

AN ABSTRACT OF THE THESIS OF

Sheryl L. Tudeen for the Master of Science Degree

in Physical Education presented on July 22, 1985

Title: The Effect of Aerobic Exercise Participation on the Self-Concept
of Sedentary Women

Abstract Approved:

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Purpose: The purpose of this study was to determine what effect participation in an aerobic exercise program had on the self-concept of sedentary women.

Methods of Research: Twenty female volunteers who had not engaged in regular (two times a week) physical activity in six months prior to the experiment served as subjects. Twelve females participated in the researcher's experimental eight-week aerobic exercise program. The control group was comprised of eight females who did not change their sedentary lifestyle habits. All subjects were pre- and post-tested on the Tennessee Self-Concept Scale and the Kasch Submaximal Bench Stepping Test for Healthy Middle-Aged Adults. Females participating in the aerobic exercise program were also pre- and post-tested on the YMCA bicycle ergometer test.

The differences in each subject's pre- and post-test scores on the Tennessee Self-Concept Scale were calculated and the five sub-scores of self-criticism, self-satisfaction, physical self, personal self and social self were used for analysis. The step test scores were used to evaluate changes in aerobic fitness. Analysis of covariance was then performed, holding any fitness effects constant, while determining whether differences in self-concept mean changes between the experimental group and the control group existed at the .05 level of significance.

Conclusions: Although self-concept differences between the two groups were found to exist at the .082 level of probability, this did not meet the earlier established level of .05 needed for statistical significance. However, based on the consistency of self-concept differences between the two groups on all sub-scores, the .08 level that was obtained and the positive written and verbal feedback by the experimental group regarding self, this study was found to have meaning on a substantive level.

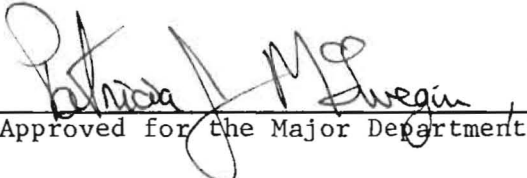
THE EFFECT OF AEROBIC EXERCISE PARTICIPATION
ON THE SELF-CONCEPT OF SEDENTARY WOMEN

A Thesis
Presented to
the Division of Health,
Physical Education, Recreation and Athletics
Emporia State University

In Partial Fulfillment
of the Requirements for the Degree
Master of Science

by
Sheryl L. Tudeen
July, 1985

Thesis
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Approved for the Major Department


Approved for the Graduate Council

Acknowledgements

The researcher wishes to express her thanks to the following people:

Dr. Patricia McSwegin, Chairperson: For her physiological expertise, her attention to detail and for caring enough to demand quality work not only in regards to this thesis, but in all she expects of her students.

Dr. Loren Tompkins, Committee Member: For his many hours of statistical guidance, for always being available and most of all, for his never ending encouragement and support.

Dr. Philip Wurtz, Committee Member: For his thoughtful insight into the self-concept variable and his willingness to take the time to explain psychological principles to a physical education student.

Dr. David Hurt, Testing and Measurement: For his time and enthusiasm in this project and his testing and measurement expertise.

A special thank you to my parents, Robert and Virginia Tudeen for their encouragement to set high goals, their belief I could attain them and for their love and support.

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Chapter One

INTRODUCTION

"Fitness craze", "health mania" and wellness boom" are phrases commonly used by Americans today. The increased use of terms referring to health, wellness, and physical fitness is not surprising considering the fact that today 59% of Americans report participating in regular physical activity, compared to only 24 percent participation 20 years ago (Corbin, 1983).

Another indication of America's involvement in this "health trend" is the amount of money spent each year on fitness and fitness-related products. In 1980, Americans spent \$5 billion on diet and exercise books, \$240 million for barbells and aerobic dance programs and another \$5 billion on health clubs and corporate fitness centers (Reed, 1981).

Despite this fitness interest, however, there is a question as to what physiological gains are being made from all this participation and monetary output. Only 35% of those individuals participating in physical activity, actually exercise strenuously enough to elicit physiological changes. On the other hand, perhaps the increased awareness of the health-related aspects of physical activity and the participation itself are beneficial.

Interest in health-related aspects of fitness has occurred gradually in both educational institutions and commercial enterprises. This interest replaced an earlier emphasis that was centered on the performance-

related skills needed for athletic success. One of the first groups to identify the need for health-related fitness was the American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD) through its Task Force on Youth Fitness. Recognizing the need to distinguish between physical fitness and physical performance, AAHPERD adopted the position that physical fitness testing and programs for development of fitness should emphasize the relationship between health and physical activity, rather than viewing exercise only as a means to become a better athlete (AAHPERD, 1980).

The World Health Organization defines health as a "state of complete physical, mental and social well-being and not merely the absence of disease and infirmity" (Pollock, Purdy, and Carroll, 1979). This definition coincides with the belief of educational researchers (Neale, Sonstroem and Metz, 1969) that physical activities can and should be used as a means for personal development and self-enhancement. Indeed, many commercial health enterprises have capitalized on this notion in promoting the enjoyment and social benefits of organized exercise programs.

While there is general agreement on the physiological benefits a regular exercise program can produce, the relationship between exercise and psychological change is less clear. Adequate levels of cardiovascular fitness, body composition, and flexibility are known to contribute to a decreased incidence and severity of such hypokinetic diseases as coronary heart disease, obesity, hypertension, and low back pain (Clarke, Jan. 1974; Oct. 1974; 1975; 1979; Corbin and Noble, 1980). Of all these health related components, cardiovascular efficiency is considered the

most important indicator of an individual's general level of physical fitness (Folkins and Simme, 1981).

One of the most important components of an individual's psychological fitness is their level of self-esteem or personal self-concept (Coopersmith, 1967). While most studies agree that self-concept is significantly associated with personal satisfaction and effective functioning, they disagree as to the role participation in physical activity plays in enhancing these feelings. The research seems to be divided into three general, but distinct groups.

First there are those researchers, who in studies involving physical activity and self-concept, report no significant association between the two variables (Heaps, 1978; Neal, 1981). Others like Carlson (1965) and Engel (1957) argue that because self-esteem is a stable dimension of personality, it cannot be significantly changed with an exercise program.

A second group has demonstrated just the opposite in their studies. They claim it is the individual's participation in exercise that produces the psychological enhancement and not the physical changes they may experience. Percy (1981) reported such an increase in the self-concept of elementary school pupils after participating in a seven-week distance running program.

The third approach taken by researchers was that participation in an exercise program by itself is not enough to produce self-concept changes, there must be a change in physical fitness as well (Folkins, Simme, 1981). Gary and Guthrie (1972) also found this to be true in studying the fitness

training effects of jogging on the self-concept of alcoholics. They suggest that the success and positive feedback an exerciser experiences tends to facilitate improvements in self-concept.

Statement of the Problem

Today, over 70 million Americans are discovering the benefits of movement (Reed, 1981). Whether it be walking, jogging, biking, swimming, or dancing, participation in exercises has increased (Anderson, 1980). The question is, are these people exercising for physical improvement or because they feel better about themselves when they do? Both of these possibilities need to be explored when examining the relationship between exercise participation and self-concept.

Because exercise is of a physiological nature, most physical educators and health practitioners would assume the physical gains to be greater than the psychological ones in any exercise program. This might not be true. Perhaps for some individuals, merely participating in an exercise program is enough to increase their self-esteem. Other participants may need to see some tangible evidence of physical change before they can have a better self-concept (Kowal, Patton, Vogel, 1978).

Unfortunately most of the research in this area has been done on abnormal populations or on individuals specifically labeled as having poor self-concepts. Other studies (Kay, Richards, Fleker, Varoz, Ray, 1972), used motor skill or strength training as their conditioning program rather than a regimen of cardiovascular training. In addition, researchers have generally used children or male subjects in their studies.

The purpose of this research was to examine the effect participation in an aerobic exercise program had on the self-concept of sedentary females. The specific objective was to determine if the self-concept of sedentary women would differ significantly following participation in an aerobic exercise program compared to the self-concept of a similar group of women who did not participate in any form of exercise.

To accomplish this goal, a quantitative study measuring the relationship among aerobic exercise participation, fitness changes and self-concept enhancement on two groups of females was examined. Instruments and protocols used to assess changes consisted of the Tennessee Self-Concept Scale, the Kasch Submaximal Bench Stepping Test for Healthy Middle-Aged Adults, and the YMCA Bicycle Ergometer test. Because cardiovascular efficiency is considered the best overall indicator of the level of fitness, an aerobic program designed to enhance cardiovascular fitness was used for the activity, and cardiovascular testing was used to evaluate the physical effects of the program.

Statement of the Hypothesis

The statement of the substantive hypothesis (null form) for this research was: There was no significant difference between the experimental groups' self-concept test mean improvement and the control groups' self-concept test mean improvement.

Statement of Significance

Too often fitness leaders and/or physical educators complete a session or course feeling disappointed that certain individuals did not score higher or perform better on physical fitness assessment tests. The criterion for success is usually not how the participant feels about his or her participation, but rather how much they improved physiologically or where they placed on national norm distributions for various aspects of fitness.

Consideration needs to be given as to whether improved physical fitness is the only benefit of regular participation in an exercise program. Perhaps there are other values to aerobic fitness training which are as important as the physical ones. In general, studies have indicated that persons high in self-esteem are happier and more effective in meeting environmental demands than are persons with low self-esteem (Coopersmith, 1967). If it is true that physical fitness and/or participation in an exercise program can enhance these feelings, then that is certainly an accomplishment worthy of consideration by physical educators and leaders in the commercial health sector.

If this research can show the impact that participation in aerobic exercise programs has on self-concept, it will serve as a reminder to those in the fitness field that priorities other than creating highly fit bodies do exist. Physical fitness and exercise programs should not be geared towards just the highly skilled. The physiological and psychological benefits of fitness training can be experienced by everyone.

Definitions of Terms

Terms relating to this study have been defined in this section.

Self-concept - An organized configuration of perceptions of the self which are admissible to awareness (Rogers, 1950).

Self-esteem - A personal judgement of worthiness that is expressed in the attitudes the individual holds toward himself (Coopersmith, 1967).

*These two terms will often be used interchangeably in this paper.

Aerobic

Exercise - Those exercises that stimulate heart and lung activity for a time period long enough to produce beneficial changes in the body (Cooper, 1970). Aerobic activities significantly raise heart and respiratory rates and should last for twenty minutes or more to produce a conditioning effect (Dintiman, Stone & Pennington & Davis, 1984).

Sedentary - Having not participated in any form of regular (two times a week) exercise for the past six months.

*Wells and Marwell (1976) note that because self-esteem is one of the evaluative components of a person's self-concept, the two terms are often used interchangeably, and McGuire (1968) supports this reasoning stating an overconcern with definitions can be counterproductive and delay the development and tests of hypotheses.

Chapter Two

REVIEW OF RELATED LITERATURE

Since the time of Socrates (Plato, 1946), there has been speculation that participation in physical activity is associated with feelings of self-worth, however, early attempts to research such a relationship were marred by lack of a link between the mind and body. Psychologists tended to view the two as complete and separate entities (Folkins, Simme, 1981).

Despite the lack of professional investigation, the "sound body - sound mind" philosophy continued to flourish and in recent years gained even more attention. Hilyer and Mitchell (1979) attributed the renewed interest to the holistic approach taken to medical treatment and individual's increased interest in physical fitness and its relationship to mental health.

With the advent of the term, "psychosomatic", psychologists and physiologists began to accept the conceptual link between mind and body and further suggested that such a relationship also existed between the psyche and the body (Folkins, Simme, 1981). Diamond hypothesized that a person's self-concept will influence and be influenced by his view of his physical appearance and physical abilities. Wylie (1974) agreed, stating that it is intuitively obvious that attitudes toward the body are important aspects of self-regard, since an individual's general appearance and physical functioning are the most visible parts of self.

Today there is general agreement that physical fitness and fitness participation can contribute to psychological fitness, however, it is difficult to cite valid, pertinent research results that validate such a relationship. A variety of different populations, fitness components, and psychological areas have been studied in an attempt to make a connection between the physiological and psychological fields.

The purpose of this research was to study the effect participation in an aerobic exercise program had on the self-concept of sedentary women. Because so little research was available on this specific combination of variables, it was necessary to explore other studies relating physical fitness, physical activity, and physical participation to various areas of psychological enhancement.

This chapter includes a review of the literature pertinent to the theoretical formulation that the self-concept of sedentary females could be enhanced by participation in an aerobic exercise program. Validation of the testing methods used to assess this relationship are also reviewed. Areas examined include: a historical overview of self-concept, the importance of self-concept, potential for self-concept change, physical fitness and aerobic exercise, studies relating to physical exercise and psychological enhancement, and validity of the testing instruments.

Self-Concept: Brief Historical Overview

Although theologians, philosophers and lay persons have suggested the existence of self-concept for centuries, it was not until the late

nineteenth and mid-twentieth centuries that any professional attempt to measure and investigate this phenomenon was made (Stensrud, 1984). Even then, the research of psychologists, sociologists and psychiatrists was more often based on everyday observations than scientific fact.

American psychologist William James (1890), one of the first to show considerable interest in the self, used uncontrolled observations and his own method of introspection to formulate his famous treatment of the topic "self". In addition, Mary Calkins (1915) used an artificial and restrained method of introspection in her attempt to study self-conception. This method was later discredited because it did not produce reliable results (Stensrud, 1984).

