	Summary of Analysis of Variance for Identity Scores.	91
8.	Summary of Analysis of Variance for Self-Satisfaction Scores	92
9.	Summary of Analysis of Variance for Behavior Scores.	93
10.	Summary of Analysis of Variance for Physical Self Scores	94
11.	Summary of Analysis of Variance for Moral-Ethical Self Scores.	95
12.	Summary of Analysis of Variance for Personal Self Scores	96
13.	Summary of Analysis of Variance for Family Self Scores	97

Table	Page
14. Summary of Analysis of Variance for Social Self Scores	98
15. Summary of Analysis of Variance for Total V Scores	100
16. Summary of Analysis of Variance for Column Total V Scores.	101
17. Summary of Analysis of Variance for Row Total V Scores	102
18. Summary of Analysis of Variance for Distribution Scores.	103

CHAPTER I

INTRODUCTION

The current emphasis on cardiovascular fitness is indicative of the priority which has been placed on physical well-being as a national goal. This emphasis has been responsible for much of the research currently devoted to the investigation of the various aspects of cardiovascular fitness. Questions concerned with the acquisition, maintenance, and health value as well as the measurement of cardiovascular fitness have been the focus of much of the present investigative concern. An area which by comparison has received relatively little attention, however, has been the psychological aspect of cardiovascular fitness. Yet in spite of this relative lack of research interest, psychological benefits continue to be claimed as a significant outcome of participation in physical activity programs including cardiovascular conditioning programs.

Statement of the Problem

The purpose of this study was to determine if significant changes in cardiovascular fitness would be paralleled

by significant changes in selected aspects of personality. In addition, the effect of knowledge of such cardiovascular changes as had occurred on selected aspects of personality was investigated. The selected aspects of personality under consideration were self-concept and need for achievement.

The main questions which the study attempted to answer were: (1) Would a significant change in cardiovascular fitness occur as a result of participation in the aerobics training program used for the study? (2) If a significant change occurred in cardiovascular fitness, would this change be paralleled by a significant change in an individual's need for achievement? (3) If a significant change occurred in cardiovascular fitness, would this change be paralleled by a significant change in an individual's self-concept? (4) If a significant change occurred in cardiovascular fitness, would the introduction of information concerning the physiological changes which had occurred influence a significant change in an individual's need for achievement? (5) If a significant change occurred in cardiovascular fitness, would the introduction of information concerning the physiological changes which had occurred influence a significant change in an individual's self-concept?

Importance of the Problem

Fitness for effective living is a significant concern in society today. The nature of fitness involves a consideration of the emotional, intellectual, and physical variables

which vary in relative importance among individuals and their respective life styles.

Throughout the history of education from the time of the ancient Greeks to the present, physical fitness and physical training have occupied a significant place in the educational objectives of a variety of civilizations. The conceptual nature of physical fitness has changed little during this period of time. Thus, while scientific and technological advances have permitted a more precise view of physical fitness, the concept is still considered to be an integral aspect of total fitness.

The present concern for physical fitness is well-documented. The high rejection rate of potential draftees, the increasing incidence of cardiovascular disease, and the findings of comparative studies of American and foreign youths are some of the primary causes for concern. In addition, the philosophic nature of a nation's concern with fitness and strength, as documented throughout the history of physical education, suggests that physical fitness programs will continue to receive support through physical education programs.

Bohanon (Cooper, 1969, p. 9-10) has stated that while the term "fitness" has been ill-defined and applied to a variety of physical conditioning programs it may be considered as a desirable state for anyone who wants to lead an active and productive life. The point is often made in discussing

physical fitness that in the absence of debilitating disease, longevity is more likely dependent on the capability of the cardiovascular and respiratory systems to withstand the stresses of modern living than upon the strength and tone of skeletal muscles. This interpretation has generally been supported by research efforts concerned with the effect of heavy muscular work on the body's ability to react to stressful situations. Such a view has led to the development of physical fitness programs designed to improve and maintain high cardiovascular function. While significant contributions have been made regarding the effects of such programs on the body, the knowledge is far from complete.

The use of any system of instruction for educational purposes quite logically encourages as complete an understanding of the nature of the program as is possible. While the general theory that physical activity is of importance to both psychological and physiological development seems tenable, the vagueness of the term prohibits a definitive statement of support.

The increasing demands being made upon the relatively small amount of school time available for instruction emphasizes the need for a more complete understanding of the effects of educational programs. Thus, while presently available evidence would seem to support the strength and endurance value of physical fitness activities, there does exist a need to determine the specific role that these

activities play in psychological development. In addition, there is a need to specifically identify both the activity as well as the aspects of development under consideration.

The choice of cardiovascular fitness as the physical activity to be investigated was made due to the present educational and societal concern with this aspect of physical fitness. An eight week running program was considered the most desirable means of inducing changes in cardiovascular fitness because it most closely paralleled both the average amount of time as well as one of the popular means of fitness training currently employed in educational settings. The decision to investigate the effect of changes in cardiovascular fitness on self-concept and need for achievement involved a theoretical consideration of the desired outcomes of the activity. The desired results of cardiovascular fitness programs are generally stated in terms of better health, improved organic efficiency, and an increased endurance for the participants. Thus, as an initial investigation it seemed reasonable that the variables of need for achievement and self-concept be investigated as possible manifestations of personality closely related to the physical health, efficiency, and endurance of the body.

In a professional sense, it seemed reasonable that physical education could only benefit from the resolution of questions concerning the psychological effect of physical activity. The continuing emphasis upon growth and development

as significant educational concerns further reinforces the need to understand the contribution various physical activities make toward these aspects of human life.

Limitations of the Study

There are recognized limitations in a study which involves the use of volunteer subjects. It is generally acknowledged that individuals who volunteer for physical training studies may do so for a variety of reasons. These reasons may be personal, medical, social or psychological in nature. Thus, in a study using volunteers, the possibility that the sample may not be representative must be considered.

Physical training studies may also represent a departure from the subjects normal way of living. This could influence changes in the normal pattern of living and produce effects which are not related to the training program. In addition, the effects of participation in a study may also have some effect on the performance of a control group not primarily involved in the experimental treatment.

The use of a relatively large group of subjects in a study concerned with the physiological effects of exercise quite logically entailed the need for a period of time devoted to training. It was hoped that the training program employed would be successful and the results would be indicative of its success. However, it was almost impossible to adequately control the life pattern of subjects in any of the

groups involved outside of the training and measurement periods. Thus, the possibility existed that the training program may have been intensified or obscured by the life patterns of the subjects involved in the study.

Another possible limitation was concerned with the effects of the experimental treatment. It was quite difficult to assess the actual limits of an individual in training. Thus, what may have seemed to be a maximal or honest effort on the part of the subject may in fact have been a performance influenced by psychological as well as physiological factors. The selection of the Aerobics program for training and the Ohio State University Step Test to evaluate the physiological effects of training was made in an attempt to circumvent this limitation. However, especially during the training program, the nature of the design used for this study made the motivation as well as the assessment of performance quite difficult.

A portion of this study was concerned with the effect of knowledge of the results of the training program on the variables need for achievement and self-concept. The design of the study was so constructed as to disguise the measurable aspects of training for the experimental groups as much as possible. It would have been facetious, however, to have assumed that individuals involved in a running program would not be somewhat aware of the fact that their condition should improve or that their performance was improving. Therefore,

the possibility that the desired conditions for each of the groups involved in the study may not have been fully achieved was considered as a possible limitation of this investigation.

The limitations inherent in a study which makes use of indirect measures of the variables under consideration were recognized. It was acknowledged that the results of personality measures may sometimes be due to variables other than those purported to be measured.

A final limitation was concerned with the method employed to obtain pulse rates during the submaximal testing period. The manual counting of rapid pulse rate is considered to be a fairly inefficient method even when trained individuals are involved in the counting. Thus, the results of the physiological test may have been influenced by this method of assessment.

A consideration of these limitations suggested that the results of this study were primarily limited to those subjects who participated in the experiment and the conditions under which they did so. Any generalizations beyond the specific conditions of the study should take these limitations into consideration.

Definition of Terms

Definitions of the key concepts under consideration in the study were:

- 1) Cardiovascular fitness: Relates to the

efficiency of the cardio-respiratory system.

The primary responsibility of the system is the maintenance of a constant environment for the cells of the tissues.

- 2) Cardiorespiratory system: Includes the systems of the body whose primary function is the transport of oxygen and carbon dioxide. The heart and its circulation, the vascular system, the blood, and the lungs and air passageways are those structures involved in this transport which are designated the cardiorespiratory system.
- 3) Self-concept: The organization of what the individual seems to be to himself. It is an organization within the individual's perceptual or phenomenal field and not open to direct observation.
- 4) Need for achievement: The transformation of an existing, unsatisfying situation in a certain direction. The concept refers to the mind's action to cause or attempt to cause this transformation.

CHAPTER II

REVIEW OF RELATED LITERATURE

The physical basis of personality manifests itself in a variety of ways. The dependence of neurological and endocrine functions upon the regular functioning of the human body is one example. Another is the social image of the ideal masculine model in society as a physique, large and strong in stature.

In 1931, Schneider (Nash, 1931) wrote that at the time much of what was known of the influence of exercise on constitutional vigor was an undeniable as it was undefinable. Today, the importance of physical activity is still widely acknowledged as being important to physical and psychological development, however, the influence of exercise still remains as undeniable as it is undefinable. This is especially true in respect to the influence of exercise on personality development (Cooper, 1969).

The holistic approach to the study of personality has been pursued with varying degrees of interest and intensity from the time of the ancient Greeks. The physiological studies by W. B. Cannon and others prior to 1930, renewed

modern concern for the larger patterns of behavior involving mind-body relationships as an interpretation of behavior (Patty & Johnson, 1953).

There are an endless variety of definitions of personality available. Krech and Crutchfield (1948) described personality as the pattern or relative importance of the various modes of adjustment to tension which are unique to the individual. Allport (1961) assessed personality as those psychological systems dynamically organized within the individual that determine characteristic behavior and thought. Personality has also been described as that which permits prediction of what a person will do in a given situation (Cattell, 1950).

The impact of Freud on the evolution of personality theory is well documented. Freud assumed that all men had the same set of instincts: survival, sexuality, and death. He felt that these instincts exerted a general influence on all functioning. Freud discussed personality development in terms of five stages of the sexual instinct: the oral, anal, phallic, latency, and genital. In addition, Freud felt that the outlines of personality were fixed in early childhood and that nothing of real developmental importance happened after age five (Maddi, 1968).

On the other hand, the results of various longitudinal studies since Freud have suggested that radical changes in personality do occur after childhood (Maddi, 1968). Thus,

while Freudian theory is by no means empirically rejected, there does seem to be more supportive evidence for the view that psychological and personality growth occur throughout life.

The term "trait" has been used in a variety of ways as an attempt to explain behavior. Descriptively, traits have been used as a reference to the differences in behavior between individuals in observable, controlled situations. Traits have also been viewed as personality constructs, created to account for behavioral consistencies or differences which are found to exist. Finally, traits have been conceptualized as underlying characteristics or psychological realities which do exist in people and are also capable of causing behavior (Mischel, 1968).

The theory of personality traits has evolved through the observation of behavior. In this respect, traits have been viewed as a dualism, existing in some tangible form in the person and also as a possible cause of behavior (Allport, 1966; Cattell, 1950).

Allport (1931, p. 268) made the following assertions about traits. He said that a trait:

1. Has more than nominal existence.
2. Is more generalized than a habit.
3. Is dynamic, or at least determinative, in behavior.
4. May be established empirically.
5. Is only relatively independent of other traits.
6. Is not synonymous with moral or social judgement.

7. May be viewed either in the light of the personality which contains it, or in the light of its distribution in the population at large.
8. . . . Acts, and even habits, that are inconsistent with a trait are not proof of the nonexistence of the traits.

Allport (1937) also stated that traits cannot be directly observed but instead are inferred. Thus, traits are observed through the acts which represent them.

McClelland (1963, p. 216) defined a trait as: " . . . the learned tendency of an individual to react as he has reacted more or less successfully in the past in similar situations when similarly motivated."

Guilford (1959) discussed personality as the composition of a unique pattern of traits. Accordingly, these traits were subdivided into four modalities: soma, motivation, aptitude, and temperament.

In Guilford's frame of reference, the somatic modality included physiological and morphological traits related to organic function and physical structure. The motivation modality included the traits of needs, interests, and attitudes. The aptitude modality referred to those traits which make up an individual's disposition.

While the results of trait analysis have largely been a function of the personality theory under which the investigation has taken place, it is generally agreed that the process has allowed for a better understanding of personality (Patty & Johnson, 1953). Trait classifications, such as

Guilfords have allowed for a simplified observation of individual behavior.

In general, observations of the acts which represent traits have indicated that traits differ in degree rather than kind from person to person (Singer, 1968). The view that traits are modifiable stems primarily from the observation that the stimulus for behavior is rarely ever exactly the same. Thus, while traits, in general, may be regarded as stable and consistent throughout life in terms of overall behavior patterns, this stability and consistency should not be thought of as being static (McClelland, 1963).

The degree to which personality may be modified seems to be a function of traits involved in the modification process. It is generally acknowledged, by those who feel personality can be modified, that the modification rate of separate traits is subject to their susceptibility to change (Singer, 1968).

Much of what has been claimed as a beneficial developmental effect of sport participation or physical education on personality remains largely a matter of conjecture. Though the literature is replete with studies involved with various aspects of the question, their results have generally been inconclusive.

Singer (1968) suggested that studies of sport and personality be classified into four areas of interest:

- 1) activity interests and personality; 2) the effect of

sports participation on personality; 3) success in sport and personality; and 4) social status and athletic accomplishments.

Activity interests and personality. The question of whether all individuals are interested in the same sports or sports at all has been the basis for a variety of investigations. These studies have attempted to determine the influence of personality on sports selection and participation.

Fauquier (1940) studied the attitudes of aggressive and submissive boys in an attempt to determine if they had different attitudes toward athletics, and the way in which athletics served their individual needs. The results of the study indicated that play habits are reflective of an individual's make-up.

Thune (1949) constructed a personality inventory to compare one hundred Y.M.C.A. weightlifters with one hundred athletes who were not weightlifters on personality and attitude measures. An analysis of the data indicated that the weightlifters were shy, lacked confidence and were very concerned about their appearance, while the non-weightlifters did not exhibit such traits as a group.

Johnson (1949) explored the relationship of emotion and competitive physical activities. The results of the study indicated that there was a difference in pre-contest emotion of football players and wrestlers.

La Place (1954) attempted to determine whether specific personality traits were associated with success in achieving major league status in baseball. The Minnesota Multiphasic Personality Inventory and a biographical sheet were administered to major and minor league players. An analysis of the data revealed that certain specific personality traits are associated with success in major league baseball.

Booth (1958), in a study involving college males, grouped the subjects into the activity classifications of athletes, non-athletes, sports groups, and competitors. The results of the study indicated a significant difference existed between the personality, as measured by the Minnesota Multiphasic Personality Inventory, of athletes and non-athletes. It was also found that personality differences existed between participants in individual, team, and combination sports activities.

While there is a great deal of evidence which indicates that personality does influence sport participation and selection, these results are far from conclusive. Keogh (1959) for example, classified college males on the basis of motor ability as measured by the Larson Test of Motor Ability. The California Test of Personality was administered in an attempt to determine if any relationship existed between personality and motor ability or athletic participation. No significant relationships were found between motor ability or athletic participation and the eighteen separate scales of the personality test.

Lakie (1962) administered five scales from the Omnibus Personality Inventory to two hundred and thirty athletes from four institutions of higher education. While finding significant differences among various athlete groups within a particular institution, Lakie found no significant differences among the athletes when they were grouped by sport but irrespective of school. The study concluded that group differences within a particular institution may be a function of recruiting or training practices.

The ability to differentiate between athletes of various sports through the use of psychological and motor tests has obvious implications for motor counseling and athletic recruitments. Kroll (1967) pursued this line of reasoning in a study of collegiate wrestlers who were grouped according to their quality or level of athletic achievement. No significant differences were found between the groups tested on any of the personality measures.

Kroll, in discussing the results, suggested several possible explanations of the way in which personality factors may be linked to athletics. The alternatives suggested were: 1) personality factors exist prior to sport participation and motivate the individual to choose a specific activity, and the individuals who possess the stronger combination of factors are the most successful; 2) that no personality pattern exists to influence the choice of an activity, but that certain personality patterns are more susceptible to

the influence of the activity and thus become successful; 3) that the possession of dissimilar non-discriminant patterns is common to both veterans and novices; and 4) that all participants enter an activity because of similar motivation patterns but that after entry, continued participation and success is a function of individual patterns.

Cooper (1969), in a review of empirical work concerning athletics and various personality variables, found that athletes exhibited a greater motivation to achieve than non-athletes. In addition, Cooper reported that athletes seemed to exhibit greater social adjustment, ascendancy, and higher emotional stability. The review urged continued investigation of the role of physical activity on both physical and psychological development.

Brunner (1969) attempted to determine the extent to which personality and other factors influenced adult participation in vigorous physical activity. The subjects for the study were an exercise group of post-school males participating in a voluntary exercise program, and a matched group of non-participating males. The Adjective Check List and a questionnaire were used to measure personality and other factors. The results of the investigation indicated that significant differences between the two groups existed on eight of twenty-four Adjective Check List scales. It was suggested that information of the effects of exercise be made more readily available, especially to youngsters.

Physical activity and personality change. The hypothesis that the activity in which an individual participates can cause a change in personality is related to the supposition that individuals choose activities on the basis of certain personality traits. Physical educators and athletic directors have long suggested the positive influence of participation in physical activities on personality development. Scott (1960b), in a review of the literature concerning the contributions of physical activity to psychological development, suggested the existence of a positive relationship between the emotion of well-being or feeling good and participation in physical activity.

Watson (1938) contended that no one could guide physical education activities and not be involved in guiding personality adjustment. He felt that athletics and physical education were closely related to emotional and social as well as physical adjustment.

Sperling (1942) attempted to determine the relationship between personality adjustment and achievement in physical education activities among college males. Statistically reliable differences were reported for athletes as opposed to non-athletes. A major weakness in the study was noted by the investigator, which had implications for similar research. It was pointed out that the inability of the study to determine if personality differences found were due to choice of activity or participation was a serious limitation.

