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STATIC RELATIONSHIPS BETWEEN PHYSICAL FITNESS, SELF-EFFICACY,
PHYSICAL COMPETENCE AND GLOBAL SELF-ESTEEM
IN CARDIAC AND ASYMPTOMATIC ADULTS

BY

LOREN M. GEMMA

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF
MASTER OF SCIENCE
IN
PHYSICAL EDUCATION

UNIVERSITY OF RHODE ISLAND

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ABSTRACT

This study was conducted to test the validity of the Exercise and Self-Esteem Model (Sonstroem & Morgan, in publication). The model examines mechanisms of self-esteem change through exercise. This study examined the degree to which model components, physical self-efficacy, perceived physical competence and global self-esteem related to each other and to measures of physical fitness.

This research involved a sample of 70 subjects involved in the University of Rhode Island's EXERLIFE Program (CRM & CF) and 75 additional subjects from URI's faculty and community organizations.

All 70 Exerlife subjects participated in baseline physical fitness testing and were administered psychological inventories. The 75 additional subjects were only administered psychological inventories. Psychological inventories included the following scales: Rosenberg's (1965) Self-Esteem Scale, twenty items from Jackson's (1984) Social Desirability Scale, seventeen Estimation-type items developed from Sonstroem's (1974) Physical Estimation and Attraction Scales, Susan Harter's (1982) Adult Self-Perception Profile, self efficacy statements formatted by Bandura and Adams (1977), and Secord & Jourard's (1953) Body Cathexis Scale.

The effect of physical fitness feedback on initial physical self-perceptions was examined by dividing the (CRM)

and (CF) subjects into two groups. Cohort A received fitness testing first followed by psychological inventories and the reverse order of administration was used in Cohort B.

There are three main sets of relationships that exist between the four levels of model variables (Appendix A). The three sets of relationships in the model are: (1) between global self-esteem and physical competence, (2) between physical competence and physical self-efficacies, and (3) between physical self-efficacies and physical fitness. In the first relationship, the mean correlation coefficient for males and females was .386 and .351 respectively. In the second relationship, the mean correlation coefficient for males and females was .447 and .434 respectively. In the third relationship, the mean correlation coefficient in males and females was .433 and .387 respectively.

The specific hypotheses tested were: (I) Perceptions of physical self-efficacy are positively and significantly related to physical fitness, (II) Physical self-efficacy scores are more highly related to physical competence scores than to global self-esteem scores, (III) Physical competence weighted by importance to the individual is more highly related to global self-esteem than physical competence alone, (IV) Physical competence scores are more highly related to global self-esteem scores than are physical self-efficacy scores, and (V) The relationship between physical fitness and physical self-efficacy will be significantly larger in Cohort A as compared to Cohort B.

Hypotheses I and II were supported statistically for both males and females. Hypotheses IV achieved statistical support with females but not with males ($t=1.56$, $p < .07$). Additional analyses found age and experience to be significantly related to physical fitness self-efficacies. Results of this research provided certain support for the Exercise and Self-Esteem Model.

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Chapter 1

INTRODUCTION

The purpose of this study was to test a recently developed Exercise and Self-Esteem Model (Appendix A) (Sonstroem & Morgan, in publication), and to clarify relationships between physical fitness and components of self-regard. This study especially examined the degree to which self-efficacy related to physical fitness and physical competence and how these components were related to global self-esteem.

The Exercise and Self-Esteem Model is vertically arranged on a generality continuum of physical competency self-perceptions. Situation specificity exists at the base of the model. Physical self-efficacy statements relative to particular physical tasks represent the lowest level of the competence dimension. Physical competence and physical self-acceptance are at a mid-range level of generality. The construct of greatest generality is represented at the top of the model as global self-esteem. The horizontal dimension of the model represents time and the right half of the model examines changes over time in the model components. A companion project examined this aspect of the model. The

present study, examined only those static relationships between model components which occurred at the time of the first test.

Within this model, lower level elements are conceived as components of higher level elements and changes in these lower level elements are postulated as predicting changes in higher order self-conceptions (Sonstroem & Morgan, in publication).

Researchers have studied different components within this model. Ewart, Stewart, Gillilan and Keleman (1986) showed that changes in strength and endurance were associated with changes in self-efficacy expectations specific to these component of fitness. Research by Sonstroem (1974,1976,1978) and Harter (1982) has established a relationship between self-perceptions of physical competence and global self-esteem. Harter (1982) has designated physical competence as one of three specific dimensions of global self-esteem. Sonstroem's research failed to show a significant relationship between global self-esteem and physical fitness. In these studies using Sonstroem's Physical Estimation and Attraction Scale (PEAS) (1974), estimation of physical fitness was significantly related to global self-esteem which provides support for estimation as a mediating variable in associations between exercise and self-esteem. These results were replicated with college men and women by Dishman (1978) as well as by Fox, Corbin, and Coultry (1985).

Current theory emphasizes the existence of multiple components of self-esteem all of which are of different importance to the individual (Shavelson, Hubner, and Stanton, 1976). Rosenberg (1979) compared four high school boys, each with global self-esteem, and concluded that for each boy a different perceived capability provided the basis for establishing favorable self-regard. According to Rosenberg (1979), individuals come to value personal resources which they assess as being successful in societal interactions. A tendency follows to rely on these particular attributes in developing global self-definition (Sonstroem & Morgan, in publication).

Statement of the Problem

The purpose of this study was to test the validity of the recently proposed Exercise and Self-esteem Model. This study employed various psychological inventories specific to the model components and several sub-maximal fitness tests. The sample size consisted of 70 subjects enrolled in either The Cardiac Rehabilitation and Maintenance Program (CRM) or The Community Fitness (CF) Program at The University of Rhode Island (URI). Additionally, sample size (CT) was increased by 75 subjects from the community who agreed to complete psychological inventories. Subjects in the two URI programs (CRM and CF) completed base line physical fitness examinations as well as the psychological inventories.

The inventories consisted of sections, each section tested a portion of the Exercise and Self-esteem Model. Inventories included, the Rosenberg Self-esteem Scale and Susan Harter's Self-Esteem Scale which both measured and evaluated global self-esteem. Physical competence was measured by seventeen Estimation-type items and by a study-developed scale utilizing a structured-alternative format. Twenty items from Jackson's Social Desirability Scale assessed the tendency for subjects to respond to the social desirability of an item rather than its actual context. Another section contained items from Messer and Harter's (1986) Adult Self-perception Profile which measured self-perceptions toward five self-esteem components. A rating scale was provided to rate the importance of these components. Self-efficacy expectations regarding certain physical tasks were also assessed. The final section of the inventory, completed by Exerlife participants only, was a 40-item Body Cathexis Scale used to assess satisfaction with different aspects of the body.

The effect of physical fitness feedback on initial physical self-perceptions was examined by dividing the (CRM) and (CF) subjects into two groups. Cohort A received fitness testing first followed by psychological inventories and the reverse order of administration was used with Cohort B.

Specific Hypotheses

1. Perceptions of physical self-efficacy are positively and significantly related to physical fitness.

2. Physical self-efficacy scores are more highly related to physical competence scores than to global self-esteem scores.

3. Physical competence weighted by importance to the individual is more highly related to global self-esteem than is physical competence alone.

4. Physical competence scores are more highly related to global self-esteem scores than are the self-efficacy scores.

5. The relationship between physical fitness and physical self-efficacy is significantly larger in subjects of Cohort A as compared to subjects of Cohort B.

Additional analyses tested for significant differences in group means. Groups were ordered on a continuum of perceived health and fitness varying from CF group at the top of the continuum through the CT group, to the CRM group. It was hypothesized that group means for physical competence, physical self-efficacies, and physical fitness would be ordered on

this continuum. There are three main sets of relationships that exist between the four levels of model variables. The three sets of relationships in the model are: (1) between global self-esteem and physical competence, (2) between physical competence and physical self-efficacies, and (3) between physical self-efficacies and physical fitness.

Significance of the Study

The role of exercise in society today is one of great importance. A vast amount of research has proven that positive physiological benefits are associated with continued physical exercise. Several of these benefits include a decrease in resting heart rate, resting blood pressure, body weight, body fat and heart rate at a given work load, and increases in aerobic capacity (American College of Sports Medicine, 1986).

Positive emotional and psychological benefits are also believed to accompany prolonged physical exercise. While reviews of research have failed to substantiate this general proposition, they have identified enhanced self-esteem as an empirically supported exercise outcome. Unfortunately, incomplete experimental designs and atheoretical approaches to self-esteem have prevented the development of an understanding regarding the mechanisms involved (Sonstroem & Morgan, in publication). A review of literature indicated a need to understand exactly how exercise actually can influence the men-

tal and emotional conditions of individuals. No model previously has been advanced to explain the "why" or "how" of self-esteem change through exercise.

Current theory emphasizes the existence of multiple components of self esteem, these components being of unequal importance to the individual (Shavelson, Hubner, and Stanton, 1976). In the past, exercise and self-esteem studies have tended to rely on measuring self-esteem as a unitary construct, that is a global feeling about the total self. The present model examines self-esteem as a collection of self-perception elements arranged on a continuum of generality from the most specific (self-efficacies) through a mid-range level (physical competence) up to global self-esteem. Inherent in this continuum is the concept that feelings of self-efficacy at specific physical tasks generalize to more general evaluations of competence in a wider variety of activities.

Since a variety of exercise experiences (e.g., social reinforcement, adoption of associated health behavior) could be responsible for increased self-esteem due to exercise, the present model is regarded as being incomplete. It is concerned only with self-perceptions of physical competence. However, studies have generally mentioned increased physical fitness as the reason for increased self-esteem. This study presents a model for examining the manner in which physical fitness is related to self-esteem. It fills a void in the

research and model tests should add knowledge to this construct area.

Definition of Terms

1. Physical Self-efficacy is the level and strength of a belief that one can successfully perform a given activity (Sonstroem & Morgan, in publication). As a measurement in the present study, physical self-efficacy refers to expectancies that one can perform varying levels of specific exercises, many of which are included in the formal CF and CR programs.

2. Competence is recognized as an essential dimension of self-esteem and refers to feelings of capability to master and experience some control over one's self and environment (Sonstroem & Morgan, in publication).

3. Physical Competence refers to a general evaluation of the self as possessing overall physical fitness (Sonstroem & Morgan, in publication).

4. Self-acceptance is "respecting oneself, including one's admitted faults" (Wylie, 1974, p. 127).

5. Body Acceptance as used in this study is synonymous with body cathexis, which refers to "the degree of feeling satisfied or dissatisfied with various parts or processes of the body" (Secord & Jourard, 1953, p. 343) and is referred to as a measure of self-acceptance (Crandell, 1973).

6. Estimation is the measure of self-perceptions of physical fitness (Sonstroem & Morgan, in publication).

7. Self-concept refers to an "organized configuration of perceptions of the self which are admissible to awareness" (Rogers, 1950, p. 379).

8. Self-esteem refers to a negative or positive attitude toward a particular object, namely the self (Rosenberg, 1965). Self-esteem is the evaluative component of self-conception (Gergen, 1971) and is thought to "consist of the fundamental processes of cognitive comparisons and affect" (Rosenberg, 1979, p. 79).

9. Social Desirability is defined as the need to obtain approval by responding in a culturally appropriate acceptable manner (Crowne & Marlowe, 1964).

10. Global Self-esteem has been thought of as the totality of the individual's thoughts and feelings having reference to himself as an object (Rosenberg, 1979).

Limitations of the Study

1. Because the inventory was administered by fitness instructors connected with the EXERLIFE Program, exercise subjects may have perceived task demands in the completion of the inventories.

2. All self-esteem sub-domains important to an individual probably were not adequately assessed by employed inventories (i.e. at work. morally).

3. The test of the model was limited to the responses of subjects who either volunteered for the exercise programs

or agreed to complete the inventories. These people do not represent a complete cross section of the adult population.

The present study was delimited to examine mainly the physical competence dimension of static relationships within the model.

Chapter 2

The Review of Literature

The review of the literature is divided into five sections. These are: (a) Global Self-esteem, (b) Physical Competence, (c) Body Cathexis, (d) Self-efficacy, and (e) The Exercise and Self-Esteem Model. Within these five sections there exists several subsections.

Global Self-Esteem

In order to fully understand the definition of self-esteem, self-concept needs to be defined as well. The term self-concept is considered "an organized configuration of perceptions of the self which are admissible to awareness" (Rogers, 1950, p.379). It may be thought of as a picture or conception of the self. Self-esteem is generally regarded as the evaluative component of self-conception (Gergen, 1971) and is thought to consist of the fundamental processes of cognitive comparisons and affect (Rosenberg, 1979; Wells and Marwell, 1976). Self-esteem is also defined as a personal judgment of worthiness (Coopersmith, 1967) or as "the extent to which the person feels positive about himself", (Gergen, 1971, p.37). Positive self-esteem is regarded as the essential element of favorable life adjustment (Coopersmith, 1967; Ger-

gen, 1971; Rosenberg, 1963, 1979). Self-esteem is a widely used construct closely related to the self-concept (Wylie, 1974).

Self-esteem is a function of (1) perceived appraisals of significant others or (2) the individuals feelings of efficacy and competence. The first represents inferred social approval while the second represents a sense of power and competence that derives as feedback from the individual's own actions. Because self-esteem has been shown to relate to personal characteristics such as acceptance of others and susceptibility to social influence, low levels of self-esteem are known to be associated with a lack of social skills and passive dependency (Lorr and Wunderlich, 1986).

The social aspect of self-esteem appears to be based on societal responses. Cooley's social "looking glass" theory (Cooley, 1902) has also had a major influence in self-esteem development. The theory states that the reactions of others to oneself serve as a mirror to reflect an image of the self. Therefore, one's ideas of self are significantly influenced by what one perceives others to think of oneself. For instance, Maehr, Mensing and Nafzger (1962) rated young boys on sport skills. The boys who received positive feedback significantly increased their personal ratings of skill ability. Boys who were given negative feedback significantly decreased their personal ratings of skill ability.

Many people often couple global self-esteem with physi-

cal fitness in the general population, even though very little substantiating empirical evidence exists on this subject (Dowell, Badgett & Landiss, 1970; Kay, Felker, Varoz (1972). Three independent researchers have separately arrived at similar results showing a lack of relationship between fitness and global self-esteem. Heaps (1978) and Leonardson and Gargiulo (1978) reported no relationship between global self-concept and fitness as measured by the 12 minute run-walk test in university freshmen. However, both investigators asked subjects to rate their physical fitness and found that these self-perceptions of personal physical fitness correlated significantly with both physical fitness and global self-concept. Sonstroem (1974) developed the Physical Estimation and Attraction Scale (PEAS) with the Estimation scale assessing self-perceptions of physical ability and sport skills. In three separate investigations (Neale, Sonstroem, & Metz, 1969; Sonstroem 1974, 1976), global self-esteem has been shown to be unrelated to physical fitness in boys aged 12 to 18. Estimation scores, however, have been positively and significantly related to both physical fitness and global self-esteem in all three studies.

Multiple Components

Global self-esteem has been regarded as multidimensional in nature with dimensions such as social, academic, and physical aspects being arranged in order of importance

(Shavelson, Hubner, and Stanton, 1976). Rosenberg's position is that components of the self-concept are of unequal centrality to the concerns of the individual and are hierarchically organized. He believes that both specific and global levels of the self-concept should be studied (Rosenberg, 1979). Global self-esteem or self-concept has been defined as "the totality of the individual's thoughts and feelings having reference to himself as an object" (Rosenberg, 1979,p.75). The importance of a specific self-concept component to the individual appears to determine its relationship to the individual's global self-esteem. "Thus, the individual strives to excel at that which he values and to value that at which he excels" (Rosenberg, 1979,p.75).

Coopersmith (1967) provided a description of the relationship between global self-esteem and the multiplicity of the selves. Self-esteem may vary across different areas of experience and according to sex, age, and other role defining conditions. Thus, it is conceivable that an individual would regard him/herself as very worthy as a student, moderately worthy as a tennis player, and totally unworthy as a musician. When appraising an individuals' overall ability, each area should be weighed by importance in order to arrive at a general level of self-esteem. The overall appraisal of abilities would presumably weight the areas according to their subjective importance, enabling the individual to arrive at a general level of self-esteem.

