

LEARNED RESOURCEFULNESS, SELF-MOTIVATION, AND  
COMMITMENT AS PREDICTORS OF AEROBIC EXERCISE  
ADHERENCE IN COLLEGE STUDENTS

by

Colleen Anna Mahoney

Dissertation submitted to the Faculty of the Graduate School  
of the University of Maryland in partial fulfillment  
of the requirements for the degree of  
Doctor of Philosophy

1990

Maryland  
LD  
3231  
.M70d  
Mahoney,  
C.A.  
Folio

Advisory Committee:

Associate Professor Roger Allen, Chairman/Advisor  
Professor and Dean John Burt  
Assistant Professor Sharon Desmond  
Lecturer Glenn Schiraldi  
Professor Donald Steel

## ABSTRACT

Title of Dissertation: LEARNED RESOURCEFULNESS, SELF-MOTIVATION, AND COMMITMENT AS PREDICTORS OF AEROBIC EXERCISE ADHERENCE IN COLLEGE STUDENTS

Colleen Anna Mahoney, Doctor of Philosophy, 1990

Dissertation directed by: Dr. Roger Allen,  
Associate Professor,  
Dept. of Health Education

In this study of exercise adherence among traditional-age college students, a number of variables were used to discriminate between those who adhere to regular aerobic exercise, those who adhere to regular non-aerobic exercise, and those who do not exercise regularly but intend to do so. The relative importance of learned resourcefulness, self-motivation, commitment to aerobic exercise, and various demographic variables to predict exercise adherence was assessed. The instruments employed in this study were a demographic questionnaire, the Self-Control Schedule, the Self-Motivation Inventory, and the Commitment to Aerobic Exercise scale. In order to test the hypotheses in this study, one-way analyses of

variance and a multiple discriminant function analysis were conducted. Chi-square analyses were used to assess the relationship between demographic variables and exercise group membership. Furthermore, a two-way analysis of variance (group x gender) was performed on the Self-Control Schedule, Self-Motivation Inventory, and Commitment to Exercise scale.

Hypotheses were generated for the following variables: weekly time commitments, learned resourcefulness, self-motivation, and commitment to aerobic exercise. Three of these were fully supported and one was partially supported by the data. In order of their relative importance, the following three psychological variables distinguished between the three exercise groups: commitment to aerobic exercise, self-motivation, and learned resourcefulness.

Among the demographic variables examined in this study, only gender discriminated significantly between the three exercise adherence groups. Males were much more likely to be non-aerobic exercise adherers than females, and females were much more likely to be non-exercisers than males. Weekly time commitments, class standing, and place of residence explained little of the variance among the three groups. The analyses of

this study indicated that psychological variables were the strongest discriminators among exercise adherence behavior patterns. Moreover, these findings dispute the notion that barriers, such as time commitments, prevent college students from engaging in regular, physical exercise. Implications of these findings and strategies for enhancing exercise adherence among college students are discussed. Specifically, it appears that interventions need to emphasize affective strategies in order to modify attitudes toward regular exercise.



### ACKNOWLEDGEMENTS

I would like to acknowledge the following people for:

**Roger Allen**, my chair and advisor, for your advice, support, sense of humor, and relaxed manner.

**Sharon Desmond** for going beyond the "call of duty" and offering me your time and expertise, as well as many laughs.

**Glenn Schiraldi** for always "being there" to offer encouragement and wisdom.

**John Burt and Don Steel** for the opportunity to work with you and partake in your deep thought and wisdom.

**Bob Gold** for always being available to offer me assistance when I needed it.

**The University Health Center** for assisting with the reproduction of this study's questionnaire.

**Marjorie Scaffa** for your assistance and friendship.

**My parents, Marlene and George Mahoney**, as well as the rest of my family, for believing in me.

And last, but most important, my husband **Dennis Thombs** for your editorial assistance, love, and support.

Thank-you all for the role you have played in my life and success!

## TABLE OF CONTENTS

<u>Section</u>	<u>page</u>
List of Tables .....	v
Chapter One - Introduction .....	1
Problem Statement .....	1
Rationale .....	4
Independent Variables .....	5
Self-Management Theory .....	7
Aerobic Exercise versus Physical Activity .....	8
Hypotheses .....	10
Definition of Terms .....	14
Chapter Two - Review of the Literature .....	14
Benefits of Aerobic Exercise .....	15
Physical Benefits .....	17
Psychological Benefits .....	20
Effects on Other Health-Related Behaviors .....	20
Benefits of Aerobic Exercise for College-Age Students .....	25
Exercise Adherence .....	25
The Problem .....	28
Epidemiology of Physical Activity .....	37
Research Needs .....	38
Psychological Models of Exercise Behavior ...	40
Health Belief Model .....	44
Theory of Reasoned Action .....	49
Locus of Control .....	54
Psychological Model for Physical Activity Participation .....	54
Self-Motivation and the Psychobiologic Model .....	58
The "Self" in Exercise .....	62
Summary of Psychological Models of Exercise Behavior .....	69
Models of Self-Management Theory .....	69
Albert Bandura's Self-Efficacy Model ...	73
Donald Meichenbaum's Self-Instruction Strategies .....	74
Frederick Kanfer's Self-Control Model ..	75
Michael Rosenbaum's Learned Resourcefulness Model .....	78
A Model of Learned Resourcefulness and Health Behaviors .....	83

Chapter Three - Methodology .....	87
Population Description .....	87
Procedure Outline .....	87
Instrumentation .....	88
Demographics .....	88
Assessment of Physical Exercise .....	89
Self-Control Schedule .....	95
Self-Motivation Inventory .....	102
Commitment to Aerobic Exercise Scale ...	107
Pilot Study .....	111
Data Analysis .....	112
Chapter Four - Findings and Discussion .....	115
Sample .....	115
Reliabilities of Scales .....	117
Results .....	118
Hypothesis One .....	119
Hypothesis Two .....	121
Hypothesis Three .....	124
Hypothesis Four .....	126
Significance of Demographic Predictor	
Variables .....	129
Multiple Discriminant Function	
Analysis .....	133
Discussion of Findings .....	138
Chapter Five - Conclusions and Recommendations ...	145
Conclusions .....	145
Recommendations .....	153
Appendix A - List of "1990 Objectives for the Nation"	
Related to Physical Activity and Exercise .....	157
Appendix B - Demographic Questionnaire .....	159
Appendix C - Assessment of Physical Exercise .....	160
Appendix D - Self-Control Schedule (SCS) .....	161
Appendix E - Self-Motivation Inventory (SMI) .....	165
Appendix F - Commitment to Aerobic Exercise	
Scale (CAE) .....	169
References .....	171