Jones (1944) found that one of the chief sources of social esteem, among boys prior to maturity, was competitive athletic skill. The study concluded that in addition to athletic proficiency being a peer value, the variables of strength and physical ability are closely related to such favorable traits as activity, aggressiveness, and leadership.

A case study of strong and weak adolescent boys yielded results which tended to confirm the relationship of physical ability to social adjustment. The findings indicated that strength seemed to be associated with a good physique, physical fitness, early maturation, social prestige, and had social stimulus value and an apparently satisfactory level of personal adjustment (Jones, 1946).

Weber (1953) studied the relation of physical fitness to academic success and personality using two hundred and forty-six freshmen as subjects. The results of the study indicated a significant relationship between physical fitness scores as measured by the Iowa Physical Efficiency Profile and the nine measures of personality of the Minnesota Multiphasic Personality Inventory score. It was concluded that the physically fit have no more stable personality traits than the physically unfit.

In an investigation of a group of athletes who won and a group of athletes who did not win varsity letters, Bentson and Summerskill (1955) attempted to determine the effect of athletic success or failure on certain aspects of

personal adjustment. They concluded that success in inter-collegiate athletics did not have a generalized effect on adjustment. It was also concluded that success in inter-collegiate athletics is related to attitudes about athletics and self.

The hypotheses that beneficial changes do occur because of athletic participation, or that athletes differ from non-athletes in a positive direction on desirable traits were investigated by Schendel (1965). Athletes and non-athletes at three educational levels were studied: ninth, twelfth, and college using the California Psychological Inventory as a measure of psychological characteristics. The results of the study indicated that there were specific differences between athletes and non-athletes at the three educational levels. However, the direction of these differences, as to positive or negative, varied with the educational level.

Tillman (1965) investigated the relationship between physical fitness and personality characteristics of high school junior and senior boys. Significant differences were found between personality traits of the top fifteen and bottom fifteen percent of the boys involved in the training program. However, the experimental group differed from the control group on only one personality trait out of twenty-eight, as measured by the Cattell Sixteen Personality Factor Questionnaire, A-S Reaction Study, and Kuder Preference Record.

Significant differences between the physical fitness of the experimental and control groups were found.

In a study of the effects of athletic participation at the United States Military Academy, it was found that a significantly greater proportion of athletes than non-athletes graduated from the academy. Werner and Gottheil (1966) investigated this finding in an attempt to determine the effects of four years of athletic participation at the academy on the personality of participants, as measured by the Sixteen Personality Factor Test. The results of the study indicated that individuals who were previously non-participants, after four years of participation in collegiate athletics, did not change in personality structure.

Johnson, Fretz, and Johnson (1968) investigated the effect of a physical development program on the self-concepts of exceptional children. The results of the study indicated that an individual physical development program could be of significant value for children. The discrepancy between self and ideal-self concepts showed a significant decrease only in respect to height. However, significant changes also occurred in self-concepts in interpersonal relations with the clinician and with parents and family.

Psychophysical factors. The suggestion that physical illness alters the body image of the affected person and thereby affects his emotional well-being has some positive implications. The corollary to such a hypothesis might be

that improvement in physical health alters the body image of the affected person and thereby affects his emotional well-being in a positive manner.

Jones (1933), in his review of the research pertaining to relationships between physical and mental development, made the following conclusions. First, attempts to correlate physical size with intelligence were too low to be of practical importance. Second, relatively little had been done in regard to the investigation of the relationship between physical size and other mental traits besides intelligence and school achievement. And third, that any comparisons between body build and intelligence and other mental factors would have to await a more extensive investigation before meaningful conclusions could be made.

The results of research concerned with the nature of the relationship of desirable physical and mental characteristics have generally been positive, though not significant. Jones responded to this finding by suggesting that while group correlations between variables yield low, positive correlations, the possibility that significant relationships may occur in individuals should be considered. Jones suggested that future research efforts delve into the processes of physical conditioning rather than attempting to deal solely with the end product of the process.

In a subsequent review, Jones (1939) dealt with

investigations pertaining to physical condition and mental development. In general, efforts to determine significant relationships between physical fitness and intelligence were termed unsuccessful.

Continued investigation of the relationship between mind and body also produced a variety of investigations concerned with somatotyping. Improved techniques of body classification gave additional impetus to these efforts.

Fiske (1944) somatotyped boys, according to Sheldon's procedure for the classification of physiques, in an attempt to determine if certain psychological and intellectual variables were related to physique. No significant correlations were found between physique and any of the personality or intellectual variables.

Fiske's results were in agreement with most other investigations of a similar nature. Thus, new areas of relationship between body and mind were looked to as an explanation of what was felt to be an observable phenomenon.

The thesis, that an individual's attitudes toward his body are of crucial importance to any comprehensive theory of personality, has been advanced (Secord & Jourard, 1953). Secord and Jourard attempted to develop a method for appraising the feelings of an individual toward his body. They also hoped to determine whether or not variables derived by this method were significant for personality theory.

The results of the study indicated that feelings about the body are related to feelings about self. In addition, it was found that low satisfaction with the body was associated with anxiety about the body and insecurity.

Investigations of the effect of illness on an individual's image of his body have some interesting if-then conclusions for individuals concerned with the positive effects of exercise. Schwab and Hamerling (1968) found that medical patients expressed most dissatisfaction with bodily parts affected by disease and were dissatisfied with many parts of the body, as well as its function.

Self-concept. The concept of self is recognized for its importance as a contributing determinant of personality, and ultimately the way in which a person reacts with his environment. The concept an individual has of himself is perhaps one of the most important ideas related to his life (McClelland, 1963).

Rogers (Koch, 1959) viewed self-concept as a term likely to be used to describe an individual's view of himself. Primarily for research purposes, Rogers defined self-concept as a conscious gestalt or perception. Ideal self was used to denote the self-concept which the individual would most like to have.

The concept of self was one of the central constructs in Rogers' theory of personality and therapy. Research and clinical findings of violent fluctuation in the self-concepts

of individuals experiencing change through therapy led Rogers to conclude that self-concept must play some role in the influencing process by which the individual could screen out unpleasant conscious experiences.

Rogers' theory of therapy and personality change was based on the proposition that if certain conditions existed then a process would occur causing certain personality and behavioral changes. This theory would seem to be in agreement with research findings which suggest that the self-concept an individual has of himself is highly influential in determining his behavior, as well as being related to his general personality and mental health.

Chodorkoff (1954) hypothesized that adequate personal adjustment was a reflection of high agreement between an individual's perception of himself and how he was perceived by others. Adjustment to reality has also been interpreted as an individual's ability to distinguish between his real self or what he considers to be his real self, and his ideal self or what he hopes to be (Harsh & Schrickel, 1959). In either case, self-concept has been viewed as an important variable in personality dynamics. Change in self has commonly been anticipated as one of the significant outcomes of therapy.

Similar comparisons have been made in terms of somatic and physiological variables and their impact on an individual's self-concept. The general feeling has been that an individual must have a realistic conception of his body, as well as his

physical limitations, to develop in a well-adjusted manner (Harsh & Schrickel, 1959).

The need for a standardized, widely applicable multi-dimensional instrument to measure self-concept has been emphasized by the increasing use of self-concept for behavioral research. The Tennessee (Department of Mental Health) Self Concept Scale was developed as an attempt to meet this need.

The Tennessee Self Concept Scale allows the subject to portray a picture of himself through the use of self-descriptive statements. The Scale consists of one hundred of these self-descriptive statements and has a wide range of application, both in terms of age as well as psychological adjustment. The manual accompanying the Tennessee Self Concept Scale states that it can be used with individuals or groups age twelve or higher with at least a sixth grade reading level. The instrument is applicable to a wide range of psychological adjustment, from the well-adjusted to the psychotic.

The Tennessee Self Concept Scale is accompanied by norms drawn from a sample of the United States population. The sample is not representative of the population in terms of its national composition. however, results of studies involving various segments of the population have not produced norms which differ significantly from those accompanying the manual (Fitts, 1965).

The development of the Tennessee Self Concept Scale is recent enough so that extensive validation findings are not available. However, the test manual does suggest that the Scale has validity in four areas. They are: 1) content validity; 2) discrimination between groups; 3) correlation with other personality measures; and 4) personality changes under particular conditions (Fitts, 1965).

Content validity for the Tennessee Self Concept Scale is based upon the method used to select the items for the test. Seven clinical psychologists were employed to judge the content of the items, and those items reflecting one hundred percent agreement by the judges were retained.

While the Tennessee Self Concept Scale has been shown to be effective in discriminating between various personality groups, it is noted that certain scales are more effective for this purpose than others. Those scales which do not seem particularly effective for this purpose are: 1) the self-criticism score; 2) column total variability; 3) the distribution score; and 4) the number of "1" responses. Included among the groups which the Scale has shown the ability to discriminate between are delinquents and non-delinquents, alcoholics and non-alcoholics, and paratrooper and non-paratrooper soldiers (Fitts, 1965).

Research findings suggest that the Tennessee Self Concept Scale is sensitive to changes in behavior due to significant experiences. Ashcraft and Fitts (1964) reported

a significant change on eighteen of the twenty-two scales for individuals involved in a six month therapy program.

Need for Achievement. The need for achievement has been recognized as a significant socio-psychological variable. McClelland (1963) categorized need for achievement as the goal of a variety of responses, or a motivational concept. Thus, borrowing an example from McClelland, a high need for achievement may be characterized behaviorally as studying hard for examinations, working long hours, or being sensitive to criticism from others (McClelland, 1963).

Need for achievement was defined by Murray (1938) as the transformation of an existing, unsatisfying situation in a certain direction. Murray's definition referred to the action of the mind to cause or attempt to cause this transformation.

Prior to Murray's use of the variable "need for achievement," the concept of achievement motivation had been explored as a psychological variable in the educational and occupational activities of adults. Lewin and Adler emphasized achievement-motivation as a central need (DeVos, 1968).

Level of aspiration represented achievement-motivation in Lewin's work. The level of aspiration referred to subsequent levels of performance anticipated by an individual who had previously performed a task. The focus of the level of aspiration was on the discrepancy

between previous performance and expected subsequent performance (Worell, 1959). In addition, level of aspiration was not viewed as a unitary concept. The work of Lewin and others conceptualized it in a much broader context.

The emphasis on achievement-motivation or need for achievement has received increased attention in both psychological and sociological research. The cross-culture research of David McClelland has done much to stimulate this interest.

Need for achievement may encompass a variety of responses which appear to have little in common. However, the similarity of the responses is subordinate to their relationship to the goal or common end. Consequently, the responses working long hours and sensitivity to criticism may appear to have little in common with each other but their relationship to the goal need for achievement characterize them as need responses.

Murray and his colleagues were responsible for the development of several techniques designed to investigate personality on the basis of needs. The efficacy of these techniques is best demonstrated by the fact that some, such as the Thematic Apperception Test, are still widely used.

Murray and his staff provided personality research with a list of needs which were compiled through an intensive investigation and observation of a small group of college males. The fact that these subjects were not disturbed

people but gifted undergraduates represented a somewhat different investigative approach to personality research in itself. The list of needs which this group compiled have provided the basis for a variety of peripheral considerations of personality.

Fantasy techniques, such as the Thematic Apperception Test, attempt to elicit responses from individuals through the use of vague or incomplete stimuli. The judgement of responses by the investigator gives an insight into the individual's personality.

Fantasy measures of need for achievement have often been criticized for their lack of control and subjective measurement techniques. However, correlational work attempting to determine the predictive power of fantasy measures of need for achievement has yielded significant findings in the area of life patterns and actions of individuals.

High or low need for achievement has been shown to have social and intellectual significance. In addition, high need for achievement has frequently been associated with middle class Americans. The high need for achievement group has been characterized as having better memory for incomplete tasks which must or must not be completed, being more likely to volunteer for psychological experiments, more active in civic and collegiate functions, more likely to choose an expert over friends to work on a difficult problem,

and most resistant to social pressure to conform (Maddi, 1968).

In work situations, it has been shown that individuals with a high need for achievement do better than individuals with a low need for achievement. French (1955) obtained results with individuals under instructional conditions which indicated that while people low in need for achievement did somewhat better on the task involved, their motive was quite possibly getting out of work.

Winterbottom (1958) investigated the relationship of need for achievement and socialization in American culture. She found that mothers of boys high in need for achievement continually emphasized the importance of the child's ability to care for himself and make decisions for himself at a much earlier age than mothers of low achievers.

McClelland (1958) reported that individuals high in need for achievement are more likely to take moderate risks in a ring toss game while persons low in need for achievement will take either large or small risks. Atkinson and Litwin (1960) in a similar study investigated the effect of the variables need for achievement and anxiety on performance. Their findings suggested that both variables have some significance for successful performance.

McClelland (1961) found that while training involved in achievement orientation may include independence, mastery, and caretaker training, cross-cultural correlations with

need for achievement showed only variations in mastery and independence training to be of importance.

Singer (1968) offered the view that the evidence available suggested that while need for achievement may not be strong enough to insure proficiency in an activity, it may exert a strong influence in the choice of activity.

Any discussion of need for achievement must take into account the findings of McClelland's study concerned with the effect of the need for achievement level of a nation on its economic development. The results of this study, using the world as its frame of reference, tend to support the results of earlier studies involving need for achievement in a different concern. The results of the study indicated that the level of need for achievement does influence the economic development of a country. It was also found that need for achievement is not influenced by a country's level of economic status (McClelland, 1961).

The influence of Murray's peripheral theory on the development of tests to assess personality may be due to a variety of factors. Maddi (1968) suggested that the popularity of Murray's needs may be a function of their common-sense appeal and the care which was taken in defining them.

Empirical investigations of personality based on Murray's need theory have generally employed a self-description format as a means of eliciting responses from individuals. Invariably, such efforts have had to come to grips with the

social desirability of the various statements included in the inventory.

The Edwards Personal Preference Schedule represents an attempt to measure fifteen personality variables which have their origin in Murray's list of manifest needs. The instrument also represents an attempt to control or minimize the influence of social desirability in responses to the statements. Maddi (1968) stated that it may be reasonably concluded that the existence of many of Murray's concrete peripheral characteristics were demonstrated empirically in Edwards test.

Validity data reported in the 1959 Manual (Edwards, 1959) is meager. An internal consistency of .74 is reported for the need for achievement variable. The split-half correlation for test-retest reliability after one week is also reported as .74 for the same variable. Reviews of the Edwards Personal Preference Schedule have expressed a general concern for the lack of attention devoted to validity and validation procedures in the Manual (Buros, 1965).

The reliability of the Edwards Personal Preference Schedule has been reported to be comparable to that of other personality inventories (Buros, 1965). Some of the scales contained in the Schedule are suspect, however, due to low reliability. Stricker (Buros, 1959) suggested that reliability coefficients reported in the Manual may have been inflated because of memory factors due to the short time period

(one week) between test periods. Stricker also stated that in most cases the Edwards Personal Preference Schedule Achievement scale was not significantly related to other measures of achievement. Comparisons with the Thematic Apperception Test yielded only one study of five reporting a significant correlation of .20. In another study only one of four groups yielded a significant correlation between the French Test of Insight and the Edwards Personal Preference Schedule, while two other studies involving the same tests found no significant correlations (Buros, 1959).

The lack of correlation between tests could be the result of measurement technique. Differences may be a desirable finding if the instruments are in fact measuring different aspects of the achievement variable. Such findings of difference or lack of correlation between personality tests are not uncommon.

Singer (1968) listed the Edwards Personal Preference Schedule as one of the more popular instruments used for making personality inventories in physical education. He concluded that need for achievement did not appear to be a significantly powerful trait in terms of insuring proficiency, but that this did not detract from findings of studies which have indicated that successful athletes have a higher than average need for achievement.

Cardiovascular Fitness. Diseases of the heart and blood vessels are the most prevalent cause of death in

America today. Together, these various disorders are responsible for over fifty-four percent of all deaths each year in the United States. In addition, estimates indicate that over twenty-five million Americans of all ages have some form of coronary ailment (Phibbs, 1967).

Coronary artery disease is a product of the so-called European-American type of civilization. The problems the disease poses to the civilized world are among the most crucial facing mankind. The primary cause of the disease seems to be the tense, overfed, underexercised, cigarette smoking life many individuals are intent on living.

It has long been contended that exercise has a therapeutic as well as a preventive value for circulatory diseases. The results of a variety of epidemiological studies have supported the hypotheses that an inverse relationship exists between physical activity and the incidence of circulatory diseases.

Morris and Crawford (1958) examined the autopsy reports of thirty-eight hundred non-coronary heart disease deaths, and found evidence which indicated that heart disease was inversely related to hard work. They also found an incidence of approximately three times as many myocardial infarctions among men engaged in less taxing occupations.

In another study, Morris and his associates (Dow and Hamilton, 1963) compared the death certificates of twenty-one thousand bus drivers and conductors. The results

of the study showed that the bus drivers had a higher incidence of heart disease. The difference was attributed in part to the physical exercise involved in performing the duties of a conductor.

This same group of investigators obtained similar findings from investigations involving postal clerks and postmen. Other reports of a similar nature have dealt with comparisons between railway clerks and switchmen, and railway clerks and maintenance track-laying crews. The results of these studies also showed that those in a sedentary occupation had a higher incidence of heart disease.

While much remains to be known about the actual therapeutic value of physical activity, it is generally acknowledged that regular physical exercise promotes the general health (Cooper, 1968; deVries, 1969). In addition, physical inactivity has consistently been identified as a significant variable related to the incidence of atherosclerosis and related circulatory diseases.

Physical fitness involves the consideration of a variety of factors. The common tendency to discuss physical fitness in general terms has led to much of the controversy and uncertainty associated with the concept. As Morehouse and Miller (1967, p. 263) stated: "fitness implies a relation between the task to be performed and the individual's capability to perform it." It should be emphasized that fitness does not describe a state of health, but rather the ability to perform a task.

deVries (1969) identified endurance as one of the more important aspects of physical fitness. He termed it a reflection of the functional health of many of the physiological systems of the body most closely related to an individual's general health.

Bohannon (Cooper, 1968) emphasized that present evidence seemed to indicate that longevity in the absence of disease was ultimately dependent on the ability of the cardiovascular and pulmonary systems to withstand the stresses of modern living. However, investigators involved in the analysis of endurance have found it difficult to relate specifically to one system of the body independent of other systems. The basic physiological interaction of the body's systems dictates that any separation of these systems be an artificial one, made in the interest of achieving a situation through which increased understanding may be gained (deVries, 1969).