Self-esteem is generally measured by asking people how much they like themselves. However, dimensions of self-esteem emerge when people are asked about their responses to different aspects of themselves; physical ability, sense of humor, socialbility, intelligence, etc.(Crandall, 1973).

Competence

Competence is referred to as one of the dimensions of self-esteem. The idea of personal competence or feelings of capability to master and experience some control over one's self and environment is recognized as an essential dimension of self-esteem (Sonstroem & Morgan , 1988). Success in meeting achievement demands is believed to produce feelings of competence (Coopersmith, 1967). Therefore, success experiences have also been theorized as antecedents of positive self-esteem (Coopersmith, 1967; Rosenberg,1979). As an example, in a summer camp where swimming was a salient activity, Koocher (1971) found that boys who learned to swim increased self-esteem significantly as compared to boys who failed to master swimming. Theoretically, success experiences encourage feelings of competence in controlling one's self and the environment (Sonstroem & Morgan, 1988).

Epstein (1973) has defined four second-order postulates under global self-esteem to include competence, power, normal self-approval, and love worthiness. Under competence, lower order postulates of general mental and physical abilities are

included as components, and assessments of specific abilities are included below these levels (Sonstroem & Morgan, 1988).

It is also true that personal identities can be formed by the satisfaction of needs and the development of competencies in specific areas (Erickson, 1959; Stryker, 1968). Today's great social emphasis on exercise, makes it possible to recruit people into exercise participation where the adoption of new identities may be tested.

Self-acceptance

Self-acceptance is considered to be a second dimension of self-esteem. "Self-acceptance might be considered a necessary but not sufficient basis for high self-esteem" (Crandell, 1973, p.46), for self-acceptance includes the acceptance of one's admitted faults and negative characteristics as well as one's positive characteristics. "People who are self-accepting are those who can regard themselves accurately, who can face the fact that they are not all they would like to be....yet who live happily and creatively with this awareness" (McCantless, 1961, p.203). Self-acceptance represents a basis of virtue or moral worth in the establishment of self-esteem.

Factors Affecting Self-Esteem Measurement

Social desirability. This is "the need to obtain approval by responding in a culturally appropriate and acceptable manner" (Crowne & Marlow, 1964) and is a prevalent form of response bias. Self-esteem judgments are strongly influenced by response biases (ie, social desirability, acquiescence, extremity, etc.). For instance, Coleman (1961) found that achieving as an athlete was the highest criterion for popularity in high school boys. The relationship between social desirability and self-esteem is not always kept clear. It is socially desirable to have high self-esteem, and esteem may be generated by social reinforcement. However, people with high self-esteem should have less need for social approval (Crandall, 1973).

Stability. This is a major deterrent to planned self-esteem change. Certain theorists such as Gergen (1971) regard the self-concept as being relatively stable. Stability appears to be influenced by age and the degree of development of self-picture (Rosenberg, 1979). For example, a 60 year old male who has gained 15 pounds may still think of himself as being at a reasonable weight as compared to a healthy 25 year old male in a fitness program who gains 15 pounds. Stability would seem to depend upon the

individual's commitment to, or the importance of the specific identity (Stryker, 1968).

The importance of the self-esteem construct is reflected in the large number of scales published. Crandall (1973) describes and reviews some 33 measures of self-esteem. Except for the Rosenberg Self-esteem Scale, which represents a global measure, virtually all are complex, multidimensional, and are confounded by other irrelevant sources of individual variation (Lorr & Wunderlich, 1986). Wylie (1974) points out that what appears to be needed are devices with a theoretical basis that are resistant to response bias but are unitary as to what is being measured.

Physical Competence

Physical competence, evaluations regarding ability at vigorous exercise and activities in general, has been proposed by certain theorists to be a major component of self-esteem (Harter, 1982).

Because research in exercise physiology shows that individuals can adapt to exercise and can obtain a training effect (American College of Sports Medicine, 1986), it is believed that all healthy individuals are capable of experiencing improvement in physical fitness, particularly in aerobic capacity, after training for a period of time. If

physical fitness is a valid basis for perceptions of physical competence, it would appear that exercise program participants should experience high levels of physical competence.

Harter (1982) has developed the Perceived Competence Scale for Children assessing competence in three specific performance domains: cognitive, social, and physical. Across four large geographical samples, correlations between physical competence and general self-esteem have ranged from .40 to .52.

Although physical competence scales exist for children and adolescents, no such scales have been validated for use with individuals in the middle and later years. Using cross-validational procedures with college males and females, Safrit, Wood, and Dishman (1985) identified 12 Estimation items from the PEAS which formed a scale they termed general competence (physical). Unfortunately, item content appeared to be more relevant to younger populations, and contained a majority of items which referred to the possession of coordination in sport skills and very few items which pertained to adult fitness programs (Sonstroem & Morgan, in publication).

Sonstroem and Kampper (1980) demonstrated that estimation of one's general ability to perform physical activities and sports (a physical competence assessment) predicted participation in school athletic programs. Sonstroem and Kampper

(1980) found that when more global measures of estimation of ability and attraction to physical activity were factored into subsets of more specific items predictability was increased.

Estimation of physical ability (PEAS) was found to be significantly related to measured fitness and to global self-esteem which provides support for estimation as a mediating variable between exercise and self-esteem factor (Neale, Sonstroem, and Metz, 1969; Sonstroem, 1974, 1976). These results have been replicated with college men and women by Dishman (1978) as well as Fox, Corbin, and Coultry (1985), although a significant correlation ($r=.25$, $p<.01$) between fitness and global self-esteem was observed for females in the latter study. Across these five studies containing subsamples, nine Pearson coefficients between estimation and physical fitness ranged from .33 to .53 (median = .41). The six coefficients between estimation and self-esteem ranged from .21 to .53 (Median = .37). Several studies using different measures of perceived physical ability have obtained similar results (Heaps, 1978; Leonardson, & Gargiulo, 1978). Research with police officers have found that estimation scores significantly increased after 20 weeks of exercise (Sonstroem & Morgan, in publication).

Sonstroem (1982) suggests that it may be that the person's perceptions or attitude about his or her physical

fitness rather than the actual fitness itself is related to favorable emotional adjustment. Further substantiation for this was provided by Sonstroem (1976), who showed that Estimation--the measure of self-perceptions of physical abilities--rather than physical fitness scores were related to a lack of neuroticism, personality disorder, and maladjustment in male adolescents as assessed by clinical scales of the Tennessee Self Concept Scale (TSCS) (Sonstroem, 1982).

Body Cathexis

Today's media, whether it be newspapers, commercials, magazines, or bill boards, all promote and encourage attractive healthy bodies. The 1980's is a decade that not only emphasizes the importance of good health but also the aesthetically appealing outcome resulting from physical fitness. The social importance of exercise has never been more important than it is today.

"It seems intuitively obvious that attitudes toward the body are important aspects of self-regard" (Wylie, 1974, 240). Young children when asked for self-descriptions most often responded by naming physical attributes and appearance (Rosenberg, 1979). Body acceptance is defined as "the degree of feeling of satisfaction or dissatisfaction with various parts or processes of the body" and is measured by the Body Cathexis Scale (Secord & Jourard, 1953, p.343).

The Body Cathexis Scale uses a five point response scale that incorporates degrees of directly accepting or rejecting body parts and processes. The scale is used in responding to 40 physical characteristics pertaining to body parts. The sum of responses across the 40 characteristics provides an overall measure of body acceptance. Secord and Jourard's (1953) original study found significant relationships between body cathexis and self-cathexis scores ($r=.58$ for college men, $r=.66$ for college women). Medical patients reported significantly lower body cathexis scores than healthy controls with discrepancies particularly pronounced on items directly related to patient dysfunction (Schwab & Harmeling, 1968).

Bercheid, Walster and Bohrnstedt (1973) randomly selected and analyzed 200 questionnaires returned by Psychology Today readers. They found that in both sexes, body image was highly related to self-esteem. Rohrbacher (1973) worked with obese boys at a summer camp and found that changes in Body Cathexis were closely related to weight loss.

Self-Efficacy

Self-efficacy has been proposed by Bandura (1977, 1982) as a common cognitive mechanism that mediates behavior change. Perceived self-efficacy is "a unique and complex self-evaluation related to performance and the process of

change," (DiClemente, 1986,p.302) and refers to the level and strength of a belief that one can successfully perform a given activity (Bandura, 1977).

Self-efficacy is considered to be a component along the dimension of competence and represents the lowest level of the competence dimension in Sonstroem and Morgan's Exercise and Self-esteem Model (in publication). Self-efficacy relates to "an evaluation of specific capabilities in specific situations" whereas self-esteem "is concerned with an evaluation of self-worth" (Stretcher et. al. 1986,p.77) People often try to develop self-efficacy in activities that give them a sense of self-worth, so that the two concepts are frequently intertwined (Stretcher et. al. 1986).

According to Bandura, behavior change and maintenance are a function of (1) expectations about outcomes (outcome expectancies) and (2) expectations about one's ability to engage in or execute the behavior (self-efficacy expectations). It is these perceptions, and not necessarily "true" capabilities, that influence behavior (Stretcher, DeVellis, Becker, Rosenstock,1986). Self-efficacy Theory places great emphasis on expectations of personal ability (Stanley & Maddux, 1986) and these expectations are powerful predictors of behavioral intentions (Maddux & Rogers, 1983). Self-efficacy Theory holds that human actions are guided by highly specific estimates of ability to perform requisite behaviors, rather than by the more global perceptions of

general athletic competence, self-esteem, or attraction to sport assessed by the physical Attraction and Estimation Scale or the self-concept measures used in the adolescent research (Ewart et. al, 1986)

Situation Specificity

"It is important to understand that the concept of self-efficacy relates to beliefs about capabilities of performing specific behaviors in particular situations (Shunk, 1984); self-efficacy does not refer to a personality characteristic or a global trait that operates independently of contextual factors (Bandura, 1977). This means that an individual's efficacy expectations will vary greatly depending on the particular task and context which confronts him/her" (Stretcher, DeVellis, Becker, Rosentock, 1986, p.74). It is therefore inappropriate to characterize a person as having "high" or "low" self-efficacy without reference to the specific behavior and circumstance with which the efficacy judgment is associated (Stretcher et. al, 1986).

Self-efficacy relates to an evaluation of specific capabilities in specific situations (Bandura, 1984). This situation specificity of the self-concept (organized configuration of perceptions of the self) parallels contemporary interpretation of personality behavior relationships (Bowers, 1973). When a risk component is added to a health situation

creating a disease-prevention context self-efficacy expectancy may be the primary predictor of behavior change (Maddux & Rogers 1983; Wurtele & Maddux, in press).

Self-efficacy as a Predictor of Behavior

Self-efficacy expectations will influence choice of activities, the amount of effort expended, and the degree of persistence exhibited at the activity (Bandura, 1988). An individual's self-efficacy judgments may vary from one activity to another, but the level of self-efficacy reliably predicts whether a particular activity will even be attempted (Bandura, 1982).

In a study by Ewart and colleagues (1983) patients' confidence in their ability to jog various distances was measured with a self-efficacy scale before a group exercise program was begun. Results showed that patients with low self-efficacy underachieved as did patients with medium self-efficacy, but those with high self-efficacy overachieved. Patients appear to realistically appraise their capacity to perform various physical activities even before carrying out these activities (Ewart, Taylor, Reese, & DeBusk, 1983). Ewart, Stewart, Gillian, & Keleman (1986) showed that changes in strength and endurance were associated with the changes in self-efficacy expectations specific to these components of fitness.

In a study of men with clinically uncomplicated

myocardial infarction, Ewart et. al. (1983), evaluated patients' confidence in their ability to perform various physical activities by means of self-efficacy scales which were completed before and after a treadmill exercise test. Increases in self-efficacy for activities similar to treadmill exercise (walking, stair climbing, and running) were greatest after treadmill exercise, whereas increases for dissimilar activities (sexual intercourse and lifting) were greatest after the results (feedback) were explained. Those patients who performed well on the test sustained high values of self-efficacy, whereas self-efficacy tended to decrease in patients who performed less well. These self-efficacy judgments predicted how well patients performed on the test and were in turn modified by the feedback pertaining to test performance.

Reciprocal determinism. This represents a relevant variable in social learning theory (Bandura, 1977). Reciprocal determinism is the idea that self-efficacy expectations not only influence behavior but are in turn influenced by the success of the behavior (Bandura, 1977). Perceived self-efficacy has predicted health behaviors such as weight loss (Weinberg, Hughes, Critelli, England, & Jackson, 1984) and smoking cessation (DiClemente, 1981). Bandura (1982) has recommended self-efficacy as an important mediating variable in the process of recovering from a heart at-

tack. Physical self-efficacy scales have been found to predict future exercise behavior in cardiac patients (Ewart et. al 1983) as well as in the general populations (Dishman, Sallis, & Orenstein, 1985). Self-efficacy expectations have also been shown to increase as a result of exercise program participation (Atkins, Kaplan, Timms, Reinsch, & Lofback, 1984; Ewart, et. al., 1983).

The Effect of Feedback on Self-Efficacy

Ludwig & Maehr (1967) demonstrated that boys who received positive feedback of physical skills from a significant other significantly increased their self-ratings on physical items specific to the feedback. In a study by Yeatts and Gordan (1968) the presence of a significant other and relevant feedback furthered the development of more accurate physical self-perceptions. Taylor, Bandura, Ewart, Miller and DeBusk (1985) showed that patients who had already been stress tested manifested more accurate self-efficacy expectations than those who had not received feedback from previous stress testing.

EXERCISE AND SELF-ESTEEM MODEL

Figure 1 (Appendix A) represents the Exercise and Self-Esteem Model which is a proposed model for examining the mechanisms of self-esteem change through exercise . The

model is vertically arranged on a generality continuum of competency self- perceptions. Situation specificity exists at the base of the model. Physical self-efficacy statements relative to particular physical tasks represent the lowest level in the competence dimension. At this level conceptions are quite accurate and more easily influenced by environmental factors. Physical competence is at a mid-range level of competence and physical self-acceptance is at a mid-range level of self-acceptance. The construct of greatest generality is represented at the top of the model as global self-esteem.

Lower level elements are conceived as components of higher level elements, and changes in these lower level elements cause changes in higher order self-conceptions (Sonstroem and Morgan, in publication).

The horizontal dimension of Figure 1 represents time. Over this time period two testing sessions exist. The initial and follow-up tests are separated by the intervention of exercise program activities. The right half of the model also examines changes in the model components and how they, in turn, predict changes in other components. The present study examined only those static relationships between model components which occurred at the time of the first test.

Physical Measures

Physical measures represent actual physical fitness as measured within an exercise or training program. Various tests are used to assess the different fitness components. Tests include body composition, flexibility, muscular endurance, strength and cardiorespiratory endurance testing. In this study, baseline sub-maximal tests in one or more areas (biking, walking, running, swimming, & stepping) were employed as a means of providing fitness data. These tests also provide feedback regarding personal capabilities. Feedback is given on test results to establish self-efficacy judgments or to estimate future progress. Exercise tests serve to enhance self-efficacies regarding the successful performance of that specific test (Ewart et. al., 1986).

Physical Self-efficacy

Within the proposed model, self-efficacy expectations in regard to performing particular exercise activities will constitute the most immediate and specific measures of perceived physical competence and are therefore represented at the lowest level of the competence dimension in the self-esteem hierarchy (Sonstroem & Morgan, 1988). The model postulates, that these physical self-efficacies are significantly related to both physical measures (at the base of the model) and to physical competence measures (at mid-level of model).

According to Bandura (1977,1982,1984), efficacy expectations vary along dimensions of magnitude, strength, and generality. Each of these dimensions has important implications for performance, and each implies slightly different measurement procedures. "Magnitude" refers to the ordering of tasks by difficulty level. "Strength" refers to probabilistic judgment of how certain one is of one's ability to perform a specific task. A two-step measurement procedure assures that where appropriate, both dimensions will be tapped. First, individuals are presented with a list of performance activities reflecting various difficulty levels then for each task they rate the strength of their ability belief on a ten unit scale ranging from 0-100. The third dimension, "generality", concerns the extent to which efficacy expectations about a particular situation or experience generalize to other situations (Stretcher et. al.,1986, p.75).