In 1935, Kurt Koffka was listing the self as an important area to be studied by Gestalt psychologists. Members in this branch of psychology used a type of introspection in which observers reported their conscious experiences without the artificial analysis or restraints used by Calkins. At this same time, sociologists were promoting the importance of social interactions in shaping the individual's self-conceptions (Cooley, 1902). Once again, these discussions stemmed more from personal observation than actual research.

It was not until 1947, when psychologist Carl Rogers offered his theory on self-concept to the American Psychological Association's Convention in Detroit, that serious consideration was given to the importance of self-concept. Rogers' theory was phenomenological in nature, claiming that every individual perceives a separate world of phenomena

all around and within oneself and it is this phenomenal field that governs one's behavior. He went on to describe self as the ". . . organizing, creative and adaptive core of personality which was most influential in determining a person's behavior" (Rogers, 1951, p. 283).

In the decades that followed, more attention was given to the importance of the self-concept variable by a variety of psychological fields. Child psychologists investigated the development of social cognition as it pertained to knowing about others and one's self in relation to others (Sahntz, 1975). Coopersmith (1967) raised the issue of the influence of parental characteristics and behavior on self-concept and Kohlberg, (1969) studied the role moral development played in the acquisition of self-concept.

Social psychologists began to examine the effects age, class, race and gender had on self-conceptions (Wylie, 1979) and self-concept variables were also included in other sociological theories. One of the most popular of these theories was attribution theory, which considers the conditions under which persons assign causal influences to themselves, to others and to impersonal factors (Gorlitz, 1980).

Despite the upsurge of interest in self-concept in the past three decades, very few studies attempted to systematically explore the self-concept phenomenon. In her survey of pertinent research literature on self-concept, Wylie (1961) reported a confusing array of hypotheses, measuring instruments and research designs used to study self-concept.

Importance of Self-Concept

Although conflict between theoretical formulation and research methods existed among investigators, there was a definite consensus as to the importance of self-concept in the individual. Self-concept theorists presumed that one could not ". . . understand and predict human behavior without knowledge of the subject's conscious perceptions of his environment, and of his self as he sees it in relation to the environment" (Wylie, 1961, p. 6).

In addition, Rosenberg (1979) contended that positive self-concept is the chief component of favorable life adjustment, and Coopersmith (1967) suggested that individuals high in self-esteem are generally happier and more effective in meeting life's daily stresses than are persons with low self-esteem. In his famous 1966 report, Coleman showed the greatest factor affecting students' success in school was their self-concept, and Treffort (1980) even submitted that ". . . the bottom line of most personal health problems is a faulty self-concept" (Treffort, 1980, p. 118).

Potential for Self-Concept Change

Because self-concept is viewed as a critical component of an individual's mental well-being, the potential for enhancing it has been studied with a great deal of interest. Although there is general acknowledgement that the possibility for change exists, psychiatrists, sociologists, and psychologists disagree as to the likelihood of enhancement occurring and the time factor involved in such a change.

In his studies on parental influence, Coopersmith (1967) reported that an individual's self-concept is formed and remains relatively stable preceding middle childhood and Kirshebaum (1979) concurred, noting that once the concept of self is formed, it is very difficult to change. Additionally Sonstroem, (1982) in his review of factors affecting an individual's self-concept, reported that changes are not readily accomplished and can often take years to occur. However, he did note that changes are seen more readily in individuals with an initial low level of self-esteem.

Rogers (1980) disagreed, taking a humanistic approach in his dealings with self-concept change. He claimed that one has, within oneself, vast resources for altering one's self-concept, basic attitudes and self-directed behavior. Although Rogers acknowledged that certain conditions were necessary for change to occur, he claimed that as one is accepted and prized, one tends to develop a more caring attitude toward oneself. Tucker (1983) agree, noting that self-esteem is generally regarded by theorists as ". . . being influenced and partially formulated by objective feedback from the environment" (Tucker, 1983, p. 389-390).

Physical Fitness and Aerobic Exercise

The importance of a healthy lifestyle has become more apparent in the last few decades as a decreasing mortality rate is being replaced by an increase in the incidence of degenerative diseases such as myocardial infarctions, strokes, hypertension, neuroses and malignancies (deVries, 1980). These changes are due not only to the efforts of the medical

profession in limiting the incidence of infectious diseases, but also to the advancement of science and technology, which has made the necessity for physical labor almost non-existent.

Some factors, such as sex, heredity and age, which contribute to degenerative disease, cannot be changed. But others, including physical activity level, can be altered and such change in fitness is also beneficial in reducing the incidence of diabetes, lung diseases, obesity and low back pain (Cooper, 1970; Williams, 1985).

Most experts recognize cardiovascular efficiency as the most critical component of physical fitness. It has also been found to be the single best indicator of an individual's level of physical fitness (Folkins, C.H.; Simme, W.E., 1981). The type of activity deemed necessary for contributing to cardiovascular efficiency is that which is aerobic in nature.

The term "aerobic" was first coined by Dr. Kenneth Cooper in his studies on the conditioning effects of certain types of exercise on young Air Force men (Cooper, 1968). Aerobics refers to ". . . a variety of exercises that stimulate heart and lung activity for a period long enough to produce beneficial changes in the body" (Cooper, 1970, p. 15). Typical examples include: vigorous running, biking, swimming and dancing.

In order for any aerobic exercise program to elicit physiological changes, several criteria must be met. The American College of Sports Medicine (1978, p. 9-10) made the following recommendations:

1. Frequency of training: three to five days per week.
2. Intensity of training: 60% to 90% of maximum Heart Rate Reserve or 50% to 85% of maximum oxygen uptake (max VO_2).

3. Duration of Training: 15 to 60 minutes of continuous aerobic activity. Duration is dependent on the intensity of the activity, thus lower intensity activity should be conducted over a longer period of time. Because of the importance of the "total fitness" effect and the fact it is more readily attained in longer duration programs, and because of the potential hazards and compliance problems associated with high intensity activity, lower to moderate intensity activity is recommended for the nonathletic adult.
4. Mode of Activity: Any activity that uses large muscle groups, than can be maintained continuously and that is rhythmical and aerobic in nature.

Frequency

For sedentary subjects just beginning an aerobic program, exercising three days a week is most often recommended with a day off between each session. Because these individuals are not used to physical exertion, it might take several weeks before they adapt to training and recover from their initial level of fatigue and soreness (Cureton, Phillips 1964). A day off between exercise sessions gives them time to recover and also decreases the likelihood of injury (Pollock, Gettman, Mileses, Bah, Durstine, Johnson, 1977). Although research indicates cardiovascular improvement can occur in two day per week programs, subjects rarely lose the body fat or weight they do in a program meeting three day a week (Pollock, Broida, Kendrick, Miller, Janeway, Linnerud, 1972).

Intensity

Several methods of determining the intensity of training exist, the two most often being percent of maximum heart rate reserve and maximum oxygen uptake. Percent of maximum heart rate reserve is the percent difference between the resting and maximum heart rate at which exercise is being performed. Maximum oxygen uptake (max VO_2) or aerobic capacity refers to the greatest amount of oxygen one can utilize under the most strenuous exercise (Astrand, 1967). Of the two methods, maximum oxygen uptake is considered the measure most representative of cardiovascular fitness (Astrand, Rodahl 1977). However, because testing methods for directly measuring max VO_2 require a lot of time, expense, and knowledge, submaximal tests were developed to indirectly estimate max VO_2 (Astrand, Rodahl, 1977). Regardless of the method used to determine an individual's maximum oxygen uptake, the American College of Sports Medicine (1978) states that for cardiovascular fitness improvements to occur, an individual must work at a minimum intensity of 50% of their max VO_2 , and the upper limit at which most participants tolerate aerobic training is 85%.

Duration

As previously mentioned, the length of time an individual needs to exercise is dependent on the intensity of their actions (American College of Sports Medicine, 1978). For the sedentary individual just beginning an aerobic exercise program, the American College of Sports Medicine recommends 40-50 minutes of moderate intensity (60-80% max VO_2) activity to stimulate a training effect. Although programs of shorter duration

(10 to 15 minutes of moderate intensity) have been shown to produce a training effect, the effect is significantly lower than from a similar program of 30-60 minutes duration (Milesis, Pollock, Bah, Ayres, Ward, Linnerud, 1976).

The length of the total training program also has an effect on the individual's improvement in cardiovascular efficiency. Improvements have been reported in programs as short as three weeks (Collingwood, Willet, 1971), however, longer program lengths of eight (Cureton, 1972) and 16 weeks (Pollock, Cureton, Greninger, 1969) are usually recommended as a minimum length for an aerobic training effect to occur.

Mode of Activity

A variety of activities can be used to train for aerobic capacity improvement. These are commonly known as moderate to high energy expenditure activities and include running/jogging (Pollock, Cureton, Greninger, 1969), bicycling (Pollock, Dimmick, Miller, Kendrick, Linnerud, 1975), swimming (Stransky, Mickelson, Van Fleet, Davis, 1979) and aerobic dancing (Vaccaro, Clinton, 1981). Of all these activities, aerobic dancing is one of the newer and more popular forms of aerobic exercise among women. Developed in 1970 by Jackie Sorenson, aerobic dance contains sets of vigorous dance steps to improve aerobic capacity, stretching movements to improve flexibility and muscle toning movements to improve muscular endurance (Williams, 1985).

Studies Relating to Physical Exercise and Psychological Enhancement

Despite the recognition by experts of the importance of self-concept to mental health, and of cardiovascular efficiency to physical fitness,

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Studies Relating to Physical Exercise and Psychological Enhancement

Despite the recognition by experts of the importance of self-concept to mental health, and of cardiovascular efficiency to physical fitness,

very few researchers have used these two variables to study the psychological effects of participating in regular physical activity. Therefore, in addition to reviewing those few studies that did investigate psychological outcomes from physiological training, this section also includes a review of other major research pertaining to the psychological-physiological relationship. Studies are divided into three general categories:

1. Those studies reporting no association between physical activity and self-concept.
2. Those studies demonstrating psychological enhancement from exercise participation.
3. Those studies claiming psychological changes as a result of physical fitness changes.

No relationship between physical fitness participation and self-concept

In his study of ninth grade boys participating in a 10-week jogging program, Neal (1981) found no changes from pre-test to post-test on self-esteem, although levels of fitness did increase. Similarly, in a study involving 67 male professors participating in a six week aerobic program, no changes in depression levels were found. However, these subjects did verbally report "feeling better" as a result of the program (Morgan, Roberts, Brand, Feinerman, 1970).

In a physical education program emphasizing motor skills, no relationship was found between the ability of junior high school boys to throw a softball, run a 50-yard dash, perform pull-ups, or do a

standing broad jump and their level of self-concept (Kay, Felker, Varoz, 1972). Gary and Guthrie (1972) also reported negative results in their study involving alcoholic men who jogged a mile a day for twenty days. Although there was a slight increase in their masculinity conception score, no other significant self-concept changes were found.

Psychological Enhancement from Exercise Participation

In his study of college males participating in a 16-week weight training program, Tucker (1983) reported significant increases in their levels of self-concept as measured by the Tennessee Self-Concept Scale. The individual's level of success on weight lifting was not determined to be a significant contributing factor. Percy, Dziuban, and Martin (1981) also reported self-changes independent of physical improvement in their study of fifth and sixth grade children involved in a three day per week running program for seven weeks.

Changes were found too by Jasnoski, Holmes, Solomon, and Aquiar (1981), in their research studying the psychological effects of aerobic conditioning on women. The twenty females participating in this ten week program showed significant increases in ability and confidence levels that were not related to improvements in physical fitness. The exercise training programs consisted of two 1-hour training classes per week, consisting of strenuous rope jumping, dancing, or running.

In a 1977 study involving 15 college students in a ten week jogging program, Leonardson and Gargiulo, reported a significant correlation between the subject's perceived fitness and their level of self-concept. No relationship was reported between actual fitness improvement and increased self-concept.

The 45 obese policemen participating in Short, DiCarlo, Stefee and Pavlou's (1984) eight week study involving aerobic conditioning also showed changes in self-concept to be unrelated to physical improvement. However, it should be noted that the sub-group participating in both the aerobic training and supplementary education program reported the greatest self-concept change.

Psychological Change as a Result of Physical Fitness Improvement

In a study involving a three week aerobic conditioning and motor skill program designed for obese teenage boys, Collingwood and Willet (1971) reported the subjects improved on physical fitness as well as their levels of self-acceptance and self-concept. Subjects were pre- and post-tested on the Kraus-Webber series of overall fitness, balance tests, chalk jump, push-ups, and sit-ups. Psychological tests included a shortened version of the body attitude scale and an index of adjustment and values.

In another study involving college students enrolled in a semester long class of jogging, psychological changes in mood, personality and work behavior variables were positively correlated with physical changes for the female students, whereas there was no changes in the males (Folkins, Lynch, Gardner, 1972). The researchers suggested the initially high level of fitness demonstrated by the male students would account for their subsequent lack of psychological change.

A similar study involving male and female recruits before and after six weeks of basic training reported just the opposite results. Males in this study improved in the areas of mood, anxiety, self-confidence

and physical fitness, but the female recruits did not. However, the basic training regimen differed in intensity between the males and females (Kowal, Patton, Vogel, 1978).