As a component of physical fitness, cardiovascular endurance is generally interpreted as an indication of the functional ability of the circulatory system under the stress of strenuous activity. Fleishman (1964) identified two types of endurance related to physical fitness. Cardiovascular endurance was said to be measurable only by prolonged exertion of the whole body.

deVries (1969) discussed cardiovascular endurance as circulorespiratory or general endurance. He explained

that the nature of general endurance involved a variety of systems of the body in an interaction which ultimately established the outer limits of performance.

In terms of its application to the general population, it has been advantageous to refer to cardiovascular endurance as a general type of endurance related to a variety of tasks involved in everyday living. Such a definition implies that an individual should maintain a level of fitness which allows him to carry out his normal activities, cope with emergencies, and enjoy physical recreation without undue stress (Morehouse & Miller, 1967).

The basic principles involved in the improvement of physical fitness may be applied to the improvement of cardiovascular fitness as well. These are generally referred to as the principles of overload and progression.

Heart and circulatory function is devoted to the maintenance of homeostasis in the body. The fact that in most exercise situations the ability to utilize oxygen and tolerate an oxygen debt is considered to be a limiting factor of performance, emphasizes the role the circulatory system plays as an integral part of the oxygen transport system of the body.

The basic procedure for improving cardiovascular endurance thus entails a continuous stressing of the body by subjecting it to progressively increasing workloads. The resultant effect is a response by the body to meet the challenge

of the increased metabolic demands of the overload. Ultimately, improvement in the body's ability to meet the challenge takes place and this is what is commonly known as the desired or training effect of exercise.

The overwhelming evidence indicates that the exercise heart rate must be increased an appreciable degree beyond the normal heart rate before improvement will occur (deVries, 1969). This factor, more than any other, has contributed to many of the misconceptions and controversies which are associated with endurance training.

The length of the work period needed to induce a training effect may range from repeated work periods of a few seconds duration to long, continuous work of an hour or more. The length of the work period and method of training used should be a reflection of the training effect desired as an outcome of the program.

For optimal training of the oxygen-transporting system, a submaximal tempo is recommended by most exercise physiologists. A submaximal tempo may be defined as training for aerobic power (deVries, 1969; Astrand & Rodahl, 1970).

When the metabolic demands of exercise are met aerobically, a steady-state condition is said to exist. Research evidence indicates that even light exercise loads cause a slight oxygen debt or lag in the body's ability to mechanically react to the situation. However, if the workload is light, oxygen available in the muscles and in the

blood is generally sufficient to meet the initial needs of the body until the heart and respiratory rate increase to the level needed to handle the situation.

Besides aerobic energy, the body also has anaerobic energy at its disposal to meet the demands of the overload. The anaerobic mechanism comes into play when the cardiovascular and respiratory systems are unable to supply sufficient oxygen to meet the energy demands of the workload.

Exercise which represents a true overload, in the sense that a steady-state cannot be achieved through aerobic processes, thus becomes increasingly dependent on anaerobic energy as the workload increases in duration. This usually involves maximal output by the individual to the point of exhaustion. The inability of the individual to aerobically meet the energy demands of the activity results in the accumulation of lactic acid as an end product of anaerobic metabolism.

The condition which exists when the oxygen uptake is insufficient to meet the exercise demands is commonly known as an oxygen debt. Oxygen debt is related to both the severity of the workload and the amount of anaerobic metabolism involved. Oxygen debt is, in effect, the cause of the recovery period when the body attempts to repay the debt it has incurred. For investigative purposes, it is important to note that the greatest part of the oxygen debt incurred is made up during the first few minutes of the

recovery period but that repayment of the total oxygen debt is usually a long term effect.

The importance which is attached to the improvement of maximal aerobic power as opposed to training to improve maximal anaerobic power is primarily due to the role these energy sources play in helping the body meet the daily needs of life. Maximal aerobic power is the primary determinant of endurance, and thus, may be viewed as a limiting factor in performance. Training for maximal aerobic power is therefore of importance to a majority of people (Morehouse & Miller, 1967; Astrand & Rodahl, 1970).

Maximal anaerobic power comes into play when the oxygen-transporting system is unable to successfully cope with the energy demands of the body. The emphasis which is placed on aerobic training does not detract from the important role anaerobic processes serve in the body. However, it is generally acknowledged that anaerobic power is primarily of concern to certain groups of athletes and other individuals who must make severe energy demands on the body. In addition, the strenuous training involved in anaerobic power development, both from a psychological and physiological standpoint, precludes its recommendation as a training program for most people (Karpovich, 1966; Morehouse & Miller, 1967; deVries, 1969; Astrand & Rodahl, 1970).

Physiologically, it is acknowledged that the demand of the body on the oxygen-transporting system varies directly

with the size of the active muscles. Thus, it follows that greater oxygen uptake is more likely to occur during dynamic rather than static exercises (Astrand & Rodahl, 1970).

There are, however, a variety of factors which must be considered in any evaluation of the maximal oxygen effect of an activity on various individuals. Motivation and stimulation, as well as technique and body position play important roles. This is quite possibly the reason that various studies of the amount of body involvement most advantageous to maximal oxygen uptake have tended to collectively produce inconclusive results (Astrand & Rodahl, 1970).

A consideration of the subjective factors involved in activity, such as localized feelings of pain or strain, and their psychological effect on performance supports the involvement of a larger muscular force in dynamic work. In addition, it appears that while cardiac output and oxygen uptake are not increased by additional muscle involvement, the efficiency of the body to utilize oxygen is increased appreciably (Astrand & Rodahl, 1970).

The ability of the body to utilize oxygen involves the consideration of a variety of physiological functions. All are related to the amount of endurance an individual possesses or his ability to maintain a steady-state. deVries (1969) listed lung ventilation, pulmonary diffusion, oxygen and carbon dioxide transfer by the blood, cardiac function, vascular adaptation and physical condition of the muscles

as some of the physiological functions related to maximal aerobic power.

A review of the functions involved in oxygen-transport identifies the circulatory system as a significant variable in the process. There is a high correlation between maximal cardiac output and maximal aerobic power. Thus, for exercise purposes, the heart and circulatory system are considered to be primarily a cardiorespiratory system whose main function is the transport of oxygen and carbon dioxide.

There are two types of circulation to be considered in terms of the oxygen transport function. These include the peripheral circulation which is primarily concerned with the training of specific muscles, and the central circulation which involves the training of as large a muscle mass as possible.

Maximal aerobic power is developed primarily through training of the central circulation which includes the heart and major vessels of the body. While inherited characteristics are the major limiting factor of an individual's maximal aerobic power, through training an individual may improve his maximal aerobic power on the average of from ten to twenty percent (Astrand & Rodahl, 1970).

It has been established that there is a high relationship between maximal cardiac output and maximal aerobic power. The dependence of muscle tissue on oxygen to maintain metabolic needs dictates that when aerobic and anaerobic

sources of power are exhausted performance will stop. An important factor to consider in this process is the heart muscle itself, in terms of its ability to provide oxygen to the skeletal muscles.

It is recognized that cardiac muscle extracts a relatively high level of oxygen from the blood even at rest. Thus, with maximal cardiac output viewed as a limiting factor of endurance, it is apparent that the flow of blood available to the heart and the efficiency of cardiac muscle in performing its work are of primary importance to maximal aerobic power.

The fact that the heart is a muscle allows the application of the training principles of overload and progression to improve its endurance and efficiency. Many of the desirable changes which occur in skeletal muscle through training also occur in cardiac muscle.

In general, the desired effects of cardiovascular training have included: (1) a decrease in heart rate for a given exercise workload, (2) an increased production at maximal heart rate, (3) greater stroke volume, and (4) an increase in the contractility of the heart. The value of training on cardiac output is evident at work as well as play, in terms of a slower heart rate and increased stroke volume. Thus, even though maximal heart rate does not appear to be increased by exercise, the efficiency of the heart does seem to improve (deVries, 1969).

The actual mechanism underlying the effect of exercise on the heart still remains unclear, due mainly to the complexity of the various body systems which are involved in physical activity. Much of what has been interpreted as a desirable effect of training on the circulatory system may, in fact, be due to the effect of exercise on other physiological functions related to the cardiovascular system under stress.

The area of most concern to physical education teachers, physicians, and lay people, however, has not been so much with the physiological processes involved, but primarily with the provision of adequate conditioning programs. It is unfortunate that most training programs and techniques have offered little to the non-athlete training for non-athletic performance situations.

The increased emphasis on physical fitness and its resultant impact on many people of various ages, occupations, and physical conditions has emphasized the need for more complete training programs for non-athletes. The work of Kraus and Hirschland (1953) did much to stimulate both the interest and the need for more adequate fitness programs. However, it remained for Dr. Kenneth Cooper to introduce a program which most closely met the program and evaluation needs of the majority of the people in the United States. Cooper's program of Aerobics involved the evaluation of more than five thousand subjects to learn more of the effects of

exercise on the body. The underlying purpose of this research was to develop an exercise program which would provide both a simplified means of evaluating physical fitness as well as a program to help people meet their individual needs. The research effort behind the Aerobics program represents a unique contribution to the field of exercise physiology. It has also brought about a clearer understanding of the beneficial health effects of activity by the general public.

While the primary concern of Cooper's work was to attempt to understand more of the physiological effects of exercise on the body, findings related to personality rehabilitation were impressive enough to be reported. Most noticeable among changes in personality were a loss of anxiety and the acquisition of the ability to relax. In addition, the subjects were said to have a better self-image and more confidence in themselves (Cooper, 1968).

The first significant finding of Cooper's work reaffirmed Fleishman's identification of two endurance factors in physical fitness. Cooper termed these categories muscular fitness and endurance fitness, with the latter of primary concern in regard to the body's ability to utilize oxygen.

The training effect of the Aerobics program is designed to increase maximal aerobic power by: (1) increasing the efficiency of the lungs to process air; (2) increasing the stroke volume of the heart; (3) improving the general

circulation of the body; (4) improving the tone of the muscles; and as a result (5) increase maximal oxygen consumption. Endurance fitness is identified as the goal of the program (Cooper, 1968).

Cooper laid down two basic principles in reference to when the beneficial effects of training begin. He stated:

If the exercise is vigorous enough to produce a sustained heart rate of 150 beats per minute or more, the training-effect benefits begin about five minutes after the exercise starts and continues as long as the exercise is performed. If the exercise is not vigorous enough to produce or sustain a heart rate of 150 beats per minute, but is still demanding oxygen, the exercise must be continued considerably longer than five minutes, the total period of time depending on the oxygen consumed.

The basis of these principles may be found in the earlier discussion of cardiovascular endurance relating to oxygen supply and demand. Summarizing, it was found that gas transport was regarded to be a limiting factor of performance by most physiologists. Gas transport was shown to be limited by cardiac output, vascular dynamics, and the capacity of the blood to carry oxygen (deVries, 1969; Astrand & Rodahl, 1970).

Previous investigations also found the overload of large muscle mass to be the most advantageous way of achieving a training effect on the circulatory system. However, while these studies found that an overload of approximately sixty percent of the maximal heart rate was the desired level for

a training effect to occur, this information did little to aid in the aerobic evaluation of various physical activities. In addition, the great majority of studies concerned with training and cardiovascular endurance were done with relatively small, non-random samples (deVries, 1969).

The Aerobics exercise program is based upon the average amount of oxygen consumed during the running of an eight minute mile. The eight minute mile provides a sub-maximal evaluation and, for research purposes, a repeatable situation.

An eight minute mile is assigned a value of five points based upon the formula used to determine the oxygen consumption. One point equals seven milliliters of oxygen consumed per minute, and by dividing this value of seven into the average oxygen consumption required for a given activity the point total is assigned.

In his discussion of the amount of exercise needed, based on the Aerobics point system, to maintain or produce a training effect, Cooper (1968) emphasized that a thirty point week of activity was necessary for desirable results. The routine, as to number of days and length of workout, is flexible within the defined limits of the system.

The values for the exercise activity running were used to compute the training program for this study. These values are presented in Appendix A.

Efforts to assess physical fitness have also provided

an indication of the variety of factors to be considered when dealing with the concept. The assessment of physical performance has generally involved two main approaches:

- (1) physical fitness tests concerned with the performance of various aspects of an actual performance situation, and
- (2) tests of cardiovascular, cardiopulmonary, and respiratory function at rest, during exercise, or both in combination (Astrand & Rodahl, 1970).

Five major components of physical fitness were identified by deVries (1969) as: Motor fitness, physical working capacity, body weight, relaxation, and flexibility. Cardiorespiratory tests were placed under the area of physical working capacity. Physical working capacity was defined as the maximum level of metabolism which the individual was capable of.

In terms of analyzing basic physiological function, those tests concerned with skill performance measurement are considered unsuitable for the measurement of physical fitness. This, of course, does not imply that such tests do not serve a useful purpose. However, as Astrand and Rodahl (1970, p. 334) stated: "From a physiological and medical viewpoint, any test battery for the evaluation of physical fitness is rather meaningless unless it is based on sound physiological considerations."

In his discussion of the various aspects of physical fitness, deVries, (1969, p. 221) stated that ". . . During

the school-age years, a combination of motor fitness and physical working capacity assumes major importance." In addition, he further suggested that, in general, the motor fitness variable loses importance for adults, while the other aspects of physical fitness become of greater concern.

As an aspect of physical fitness, cardiovascular fitness is generally viewed as an indication of the functional ability of the circulatory system. Thus, most tests related to this area have attempted to tax the circulatory system through the use of standard work loads to enable measurement of the desired variables.

Three methods of producing standard work loads were identified by Astrand and Rodahl (1970) as being the most widely used techniques. Included among these three were: the treadmill run, work on a bicycle ergometer which was considered to be the most desirable technique, and the step test which was considered the least desirable technique.

deVries (1969) stated that most tests of physical working capacity were essentially a measure of aerobic capacity. As was previously discussed, aerobic muscle activity takes place in the presence of oxygen which oxidizes carbohydrate sources of energy to carbon dioxide and water. It should be remembered that anaerobic processes can also produce energy for muscular activity, though the duration of this type of metabolism is generally very limited. The relationship of anaerobic and aerobic energy

yield is also largely a function of the duration of the workload as well as its intensity. In a standard work situation of maximal effort, anaerobic power is generally of more importance than aerobic power during the first two minutes of activity. However, as the length of work time increases, aerobic power becomes more important. It has also been shown that aerobic and anaerobic power interrelationships vary between individuals, thus offering some explanation for differing basic abilities (Astrand & Rodahl, 1970).

In exercise situations, evidence indicates that the ability to utilize oxygen and tolerate an oxygen debt is considered to be a limiting factor of performance. Thus, maximal oxygen uptake, or the highest load the oxygen transport systems are capable of sustaining, is considered to be a highly desirable measure of physical fitness when the capacity of the individual for prolonged work is of primary concern (Astrand & Rodahl, 1970).

An alternative means of evaluating the functional capacity of the circulatory system, in the absence of the equipment necessary to measure oxygen consumption, involves the use of heart rate. deVries (1969) stated that the use of heart rate at submaximal work loads has been validated as a measure of physical working capacity. However, Clarke (1967) had previously suggested that the evidence surrounding the use of such tests is far from conclusive. In addition,

Astrand and Rodahl (1970) discussed a number of factors which must be considered in the assessment of the efficiency of an individual's oxygen-transporting system when heart rate is used as the assessor.

The assessment of cardiovascular fitness through the use of heart rate is based upon the assumption that cardiac output is relatively stable at a given oxygen uptake. Cardiac output is a function of heart rate multiplied by stroke volume, thus the greater the stroke volume the lower the heart rate.

Maximal heart rate is generally accepted as a final determinant of maximal cardiac output and oxygen uptake. Experimental evidence, however, indicates that there are considerable sources of error inherent in any predication of the efficiency of the oxygen transport system from sub-maximal tests (Astrand & Rodahl, 1970). Some of the sources of error which have been identified are: (1) evidence which indicated that heart rate does not always increase linearly with an increase in oxygen uptake, especially in the case of heavy workloads; (2) the effect of age on maximal heart rate; (3) the variance which may occur in mechanical efficiency; and (4) the fact that cardiac output is not strictly related to oxygen uptake for all individuals (Astrand & Rodahl, 1970).

The net effect of these sources of error is of most concern when an evaluation of the maximal effect of the

oxygen-transport system is the primary objective. However, it has also been recognized that evaluations which require maximal or all-out performance are also subject to outside influence from extraneous and often uncontrollable variables. The primary source of error for all-out tests is considered to be of a psychological rather than a physiological nature. Thus, all-out tests of maximal performance must also be considered somewhat suspect.

The discussion of cardiovascular fitness and evaluation related to it seems to indicate that the choice of the test or type of test to be used should primarily be a function of the purpose of the testing situation. Astrand and Rodahl (1970) discussed two situations for which they found submaximal tests to be of value. The first situation involved the use of a cardiovascular test to examine the circulatory system under functional stress with patients or individuals thought to be in healthy condition. The second identified was the determination of whether or not a training program had been effective in improving the circulatory capacity of its participants. Kurucz, Fox, and Mathews (1969) emphasized the value of submaximal tests in the study of exercise and cardiovascular disease, and the implementation of physical fitness programs. The submaximal test is said to allow a means of appraising fitness within relative safe tolerance limits.

The general consensus of opinion regarding the use

of submaximal exercise tests indicates that they are considered to be valuable as screening tests for the evaluation of the functional capacity of the cardiovascular system. In addition, such tests are felt to be useful for work with patients when the effects of exercise or activity are of concern. Finally, they are deemed to be useful as a motivation device when used in conjunction with training programs.

The evidence, however, does not support the use of the submaximal exercise test for research purposes when an actual measurement of the functional capacity of the oxygen transporting system is desired. This, however, does not preclude the use of submaximal exercise tests to evaluate changes in cardiovascular function as a result of training programs.

In order to carry out a submaximal exercise test, an exercise workload must be set up which is measurable, repeatable, and requires very little skill (deVries, 1969). Three methods of producing a standard work load were previously discussed and one of them, the step-test, was identified as the least desirable method. In spite of its low ranking among methods of producing testing work loads, step-testing continues to be one of the more popular methods used in submaximal testing.