# LIST OF TABLES

<u>Number</u>	<u>page</u>
1. Reasons for Excluding Students from the Data Analysis .....	116
2. Internal Consistency Reliabilities for the SCS, SMI, and CAE .....	118
3. The Mean Scores for Weekly Time Commitments ..	120
4. ANOVA on Weekly Time Commitments by Exercise Group .....	121
5. Self-Control Schedule Mean Scores .....	122
6. ANOVA on Self-Control Schedule Mean Scores by Exercise Group .....	123
7. Self-Motivation Inventory Mean Scores .....	125
8. ANOVA on Self-Motivation Inventory Mean Scores by Exercise Group .....	126
9. Commitment to Aerobic Exercise Mean Scores .....	127
10. ANOVA on Commitment to Aerobic Exercise Mean Scores by Exercise Group .....	128
11. A Comparison of Gender by Exercise Group .....	130
12. ANOVA on Self-Control Schedule Scores by Group and Gender .....	131



13. ANOVA on Self-Motivation Inventory Scores	
by Group and Gender .....	132
14. ANOVA on Commitment to Aerobic Exercise	
Scores by Group and Gender .....	133
15. Discriminant Function Analysis Predicting	
Membership in One of Three Exercise	
Groups .....	135

## CHAPTER ONE

### INTRODUCTION

#### PROBLEM STATEMENT

The purpose of this study was to attempt to identify characteristics which distinguish between college students who adhere to regular aerobic exercise, those who adhere to regular non-aerobic exercise, and those who do not exercise but intend to within the next year.

#### RATIONALE

During this century American society has been transformed from a physically active, rural-based society into a population of city dwellers and suburbanites, who frequently look for ways to make life easier and convenient by conserving effort and energy (Pollock, Wilmore, and Fox, 1978). There is growing evidence demonstrating that physical inactivity and the increased sedentary nature of daily living habits are a serious threat to the health of Americans (Pollock et al., 1978; U.S. Department of Health and Human Services, 1980). There has been strong interest among health educators concerning the relationship between physical activity and health (Dishman, 1988;

Fox and Haskell, 1978; Gauvin, 1989; Heaps, 1978; Paffenbarger and Hyde, 1988; Pollock et al., 1978; Powell, 1988; Roth and Holmes, 1985; Sonstroem, 1988; U.S. Department of Health and Human Services, 1980). More specifically, health educators and other professionals have sought to understand factors that promote a physically active lifestyle, rather than a sedentary one.

According to the U.S. Public Health Service, the enhancement of the health status of Americans is dependent upon greater participation in regular exercise (Powell, 1988). Included in the "1990 Objectives for the Nation" are 11 goals in the area of physical fitness and exercise (see Appendix A) (U.S. Department of Health and Human Services, 1980). There is also general agreement among health educators and other professionals that regular exercise has both physical and psychological benefits (Shangold and Mirkin, 1988; Weber and Wertheim, 1989).

In order to obtain most of the physiological and psychological benefits of exercise it must be conducted on a regular basis for a substantial period of time (Lee and Owen, 1986b). Surveys indicate that less than half of the American population exercise on a

regular basis, and between one third and one half are sedentary (Dishman, Sallis, and Orenstein, 1985; Martin and Dubbert, 1982b; Stephens, Jacobs, and White, 1985). Given the apparent difficulty people have in maintaining an exercise program, research is needed to determine which factors are associated with cessation and which can increase the probability of adherence to a regular aerobic exercise regimen.

Health educators have recognized that behavior change is difficult to achieve, and that it is usually important to understand the factors that influence it (Green, Kreuter, Deeds, and Partridge, 1980). Research over the past ten years has generally failed to predict who will exercise, why, and for how long (Cox, 1984; Dishman, 1982a, 1985; Morgan, 1977). Most studies have lacked the precision required to design systematic interventions aimed at changing current physical activity and exercise patterns (Dishman, 1988). Other studies have not been able to be duplicated in different settings, and thus have proven to be of limited utility (Dishman, 1988). Dishman and colleagues (1982a, 1985) have suggested a need to develop models capable of guiding future exercise participation studies.



### **Independent Variables**

Aside from a number of demographic variables, two psychological variables and a psychological model were used in this study in an effort to distinguish between aerobic exercise adherers, non-aerobic exercise adherers, and non-exercisers. The variables included "commitment" to aerobic exercise (Deeter, 1989; Gruger, 1981; Nielsen and Corbin, 1986) and "self-motivation" (Dishman and Gettman, 1980; Dishman and Ickes, 1981). Existing literature indicates that these variables may have the ability to predict exercise adherence (Sonstroem, 1988). However, they have not been successfully incorporated into models which can fully explain exercise behavior (Deeter, 1989; Dishman, 1988). That is, these variables appear to be atheoretical. Thus, a model of "self-management" (i.e., learned resourcefulness) was also included in this study in order to determine whether or not it is superior to "commitment" and "self-motivation" in assessing exercise adherence. Such a positive finding would offer a theoretical basis for the future study of exercise adherence. "Commitment" is measured by the Commitment to Aerobic Exercise (CAE) scale (see Appendix F), while "self-motivation" and "self-

management" were measured by the Self-Motivation Inventory (SMI) and the Self-Control Schedule (SCS), respectively (see Appendixes E and D).