In this study, it was hypothesized that these perceptions of physical self-efficacy are positively and significantly related to physical fitness. Physical self-efficacy scores would be expected to be more highly related to physical competence than physical self-acceptance. Additionally, physical self-efficacy scores are more highly related to physical competence scores than to global self-esteem.

Physical Competence

The proposed model incorporates competence as a dimension of self-esteem, and as a motivating agent integrated within components of self-conception which are organized hierarchically on the basis of situational generality. Physical competence is a broader construct capable of incorporating generalization from more specific self-efficacy statements. Generalization is based on a process of inducing and applying feelings of competence obtained at specific exercise program activities to a broader variety of less well defined activities and settings (Sonstroem & Morgan, in publication).

Within this study, it was hypothesized that physical competence would be more closely related to global self-esteem than physical self-efficacy would be. It was also hypothesized that physical competence weighted by importance to the individual is more highly related to global self-esteem than is physical competence alone.

Physical Self-Acceptance

Body acceptance, has a strong association with global self-esteem (Bercscheid & Walster, 1973; Crandall, 1973; Harter, 1983). Placing it on the same level of generality as physical competence permits comparisons of the respective influences of physical competence and physical acceptance on self-esteem. The Body Cathexis Scale, (Secord & Jourard,

1953) used in examining this model, can provide micro-analysis of those body aspects where self-acceptance is influenced by fitness and self-efficacy changes from the lower portion of the model. In turn, examinations may determine those body aspects which significantly impact on self-esteem.

Watkins and Park (1972) demonstrated that higher correlations between body images and self-concept are obtained by using measures which weight the importance of each aspect of the constructs for each individual subject. Because this would result in a more accurate reflection of a subject's attitude towards his body and self, the present study includes weighting the importance of physical self-acceptance to the individuals. In this study, it is hypothesized that body acceptance weighted by importance to the individual is more highly related to global self-esteem than is body acceptance.

Global Self-Esteem

For the purpose of this study global self-esteem presents itself as the construct best identifying overall adjustment and the ability to generalize adjustment to a variety of settings, while multiple components constitute mediators more closely associated with exercise behavior (Sonstroem & Morgan, in publication). As this study examined the Exercise and Self Esteem model it utilized the Rosenberg Self-esteem Scale to measure global self-esteem. The Rosenberg Self-esteem Scale has been rated by Wylie (1974) as one

of the best instruments evaluating overall self-regard and has received extensive use in research for both children and adults (Sonstroem & Morgan, in publication).

The underlying assumption in using global self-esteem to predict behavior is that the individual has some single, basic concept of himself as superior or inferior, good or bad, and that this concept of self will have a significant impact on social conduct. Positive self-esteem has become the single variable best defining emotional and life adjustment (Sonstroem, 1986). A second measure of global self-esteem used in this study was represented by a six-item scale contained in the Adult Self-Perception Profile (Harter, 1986).

CHAPTER 3

Procedure

The procedure is divided into five sections. These sections are: (a) Selection of Subjects, (b) Characteristics of Exercise Programs, (c) Instruments, (d) Computation of Study Variables, and (e) Statistical Analyses. Each section is then divided into several subcategories.

Selection of Subjects

This research involved a sample of 70 subjects enrolled in the University of Rhode Island EXERLIFE Program. The EXERLIFE Program consists of a cardiac rehabilitation and cardiovascular maintenance component (CRM) as well as a community fitness component (CF). Besides the 70 Exerlife subjects, an additional 75 subjects (CT) were recruited and used for a comparison group. A total of 61 females with a mean age of 54.6 and a total of 84 males with a mean age of 54 participated in this study. The entire sample size consisted of 145 subjects with a mean age of 54.2 years.

All subjects were volunteers after being encouraged to participate in the program. One hundred percent of EXERLIFE subjects agreed to participate. Although no records were kept, roughly 60-70% of people outside the program agreed to

participate as CT subjects.

Cardiac Rehabilitation and Cardiovascular Maintenance (CRM)

This study included 26 male and 7 female participants of the CRM program, aged 37-72 with a mean age of 58. The cardiac rehabilitation program is designed to help lower the risk of heart or coronary artery disease for those participants (n=11) who have had a heart attack, coronary artery bypass surgery, percutaneous transluminal angioplasty, or have stabilized angina. The twenty-two participants in the maintenance portion either possessed coronary risk factors or they were one of the 10 participants who had completed twelve weeks of a cardiac rehabilitation program.

Of the 33 CRM subjects (11 Cardiac Rehab), twelve had suffered myocardial infarctions, eight had coronary artery bypass graphs, one had a percutaneous transluminal angioplasty, ten had experienced or stabilized angina, one suffered several small strokes, and twenty of these subjects possessed one or more other coronary artery disease risk factors such as diabetes mellitus, hypertension, hypercholesterolemia, obesity, smoking, or a sedentary inactive lifestyle. Of these thirty-three CRM subjects, twenty-two of them had participated in the EXERLIFE program for less than six months, seven had been members of six months to one year and four of the subjects had been members for over one year.

Community Fitness

Twenty-five male and twelve female subjects were participants in the CF program. The thirty-seven subjects of the CF program were asymptomatic individuals whose interest was to increase their overall fitness level through various modes of exercise. All 70 Exerlife subjects (CRM & CF) participated in baseline physical fitness testing and were administered psychological inventories.

Comparison Group

Sample size was increased by 75 subjects(CT), 42 females and 33 males. These 75 subjects were recruited from URI's faculty and staff, friends of Exerlife participants, community organizations and a night class at the URI extension in Providence, RI. Faculty and staff were randomly selected from the campus directory. Phone calls were made to prospective subjects asking them to participate in a research study conducted by graduate assistants at URI where their participation would involve completing and returning a health related inventory. During the phone conversation, all subjects were told that information would remain confidential and would not be used outside of the study. These additional subjects(CT) did not participate in the fitness testing.

Characteristics of Exercise Programs

At the time of the test administrations, a majority of the exercise subjects had been enrolled in the CF and CRM programs for many months. Therefore, the nature of these programs is provided below.

Cardiac Rehabilitation

The 11 subjects of the cardiac rehabilitation program participated in 3 supervised and EKG monitored exercise sessions a week. A modified chest lead (MCL) V5 was used for telemetry monitoring on a transkinetics TEM 4000. Blood pressures and heart rates were monitored and recorded throughout the session as were RPE's using Borgs scale (Pollock, Wilmore, and Fox, 1985). Individualized exercise prescriptions were derived from the Comoss protocols (Comoss, 1980) and ranged from 10 to 45 minutes of total exercise time with a one to three minute rest period (of walking) in between exercise modalities.

Cardiovascular Maintenance

The twenty two cardiovascular maintenance participants met three days a week for forty-five minute exercise sessions. EKG monitoring was conducted once per month as opposed to every exercise session. Heart rates, blood pressures and

RPE's were monitored and recorded. Exercise prescriptions were individualized and participants exercised continuously for an average of 45 minutes without intermittent rest periods. Nine of the maintenance subjects participated regularly in an aquatics program one day a week rather than using the exercise equipment. Besides participating in the exercise program, several Cardiac Rehabilitation and Maintenance individuals received nutritional counseling.

Community Fitness

The 37 CF subjects participated in a group warm-up and then separated with a group leader to continue a preferred mode of exercise. Subject choices included: outdoor running, outdoor walking, weight lifting, use of universal and free weight equipment, lap swimming, aquatics, aerobic dance, and all the exercise equipment used by the CRM participants (ie, bicycles, arm ergometers, etc). At the end of the exercise session, all those who were interested participated in competitive volleyball games.

Instruments

All 70 EXERLIFE subjects participated in baseline physical fitness examinations and were administered psychological inventories. The 33 CRM subjects and the 37 CF subjects were divided into two groups to examine the effect of physical

fitness feedback on initial physical self-perceptions. Cohort A received fitness testing first followed by psychological inventories and the reverse order was used on Cohort B.

Administration of Psychological Inventories

The 70 EXERLIFE participants were administered the psychological inventories in a quiet classroom setting free from any distractions. The administrator mentioned to all subjects that there were no right or wrong answers and to answer the questions truthfully and accurately as each item pertains to themselves. The administrator remained in the room so that any questions the participants may have had regarding the inventory were answered. An informed consent was included in the inventory (Appendix B). Completion of the inventory took approximately 30 minutes and subjects were told that answers were to be kept confidential.

The 75 additional subjects (CT), outside of the EXERLIFE Program, received their inventories either through the mail, at an organizational meeting, class session, or by personal contact. All additional subjects received their inventories between August and November of 1987. These additional inventories were received at the URI Human Performance Laboratory by mail or were picked up by the investigators between September and December of 1987.

The inventories were preceded by a cover letter and a

consent form found on pages 1 and 2 of Appendix B. Following the consent form, the test packet included Rosenberg's Self-esteem Scale (Rosenberg, 1965), Harter's Self-Esteem Scale (1986), seventeen Estimation-type items (Sonstroem, 1974), items from Jacksons Social Desirability Scale (Jackson, 1984), a research based scale using Susan Harter's structured alternative format (Harter, 1982), a subscale of the Adult Self-Perception Profile (Messer, & Harter, 1986), a rating scale (Messer, & Harter, 1986), self-efficacy statements and expectations formatted by Bandura and Adams (1977) and the Body Cathexis Scale (Secourd and Jourard, 1953). The Body Cathexis Scale was administered only to EXERLIFE participants. It was believed that CT subjects would not agree to an additional time expenditure for completion of this test. Additionally, the Body Cathexis Scale contained a fifth type of response format. Because personal supervision of test administrations with CT subjects was not possible, reliability concerns precluded use of Body Cathexis Scale with CT subjects.

Psychological Instruments

The Rosenberg Self-esteem Scale. The first ten items (Appendix B) consisted of the Rosenberg Self-Esteem Scale, a measure of global self-esteem. The scale contains ten attitude statements concerning an individual's feelings of self-description and self-worth, and uses a five-point

Likert Scale to provide accurate responses. The scale asks subjects to express their agreement or disagreement with each statement as to how it applies to them.

The Rosenberg Self-esteem Scale has been rated by Wylie (1974) as one of the best instruments evaluating self-regard and has received extensive use in research for both adults and adolescents. When the scale was designed and used with high school students a Guttman scale reproducibility coefficient of .92 was obtained. Silber and Tippet (1965) found a test-retest correlation over 2 weeks of .85 (n=25).

Estimation. Seventeen estimation-type items comprised a portion of Section 2 in the inventory (Appendix B) and were used to assess self-perceptions of physical competence. Estimation items in the inventory were numbers: 13,16,17,20,21, 22,23,27,29,30,31,32,38,39,40,41,41, and 42 (Appendix B). Items in the Physical Estimation and Attraction Scale (PEAS) were originally written for adolescent boys and contain reference to running speed, agility, and athletic coordination. These items were deleted from the form employed in the present study. The Estimation scale in the present study utilized seven items from the original scales plus ten newly generated items believed to relate specifically to perceptions of physical fitness competence as experienced by people in their middle and later years.

The PEAS was originally an 87 item test. The estimation scale contained 33 items assessing attitudes towards the self

as possessing capabilities at physical activity and sport. Many of these items were regarded as being inappropriate for the present sample as they referred to activities such as sprinting, gymnastics, and athletic participation. The psychometric properties of the PEAS and their construct validity have been tested with adolescent male subjects (Sonstroem, 1974,1975,1976). A Kuder-Richardson internal consistency coefficient, (KR-20)) of .87 has been obtained (Sonstroem, 1974). A two week test-retest reliability of .92 for Estimation and has also been reported (Sonstroem,1978).

A five point Likert Scale was utilized to provide greater response sensitivity. Strongly agree or extremely characterisric of me would represent a very positive view toward a statement. This scale utilized the same directions and scales that were used for the Rosenberg Scale.

Social Desirability. Twenty items from The Social Desirability Scale (Jackson ,1984) combined with the seven-teen Estimation items and three neutral statements complete section two of the inventory. The social desirability items were numbers: 11,14,15,19,24,25,28,33,34,35,36,37,and 43-50. The three neutral items were numbers: 12,18,and 26 (Appendix B).

The Social Desirability Scale is a 20-item test designed to assess the tendency for subjects to respond in a culturally appropriate or acceptable manner to an item rather

than to its actual content. "This scale was prepared to permit evaluation of profiles for responses primarily in terms of a prominent connotative property of items other than specific content, namely their desirability" (Jackson, 1984, p.26). Kuder-Richardson internal consistency (KR-20) values of .59 and .62 have been obtained with high school males and with male and female undergraduates respectively. Two week test-retest reliabilities ranging from .80 to .96 have been reported (Jackson, 1984).

Adult Self-Perception Profile. The Adult Self-Perception Profile was devised by Susan Harter (Appendix B). The scales measure self-perceptions toward global self-esteem and toward five of its components: physical appearance, intelligence, sense of humor, athletic competence and sociability. Statements 2, 9, 18, and 25 measure self-perceptions towards sociability. Statements 4, 12, 19, and 27 refer to one's athletic competence. Numbers 5, 13, 20, and 28 measure self-perceptions towards one's physical appearance. Statements 7, 14, 22 and 29 refer to one's perceived level of intelligence. Numbers 8, 16, 23, and 30 pertain to one's sense of humor. Statements 1, 6, 11, 15, 21 and 26 of the inventory are measures of general self-esteem. Those scales not germane to the model were utilized as a basis for examining the discriminatory validity of self-efficacy and physical

competence scales. The Adult Self-Perception Profile utilizes a structured alternative response format in an effort to reduce socially desirable responses.

Also within this section of the inventory was a study-developed physical competence scale. This scale consisted of four statements which measured competence in the ability to carry out physical activities. It was constructed utilizing Harter's structured alternative response format. Numbers 3,10,17, and 24 pertain to one's ability to carry out physical activities.

A Rating Scale. This section was also developed by Susan Harter (Appendix B). Subjects are asked to rate (on a scale from one to four) the six components of self-esteem that were used in the previous scale in terms of their relative personal importance.

Self-Efficacy Expectations. Expectations regarding certain physical tasks comprised Section V (Appendix B). The five physical activities used within this section were: walking, stair climbing, jogging, bent knee sit-ups and stationary bicycling. For each activity, subjects were asked how confident they were when performing different levels of intensity and/or duration. Answers ranged from 0-100% as a representation of one's confidence level.

The format for this portion of the inventory was that sug-

gested by Bandura and Adams (1977) and operationalized for cardiac patients by Ewart et. al (1986). Using this format, Ewart (1978) found correlations between peak treadmill heart rate and post-treadmill self-efficacy which approximated $r=.5$. Ewart et. al. (1985) utilized the self-efficacy scale and found that jog self-efficacy correlated significantly with mean twenty minute heart rate $r=.44$, $p<.005$, with peak exercise heart rate $r=.42$, $p<.005$ and with the number of minutes above or below the target heart rate range $r=.39$, $p<.007$. Ewart (1986) using the self-efficacy scale, found test-retest correlation coefficients over periods of one week and ten weeks. Some correlations were lifting self-efficacy, week one was .80, and week ten was .85, push-ups, week one was .74 and .60 for week ten.

The scores in the present study yielded the most specific measures of perceived competence. A mean score was determined in each of the physical activities previously mentioned. These represented an average confidence level towards performing activities at differing levels of intensity and/or duration.

The Body Cathexis Scale, Section VI, was included only in the inventories administered to the Exerlife participants (CRM and CF). This measured one's satisfaction with different aspects of the body (Appendix B, p. 14). The Body Cathexis Scale can provide micro-analyses of the body aspects

where self-acceptance is influenced by fitness and self-efficacy changes from the lower portion of the model. Forty physical characteristics are listed and subjects rate their satisfaction with each body part on a five-point Likert scale. In the present study only the overall body cathexis score was utilized. In the original study body cathexis and self cathexis correlated .58 for males and .66 for females (Secord and Jourard, 1958). Johnson (1956) obtained correlations of .66 for males and .79 for females between general esteem and body esteem.