Step-up exercise or bench-stepping requires a very minimum of skill and is easily used with large groups of subjects. However, from a methodological standpoint there

are several sources of concern to the researcher. Technique and the localization of fatigue are difficult factors to control in step-tests. In addition, the effect of the dual workload, involving stepping up and stepping down, is as yet not fully understood (deVries, 1969).

Perhaps the primary reason underlying the use of step-tests in opposition to the more preferred methods is the availability of equipment. The equipment required for step-testing is usually readily available and comparatively inexpensive. In addition, the technique is probably more familiar to a great majority of physical educators.

There are an increasing number of step-up exercises available for physical fitness testing. Some are modifications of previously established tests, while others represent new approaches to the assessment of physical fitness.

The Ohio State University Step Test was developed as a submaximal test of cardiovascular fitness for individuals between the ages of 18 and 60. The test was developed in such a manner that heart rate could be determined throughout the test and the subject's pulse would not exceed one-hundred fifty beats per minute. The exercise required consists of stepping onto a bench and stepping down to a specified cadence. The test terminates when the heart rate reaches one hundred fifty beats or the subject has completed all of the test requirements. Scoring is recorded in terms of the number of innings or bouts of exercise completed, with

one being the lowest value and nineteen the highest value attainable (Kurucz, et al, 1969).

Kurucz, Fox, and Mathews (1969, p. 166) described the test as follows: The test comprises eighteen innings of fifty second duration (total fifteen minutes). Each inning is divided into a thirty second work period and a twenty second rest period. During the twenty second rest period, the subject's pulse is taken for ten seconds beginning with the second "five" and stopping at the second "fifteen." (See Appendix B.)

The equipment necessary for the test consists of two benches, one fifteen inches and one twenty inches in height, a stopwatch, metronome, and tape recorder if desired. The use of an adjustable handrail is recommended, though not required for the test.

The Ohio State University Step Test reports a validity coefficient of .94 with the Balke Treadmill Test for thirty subjects ranging in age from 19 to 56. A test-retest reliability of .94 is also reported for twenty-four subjects ranging in age from 19 to 56. Of most concern to the present study, was the report that the test appeared to be sensitive to changes in cardiovascular fitness (Kurucz et al, 1969).

Based upon the review of the literature, the following assumptions were made:

- 1) The development of personality is a lifelong

process which can be influenced by significant experiences.

- 2) An individual's personality is composed of various behavioral aspects, sometimes known as traits, some of which are more stable than others.
- 3) The self concept is a significant aspect of personality, which can be highly influential in determining an individual's behavior.
- 4) The self-concept is a changeable aspect of personality which can influence or be influenced by physiological changes occurring as a result of participation in physical activity.
- 5) The need for achievement is a significant aspect of personality, which can be highly influential in determining an individual's behavior.
- 6) The need for achievement is a changeable aspect of personality which can be influenced by physiological changes occurring as the result of participation in a physical activity.
- 7) The psychological measure used in this study, the Tennessee Self Concept Scale and the Edwards Personal Preference Schedule, are sensitive to changes in the behavioral factors they are said to measure.
- 8) Changes in cardiovascular fitness can occur as a result of the training methods used in this study.

- 9) The fitness measure used in this study, the Ohio State University Step Test, is sensitive to changes in cardiovascular fitness which occur as the result of participation in a cardiovascular training program.

Hypotheses

The following series of null hypotheses were formulated to carry out the purposes of this study:

- Hypothesis 1: There is no significant difference in pre to post cardiovascular endurance changes between the subjects in training group E_1 and the subjects in training group E_2 .
- Hypothesis 2: There is no significant difference in pre to post cardiovascular endurance changes between the subjects in training group E_1 and the subjects in the control group, C.
- Hypothesis 3: There is no significant difference in pre to post cardiovascular endurance changes between the subjects in training group E_2 and the subjects in the control group, C.
- Hypothesis 4: There is no significant difference in pre to post need for achievement changes between the subjects in training group E_1 and the subjects in training group E_2 .
- Hypothesis 5: There is no significant difference in pre to post need for achievement changes between the subjects in training group E_1 and the subjects in the control group, C.
- Hypothesis 6: There is no significant difference in pre to post need for achievement changes between the subjects in training group E_2 and the subjects in the control group, C.
- Hypothesis 7: There is no significant difference in pre to post Self-Criticism Score changes between the subjects in training group E_1 and the subjects in training group E_2 .

- Hypothesis 8: There is no significant difference in pre to post Self-Criticism Score changes between the subjects in training group E_1 and the subjects in the control group, C.
- Hypothesis 9: There is no significant difference in pre to post Self-Criticism Score changes between the subjects in training group E_2 and the subjects in the control group, C.
- Hypothesis 10: There is no significant difference in pre to post Total P Score changes between the subjects in training group E_1 and the subjects in training group E_2 .
- Hypothesis 11: There is no significant difference in pre to post Total P Score changes between the subjects in training group E_1 and the subjects in the control group, C.
- Hypothesis 12: There is no significant difference in pre to post Total P Score changes between the subjects in training group E_2 and the subjects in the control group, C.
- Hypothesis 13: There is no significant difference in pre to post Identity score changes between the subjects in training group E_1 and the subjects in training group E_2 .
- Hypothesis 14: There is no significant difference in pre to post Identity score changes between the subjects in training group E_1 and the subjects in the control group, C.
- Hypothesis 15: There is no significant difference in pre to post Identity score changes between the subjects in training group E_2 and the subjects in the control group, C.
- Hypothesis 16: There is no significant difference in pre to post Self Satisfaction score changes between the subjects in training group E_1 and the subjects in training group E_2 .
- Hypothesis 17: There is no significant difference in pre to post Self Satisfaction score changes between the subjects in training group E_1 and the subjects in the control group, C.

- Hypothesis 18: There is no significant difference in pre to post Self Satisfaction score changes between the subjects in training group E_2 and the subjects in the control group, C.
- Hypothesis 19: There is no significant difference in pre to post Behavior score changes between the subjects in training group E_1 and the subjects in training group E_2 .
- Hypothesis 20: There is no significant difference in pre to post Behavior score changes between the subjects in training group E_1 and the subjects in the control group, C.
- Hypothesis 21: There is no significant difference in pre to post Behavior score changes between the subjects in training group E_2 and the subjects in the control group, C.
- Hypothesis 22: There is no significant difference in pre to post Physical Self score changes between the subjects in training group E_1 and the subjects in training group E_2 .
- Hypothesis 23: There is no significant difference in pre to post Physical Self score changes between the subjects in training group E_1 and the subjects in the control group, C.
- Hypothesis 24: There is no significant difference in pre to post Physical Self score changes between the subjects in training group E_2 and the subjects in the control group, C.
- Hypothesis 25: There is no significant difference in pre to post Moral-Ethical Self score changes between the subjects in training group E_1 and the subjects in training group E_2 .
- Hypothesis 26: There is no significant difference in pre to post Moral-Ethical Self score changes between the subjects in training group E_1 and the subjects in the control group, C.
- Hypothesis 27: There is no significant difference in pre to post Moral-Ethical Self score changes between the subjects in training group E_2 and the subjects in the control group, C.

- Hypothesis 28: There is no significant difference in pre to post Personal Self score changes between the subjects in training group E_1 and the subjects in training group E_2 .
- Hypothesis 29: There is no significant difference in pre to post Personal Self score changes between the subjects in training group E_1 and the subjects in the control group, C.
- Hypothesis 30: There is no significant difference in pre to post Personal Self score changes between the subjects in training group E_2 and the subjects in the control group, C.
- Hypothesis 31: There is no significant difference in pre to post Family Self score changes between the subjects in training group E_1 and the subjects in training group E_2 .
- Hypothesis 32: There is no significant difference in pre to post Family Self score changes between the subjects in training group E_1 and the subjects in the control group, C.
- Hypothesis 33: There is no significant difference in pre to post Family Self score changes between the subjects in training group E_2 and the subjects in the control group, C.
- Hypothesis 34: There is no significant difference in pre to post Social Self score changes between the subjects in training group E_1 and the subjects in training group E_2 .
- Hypothesis 35: There is no significant difference in pre to post Social Self score changes between the subjects in training group E_1 and the subjects in the control group, C.
- Hypothesis 36: There is no significant difference in pre to post Social Self score changes between the subjects in training group E_2 and the subjects in the control group, C.
- Hypothesis 37: There is no significant difference in pre to post Total V score changes between the subjects in training group E_1 and the subjects in training group E_2 .

- Hypothesis 38: There is no significant difference in pre to post Total V score changes between the subjects in training group E_1 and the subjects in the control group, C.
- Hypothesis 39: There is no significant difference in pre to post Total V score changes between the subjects in training group E_2 and the subjects in the control group, C.
- Hypothesis 40: There is no significant difference in pre to post Column Total V score changes between the subjects in training group E_1 and the subjects in training group E_2 .
- Hypothesis 41: There is no significant difference in pre to post Column Total V score changes between the subjects in training group E_1 and the subjects in the control group, C.
- Hypothesis 42: There is no significant difference in pre to post Column Total V score changes between the subjects in training group E_2 and the subjects in the control group, C.
- Hypothesis 43: There is no significant difference in pre to post Row Total V score changes between the subjects in training group E_1 and the subjects in training group E_2 .
- Hypothesis 44: There is no significant difference in pre to post Row Total V score changes between the subjects in training group E_1 and the subjects in the control group, C.
- Hypothesis 45: There is no significant difference in pre to post Row Total V score changes between the subjects in training group E_2 and the subjects in the control group, C.
- Hypothesis 46: There is no significant difference in pre to post Distribution score changes between the subjects in training group E_1 and the subjects in training group E_2 .
- Hypothesis 47: There is no significant difference in pre to post Distribution score changes between the subjects in training group E_1 and the subjects in the control group, C.
- Hypothesis 48: There is no significant difference in pre to post Distribution score changes between the subjects in training group E_2 and the subjects in the control group, C.

CHAPTER III

METHODOLOGY

The framework of this study was based upon a theoretical consideration of the stated desirable outcomes which are said to occur as a result of improved cardiovascular fitness. Specifically, the study was an attempt to investigate the subjective utterances of "feel good" and "feel better," and the psychological impact of improved physiological functioning. These outcomes were represented in the study as the psychological variables self-concept and need for achievement, respectively.

Design

The design of the study was a pretest, experimental treatment, posttest, control group model. The subjects and treatments were randomly assigned, through the use of a table of random numbers, to the three groups involved in the study which included: (1) E_1 , experimental group one, which took part in the pre-training tests involving the various physiological and psychological variables. The group then took part in the running program and then took the post-training physiological and psychological tests without being

notified of any change which had occurred in their cardiovascular fitness; (2) E_2 , experimental group two, followed the same procedure as experimental group one except that experimental group two was advised of changes which had occurred in cardiovascular fitness prior to taking the post-training psychological tests; and (3) C_1 the control group, which took the pre-training physiological and psychological tests but did not participate in the training program. The control group took the post-training test at the same time as E_1 and E_2 and did not receive any information concerning cardiovascular fitness levels (Edwards, 1965).

Subjects

The subjects for this study were 42 college male volunteers enrolled in required physical education classes at the University of Tulsa. Of the original sample of 42 subjects, 39 completed all phases of the study. The subjects ranged in age from 17 to 30 years and the mean age for the sample was twenty and one-half years.

All the subjects participating in the study were required to present a health card issued by the Alexander Health Center of the University of Tulsa. This health card was used to determine the general physical condition of the subjects. All the subjects participating in the study were determined to be in good physical health on the basis of the procedure used.

Description of Training Program

The subjects in the experimental groups met three times a week, from 7:30 to 8:30 A.M. on Monday, Wednesday, and Friday in the varsity gym of Mabee Gymnasium at the University of Tulsa. The training program began on February 9, 1970 and ended on March 25, 1970. There were twenty training periods in the program. Absences were made up on Tuesdays and Thursdays.

The program was based upon the Aerobics running program (Appendix A) and was designed to improve the cardiovascular fitness of the participants. The subjects were urged to try and improve their performance throughout the program, but other than the actual counting of laps run and the amount of time run, no information was given regarding the purpose or effect of the program.

The first training session consisted of a twelve minute run for distance. The distance an individual ran provided an indication of the type of running program he should follow. The running programs were based upon the Aerobics program. The requirements of the program were considered the minimum allowable performance and in a majority of cases the subjects exceeded the requirements at each workout. On the basis of the Aerobics Twelve Minute Test the subjects were classified according to fitness categories (Appendix C) as shown in Table 1. The time run was determined through the use of a stopwatch and the distance run was

computed on the basis on one lap of the course and equaling one-twelfth of a mile.

TABLE 1
DISTRIBUTION OF SCORES ON TWELVE
MINUTE TEST

Subjects	Category
0	I
6	II
11	III
7	IV
4	V

The subjects reported to the examiner or a laboratory assistant at the beginning of each training period. The subjects received instructions concerning the course to be run, the time of the run, and the minimum distance to be covered. The minimum distance assigned varied from subject to subject. The Twelve Minute Test was administered periodically to allow for an evaluation of performances in order to determine if improvement was occurring or a change in the training program was warranted. The periodic evaluations indicated that a majority of the participants improved their performance throughout the test (Appendix C).

Description of Tests

The study involved the use of three tests as indicators of those variables under consideration. The instruments were selected primarily on the basis of how well they

served the purposes and procedures of the study. This involved a consideration of the following factors: (1) what the test was said to measure; (2) the amount of time required to administer the test; (3) the age group for which the test was applicable; (4) the administrative and scoring procedures; (5) the accessibility of the test; and (6) the use of special equipment required for the test. The Ohio State University Step Test, the Tennessee Self Concept Scale and the Edwards Personal Preference Schedule were selected to measure the variables of cardiovascular fitness, self-concept, and need for achievement, respectively.

Ohio State University Step Test

Equipment. The equipment consists of two steps, one fifteen inches in height and the other twenty inches in height. A handbar was not used. Wooden platforms were constructed and used to modify pre-existing areas to the specifications of the test. A metronome, stopwatch, and tape recorder were used to prepare a tape recording of the test. The results were recorded on mimeographed sheets (Appendix B).

Description. The test is a submaximal cardiovascular step test. It consists of eighteen fifty second innings with each inning divided into a thirty second work period and a twenty second rest period. During the thirty second work period the subject steps up and down at a given cadence. The pulse is taken for ten seconds during the rest

period, with the count commencing at five seconds into the rest period and stopping at fifteen seconds into the rest period. The test is divided into three phases which are as follows:

- 1) Phase I--the subject performs on the fifteen inch bench at a twenty-four step per minute cadence for the first six innings.
- 2) Phase II--the subject performs on the fifteen inch bench at a thirty step per minute cadence for the second six innings.
- 3) Phase III--the subject performs on the twenty inch bench at a thirty step per minute cadence for the third six innings.

Test Instructions. The subjects were given the following instructions:

The instructions for this test are as follows: (1) you will step up and down in cadence with my commands, and (2) you will stop at a given command and your pulse will be counted. To acquaint you with the procedure, I am going to let you first listen as to what you are supposed to do. The starting command will be ready-up, at which time you place one foot on the step, straighten both legs and back and immediately step down again, one foot at a time. Your pulse will then be counted. You will continue until stopped at a predetermined time by the person counting your pulse. When you are stopped leave quietly, and remember that you are to report to the classroom in the gym at six thirty in the morning. Listen now as we go through the trial inning.

After the end of the ten second pulse count in the sixth inning and prior to the start of the seventh inning, the subjects are advised that the cadence will increase. After

the ten second pulse count in the twelfth inning and prior to the beginning of the thirteenth inning, the subjects are told to move to the twenty inch bench.

Participation in the test continues until all eighteen innings are completed or the pulse rate reaches or surpasses one hundred fifty beats per minute. The pulse is taken from the radial artery at the wrist or at the neck from the carotid artery.

The subjects are allowed to lead with either foot or alternate the lead foot if one leg becomes tired. The subjects are required to step completely on to the step during the test and stand erect during the rest period.

Scoring. The pulse count was recorded on the score sheet by circling the ten second count for the inning just completed. The test was terminated at the end of eighteen innings or when a pulse count of twenty-five or above beats for ten seconds was recorded.

The first test was recorded in black ink and the second test was recorded in red ink on the same score sheet.

Tennessee Self Concept Scale: Counseling Form

Equipment. A test manual, test booklet, and combination answer and scoring packet are needed to administer the Scale. A ball point pen is the preferred writing instrument.

Description. The Scale consists of one hundred self descriptive statements which the subject uses to describe

himself. The subject is provided with the following choices to describe himself on each item: (1) completely false, (2) mostly false, (3) partly false and partly true, (4) mostly true, and (5) completely true.

The Scale is available in two forms, the Counseling Form and the Clinical and Research Form. The items used are the same for both forms however, the Counseling Form is quicker and easier to score as it deals with fewer variables and less scores. The Counseling Form is recommended for use where self-interpretation by the subject is desirable or when the examiner lacks an extensive background in psychometrics and psychopathology.

The scores appearing in the counseling form are listed and described in the Tennessee Self Concept Scale Manual (Fitts, 1965) as:

I. Counseling Form

- A. The Self Criticism Score (SC). This scale is composed of 10 items.¹ These are all mildly derogatory statements that most people admit as being true for them. Individuals who deny most of these statements most often are being defensive and making a deliberate effort to present a favorable picture of themselves. High scores generally indicate a normal, healthy openness and capacity for self-criticism. Extremely high scores (above the 99th percentile) indicate that the individual may be lacking in defenses and may in fact be pathologically undefended. Low scores indicate defensiveness, and suggest that the Positive Scores are probably artificially elevated by this defensiveness.
- B. The Positive Scores (P). These scores derive directly from the phenomenological classification scheme already mentioned. In the original analysis of the item pool the statements seemed to be conveying three primary messages: (1) This is what I am, (2) This is how I feel about myself,

and (3) This is what I do. On the basis of these three types of statements the three horizontal categories were formed. They appear on the Score Sheet as Row 1, Row 2, and Row 3 which, when added, constitute the Total Positive or Total P Score. These scores represent an internal frame of reference within which the individual is describing himself.

Further study of the original items indicated that they also varied considerably in terms of a more external frame of reference. Even within the same row category the statements might vary widely in content. For example, with Row 1 (the What I am category) the statements refer to what I am physically, morally, socially, etc. Therefore, the pool of items was sorted again according to these new vertical categories, which are the five Column Scores of the Score Sheet. Thus the whole set of items is divided two ways, vertically into columns (external frame of reference) and horizontally into rows (internal frame of reference) with each item and each cell contributing to two different scores.