### **Self-Management Theory**

Although our modern society has made significant strides in eliminating many infectious diseases, it has largely failed to promote health-related behaviors such as exercise. In fact, conditions in our society often promote illness-related behaviors (i.e., smoking, overeating, inactivity, abusing alcohol, etc.) rather than health-related ones. Furthermore, the dynamic nature of our modern society is demanding and stressful, often resulting in adverse effects on one's physical and psychological well-being. However, many people do not submit completely to the situational pulls of modern life (Rosenbaum, 1989). Instead, they appear to know how to manage their behavior such that health-enhancing ones are adopted and self-destructive ones avoided. In other words, they appear to have self-management skills which inoculate them against negative environmental influences (Meichenbaum, 1977).

This study attempted to test the efficacy of

self-management skills in assessing adherence to exercise. Self-management models are based on the assumptions that:

- 1) human behavior is goal-directed;
- 2) self-control behavior is necessary when people encounter obstacles to the smooth-execution of goal-directed behaviors;
- 3) self-control behavior is associated with certain process-regulating cognitions; and
- 4) multiple and interactive factors influence process-regulating cognition and self-control behavior (Rosenbaum, 1989).

It is believed that individuals who intend to be active but remain sedentary lack the self-regulatory skills necessary to engage in the complex sets of behaviors referred to as exercise habits (Dishman et al., 1985). Short-term studies suggest that interventions that teach goal setting, planning, self-monitoring, and self-reward skills can increase participation among people who intend to exercise (Martin, Dubbert, Katell, Thompson, Raczynski, Lake, Smith, Webster, Sikora, and Cohen, 1984). If self-management differences are found between adherers to exercise and non-exercisers, this knowledge can be



helpful to health educators in designing exercise programs. Moreover, it is reasonable to speculate that self-management skills may be better developed among aerobic exercise adherers than among non-aerobic exercise adherers. Adherence to aerobic exercise may require greater degrees of self-control skills and an ability to delay immediate gratification than that which exists in non-aerobic exercise adherence.

#### **Aerobic Exercise versus Physical Activity**

Due to the complexity of physical activity and exercise behaviors and their measurement, this study defined "exercise" as aerobic exercise specifically. Physical activity research findings collectively suggest that if psychological factors are to be successfully used to predict future activity, they should be directed to specific types or intensities of physical activity and time frames, rather than toward a broad and diffuse concept of exercise (Dishman, 1982a; Dishman et al., 1985). For these reasons, aerobic exercise, as opposed to general physical activity, was studied. This study also addressed non-aerobic exercise adherence because of the possible common characteristics between adherers. Furthermore,



exercise adherence, rather than initiation, was the foci of this study.

Existing evidence indicates that aerobic exercise has a favorable influence on a broad spectrum of health conditions (Cooper, 1982; Powell, 1988). The conditions include diseases of large public health importance such as coronary heart disease, hypertension, obesity, and diabetes (Cooper, 1982; Powell, 1988). Claims have also been made that aerobic exercise provides a broad spectrum of psychological benefits (Cooper, 1982; Taylor, Sallis, and Needle, 1985). Moreover, the "1990 Objectives for the Nation" rely on a definition of aerobic exercise as their guideline for the physical fitness and exercise objectives (U.S. Department of Health and Human Services, 1980).

### **HYPOTHESES**

1. There will be no significant differences between the aerobic exercise adherence group, the non-aerobic exercise adherence group, and the non-exercise group relative to self-reported time commitments. This variable was assessed by items 7-9 (i.e., weekly school/work/extracurricular time

commitments) of the demographic portion of this study's questionnaire.

2. The exercise adherence groups (i.e., aerobic and non-aerobic) will report a higher level of learned resourcefulness when compared to the non-exercise group, such that the former groups will have greater mean scores on the Self-Control Schedule (SCS) than the latter group.
  - 2A. The SCS will discriminate significantly between the exercise adherence groups and the non-exercise group.
  - 2B. The aerobic exercise adherence group will report a higher level of learned resourcefulness when compared to the non-aerobic exercise adherence group.
3. The exercise adherence groups (i.e., aerobic and non-aerobic) will report a higher level of self-motivation when compared to the non-exercise group, such that the former groups will have greater mean scores on the Self-Motivation

Inventory (SMI) than the latter group.

3A. The SMI will discriminate significantly between the exercise adherence groups and the non-exercise group.

4. The aerobic exercise adherence group will report a higher level of commitment to aerobic exercise when compared to the non-aerobic exercise adherence group and the non-exercise group, such that the former group will have a greater mean score on the Commitment to Aerobic Exercise (CAE) scale than the latter groups.

4A. The CAE will discriminate significantly between the aerobic exercise adherence group and both the non-aerobic exercise adherence group and the non-exercise group.

#### DEFINITION OF TERMS

**Aerobic exercise adherence** - a variety of exercises, conducted on a regular basis over at least a 6 month period, that stimulate heart and lung activity for a period of time sufficiently long enough to produce



beneficial changes in the body (Cooper, 1970). In order to be effective, it should be performed for 15 to 60 minutes at a time (duration), at 65 to 90% of one's maximum heart rate reserve (intensity), for 3 to 5 days per week (frequency) (American College of Sports Medicine, 1986). For the purposes of this study, aerobic exercise adherence was operationalized by responses to the physical exercise questionnaire and Cooper's (1982) aerobic point system. In order to be categorized as an aerobic exercise adherer, females had to score at least 27 points per week, and men at least 32 points per week, based on Cooper's (1982) aerobic point system. Both females and males had to report having been involved in this level of activity for at least 6 months.

**Non-aerobic exercise adherence** - a variety of isometric, isotonic, isokinetic, and anaerobic exercises, conducted on a regular basis over at least a 6 month period, that have little effect on cardiovascular or endurance fitness. Subjects were categorized as non-aerobic exercise adherers if they reported exercising at least 3 days a week, for at least 15 minutes at a time, over the past 6 months, but did not meet the



aerobic criteria based on Cooper's (1982) point system (i.e., females who scored less than 27 points per week and males who scored less than 32 points per week).

**Non-exercise** - the lack of regular physical exercise activity despite intention to do so. Subjects were categorized as non-exercisers if they reported that they do not currently exercise on a regular basis, but they intend to begin a regular exercise program within the next year.