Physical Measures

The CRM and CF subjects all completed a submaximal step test. However, depending on the mode of exercise the CF subjects most often trained with, they completed one of four other fitness tests besides the submaximal step test. Results from all five fitness tests were classified as poor, fair, good, excellent or superior (Cooper, 1982) and recorded on standardized feedback forms (Appendix E).

Sub-maximal Step Test (10 inch step). The step test (Siconolfi, Garber, Lasater, Carleton, 1985) was administered to all Exerlife participants (CF and CRM). Prior to the start of the test each subject was weighed and height was measured to record and calculate their Body Mass Index. A

technician administered the step test to four subjects at a time using a cassette tape developed by Sicolnofi et. al which instructed the subjects through the step test. All subjects were tested before their exercise session began to avoid an all ready elevated heart rate response.

This test invoked a subject workloads not greater than 65% of the subjects' predicted maximal capacity or not greater than 65% of their maximal heart rate achieved on their last GXT. The latter applied to subjects who were taking medication that affected their heart rate response (i.e., beta blockers). Heart rate and EKG's were recorded throughout the step test using a (MCL) V5 electrode placement.

The step test consists of 3 stages each lasting 3 minutes with a one minute rest between each stage. The stepping cadence would increase with each stage from 17 steps to 26 and then 34 steps per minute, with MET values of 4,7, and 10 respectively. Four subjects at a time stepped simultaneously with the set pace of a metronome recorded on the cassette tape. Prior to each stage was a 15 second warm-up period for subjects to become accustomed to the beat on the tape. During the last 30 seconds for each 3 minute stage, a buzzer sounded at 2:30, 2:45, and 3:00 and heart rates were recorded by the technician. At the sound of the third buzzer, subjects were asked to sit down for a one minute rest while the technician evaluated the subjects' heart rate

response. The form used to record responses during the step test is found in Appendix C. If the average of the 3 heart rates was equal to or exceeded 65% of the subjects MHR the step test was completed. Otherwise, following a one minute rest period, the subjects began stage 2. The criteria were the same in determining whether the subject would continue on to Stage 3.

The exact time the subject reached 65% of their MHR was recorded. The duration and workload achieved when reaching 65% of their MHR was also recorded (Appendix C). The step test was conducted by the technician in conjunction with a cassette tape developed by Siconolfi, et. al. The tape mentioned the purpose of the step test and provided the subjects with specific instructions as well as the pace for stepping.

Depending on the last stage completed by the subject, standardized published regression formulas (Siconolfi, et. al. p.385) were used to derive oxygen uptake in l.min^{-1} for that particular stage. Using their estimated VO_2 in l.min^{-1} for their last stage completed together with their average heart rate for the last stage of stepping, their estimated VO_2 max in l.min^{-1} was derived using the Astrand Rhythmic nomogram (Astrand & Rhythmic, 1954, p.219). A second formula (Siconolfi et. al., p.384) was used to adjust for age and then oxygen uptake was converted in terms of body weight to $\text{ml.kg}^{-1}.\text{min}^{-1}$. The subjects estimated VO_2 max was then classified as poor, fair, good, excellent or superior ac-

cording to their age and sex. The formulas used and the modified calculations made for subjects on medications affecting their heart rate response can be found in Appendix C.

Cooper's 1.5 mile run (Cooper, 1982). This test was administered to seventeen CF participants for a reliable estimate of one's aerobic capacity. The test was conducted on the URI 400 meter outdoor track after proper warm-up and stretching. The total time in minutes for completion of the test was recorded and then classified into Cooper's fitness categories.

Cooper's 3 mile walk (Cooper, 1982). This test was administered to two CF participants who most often walked during their three day a week exercise sessions. The subjects were to cover three miles in the fastest time possible (without running) on the URI 400 meter outdoor track. Total time was recorded in minutes and then classified using Cooper's fitness classifications.

Cooper's 12 minute swim test (Cooper 1982). This test was administered to six CF subjects whose dominant mode of training was swimming. The swimming test required the subjects to swim as far as possible within twelve minutes. Subjects used whatever stroke they preferred and rested if necessary, but tried for a maximum effort. The number of laps

completed within the allowed time was recorded and classified using Coopers fitness classifications. RPE and heart rate were also recorded. The test was performed using the indoor 25 yard pool at URI. The form used to record the results from Cooper's three field tests can be found in Appendix E.

YMCA Sub-maximal Bike Test. The YMCA submaximal bike test (Myers, Golding, Sinning, 1973, p.33) was administered to nine CF participants. Prior to testing, a Monark cycle ergometer (Monark, Quinton Instruments, Seattle, WA) was calibrated with a 1 kg weight. The cycle ergometer was adjusted so that the leg had a slight bend at the knee when the pedal was in the down position. The pedalling rate was kept constant at 50 RPM's utilizing the computer attached monitor on the bicycle. Subjects had a (MCL) V5 electrode placement connected to a Transkinetics TEM 4000 telemetry to assure accurate heart rate recordings. Heart rates were recorded at each stage of pedalling (Appendix D).

The initial protocols were standardized by sex and each stage lasted a duration of three minutes (Clayton, et. al, p. 33). The increase in workload was determined by the HR response during the second and third minute of the stage. If these two heart rates differed by more than five beats, then an extra minute was continued at this workload to assure

a steady state. Additional workload was administered using a branching design which depended on the heart rate response from the previous stage. The test was complete at approximately 80-85% of the subjects predicted maximal heart rate. The final heart rate in both the second and third workload were plotted against its respective workload on a graph. A straight line was then drawn diagonally through the two plotted points and extended to the subjects age estimated maximal heart rate. The point at which the diagonal line intersected the horizontal (maximal heart rate) line represented the max oxygen uptake in l.min^{-1} . This was then divided by body weight to account for weight ($\text{ml.kg}^{-1}.\text{min}^{-1}$) and compared to others of the same sex and age for a fitness classification of poor, fair, good, excellent or superior was determined.

Computation of Study Variables

Psychological Variables

The ten Rosenberg Self-Esteem items (ROSE), the seventeen Estimation items, and the twenty social desirability items (SD) were scored at the academic computer center. These scales used a five point Likert Scale. When computing the scores, an answer of "Strongly Disagree" was awarded five points, therefore, a lower final score represented having a

higher value of what was being measured.

Susan Harter's Adult Self-Perception Profile was scored by hand. This scale consists of four items each measuring sociability (SOC), physical appearance (APP), intelligence (INT), sense of humor (HUM), and athletic ability (ATH), and six items measuring global self-esteem (SE). Point values of one to four were given for the subjects' responses. A higher point value represented a higher level of competence in the area being scored. The four or six responses for each component of global self-esteem were then summed resulting in one final score for each component.

The subjects rated each component of global self-esteem in order of importance and responses were awarded a point value of one to four, four representing very important. These numbers would be assigned to variables that represent each component (i.e., IMPHY represents the importance of being good at physical activities and IMAPP represents the importance of being good looking).

Self-efficacy scales were also scored by hand. Statements were divided into five sections for five different modes of exercise (walking, stair climbing, biking, situps, and jogging). Each statement was answered using a percent scale ranging from 0 to 100% representing one's confidence in completing that particular exercise. Each of the six sections had stated different levels of difficulty (in increasing order) when performing that particular mode of exercise.

The percents were summed for each mode of exercise and divided by the number of choices (or levels of difficulty). Therefore, an average percent was calculated for each mode of exercise. These percents were represented by separate variables (i.e., EFW represented self-efficacy of walking, EFST represented self-efficacy of climbing stairs).

The Body Cathexis (BC) Scale was hand scored by summing the responses to forty items. Each item had been answered on a five point scale. A higher total represented a greater acceptance of body parts.

Variables Representing Physical Measures

The final step test results included: number of seconds stepping (SECS) before reaching 65% of the age predicted MHR and a fitness classification (STECAT) consisting of poor, fair, good, excellent, or superior. CATA, the third physical performance measure, represents a mean fitness classification for the CF and CRM subjects. CATA combines fitness categories of the step test, mile and a half run, three mile walk, twelve minute swim and the sub-maximal bike test.

In this study, age (AGE) to the past birthday was used as opposed to age to the nearest birth date.

Stastical Analysis

All subject data were coded by I.D. Data were analyzed at the URI Academic Computer Center utilizing Statistical Packages for the Social Sciences (SPSSX). The means for the three groups (CF, CT, CRM) were ordered first on a basis of hypothesized health and lack of physical impairment. Means for the groups were tested for significant differences by one-way analysis of variance. A priori contrasts compared the means of CF and CT groups and the means for the CRM and CT groups. Associations between different model levels (i.e., physical fitness, physical self-efficacies, physical competence, global self-esteem) were examined by computing Pearson r coefficients. Study hypotheses were examined next by Pearson correlation procedures and tests for significant differences between coefficients. Finally, the effect of age and experience on variable relationships was examined by partial correlation procedures.

Chapter 4

RESULTS AND CONCLUSIONS

This chapter is divided into six sections. These sections are: (a) Comparison of Groups, (b) Relationships Between Study Variables, (c) Tests of Hypotheses, (d) Discussion, (e) Practical Implications, and (f) Implications for Future Research. The abbreviations used for the study variables are presented in Table 1 of Chapter 4.

TABLE 1
LIST OF VARIABLES

<u>Variable</u>	<u>Abbreviation</u>
Cardiac & Maintenance Subjects	CRM
Additional Subjects	CT
Community Fitness Subjects	CF
Harter's Global Self-Esteem	SE
Rosenberg's Global Self-Esteem	ROSE
Study Developed Physical Competence Scale	PHY
Sonstroem's Estimation Items	EST
Harter's Appearance	APP
Harter's Intelligence	INT
Harter's Importance of Physical Activity	IMPHY
Harter's Importance of Intelligence	IMINT
Secord & Jourard's Body Cathexis Scale	BC
Jackson's Social Desirability Scale	SD
Self-Efficacy for Walking	EFW
Self-Efficacy for Stair Climbing	EFST
Self-Efficacy for Biking	EFB
Self-Efficacy for Sit-Ups	EFS
Self-Efficacy for Jogging	EFJ
Height	HT
Weight	WT
Seconds of Stepping on Step Test	SECS
Step Test Category	STECAT
Average of Physical Test Categories	CATA

Comparison of Groups

The three groups (CF, CT, CRM) were a priorily ordered on a basis of hypothesized health and fitness. That is, the CF group, by virtue of their exercise experiences, was assumed to be positioned at the top of a health fitness continuum. The CRM group by virtue of high risk status or CHD were assumed to be positioned at the lower end of the continuum. It was hypothesized that model variable scores would be ordered on this same continuum.

Self-Perception Means

Tables 2 and 3 present self-perception and age means, and tests for significant group differences. Row 1 lists the variables that were compared among the three groups (CF,CT, & CRM). Rows two, three and four contain the mean scores for the three groups for each of the twelve variables. Probabilities associated with the F test for significant differences between groups are presented in row 5. Since the CRM group represented an important study emphasis, the first a priori contrast of Table 2 (Row 6) compared the means of the CRM group with the mean of the CT group. The second contrast (Row 7) compared means of the CF and CT groups.

Self-perception means for males. The self-perception means and tests for group differences in males are shown in Table 2. There were no significant differences between the three groups (CRM, CF, CT) in self-esteem (SE) values when measured by the six-item scale contained in the Adult Self-Perception Profile.

When the means for the Rosenberg Self-Esteem Scale (ROSE) were analyzed using one-way ANOVA, statistical significance was established at the .05 level. A priori contrasts between CRM and CT (ROSE) values were significant at the .05 level. CF means were not significantly higher than CT means in either ROSE or SE values.

Self-perceptions of physical competence were measured by the study-developed PHY scale and by Estimation items (EST). Analysis of variance among PHY values established a .05 level of significance for differences between groups. The a priori contrast between CRM & CT was analyzed and statistical significance was obtained at the .05 level. CRM subjects had significantly lower PHY values as compared to the control group. Analysis of variance among the EST values established a high level of significance ($p < .01$) for differences between groups. The a priori contrast between CRM & CT was analyzed and statistical significance was established at the .05 level. Both physical competence values (PHY & EST) for the CRM group were significantly lower than for the CT group.

Analysis of variance among APP values established a significant difference between the three groups ($p < .05$). This significant difference was accounted for primarily by the CRM vs. CT contrast ($p < .01$). CRM subjects demonstrated significantly lower self-perceptions of appearance than did the CT subjects.

Table 2 shows that the CF group was significantly higher ($p < .05$) than the CT group when rating the importance of physical competence (IMPHY).

Self-perception means for females. Self-perception means and tests for group differences are shown in Table 3. The analysis of variance between the three groups for SE values approached the .05 level of significance ($p < .07$). SE values for females were significantly lower in the CRM group than the CT group ($p < .05$).

A statistically significant difference ($p < .05$) between groups in EST values was obtained in the ANOVA. This significant difference was accounted for primarily by the CF vs. CT contrast. Community fitness subjects held significantly more favorable beliefs ($p < .01$) about their physical competence when measured by estimation items than did comparison subjects. No significant differences were found in CRM means as compared to the average CT mean. Unlike males, female cardiac rehabilitation and maintenance subjects did not think

TABLE 2

SELF-PERCEPTION MEANS AND TESTS FOR GROUP DIFFERENCES (MALES)

GROUP	n	SE ^a	ROSE ^b	PHY ^a	EST ^b	APP ^a	INT ^a	IMPHY ^a	IMAPP ^a	IMINT ^a	BC ^a	SD ^b	AGE ^a
CF	25	20.16	1.73	12.96	2.28	11.52	13.56	3.60	2.44	3.32	143.28	2.92	50.60
CT	33	20.58	1.49	12.61	2.53	12.36	13.45	3.21	2.30	3.45		2.95	53.45
CRM	26	19.46	1.79	11.27	2.87	10.73	12.77	3.38	2.35	3.19	137.96	2.89	57.85
<u>Diffs.</u>													
ANOVA		n.s.	*	*	**	*	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
CRM vs. CT		n.s.	*	*	*	**	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
CF vs. CT		n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	*	n.s.	n.s.	n.s.	n.s.	n.s.

* p < .05

** p < .01

^a Higher scores = larger variable values^b Lower scores = larger variable values

TABLE 3

SELF-PERCEPTION MEANS AND TESTS FOR GROUP DIFFERENCES (FEMALES)

GROUP	n	SE ^a	ROSE ^b	BY ^a	EST ^b	APP ^a	INT ^a	IMBY ^a	IMAP ^a	IMINT ^a	RC ^a	SP ^b	AGE ^a
CF	12	19.08	1.81	12.67	2.32	11.00	12.42	3.83	2.50	3.75	139.25	2.83	48.08
CT	42	19.05	1.81	11.45	2.84	11.17	12.24	3.49	2.39	3.54		3.04	55.38
CRM	7	16.00	1.81	10.86	2.63	11.14	14.14	3.43	2.57	3.57	135.14	3.04	60.86
<u>Diff's.</u>													
ANOVA		n.s.	n.s.	n.s.	*	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	*
CRM vs. CT		*	n.s.	n.s.	n.s.	n.s.	*	n.s.	n.s.	n.s.		n.s.	n.s.
CF vs. CT		n.s.	n.s.	n.s.	**	n.s.	n.s.	*	n.s.	n.s.		*	n.s.

^a Higher scores = larger variable values^b Lower scores = larger variable values

* p < .05

** p < .01

significantly less of their physical competence than the other subjects. A limiting factor in these results may have been caused by the extremely small sample size of CRM females (N=7). CRM values for PHY(M=10.86) were lower than those for CT (M=11.45) and CF (M=12.67).

CF values were significantly higher ($p<.05$) than CT values in importance of physical competence(IMPHY) and in social desirability (SD) ($p<.05$).

A significant difference in age was found for the three groups (CF, M=48.08, CT, M=56.38, CRM, M=60.86).