1. Total P Score. This is the most important single score on the Counseling Form. It reflects 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; often feel anxious, depressed, and unhappy; and have little faith or confidence in themselves.

If the Self Criticism (SC) Score is low, high P Scores become suspect and are probably the result of defensive distortion. Extremely high scores (generally above the 99th percentile) are deviant and are usually found only in such disturbed people as paranoid schizophrenics who as a group show many extreme scores, both high and low.

On the Counseling Form the Positive Scores are simply designated as P Scores, while on the Score Sheet of the C and R Form they are referred to as P N Scores in order to clarify the computations involved.

2. Row 1 P Score -- Identity. These are the "what I am" items. Here the individual is describing his basic identity -- what he is as he sees himself.

3. Row 2 P Score -- Self Satisfaction. This score comes from those items where the individual describes how he feels about the self he perceives. In general this score reflects the level of self satisfaction or self acceptance. An individual may have very high scores on Row 1 and Row 3 Scores yet still have a high Self Satisfaction Score on Row 2. The sub-scores are therefore best interpreted in comparison with each other and with the Total P Score.
 4. Row 3 P Score -- Behavior. This score comes from those items that say "this is what I do, or this is the way I act." Thus this score measures the individual's perception of his own behavior or the way he functions.
 5. Column A -- Physical Self. Here the individual is presenting his view of his body, his state of health, his physical appearance, skills, and sexuality.
 6. Column B -- Moral-Ethical Self. This score describes the self from a moral-ethical frame of reference--moral worth, relationship to God, feelings of being a "good" or "bad" person, and satisfaction with one's religion or lack of it.
 7. Column C -- Personal Self. This score reflects the individual's sense of personal worth, his feeling of adequacy as a person and his evaluation of his personality apart from his body or his relationships to others.
 8. Column D -- Family Self. This score reflects one's feelings of adequacy, worth, and value as a family member. It refers to the individual's perception of self in reference to his closest and most immediate circle of associates.
 9. Column E -- Social Self. This is another "self as perceived in relation to others" category but pertains to "others" in a more general way. It reflects the person's sense of adequacy and worth in his social interaction with other people in general.
- C. The Variability Score (V). The V Scores provide a simple measure of the amount of variability or inconsistency, from one area of self perception to another. High scores mean that the subject is quite variable in this respect while low scores

indicate low variability which may even approach rigidity if extremely low (below the first percentile).

1. Total V. This represents the total amount of variability for the entire record. High scores mean that the person's self concept is so variable from one area to another as to reflect little unity or integration. High scoring persons tend to compartmentalize certain areas of self and view these areas quite apart from the remainder of self. Well integrated people generally score below the mean on these scores but above the first percentile.
 2. Column Total V. This score measures and summarizes the variations within the columns.
 3. Row Total V. This score is the sum of the variations across the rows.
- D. The Distribution Score (D). This score is a summary score of the way one distributes his answers across the five available choices in responding to the items of the Scale. It is also interpreted as a measure of still another aspect of self perception: certainty about the way one sees himself. High scores indicate that the subject is very definite and certain in what he says about himself while low scores mean just the opposite. Low scores are found also at times with people who are being defensive and guarded. They hedge and avoid really committing themselves by employing "3" responses on the Answer Sheet.
- Extreme scores on this variable are undesirable in either direction and are most often obtained from disturbed people. For example, schizophrenic patients often use "5" and "1" answers almost exclusively, thus creating very high D scores. Other disturbed patients are extremely uncertain and noncommittal in their self descriptions with a predominance of "2", "3" and "4" responses and very low D scores.
- E. The Time Score. This score is simply a measure of the time, to the nearest minute, that the subject requires to complete the Scale. The author has only recently made any study of this variable, and at this point little is known as to its meaning or significance. It correlates significantly with only one of the many other scores of the Scale (Net Conflict .05 level). Therefore, any validity it may prove to have with other criteria should add to the total validity of the Scale.

The data does indicate that, provided the individual has sufficient education, intelligence, and reading ability to handle this task, the majority of subjects complete the Scale in less than 20 minutes. These qualifications are quite important; if they are not met, the Time Score obviously has little meaning. It has been found that psychiatric patients in general take longer than non-patients. This is particularly true of those who are overly compulsive, paranoid or depressed.

1. These items have been taken from the L-Scale of the Minnesota Multiphasic Personality Inventory (1951), Copyright 1943, the University of Minnesota. Published by the Psychological Corporation. Reproduced by special arrangements.

Test instructions. The Tennessee Self Concept Scale: Counseling Form is a self-administering instrument. The instructions are provided on the inside cover of the booklet. The subjects are urged not to omit any item. The examiner may point out the arrangement of the answer sheet prior to the beginning of the test.

Scoring. The scoring of the scale was done by hand. The Counseling Form may be scored by hand in about five to seven minutes. The scoring instructions were explained on the score sheet in the Combination Packet, and also in the Manual accompanying the test.

Edwards Personal Preference Schedule

Equipment. A test manual, test booklet, and special answer sheet are needed to administer the test.

Description. The Edwards Personal Preference Schedule is designed to provide quick and convenient measures of

fifteen relatively independent personality variables. The variables the instrument is said to measure are based upon the test of manifest needs described by Murray and others. The variables included in the test are: Achievement, Deference, Order, Exhibition, Autonomy, Affiliation, Intraception, Succorance, Dominance, Abasement, Nurturance, Change, Endurance, Heterosexuality, and Aggression. The variable under consideration for purpose of this study was Achievement.

The Achievement variable is described in the Manual as:

1. ach Achievement: To do one's best to be successful, to accomplish tasks requiring skill and effort, to be a recognized authority, to accomplish something of great significance, to do a difficult job well, to solve difficult problems and puzzles, to be able to do things better than others, to write a great novel or play.

The test is constructed so that each of the fifteen variables under consideration are paired twice with each of the other variables. Therefore items relating to each variable appear twenty-eight times in the test. There are two hundred twenty-five pairs of statements.

Test Instructions. The Edwards Personal Preference Schedule is self administering and can be given individually or to a group of individuals. The directions for the Schedule are on the cover of each test booklet. The subjects are asked to respond to each item on the basis of which of the statements is most representative or characteristic of

themselves. The subjects are directed to circle their choice for each item on the answer sheet accompanying the test.

The Edwards Personal Preference Schedule should be completed in about forty minutes by most college students.

Scoring. The scoring of the scale was done by hand. The regular hand scoring answer sheet can be scored in about ten to fifteen minutes. The scoring instructions and template required for scoring were available in the test Manual.

Statistical treatment of the data. The one-way, fixed-effects, completely randomized analysis of variance statistical model was used to test the hypotheses formulated for the study. The data measured were on an interval scale. The level of significance at which the null hypothesis would not be accepted was .05 for the observations. The Scheffé test was used to provide an estimate of differences found in those cases in which the null hypothesis was not accepted.

The one-way analysis of variance model involves an analysis of all the variation identified in a set of data. The purpose of the technique is to determine, mathematically, the actual source of the variation. The one-way analysis of variance test is appropriate for comparing two or more population means, provided the basic assumptions of the test are met. Weber and Lamb (1970, p. 105) listed the following assumptions:

1. The data are measured on an interval (or ratio) scale.

2. The columns of data are independent, random samples from the treatment populations.
3. The treatment populations are normal.
4. The treatment populations have the same variance.

The first two assumptions are generally considered the most critical. The last two assumptions are not considered to be as important especially when the sample sizes are fairly large and equal.

The determination of the significance of variation found through the one-way analysis of variance model involves the use of the F test. The F test, when used in connection with one-way analysis of variance, allows for the testing of hypotheses involving comparisons of two or more groups on a single variable.

The F test utilizes two different degrees of freedom, one for the numerator and one for the denominator or one for each of the two variance compared. The use of the F test involves a consideration of the same assumptions which apply to the analysis of variance test.

The Scheffé test is a method which leads to an estimate of the magnitude of difference between means when F is found to be significant. The Scheffé test requires knowledge of the information needed to compute the F test and provides for a contrast among population means (Walker and Tev, 1969).

The Scheffé test is considered a desirable method of evaluating a significant F because of its wide range of applicability, relatively simple computational procedures, and the information it yields (Fox, 1969).

Administration of Tests

The testing procedure used for the study was based upon the need to construct a situation which would facilitate the testing of a fairly large sample in a reasonable amount of time. The use of a posttest also dictated that the procedure be one which could be easily replicated.

The volunteers who participated in the study were recruited from students enrolled in physical education classes at the University of Tulsa and were obtained through the cooperation of the Director of the Basic Skills Physical Education Program at the University of Tulsa. The students volunteering for participation in the study were transferred to a special section in the Basic Skills Program which met three times a week for an eight week period.

The testing procedure followed by all subjects participating in the study was:

1. All the subjects reported to the testing area, by the swimming pool, on the afternoon of Thursday, February 5th for a physical fitness test. The subjects were instructed to report between the hours of four and six at a randomly assigned time. The subjects were advised not to engage in heavy physical activity that afternoon and were advised to eat at least two to three hours prior to the test time. In addition, those who smoked were asked to refrain from smoking for at least thirty minutes prior to the test.

2. Upon arrival at the test area, the subjects were seated and their pulse was located and marked. The subjects remained seated while the instructions for the test and sample inning were given. The subjects were then asked if there were any questions regarding the test prior to beginning it.

3. The testing area allowed for a maximum of six subjects to be tested at one time. Six laboratory assistants were used to take the pulse count during each rest period. The assistants received prior instructions as to the nature of the test, how to take a pulse, how to record the pulse counts, and when to terminate the test. The assistants were also instructed not to allow the subjects to see the test scores.

4. Upon completion of the submaximal cardiovascular step test the subjects were advised to leave and return the next morning for the written examinations.

5. All the subjects reported to the classroom located in Mabee Gymnasium at the University of Tulsa on the morning of Friday, February 6, 1970. The subjects had been instructed to report between 6:30 and 7:00 a.m. for additional testing.

6. Upon arrival, the subjects received the test booklets and answer sheets for the Tennessee Self Concept Scale and the Edwards Personal Preference Schedule. The subjects were advised to read the instructions carefully, make sure that their name appeared on each answer sheet.

The subjects were also advised that the Tennessee Self Concept Scale was to be finished before the Edwards Personal Preference Schedule was begun. The subjects were told to answer all the items and were given a short demonstration as to how each answer sheet was to be used.

7. A list of two groups was posted in the classroom and upon completion of the written tests, each subject was advised to locate his name on the appropriate list and follow the directions indicated. Those subjects on List I were advised to report to Mabee Gymnasium on February 9, 1970, at 7:30 or 8:00 a.m. to begin running. They were also advised that they were to report to the testing area by the swimming pool on Thursday, March 26, 1970 between 4:00 and 6:00 p.m. for physical fitness testing. In addition, they were told to report to the classroom in Mabee Gymnasium on the morning of Friday, March 27, 1970, at 6:30 or 7:00 a.m. for additional testing. The subjects on List II were advised that their running program would begin April 6, 1970. The subjects on List II were also advised that they were to report to the testing area by the swimming pool on Thursday, March 26, 1970 between 4:00 and 6:00 p.m. for physical fitness testing. In addition, they were told to report to the classroom in Mabee Gymnasium on the morning of Friday, March 27, 1970 between 6:30 and 7:00 a.m. for additional testing.

8. During the week of March 16-20, 1970 all the subjects participating in the study were contacted by

telephone and reminded of the upcoming test dates and times.

9. The posttests were administered on March 26 and 27, 1970. On Thursday, March 26, the subjects reported to the testing area by the swimming pool in Mabee Gymnasium for the submaximal cardiovascular step test. The same procedure was followed for the posttest as was used for the pretest.

On Friday, March 27, 1970, the subjects met in the classroom in Mabee Gymnasium between 6:30 and 7:00 a.m. for the post-psychological testing. The procedure for the post-psychological testing was the same as used for the pretest with one exception. Those subjects in groups E_1 and C followed the same procedure as was used for the pretest. Each subject in group E_2 was given his submaximal cardiovascular step test along with a brief explanation and interpretation of the results, on the back of the test before beginning the post-psychological tests. The subjects in group E_2 then followed the same testing procedure as groups E_1 and C.

CHAPTER IV

RESULTS

The one-way, fixed-effects, completely randomized analysis of variance model was used to test the null hypotheses related to the basic questions of the study. The Scheffé test was used to make specific comparisons between means in the case of a significant F.

The basic questions which the study attempted to answer were: (1) Would a significant change in cardiovascular fitness occur as a result of participation in the aerobics training program used for the study? (2) If a significant change occurred in cardiovascular fitness, would this change be paralleled by a significant change in an individual's need for achievement? (3) If a significant change occurred in cardiovascular fitness, would this change be paralleled by a significant change in an individual's self-concept? (4) If a significant change occurred in cardiovascular fitness, would the introduction of information concerning the physiological changes which had occurred influence a significant change in an individual's need for achievement? (5) If a significant change occurred in

cardiovascular fitness, would the introduction of information concerning the physiological changes which had occurred influence a significant change in an individual's self-concept?

Cardiovascular Fitness

The basic assumption of the study was that a significant difference in pre to post cardiovascular fitness would occur as a result of participation in the training program. Three null hypotheses were formulated to test the assumption:

- Hypothesis 1: There is no significant difference in pre to post cardiovascular endurance changes between the subjects in training group E_1 and the subjects in training group E_2 .
- Hypothesis 2: There is no significant difference in pre to post cardiovascular endurance changes between the subjects in training group E_1 and the subjects in the control group, C_1 .
- Hypothesis 3: There is no significant difference in pre to post cardiovascular endurance changes between the subjects in training group E_2 and the subjects in the control group, C_2 .

The one-way, fixed-effects, completely randomized analysis of variance model was used to analyze the pre to post difference scores of the two training groups and the control group on the Ohio State University Step Test. The F test of the significance of difference between two variance estimates, as shown in Table 2, produced an F value of 6.509. The F value, 6.509, found for the step test data exceeded the critical value of F of 3.26 required for significance

at the .05 level with 2 and 36 degrees of freedom. The F value of 6.509 was determined to be a significant value on the basis of this evidence and a Scheffé test was used to analyze the implications of this difference for the associated null hypotheses.

TABLE 2
SUMMARY OF ANALYSIS OF VARIANCE FOR
OHIO STATE UNIVERSITY STEP TEST

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F	F .95(2,36)
Treatment	65.589	2	32.794	6.509	3.26
Error	181.385	36	5.038		
Total	246.974	38			

The results of the Scheffé test, as shown in Table 3, indicated that the two training groups did not differ significantly, but that both the training groups differed significantly from the control group.

TABLE 3
SUMMARY OF SCHEFFÉ TEST FOR OHIO STATE
UNIVERSITY STEP TEST

Contrasts	Significant Differences
$-1.864\langle 1 - 1_2 \rangle 2.632$	No
$.675\langle 1 - 1_3 \rangle 5.171$	Yes
$.291\langle 1_2 - 1_3 \rangle 4.787$	Yes

On the basis of the data obtained from the Scheffé test, the first null hypothesis was accepted. This hypothesis stated:

Hypothesis 1: There is no significant difference in pre to post cardiovascular endurance changes between the subjects in training group E_1 and the subjects in training group E_2 .

The data, however, did indicate that the sample means of each of the two training groups, E_1 and E_2 , were significantly higher than the mean of the control group. Thus, the second and third null hypotheses, stated below, were not accepted.

Hypothesis 2: There is no significant difference in pre to post cardiovascular endurance changes between the subjects in training group E_1 and the subjects in the control group, C .

Hypothesis 3: There is no significant difference in pre to post cardiovascular endurance changes between the subjects in training group E_2 and the subjects in the control group, C .

Need for Achievement

A second set of questions dealt with the influence of changes in cardiovascular fitness and/or the information of such changes on an individual's need for achievement.

Three null hypotheses were formulated in relation to this second set of questions. They were:

Hypothesis 4: There is no significant difference in pre to post need for achievement changes between the subjects in training group E_1 and the subjects in training group E_2 .

Hypothesis 5: There is no significant difference in pre to post need for achievement changes between the subjects in training group E_1 and the subjects in the control group, C .

Hypothesis 6: There is no significant difference in pre to post need for achievement changes between the subjects in training group E_2 and the subjects in the control group, C.

The one-way, fixed effects, completely randomized analysis of variances method was used to analyze the pre to post difference scores of the three groups involved in the study. The F test of the significance of difference between variance estimates, as shown in Table 4, yielded an F ratio of .719 which was not significant at the .05 level. An F value of 3.26 for 2 and 36 degrees of freedom was necessary for significance at the .05 level. On the basis of this evidence the null hypotheses 4, 5, and 6, as stated previously, were accepted and it was determined that no significant differences in pre to post need for achievement scores existed between any of the groups tested.

TABLE 4
SUMMARY OF ANALYSIS OF VARIANCE FOR
NEED FOR ACHIEVEMENT

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F	F .95(2, 36)
Treatment	12.512	2	6.256	.719	3.26
Error	313.231	36	8.701		
Total	325.743	38			

Self Concept

The final set of questions were concerned with the influence of changes in cardiovascular fitness, and/or the information of such changes on the self concept of an individual. The instrument employed to measure self-concept, the Tennessee Self Concept Scale, examined fourteen aspects of self concept.

Self-Criticism Score. A series of three null hypotheses were stated in regard to Self Criticism Score changes. They were:

- Hypothesis 7: There is no significant difference in pre to post Self Criticism Score changes between the subjects in training group E_1 and the subjects in training group E_2 .
- Hypothesis 8: There is no significant difference in pre to post Self Criticism Score changes between the subjects in training group E_1 and the subjects in the control group, C.
- Hypothesis 9: There is no significant difference in pre to post Self Criticism Score changes between the subjects in training group E_2 and the subjects in the control group, C.

The one-way, fixed-effects, completely randomized analysis of variance model was used to analyze the data. An F ratio of .279 was found, as shown in Table 5, and this value did not exceed the F value of 3.26 necessary for significance at the .05 level with 2 and 36 degrees of freedom. On the basis of this evidence it was concluded that no significant differences existed between any of the groups in respect to Self Criticism Scores and the null hypotheses 7, 8, and 9 were accepted.