**Time commitment** - the amount of hours a student devotes to school, work, and non-athletic, non-social extra-curricular activities each week. For the purposes of this study, this variable was operationalized by items 7-9 of the demographic portion of the questionnaire.

**Commitment to Aerobic Exercise** - viewed as a process through which a contract with self is made to the commitment of aerobic exercise (Deeter, 1989). For the purposes of this study, this variable was operationalized by a score on the Commitment to Aerobic Exercise Scale.

**Learned Resourcefulness** - a personality repertoire which is defined as a "set of behaviors and skills (primarily cognitive) by which individuals self-regulate internal responses that interfere with the smooth execution of an ongoing behavior" (Rosenbaum, 1988, p. 483). For the purposes of this study, learned resourcefulness was operationalized by a score on the Self-Control Schedule.

**Self-Motivation** - "... conceptualized as a generalized, nonspecific tendency to persist in the absence of extrinsic reinforcement and is thus largely independent of situational influence" (Dishman and Gettman, 1980, p. 297). For the purpose of this study, self-motivation was operationalized by a score on the Self-Motivation Inventory.

## CHAPTER TWO

### REVIEW OF THE LITERATURE

#### BENEFITS OF AEROBIC EXERCISE

Aerobic exercise refers to a variety of exercises that stimulate heart and lung activity for a time period sufficiently long enough to produce beneficial changes in the body (Cooper, 1970). In order to be effective, it should be performed for 15 to 60 minutes at a time (duration), at 65 to 90% of one's maximum heart rate reserve (intensity), for 3 to 5 days per week (frequency) (American College of Sports Medicine, 1986). The main objective of aerobic exercise is to increase the maximum amount of oxygen that the body can process within a given time (Cooper, 1970).

Existing literature describes both physiological (Brownell, 1982; Lee and Owen, 1986a; Martin and Dubbert, 1982b; Thompson, Jarvie, Lahey, and Cureton, 1982) and psychological (Dishman, 1982b, 1985; Folkins and Sime, 1981; Martin and Dubbert, 1982b; Morgan, 1981; Simons, McGowan, Epstein, Dupfer, and Robertson, 1985) benefits of regular aerobic exercise. It appears to influence disease prevention and treatment of disease, as well as behaviors of public health concern such as weight control. More than twenty



years ago, Karvonen and Barry (1967) compiled substantial evidence indicating that a positive relationship exists between physical activity and health and longevity. Moreover, lack of physical exercise has been identified as an associated, if not a causal factor, in a variety of diseases such as cardiac disease, hypertension, and diabetes (Fox and Haskell, 1978; Kraus and Rabb, 1961; Mayer, 1968; Pollock et al., 1978).

### **Physical Benefits**

The scientific evidence supporting the associations and measuring the impact of the physical benefits of aerobic exercise has grown slowly. However, evidence is accumulating that the benefits far outweigh the risks (Powell, 1988). The relationship between vigorous exercise and cardiovascular health is well substantiated (Blackburn, 1976; Haskell, 1984; Paffenbarger and Hyde, 1984, 1988; Pate and Blair, 1978; Rowland, 1981; Siscovick, LaPorte, and Newman, 1985). In fact, the National Institute of Health (1981) estimates that cardiovascular disease has declined by 25% in the past decade due in part, to an increase in daily exercise among formerly sedentary

individuals.

The few studies conducted examining aerobic exercise and its impact on hypertension show a moderate, but significant decrease in blood pressure (Boyer and Kasch, 1970; Siscovick et al., 1985). In addition, it appears that aerobic exercise may be inversely related to the development of osteoporosis and the risk of fracture since it tends to build stronger and thicker bones (Powell, 1988). Although the value of aerobic exercise on lower back pain has not been established, strength and flexibility (both of which are outgrowths of regular aerobic exercise) exercises have been advocated for management of such pain. Furthermore, a limited amount of data suggest that aerobic exercise can impact the prevention and treatment of diabetes mellitus since it reduces blood glucose levels, increases the number of insulin receptors, and increases the effect of insulin in noninsulin-dependent diabetes (Cooper, 1968; Siscovick et al., 1985). Since aerobic exercise produces a transient increase in concentration of white blood cells in the circulation, the incidence and severity of acute, minor illnesses is reduced (Simon, 1984).

### Psychological Benefits

Evidence also exists to substantiate the mental health benefits of regular aerobic exercise (Bakal, 1979; Dishman, 1985; Folkins, 1976; Folkins and Sime, 1981; Heaps, 1978; Hughes, 1984; Ismail and Young, 1977; Morgan, 1981; Powell, 1988; Sonstroem and Morgan, 1989; Taylor, et al., 1985). For example, several studies suggest that the physiological changes which occur as a result of regular aerobic exercise improve one's general sense of well-being (Bartley and Belgrave, 1987; Folkins, 1976; Morgan, 1981; Seeman, 1978), self-esteem (Folkins and Sime, 1981; Hughes, 1984; Sonstroem and Morgan, 1989), and work performance (Blair, 1988). The efficacy of aerobic exercise in the reduction of tension (Byrd, 1963; deVries, 1968) and anxiety states (Folkins, Lynch, and Gardner, 1972; McGlynn, Franklin, Lauro, and McGlynn, 1983; Morgan, 1979; Pauly, Palmer, Wright, and Pfeiffer, 1982; Pistacchio, Weinberg, and Jackson, 1989) is also well documented. Such findings have shown that vigorous exercise, performed at an intensity and frequency that improves cardiovascular fitness, is associated with a reduction in temporary or situational anxiety.

The ability to cope with stress is also related



to physical fitness (Keller, 1980). Roth and Holmes (1985) found that fitness moderates stress-illness relationships. Regular aerobic exercise is believed to be the body's natural mechanism for reducing psychophysiological arousal and, in turn, it releases physical and mental tensions (Allen, 1983; Roth and Holmes, 1985)). For example, Blumenthal, Williams, Williams, and Wallace (1980) found that with increased physical fitness there was a decrease in Type A behavior. Lastly, it appears that depression is reduced as increased physical fitness is achieved (Folkins, et al., 1972; Greist, Klein, Eischens, and Faris, 1978; Morgan and Horstman, 1976; Morgan, Roberts, Brand, and Feinerman, 1970; Vitelli and Frische, 1982).