Physical Self-Efficacy Means

Tables 4 and 5 present self-efficacy group means and tests for significant differences in males and females respectively. The top row consists of the self-efficacy variables that were compared among the three groups. Rows two, three, and four present the CF, CT, and CRM means for each self-efficacy. Differences obtained between the CF, CT, & CRM values using one-way ANOVA are found in row five. Row six compared the mean of the CRM group with the mean of the CT group. The second contrast (row seven) compared means of CF and CT groups.

TABLE 4

SELF-EFFICACY GROUP MEANS AND TESTS FOR DIFFERENCES (MALES)

GROUP	EFW	EFST	EFJ	EFS	EFB
CF	85.75	85.2	60.91	56.32	74.54
CT	88.38	84.66	47.87	50.89	63.81
CRM	79.04	66.68	31.03	38.83	55.87
<u>Diff's.</u>					
ANOVA	n.s.	***	**	*	**
CRM vs. CT	*	***	*	*	n.s.
CF vs. CT	n.s.	n.s.	n.s.	n.s.	n.s.

* p < .05

** p < .01

*** p < .001

Self-efficacy means for males. When the self-efficacy means were analyzed using one-way ANOVA, statistically significant differences were found in four of five self-efficacies ($p < .05$ to $p < .001$). These significant differences were accounted for primarily by the CRM vs CT contrast (Row 6). CT subjects held significantly more favorable beliefs ($p < .05$ to $p < .001$) about their physical self-efficacies than did the CRM subjects.

The a priori contrast between CF and CT physical self-efficacies surprisingly were not significant. Only two out of five comparisons approached customary significance levels ($p < .10$ for EFJ and $p < .07$ for EFB). Therefore, CT subjects thought as much of their physical self-efficacies as did the CF subjects.

Self-efficacy means for females. ANOVA analyses of self-efficacies established significant group differences ($p < .05$ to $p < .001$) for all but one self-efficacy (EFS). The CRM vs CT contrast displayed CRM values that were not significantly lower than those of the control group in any of the self-efficacies. A limiting factor in these results may have been caused by the extremely small sample size of the CRM females ($N=7$).

The CF self-efficacy values were significantly higher ($p < .01$ to $p < .001$) than CT values in four of five self-efficacies. These CF values were expected to be higher than

TABLE 5

SELF-EFFICACY GROUP MEANS AND TESTS FOR DIFFERENCES (FEMALES)

<u>GROUP</u>	<u>EFW</u>	<u>EFST</u>	<u>EFJ</u>	<u>EFS</u>	<u>EFB</u>
CF	91.32	89.93	60.47	48.14	73.27
CT	74.76	63.93	20.81	34.93	51.26
CRM	65.24	59.50	13.10	16.44	57.80
<u>Diff's.</u>					
ANOVA	*	***	***	n.s.	*
CRM vs. CT	n.s.	n.s.	n.s.	n.s.	n.s.
CF vs. CT	**	***	***	n.s.	**

* $p < .05$ ** $p < .01$ *** $p < .001$

CT values. It was known that all CT subjects were participating in a formal exercise program.

Group Fitness Scores

Group fitness means and significant differences in males and females are presented in Tables 6 & 7. Variables representing the three fitness measures, and height and weight are in row one. CF & CRM means for the fitness measures, height and weight are listed in rows two and three. Probabilities associated with tests for differences between the two groups using analysis of variance are listed in row four.

Fitness in males. Table 6 represents results of physical fitness testing for males. Because fitness testing was not administered to the CT group, these data are available only for CRM and CF subjects.

When the fitness group means were analyzed using one-way ANOVA, statistical significance of .001 was established for all the fitness indices (SECS, STECAT and CATA). As expected, CF fitness means were significantly higher than the fitness means obtained by the CRM group. Differences in height and weight among the three groups were not significant.

Fitness in females. Table 7 presents results of physical measures for females in CF and CRM groups. The ANOVA's

TABLE 6

GROUP FITNESS MEANS AND SIGNIFICANT DIFFERENCES (MALES)

GROUP	SECS	STECAT	CATA	HT	WT
CF	200.92	3.04	3.02	70.40	188.40
CRM	17.69	1.77	1.77	70.58	192.96
ANOVA	***	***	***	n.s.	n.s.

*** $p < .001$

TABLE 7

GROUP FITNESS MEANS AND SIGNIFICANT DIFFERENCES (FEMALES)

GROUP	SECS	STECAT	CATA	HT	WT
CF	123.17	2.50	3.04	66.50	141.00
CRM	12.14	2.14	2.14	66.71	152.71
ANOVA	**	n.s.	**	n.s.	n.s.

** P < .01

show significant differences ($p < .01$) between the CF and CRM groups on two physical measures (SECS and CATA). CF females were significantly more fit in these two fitness indices. Female CRM fitness values when compared to CF values were not as significant ($p < .01$) as they were in the males ($p < .001$). A limiting factor in these results may have been caused by the extremely small sample size of CRM females ($N=7$).

Summary of Group Differences

The discriminatory variables in Tables 2 & 3 that were not expected to relate to principle model variables were: INT, IMAPP, and IMINT. As expected none of these values were significantly different among the three groups.

The variables that were expected to be significantly different among the three groups were: PHY, EST, and IMPHY. Physical competence means for the CRM males were significantly lower than the CT mean for both EST and PHY. These same values were lower in CRM females as compared to CT females, however, not significantly lower. Overall, CRM subjects have lower physical competence levels than do the CT subjects. Quite probably, CRM subjects realize that their exercise tolerance is limited and restricted due to their individual CHD conditions. CF females had significantly higher EST values than did CT females. It would appear that their

exercise experience has served to provide them with confidence in their general physical abilities.

CF values were significantly higher ($p < .05$) than CT values in importance of physical competence (IMPHY). Perhaps, because the CF subjects exercise on a routine basis, they are more conscious of their levels of physical competence and rate their physical ability as being more important to them.

Variables that were uncertain as to whether significant differences would exist among groups were: SE, ROSE, APP, SD, and AGE. The CRM females had significantly lower levels of SE than the CF and CT groups. SE was measured by six items within the Adult Self-Perception Profile. These items specifically related to global self-esteem. This difference did not exist in CRM males. Table 2 shows that CF subjects have a greater need than CT subjects to obtain approval by responding in a manner acceptable by most others (SD).

In Tables 4 & 5 all five self-efficacies were expected to be different between the three groups. CRM males scored significantly lower in all physical self-efficacies than CT males. While CRM female means were considerably below those of the CT females, these differences were not significant. Unexpectedly, the CF males did not score significantly higher than the CT males in any of the five physical self-efficacies. CF female scores were significantly higher than CT female scores in four of five physical self-efficacies.

In Tables 6 & 7 the three fitness indices (SECS, STECAT, and CATA) were expected to be different between the CF and the CRM group however HT and WT were discriminatory variables. As expected, CF fitness means were significantly higher than the fitness means obtained by the CRM group (Table 6 & 7). These results agree with what was hypothesized. That is, the CF group by virtue of better health was assumed to be positioned at the top of the health/fitness continuum as compared to the CRM group by virtue of high risk status or CHD were assumed to be positioned at the end of the continuum.

Relationships Between Study Variables

There are three main sets of relationships that exist between the four levels of model variables (Appendix A). Level one measures global self-esteem represented by the variables SE & ROSE. Level two measures physical competence represented by the variables PHY & EST. Self-efficacies are measured in level three and are represented by the values of EFW, EFB, EFS, EFST, and EFJ. The variables SECS, STECAT, and CATA measure physical fitness and represent level four in the model. The three sets of relationships tested in this study were: (1) between global self-esteem (SE & ROSE) and physical competence (PHY & EST), (2) between physical competence and physical self-efficacies (EFW, EFS, EFB, EFST, & EFJ), and (3)

between physical self-efficacies and physical fitness (SECS, STECAT, & CATA).

Relationships Between Self-Perception Variables

Self-Perception variables in males. Table 8 presents correlation coefficients of self-perception variables for male subjects. In Table 8, PHY and EST, two measures of physical competence, have a correlation coefficient of .80. This provides some support for a conclusion that these scales, were measuring the same construct.

Values in Table 8 show that the first of the three model relationships, between self-esteem and physical competence, does exist. Significant relationships between self-esteem and physical competence were found in three of the four coefficients at the .001 level (across all males).

Much support was provided for the second set of model relationships, those between physical competence and physical self-efficacy. Ten out of ten coefficients between physical competence and self-efficacies were significant. Nine coefficients were at the .001 level of significance and one at a .05 level of significance. The percentage of explained variance accounted for by those ten coefficients ranged from .036 to .384 with a median value of .211. Only six of the ten coefficients between global self-esteem and self-efficacies were significant, however, they were all of lesser

TABLE 8

CORRELATION MATRIX FOR SELF-PERCEPTION VARIABLES (MALES)

	ROSE	PHY	EST	APP	INT	BC	SD	EFM	EFST	EFJ	EFS	EFB	EXP	AGE
SE	.64 ^c	.51 ^c	.38 ^c	.44 ^c	.59 ^c	.38 ^b	.10	.25 ^b	.25 ^b	.11	.25 ^b	.01	.04	-.04
ROSE	-	.34 ^c	.31 ^b	.38 ^c	.48 ^c	.36 ^b	-.22 ^a	.25 ^b	.36 ^c	.14	.26 ^b	.13	.04	.12
PHY	-	-	.80 ^c	.54 ^c	.35 ^c	.47 ^c	-.08	.45 ^c	.47 ^c	.33 ^c	.34 ^c	.19 ^a	.21	-.12
EST	-	-	-	.45 ^c	.24 ^a	.43 ^c	-.03	.56 ^c	.62 ^c	.51 ^c	.61 ^c	.38 ^c	.39 ^b	-.25 ^b
APP	-	-	-	-	.32 ^b	.61 ^c	.01	.27 ^b	.28 ^b	.18 ^a	.25 ^b	.20 ^a	.17	.11
INT	-	-	-	-	-	.26 ^a	.14	.22 ^a	.15	.09	.31 ^b	.18 ^a	.07	-.18 ^a
BC	-	-	-	-	-	-	.06	.11	.21	.07	.15 ^a	.28 ^a	.10	.22
SD	-	-	-	-	-	-	-	.11	.13	.11	-.04	.09	.05	.16
EFM	-	-	-	-	-	-	-	-	.80 ^c	.53 ^c	.39 ^c	.45 ^c	.23 ^a	-.28 ^b
EFST	-	-	-	-	-	-	-	-	-	.61 ^c	.51 ^c	.45 ^c	.41 ^c	-.39 ^c
EFJ	-	-	-	-	-	-	-	-	-	-	.60 ^c	.55 ^c	.56 ^c	-.54 ^c
EFS	-	-	-	-	-	-	-	-	-	-	-	.50 ^c	.38 ^b	-.56 ^c
EFB	-	-	-	-	-	-	-	-	-	-	-	-	.57 ^c	-.30 ^a
EXP	-	-	-	-	-	-	-	-	-	-	-	-	-	-.28 ^a

a p < .05

b p < .01

c p < .001

magnitude than the physical competence and self-efficacy coefficients which supports model predictions.

In Table 8, appearance was highly related to global self-esteem and body cathexis. Satisfaction with one's appearance is significantly ($p < .001$) related to global self-esteem in males. As would be expected from the model, BC (body cathexis) developed a significant coefficient with only two of five physical self-efficacies. Appearance was significantly related to all five physical self-efficacies in males. These results provide support for considering physical appearance as an important component of exercise. There appears to be evidence in males that expectancies regarding successful execution of specific exercise activities are related to more favorable perceptions of one's appearance.

Age and experience (EXP) among males were significantly related to self-efficacies and to estimation. EXP represents the number of months spent in the program before test 1. A significant relationship existed between EXP and all five self-efficacies in males. Those subjects who had been attending the exercise program for a longer period of time had higher physical self-efficacies than those subjects who hadn't attended as long. By themselves, these relationships tend to support the developmental aspects of the model. A negative relationship existed between age and self-efficacy scores. Younger subjects tended to display higher self-efficacy values.

Self-Perception variables in females. Table 9 presents the correlations for self-perception variables in female subjects. Table 9 displays significant relationships between the two self-esteem measures and the two physical competence measures for all four coefficients. These results were similar to those of males and supported relationships between level 1 (self-esteem and physical competence) and level 2 (physical competence and self-efficacy) in the model.

All ten coefficients between physical self-efficacy and physical competence were significant ranging from $r = .28$ to $r = .63$. The percent of explained variance accounted for by these ten coefficients ranged from .078 to .396 with a median value of .202. This provides support for the second relationship in the Exercise and Self-esteem Model, that being between physical competence and physical self-efficacy. Only two out of ten coefficients between self-efficacy and global self-esteem were significant.

In Table 9, appearance was highly related to global self-esteem and to body cathexis as it was in males. Appearance also related significantly to three of the five self-efficacies. As would be expected BC was significant with only one of five physical self-efficacies. These results provide support for considering physical appearance as an important component of an exercise and self-esteem

TABLE 9

CORRELATION MATRIX FOR SELF-PERCEPTION VARIABLES (FEMALES)

	ROSE	PHY	EST	APP	INT	BC	SD	EFW	EFST	EFJ	EFJ	EFJ	EFJ	EFJ	EXP	AGE
SE	.58 ^c	.36 ^b	.26 ^a	.49 ^c	.38 ^c	.45 ^a	.06	-.07	.03	.24 ^a	.24 ^a	.04	.15	-.07		
ROSE	-	.37 ^b	.42 ^c	.55 ^c	.41 ^c	.18	.05	.10	.18	.11	.13	.08	-.36	-.08		
PHY	-	-	.80 ^c	.09 ^c	.34 ^b	.37	.05	.28 ^a	.35 ^b	.51 ^c	.44 ^c	.29 ^b	.43 ^a	-.08		
EST	-	-	-	.40 ^c	.40 ^c	.41 ^a	-.08	.37 ^b	.49 ^c	.63 ^c	.53 ^c	.46 ^c	.43 ^a	-.14		
APP	-	-	-	-	.57 ^c	.51 ^b	-.04	.12	.19	.28 ^a	.29 ^c	.21 ^a	.27	-.04		
INT	-	-	-	-	-	.56 ^b	-.11	.14	.15	.18	.14	.26 ^a	.04	-.13		
BC	-	-	-	-	-	-	.12	.32	.02	.32	-.07	.41 ^a	.34	-.10		
SD	-	-	-	-	-	-	-	.23 ^a	.14	.01	-.10	.07	-.05	.13		
EFW	-	-	-	-	-	-	-	-	.66 ^c	.40 ^c	.34 ^b	.61 ^c	.49 ^a	-.47 ^c		
EFST	-	-	-	-	-	-	-	-	-	.61 ^c	.58 ^c	.73 ^c	.50 ^a	-.68 ^c		
EFJ	-	-	-	-	-	-	-	-	-	-	.62 ^c	.60 ^c	.78 ^c	-.41 ^c		
EFJ	-	-	-	-	-	-	-	-	-	-	-	.51 ^c	.53 ^b	-.61 ^c		
EFB	-	-	-	-	-	-	-	-	-	-	-	-	.68 ^c	-.58 ^b		
EXP	-	-	-	-	-	-	-	-	-	-	-	-	-	-.50 ^b		

^a p < .05^b p < .01^c p < .001

model. This supports the idea that the subjects also exercise for cosmetic reasons.

Similar to male results, age and experience (EXP) among females were significantly related to self-efficacies. The longer the subjects exercised in the program before Test 1 the higher the self-efficacy values were. Age had a negative relationship with physical self-efficacies. Younger subjects exhibited higher physical self-efficacy values.

Relationship Between Physical Fitness and Physical Self-Efficacies

Relationships in males. Table 10 presents the relationships between physical fitness and physical self-efficacies in males. All five physical self-efficacies were significantly related to the numbers of seconds stepped before reaching 65% of the predicted maximal heart rate (SECS). One of those five coefficients was at a .001 level of significance. The percentage of explained variance accounted for by these five coefficients ranged from .06 to .22 with a median value of .13.