TABLE 5

SUMMARY OF ANALYSIS OF VARIANCE FOR
SELF CRITICISM SCORES

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F	F .95(2,36)
Treatment	11.744	2	5.872	.279	3.26
Error	758.154	36	21.060		
Total	769.898	38			

Total P Score. The Total P score was interpreted as a reflection of an individual's overall level of self esteem (Fitts, 1965). The null hypotheses related to Total P score changes were:

Hypothesis 10: There is no significant difference in pre to post Total P score changes between the subjects in training group E_1 and the subjects in training group E_2 .

Hypothesis 11: There is no significant difference in pre to post Total P score changes between the subjects in training group E_1 and the subjects in the control group, C.

Hypothesis 12: There is no significant difference in pre to post Total P score changes between the subjects in training group E_2 and the subjects in the control group, C.

The one-way, fixed-effects, completely randomized analysis of variance model produced an F ratio of .336 for the data as shown in Table 6. This value was not significant at the .05 level for 2 and 36 degrees of freedom. It was concluded that no significant differences existed between any of the groups in respect to the overall level of self

esteem. On the basis of this evidence, the null hypotheses 10, 11, and 12 were accepted.

TABLE 6
SUMMARY OF ANALYSIS OF VARIANCE FOR
TOTAL P SCORES

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F	F .95(2,36)
Treatment	11.744	2	5.872	.336	3.26
Error	758.154	36	21.061		
Total	769.898	38			

Identity scores. Hypothesis 13, 14, and 15 dealt with Identity score changes or scores which reflect how an individual sees himself. The hypotheses stated were:

Hypothesis 13: There is no significant difference in pre to post Identity score changes between the subjects in training group E_1 and the subjects in training group E_2 .

Hypothesis 14: There is no significant difference in pre to post Identity score changes between the subjects in training group E_1 and the subjects in the control group, C.

Hypothesis 15: There is no significant difference in pre to post Identity score changes between the subjects in training group E_2 and the subjects in the control group, C.

The data were analyzed through the use of the one-way, fixed-effects, completely randomized analysis of variance model. The analysis produced an F ratio of .790 which was not significant at the .05 level for 2 and 36 degrees of

freedom as shown in Table 7. The null hypothesis 13, 14, and 15 which dealt with Identity score changes were therefore accepted.

TABLE 7
SUMMARY OF ANALYSIS OF VARIANCE FOR
IDENTITY SCORES

Source of Variation	Sum of Squares	Degree of Freedom	Mean Square	F	F .95(2,36)
Treatment	100.153	2	50.076	.790	3.26
Error	2282.770	36	63.410		
Total	2382.923	38			

Self Satisfaction scores. Self Satisfaction scores related to how an individual felt about the self he perceived (Fitts, 1965). Three hypotheses were stated in reference to Self Satisfaction scores. They were:

Hypothesis 16: There is no significant difference in pre to post Self Satisfaction score changes between the subjects in training group E_1 and the subjects in training group E_2 .

Hypothesis 17: There is no significant difference in pre to post Self Satisfaction score changes between the subjects in training group E_1 and the subjects in the control group, C.

Hypothesis 18: There is no significant difference in pre to post Self Satisfaction score changes between the subjects in training group E_2 and the subjects in the control group, C.

The one-way, fixed-effects, completely randomized analysis of variance model was used to analyze the pre to

post differences for Self Satisfaction scores for the three groups E_1 , E_2 and C. An F ratio of .247 was found for the data and this value did not exceed the F value of 3.26 necessary for significance at the .05 level with 2 and 36 degrees of freedom. The three null hypotheses were therefore accepted and it was concluded that no significant differences existed between any of the groups for the variable, Self Satisfaction scores. The data are presented in Table 8 below.

TABLE 8
SUMMARY OF ANALYSIS OF VARIANCE FOR
SELF SATISFACTION SCORES

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F	F .95(2.36)
Treatment	65.692	2	32.846	.247	3.26
Error	4778	36	132.722		
Total	4843.692				

Behavior scores. The Behavior scores on the Tennessee Self Concept Scale were interpreted as an indication of how the individual perceived the way he functioned. Three hypotheses were formulated in regard to Behavior score changes. They were:

Hypothesis 19: There is no significant difference in pre to post Behavior score changes between the subjects in training group E_1 and the subjects in training group E_2 .

Hypothesis 20: There is no significant difference in pre to post Behavior score changes between the subjects in training group E_1 and the subjects in the control group, C.

Hypothesis 21: There is no significant difference in pre to post Behavior score changes between the subjects in training group E_2 and the subjects in the control group, C.

An F ratio of .221 was computed for the Behavior score data through the use of the one-way, fixed-effects, completely randomized analysis of variance model. An F value of 3.26 was necessary for significance at the .05 level for 2 and 36 degrees of freedom, therefore, it was concluded that the evidence presented did not provide a sufficient basis for not accepting the null hypotheses 19, 20, and 21. Table 9 presents the data for Behavior scores.

TABLE 9
SUMMARY OF ANALYSIS OF VARIANCE FOR
BEHAVIOR SCORES

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F	F .95(2,36)
Treatment	21.590	2	10.795	.221	3.26
Error	1760.769	36	48.910		
Total	1782.359	38			

Physical Self scores. These scores represented an individual's view of his body, state of health, physical appearance, skills, and sexuality (Fitts, 1965). The hypotheses related to Physical Self scores were:

Hypothesis 22: There is no significant difference in pre to post Physical Self score changes between the subjects in training group E_1 and the subjects in training group E_2 .

Hypothesis 23: There is no significant difference in pre to post Physical Self score changes between the subjects in training group E_1 and the subjects in the control group, C.

Hypothesis 24: There is no significant difference in pre to post Physical Self score changes between the subjects in training group E_2 and the subjects in the control group, C.

An analysis of the data was made through the use of a one-way, fixed-effects, completely randomized analysis of variance model. An F ratio of .781 was produced which was not significant at the .05 level of significance for 2 and 36 degrees of freedom. The data are presented in Table 10. On the basis of this evidence, the null hypotheses 22, 23, and 24 were accepted.

TABLE 10
SUMMARY OF ANALYSIS OF VARIANCE FOR
PHYSICAL SELF SCORES

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F	F .95(2,36)
Treatment	42.205	2	21.102	.781	3.26
Error	972.769	36	27.021		
Total	1014.974	38			

Moral-Ethical Self scores. Three hypotheses were formulated regarding differences in Moral-Ethical Self scores. They were:

Hypothesis 25: There is no significant difference in pre to post Moral-Ethical Self score changes between the subjects in training group E_1 and the subjects in training group E_2 .

Hypothesis 26: There is no significant difference in pre to post Moral-Ethical Self score changes between the subjects in training group E_1 and the subjects in the control group, C .

Hypothesis 27: There is no significant difference in pre to post Moral-Ethical Self score changes between the subjects in training group E_2 and the subjects in the control group, C .

The one-way, fixed-effects, completely randomized analysis of variance model was used for the analysis of the data as presented in Table 11. The F ratio of .781 was not significant at the .05 level for 2 and 36 degrees of freedom. The three hypotheses 25, 26, and 27 were accepted and it was concluded that no significant differences existed between any of the groups for Moral-Ethical Self scores.

TABLE 11
SUMMARY OF ANALYSIS OF VARIANCE FOR
MORAL-ETHICAL SELF SCORES

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F	F .95 (2, 36)
Treatment	51.881	2	25.940	.653	3.26
Error	1429.385	36	39.705		
Total	1481.266	38			

Personal Self scores. The Personal Self scores were interpreted as an individual's sense of personal worth and

adequacy apart from his body or his relationship to others (Fitts, 1965). A series of three hypotheses related to Personal Self scores were stated as follows:

Hypothesis 28: There is no significant difference in pre to post Personal Self score changes between the subjects in training group E_1 and the subjects in training group E_2 .

Hypothesis 29: There is no significant difference in pre to post Personal Self score changes between the subjects in training group E_1 and the subjects in the control group, C.

Hypothesis 30: There is no significant difference in pre to post Personal Self score changes in the subjects in training group E_2 and the subjects in the control group, C.

The analysis of the data was accomplished through the use of the one-way, fixed-effects, completely randomized analysis of variance model. An F ratio of .274 was computed for the data as shown in Table 12. An F value of 3.26 for 2 and 36 degrees of freedom was necessary for significance at the .05 level therefore it was concluded that the evidence did not indicate that significant differences for Personal Self scores existed between the groups E_1 , E_2 and C. The null hypotheses 28, 29, and 30 were accepted.

TABLE 12
SUMMARY OF ANALYSIS OF VARIANCE FOR
PERSONAL SELF SCORES

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F	F .95(2,36)
Treatment	20.667	2	10.334	.274	3.26
Error	1358.923	36	37.748		
Total	1379.590	38			

Family Self scores. Family Self scores were interpreted as an individual's perception of himself as a family member (Fitts, 1965). The three hypotheses formulated in reference to Family Self scores were:

Hypothesis 31: There is no significant difference in pre to post Family Self score changes between the subjects in training group E_1 and the subjects in training group E_2 .

Hypothesis 32: There is no significant difference in pre to post Family Self score changes between the subjects in training group E_1 and the subjects in the control group, C.

Hypothesis 33: There is no significant difference in pre to post Family Self score changes between the subjects in training group E_2 and the subjects in the control group, C.

The one-way, fixed-effects, completely randomized analysis of variance model was used to analyze the data. An F ratio of .430 was found for the data and this value was not significant at the .05 level for 2 and 36 degrees of freedom. The evidence presented did not indicate the existence of a significant difference in pre to post Family Self score differences between any of the groups. The null hypotheses 31, 32, and 33 were therefore accepted. Table 13 is a presentation of the data for Family Self scores.

TABLE 13
SUMMARY OF ANALYSIS OF VARIANCE FOR
FAMILY SELF SCORES

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F	F .95(2,36)
Treatment	24.974	2	12.487	.430	3.26
Error	1044.462	36	29.013		
Total	1069.436	38			

Social Self scores. The Social Self scores were interpreted as an individual's general perception of himself to others (Fitts, 1965). Three hypotheses concerning pre to post score differences for Social Self were stated as follows:

Hypothesis 34: There is no significant difference in pre to post Social Self score changes between the subjects in training group E_1 and the subjects in training group E_2 .

Hypothesis 35: There is no significant difference in pre to post Social Self score changes between the subjects in training group E_1 and the subjects in the control group, C.

Hypothesis 36: There is no significant difference in pre to post Social Self score changes between the subjects in training group E_2 and the subjects in the control group, C.

The one-way, fixed-effects, completely randomized analysis of variance method was used to analyze the data. An F ratio of 1.055 was computed for the data as shown in Table 14. This value was not significant at the .05 level for 2 and 36 degrees of freedom and a conclusion of no significant difference between the groups for pre to post

TABLE 14
SUMMARY OF ANALYSIS OF VARIANCE FOR
SOCIAL SELF SCORES

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F	F .95(2,36)
Treatment	74.052	2	37.026	1.055	3.26
Error	1263.846	36	35.107		
Total	1337.898	38			

Social Self scores was reached. The three null hypotheses 34, 35, and 36 were therefore accepted.

Total V scores. The Total V scores on the Tennessee Self Concept Scale represented the total amount of variability for the whole test. Three hypotheses were formulated in regard to pre to post differences in Total V Scores between the training and control groups. These hypotheses were:

Hypothesis 37: There is no significant difference in pre to post Total V score changes between the subjects in training group E_1 and the subjects in training group E_2 .

Hypothesis 38: There is no significant difference in pre to post Total V score changes between the subjects in training group E_1 and the subjects in the control group, C.

Hypothesis 39: There is no significant difference in pre to post Total V score changes between the subjects in training group E_2 and the subjects in the control group, C.

The one-way, fixed-effects, completely randomized analysis of variance model was used to analyze the pre to post group difference scores of the two training groups and the control group for Total V scores. An F ratio of 1.380 was found for the data as shown in Table 15. The F ratio of 1.380 did not exceed the table value of 3.26 required for significance at the .05 level for 2 and 36 degrees of freedom, therefore, it was determined that no significant differences existed between any of the groups. On the basis of this evidence, the null hypotheses 37, 38, and 39 were accepted.

TABLE 15
SUMMARY OF ANALYSIS OF VARIANCE FOR
TOTAL V SCORES

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F	F .95(2,36)
Treatment	327.590	2	163.795	1.380	3.26
Error	4271.077	36	118.641		
Total	4598.667	38			

Column Total V scores. These measures were similar Total V scores but related specifically to variability in columns (Fitts, 1965). Three hypotheses related to Column Total V scores were stated. They were:

Hypothesis 40: There is no significant difference in pre to post Column Total V score changes between the subjects in training group E_1 and the subjects in training group E_2 .

Hypothesis 41: There is no significant difference in pre to post Column Total V score changes between the subjects in training group E_1 and the subjects in the control group, C.

Hypothesis 42: There is no significant difference in pre to post Column Total V score changes between the subjects in training group E_2 and the subjects in the control group, C.

An F ratio of .902 was found for the Column Total V score data through the use of the one-way, fixed-effects, completely randomized analysis of the variance model. The F ratio of .902 did not exceed the critical value of 3.26 necessary for significance at the .05 level for 2 and 36 degrees of freedom. On the basis of this evidence the

associated null hypotheses 40, 41, and 42 were accepted and it was concluded that no significant differences existed between the various groups in regard to Column Total V scores. The data are presented in Table 16.

TABLE 16
SUMMARY OF ANALYSIS OF VARIANCE FOR
COLUMN TOTAL V SCORES

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F	F .95(2,36)
Treatment	146.820	2	73.410	.902	3.26
Error	2930.155	36	81.393		
Total	3076.975	38			

Row Total V scores. These scores were similar to Column Total V scores except that they referred specifically to variation across the rows (Fitts, 1965). A series of three hypotheses related to Row Total V scores were stated as follows:

- Hypothesis 43: There is no significant difference in pre to post Row Total V score changes between the subjects in training group E_1 and the subjects in training group E_2 .
- Hypothesis 44: There is no significant difference in pre to post Row Total V score changes between the subjects in training group E_1 and the subjects in the control group, C.
- Hypothesis 45: There is no significant difference in pre to post Row Total V score changes between the subjects in training group E_2 and the subjects in the control group, C.

The one-way, fixed-effects, completely randomized analysis of variance model was used to analyze the data related to pre to post differences for Row Total V scores between the groups involved in the study. An F ratio of .885 was computed for the data. The generated F value did not exceed the critical value of 3.26 necessary for significance at the .05 level for 2 and 36 degrees of freedom. On the basis of this evidence, the null hypotheses 43, 44, and 45 were accepted. The data are presented in Table 17.

TABLE 17
SUMMARY OF ANALYSIS OF VARIANCE FOR
ROW TOTAL V SCORES

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F	F .95(2,36)
Treatment	42	2	21	.885	3.26
Error	854.308	36	23.731		
Total	896.308	38			

Distribution scores. The Distribution scores on the Tennessee Self Concept Scale were interpreted as another measure of the certainty with which one views himself (Fitts, 1965). Three hypotheses were stated in regard to pre to post differences in Distribution scores between the various groups in the study. The hypotheses stated were:

Hypothesis 46: There is no significant difference in pre to post Distribution score changes between the

subjects in training group E_1 and the subjects in training group E_2 .

Hypothesis 47: There is no significant difference in pre to post Distribution score changes between the subjects in training group E_1 and the subjects in the control group, C.

Hypothesis 48: There is no significant difference in pre to post Distribution score changes between the subjects in training group E_2 and the subjects in the control group, C.

The one-way, fixed-effects, completely randomized analysis of variance model was used to analyze the data. An F ratio of .012 was computed for the data as shown in Table 18. This F ratio, .012, did not exceed the critical value of 3.26 necessary for significant at the .05 level for 2 and 36 degrees of freedom. The evidence did not indicate the existence of a significant difference between the various groups involved in the study for pre to post differences on Distribution scores. Therefore, the null hypotheses 46, 47, and 48 were accepted.

TABLE 18
SUMMARY OF ANALYSIS OF VARIANCE FOR
DISTRIBUTION OF SCORES

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F	F .95(2,36)
Treatment	218	2	109	.012	3.26
Error	5668.924	36	157.740		
Total	5886.924	38			

CHAPTER V

DISCUSSION

A total of 16 F ratios were generated from the data. One of these was significant at the .05 level for 2 and 36 degrees of freedom. The significant value was found for the cardiovascular fitness data. A Scheffé test for this data indicated that no significant difference existed between the two training groups in terms of pre to post differences in cardiovascular fitness. However, it was found that both training groups differed significantly from the control group in terms of pre to post differences in cardiovascular fitness. The changes which were found to have occurred in the cardiovascular fitness levels of the training groups were generally of a positive nature. The results of the step-test indicated that a significant decrease in heart rate at a given exercise workload had occurred for the training groups in comparison to the control group. The evidence supported Cooper's premise that participation in an aerobics exercise program would improve endurance fitness. The assumption that the Ohio State University Step Test would be sensitive to changes in cardiovascular fitness was also substantiated

by the evidence. The results were consistent with what would be expected to occur when a physiological system is subjected to a progressive overload over an extended period of time. From a statistical as well as a physiological point of view, the significance of the cardiovascular fitness findings were quite important. The findings provided the necessary conditions for further investigation of the data. In addition, the overriding question of whether a specific physical activity would have an effect on specific aspects of personality could also be dealt with under the conditions which existed for the study.