It is important to note that these psychological constructs are difficult to measure. Therefore, several researchers emphasize that caution must be used in interpreting the psychological benefits of aerobic exercise (Folkins and Sime, 1981; Gauvin, 1989). Results of several studies challenge the often accepted psychological benefits of exercise, and have indicated that beneficial results are most pronounced with subjects who are more distressed prior to exercise implementation (deVries, 1968; Folkins, et al.,

1972; McPherson, Paivio, Yhasz, Rechnitzer, Pickard, and Lefcoe, 1967; Pistacchio et al., 1989; Wifley and Kuncce, 1986). Others have argued that psychological improvements are associated with perceptions of changes rather than actual changes in fitness (Heaps, 1978; Leonardson and Gargiulo, 1978). Furthermore, Frazier and Nagy (1989) found no significant change in mood states in subjects participating in regular aerobic exercise. This absence of agreement was responsible in part, for a state-of-the art workshop sponsored by the Office of Prevention at the National Institute of Mental Health, in which a consensus panel attempted to identify what is known about the influence of exercise on mental health (Morgan and Goldston, 1987). The consensus statements supported the concept that physical fitness is associated with mental health. They also supported the idea that improvements in physical fitness through regular exercise are associated with improved emotional affect in some individuals. The panel qualified these statements by emphasizing that the relationships were correlational rather than causal (Morgan and Goldston, 1987).

### **Effects on Other Health-Related Behaviors**

The fact that aerobic exercise plays an important role in the ability to control body weight is well established (Blair, Jacobs, and Powell, 1985). Regular aerobic exercise increases one's metabolism which burns additional energy from ingested food and stored fat deposits (Blair et al., 1985). However, any possible positive effects of regular aerobic exercise on other health-related behaviors such as smoking prevention and cessation, or alcohol and substance abuse is unsubstantiated (Engs and Mulhall, 1981; Powell, 1988).

Though the adverse effects (e.g., injuries) of aerobic exercise need further attention and research, they appear minor, rare, or unusually obscure (Powell, 1988). The balance of existing evidence suggests that the benefits far outweigh the adverse effects (Powell, 1988).

### **BENEFITS OF AEROBIC EXERCISE FOR COLLEGE-AGE STUDENTS**

During the college years, individuals often increase their study and social time to the detriment of fitness time, and their physical condition deteriorates (Smith and Smith, 1988). These years also typi-



cally involve a less healthy diet, reduced sleep, increased fatigue, and stress which are all lifestyle factors that can undermine one's physical well-being (Smith and Smith, 1988). Cardiovascular disease, obesity, and high blood pressure may not affect or concern individuals at this point in their lives, but during the college years one can establish behaviors that lead to serious health problems in the future (Smith and Smith, 1988). In order to determine how physical activity relates to cardiovascular heart disease (CHD) risk, Paffenbarger and colleagues (1978, 1983, 1988) have studied patterns of leisure-time exercise, other lifestyle elements, and the health status of 50,000 former students from two Universities. Data extending from the year 1900 to the present time have been obtained from physical examinations and other college records of students who were enrolled at the universities during the years 1916 to 1950, from alumni responses to self-administered mail questionnaires, and from death certificates (Paffenbarger and Hyde, 1988; Paffenbarger, Wing, and Hyde, 1978; Paffenbarger, Wing, Hyde, and Jung, 1983). Subsets of the total population have been studied for personal characteristics during the years enrolled in

college, for present-day exercise habits and physician-diagnosed CHD. Analyses have shown that current and continuing exercise adherence, rather than a history of youthful or hereditary vigor and athleticism, is associated inversely with risk of CHD in all age groups studied (Paffenbarger and Hyde, 1988; Paffenbarger et al., 1978; Paffenbarger et al., 1983).

Rates of first heart attack of CHD among 16,936 Harvard University alumni during 10 years (1962 to 1972) or 6 years (1966 to 1972) were expressed per 10,000 man-years (Paffenbarger and Hyde, 1988; Paffenbarger et al., 1978; Paffenbarger et al., 1983). There were 572 first heart attacks. Age-specific rates of CHD declined consistently with increases in energy expenditure by stair-climbing, walking, and sports play (as determined from mail questionnaires), and with increasing kcal/week in a composite physical activity index (Paffenbarger and Hyde, 1988). Similar trends were found for both non-fatal and fatal clinical events (angina pectoris, myocardial infarction, and, to a lesser degree, sudden death). Overall CHD risk patterns were similar in each 10-year age group from 35 through 74 years (Paffenbarger and Hyde,



1988). The cardiovascular health advantage from exercise adherence was seen over a wide range of lifestyles and at all ages studied (Paffenbarger and Hyde, 1988). The effect was augmented, moreover, by vigorous sports play. In summary, alumni still engaging in strenuous activities plus at least a minimum of about 1,000 additional kcal/week of stair-climbing, walking, and other light activities, had less than half (0.42) the CHD incidence of their nonathletic, mostly sedentary classmates (Paffenbarger and Hyde, 1988; Paffenbarger et al., 1978; Paffenbarger et al., 1983). Vigorous exercise by alumni seems important to their cardiovascular health, but sports play of their student days carries little or no benefit into the later years. Ex-varsity athletes who remained active as alumni had less than half the CHD risk of classmates least active during and after college (Paffenbarger and Hyde, 1988). Ex-varsity athletes inactive as alumni were at greatest risk for developing CHD. Lastly, inactive students becoming active alumni had as low a risk as active ex-varsity, athletic alumni (Paffenbarger and Hyde, 1988; Paffenbarger et al., 1986; Paffenbarger et al., 1983).