Hilyer and Mitchell (1979) reported physical gains in two different groups of college students involved in a ten-week running program. One group simply participated in the running portion of the study and the other group combined running with counseling sessions. Although more self-concept changes were evident in the counseling-running group, individuals who started with low self-concept in both groups, showed an increase.

Additional Studies

Three additional studies investigating the relationship between physical activity and psychological enhancement also merit review. Because these studies did not employ any method of physical testing, the psychological improvements that resulted could not be attributed exclusively to participation.

Clifford and Clifford (1967) reported self-concept changes in boys aged 16 to 21 participating in one month of the Outward Bound School in Colorado. The specific purpose of the camp was to build physical stamina and to push each individual to his physical limit. Although self-concept changes were related to the initial level of self-evaluation, overall changes in self-concept also occurred.

In two other studies involving discharged psychiatric patients, psychological improvements were made following participation in regular exercise. Lyon (1978) noted reduced levels of anxiety following an eight

week jogging program, and Morgan, Roberts, Brand and Feinerman (1970) also reported decreases in depression in depressed males following six weeks of chronic aerobic exercise consisting of circuit training, jogging and swimming.

Validity of Testing Instruments

Tennessee Self-Concept Scale

The Tennessee Self-Concept Scale (TSCS) is one of the most frequently used instruments for evaluating an individual's level of self-concept. Developed by William Fitts in cooperation with the Tennessee Department of Mental Health, the TSCS is self-administered and can be completed by individuals 12 years or older, who possess at least a sixth grade reading ability (Fitts, 1965).

The TSCS is an objective Likert-type instrument consisting of 100 items, 90 of which contribute to 3 x 5 self-concept classification system. Together, these items yield scores for three internal and five external dimensions of self-concept as well as a total score for self-esteem. The internal reference is sub-divided into three areas: (1) identity; (2) self-satisfaction; and (3) behavior, and indicate how a person describes himself. The external reference point is subdivided into five areas: (1) physical self; (2) moral-ethical self; (3) personal self; (4) family self; and (5) social self. The external frame is a measure of how the individual utilizes outside sources to describe himself (Pound, Hanses, Putnam, 1977).

Because different components of self-concept are of unequal centrality to the interests of the individual and are hierarchially organized,

Rosenberg (1979) recommends scales that use both specific and global levels of self-concept. Sonstroem (1982) agree, noting the use of part or specific scales is advised as a means of studying the relationship between exercise and self-esteem.

The ten items not included in the self-esteem evaluation in the TSCS test, make up the self-criticism score. This score not only indicates a person's defensiveness but can also be used as a lie scale to check the validity of subject responses. The inclusion of lie or faking scales is recommended with psychometric inventories (Sonstroem, 1982).

In terms of validity measures, the Tennessee Self-Concept Scale met standards on three different levels:

Content Validity - Items in the classification system used for the raw scores and column scores were kept only if agreed upon unanimously by a panel of expert judges (Fitts, 1965).

Discrimination Between Groups - In order for this scale to be meaningful, one would rightfully expect that groups who differ on specific psychological dimensions would also differ on self-concept. In studies utilizing psychiatric patients and those done with non-patients, this was found to be the case for almost every score (Fitts, 1965).

Correlations with Other Measures - Correspondence between scores on this scale and other self-inventory tests were compared. Between the MMPI Scores and the Tennessee Self-Concept Scale, a correlation significant at the .05 level was reported. The same significance was demonstrated between the Tennessee Self-Concept Scale and Edward's Personal Preference Schedule (Fitts, 1965).

Validation of Physical Testing
Protocols Chosen

The two aerobic capacity measurements used to assess physiological changes as a result of the eight week aerobic program were the Kasch Submaximal Bench Stepping Test for Healthy Middle-Aged Adults and the YMCA Bicycle Ergometer Test. Both of these tests were submaximal in nature.

Although direct measures of max $\dot{V}O_2$ are considered superior, they are also more time consuming, more expensive, more difficult to administer and potentially more dangerous to the subject (Pollock, Wilmore, Fox 1984). Estimation of this same value can be made with relative accuracy from an individual's heart rate response at submaximal workloads, performance time or distance on a standardized test. These tests, while not as precise as the maximal tests, are useful in deciding whether an exercise program has been effective in improving the individual's circulatory capacity (Astrand, Rodahl, 1977).

The basic assumption underlying the use of step tests is that given the same amount of work to accomplish, the participant with the lower heart rate immediately following the test will be in better physical condition and therefore will have a higher max $\dot{V}O_2$ (Pollock, Wilmore, Fox, 1984). The Kasch step test is specifically designed and normed for middle-aged men and women. The use of a twelve inch stepping bench in this test instead of the more common used sixteen inch bench also makes it more practical for initial testing on sedentary subjects.

Bicycle ergometer tests are also based on the fact that heart rate and max VO_2 are linearly related over a broad spectrum. Once again the assumption is that a more fit individual will have a lower steady-state heart rate at any given level of work (Astrand, Rodahl, 1977). The most commonly used submaximal bicycle ergometer tests include a physical work capacity test developed by Sjostrand and a single-stage test by Astrand and Ryhming. These tests are designed to estimate max VO_2 by graphing an individual's submaximal heart rate versus their power output at heart rates between 110 and 150 beats per minute. This heart range has been shown to have the best linear relationship with max VO_2 over a wide range of fitness levels and ages (Pollock, Wilmore, Fox, 1984). Wyndham (1967) found the multistage tests to be more valid than the single stage tests.

The YMCA modified the Sjostrand test by using two or three minute continuous stages to estimate max VO_2 . Pollock, Wilmore and Fox (1984) recommend the YMCA protocol because of its explicit instructions and appropriate norms.

Summary

The individual importance of self-concept and cardiovascular efficiency has been recognized by members in both the psychological and physiological fields. It has not been until fairly recently, however, that the two professions have begun to examine the effects one can have on the other.

Carl Rogers (1951) was one of the first psychologists to devote considerable time to the self-concept variable and he later claimed

self-concept to be that part of the personality which was the most influential in determining a person's behavior. Treffort (1980) added that the underlying factor involved in most personal health problems is a poor self-concept. Although there is general disagreement on the likelihood of self-concept change, most experts agree that the propensity for enhancement exists (Sonstroem, 1982, Rogers, 1980, Tucker, 1983).

The component most critical to an individual's overall physical fitness is cardiovascular efficiency (Folkins, Simme, 1981). The type of activities needed to improve this aspect of fitness are called aerobic exercises. The American College of Sports Medicine (1978) issued recommendations on the levels of frequency, intensity, duration and mode of activity that should be included in exercise programs designed to elicit a change in aerobic capacity.

For the sedentary individual just beginning an aerobic exercise program, studies indicate individuals should exercise three days a week, between 50% and 80% of their max VO_2 for approximately 30-60 minutes in duration. Although physical changes can occur in as little time as three weeks, (Collingwood, Willet, 1971), longer program lengths of eight (Cureton, Phillips 1964) and 16 weeks (Pollock, Cureton, Greninger, 1969) are usually necessary before any significant changes can occur. Exercises that are continuous and aerobic in nature and that involve large muscle groups are recommended. Examples include: jogging, swimming, bicycling and aerobic dancing.

Research investigating the effects of physical activity on psychological enhancement falls into three general categories. Those studies reporting no relationship between physical fitness participation and self-concept include the work of Morgan, Roberts, Brand and Feinerman in their 1970 study involving 67 male professors participating in a six week aerobic program and similar work by Neal (1981) in his study of ninth grade boys participating in a ten week jogging program. No psychological improvement was seen in either group.

Studies noting psychological enhancement from exercise participation included Tucker (1981) in his study on the self-concept of college males involved in a 16-week weight training program and Percy, Dziuban and Martin (1981) in their study of fifth and sixth graders involved in a seven week running program. The twelve females participating in Jasnoski, Holmes, Solomon and Aquiar's (1981) program of aerobic conditioning also showed increases in ability and confidence levels.

The final category of research included those studies which showed psychological change as a result of physical fitness improvement. Collingwood and Willet (1971) found both physical fitness increases and improved self-acceptance in a program geared towards obese teen-age boys. In two different jogging programs, Folkins, Lynch and Gardner (1972) and Hilyer and Mitchell (1979) found positive psychological changes in subjects who exhibited physical fitness changes as well.

Three other studies reporting psychological changes following an exercise program (Clifford and Clifford, 1967, Lyon, 1978 and Morgan, Roberts, Brand and Feinerman, 1970) did not utilize any physiological

testing. It could not be distinguished whether these psychological changes were as a result of physical change or program participation.

The three testing protocols used in this study were the Tennessee Self-Concept Scale (TSCS), the Kasch Submaximal Bench Stepping Test for Healthy Middle-Aged Adults and the YMCA bicycle Ergometer Test. All three have been in existence for several years and are used frequently in their respective professions.

The TSCS is an objective-Likert instrument consisting of 100 items. It reports scores on nine different sub-areas as well as giving a total self-concept score. The TSCS met four different validity standards in terms of content validity, discrimination between groups, correlation with other measures and personality changes under particular conditions.

The step test and bicycle ergometer test are both submaximal in nature and, therefore, indirectly measure an individual's max VO_2 or aerobic capacity. Submaximal tests have been found to be useful in predicting whether an exercise program has been effective in improving an individual's circulatory capacity (Astrand, Rodahl, 1977) and are preferable when time, expense and lack of medical assistance are factors (Pollock, Wilmore, Fox, 1984).

The Kasch step test was specifically designed and normed for middle-aged adults and the YMCA bicycle ergometer test is also highly recommended because of its detailed instructions, guidelines and appropriate norms. Both tests measure the heart's response to work and assume that the individual with the lower heart rate is the more fit individual (Astrand, Rodahl, 1977).

Chapter Three

METHODS AND PROCEDURES

This study focused on the effect participation in an aerobic exercise program had on the self-concept of sedentary females. Changes in physical condition for these same women were also examined. The methods and procedures used in this study are described in this chapter. Information on population and sampling, materials and instrumentation, design of the study, data analysis, and study limitations are also included.

Population and Sampling

Subjects for this experiment consisted of twenty adult female volunteers from a midwestern city of 30,000 people. Participants ranged in age from 19 to 66 years and were not currently involved in a regular exercise program, other than the experimental program, and had not been in a regular exercise program for six months. Volunteers were requested using newspaper advertisements, posted notices, items in the University's daily memo, and by word of mouth. These notices stated that a graduate student from the local university needed volunteers for a free eight week aerobic exercise class. Two different time slots, 8:30 a.m. and 12:30 p.m., along with a phone number for more information were given. Examples are included in Appendix A.

Thirty-seven women responded to these notices and 29 attended on the first day of class. The eight subjects who did not attend the first meeting were later contacted by the researcher. Time conflicts and change

of mind were given as their reasons for lack of attendance. Four of these women agreed to serve as members of the control group. In addition, there were four women who attended the first meeting who later indicated they would not be able to join the exercise class. These four women also agreed to be members of the control group. Three other women from the community also served as control subjects.

A total of 35 women completed both the psychological and physiological pre-tests. Of these individuals, 20 were members of the experimental group and 11 were in the control group. Four women who completed the exercise program and all of the testing were not considered subjects in either group as they did not meet the sedentary criteria.

Five subjects in the experimental group did not complete the program due to illness, vacation, time conflicts, or other reasons. In addition, the data of three other subjects in this group were dropped due to their poor attendance (less than 70%). This left an experimental group consisting of 12 subjects. The mean age for subjects in this group was 37.

In the control group, the data of two subjects were not included because they joined a health club midway through the experiment. One other subject in this group repeatedly did not show up for the post-testing despite several attempts to accommodate her. The eight subjects who completed both the pre- and post-testing comprised the control group. These subjects had a mean age of 36.

Design of the Study

The research design used in this study was quasi-experimental in nature. Because human subjects were involved, manipulation of all

relevant variables was not possible. The design procedure for this study was a nonrandomized experimental group and control group pre-test and post-test. Although this was not the ideal design, it was the best alternative considering the time and subject limitations.

Materials and Instrumentation

Three specific tests were used in this study. The Kasch Submaximal Bench Stepping Test for Healthy Middle-Aged Adults and the YMCA bicycle ergometer test were used to measure aerobic fitness, and the Tennessee Self-Concept Scale was used to assess psychological changes in the subject's self-concept. The validity for each of these was outlined earlier in chapter two. Although subjects were also measured on body composition, that information was gathered merely for the participants' own enlightenment and not for use in the study itself.

A checklist of the equipment required for the completion of this study can be found in Appendix B. Two pieces of equipment require special mention:

- A. Metronome - This device is an indicator of rhythm and can be used to establish continuous paces. For the purpose of this research, a Fran II metronome, manufactured by the LaFayette Instrument Company was used to establish a standard rhythm for the three minute Kasch step test. The metronome was calibrated before each testing session by comparing the rhythm of the metronome to a second hand on a clock.

B. Bicycle Ergometer - This piece of equipment is one method of establishing a standard workload such as is needed in assessing cardiovascular conditioning and physical fitness changes. In this study, a Monark-Crescent AB Bicycle Ergometer was used. Calibration was also checked prior to each testing session by the methods described in Appendix C.