As was mentioned previously, only the F ratio for the cardiovascular fitness data was found to be significant. The results of the study indicated that the psychological variables, self-concept and need for achievement, were not significantly influenced or affected by the changes which had occurred in cardiovascular fitness levels or the information of such changes as had occurred. These results were in general agreement with the findings of Weber (1953), Benton and Summerskill (1955), Tillman (1965), and Werner and Gottheil (1966). The findings of this study did not support Cooper's (1968) report of significant positive changes in the personality of participants in aerobic training programs, nor did they support the findings of studies which have dealt with special interest groups such as mentally retarded children. Two alternative interpretations

of the results of the study seemed appropriate as a basis for discussion. They were: (1) that the Freudian position, that personality was essentially fixed in early childhood and remained relatively unchanged thereafter, had been substantiated; or (2) that the results reflected the susceptibility of the aspects of personality being investigated under the conditions of this study to change. Acceptance of the first alternative seemed the least desirable choice because of the inability of previous research to fully substantiate its validity. In addition, the nature of this investigation, as an attempt to deal with specific aspects of physical fitness and personality rather than the total entities of these variables seemed to preclude the adoption of the first alternative as an explanation of the results of the study. In terms of the second alternative it was felt that several explanations were plausible. The literature concerning personality had indicated that it was a fairly stable item throughout life. This, however, did not prevent the occurrence of changes in personality throughout life due to significant experiences. Since the results of the present study had produced no evidence of significant changes in either the self-concept or need for achievement aspects of personality, it was concluded that the experimental treatment had not been interpreted as a significant experience by the subjects. Two explanations were offered. The obvious was that the activity of running as it was used

in this study and its resulting increased cardiovascular fitness did not represent a significant experience in terms of the self-concept and need for achievement aspects of personality. The alternative explanation offered was that the results of the study only indicated that a twenty session training period did not represent a significant experience in terms of the self-concept and need for achievement aspects of personality. Thus, if the second explanation were accepted, the variables of running, self-concept, and need for achievement would remain very much alive as possible related factors, and the time factor or length of the training session would become a suggested variable for manipulation. It was also recognized that the time factor could also serve as a possible explanation for the results of the study as they related to the interpretation of fitness results by group E_2 . The lack of significant findings for group E_2 could be attributed to the fact that the subjects were not given enough time to reflect upon the results of their performance. A second possibility concerned a lack of awareness on the part of the subjects of the desirability of acquiring and maintaining high cardiovascular fitness.

In general, the overall findings of no significance for the variables self-concept and need for achievement precluded an attack or defense of the stated assumptions of the study. What could be said was that the investigation had satisfied its basic intent by providing results which

could be of value to future investigations. In addition, it would seem that the results of this study emphasized the need for continued investigation of the psychological aspect of physical education.

CHAPTER VI

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The purpose of this study was to determine, from an analysis of responses on the Tennessee Self Concept Scale and the Edwards Personal Preference Schedule, whether changes in cardiovascular fitness levels were paralleled by significant changes in selected aspects of personality. The selected aspects of personality under consideration were self-concept and need for achievement.

A total of 48 null hypotheses were formulated for the purpose of answering the basic questions posed by the study. These questions were: (1) Would a significant change in cardiovascular fitness occur as a result of participation in the aerobics program used for the study? (2) If a significant change occurred in cardiovascular fitness, would this change be paralleled by a significant change in an individual's need for achievement? (3) If a significant change occurred in cardiovascular fitness, would this change be paralleled by a significant change in an individual's self-concept? (4) If a significant change occurred in cardiovascular fitness, would the introduction

of information concerning the physiological changes which had occurred influence a significant change in an individual's need for achievement? (5) If a significant change occurred in cardiovascular fitness, would the introduction of information concerning the physiological changes which had occurred influence a significant change in an individual's self-concept?

The subjects for the study were 42 college male volunteers enrolled in required physical education classes at the University of Tulsa. Of the original sample, 39 subjects completed all phases of the study. The subjects were randomly assigned to one of three groups. The three treatments, two experimental and one control, were then randomly assigned to the groups. All random assignments were made through the use of a table of random numbers.

The design of the study was a pretest, experimental treatment, posttest, and control group model. All of the subjects participated in the Ohio State University Step Test which served as the measure of cardiovascular fitness. The subjects then completed the Tennessee Self Concept Scale and the Edwards Personal Preference Schedule which were the measures of self-concept and need for achievement, respectively. The first scores served as the pretest data. The subjects in the experimental groups then participated in an aerobics running program for a period of twenty training sessions, meeting three times a week. Upon completion of

training program, all of the subjects in the study again completed the Ohio State University Step Test, however, prior to the psychological tests the subjects in experimental group E_2 were given an evaluation of their cardiovascular fitness. The Tennessee Self Concept Scale and Edwards Personal Preference Schedule were then administered to all of the subjects. These scores served as the posttest data.

A total of sixteen one-way, fixed-effects, completely randomized analysis of variance models were used to analyze the data for pre to post mean differences between groups on the various aspects of self-concept and need for achievement under consideration. A significant F value was found for the step-test data and a Scheffé test indicated that the training groups had improved their cardiovascular fitness significantly in comparison to the control group. The Scheffé test indicated that no significant difference existed between the pre to post mean differences for cardiovascular fitness of the two training groups. No other significant F values were found for the remaining tests.

Conclusions

The results of the present study indicated that changes in cardiovascular fitness as induced by the training program employed for purposes of this study did not significantly influence or otherwise cause a change in the self-concept or need for achievement aspects of personality. In

addition, the results of the present study indicated that the introduction of information concerning changes which had occurred in cardiovascular fitness as a result of the training program employed for the purposes of this study had not influenced or otherwise caused a change in the self-concept and need for achievement aspects of personality.

On the basis of these findings, it was hypothesized that cardiovascular fitness, as induced by the training program employed for the purposes of this study, did not represent a significant experience in terms of effecting a change in the self-concept and need for achievement aspects of personality. It was further hypothesized that the introduction of the information of changes in cardiovascular fitness which had actually occurred did not alter the significance of the experience as it related to change in the self-concept and need for achievement aspects of personality.

These results did not support the theory that the positive effects of exercise on psychological development are of a general nature and applicable to a wide range of activities and behavioral outcomes. The results did seem supportive of the theory that the positive effects of exercise on psychological development are if they occur of a more specific nature both in terms of the activity participated in and the aspects of personality under examination.

Recommendations for Further Study

Based upon a review of the literature and the experience gained through this study, the following recommendations are made:

- 1) Further research should be conducted on the effect of changes in cardiovascular fitness on the self-concept and need for achievement aspects of personality. It is suggested that future efforts take into account the findings of the present study, especially the discussion regarding the length of time devoted to training for cardiovascular fitness.
- 2) Further research should be concerned with the influence that the knowledge of the benefits of exercise and cardiovascular fitness have on physical performance, self-concept and need for achievement. Close attention should be paid to the type of information given, the ability of the recipient to understand the information, and the length of time and conditions allowed for the recipient to interpret the information.
- 3) Further research should be devoted to an understanding of the interactions of the variables of cardiovascular fitness, self-concept, and need for achievement as they occur among women.
- 4) The Aerobics training program could be useful in future investigations concerned with increasing

cardiovascular fitness. The program's flexibility makes it adaptable to individual's of varying ability.

- 5) The Ohio State University Step Test could be useful in future investigations where there is a need for submaximal test of cardiovascular fitness.
- 6) The psychological tests used for this study, the Tennessee Self-Concept Scale and the Edwards Personal Preference Schedule, both could be useful in future investigations of self-concept and need for achievement.

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APPENDIX

PLEASE NOTE:

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UNIVERSITY MICROFILMS.

APPENDIX B
OSU STEP-TEST

TABLE I

		OSU STEP-TEST INNING										PRE-TEST: black POST-TEST: red							
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII
pulse rate:	circle 10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
		11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
		12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
		13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
		14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
		15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
		16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
		17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
		18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
		19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
sec. amt for each inning		20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
		21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
		22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
		23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
		24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
		25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
		26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
		27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27
		28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
		29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
		30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
		31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
		32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
		33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
		34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34
		35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35
		36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
		37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37
		38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38
		39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39
		40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
		41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41	41
		42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42
		43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43

APPENDIX C
TRAINING PERIODS

TABLE I
 TRAINING PERIODS - GROUP E₁
 (Twelve Minute Tests in 1/12 Mile Laps)

NAME	1	5	<u>Training Session</u>		17	Final
			9	13		
Al Sheeredah	16	17	14	18	23	24
Bates	13	12	16	16	18	22
Fick	17	18	20	22	23	24
Griggs	21	23	22	26	27	28
Jackson	19	20	21	23	24	25
Johnston	16	16	17	16	18	22
Kelly	12	14	15	17	15	22
McAnally	17	20	16	18	20	27
McDaniel	20	21	19	20	23	23
Norton	20	24	23	25	21	26
Oberlin	16	17	19	18	19	21
Villareal	17	19	18	19	20	23
Young	20	22	23	25	24	26

TABLE II
 TRAINING PERIODS - GROUP E₂
 (Twelve Minute Tests in 1/12 Mile Laps)

NAME	1	5	<u>Training Session</u>		17	Final
			9	13		
Arbuckle	15	15	16	18	22	25
Beck	14	12	13	17	23	22
Bertelson	15	14	15	15	19	22
Brown	16	13	16	14	15	19
Donohue	17	17	18	20	23	23
Lloyd	22	19	17	20	24	28
Losher	18	19	20	21	23	25
McKenzie	21	17	16	18	21	25
Parker	21	20	23	25	22	24
Prentice	14	16	13	15	17	23
Roberts	19	21	20	23	23	24
Rudolph	16	18	18	21	23	24
Scivally	14	14	15	17	18	21
Walsh	19	18	19	22	24	23
West	14	15	15	16	17	21

APPENDIX D

INTERPRETATION OF OSU STEP-TEST

APPENDIX D
INTERPRETATION OF OSU STEP-TEST

Typed on back of OSU score sheets (Appendix B)

Black - indicates results of first test.

Red - indicates results of second test.

To interpret the chart, multiply the circled figure by 6 and this will give the pulse rate for one minute. When the pulse rate reaches or passes 150 beats per minute, the test is stopped and the score is recorded as the inning in which the test is stopped.

If physical fitness has improved the duration of the second test (red) will be longer than the first test (black). Thus, if fitness has improved the inning score for the second test (red) will exceed the inning score for the first test (black).

APPENDIX E
PERMISSION TO USE
AEROBICS TABLES

APPENDIX E
LETTER FROM PUBLISHER

M. Evans
and Company, Inc., Book Publishers
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May 25, 1970

Mr. Michael W. Davis
Department of Health and Physical Education
University of Tulsa
600 South College, Tulsa, Oklahoma

Dear Mr. Davis:

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Sincerely,

Julia La Muniere

APPENDIX F
PRESENTATION OF DATA

TABLE I
PRE-POST SCORES OHIO STATE
UNIVERSITY STEP TEST

SUBJECT	GROUP					
	E ₁		E ₂		C	
	Pre	Post	Pre	Post	Pre	Post
1	6	9	3	9	7	7
2	7	9	3	5	5	6
3	5	13	5	8	6	7
4	8	10	7	9	7	5
5	4	6	7	6	2	3
6	12	10	7	10	4	7
7	11	16	10	17	6	5
8	8	14	5	7	3	5
9	7	8	8	10	3	6
10	8	10	6	9	7	8
11	8	11	4	8	4	4
12	1	10	3	7	8	7
13	7	11	3	6	2	1

Total Number of Subjects = 39

TABLE II
SUMMARY PRE-POST DATA OHIO STATE
UNIVERSITY STEP TEST

SUBJECT	GROUP					
	E_1	E_2	C	E_1	E_2	C
	X	X	X	X^2	X^2	X^2
1	3	6	0	9	36	0
2	2	2	1	4	4	1
3	8	3	1	64	9	1
4	2	2	-2	4	4	4
5	2	-1	1	4	1	1
6	-2	3	3	4	9	9
7	5	7	-1	25	49	1
8	6	2	2	36	4	4
9	1	2	3	1	4	9
10	2	3	1	4	9	1
11	3	4	0	9	16	0
12	9	4	-1	81	16	1
13	$\frac{4}{45}$	$\frac{3}{40}$	$\frac{-1}{7}$	$\frac{16}{261}$	$\frac{9}{170}$	$\frac{1}{33}$
$\Sigma X =$						
N = 13		13	13			
$\bar{X} = 3.461$		3.077	.538			
TOTAL N = 39						
TOTAL X = 92						

TABLE III
PRE-POST SCORES NEED FOR
ACHIEVEMENT SCORES

SUBJECT	GROUP					
	E ₁		E ₂		C	
	Pre	Post	Pre	Post	Pre	Post
1	11	17	11	18	12	11
2	19	18	12	12	22	26
3	17	17	14	14	13	12
4	24	28	13	14	9	10
5	14	13	22	21	21	19
6	21	24	19	23	16	13
7	23	22	19	15	18	20
8	18	14	17	18	8	7
9	14	15	11	14	20	24
10	27	24	17	17	6	12
11	13	14	16	20	19	20
12	13	7	13	17	18	18
13	9	12	23	24	23	23

Total Number of Subjects = 39

TABLE IV
SUMMARY PRE-POST DATA
NEED FOR ACHIEVEMENT

SUBJECT	GROUP					
	E_1	E_2	C	E_1	E_2	C
	X	X	X	X^2	X^2	X^2
1	6	7	-1	36	49	1
2	-1	0	4	1	0	16
3	0	0	-1	0	0	1
4	4	1	1	16	1	1
5	-1	-1	-2	1	1	4
6	3	4	-3	9	16	9
7	-1	-4	2	1	16	4
8	-4	1	-1	16	1	1
9	1	3	4	1	9	16
10	-3	0	6	9	0	36
11	1	4	1	1	16	1
12	-6	4	0	36	16	0
13	$\Sigma X = \frac{3}{2}$	$\frac{1}{20}$	$\frac{0}{10}$	$\Sigma X^2 = \frac{9}{136}$	$\frac{1}{126}$	$\frac{0}{90}$
	N = 13	13	13			
	$\bar{X} = .154$	1.538	.769			
	TOTAL N = 39					
	TOTAL X = 32					

TABLE V

PRE-POST SCORES SELF-
CRITICISM SCORE

SUBJECT	GROUP					
	E ₁		E ₂		C	
	Pre	Post	Pre	Post	Pre	Post
1	33	32	34	33	35	31
2	38	43	32	32	37	39
3	27	30	31	35	38	37
4	39	37	36	36	43	41
5	29	33	40	42	31	37
6	31	47	41	40	35	30
7	39	37	42	31	32	41
8	38	33	41	43	25	31
9	39	39	30	32	39	36
10	37	34	40	38	26	22
11	32	34	30	34	37	39
12	41	41	36	35	33	36
13	39	41	38	42	47	45

Total Number of Subjects = 39

TABLE VI
SUMMARY PRE-POST DATA
SELF CRITICISM SCORES

SUBJECT	GROUP					
	E_1	E_2	C	E_1	E_2	C
	X	X	X	X^2	X^2	X^2
1	-1	-1	-4	1	1	16
2	5	0	2	25	0	4
3	3	4	-1	9	16	1
4	-2	0	-2	4	0	4
5	4	2	6	16	4	36
6	16	-1	-5	256	1	25
7	-2	-11	9	4	121	81
8	-5	2	6	25	4	36
9	0	2	-3	0	4	9
10	-3	-2	-4	9	4	16
11	2	4	2	4	16	4
12	0	-1	3	0	1	9
13	$\frac{2}{\Sigma X = 19}$	$\frac{4}{2}$	$\frac{-2}{7}$	$\frac{4}{\Sigma X^2 = 357}$	$\frac{16}{188}$	$\frac{4}{245}$
	N = 13	13	13			
	$\bar{X} = 1.462$	.154	.538			
	TOTAL N = 39					
	TOTAL X = 28					

TABLE VII
PRE-POST SCORES TOTAL
P SCORE

SUBJECT	GROUP					
	E ₁		E ₂		C	
	Pre	Post	Pre	Post	Pre	Post
1	323	319	331	339	334	345
2	338	318	332	328	398	412
3	311	343	388	369	358	357
4	357	367	318	318	283	326
5	369	376	297	333	337	341
6	361	382	324	343	362	381
7	325	324	291	319	359	363
8	343	344	335	360	374	386
9	366	373	353	347	366	369
10	322	347	371	381	421	405
11	302	312	317	341	300	301
12	320	359	270	345	283	304
13	332	323	293	292	335	362

Total Number of Subjects = 39

TABLE VIII
SUMMARY PRE-POST DATA
TOTAL P SCORES

SUBJECT	GROUP					
	E_1	E_2	C	E_1	E_2	C
	X	X	X	X^2	X^2	X^2
1	-4	8	11	16	64	121
2	-20	-4	14	400	16	196
3	32	-19	-1	1024	361	1
4	10	0	43	100	0	1849
5	7	36	4	49	1296	16
6	21	19	19	441	361	361
7	-1	28	4	1	784	16
8	1	25	12	1	625	144
9	7	-6	3	49	36	9
10	25	10	-16	625	100	256
11	10	24	1	100	576	1
12	39	75	21	1521	5625	441
13	$\frac{-9}{\Sigma X = 118}$	$\frac{-1}{195}$	$\frac{27}{142}$	$\frac{81}{\Sigma X^2 = 4408}$	$\frac{1}{9845}$	$\frac{729}{4140}$
	N = 13	13	13			
	$\bar{X} = 9.077$	15	10.923			
	TOTAL N = 39					
	TOTAL X = 455					

TABLE IX
PRE-POST SCORES
IDENTITY SCORE

SUBJECT	GROUP					
	E ₁		E ₂		C	
	Pre	Post	Pre	Post	Pre	Post
1	116	118	125	119	126	127
2	124	106	122	121	137	140
3	118	129	128	129	129	123
4	113	123	110	109	110	124
5	137	138	127	121	122	127
6	131	138	122	130	127	134
7	124	120	105	111	136	129
8	136	123	129	127	131	142
9	141	134	112	114	132	133
10	110	113	134	130	144	139
11	104	109	107	115	106	109
12	128	134	106	130	101	111
13	113	114	91	106	132	128

Total Number of Subjects = 39

TABLE X
SUMMARY PRE-POST DATA
IDENTITY SCORES

SUBJECT	GROUP					
	E_1	E_2	C	E_1	E_2	C
	X	X	X	X^2	X^2	X^2
1	2	-6	1	4	36	1
2	-18	-1	3	324	1	9
3	11	-1	-6	121	1	36
4	0	-1	14	0	1	196
5	1	-6	5	1	36	25
6	7	8	7	49	64	49
7	-4	6	-7	16	36	49
8	-13	-2	11	169	4	121
9	-7	2	1	49	4	1
10	3	-4	-5	9	16	25
11	5	8	3	25	64	9
12	6	24	10	36	576	100
13	$\frac{1}{\Sigma X = -6}$	$\frac{15}{42}$	$\frac{-4}{33}$	$\frac{1}{\Sigma X^2 = 804}$	$\frac{225}{1064}$	$\frac{16}{637}$
	N = 13	13	13			
	$\bar{X} = -.462$	3.231	2.538			
	TOTAL N = 39					
	TOTAL X = 69					