Aerobic exercise has psychologic as well as



physiologic benefits for college-age students (Bartley and Belgrave, 1987; Greenberg, Ramsey, and Hale, 1987). Many college students do not adapt and cope successfully with the pressures associated with college life (Bartley and Belgrave, 1987; Greenberg et al., 1987). This is evidenced by relatively high drop-out rates, widespread alcohol abuse, and the general prevalence of irresponsible behavior on college campuses (Bartley and Belgrave, 1987; Greenberg et al., 1987). Investigations for identifying successful strategies for helping college students cope with and adjust to college life have been recommended (American Council on Education, 1988; Bartley and Belgrave, 1987; Rich, 1985). The college years are an ideal time to make positive lifestyle changes that can last a lifetime. These years represent a formative period in which young adults can be presumed to be relatively adaptive and flexible in experimenting with new behaviors (Beeler, 1986). It is believed that regular aerobic exercise may be a viable strategy, or may be used as a supplemental strategy, in adapting and coping with the stressors of college life (Albinson, 1974; Bartley and Belgrave, 1987; Hart and Shuey, 1964; Hilyer and Mitchell, 1979;

Roth and Holmes, 1985). Most college campuses offer a wide variety of physical fitness opportunities.

Today's college students are in an enviable position of being largely able to choose how healthy they wish to be in the future.

### **EXERCISE ADHERENCE**

#### **The Problem**

National goals call for participation in regular and vigorous physical activity by 90 percent of youth and 60 percent of adults by 1990 (U.S. Department of Health and Human Services, 1980). At this time, however, best estimates indicate that 41 percent to 51 percent of adults are sedentary, while only one-third of all adults participate in exercise on a weekly basis (Bucher, 1974; Harris, 1978; National Center for Health Statistics, 1980). Just 15 percent of all American adults are believed to expend an energy equivalent (1,500 kcal per week) of known epidemiologic significance (Harris, 1978). Even among those who are enrolled in structured exercise programs, both for prevention/health enhancement and for rehabilitation, adherence is disappointingly low. Roughly half will discontinue activity at some time in the coming year

(Dishman, 1982a; Dishman et al., 1985; Martin et al., 1984; Morgan, 1977; Oldridge, 1982). Moreover, less than 10 percent of sedentary adults are likely to begin a program of regular exercise within a year (Dishman et al., 1985).

Estimates do show recent increases in participation in activity that develops cardiopulmonary and musculoskeletal fitness (Stephens et al., 1985). However, these increases seem to occur only in certain population segments, notably, young adults, the well educated, and members of high socioeconomic groups (Harris, 1978). These findings are similar to recent Canadian estimates (Canada Fitness Survey, 1983). However, the U.S. increases are not as high as the Canadian increases (Dishman et al., 1985). According to existing data, participation by Americans in all types of physical activity has increased only slightly (from 4 percent to 14 percent) during the past decade (Clarke, 1973; Dishman et al., 1985; Harris, 1978). Although we cannot precisely identify the current nationwide rate, it seems unlikely that the 1990 goals for the Nation for participation in physical activity and exercise can be met (Stephens et al., 1985).

One barrier to developing effective methods to



encourage physical activity among all segments of the population is lack of knowledge of the determinants of regular physical activity (Dishman et al., 1985). In two reviews and analyses of the exercise adherence problem, Dishman (1988) and Dishman et al. (1985) indicated that most studies have focused on situational barriers rather than on psychological aspects of exercise maintenance. As such, the existing literature provides little insight into the central motivational determinants of the individuals themselves (Sonstroem, 1982).

Studies repeatedly show that adoption and maintenance of an exercise routine are independent, and associated with different determinants (Dishman, 1988). It appears that initiation of exercise is not nearly as critical a problem in our society as is adherence to the behavior. This can be observed in the success of the commercial sector (i.e., fitness spas, fitness products, media promotion, etc.) in prompting people to initiate an exercise program (Dishman, 1982c). Moreover, it appears that initiation does not successfully determine future exercise adherence (Dishman, 1982c). Thus, understanding the factors that contribute to exercise adherence, rather

than initiation, may be the most important issue for health educators to address.

To date, it appears that research on exercise adherence has largely been atheoretical and unsystematic (Dishman, Ickes, and Morgan, 1980). This undoubtedly has slowed research progress in this area (Dishman, 1982c, 1988). Dishman et al. (1985) have suggested a need to develop models capable of guiding future exercise participation studies. In addition, most of the research conducted on the problem of exercise adherence has been limited to retrospective analyses of dropouts, poor adherers, and good adherers from heart disease prevention and treatment trials (Martin, 1981; Martin and Dubbert, 1982a, 1982b). There have been few studies of exercise adherence among college student populations.

### **Epidemiology of Physical Activity**

One important public health issue is the distribution of physical activity behaviors across various populations (Mason and Powell, 1985). Rational planning and promotional efforts require that the activity practices of the population and selected subgroups of the population be known with a reasonable

degree of accuracy (Powell, 1988). The results of several polls and surveys have been reported. However, the body of research is noted more for its quantity than quality (Stephens et al., 1985). The major problem is the definition of "active" (Powell, 1988). The proportion of active persons in the population depends on how active is defined.

In spite of the variations in the definition of an active person, the demographic factors of age, socioeconomic status, and gender have consistently been associated with level of activity in various surveys of adults (Powell, 1988). Younger age and higher socioeconomic status, whether measured by income, occupation or educational level, are associated with more leisure-time physical activity (Powell, 1988; Stephens et al., 1985). Males are more likely than females to be classified as physically active, especially if frequency or intensity of activity is considered (Powell, 1988; Stephens et al., 1985).

Involvement in physical activity does not appear to differ between whites and other races once age and socioeconomic status are taken into account (Powell, 1988). Suburbanites have been reported to be more active than urban or rural residents, and persons in



the western United States have been reported to be more active than residents from other regions (Powell, 1988). These geographic findings, however, may be attributable to differences of age distribution, socioeconomic status, or other factors.

Rational public health planning also requires knowledge about the factors that appear to be associated with physical activity (Powell, 1988). Research has produced a relatively long list of potentially important determinants of physical activity (Dishman et al., 1985). Unfortunately, variable methods of assessment and definitions make it impossible to say which are the most important independent (predictor) variables. Some of the likely determinants have better potential than others for public health intervention activities (Powell, 1988). For example, knowledge about health and exercise, and access to facilities are conditions which can be improved with relative ease. Cost of participation, availability of time, and certain aspects of social reinforcement are other factors that may not readily be influenced by public health interventions (Powell, 1988).