Measurement and Program Procedures

The subjects in the experimental group participated in an eight week aerobic exercise program that met three times a week on Mondays, Wednesdays, and Fridays. The subjects had the choice of attending either the 8:30-9:20 a.m. class or the 12:30-1:20 p.m. class. The identical format was followed in both sessions. Subjects in the control group did not participate in any exercise program and were encouraged not to make changes in their exercise habits until after the completion of the program. Both groups completed pre- and post-tests, measuring physiological and psychological variables which might reflect changes due to the experimental program.

Although the actual exercise portion of the class and the start of the eight week program did not begin until Monday, April 22, 1985, experimental group subjects met with the researcher (who also served as the aerobic instructor) for the first time on Wednesday, April 17, 1985. The first two classes were used for organization and administrative purposes.

During the first session, subjects were briefed on the class content, the testing procedures and their responsibilities as subjects. A short tour including the locker room, the dance studio and the physiology laboratory followed. Upon returning to the classroom, subjects were given a chance to ask questions before signing the informed consent and medical history forms. Those subjects 35 years and older were also required to return a medical release form from their physician before beginning the program (Appendix D).

Subjects were then informed they would be given the self-concept test and the step test during the next class period and were instructed to wear comfortable clothes suitable for movement. They were also asked to refrain from eating or drinking up to two hours before the testing began and not to exercise the day of the test.

The second class meeting started with the administration of the Tennessee Self-Concept inventory. Subjects were gathered in one classroom and given a pencil, test booklet and answer sheet. The researcher then went over the format of the test, explaining the response choices and the item order. Subjects were asked to respond to each statement honestly and ask for assistance if they had any questions. Once they had completed the test they were instructed to turn in all their test materials to the exam proctor and report to the Human Performance Lab to do the step test.

As several subjects gathered in the lab, the researcher led them in a series of stretching exercises (Appendix E), while explaining the nature of the test. The researcher then demonstrated the four count

stepping pattern each subject would be completing: (1) right foot up, (2) left foot up, (3) right foot down, (4) left foot down. A 12 inch stepping bench was used for this test, and a metronome set at 96 beats per minute was used to establish the cadence. Subjects were allowed several practice steps before beginning their three minute work bout.

Upon completion of the three minutes of stepping, or as in the case of some individuals, when the subject was no longer able to keep pace with the metronome, she was instructed to sit down. Five seconds into the recovery, the researcher began counting the subject's heart rate for a full minute using a stethoscope and a stopwatch. This score was recorded on an individual testing form (Appendix F). For those individuals who were unable to step for the entire three minutes, a note was made of the seconds they completed before stopping. Subjects were requested to walk around for several minutes after the test and to repeat the stretching exercises they had done previously. Before leaving, each subject signed up for a lab time early the following week to complete the testing.

In this second testing session, subjects were weighed and had the option of having skinfold measurements taken to determine percent body fat. Skinfolds were done behind a screen and taken at four different body sites: triceps, iliac, abdomen and thigh. The YMCA bicycle ergometer test was also given to each subject at this time. Once again, the subjects had been requested not to eat or drink prior to the testing

session or engage in any exercising. Subjects were given a brief explanation of the bicycle ergometer test as they stretched.

Before the test was started, the bicycle ergometer was calibrated (Appendix C) and the seat height was adjusted for each subject. Individuals were requested to use the speedometer to maintain a constant pedaling rate of 18 kilometers per hour throughout the entire test. With no resistance to the wheel, this rate was then practiced for one minute by each subject prior to the start of the test. Subjects were encouraged to comment on how they felt periodically during the test to ensure they were not over-taxing themselves.

The initial workload for each subject was set at 150 kilogram-meters per minute. The subject pedaled at this first workload for three minutes. During the second and third minute of the workout, the subject's heart rate was measured using a stethoscope and stopwatch. This measurement was figured as the time it took for the subject's heart rate to beat thirty times. Using a heart rate conversion chart, (Appendix G) this time was converted to beats per minute and recorded on the subject's testing sheet (Appendix G). If the heart rates at the second and third minute differed by more than five beats, additional minutes were added at the same workload until a steady heart rate value was obtained. These heart rate values were recorded and new workloads were set in accordance with the workload setting guidelines established for females (Appendix G).

These same procedures were followed for the second and third workouts, with the new workload value being recorded each time. If the

first workload had elicited a heart rate of 110 bpm or greater, there was no need for a third workload. In order to be consistent throughout the test, the heart rates were measured during the last 15 seconds of the second and third minutes for each workload. In addition, the workload setting was monitored periodically to ensure the friction belt had not slipped, changing the intensity of the test.

Once the heart rates at the end of the second and third minutes of the third workloads were recorded, the test was completed. Subjects were requested to continue pedaling as the researcher reduced the bikes resistance to zero. Individuals continued this light exercise until their heart rate returned to 110 bpm or less. Participants were assisted down from the bike and urged to walk around the room and stretch before leaving.

The heart rates the subjects obtained in the third minute of the second and third workloads were then plotted against the respective workloads on the maximum physical working capacity graph (Appendix G). This was done to figure an estimated max VO_2 value for each subject (Appendix G). Because the amount of oxygen needed for any task is a function of size and weight, it was necessary to put this value in a relative form, that is to calculate a value per kilogram of body weight. A conversion chart was used to convert the maximum oxygen uptake (liters/min.) to millimeters per kilogram of body weight per minute (ml/kg/min.).

The results of the bicycle ergometer test and the step test were discussed with the subjects during the first week of regular exercise

class. Each subject was given a card with her individual scores and ratings, while the researcher explained the general significance of the two physical tests to the group. Confidentiality was maintained with the use of code numbers assigned to each subject. The researcher was the only person with access to these codes.

Due to time limitations, the subjects in the control group began their testing one week after the experimental group and completed their post-test eight weeks later. Subjects in this group were given identical instructions and followed the same testing procedure as the experimental group with two exceptions. The control group subjects completed their psychological and physiological testing in one session and they did not perform the bicycle ergometer test. These decisions were made from a practical standpoint.

In order to accommodate some of the subjects in the control group, the researcher had to administer the tests at various sites and under certain time constraints. Because the equipment used in the step test was easily transportable and the test itself lasts only four minutes, this protocol was chosen as the means of assessing aerobic capacity in the control group. Utilizing the format established with the experimental subjects, the subjects in the control group also completed the Tennessee Self-Concept inventory before beginning the step test.

The scores of the experimental and control groups' Tennessee Self-Concept pre- and post-tests were calculated, following the completion of the experiment. Each subject's answer sheet was in the form of an enclosed packet, which registered all their answers directly on a score

sheet by carbon paper. This score sheet was not visible to the subject and could be seen only by tearing the perforated edge of the packet and removing the overlaying answer sheet and carbon paper (Appendix H).

The score sheet was arranged in columns and rows with each of the subdivisions reporting for a specific area. Column A reflected physical self, Column B was moral-ethical self, Column C was personal self, Column D was family self and Column E was social self. Row 1 reported identity, Row 2 self-satisfaction, and Row 3 behavior. The total positive score was computed by adding either the row totals or the column totals. The responses from a separate column were used to compute the self-criticism score. Further detailed scoring instructions are included in Appendix I.

All scores were hand-figured by the researcher and double checked using a calculator. The difference between an individual's pre- and post-test scores on each of the sub-divisions listed above was recorded and used for analysis. Subjects were not told their self-concept scores until the entire experiment was over, and then only if they specifically requested. Once again, confidentiality was maintained through the use of code numbers.

The aerobic exercise program provided for the experimental subject was designed in accordance with exercise guidelines established by the YMCA and American College of Sports Medicine. A sample format of a typical exercise routine is included in Appendix J. The sessions lasted 50 minutes and included a warm-up period (stretching), a muscular endurance section (one specific region of the body exercised repeatedly) an aerobic

movement portion and a cool-down section. All the exercises and movements were choreographed to music.

Before any exercises started each session, attendance was recorded and the participants took their resting pulse. Periodically throughout the class, pulse rate was checked again. Subjects were frequently asked what their heart rate was and reminded to stay within their training zone. Information on their individual range had been given to them previously on the first day of class. Using the subject's bicycle ergometer scores, their training zone was calculated as 50-85 percent of their estimated maximum aerobic capacity. Subjects were encouraged to exercise within their own heart rate range. Modifications or alternatives for specific exercises were also given. As the sessions progressed, the intensity of the exercises increased also.

Statistical Design

Data in this study were analyzed with descriptive statistics (means, ranges and standard deviations) as well as with inferential statistics. Analysis of covariance (ANCOVA) was employed to study what effect the treatment (participation in an aerobic exercise program) had on the experimental group's self-concept. Because there was a strong possibility the exercise program would produce physiological changes in the subjects, and these changes could account for psychological differences, the fitness variable was controlled.

By utilizing an ANCOVA, the researcher was able to study the self-concept mean sub-scores between and within the two groups, while at the

same time holding any physical changes constant. Physical changes in the experimental group were further analyzed using a t-test to determine the differences between the pre- and post-test scores on their YMCA bicycle ergometer tests.

Substantive Hypothesis (null form)

There is no significant difference between the experimental group's self-concept test mean improvement and the control group's self-concept test mean improvement.

Statistical Hypothesis

Null Hypothesis: $\mu_e = \mu_c$

Alternative Hypothesis: $\mu_e > \mu_c$

A rejection of the null hypothesis would indicate the treatment effect of participating in an aerobic exercise program had significantly contributed to the change in the experimental group's self-concept.

A .05 level of significance was used.

Limitations of the Study

Caution must be taken in attempting to generalize the results of this experiment to any other population. Although there is undoubtedly a segment of the population consisting of sedentary females, because of the nature of this study's subject selection, it is not accurate to label the groups used in this study as random. Any significant results obtained in this research need to be verified in a controlled experimental environment.

Chapter Four

ANALYSIS OF DATA

The purpose of this study was to determine the effect that participation in an aerobic exercise program had on the self-concept of sedentary women. This chapter is devoted to the analysis of data obtained from the psychological and physiological pre- and post-tests given to both the experimental and control groups. These tests included the Tennessee Self-Concept Scale and the Kasch Submaximal Bench Stepping Test for Healthy Middle-Aged Adults. A third test, the YMCA Bicycle Ergometer Test was administered to the experimental group only.

The statistical procedure used for analysis included: Analysis of Covariance (ANCOVA) and Analysis of Variance (ANOVA). In addition, a t-test was run on the experimental group's bicycle ergometer scores to determine if significant differences existed between pre- and post-physical conditions. A .05 level of significance was used.

Sample Analysis

The subjects in this study consisted of 20 female volunteers who had not engaged in regular (two times a week) physical activity in the six months prior to the experiment. The experimental group included 12 females who participated in the researcher's eight week aerobic exercise program. The control group was comprised of eight females who did not

change their sedentary lifestyle habits. The mean age for the experimental group participants was 37 and for the control group participants was 36.

Statistical Analysis

To analyze the differences between the collective scores obtained from the experimental group and those of the control group, analysis of covariance (ANCOVA) was used. This statistical technique allowed the researcher to simultaneously study a number of variables between and within the two groups, while at the same time, adjusting to control for a noise variable. In this design, the self-concept sub-scores were the variables compared and fitness change was the noise variable held constant. It was important to determine whether changes in self-concept were due to physiological changes or whether changes could be attributed to merely participating in a group aerobics program.

Although the Tennessee Self-Concept scale reports nine different sub-scores for each individual, in this experiment only five of the most relevant ones were utilized. These scores included: self-criticism, self-satisfaction, physical self, personal self and social self. Three of these scores: physical self, personal self and social self represent the individual's external frame of reference. Physical self describes the individual's feelings on her body, state of health, physical appearance, skills and sexuality, personal self reflects the individual's acceptance of personal worth, and social self refers to the individual's sense of . . . "adequacy and worth in her social interaction with other people" (Fitts, 1965, p. 3).

Self-satisfaction is included in the internal frame of reference sub-section where the individual is describing herself. This score is derived from those test items in which the individual describes how she feels about the self she perceives. The self-criticism score is a measure of the individuals defensiveness. A high score in this area is generally a sign of openness and capacity for self-criticism. However, extremely high scores (above the 99th percentile) are deviant and indicate the individual may be lacking in defenses. On the other end, low scores indicate defensiveness and can be used to determine the validity of high overall positive scores. Therefore, not only does this subscore report defensiveness, it can also be used as a lie scale to check the honesty of the subject's responses.

In this experiment, the step test scores were used as a constant to adjust for increases in fitness and to determine to what extent this contributed to self-concept changes. Ideally these scores would have been reported as the heart beats counted in the one minute recovery period following the three minutes of stepping. However, because of fatigue or the inability to keep pace with the metronome, certain individuals in both the experimental and control groups were unable to successfully complete the test. Therefore, a formula was devised to take this into consideration.

The amount of time the subjects were able to continue stepping to the beat of the metronome was converted into seconds and then divided into their one minute recovery count. A subject who completed the full three minute test would automatically have a 180 second count in the

denominator of their fraction. The recovery heart rate was placed in the numerator. Because a low heart rate is desirable, a smaller score was therefore considered to represent a fitter individual. To arrive at the differences in fitness scores, the subject's post-test score was subtracted from the pre-test score. In this case, the larger the number, the greater the difference. A hypothetical example is included in Appendix K. Although the scores used for the step test represent a value which relates to physical changes, they cannot be regarded as a direct indication of change in aerobic capacity due to the mathematical calculations performed.