The five coefficients between self-efficacies and STECAT were all significant. Three of these coefficients were at a .001 level of significance. The percentage of explained variance accounted for by these five coefficients ranged from .12 to .29 with a median value of .18. STECAT was a better

TABLE 10
RELATIONSHIPS BETWEEN PHYSICAL FITNESS
AND PHYSICAL SELF-EFFICACIES (males)

<u>VARIABLE</u>	<u>SECS</u>	<u>STECAT</u>	<u>CATA</u>
EFW	.25 a	.43 c	.32 b
EFST	.36 b	.53 c	.49 c
EFJ	.47 c	.54 c	.44 c
EFS	.38 b	.37 b	.43 c
EFB	.24 a	.35 b	.42 c

a p < .05
b p < .01
c p < .001

measure of fitness than SEC. STECAT was based on the estimated V02 max derived from the number of stages stepped, whereas, SEC represented the seconds stepped before reaching 65% of the predicted maximal heart rate. This figure could easily have been distorted by an already elevated heart rate due to caffeine, anxiety, or prior physical activity (i.e. stretching, warm-ups etc). STECAT value also represented a full stage of a particular intensity or workload as opposed to a portion of a stage (SECS).

All five coefficients between self-efficacies and the mean for fitness classifications (CATA) were significantly related. Four of five of these coefficients were at a .001 level of significance. The percentage of explained for by these five coefficients ranged from .10 to .24 with a median of .18. The results in Table 10 indicate significant relationships between physical fitness scores and physical self-efficacy scores in males. The third set of relationships existing in the model, that between physical self-efficacies and physical fitness, is supported by these results.

Relationships in females. The relationships between physical fitness and physical self-efficacies in females are presented in Table 11. The values presented in Table 11 were accounted for by an N of only 19 females. Two of five coefficients between SECS and self-efficacies were significant.

TABLE 11
RELATIONSHIPS BETWEEN PHYSICAL FITNESS AND
PHYSICAL SELF-EFFICACIES (FEMALES)

<u>VARIABLE</u>	<u>SECS</u>	<u>STECAT</u>	<u>CATA</u>
EFW	.50b	.30	.52a
EFST	.56b	.18	.47a
EFJ	.36	.28	.70c
EFS	.18	-.01	.35
EFB	.23	.43a	.65c

a $p < .05$
b $p < .01$
c $p < .001$

These accounted for .25 and .31 of the variance. These two self-efficacies were EFW and EFST--two of the effecacies most similiar to the activity of step testing. Surprisingly, only one of five coefficients between STECAT and self-efficacies was significant this may be a result of the small N. However, four of five coefficients between CATA and self-efficacies were significant. The percentage of explained variance accounted for by these four coefficients ranged from .22 to .49 with a median of .34. A mean of the fitness classifications (CATA) was significantly related to physical self-effacicies in female subjects. A total of seven out of fifteen coefficients were significant in the relationships of physical fitness and physical self-efficacies in females. This supports the models' third relationship between self-efficacy and physical fitness (Appendix A). These results are not as significant as the male results, possibly due the smaller n.

Summary of Variable Relationships

The three sets of relationships within the four levels of the model were supported by both males and females. A significant relationship between physical competence and global self-esteem was found in both males and females. A strong positive significant relationship was found to exist between physical self-efficacies and physical competence in both males and females. Results also showed a significant

relationship between physical self-efficacy and physical physical fitness with a much stronger relationship among the males than females.

Experience and age were two factors both significantly related to physical self-efficacies. Appearance (APP) was found to be an important component of exercise in both males and females.

Tests of Hypotheses

Hypothesis 1. Perceptions of physical self-efficacy are positively and significantly related to physical fitness.

The five self-efficacies (EFW,EFST,EFS,EFB,EFJ) and the three fitness indices (STECAT,SECS,CATA) generated fifteen coefficients for each sex. These thirty coefficients are contained in Tables 10 & 11. Results in Tables 10 & 11 were discussed previously under relationships between study variables. All of the male coefficients were significant and seven of the fifteen female coefficients were significant. The fact that twenty-two of thirty coefficients were significant represented relationships offsetting acknowledged probability inflations caused by the large number of coefficients. Therefore, the research hypothesis was accepted. It is concluded that perceptions of physical self-efficacy are

significantly related to physical fitness.

Hypothesis 2. Physical self-efficacy scores are more highly related to physical competence scores than to global self-esteem scores.

In Table 8, when each of the five coefficients developed for a particular self-efficacy were related to values of PHY and EST (physical competence measures), all ten coefficients were significant for males. When these same five self-efficacy variables were correlated with values of ROSE and SE (self-esteem measures) only six coefficients were significant for males. These results showed a greater correspondence between self-efficacy and physical competence than between self-efficacy and global self-esteem in males.

In Table 9, the comparison of the five self-efficacy coefficients with the values of PHY and EST in females resulted in all ten coefficients being significant. The comparison of self-efficacy coefficients with SE and ROSE (self-esteem measures) in females resulted in only two significant coefficients.

As a test of Hypothesis 2^a, mean coefficients for each self-efficacy were computed for PHY and EST (column 4 of Tables 12 & 13). For each self-efficacy^a mean coefficients were computed also for the two self-esteem measures (column 7

TABLE 12

VALUES USED AND OBTAINED DIFFERENCES IN TEST OF
HYPOTHESIS 2 (MALES)

	PHY	EST	MEAN	SE	ROSE	MEAN	t
EFW	.454	.559	.506	.254	.253	.254	2.17 +
EFST	.469	.620	.545	.249	.347	.298	2.19 +
EFJ	.331	.514	.423	.113	.140	.127	2.42 *
EFS	.340	.614	.477	.246	.257	.252	1.90 +
EFB	.191	.377	.284	.006	.131	.069	1.66

+ $p < .05$

* $p < .01$

TABLE 13

VALUES USED AND OBTAINED DIFFERENCES IN TEST OF
HYPOTHESIS 2 (FEMALES)

	PHY	EST	MEAN I	SE	ROSE	MEAN I	t
EFW	.278	.369	.324	.065	.101	.018	1.98 +
EFST	.350	.487	.418	.027	.175	.101	2.13 +
EFJ	.511	.631	.571	.242	.112	.177	2.92 *
EFS	.438	.529	.484	.237	.134	.186	2.07 +
EFB	.285	.458	.372	.041	.079	.060	2.05 +

+ p < .05

* p < .01

of Tables 12 & 13). A t-test comparing values in columns four and seven was then calculated for each of the self-efficacies.

The following formula from Ferguson(1966, p189) was employed:

$$t = \frac{(r_{12} - r_{13}) \sqrt{(N-3) (1 + r_{23})}}{\sqrt{2 (1 - r_{12}^2 - r_{13}^2 - r_{23}^2 + 2r_{12}r_{13}r_{23})}}$$

In Tables 12 and 13, PHY & EST correlations with a specific self-efficacy were averaged to obtain a mean physical competence correlation. SE and ROSE correlations with a specific self-efficacy were also averaged to obtain a mean self-esteem correlation. These were calculated to satisfy the $r_{12} + r_{23}$ coefficients for the equation above. The four correlations between physical competence and self-esteem were averaged to obtain a mean correlation for physical competence and self-esteem (r_{23} in equation). This t-test was used to test for significant differences between coefficients for dependent samples.

The results for males, shown in Table 12, indicated that self-efficacies were more highly related to physical competence than to self-esteem in four of five comparisons. Three of these values were at a .05 level of significance and one was at a .01 level of significance. Comparisons with self-efficacy EFB(self-efficacy for biking) did not reach a t of 1.67 which was needed for significance at the .05 level. It did however, approach significance with a t of 1.66.

Table 13 presents similiar results for females. In all five instances t values were greater than 1.67 ($p < .05$). Four were at a .05 level of significance and 1 was at a .01 level of significance. These results supported Hypothesis 2. It was concluded that physical self-efficacy scores are more highly related to physical competence scores than to global self-esteem scores.

Hypothesis 3. Physical competence weighted by importance to the individual is more highly related to global self-esteem than is physical competence alone.

Table 14 represents the relationships between physical competence and self-esteem in both males and females (rows 1 and 3 respectively. Rows 2 & 4 present these relationships

TABLE 14
RELATIONSHIP OF PHYSICAL COMPETENCE WEIGHTED BY
IMPORTANCE TO SELF-ESTEEM

		SE	ROSE
MALES	PHY	.506	.339
	PHY x IMPHY	.397	.192
FEMALES	PHY	.355	.369
	PHY x IMPHY	.342	.339

when physical competence is weighted by importance. PHY was multiplied by IMPHY to obtain a measure of physical competence weighted by importance. Contrary to expectations, physical competence (rows 1 & 3) develops greater relations by itself with global self-esteem than when it is weighted by importance (rows 2 & 4). The results were in a direction opposite to that hypothesized for both males and females. Therefore, the hypothesis was not supported. Physical competence weighted by importance is not more highly related to global self-esteem than physical competence alone.

Hypothesis 4. Physical competence scores are more highly related to global self-esteem scores than are the self-efficacy scores.

Self-esteem relationships with physical competence and physical self-efficacy for males are presented in Table 15. The four physical competence--self-esteem coefficients were averaged to obtain a .385 value. The ten coefficients between self-efficacy and self-esteem were averaged to obtain a value of .200.

The test of Hypothesis 4 employed the same t-test for significance as Hypothesis 2. Using the two means, a t value of 1.56 was obtained. A critical t of 1.67 was required to obtain a .05 level of significance. Therefore, this

TABLE 15

SELF-ESTEEM RELATIONSHIP WITH PHYSICAL COMPETENCE AND
PHYSICAL SELF-EFFICACY (MALES)

	SE	ROSE	GRAND MEAN	t
PHY	.506	.339	.385	1.56
EST	.384	.312		
EFW	.254	.253	.200	
EFST	.249	.347		
EFJ	.113	.140		
EFS	.246	.257		
EFB	.006	.131		

Table 16

Self-Esteem Relationships With Physcial Competance. and Physical
Self-Efficacies (Females)

	SE	ROSE	GRAND MEAN	t
PHY	.355	.369	.350	* 1.684
EST	.258	.419		
EFW	-.065	.101	.108	
EFST	.027	.175		
EFJ	.242	.112		
EFS	.237	.134		
EFB	.041	.079		

* $p < .05$

hypothesis was not supported for males. Physical competence scores were not more highly related to global self-esteem scores than to self-efficacy scores in males.

Table 16 presents values for self-esteem relationships with physical competence and physical self-efficacies. The four physical competence--self-esteem coefficients were averaged to obtain a .350 value. The ten coefficients between self-efficacy and self-esteem were averaged to obtain a value of .108. A t value of 1.68 was obtained at a .05 level of significance. Therefore, this hypothesis was supported for females. It was concluded that physical competence scores are more highly related to global self-esteem scores than are self-efficacy scores in females.

Hypothesis 5. The relationship between physical fitness and physical self-efficacy is significantly larger in subjects of Cohort A as compared to subjects of Cohort B.

STECAT and CATA are the two physical measures being compared in Table 17. The sample consisted of both male and females. Cohort A received the results from these two fitness measures prior to answering the psychological inventory. The reverse order of administration was used for Cohort B. Because Cohort A received fitness feedback before answering the

Table 17
The Effect of Physical Fitness Feedback on Initial Physical
Self-Perceptions

<u>Cohort A</u>	<u>n</u>	<u>STECAT</u>	<u>z r</u>	<u>CATA</u>	<u>z r</u>
EFW	35	.417	.442	.492	.536
EFST		.540	.604	.651	.775
EFJ		.600	.693	.640	.758
EFS		.392	.412	.483	.530
EFB		.433	.466	.589	.678
$\bar{z}n$			.523		.655
<u>Cohort B</u>	<u>n</u>				
EFW	31	.264	.271	.451	.485
EFST		.312	.321	.455	.491
EFJ		.215	.218	.318	.332
EFS		.098	.100	.150	.151
EFB		.140	.141	.256	.261
$\bar{z}n$			.210		.344

STECAT: $z = 1.21$ ($p < .19$)

CATA: $z = 1.20$ ($p < .19$)

inventories it was expected that Cohort A would manifest a greater correspondence between physical fitness and physical self-efficacy than would Cohort B.

Table 17, column two, presents the mean relationships between STECAT and self-efficacies for subjects in Cohort A and Cohort B. Column four presents the relationships between CATA and self-efficacies for subjects in Cohort A and Cohort B.

Fisher z's were calculated (Column three and five) to convert the coefficients in columns two and four to a position in the normal distribution. Mean Fisher z's were calculated for both fitness measures (CATA and STECAT) for subjects in both Cohorts (Row seven and fourteen).

A mean z of .523 for STECAT in Cohort A was compared to the mean z of .210 for STECAT in Cohort B. The STECAT difference between Cohort A and Cohort B produced a z value of 1.21. A value of 1.67 was required to reach a .05 level of significance.

When the same analysis was done with the CATA values, the CATA difference between Cohort A and Cohort B was a z value of 1.20 value. A value of 1.67 was required to reach a .05 level of significance.

Therefore, hypothesis 5 was not supported. These results did not show that feedback from physical activities had a significant effect on initial physical self-perceptions.

Table 18

Partial Correlation Between Model Variables With Age and Experience Controlled (Males)

	ROSE	PHY	EST	APP	BC	EFM	EFST	EFJ	EFS	EFB	STECAT	CAT
SE	.64 ^c	.51 ^c	.40 ^b	.45 ^c	.40 ^b	.25 ^a	.26 ^a	.11	.27 ^a	-.03	-.06	-.03
ROSE	-	.33 ^b	.38 ^b	.38 ^b	.35 ^b	.25 ^a	.35 ^b	.10	.24 ^a	.11	.21	.15
PHY	-	-	.80 ^c	.55 ^c	.46 ^c	.42 ^c	.43 ^c	.26 ^a	.30 ^a	.08	.45 ^c	.46 ^c
EST	-	-	-	.46 ^c	.49 ^c	.51 ^c	.57 ^c	.36 ^b	.55 ^c	.18	.51 ^c	.67 ^c
APP	-	-	-	-	.59 ^c	.29 ^a	.30 ^a	.22	.34 ^b	.16	.21	.31 ^a
BC	-	-	-	-	-	.16	.29 ^a	.16	.31 ^a	.34 ^b	.18	.31 ^a
EFM	-	-	-	-	-	-	.78 ^c	.46 ^c	.26 ^a	.37 ^b	.35 ^b	.24 ^a
EFST	-	-	-	-	-	-	-	.43 ^b	.32 ^b	.25 ^a	.40 ^b	.39 ^b
EFJ	-	-	-	-	-	-	-	-	.35 ^a	.29 ^a	.37 ^b	.29 ^a
EFS	-	-	-	-	-	-	-	-	-	.33 ^b	.16	.34 ^b
EFB	-	-	-	-	-	-	-	-	-	-	.16	.25 ^a
STECAT	-	-	-	-	-	-	-	-	-	-	-	.90 ^c

a p < .05

b p < .01

c p < .001

Table 10

Partial Correlations Between Model Variables With Age and Experience Controlled (Females)

	ROSE	PHY	EST	APP	BC	EFW	EFST	EFJ	EFS	EFB	STECAT	CATA
SE	.73 ^c	.33	.22	.48 ^a	.43 ^a	-.17	-.07	.20	.21	-.09	-.05	.12
ROSE	-	.72 ^c	.76 ^c	.80 ^c	.40	.27	.33	.70 ^c	.31	.41 ^a	.15	.06
PHY	-	-	.76 ^c	.36	.25	.15	.34	.33	.41 ^a	.06	.55 ^b	.72 ^c
EST	-	-	-	.32	.30	.24	.50 ^a	.53 ^a	.50 ^a	.31	.18	.40
APP	-	-	-	-	.45 ^a	.02	.16	.12	.26	.09	.48 ^a	.55 ^b
BC	-	-	-	-	-	.23	-.16	.09	-.31	.32	.33	.27
EFW	-	-	-	-	-	-	.48 ^b	.02	-.03	.37	.12	.21
EFST	-	-	-	-	-	-	-	.48 ^a	.22	.52 ^a	-.08	.01
EFJ	-	-	-	-	-	-	-	-	.43 ^a	.14	.00	.38
EFS	-	-	-	-	-	-	-	-	-	.08	-.35	-.21
EFB	-	-	-	-	-	-	-	-	-	-	.24	.25
STECAT	-	-	-	-	-	-	-	-	-	-	-	.94 ^c

a p < .05
b p < .01
c p < .001

Additional Analysis

Partial Correlation Between Model Variables With Age and Experience Controlled

Relationships in males. Table 18 presents partial correlation coefficients developed between model variables with age and experience controlled in males. When comparing the results in Table 18 to results in Table 8 it is noticed that the significant relationships between self-esteem and physical competence and between physical competence and physical self-efficacies were not extinguished when controlling for age and experience. Also, significant relationships between self-efficacies and physical fitness still existed in 8 of the 10 possible relationships. These results show that relationships between self-efficacies and actual physical fitness remain significant when age and experience are controlled. This means that the static relationships of the Exercise and Self-Esteem Model are applicable to people of varying ages and experience levels.