Surveys have consistently shown that people

participate in physical activity for two main reasons: health benefits and enjoyment (Canada Fitness Survey, 1983; Miller Brewing Company, 1983; Palm, 1978).

Which of the two is more important will depend on the individual, and different programs will probably attract individuals with different priorities. Initial reasons for participating in exercise are often not the same as the reasons for continuing an exercise regimen (Heinzelmann, 1973; Oldridge, 1982; Perrin, 1979; Wankel, 1985). Whereas initial involvement is often related to a desire to obtain health-related benefits, continued involvement is more dependent on enjoyment of the program, its convenience, and the social support received (Powell, 1988).

In one of the early studies of factors affecting exercise involvement, Heinzelmann and Bagley (1970) found that the most important reasons for joining an adult fitness program was a desire to feel better and healthier and a concern about reducing the chances of having a heart attack. On the other hand, when participants were later asked what helped them stay with the program, the most frequently reported reasons were the program's organization and leadership (31%), recreational games (29%), and social aspects of

camaraderie (26%) (Heinzelmann and Bagley, 1970). Similarly, Perrin (1979) reported that whereas new exercise participants claimed health benefits were their main reason for being active, long-term participants emphasized enjoyment as the primary reason for their continued involvement in physical activity. Self perceptions of exercise ability, feelings of health responsibility, and attitude toward exercise have not predicted who will adhere to an exercise program (Andrew, Oldridge, Parker, Cunningham, Rechnitzer, Jones, Buck, Kavanaugh, Shephard, and McDonald, 1981; Dishman, et al., 1985).

Wankel (1985) found that people who dropped out of a program and people who stayed with it both rated health benefits as the most important reason for joining the program, and both agreed on the relative importance of these goals. The participants who continued in the program, however, scored higher than the dropouts on other goals such as competition, curiosity, enjoyment, recreational skills, and going out with friends. The long-term participants reacted more positively to the program than did the dropouts and reported developing a greater degree of friendship with other participants in the program (Wankel, 1985).



Social support was related to continued involvement in a program in that continuing participants reported greater levels of encouragement from their families, friends, and work supervisors than did dropouts. Andrew et al. (1981) and Andrew and Parker (1979) have also demonstrated that family support is important to continued involvement in postcardiac exercise programs. Several other studies provide additional evidence that attitudes of spouse and family toward a program are indeed important factors in exercise adherence (Gillum and Barsky, 1974; Heinzelmann and Bagley, 1970). Fifteen percent of the males who responded to the Canada Fitness Survey and 20% of the females claimed that family interest would encourage them to be more active, while 17% of the males and 18% of the females said that a friend's interest would do the same (Canada Fitness Survey, 1983). In the Fitness Ontario (1981) survey of physical activity patterns, 63% of the respondents indicated that the encouragement of family and friends was either "very important" or "somewhat important" to their involvement in physical activity.

Other social factors are also important to involvement. Among males, 18% reported that having an

exercise partner would encourage them to be more active, while among females, 25% responded in a similar fashion (Canada Fitness Survey, 1983). Furthermore, 14% of the females, but only 8% of the males, indicated that fitness classes would encourage them to increase their participation. This result is consistent with the common observation that the vast majority of participants in community fitness classes are women (Wankel, 1988). Males tend either to exercise on their own or go to a club or activity center alone and exercise with the people there, while females tend to prefer going with someone to exercise class (Wankel, 1988).

Although dropping out of a program or giving up regular physical activity might appear simply to be the opposite of participation, this is not necessarily the case (Wankel, 1988). Just as there may be substantial differences between reasons for initial involvement and reasons for long-term involvement, so there may be very different reasons for terminating physical activity.

Inconvenience is one of these reasons, and a major one. Of the people who dropped out of an industrial exercise program, 42% stated their primary

reason for doing so was that the program was located too far from their home (Wanzel, 1977, 1978). Over 40% of this group claimed that they dropped out due to the interruption of their daily schedule. Wankel (1985) obtained similar results when he found that inconvenient time and location were two of the most important reasons given for withdrawing from an employee fitness program. Earlier research by Teraslinna, Partanen, Koskela, and Oja (1969) and Hanson (1976) indicated that proximity of an exercise program to one's place of work influenced involvement in the program. This evidence of the importance of convenient time and location is consistent with the previously reported observation that "lack of time" is one of the greatest obstacles to increased physical activity (Wankel, 1988).

Convenience, however, does not ensure involvement. Although lack of convenience is definitely an obstacle and is frequently reported as the reason for withdrawing from an activity, convenience in itself is not a sufficient motivating influence for most people to become involved in a program (Wankel, 1988). Obviously, there are activities that can easily be practiced at home or near the work-place, which people



still do not choose to practice.

A number of studies have reported lack of enjoyment or loss of interest as factors influencing withdrawal from a program (Boothby, Tungatt, and Townsend, 1981; Wankel, 1985). The Canada Fitness Survey (1983) reported that "being too lazy" or "lacking energy" and having "no skills or leaders" as obstacles to increased activity. The lack of social support has also been identified as a factor contributing to an individual's withdrawal from sport or activity programs (Boothby et al., 1981; Heinzelmann, 1973; Oldridge, 1982; Wankel, 1985). In a review of the literature, Martin and Dubbert (1982b) found that predictors of poor exercise adherence tend to be low self-motivation, smoking, inactive leisure time pursuits, Type A behavior pattern, high body weight, lack of social support, type of exercise too strenuous, and inconvenient time and/or location of programs.

Dropping out of an exercise program may simply reflect a lack of interest, intention, or commitment, since regular exercisers are as likely as, or even more likely than, the sedentary individual to view time as a barrier to activity (Canada Fitness Survey, 1983; Dishman et al., 1985). Clearly, then, further.

research is needed on factors other than inconvenience, which may influence involvement (Wankel, 1988).