When an ANCOVA was run on the self-concept variables, holding the physical changes constant, differences were found to exist at the .082 level of probability. This did not meet with the earlier established level of .05 needed for statistical significance. Therefore it was necessary to accept the Null hypothesis $\mu_e = \mu_c$.

Substantive Analysis

Statistical significance could not be attached to the outcome of this experiment. However, there were several aspects of the data that suggested the alternative hypothesis ($\mu_e > \mu_c$) was true. Minium reminds researchers that it is the substantive discipline of logic and inquiry that enters most importantly into judgements and that "statistical procedures do not carry automatic authority" (Minium, 1980, p. 354). Although it is not the intent of the researcher to detract from the fact that statistically no significance was found, it is important the the meaningfulness of this experiment is examined.

The decision to use a .05 alpha level in this experiment was an arbitrary choice, as it is in any research design. However, experts suggest that when the area being investigated is a relatively new one, there are grounds for setting an alpha value of .10 or even .20 (Minium, 1970). Had either of these levels been established, this experiment would have demonstrated significance. The results of the ANCOVA showed significance at the .08 level. It is highly likely that in accepting the null hypothesis in this experiment, a type II error was made.

It is also important to remember a person's general self-concept is established early in life and remains relatively stable over the years (Coopersmith, 1967). Taking this into consideration, the fact that there were any changes in the self-concepts of the experimental group's middle-aged subjects, let alone consistent ones has great meaning. Table reports the mean differences for the experimental and control groups' pre- and post-test scores on the five areas of the Tennessee Self-Concept scale.

Table 1

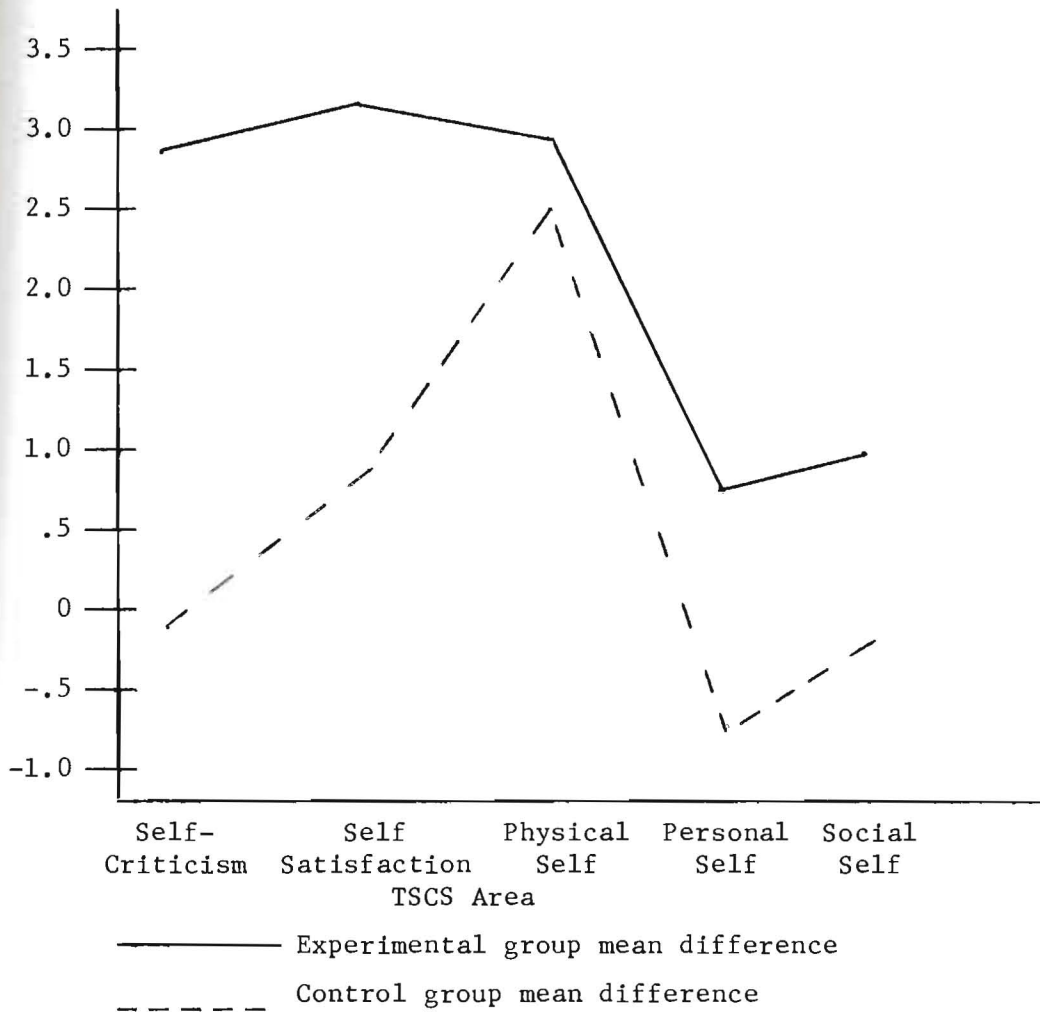
Experimental and Control Groups' Incremental Mean Changes
Between Pre-test and Post-test Self-Concept Response

Group \ TSCS Area	Self-Criticism	Self-Satisfaction	Physical Self	Personal Self	Social Self
Experimental \bar{x} n = 12	2.58	3.08	2.67	.75	.92
Control \bar{x} n = 8	-.13	.88	2.50	-.75	-.25

In every case, the experimental group showed a positive increase in self concept above that of the control group. The graph in figure further illustrates the differences between these two groups.

Figure 1

Experimental and Control Groups Incremental Mean Changes
Between Pre-Test and Post-Test Self-Concept Response



In examining all of these self-concept scores, it was important to note whether there were any particular sub-tests on which the two groups appeared to differ significantly. A one way ANCOVA showed that the self-criticism component was significant at the .028 level. At first this finding was surprising, considering the self-criticism score reflects the individual's defensiveness. The statements that make up this score are ones that most people admit to as being true. To deny them, is an attempt to paint a nice picture of oneself. The collective self-criticism scores of the experimental group decreased in the post-test, indicating an increase in defensiveness. The control group exhibited little change in this area.

Further examination and interpretation of the self-criticism changes indicated they were consistent with the rest of the data. Because neither group of subjects had been previously involved in a regular exercise program, the pre-test scores on the self-criticism variable represented a fairly honest perception by the subjects of themselves. However, when the subjects in the experimental group became involved in a regular exercise program with others, they were exposed to their real physical capabilities and the expectations of society. This could account not only for the rise in defensiveness, but also for the lack of significant change in the post-test on physical self. By the time the experimental subjects took the self-concept post-test, they had a more realistic view of their own physical self.

The question that then arose was as to whether evidence existed to suggest that the patterns of self-concept change were due to the change

in physical condition resulting from participation in the aerobics program. To test this, the results of the original ANCOVA were compared with the findings of an identical ANOVA, which had the adjustment of scores for program participation removed. The coefficient used to measure the differences between these two statistical techniques was Omega Squared. This quantity is calculated with the formula:

$$\Lambda^2_W = \frac{SS_a - (K-1) (MS_{S/A})}{SS_T + MS_{SA}}$$

Where:

SS_A = amount of standard deviation or variance attributable to the treatment effect

K = number of groups

$MS_{S/A}$ = mean square of error

SS_T = variance of all data

This calculation allowed the researcher to measure the percentage of variance between the two groups that was attributed exclusively to the treatment effect, i.e. participation in the aerobics program. When the Omega Squared was run for the factorial ANOVA, a .0157 coefficient was found. This same technique was then applied to the ANCOVA data which adjusts for change in physical condition, and a .02 coefficient was established. Had the effect of physical change been a major contributor to the changes in self-concept, the range between these two percentages would have been greater. Two percent of the variance on self-concept between the experimental and the control groups was directly

related to aerobic participation. While this may not appear worth considering, it is important to consider the endless stimuli these women are exposed to everyday and remember there is a two percent difference that can be specifically accounted for.

Furthermore, the results of a t-test on the experimental group's bicycle ergometer tests failed to show any significance in terms of physiological improvement. The t obtained in this experiment was calculated at $-.84$ and a t value of 2.201 was needed to claim significance. Therefore, any psychological changes could not be attributed to a physiological change.

Although there was not a systematic recording of statements received by the aerobics instructor, the general tone of the participant's comments was highly favorable. Subjects remarked on their higher energy levels, their pleasure with the program and their overall sense of well-being. In order to collaborate these observations, subjects were asked to respond to a series of five, yes or no questions formulated by the researcher regarding their feelings following the eight week exercise program. The purpose of this questionnaire was not to establish a statistical argument, but rather to substantiate the feedback already received by the researcher. Unfortunately, psychometric assessments do not exist for the objective appraisal of this "feeling better" sensation (Morgan, Roberts, Brand-Feinerman, 1970). The five questions and assembled responses are included in Table 2 . A copy of the questionnaire is included in Appendix L.

Table 2

Subject Responses to Subjective Questionnaire
Regarding Feelings About Self at Conclusion of
Aerobic Exercise Class

<u>Question</u>	Response:	<u>YES</u>	<u>NO</u>
1. Exercising makes me feel good.		12	0
2. I like myself better when I'm exercising		12	0
3. I feel fit.		11	1
4. I like my body better now.		12	0
5. I have more confidence in myself.		12	0

As the data indicated, the experimental group reported favorable changes as a result of the aerobic program. Eleven of the twelve subjects responded positively to every question.

Chapter Five

SUMMARY, CONCLUSIONS, DISCUSSION, RECOMMENDATIONS

This study was designed to investigate the effect participation in an aerobic exercise program had on the self-concept of sedentary women. Twenty female volunteers who had not participated in regular (two times a week) physical activity in the six months prior to the experiment, served as subjects. Twelve females made up the experimental group by participating in an eight week aerobic exercise program, and the other eight subjects comprised the control group by continuing with their sedentary lifestyle habits.

All subjects completed pre- and post-tests on the Tennessee Self-Concept Scale and the Kasch Submaximal Bench Stepping Test for Healthy Middle-Aged Adults. In addition, those females participating in the aerobic exercise program were also pre- and post-tested on the YMCA bicycle ergometer test.

Conclusions

The differences in each subject's pre- and post-test scores on the Tennessee Self-Concept Scale were calculated and five of the scale's most relevant sub-scores were used for analysis. The specific sub-scores used were: self-criticism, self-satisfaction, physical self, personal self, and social self.

Analysis of covariance was used to study the self-concept changes between and within the experimental and control groups. This technique

allowed the researcher to simultaneously control for any fitness changes that might have occurred as a result of the program. The step test scores were used to evaluate changes in aerobic fitness.

On the basis of this analysis, it was determined that there was no significant difference between the experimental group's incremental changes between pre- and post-test self-concept response and the control group's incremental changes between pre- and post-test self-concept response.

Discussion

It is possible that several factors contributed to the lack of significant statistical results in this experiment. These factors might include: length of the treatment time, sample size, attendance requirements, the nature of the psychological testing instrument and the alpha level chosen.

Members in both the experimental and control groups volunteered for this experiment and therefore did not ideally represent the general population. In addition, both groups were fairly small. The experimental group consisted of 12 females and the control group was made up of eight females.

Because self-concept is considered a fairly stable dimension of an individual's personality (Coopersmith, 1967), it may be that eight weeks of exercise participation was not a long enough treatment time to elicit significant psychological changes. Subjects were allowed to miss one session per week and still meet the 70% attendance requirements for inclusion in the data. Therefore, it is possible that both the frequency

of participation and total duration of the program fell short of the participation time needed to bring about changes in a fairly stable variable.

Another possible explanation for the failure to find significance lies in the direction of the psychological testing instruments themselves. Morgan, Roberts, Brand and Feinerman (1970) suggest that existing psychometric tests are not sensitive enough to detect psychological changes in the "normal" individual. They claim tests specifically measuring the proposed areas of change need to be developed and utilized.

Choosing an alpha level of significance for any experiment is an arbitrary decision. Statistics can be used to give direction or mathematically support an argument, however, they do not carry automatic authority. Regardless of whether statistical significance is obtained, Minium (1970) reminds researchers that it is the substantive application of logic and inquiry that enter most importantly into judgements.

Based on this interpretation, evidence existed on the substantive level to support the alternate hypothesis $\mu_e > \mu_c$. The incremental mean changes in the experimental group's self-concept sub-scores were consistently higher than the self-concept changes in the non-exercising control group. Subjects in the experimental group also responded favorably to a questionnaire regarding feelings about self at the conclusion of the aerobic class.

Both of these factors, coupled with the statistical difference found at the .08 level of probability, suggest a change in self-concept did occur and further research in this area is needed.

Recommendations

Although this study showed no statistical significant differences between the experimental group's and control group's incremental changes between pre- and post-test self-concept response, the researcher suggests further pursuit of this topic in the following ways:

1. A replication of this study should be done in which the aerobic exercise treatment is extended for a longer period of time and stricter attendance standards are set for inclusion in the data set.
2. A psychometric test should be developed to objectively measure the "feeling better" sensation reported by subjects.
3. A similar study involving three separate groups of women should be done. One group would serve as a control group, another would participate in an aerobic program adhering to strict American College of Sports Medicine exercise program guidelines and the third would be involved in a commercial recreational type activity program where the only concern would be participation.