Different values may also exist for Table 8 and 18 due to the change in N. In Table 8, 80 males were used, however, in Table 18, only 47 had experience values and were used.

Female Relationships. Table 19 presents partial correlations between model variables with age and experience controlled for in females. The results may be somewhat unreli

able due to the extremely small N. Only 19 females had experience values and therefore were used in Table 19, as opposed to an N of 60 in Table 9. Two of the four coefficients between global self-esteem and physical competence were significant in Table 19 as compared to all four of the coefficients being significant in Table 9 (when age and experience were not controlled for). Only four of ten coefficients between physical competence and self-efficacies were significant. In Table 8 all ten coefficients were significant.

In Table 11, five of ten coefficients between actual fitness and self-efficacies were significant. Here, none of the ten were significant. Therefore, it is concluded that age and experience are mediating variables in model relationships for women.

Discussion

The intent of this research was to test the recently developed Exercise and Self-esteem Model and to better understand the static relationships between physical fitness and components of self-perception.

In order to examine the potential predictive merit of the model as compared to past results, mean coefficients were computed for variables in the same level of the model. This was done at all four levels within the model and are dis

TABLE 20

Mean Correlation Coefficients for Model Relationships

<u>Model Relationships</u>	<u>Correlation Coefficients</u>	
	<u>Males</u>	<u>Females</u>
Self-Esteem & Physical Competence	.386	.351
Physical Competence & Self-Efficacy	.447	.434
Physical Fitness & Self-Efficacy	.433	.387

played in Table 20. For example, coefficients between EFW, EFST, EFJ, EFS, EFB and STECAT, CATA were averaged to obtain a mean value between fitness and self-efficacies. Mean coefficients for the three model relationships were then related to similar analyses in the contemporary literature.

As evidenced in the test of Hypothesis I, physical fitness scores (SECS, STECAT, CATA) were significantly related to physical self-efficacies (EFW, EFB, EFS, EFJ, EFST) (Tables 10 & 11). These results are in agreement with Ewart's (1983) past research concerning patients who realistically appraised their capacity to perform various physical activities even before carrying out these activities. Results of the present study found the mean correlation coefficient between fitness and physical self-efficacies to be .387 in females and .433 in males (Table 20). These values are comparable with past research examining this relationship. For example, Ewart et al. (1985) tested cardiac patients and found that jogging self-efficacy correlated significantly with a mean twenty minute heart rate ($r=.44$) and a peak exercise heart rate ($r=.42$). Jog self-efficacies were also found to relate to treadmill test performance ($r=.66$). Ewart et al (1982) also found that self-efficacy values after performing a treadmill test were more significantly related to performance ($r=.5$) than the self-efficacy values before performing the treadmill test ($r=.36$).

The mean correlation coefficient for the second model

relationship between physical self-efficacies and physical competence was .434 in females and .447 for males (Table 20). Since the inclusion of self-efficacies within a competence dimension of self-esteem represents a singular introduction, no comparative data relating self-efficacy to physical competence could be found. However, physical competence scores within the study did relate well to the lower level of physical fitness (Table 18 and 19). Hansford and Hattie (1982) in a meta-analysis of one-hundred twenty eight educational studies found a mean coefficient of .42 between academic achievement and perceived competence of academic ability. Across nine subsamples which related Estimation to physical fitness, the median coefficient was found to be .41 (Sonstroem and Morgan, 1988). Another often cited study in this area found a coefficient of .27 between a different measure of perceived fitness and actual fitness (Heaps, 1972).

As evidenced in the test of Hypothesis 2, the physical self-efficacy--physical competence relationship was found to be significantly higher than the physical self-efficacy--global self-esteem relationship (Tables 12 & 13). This means that expectancies of performing successfully at specific exercise program activities are significantly associated with one's general perceptions of physical competence. Future research should be capable of identifying the direction of this relationship. These results concur with results by Sonstroem

& Kampper (1980) which demonstrated that physical competence assessments predicted participation in school athletic programs.

The mean correlation coefficient examining the relationship between physical competence and global self-esteem was .351 in females and .386 in males (Table 20). In the Manual for the Self-Perception Profile for Children (Harter, 1985), scholastic competence, social acceptance, athletic competence, and perception of physical appearance were found to relate to global self-esteem with correlation coefficients of .51, .45, .37, and .65 respectively. Past research by Leonardson (1977) found perceived physical fitness and self-concept to be related significantly but moderately correlated (r 's=.34 and .05) for high school and college students respectively. The present study found relationships between physical competence and global self-esteem to be somewhat less than those. These results may be due to the fact that the scales used to test physical competence were study-developed and therefore further instrument improvement may be needed to obtain better relationships between physical competence and global self-esteem.

In assessing model relationships, the concept of component independence must be kept in mind. That is the assessment of optimal relationships must consider permissible ceilings as well as minimal relationships. Within the model, physical self-efficacies are considered to be components of

physical competence and physical competence is regarded as a component of global self-esteem. Any coefficient (i.e., $r=.75$) which accounted for more than 50% of the variance in the scores would tend to invalidate model structure. This means that the two variables could be perceived as measuring the same construct. That is, a coefficient of .75 between physical competence and general self-esteem would indicate to the critical reader that the physical competence measure may be interpreted as a measure of global self-esteem.

As evidenced in the test of Hypothesis 4, physical competence scores were more highly related to global self-esteem scores than self-efficacy scores (Tables 15 & 16). Hypothesis 3 was not supported. This means that in the case of the present study, weighting the importance of physical competence to the individual did not increase the relationship between physical competence and global self-esteem (Table 14). These results failed to support those of Watkins and Park (1972) who demonstrated that higher correlations between body image and self-concept are obtained by using measures which weight the importance of each aspect of the body for each individual subject.

The study results did not support Hypothesis 5. For the purpose of this study, physical fitness feedback did not have a significant effect on physical self-perceptions (Table 17). This research did not replicate that of Taylor et. al., (1985) which showed that patients who had already been stress

tested manifested more accurate self-efficacy expectations than those who had not received feedback from previous stress testing. In the present study, results may have been influenced by communication between groups. Since therapy represents the primary purpose of the EXERLIFE program there was no way to separate Cohort A and Cohort B during the course of therapy. Subjects appeared to be quite interested in the psychological inventories. It is possible that before Cohort A completed the psychological inventories they may have communicated with subjects in Cohort B regarding the item content. It is also possible that the EXERLIFE subjects did not understand the nature of the feedback in regards to their fitness test results.

When examining the self-perception values for differences among the three groups, perhaps the "injured" self-esteem of the cardiac patients was already healed when tested for in the present study (Tables 2 & 3). Expected differences in physical competence between the three groups did exist. CRM male subjects had significantly lower physical competence levels than the CT male subjects (Table 2). CF female subjects had significantly higher levels of physical competence than the CT female subjects (Table 3). Significant differences in self-efficacies existed between the three groups (Tables 4 & 5). CRM male subjects had significantly lower self-efficacy values than CT male subjects. However, expected CF-CT differences in self-efficacies were

not found. The comparison of fitness scores resulted in expected differences between groups (Tables 10 & 11).

Not included in the Exercise and Self-Esteem Model were the variables of age and experience. Experience was found to be significantly related to self-efficacy, physical fitness, and physical competence. Age was significantly related to self-efficacy scores. These results were true for both males and females. Controlling for the effect of these variables served to extinguish the significance of variable relationships for females. Such was not the case for males, however.

In general, this study provided support for the Exercise and Self-Esteem Model and support for this study's hypotheses. Three of the study's five hypotheses were supported. Hypothesized relationships between the four levels of the model were also supported (for a summary see Table 20). While these relationships were significant and comparably sizeable, they do not necessarily represent optimal relationships as already discussed.

A limitation regarding study results concerns a possible inflation of alpha values for the analysis of variance results reported in Tables 2-7. Because of the many comparisons attempted it is possible that certain of these significant results may have occurred by chance.

Another limitation regarding study results concerned the use of a fitness test (sub-maximal step test) which had not received validation for cardiac patients. Additionally, the

step test may be an imperfect measurement of fitness. Although not reported here within the study, correlations with other fitness values were moderate at best.

A third limitation to the study concerned response biases. The test of the model was limited to the responses of subjects who either volunteered for the exercise programs or agreed to complete the inventories. These people do not represent a complete cross section of the population.

Practical Implications

Within the present research, the Exercise and Self-Esteem Model was supported using cardiac and asymptomatic subjects.

CRM subjects were found to have lower physical competence scores than self-esteem scores. The clinician or the exercise leader in the the rehab setting may want to emphasize increasing self-perceptions of physical competence. Showing individualized physical improvements and positive feedback to the individuals would increase levels of self-efficacy. In turn, results from this study show that physical self-efficacy is highly related to physical competence and this is the area in which CRM subjects had low scores. Successful experiences have often been a determining factor in positive self-esteem (Coopersmith, 1967; Rosenberg, 1979). It is important that successful experiences are noticed and

positive feedback is given to the participants.

Participants need to recognize their individual progress to help them realize that improvements are being made. Individual goals, both long term and short term, should be set so that progress can be easily recognized. Goal attainment has been suggested as a probable agent in enhancing self-esteem (Sonstroem, 1984).

This study did not see expected differences in self-esteem among the three groups. A limited factor was the small number of subjects with low EXP values. The majority of the subjects had been in the exercise program for six months or more. At this point within an exercise program physiological and psychological benefits come to a stand still or maintenance phase unless continuous increases in individual programs are administered to the subjects. It is important that the exercise leader is aware of the point when subjects stop achieving and reach a maintenance level.

Recommendations for Future Research

The present study did not use many cardiac patients who were in week one or two of their twelve week rehabilitation program. A greater number of cardiac subjects at week one of the program is recommended for future research to determine whether or not the present results would have been altered.

A more precise and accurate test to assess fitness

levels in the two groups (CRM & CF) could have added to the study. However, financial limitations restricted the researchers in this study from graded exercise testing. Future studies should consider administering a fitness test other than the sub-maximal step test employed in this study.

Future studies may also want to experiment with different self-efficacy measures for the relationships in this study weren't as high as they could have been.

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APPENDIX A
EXERCISE AND SELF-ESTEEM MODEL

APPENDIX B
PSYCHOLOGICAL INVENTORIES

Please complete the following blanks.

NAME _____ SEX (M or F) _____ AGE _____

Please Read Carefully

The following questionnaire will be used in a health-related research study. Please complete it in a quiet setting free from any distractions (i.e., TV, radio, children). It will require about 30 minutes of your time.

There are no right or wrong answers on this questionnaire. Honest and accurate answers are needed to all items on the inventory in order to help us better understand all people and improve our services. Please respond accurately to each item as it affects you. All information will remain confidential and will not be used outside of this study. If you have any questions regarding this questionnaire, feel free to call Suzanne or Loren at 792-2087.

After completing the questionnaire, please place it (including the IEM answer sheet) in the self-addressed envelope and return it immediately. You will be receiving additional questionnaires in October and December.

Your participation in this research study is gratefully appreciated. Thank you for your assistance.

Suzanne Osborne
Loren Gemma
Human Performance Laboratory
Universtiy of Rhode Island
Kingston, RI 02881

Informed Consent - Behavioral Data

You are being asked to answer some questions on the following pages. The purpose of these questions is to develop some ideas about what people think about physical activity and what they think about themselves in relation to physical activity and health.

It should be emphasized that there are no right or wrong, no good or bad responses to the question you are answering. Please answer each item as you really feel about it.

Data will remain strictly confidential. All data will be coded and will not be identifiable by name. You do not have to complete these inventories and you may refuse to do so at any time. Please feel free to ask any questions you may have.

Voluntary Consent

Date _____ The purpose of my participation in these procedures has been explained to me. I freely consent to participate. I understand that I am not required to participate and that I may stop participation at any time.

_____ (Signature) _____

_____ (Witness) _____

___ I would like a summary of study results when completed

SECTION I - Use the Attached IBM Answer Sheet only for next 50 items. The statements below reflect certain attitudes and interest of persons. There are no right or wrong answers. Read each statement and decide the degree to which it applies to you. Indicate your answer by blackening the appropriate space on the separate answer sheet. In some cases you may have difficulty deciding which responses is best, but please make some decision and answer every item. Please do not attempt to be consistent in your answers during the test, but respond to each item individually. Even if an item asks about things you have not experienced, answer it as best you can on the basis of what you have heard, seen or read. Express your agreement or disagreement by filling in the appropriate circle on your answer sheet according to the following:

Strongly Agree	Agree	Neither Agree or Disagree	Disagree	Strongly Disagree
A	B	C	D	E

The significance of this research depends upon the degree to which you express your own opinion.

1. I feel that I'm a person of worth, at least on an equal basis with others.
2. I feel that I have a number of good qualities.
3. All in all, I am inclined to feel that I am a failure.
4. I am able to do things as well as most other people.
5. I feel I do not have much to be proud of.
6. I take a positive attitude toward myself.
7. On the whole, I am satisfied with myself.
8. I wish I could have more respect toward myself.
9. I certainly feel useless at times.
10. At times I think I am no good at all.

SECTION II

11. I always try to be considerate of the feelings of my friends.
12. I would have made a good accountant.
13. I lack confidence in performing physical activities.
14. Nothing that happens to me makes much difference one way or the other.

15. I often take responsibility for looking out for newcomers in a group.
16. I am a good deal stronger than most of my friends.
17. My body is capable of hard exercise.
18. I prefer woodworking to tinkering with a motor.
19. In the long run humanity will owe a lot more to the teacher than to the salesperson.
20. I am in better physical condition than most people my age.
21. Vigorous exercise would leave my body tired and sore.
22. I am well-equipped to excel at physical activities.
23. Probably I could get into good physical condition faster than most people my age.
24. I have a number of health problems.
25. I often have the feeling that i am doing something evil.
26. I enjoy people who talk a great deal.
27. My body adapts well to exercise.
28. I almost always feel sleepy and lazy.
29. I doubt that I could ever get into good physical condition.
30. I can run for longer distances than most people my age.
31. I have a healthy body.
32. I often doubt my physical abilities.
33. My memory is as good as other peoples.
34. I am not willing to give up my own privacy or pleasures in order to help other people.
35. Most of my teachers were helpful.
36. I am seldom ill.
37. We ought to let the rest of the world solve their own problems and just look after ourselves.

38. I could do better at long distance hiking than the average person my age.
39. It takes me two days to recuperate from a physical workout.
40. I am quite limber and agile compared to others my age.
41. I really don't have the energy to exercise four times a week.
42. My friends seem to be more physically active than I am.
43. My life is full of interesting activities.
44. I often question whether life is worthwhile.
45. I am able to make correct decisions on difficult questions.
46. I believe people tell lies anytime it is to their advantage.
47. Rarely, if ever, has the sight of food made me ill.
48. I find it very difficult to do what is expected of me.
49. I am always prepared to do what is expected of me.
50. Many things make me feel uneasy.

Adult Self-Reflection

Name _____

WHAT I AM LIKE

These are statements which allow people to describe themselves. There are no right or wrong answers since people differ markedly. Please read the entire sentence across. First decide which one of the two parts of each statement best describes you; then go to that side of the statement and check whether that is just sort of true for you or really true for you. You will just check ONE of the four possible answers for each statement.