TABLE XI
PRE-POST SCORES SELF-
SATISFACTION SCORE

SUBJECT	GROUP					
	E ₁		E ₂		C	
	Pre	Post	Pre	Post	Pre	Post
1	105	101	105	117	97	108
2	105	92	103	104	127	134
3	89	101	134	118	115	122
4	110	119	109	106	81	98
5	105	119	59	90	104	104
6	119	123	91	99	117	122
7	90	99	97	105	104	114
8	99	108	102	129	119	120
9	100	120	123	125	117	116
10	104	120	119	127	140	135
11	89	97	94	116	87	87
12	94	115	79	111	87	93
13	108	103	116	100	97	114

Total Number of Subjects = 39

TABLE XII

SUMMARY PRE-POST DATA SELF-SATISFACTION SCORES

SUBJECT	GROUP					
	E_1	E_2	C	E_1	E_2	C
	X	X	X	X^2	X^2	X^2
1	-4	12	11	16	144	121
2	-13	1	7	169	1	49
3	12	-16	7	144	256	49
4	9	-3	17	81	9	289
5	14	31	0	196	961	0
6	4	8	5	16	64	25
7	9	8	10	81	64	100
8	9	27	1	81	729	1
9	20	2	-1	400	4	1
10	16	8	-5	256	64	25
11	8	22	0	64	484	0
12	21	32	6	441	1024	36
13	-5	-16	17	25	256	289
ΣX	$=100$	116	75	$\Sigma X^2 = 1970$	4060	985
N	= 13	13	13			
$\bar{X}$	= 7.692	8.923	5.769			
TOTAL N	= 39					
TOTAL X	= 291					

TABLE XIII
PRE-POST SCORES
BEHAVIOR SCORE

SUBJECT	GROUP					
	E ₁		E ₂		C	
	Pre	Post	Pre	Post	Pre	Post
1	102	100	101	103	111	110
2	109	110	107	103	134	138
3	104	113	126	122	114	112
4	124	125	99	103	92	104
5	127	119	111	122	111	110
6	111	121	111	114	118	125
7	111	105	89	103	119	120
8	108	113	104	104	124	124
9	125	119	118	108	117	120
10	108	114	118	124	137	131
11	109	106	116	110	107	105
12	98	110	85	104	95	100
13	111	106	86	86	106	120

Total Number of Subjects = 39

TABLE XIV
SUMMARY PRE-POST DATA
BEHAVIOR SCORES

SUBJECT	GROUP					
	E ₁	E ₂	C	E ₁	E ₂	C
	X	X	X	X ²	X ²	X ²
1	-2	2	-1	4	4	1
2	1	-4	4	1	16	16
3	9	-4	-2	81	16	4
4	1	4	12	1	16	144
5	-8	11	-1	64	121	1
6	10	3	7	100	9	49
7	-6	14	1	36	196	1
8	5	0	0	25	0	0
9	-6	-10	3	36	100	9
10	6	6	-6	36	36	36
11	-3	-6	-2	9	36	4
12	12	19	5	144	361	25
13	5	0	14	25	0	196
$\Sigma X =$	14	35	34	$\Sigma X^2 =$	562	911
N =	13	13	13			
$\bar{X} =$	1.077	2.692	2.615			
TOTAL N =	39					
TOTAL X =	83					

TABLE XV
PRE-POST SCORES PHYSICAL-
SELF SCORE

SUBJECT	GROUP					
	E ₁		E ₂		C	
	Pre	Post	Pre	Post	Pre	Post
1	67	65	72	71	67	71
2	63	62	64	68	85	90
3	54	71	68	69	79	73
4	75	76	62	60	67	69
5	60	66	55	55	62	67
6	76	82	58	64	73	78
7	72	68	54	57	85	80
8	76	73	59	62	62	64
9	74	74	68	74	72	74
10	72	78	80	84	87	85
11	55	60	52	69	63	68
12	67	73	57	70	64	64
13	71	70	61	57	73	73

Total Number of Subjects = 39

TABLE XVI

SUMMARY PRE-POST DATA
PHYSICAL SELF SCORES

SUBJECT	GROUP					
	E_1	E_2	C	E_1	E_2	C
	X	X	X	X^2	X^2	X^2
1	-2	-1	4	4	1	16
2	-1	4	5	1	16	25
3	17	1	-6	289	1	36
4	1	-2	2	1	4	4
5	6	0	5	36	0	25
6	6	6	5	36	36	25
7	-4	3	-5	16	9	25
8	-3	3	2	9	9	4
9	0	6	2	0	36	4
10	6	4	-2	36	16	4
11	5	17	5	25	289	25
12	6	13	0	36	169	0
13	$\Sigma X = \frac{-1}{36}$	$\frac{-4}{50}$	$\frac{0}{17}$	$\Sigma X^2 = \frac{1}{490}$	$\frac{16}{602}$	$\frac{0}{193}$
	N = 13	13	13			
	$\bar{X} = 2.769$	3.846	1.308			
	TOTAL N = 39					
	TOTAL X = 103					

TABLE XVII
PRE-POST SCORES MORAL-
ETHICAL-SELF SCORE

SUBJECT	GROUP					
	E ₁		E ₂		C	
	Pre	Post	Pre	Post	Pre	Post
1	60	66	65	67	64	67
2	65	58	66	64	82	79
3	62	66	79	76	68	70
4	70	77	73	67	52	63
5	82	76	57	66	63	66
6	61	72	65	61	72	75
7	59	61	63	76	69	75
8	66	71	76	72	86	83
9	70	76	69	74	77	71
10	65	73	71	73	82	78
11	67	69	70	75	55	48
12	61	69	58	70	65	65
13	66	62	54	72	72	80

Total Number of Subjects = 39

TABLE XVIII
SUMMARY PRE-POST DATA MORAL-
ETHICAL SELF SCORES

SUBJECT	GROUP					
	E_1	E_2	C	E_1	E_2	C
	X	X	X	X^2	X^2	X^2
1	6	2	3	36	4	9
2	-7	-2	-3	49	4	9
3	4	-3	2	16	9	4
4	7	-6	11	49	36	121
5	-6	9	3	36	81	9
6	11	-4	3	121	16	9
7	2	13	6	4	169	36
8	5	-4	-3	25	16	9
9	6	5	-6	36	25	36
10	8	2	-4	64	4	16
11	2	5	-7	4	25	49
12	8	12	0	64	144	0
13	$\Sigma X = \frac{-4}{42}$	$\frac{18}{47}$	$\frac{8}{13}$	$\Sigma X^2 = \frac{16}{520}$	$\frac{324}{857}$	$\frac{64}{371}$
N =	13	13	13			
$\bar{X}$ =	3.231	3.615	1.000			
TOTAL N =	39					
TOTAL X =	102					

TABLE XIX
PRE-POST SCORES PERSONAL-
SELF SCORE

SUBJECT	GROUP					
	E ₁		E ₂		C	
	Pre	Post	Pre	Post	Pre	Post
1	67	64	64	67	64	64
2	60	67	65	62	68	74
3	59	65	80	76	73	75
4	64	70	60	62	49	59
5	75	71	59	70	75	66
6	69	68	57	66	72	76
7	59	61	57	66	66	69
8	69	69	66	72	74	80
9	74	74	74	67	73	78
10	61	66	66	72	85	79
11	63	63	60	65	58	57
12	55	63	44	63	52	57
13	63	65	65	60	52	69

Total Number of Subjects = 39

22

SUBJECT	GROUP					
	E_1	E_2	C	E_1	E_2	C
	X	X	X	X^2	X^2	X^2
1	-3	3	0	9	9	0
2	7	-3	6	49	9	36
3	6	-4	2	36	16	4
4	6	2	10	36	4	100
5	-4	11	-9	16	121	81
6	-1	9	4	1	81	16
7	2	9	3	4	81	9
8	0	6	6	0	36	36
9	0	-7	5	0	49	25
10	5	6	-6	25	36	36
11	0	5	-1	0	25	1
12	8	19	5	64	361	25
13	$\frac{2}{28}$	$\frac{-5}{51}$	$\frac{17}{42}$	$\frac{4}{244}$	$\frac{25}{853}$	$\frac{289}{658}$
	N = 13	13	13			
	$\bar{X} = 2.154$	3.923	3.231			
	TOTAL N = 39					
	TOTAL X = 121					

TABLE XXI
PRE-POST SCORES FAMILY-
SELF SCORE

SUBJECT	GROUP					
	E ₁		E ₂		C	
	Pre	Post	Pre	Post	Pre	Post
1	62	65	66	67	72	68
2	77	67	74	72	83	88
3	69	73	82	77	71	75
4	75	74	57	61	54	68
5	77	81	67	74	69	74
6	74	81	73	76	75	80
7	72	71	70	69	62	64
8	63	65	70	81	76	82
9	71	73	68	62	74	73
10	67	67	82	77	83	82
11	51	63	61	67	61	64
12	69	74	61	74	48	56
13	66	62	57	56	71	71

Total Number of Subjects = 39

TABLE XXII

SUMMARY PRE-POST DATA
FAMILY SELF SCORES

SUBJECT	GROUP					
	E_1	E_2	C	E_1	E_2	C
	X	X	X	X^2	X^2	X^2
1	3	1	-4	9	1	16
2	-10	-2	5	100	4	25
3	4	-5	4	16	25	16
4	-1	4	14	1	16	196
5	4	7	5	16	49	25
6	7	3	5	49	9	25
7	-1	-1	2	1	1	4
8	2	11	6	4	121	36
9	2	-6	-1	4	36	1
10	0	-5	-1	0	25	1
11	12	6	3	144	36	9
12	5	13	8	25	169	64
13	$\Sigma X = \frac{-4}{23}$	$\frac{-1}{25}$	$\frac{0}{46}$	$\Sigma X^2 = \frac{16}{385}$	$\frac{1}{493}$	$\frac{0}{418}$
	N = 13	13	13			
	$\bar{X} = 1.769$	1.923	3.538			
	TOTAL N = 39					
	TOTAL X = 94					

TABLE XXIII
PRE-POST SCORES SOCIAL-
SELF SCORE

SUBJECT	GROUP					
	E ₁		E ₂		C	
	Pre	Post	Pre	Post	Pre	Post
1	67	59	64	67	67	75
2	73	64	63	62	80	81
3	67	68	79	71	67	64
4	73	70	66	68	61	67
5	75	82	65	68	68	68
6	81	81	71	76	70	72
7	63	63	47	51	77	75
8	69	66	64	73	76	77
9	77	76	74	70	70	73
10	57	63	72	75	84	81
11	66	57	74	65	63	64
12	68	80	50	68	54	62
13	66	64	56	47	67	69

Total Number of Subjects = 39

TABLE XXIV
SUMMARY PRE-POST DATA
SOCIAL SELF SCORES

SUBJECT	GROUP					
	E_1	E_2	C	E_1	E_2	C
	X	X	X	X^2	X^2	X^2
1	-8	3	8	64	9	64
2	-9	-1	1	81	1	1
3	1	-8	-3	1	64	9
4	-3	2	6	9	4	36
5	7	3	0	49	9	0
6	0	5	2	0	25	4
7	0	4	-2	0	16	4
8	-3	9	1	9	81	1
9	-1	-4	3	1	16	9
10	6	3	-3	36	9	9
11	-9	9	1	81	81	1
12	12	18	8	144	324	64
13	$\Sigma X = \frac{-1}{-8}$	$\frac{-9}{34}$	$\frac{2}{24}$	$\Sigma X^2 = \frac{1}{476}$	$\frac{81}{720}$	$\frac{4}{206}$
	N = 13	13	13			
	$\bar{X} = -.615$	2.615	1.846			
	TOTAL N = 39					
	TOTAL X = 50					

TABLE XXV
PRE-POST SCORES
TOTAL V

SUBJECT	GROUP					
	E ₁		E ₂		C	
	Pre	Post	Pre	Post	Pre	Post
1	35	29	47	49	45	37
2	49	47	36	35	33	32
3	47	41	28	36	35	37
4	38	24	35	22	69	49
5	58	40	82	65	38	43
6	49	57	66	63	23	20
7	51	36	55	49	55	34
8	58	25	53	49	43	48
9	55	27	50	41	37	30
10	47	50	45	28	25	31
11	48	32	53	20	38	44
12	58	49	56	54	37	31
13	24	27	72	48	75	70

Total Number of Subjects = 39

TABLE XXVI

SUBJECT	GROUP					
	E_1	E_2	C	E_1	E_2	C
	X	X	X	X^2	X^2	X^2
1	-6	2	-8	36	4	64
2	-2	-1	-1	4	1	1
3	-6	8	2	36	64	4
4	-14	-13	20	196	169	400
5	-18	-17	5	324	289	25
6	8	-3	-3	64	9	9
7	-15	-6	-21	225	36	441
8	-33	-4	5	1089	16	25
9	-28	-9	-7	784	81	49
10	3	-17	6	9	289	36
11	-16	-33	6	256	1089	36
12	-9	-2	-6	81	4	36
13	$\frac{3}{\Sigma X = -133}$	$\frac{-24}{-119}$	$\frac{-5}{-47}$	$\frac{9}{\Sigma X^2 = 3113}$	$\frac{576}{2627}$	$\frac{25}{1151}$
	N = 13	13	13			
	$\bar{X} = -10.231$	-9.154	-3.615			
	TOTAL N = 39					
	TOTAL X = -299					

TABLE XXVII
PRE-POST SCORES COLUMN
TOTAL V

SUBJECT	GROUP					
	E ₁		E ₂		C	
	Pre	Post	Pre	Post	Pre	Post
1	19	20	32	31	31	23
2	27	27	21	21	15	14
3	29	29	13	20	19	20
4	22	14	17	11	50	33
5	36	22	68	40	22	27
6	26	30	40	40	14	12
7	34	23	29	22	32	18
8	39	15	33	29	19	25
9	41	19	25	23	23	18
10	24	27	24	14	14	17
11	25	17	26	9	24	24
12	39	28	32	35	17	19
13	12	15	46	23	42	38

Total Number of Subjects = 39

TABLE XXVIII
SUMMARY PRE-POST DATA
COLUMN TOTAL N

SUBJECT	GROUP					
	E_1	E_2	C	E_1	E_2	C
	X	X	X	X^2	X^2	X^2
1	1	-1	-8	1	1	64
2	0	0	-1	0	0	1
3	0	7	1	0	49	1
4	-8	-6	-17	64	36	289
5	-14	-28	5	196	784	25
6	4	0	-2	16	0	4
7	-11	-7	-14	121	49	196
8	-24	-4	6	576	16	36
9	-22	-2	-5	484	4	25
10	3	-10	3	9	100	9
11	-8	-17	0	64	289	0
12	-11	3	2	121	9	4
13	$\frac{3}{\Sigma X = -87}$	$\frac{-23}{-88}$	$\frac{-4}{-34}$	$\frac{9}{\Sigma X^2 = 1661}$	$\frac{529}{1866}$	$\frac{16}{670}$
	N = 13	13	13			
	$\bar{X} = -6.692$	-6.769	-2.615			
	TOTAL N = 39					
	TOTAL X = -209					

TABLE XXIX
PRE-POST SCORES
ROW TOTAL V

SUBJECT	GROUP					
	E ₁		E ₂		C	
	Pre	Post	Pre	Post	Pre	Post
1	16	9	15	18	14	14
2	22	20	15	14	18	18
3	18	12	15	16	16	17
4	16	10	18	11	19	16
5	22	18	14	25	16	16
6	23	27	26	23	9	8
7	17	13	26	27	23	16
8	19	10	20	20	24	23
9	14	8	25	18	14	12
10	23	23	21	14	11	14
11	23	15	27	11	14	20
12	19	21	24	19	20	12
13	12	12	26	25	33	32

Total Number of Subjects = 39

TABLE XXX
SUMMARY PRE-POST DATA
ROW TOTAL V

SUBJECT	GROUP					
	E_1	E_2	C	E_1	E_2	C
	X	X	X	X^2	X^2	X^2
1	-7	3	0	49	9	0
2	-2	-1	0	4	1	0
3	-6	1	1	36	1	1
4	-6	-7	-3	36	49	9
5	-4	11	0	16	121	0
6	4	-3	-1	16	9	1
7	-4	1	-7	16	1	49
8	-9	0	-1	81	0	1
9	-6	-7	-2	36	49	4
10	0	-7	3	0	49	9
11	-8	-16	6	64	256	36
12	2	-5	-8	4	25	64
13	$\frac{0}{\Sigma X = -46}$	$\frac{-1}{-31}$	$\frac{-1}{-13}$	$\frac{0}{\Sigma X^2 = 358}$	$\frac{1}{571}$	$\frac{1}{175}$
	N = 13	13	13			
	$\bar{X} = -3.538$	-2.385	-1.000			
	TOTAL N = 39					
	TOTAL X = -90					

TABLE XXXI
PRE-POST SCORES
DISTRIBUTION SCORE

SUBJECT	GROUP					
	E ₁		E ₂		C	
	Pre	Post	Pre	Post	Pre	Post
1	90	66	109	115	99	97
2	98	108	84	80	161	177
3	85	91	133	120	116	106
4	110	113	84	71	92	103
5	130	127	138	139	84	96
6	120	143	129	133	101	116
7	89	81	99	104	121	116
8	125	99	109	124	128	147
9	129	116	115	100	126	118
10	97	103	139	131	165	150
11	80	66	67	87	69	70
12	107	114	108	108	51	60
13	73	76	119	102	140	147

Total Number of Subjects = 39

TABLE XXXII
SUMMARY PRE-POST DATA
DISTRIBUTION SCORES

SUBJECT	GROUP					
	E_1	E_2	C	E_1	E_2	C
	X	X	X	X^2	X^2	X^2
1	-24	6	-12	576	36	144
2	10	-4	16	100	16	256
3	6	-13	-10	36	169	100
4	3	-13	11	9	169	121
5	-3	1	12	9	1	144
6	23	4	15	529	16	225
7	-8	5	-5	64	25	25
8	-26	15	19	676	225	361
9	-13	-15	-8	169	225	64
10	6	-8	-15	36	64	225
11	-14	20	1	196	400	1
12	7	0	9	49	0	81
13	$\frac{3}{\Sigma X = -30}$	$\frac{-17}{-19}$	$\frac{7}{40}$	$\frac{9}{\Sigma X^2 = 2458}$	$\frac{289}{1635}$	$\frac{49}{1796}$
	N = 13	13	13			
	$\bar{X} = -2.308$	-1.462	3.077			
	TOTAL N = 39					
	TOTAL X = -9					