The researcher further recommends that regardless of the physiological purpose behind their programs, leaders in both the educational and commercial fitness fields consider the importance of self-enhancement and the role it could play in keeping individuals in exercise programs long enough to experience physical fitness changes as well.

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Appendix A
Advertising Samples

Sample Advertising:

Sample from University Memo:

START YOUR DAY WITH SOME EXERCISE - 8:30-9:20 a.m. or 12:30-1:20 p.m.
FREE beginning Aerobic Class for women . . . Graduate student needs
volunteers to participate in an 8 week program, April 10-June 7.
Fitness testing included. To sign up, or for more info. contact
Sheryl in 218 PE Building or call 343-1200, Ext. 354 or 342-7315.
Spons. By HPERA.

Newspaper Advertisement:



BEGINNING AEROBICS
★ FREE ★
Graduate Student Needs Persons
For 8 Week Program
Monday-Wed. & Friday
Starting Wed., April 10
Contact Sheryl in P.E. at E.S.U.
343-1200 Ext. 354
or 342-7315

Appendix B
Equipment Checklist

EQUIPMENT LIST

The following is a complete list of the materials required to collect the necessary data:

1. #2 pencils
2. Fitness Recording Forms
3. Informed Consent Forms
4. Tennessee Self-Concept Questionnaire
5. Tennessee Self-Concept Answer Sheets
6. Medical Release Forms
7. Metronome
8. Stethoscope
9. Stop Watch
10. 12-inch Step Bench
11. Monark-Crescent AB Bicycle Ergometer
12. Evaluation Tables for:
 - a. YMCA 3-site skinfold measurements
 - b. 3-minute step test
 - c. 6-7 mini bike test
13. Calculator
14. Skinfold Calipers

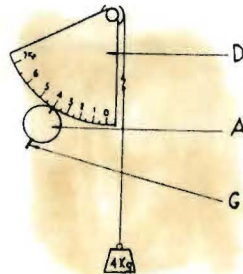
Appendix C

Bicycle Ergometer Calibration

Bicycle Ergometer Calibration

Bicycle Ergometer -- The bicycle ergometer is one method of assessing cardiovascular conditioning and physical fitness changes. Providing the adjusting screw G for the pendulum weight has an unbroken color seal, the bike is considered calibrated. However, this can and will be periodically checked by (Astrand):

1. setting the mark on the pendulum weight at "0";
2. attaching a weight known to be accurate (Fig. 3);
3. a 1 kg. weight should give a reading of 1 kg. on the scale D;
4. the center of gravity of the pendulum weight can be moved by means of adjusting screw G.



Appendix D

Subject Forms

Informed Consent
Medical History
Medical Release

INFORMED CONSENT FORM

I, Sheryl Tudeen am asking for your participation in research designed to evaluate the effect aerobic exercise has on the well-being of an individual. It is important to study factors other than physical ability in determining the worth of fitness programs.

The Division of Health, Physical Education, Recreation and Athletics supports the practice of protection for human subjects participating in research and related activities. The following information is provided so that you can decide whether you wish to participate in the present study.

As a subject in this study, your presence will be required for 50 minutes, three times a week for the duration of the eight-week program. Two additional time slots will be arranged, at your convenience to facilitate the physical fitness testing. The exercise portion of this study is geared towards individuals who have not been engaged in vigorous physical activity for the past six months or more.

Each session will include a warm-up period (10-15 minutes), a muscular endurance period (10-20 minutes), an aerobic movement period (10-20 minutes) and a cool-down period (5-10 minutes). The times for each of these sections will vary as the eight weeks ensue and the individual becomes more accustomed to exercise. Subjects will be encouraged to progress in terms of intensity and duration within their own individual ability levels.

The testing for each participant will include a written questionnaire and three physical fitness measurements. The written test requires the individual to answer a series of 100 statements concerning self-description. The fitness testing includes skinfold measurements to determine percent body fat and a bike and step test for assessing cardiovascular fitness.

The fitness testing sessions will require some physical exertion which might induce temporary discomfort and or muscle soreness in the lower extremities. A series of stretching exercises will be performed both before and after the tests to reduce this effect. A skinfold caliper is used to determine percent body fat. There is a slight pinch involved in the measurement of each skinfold site. This testing provides both the researcher and the individuals with information needed to set the proper exercise intensity. The risk of physical harm to you as the subject is minimal.

Your permission to use the data described above is requested for the purpose of conducting research for a thesis. All data will remain confidential. Results will be presented in a manner which will not allow individual identification. Sheryl Tudeen, the primary investigator, will possess the list matching code numbers to the names of the participants. If you have any further questions in reference to this research study, please contact Sheryl Tudeen at 343-1200, ext. 354, or at home, 342-7315.

"I have read the above statements and have been fully advised of the procedures to be used in this project. I have been given sufficient opportunity to ask questions I had concerning the procedures and possible risks involved and I assume them voluntarily. I likewise understand that I can withdraw from the study at any time without being subject to reproach."

Date

Subject

MEDICAL HISTORY

Name _____ Age _____ Date _____

Race _____ Occupation _____ Sex _____

Education (circle highest grade completed) 6, 7, 8, 9, 10, 11, 12
college - 1, 2, 3, 4, Advanced Degree

Family History:

Father: Living _____ Deceased _____ Age _____ Cause _____

Mother: Living _____ Deceased _____ Age _____ Cause _____

Heart Disease _____ Diabetes _____ Stroke _____ Cancer _____

Asthma _____ Allergies _____ Other _____

Past Health:

Childhood diseases (severe or complicated) _____

Accidents _____

Hospitalizations: Yes _____ No _____ (if yes, please explain more on back)

Current Health - please answer yes or no:

chest pain _____ breathing trouble _____ cough _____ wheezing _____

short breath _____ indigestion _____ bowel trouble _____ backaches _____

urination problems _____ joint pain _____ headaches _____ blackouts _____

bleeding _____ (from where _____) vision trouble _____

Comments _____

Medications - Current: Yes _____ No _____

Type _____

Exercise (within the past six months):

Very Active _____ Active _____ Slightly Active _____

Sedentary _____

Do you participate in a regular fitness program (2X week) Yes _____ No _____

What kind of recreation activity? _____

In the past, were you a regular exercise participant? Yes _____ No _____

When and why did you cease participation? Date _____

Reason for Quitting _____

Alcohol:

Daily? Yes _____ No _____

Beer _____ Wine _____ Whiskey _____

Amount: 0-1 per day _____ 2-4 per day _____ Over 4 per day _____

Never _____

General:

What motivated you to join this program? _____

What goals do you hope to attain by participating in this program? _____

SMOKING HISTORY

Please answer the questions below
by checking the proper boxes.

Name _____

Date _____

Have you ever smoked cigarettes
for at least one year?

Yes _____
No _____

If the answer above is YES, check
the number of years you have
smoked. _____ years.
(write in)

1-5 years _____
5-9 years _____
10-19 years _____
20 or more years _____

At present, do you smoke cigarettes?

Yes _____
No _____

At present, how many cigarettes do
you smoke each day?

Have quit _____
Less than ½ pack per day _____
About ½ pack per day _____
About 1 pack per day _____
About 1½ packs per day _____
2 packs or more per day _____

At present, or in the past, have
you . . .

Smoked cigars _____
Smoked a pipe _____
Used chewing tobacco
or snuff _____

If you have stopped smoking, how
many years did you smoke?

_____ years
(write in)

If you have stopped smoking, how
many cigarettes did you smoke
each day?

Less than ½ pack per day _____
About ½ pack per day _____
About 1 pack per day _____
About 1½ packs per day _____
2 packs or more per day _____

If you have stopped smoking
cigarettes, how many years
have you stopped?

Less than 1 year _____
1-4 years _____
5-9 years _____
10-15 years _____
16 or more years _____

_____ years
(write in)



April, 1985

Dear Physician:

A Beginner Aerobics class for women will be held this Spring at the Emporia State University facilities. The program is designed for apparently healthy individuals. The basic program consists of 40-50 minutes of exercises focusing on promotion of cardiovascular fitness, low back/hamstring flexibility and muscular endurance exercises. Each of the sessions include a warm-up and cool-down period. Gradually the aerobic activities will be increased to the point where the individual can get to their target heart rate for at least 20 minutes. Participants will be taught and encouraged to exercise within their own capabilities.

This program has been designed and will be conducted in accordance with the guidelines established by the American College of Sports Medicine. Sheryl Tudeen, a Graduate Student in HPERA at ESU, will be leading the program. All participants 35 years of age or older or those who have or have had any cardiovascular respiratory diseases are required to obtain medical clearance to participate in this program.

Please read the attached flier for further information or call Sheryl Tudeen at 343-1200, Ext. 354.

Sincerely,

I believe that _____ is, from a medical
(Participant's Name)
perspective, able to participate in the E.S.U. Adult Fitness Program
as described above.

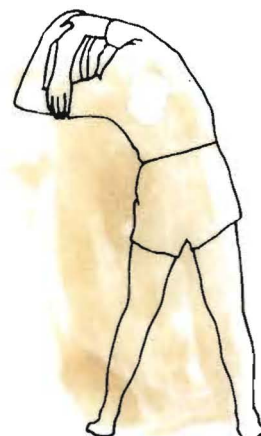
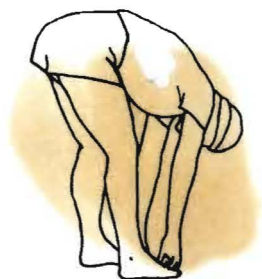
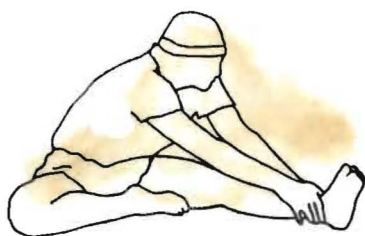
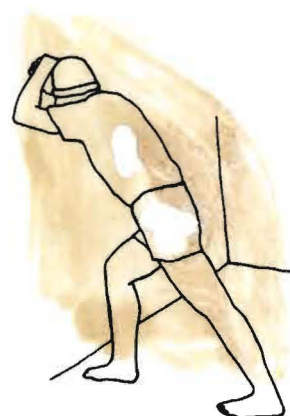
(Physician's Name)

(Date)

(Physician's Signature)

Appendix E
Stretching Exercises

Stretching Exercises:



Appendix F
Individual Testing Form

FITNESS RECORDING SHEET

Code # _____

T-1

Date _____ Age _____

Wt. _____ lbs. _____ kg.

Ht. _____ in. Time _____

Y's Percent Fat Estimate

Tricep _____ mm

Ilium _____ mm

Abdomen _____ mm

T₃ _____ mm

% fat _____

Rating _____

Kasch Pulse Recovery Test

Total Heart Rate _____

Rating _____

Y's Bicycle ErgometerMax O₂ (L/min) _____Max O₂ (ml/kg) _____

Rating _____

T-2

Date _____ Age _____

Wt. _____ lbs. _____ kg.

Ht. _____ in. Time _____

Y's Percent Fat Estimate

Tricep _____ mm

Ilium _____ mm

Abdomen _____ mm

T₃ _____ mm

% fat _____

Rating _____

Kasch Pulse Recovery Test

Total Heart Rate _____

Rating _____

Y's Bicycle ErgometerMax O₂ (L/min) _____Max O₂ (ml/kg) _____

Rating _____

Appendix G

Bicycle Ergometer Test Forms

Heart Rate Conversion Sheet
Maximum Physical Working Capacity Prediction
Workload Guide for Females
Max VO_2

Y's Way to Physical Fitness

Table 4-9

Heart Rate Conversion Sheet (30 Beats to Rate/Min)

Sec.	/Min.	Sec.	/Min.	Sec.	/Min.
22.0	82	17.3	104	12.6	143
21.9	82	17.2	105	12.5	144
21.8	83	17.1	105	12.4	145
21.7	83	17.0	106	12.3	146
21.6	83	16.9	107	12.2	148
21.5	84	16.8	107	12.1	149
21.4	84	16.7	108	12.0	150
21.3	85	16.6	108	11.9	151
21.2	85	16.5	109	11.8	153
21.1	85	16.4	110	11.7	154
21.0	86	16.3	110	11.6	155
20.9	86	16.2	111	11.5	157
20.8	87	16.1	112	11.4	158
20.7	87	16.0	113	11.3	159
20.6	87	15.9	113	11.2	161
20.5	88	15.8	114	11.1	162
20.4	88	15.7	115	11.0	164
20.3	89	15.6	115	10.9	165
20.2	89	15.5	116	10.8	167
20.1	90	15.4	117	10.7	168
20.0	90	15.3	118	10.6	170
19.9	90	15.2	118	10.5	171
19.8	91	15.1	119	10.4	173
19.7	91	15.0	120	10.3	175
19.6	92	14.9	121	10.2	176
19.5	92	14.8	122	10.1	178
19.4	93	14.7	122	10.0	180
19.3	93	14.6	123	9.9	182
19.2	94	14.5	124	9.8	184
19.1	94	14.4	125	9.7	186
19.0	95	14.3	126	9.6	188
18.9	95	14.2	127	9.5	189
18.8	96	14.1	128	9.4	191
18.7	96	14.0	129	9.3	194
18.6	97	13.9	129	9.2	196
18.5	97	13.8	130	9.1	198
18.4	98	13.7	131	9.0	200
18.3	98	13.6	132	8.9	202
18.2	99	13.5	133	8.8	205
18.1	99	13.4	134	8.7	207
18.0	100	13.3	135	8.6	209
17.9	101	13.2	136	8.5	212
17.8	101	13.1	137	8.4	214
17.7	102	13.0	138	8.3	217
17.6	102	12.9	140	8.2	220
17.5	103	12.8	141	8.1	222
17.4	103	12.7	142	8.0	225

MAXIMUM PHYSICAL WORKING CAPACITY PREDICTION.