- | | Really
True
For Me | Sort of
True
For Me | | Sort of
True
For Me | Really
True
For Me |
|----|--------------------------|---------------------------|---|---------------------------|--------------------------|
| 1. | _____ | _____ | Some adults BUT Other adults
like the way don't like
they are the way they
leading their are leading
lives. their lives. | _____ | _____ |
| 2. | _____ | _____ | Some adults BUT Other adults
feel that often question
they are whether they
enjoyable to are enjoyable
be with. to be with. | _____ | _____ |
| 3. | _____ | _____ | Some adults BUT Other adults
feel that feel that
their bodies their bodies
are weak. are strong. | _____ | _____ |
| 4. | _____ | _____ | In games BUT Other adults
and sports usually play
some adults rather than
usually watch just watch.
instead of play | _____ | _____ |
| 5. | _____ | _____ | Some adults BUT Other adults
are happy are not happy
with the way with the way
they look. they look. | _____ | _____ |
| 6. | _____ | _____ | Some adults BUT Other adults
are very would like
happy the way to be different.
they are | _____ | _____ |

- | Really
True
for Me | Sort of
True
for Me | | | Sort of
True
for Me | Really
True
for Me |
|--------------------------|---------------------------|---|-----|--|--------------------------|
| 7. _____ | _____ | When some adults don't understand something, it makes them feel stupid. | BUT | Other adults don't necessarily feel stupid when they don't understand. | _____ |
| 8. _____ | _____ | Some adults can really laugh at themselves. | BUT | Other adults have a hard time laughing at themselves. | _____ |
| 9. _____ | _____ | Some adults feel uncomfortable when they have to meet new people. | BUT | Other adults like to meet new people. | _____ |
| 10. _____ | _____ | Some adults believe that they could really become physically fit. | BUT | Other adults doubt their ability to become physically fit. | _____ |
| 11. _____ | _____ | Some adults sometimes question whether they are a worthwhile person. | BUT | Other adults feel that they are a worthwhile person. | _____ |
| 12. _____ | _____ | Some adults think they could do well at just about any new physical activity they haven't tried before. | BUT | Other adults are afraid they might not do well at physical activities they haven't ever tried. | _____ |
| 13. _____ | _____ | Some adults think they are not very attractive or good looking. | BUT | Other adults think that they are attractive or good looking. | _____ |
| 14. _____ | _____ | Some adults feel that they are intelligent. | BUT | Other adults question whether they are very intelligent. | _____ |

15. _____ Some adults are _____ Other adults _____
 disappointed BUT are quite pleased
 with themselves with themselves.
16. _____ Some adults find _____ Other adults _____
 it hard to find it very easy
 act in a jok- to joke or kid
 ing or kidding around with friends
 manner with BUT and colleagues.
 friends or
 colleagues
17. _____ Some adults _____ Other adults _____
 feel that their feel that their
 physical con- physical condition
 dition is not is better than that
 as good as BUT of others their age.
 others their
 age.
18. _____ Some adults _____ Other adults _____
 feel at ease BUT are quite shy.
 with other
 people.
19. _____ Some adults _____ Other adults _____
 do not feel feel they do very
 that they are well at all kinds
 very good BUT of sports.
 when it comes
 to sports
20. _____ Some adults _____ Other adults _____
 like their BUT do not like their
 physical ap- physical appearance.
 pearance the
 way it is
21. _____ Some adults _____ Other adults _____
 are dissatis- are satisfied with
 fied with BUT themselves.
 themselves.

22. _____ Some adults _____ Other adults _____
do not feel BUT feel that they
that they are are intellectually
very intellect- capable.
ually capable
23. _____ Some adults BUT Other adults _____
feel that they wish their sense
have a good of humor was better.
sense of humor
24. _____ Some adults BUT Other adults _____
feel they doubt their ability
are very cap- to exercise.
able at exercis-
ing.
25. _____ Some adults BUT Other adults _____
are not very are sociable.
sociable
26. _____ Some adults BUT Other adults _____
like the kind would like to be
of person they someone else.
are
27. _____ Some adults BUT Other adults _____
feel they are don't feel they
better than can play as well.
others their
age at sports
28. _____ Some adults BUT Other adults _____
are unsatis- like their face
fied with and hair the way
their face they are.
or hair.
29. _____ Some adults BUT Other adults _____
feel like wonder if they are
they are just as smart.
as smart as
others

Really Sort of
True True
for Me for Me

Sort of Really
True True
for Me for Me

30. _____ Some adults BUT Other adults _____
_____ feel that _____ are able to find _____
they are often humor in their life.
too serious
about their life

RATING SCALE

Certain aspects of peoples' lives are more important to them than are other aspects. Please indicate the extent that each of the items below is important in your own life. Rate each item as being either: "Very Important", "Pretty Important", "Only Sort of Important", or "Not Very Important", (select only one answer for each item).

HOW IMPORTANT IS IT TO YOU?	VERY IMPORTANT	PRETTY IMPORTANT	ONLY SORT OF IMPORTANT	NOT VERY IMPORTANT
1. To be sociable/at ease	_____	_____	_____	_____
2. To be physically fit	_____	_____	_____	_____
3. To be good looking	_____	_____	_____	_____
4. To be intelligent	_____	_____	_____	_____
5. To have a sense of humor	_____	_____	_____	_____
6. To be good at physical activities	_____	_____	_____	_____

On the lines below list the 3 areas from above which are most important to you and list the 2-3 areas which are least important to you.

Most Important

Least Important

Name _____

Date _____

This form asks you how much physical activity you think you can handle right now. It gives the medical team a better picture of how you are feeling.

Activities are listed on the pages that follow. You show how confident you are that you could do each activity now by writing a number in the blank to the right of the activity. Use one of the following numbers to show how confident you are.

Definitely <u>Cannot</u>	Probably <u>Cannot</u>	Maybe (50/50)	Probably <u>Can</u>	Definitely <u>Can</u>
Do It				Do It
0 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%				

Example: Jim is asked how far he thinks he can throw a football. Can he throw it 10 yards? 15 yards? 30 yards? 40 yards? 60 yards? Jim decides that he can definitely throw the football 10 yards--he is 100% confident about that. He is pretty sure he can throw the football 15 yards--he feels 80% certain. He feels there is about a 50/50 chance he could throw the ball 30 yards, but thinks his chances of hitting the 40 yard marker are slim. He is definitely sure he cannot throw the ball 60 yards.

Jim should write his answers to the question like this:

<u>Throw a football</u>	<u>Confidence</u>
10 yards	<u>100</u>
15 yards	<u>80</u>
30 yards	<u>50</u>
40 yards	<u>20</u>
60 yards	<u>0</u>

If Jim was definitely sure he could throw the ball 60 yards, he would have put a "100" in every blank. If he was definitely sure he could not throw a ball even as far as 10 yards, he would have put a "0" in every blank.

Now look at each activity and show how confident you are that you could do it NOW.

Definitely	Probably	Maybe	Probably	Definitely						
<u>Cannot</u>	<u>Cannot</u>	(50/50)	<u>Can</u>	<u>Can</u>						
Do It				Do It						
0	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Walking

Confidence

Walk for 1 minute

Walk for 3 minutes

Walk for 5 minutes

Walk for 10 minutes

Walk for 15 minutes

Walk for 20 minutes

Walk for 25 minutes

Walk for 30 minutes

Walk for 45 minutes

Walk for 60 minutes

Walk for 90 minutes

Walk for 2 hours

Walk for 3 hours

Walk for 5 hours

Stair climbing (1 flight = 12 steps)

Walk up 1/2 flight

Walk up 1 flight

Walk up 2 flights

Walk up 3 flights

Walk up 4 flights

Walk up 6 flights

Walk up 8 flights

Walk up 10 flights

Walk up 12 flights

Definitely		Probably		Maybe	Probably		Definitely			
<u>Cannot</u>	<u>Cannot</u>	(50/50)		Can	<u>Can</u>					
Do It							Do It			
0	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

<u>Jogging</u>	<u>Confidence</u>
Jog 200 yards	_____
Jog 1/4 mile	_____
Jog 1/2 mile	_____
Jog 1 mile	_____
Jog 1.5 miles	_____
Jog 2 miles	_____
Jog 2.5 miles	_____
Jog 3 miles	_____
Jog 4 miles	_____
Jog 6 miles	_____
Jog 8 miles	_____

<u>Bent knee situps</u>	
Sit up 5 times	_____
Sit up 10 times	_____
Sit up 20 times	_____
Sit up 30 times	_____
Sit up 40 times	_____
Sit up 60 times	_____
Sit up 100 times	_____
Sit up 120 times	_____

Definitely <u>Cannot</u> Do It	Probably Cannot	Probably (50/50)	Maybe Can	Probably <u>Can</u>	Definitely Do It					
0	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

<u>Stationary Bicycle</u>	<u>Confidence</u>
Pedal 3 minutes	_____
Pedal 5 minutes	_____
Pedal 7 minutes	_____
Pedal 9 minutes	_____
Pedal 12 minutes	_____
Pedal 15 minutes	_____
Pedal 20 minutes	_____
Pedal 25 minutes	_____
Pedal 30 minutes	_____
Pedal 45 minutes	_____
Pedal 60 minutes	_____
Pedal 75 minutes	_____
Pedal 90 minutes	_____
Pedal 120 minutes	_____

On the following pages are listed a number of things characteristic for yourself or related to you. You are asked to indicate which things you are satisfied with exactly as they are, which things you worry about and would like to change if it were possible, and which things you have no feelings about one way or the other.

Consider each item listed below and encircle the number which best represents your feelings according to the following scale:

1. Have strong feelings and wish change could somehow be made.
2. Don't like, but can put up with.
3. Have no particular feelings one way or the other.
4. Am satisfied
5. Consider myself fortunate.

1. Hair	1	2	3	4	5
2. Facial complexion	1	2	3	4	5
3. Appetite	1	2	3	4	5
4. Hands	1	2	3	4	5
5. Distribution of hair over body	1	2	3	4	5
6. Nose	1	2	3	4	5
7. Physical stamina	1	2	3	4	5
8. Elimination	1	2	3	4	5
9. Muscular strength	1	2	3	4	5
10. Waist	1	2	3	4	5
11. Energy level	1	2	3	4	5
12. Back	1	2	3	4	5
13. Ears	1	2	3	4	5
14. Age	1	2	3	4	5
15. Chin	1	2	3	4	5
16. Body build	1	2	3	4	5
17. Profile	1	2	3	4	5
18. Height	1	2	3	4	5

19. Keeness of senses	1	2	3	4	5
20. Tolerance for pain	1	2	3	4	5
21. Width of shoulders	1	2	3	4	5
22. Arms	1	2	3	4	5
23. Chest (or breasts)	1	2	3	4	5
24. Appearance of eyes	1	2	3	4	5
25. Digestion	1	2	3	4	5
26. Hips	1	2	3	4	5
27. Resistance to illness	1	2	3	4	5
28. Legs	1	2	3	4	5
29. Appearance of teeth	1	2	3	4	5
30. Sex drive	1	2	3	4	5
31. Feet	1	2	3	4	5
32. Sleep	1	2	3	4	5
33. Voice	1	2	3	4	5
34. Health	1	2	3	4	5
35. Sex activities	1	2	3	4	5
36. Knees	1	2	3	4	5
37. Posture	1	2	3	4	5
38. Face	1	2	3	4	5
39. Weight	1	2	3	4	5
40. Sex organs	1	2	3	4	5

APPENDIX C

APPENDIX C
STEP TEST FORM

Name _____ Date: _____ Age _____ Wt: _____

Predicted MHR = $220 - \text{age}$ MHR= _____ 65% MHR= _____

15 Second Warm-up

STAGE 1

Heart Rate 1 (2:30) _____

Heart Rate 2 (2:45) _____

Heart Rate 3 (end) _____

RPE _____

Exact time 65% is achieved _____

RPE at 65% _____

Avg of 3 HR's _____

If Avg is $>$ or $=$ to 65% of MHR, than END test. Otherwise continue to Stage 2.

15 second warm-up

STAGE 2

Heart Rate 1 (2:30) _____

Heart Rate 2 (2:45) _____

Heart Rate 3 (end) _____

RPE _____

Exact time 65% is achieved _____

RPE at 65% _____

Avg of 3 HR's _____

If Avg is $>$ or $=$ to 65% of MHR, than END test. Otherwise continue onto Stage 3

15 second warm-up

Stage 4

Heart Rate 1 (2:30) _____

Heart Rate 2 (2:45) _____

Heart Rate 3 (end) _____

Exact time 65% is achieved _____

RPE _____

Avg of 3 HR's _____

RPE at 65% _____

The test is over.

APPENDIX C

REGRESSION FORMULA'S FOR STEP TEST

Estimates of oxygen consumption for the last stage completed were made using the following equations:

$$\begin{aligned} \text{Stage 1 } \text{VO}_2^2 \text{ (l/min)} \\ = 16.287 \times \text{Wt (kg)}/1000 \end{aligned}$$

$$\begin{aligned} \text{Stage 2 } \text{VO}_2^2 \text{ (l/min)} \\ = 24.910 \times \text{Wt (kg)}/1000 \end{aligned}$$

$$\begin{aligned} \text{Stage 3 } \text{VO}_2^2 \text{ (l/min)} \\ = 33.533 \times \text{Wt (kg)}/1000 \end{aligned}$$

The $\text{VO}_2 \text{ max}$ (liter.min⁻¹: liters of oxygen consumed per minute) was estimated from the Astrand-Rhyming Nomogram (1954) using the mean steady heart rate and the final exercise heart rate. Separate regression equations for male and female subjects were used to correct the $\text{VO}_2 \text{ max}$ for age. These equations were:

$$\begin{aligned} \text{FOR MALES: } Y = & 0.348 (X^1) \\ & -0.035 (X^2) \\ & +3.011 \end{aligned}$$

$$\begin{aligned} \text{FOR FEMALES: } Y = & 0.302 (X^1) \\ & -.019 (X^2) \\ & + 1.593 \end{aligned}$$

$X^1 = \text{age}$

$X^2 = \text{VO}_2 \text{ l/min}$

*Siconolfi, Garber, Lasater and Carleton (1985).

For those subjects taking heart rate altering drugs (i.e. beta blockers), the heart rate-oxygen consumption linear relationship was negated. Therefore, an estimate of maximal oxygen consumption was derived following these steps: (1) Before starting the step test, 65% of maximal heart rate achieved on the subject's most recent stress test was calculated as their stopping point on the test. (2) The average of the three heart rates taken at the last stage completed was calculated as an exact percentage of the subject's true maximal heart rate. (3) The percentage of maximal heart rate not achieved was determined simply by subtracting the maximal heart rate by the average of the three heart rates. (4) The estimate of oxygen consumption was determined using the same formulas described above. (5) The percentage of maximal heart rate not achieved was utilized to calculate the maximal oxygen consumption by taking that percentage of the calculated oxygen consumption for the last stage completed, and adding it back to itself. This gave us an estimate of maximal oxygen consumption, and the same formulas were used to correct for the subject's age.

APPENDIX D

BIKE TEST FORM

NAME	Date	Est. MHR	HT	WT
Sex:	Age:	85% of MHR		
Seat height				

Stage 1: 3 minutes

Workload_____

Heart Rates

1:50 _____
2:50 _____
3:50 _____

RPE 2:40 _____

Stage 2: 3 minutes

Workload_____

Heart Rates

1:50 _____
2:50 _____
3:50 _____

RPE 2:40 _____

Stage 3: 3 minutes

Workload_____

Heart Rates

1:50 _____
2:50 _____
3:50 _____

RPE 2:40 _____

Stage 4: 3 minutes

Workload_____

Heart Rates

1:50 _____
2:50 _____
3:50 _____

RPE 2:40 _____

APPENDIX E
FITNESS FEEDBACK FORM

Name _____

Classifications:

POOR FAIR GOOD EXCELLENT SUPERIOR

	Test 1	Test 2
1.5 Mile Run Time	_____ _____	_____ _____
3.0 Mile Walk Time	_____ _____	_____ _____
Bike Test Time	_____ _____	_____ _____
12 Minute Swim Time	_____ _____	_____ _____
Step Test Time	_____ _____	_____ _____