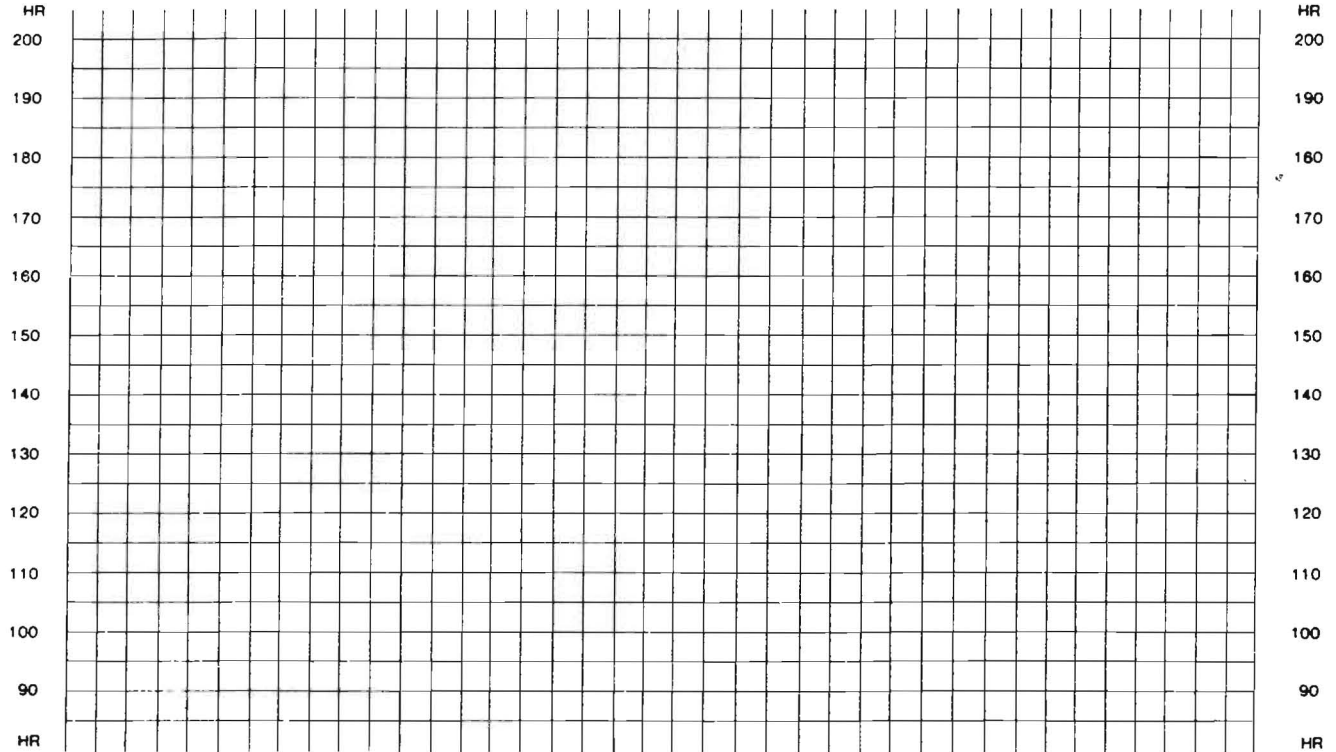
NAME _____ AGE _____ WEIGHT _____ LB. _____ KG SEAT HEIGHT _____

PREDICTED MAX. HR _____

	DATE	1st WORKLOAD HR USED	2nd WORKLOAD HR USED	MAX. WORKLOAD	MAX O ₂ (L/min)	MAX O ₂ (ml/kg)
TEST 1	_____	_____	_____	_____	_____	_____
TEST 2	_____	_____	_____	_____	_____	_____
TEST 3	_____	_____	_____	_____	_____	_____

DIRECTIONS

- Plot the HR of the 2 workloads versus the work (kgm/min).
- Determine the subject's max HR line by subtracting subject's age from 220 and draw a line across the graph at this value.
- Draw a line through both points and extend to the max HR line for age.
- Drop a line from this point to the baseline and read the predicted max workload and O₂ uptake.

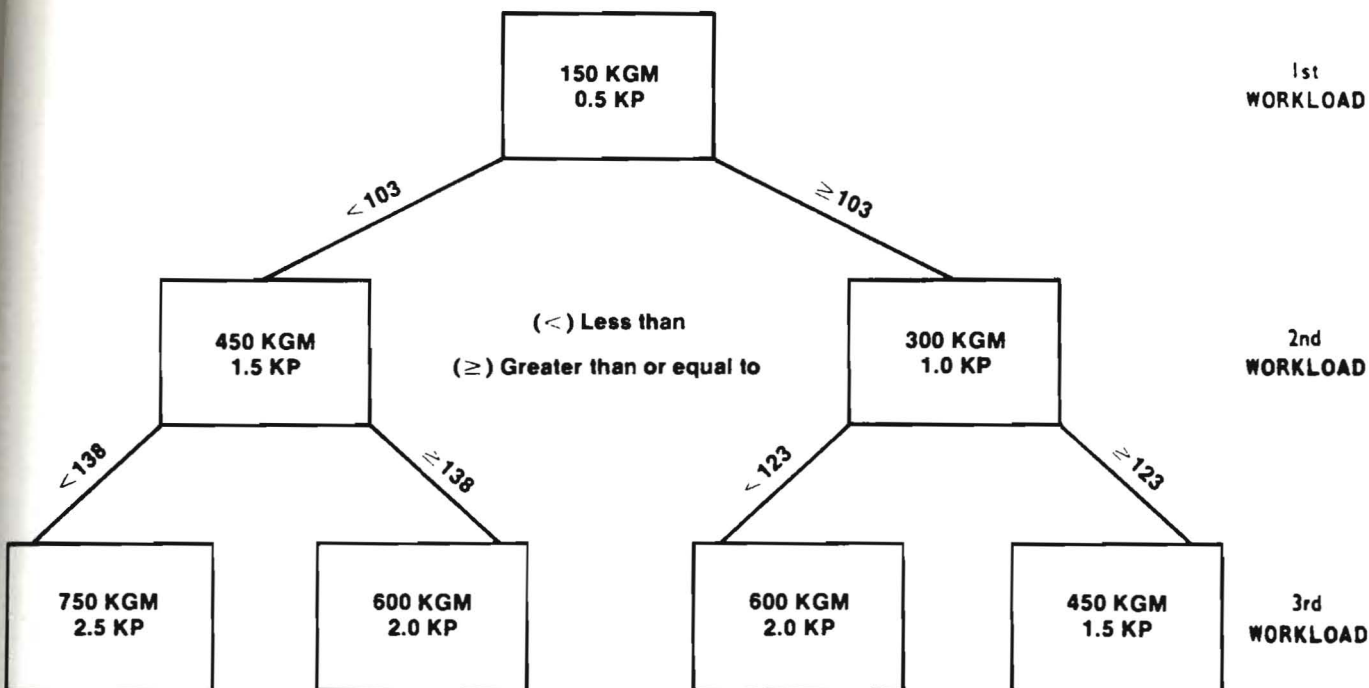


WORKLOAD (kgm/min)	150	300	450	600	750	900	1050	1200	1350	1500	1650	1800	1950	2100
MAX O ₂ UPTAKE (L/m)	0.6	0.9	1.2	1.5	1.8	2.1	2.4	2.8	3.2	3.5	3.8	4.2	4.6	5.0
KCAL USED (Kcal/m)	3.0	4.5	6.0	7.5	9.0	10.5	12.0	14.0	16.0	17.5	19.0	21.0	23.0	25.0
APPROX. MET LEVEL (for 132) lbs.)	3.3	4.7	6.0	7.3	8.7	10.0	11.3	12.7	14.0	15.3	16.7	18.0	19.3	20.7
APPROX. MET LEVEL (for 176 lbs.)	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0

Table 4-8

Y's Way to Physical Fitness

GUIDE TO SETTING WORKLOADS FOR FEMALES ON THE BICYCLE ERGOMETER



DIRECTIONS

1. Set the first workload to 150 kgm/min (.5 KP).
2. If steady-state heart rate is < 103, set 2nd load at 450 kgm/min (1.5 KP).
If steady-state heart rate is ≥ 103, set 2nd load at 300 kgm/min (1.0 KP).
3. Follow this same pattern for setting the third and final load.
4. NOTE: If the 1st workload elicits a HR of 110 or more, it is used on the graph, and only ONE more workload will be necessary.

FOOTNOTES

- I. The Y's Way to Physical Fitness bicycle test is for healthy individuals who have been cleared by a physician to exercise. This test measures cardiorespiratory fitness and is *not* a medical screening test.
- II. This aid to setting workloads is only a guide; common sense should also be used. Always be conservative. Use lower workloads for borderline scores.
- III. The two plot points should be in the linear portion of the curve (approximately 110-150 bpm). It is better to have the two points toward the low end of this linearity.

pound	kg	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0	5.1	5.2	5.3	5.4	5.5	5.6	5.7	5.8	5.9	6.0	
110	50	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	
112	51	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57	59	61	63	65	67	69	71	73	75	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	
115	52	29	31	33	35	37	38	40	42	44	46	48	50	52	54	56	58	60	62	63	65	67	69	71	73	75	77	79	81	83	85	87	88	90	92	94	96	98	100	102	104	106	108	110	112	113	115	
117	53	28	30	32	34	36	38	40	42	43	45	47	49	51	53	55	57	58	60	62	64	66	68	70	72	74	75	77	79	81	83	85	87	89	91	92	94	96	98	100	102	104	106	108	109	111	113	
119	54	28	30	31	33	35	37	39	41	43	44	46	48	50	52	54	56	57	59	61	63	65	67	69	70	72	74	76	78	80	81	83	85	87	89	91	93	94	96	98	100	102	104	106	107	109	111	
121	55	27	29	31	33	35	36	38	40	42	44	45	47	49	51	53	55	56	58	60	62	64	65	67	69	71	73	75	76	78	80	82	84	85	87	89	91	93	95	96	98	100	102	104	105	107	109	
123	56	27	29	30	32	34	36	38	39	41	43	45	46	48	50	52	54	55	57	59	61	63	64	66	68	70	71	73	75	77	79	80	82	84	86	88	89	91	93	95	96	98	100	102	104	105	107	
126	57	26	28	30	32	33	35	37	39	40	42	44	46	47	49	51	53	54	56	58	60	61	63	64	66	67	68	70	72	74	75	77	79	81	82	84	86	88	89	91	93	95	96	98	100	102	104	105
128	58	26	28	29	31	33	34	36	38	40	41	43	45	47	48	50	52	53	55	57	59	60	62	64	65	67	69	71	72	74	76	78	79	81	83	84	85	88	90	91	93	95	97	98	100	102	103	
130	59	25	27	29	31	32	34	36	37	39	41	42	44	46	47	49	51	53	54	56	58	59	61	63	64	65	68	69	71	73	75	76	78	80	81	83	85	86	88	90	92	93	95	97	98	100	102	
132	60	25	27	28	30	32	33	35	37	38	40	42	43	45	47	48	50	52	53	55	57	58	60	62	63	65	67	68	70	72	73	75	77	78	80	82	83	85	87	88	90	92	93	95	97	98	100	
134	61	25	26	28	30	31	33	34	36	38	39	41	43	44	46	48	49	51	52	54	56	57	59	61	62	64	66	67	69	70	72	74	75	77	79	80	82	84	85	87	89	90	92	93	95	97	98	
137	62	24	26	27	29	31	32	34	35	37	39	40	42	44	45	47	48	50	52	53	55	56	58	60	61	63	65	66	68	69	71	73	74	76	77	79	81	82	84	85	87	89	90	92	94	95	97	
139	63	24	25	27	29	30	32	33	35	37	38	40	41	43	44	46	48	49	51	52	54	56	57	59	60	62	63	65	67	68	70	71	73	75	76	78	79	81	83	84	86	87	89	90	92	94	95	
141	64	23	25	27	28	30	31	33	34	36	38	39	41	42	44	45	47	48	50	52	53	55	56	58	59	61	63	64	66	67	69	70	72	73	75	77	78	80	81	83	84	86	88	89	91	92	94	
143	65	23	25	26	28	29	31	32	34	35	37	38	40	42	43	45	46	48	49	51	52	54	55	57	58	60	62	63	65	66	68	69	71	72	74	75	77	78	80	82	83	85	86	88	89	91	92	
146	66	23	24	26	27	29	30	32	33	35	36	38	39	41	42	44	45	47	48	50	52	53	55	56	58	59	61	62	64	65	67	68	70	71	73	74	76	77	79	80	82	83	85	86	88	89	91	
148	67	22	24	25	27	28	30	31	33	34	36	37	39	40	42	43	45	46	48	49	51	52	54	55	57	58	60	61	63	64	66	67	69	70	72	73	75	76	78	79	81	82	84	85	87	88	90	
150	68	22	24	25	26	28	29	31	32	34	35	37	38	40	41	43	44	46	47	49	50	51	53	54	56	57	59	60	62	63	65	66	68	69	71	72	74	75	76	78	79	81	82	84	85	87	88	
152	69	22	23	25	26	28	29	30	32	33	35	36	38	39	41	42	43	45	46	48	49	51	52	54	55	57	58	59	61	62	64	65	67	68	70	71	72	74	75	77	78	80	81	83	84	86	87	
154	70	21	23	24	26	27	29	30	31	33	34	36	37	39	40	41	43	44	46	47	49	50	51	53	54	56	57	59	60	61	63	64	66	67	69	70	71	73	74	76	77	79	80	81	83	84	86	
157	71	21	23	24	25	27	28	30	31	32	34	35	37	38	39	41	42	44	45	46	48	49	51	52	54	55	56	58	59	61	62	63	65	66	68	69	70	72	73	75	76	77	79	80	82	83	85	
159	72	21	22	24	25	26	28	29	31	32	33	35	36	38	39	40	42	43	44	46	47	49	50	51	53	54	56	57	59	60	62	63	64	66	67	68	69	71	72	74	75	76	78	79	81	82	83	
161	73	21	22	23	25	26	27	29	30	32	33	34	36	37	38	40	41	42	44	45	47	48	49	51	52	53	55	56	58	59	60	62	63	64	66	67	68	70	71	73	74	75	77	78	79	81	82	
163	74	20	22	23	24	26	27	28	30	31	32	34	35	36	38	39	41	42	43	45	46	47	49	50	51	53	54	55	57	58	59	61	62	64	65	65	68	69	70	72	73	74	76	77	78	80	81	
165	75	20	21	23	24	25	27	28	29	31	32	33	35	36	37	39	40	41	43	44	45	47	48	49	51	52	53	55	56	57	59	60	61	63	64	65	67	68	69	71	72	73	75	76	77	79	80	
168	76	20	21	22	24	25	26	28	29	30	32	33	34	36	37	38	39	41	42	43	45	46	47	49	50	51	53	54	55	57	58	59	61	62	63	64	66	67	68	70	71	72	74	75	76	78	79	
170	77	19	21	22	23	25	26	27	29	30	31	32	34	35	36	38	39	40	42	43	44	45	47	48	49	51	52	53	55	56	57	58	60	61	62	64	65	66	68	69	70	71	73	74	75	77	78	
172	78	19	21	22	23	24	26	27	28	29	31	32	33	35	36	37	38	40	41	42	44	45	46	47	49	50	51	53	54	55	56	58	59	60	62	63	64	65	67	68	69	71	72	73	74	76	77	
174	79	19	20	22	23	24	25	27	28	29	30	32	33	34	35	37	38	39	41	42	43	44	46	47	49	50	51	52	53	54	56	57	58	59	61	62	63	65	66	67	68	70	71	72	73	75	76	
176	80	19	20	21	23	24	25	26	28	29	30	31	33	34	35	36	38	39	40	41	43	44	45	46	48	49	50	51	53	54	55	56	58	59	60	61	63	64	65	66	68	69	70	71	72	74	75	
179	81	19	20	21	22	23	25	26	27	28	30	31	32	33	35	36	37	38	40	41	42	43	44	46	47	48	49	51	52	53	54	56	57	58	59	60	62	63	64	65	67	68	69	70	72	73	74	
181	82	18	20	21	22	23	24	26	27	28	29	30	32	33	34	35	37	38	39	40	41	43	44	45	46	48	49	50	51	52	54	55	56	57	59	60	61	62	63	65	66	67	68	70	71	72	73	
183	83	18	19	20	22	23	24	25	27	28	29	30	31	33	34	35	36	37	39	40	41	42	43	45	46	47	48	49	51	52	53	54	55	57	58	59	60	61	63	64	65	66	67	69	70	71	72	
185	84	18	19	20	21	23	24	25	26	27	29	30	31	32	33	35	36	37	38	39	40	42	43	44	45	46	48	49</																				

Appendix H

Tennessee Self-Concept Score Sheet

SCORE SHEET

Counseling Form
Tennessee Self Concept Scale

MARY A. JONES 14 20 10-10-64 2:07 2:27 22 min.

HOW THE INDIVIDUAL PERCEIVES HIMSELF

IN TERMS OF:	COLUMN A PHYSICAL SELF	COLUMN B MORAL-ETHICAL SELF	COLUMN C PERSONAL SELF	COLUMN D FAMILY SELF	COLUMN E SOCIAL SELF	SELF CRITICISM	ROW TOTALS	VARIABILITY Range of P Cell Scores				
ROW 1.	P-1 P-2 P-3 N-4 N-5 N-6	P-19 P-20 P-21 N-22 N-23 N-24	P-37 P-38 P-39 N-40 N-41 N-42	P-55 P-56 P-57 N-58 N-59 N-60	P-73 P-74 P-75 N-76 N-77 N-78	91 92 93 94	139	5				
IDENTITY	5 5 5 1 1 1	5 5 5 1 1 1	5 5 5 1 1 1	5 5 5 1 1 1	5 5 5 1 1 1	5 5 5 5						
WHAT HE	4 4 4 2 2 2	4 4 4 2 2 2	4 4 4 2 2 2	4 4 4 2 2 2	4 4 4 2 2 2	4 4 4 4						
IS	3 3 3 3 3 3	3 3 3 3 3 3	3 3 3 3 3 3	3 3 3 3 3 3	3 3 3 3 3 3	3 3 3 3						
	2 2 2 4 4 4	2 2 2 4 4 4	2 2 2 4 4 4	2 2 2 4 4 4	2 2 2 4 4 4	2 2 2 2						
	1 1 1 5 5 5	1 1 1 5 5 5	1 1 1 5 5 5	1 1 1 5 5 5	1 1 1 5 5 5	1 1 1 1						
	p 27		p 25		p 27		p 30					
ROW 2.	P-7 P-8 P-9 N-10 N-11 N-12	P-25 P-26 P-27 N-28 N-29 N-30	P-43 P-44 P-45 N-46 N-47 N-48	P-61 P-62 P-63 N-64 N-65 N-66	P-79 P-80 P-81 N-82 N-83 N-84	95 96 97 98	128	8				
SELF	5 5 5 1 1 1	5 5 5 1 1 1	5 5 5 1 1 1	5 5 5 1 1 1	5 5 5 1 1 1	5 5 5 5						
SATIS-	4 4 4 2 2 2	4 4 4 2 2 2	4 4 4 2 2 2	4 4 4 2 2 2	4 4 4 2 2 2	4 4 4 4						
FACTION	3 3 3 3 3 3	3 3 3 3 3 3	3 3 3 3 3 3	3 3 3 3 3 3	3 3 3 3 3 3	3 3 3 3						
HOW HE	2 2 2 4 4 4	2 2 2 4 4 4	2 2 2 4 4 4	2 2 2 4 4 4	2 2 2 4 4 4	2 2 2 2						
ACCEPTS	1 1 1 5 5 5	1 1 1 5 5 5	1 1 1 5 5 5	1 1 1 5 5 5	1 1 1 5 5 5	1 1 1 1						
HIMSELF	p 22		p 25		p 26		p 30					
ROW 3.	P-13 P-14 P-15 N-16 N-17 N-18	P-31 P-32 P-33 N-34 N-35 N-36	P-49 P-50 P-51 N-52 N-53 N-54	P-67 P-68 P-69 N-70 N-71 N-72	P-85 P-86 P-87 N-88 N-89 N-90	99 100	137	5				
BEHAVIOR	5 5 5 1 1 1	5 5 5 1 1 1	5 5 5 1 1 1	5 5 5 1 1 1	5 5 5 1 1 1	5 5						
HOW HE	4 4 4 2 2 2	4 4 4 2 2 2	4 4 4 2 2 2	4 4 4 2 2 2	4 4 4 2 2 2	4 4						
ACTS	3 3 3 3 3 3	3 3 3 3 3 3	3 3 3 3 3 3	3 3 3 3 3 3	3 3 3 3 3 3	3 3						
	2 2 2 4 4 4	2 2 2 4 4 4	2 2 2 4 4 4	2 2 2 4 4 4	2 2 2 4 4 4	2 2						
	1 1 1 5 5 5	1 1 1 5 5 5	1 1 1 5 5 5	1 1 1 5 5 5	1 1 1 5 5 5	1 1						
	p 26		p 29		p 25		p 27					
	p 30											
COLUMN TOTALS	Σ P 75		79		77		87		86		Total Positive or P → 404	Row Tot V 18
	V. (Range of P Cell Scores) 5		4		2		3		4		Col. Tot V → 18	36

SC = 25

DISTRIBUTION OF RESPONSES

NUMBER OF 5'S 4'S 3'S 2'S 1'S

TOTALS $\frac{23}{x_2} \frac{25}{x_1} \frac{6}{x_1} \frac{14}{x_1} \frac{32}{x_2} = 100$

D = $46 + 25 + 14 + 64 = 149$

WILLIAM H. FITZ 1964

PUBLISHED BY
COUNSELOR RECORDINGS AND TESTS
BOX 6184, ACKLEN STA
NASHVILLE, TENN 37212

I-H

Fig. 1. Completed Score Sheet, Counseling Form

Appendix I

Tennessee Self-Concept Scoring Instructions

Scoring Instructions for Tennessee Self-Concept Scale

Counseling Form

On the actual Score Sheets the basic 90 items are half in black (positive items) and half in red (negative items). The response scale numbers for negative items have all been reversed on the Score Sheet in order to permit a simple, unified scoring system. By this system a person who says completely false to a negative item obtains a high score just as he does when he says completely true to a positive item. Thus high scores uniformly mean positive self description.

I. Counseling Form

- A. The Self Criticism Score (SC). Add the circled scores for items 91 through 100. Enter the sum in the box labeled SC=. This is the SC Score.
- B. The Positive Scores - The Row Scores, the Column Scores, the Total P Score. Note that the Score Sheet has three horizontal rows and five vertical columns. This combination yields fifteen cells of six items each.
 1. Add the six circled scores in the first cell. Enter the sum next to the letter P at the bottom of the cell. Do the same with each of the fifteen cells. (Note: on Form C and R, scores for positive and negative items are computed separately and combined into a P + N Score which is the same as the P Score of the Counseling Form.)
 2. Row Scores. Add horizontally the five cell sums for the first row (Identity row). Enter the resulting figure in the Row Totals column. Do the same for the other rows.
 3. Column Scores. Add vertically the three cell sums for Column A (Physical Self). Enter the resulting figure in the Column Total section. Do the same for the other four columns.
 4. Total P Score. Since this score is the total Positive score, it may be computed by adding either the Row Totals for P or the Column Totals for P. The resulting sum should be the same. It is best, indeed, to do the sum both ways so that you have an accuracy check for the computations. Enter the resulting figure in the box labeled Total Positive or P.

Appendix J

Exercise Routine Sample

SAMPLE AEROBIC EXERCISE FORMAT

I. Warm-up (10 - 15 minutes)

- A. Include exercises that stretch muscles and joints through full range of motion.
- B. All body parts are exercised and stretched
 - 1. neck
 - 2. shoulder joints
 - 3. trunk
 - 4. hip joints (hamstrings included)
 - 5. knees
 - 6. ankles and calves
 - 7. lower back

II. Muscular Endurance (10 - 20 minutes)

- A. Include exercises for all major joint movements of the different body segments.
- B. Areas to cover:
 - 1. posterior arms, anterior chest
 - 2. back, buttocks, posterior thighs
 - 3. calf, thigh
 - 4. abdominals
 - 5. upper back and shoulder girdle

III. Aerobic Movement (10 - 20 minutes)

- A. A gradual increase in time spent in this section
- B. Concentrate on exercise consistency and intensity, monitoring pulse to determine target heart rate
- C. Sample movements include:
 - 1. walking
 - 2. sliding
 - 3. skipping
 - 4. side swings
 - 5. The pogo

IV. Cool-Down (5 - 10 minutes)

- A. Nontensive, relaxing exercises emphasized
- B. Return heart rate closer to pre-exercise rate
- C. Walking and stretching exercises used

Appendix K
Step Test Scoring

Sample Step Test CalculationPretest

Seconds performed stepping (out of a possible 180) - 180 sec.

Recovery heart rate taken for one minute - 120 beats

$$\text{ratio} = \frac{120}{180} = .67$$

Post-test

Seconds performed stepping (out of a possible 180) - 180 sec.

Recovery heart rate taken for one minute - 90 beats

$$\text{ratio} = \frac{90}{180} = .5$$

Difference (Pretest - Post-test)

$$.67 - .5 = .17$$

Appendix L
Subjective Questionnaire

Name _____

Based on the eight week exercise program you just completed, Please answer the following questions. Circle either yes or no.

- | | | |
|--|-----|----|
| 1. Exercising makes me feel good. | YES | NO |
| 2. I like myself better when I'm exercising. | YES | NO |
| 3. I feel fit. | YES | NO |
| 4. I like my body better now. | YES | NO |
| 5. I have more confidence in myself. | YES | NO |