### **Research Needs**

As part of the implementation plans to attain the Public Health Service physical fitness and exercise goals for 1990, The Workshop on Epidemiologic and Public Health Aspects of Physical Activity and Exercise was sponsored by the U.S. Department of Health and Human Services in 1984 at the Centers for Disease Control in Atlanta, Georgia. The goals of the workshop was to provide summaries of the status of knowledge about, and recommendations for future research on, the relationships between physical activity and public health, and on the epidemiology of exercise (Powell and Paffenbarger, 1985). After review and discussion by a panel of 33 experts from the fields of public health and exercise science, recommendations and questions for the future study of exercise adherence were agreed upon (Dishman et al., 1985). The panel's following recommendations are relevant to the present study:

- 1) "specify the cognitive and behavioral skills or

physical abilities needed to initiate and maintain a physical activity program";

- 2) "identify and put in priority the critical interactions, within and among personal and environmental factors, that determine a person's willingness and ability to be active";
- 3) "study how activity determinants differ according to a person's age, gender, ethnicity, socioeconomic level, and health or fitness status";
- 4) "establish whether determinants of participation in supervised and unsupervised programs differ"; and
- 5) "determine who is most likely to follow and benefit from programs of vigorous exercise, from routine physical activity, and activity modified for disabling conditions" (Dishman, 1988, pp. 423-424).

#### PSYCHOLOGICAL MODELS OF EXERCISE BEHAVIOR

"Despite a remarkable growth in applied interest about exercise adherence, the development of conceptual models leading toward a motivational theory of habitual physical activity has lagged behind" (Dishman, 1988, p. 123). There are several existent psychological models and associated variables that appear to be applicable to the study of exercise



participation (Sonstroem, 1988). These models or portions of them have been tested directly in exercise programs, or more often have been used to examine other health promotion efforts such as health screening, smoking cessation, weight loss, and compliance to a medical regimen (Sonstroem, 1988). Because adherence rates for these behaviors are similar to exercise dropout rates, similar motivational constructs have been proposed for physical activity (Dishman, 1982a, 1987; Morgan, 1977).

Models or variables which have been used in health behavior research include the Health Belief Model (Becker and Maiman, 1975; Rosenstock, 1974), the Theory of Reasoned Action (Fishbein and Ajzen, 1975), and locus of control (Strickland, 1978; Wallston, Wallston, and DeVellis, 1978). Two models generated specifically for the prediction of exercise behavior include the Psychological Model for Physical Activity Participation (Sonstroem, 1978) and the Psychobiologic Model (Dishman and Gettman, 1980). The purpose of this section of the literature review is to review and critique these models. The potential for explaining activity participation with other motivational variables such as self-esteem and self-efficacy will also

be discussed.

### **Health Belief Model**

According to Rosenstock (1974), compliance with any health behavior depends on perceived vulnerability to a disorder, belief that health risk is increased by noncompliance, and belief that health effectiveness of the behavior outweighs barriers. Research on the Health Belief Model (HBM) has centered on its four major components: susceptibility, severity, benefits, and barriers (Rosenstock, 1974). Susceptibility refers to an individual's perception of the likelihood of contracting a particular disease (Rosenstock, 1974). The individual's evaluation of the consequences of developing this disease is termed severity (Rosenstock, 1974). The benefits component describes an individual's beliefs regarding the effectiveness of taking a specific health action (Rosenstock, 1974). Finally, barriers refer to an individual's beliefs regarding the potentially negative aspects of adopting the particular health behavior (Rosenstock, 1974). These variables are influenced by demographic and socio-psychological variables. In addition, a cue to action (i.e., an internal or external stimulus which

triggers the behavior) must be present if action is to be initiated.

Janz and Becker (1984) have critically reviewed 46 HBM studies of a variety of health-related behaviors, and report success of the model and most of its four major components. Twenty-four of these studies explored preventive-health behaviors, 19 examined sick-role behaviors, and 3 addressed clinic utilization. Across various study designs and behaviors, "perceived barriers" proved to be the most powerful of the HBM components (Janz and Becker, 1984). "Perceived susceptibility" was a stronger contributor to the understanding of preventive-health behaviors than sick-role behaviors, while the opposite was true for "perceived benefits" (Janz and Becker, 1984). The "perceived severity" dimension of the HBM produced the lowest overall significance ratios, although it was strongly related to sick-role behaviors (Janz and Becker, 1984).

In exercise settings the HBM has failed to replicate these positive results. Lindsay-Reid and Osborn (1980) persuaded 124 previously inactive members of the Toronto Fire Department to begin individual exercise programs. A heart disease risk index, an illness



probability index, and a benefits index were administered at the outset of the program. At 3 months, and contrary to prediction, 71% and 72% respectively of the 70 adherers had scores below the means of the entire group on two of the susceptibility measures. Moreover, prior to initiating the program, they also believed themselves less susceptible to heart disease and illness than the nonadherers.

Olson and Zanna (1982) studied 60 male and female subjects who began exercising at Vic Tanny and Nautilus centers. Adherers were defined as those who attended at least once per week during the third month of the study. Susceptibility and severity regarding heart, respiratory, blood pressure, and obesity problems, and perceived benefits of exercising in preventing these problems, were examined. Male adherers believed themselves more susceptible to heart, respiratory, and obesity problems which supported HBM predictions (Olson and Zanna, 1982). However, an opposite, nonsignificant result occurred for females (Olson and Zanna, 1982). Surprisingly, adherers had significantly lower severity scores than other subjects (Olson and Zanna, 1982).

Tirrell and Hart (1980) studied 30 coronary

bypass patients and measured their knowledge about a prescribed heart-walk regimen, compliance to the regimen, and the use of pulse monitoring in daily activities. The four basic components of the HBM plus general health motivation, a component introduced by Becker and Maiman (1975), served as predictors. Across the 15 correlations between behavior and model components, only 2 were significant in the predicted direction.

Calnan and Moss (1984) report that support for the HBM has been derived mainly from retrospective studies measuring belief and behavior concurrently. This may account for the inability of the HBM to predict health-related behavior in prospective studies (Calnan and Moss, 1984). In addition, most studies have not tested the total model (Lindsay-Reid and Olson, 1980; Morgan, Shephard, and Finucane, 1984; Noland and Feldman, 1984; Oldridge and Spencer, 1985; Slenker, Price, Roberts, and Jur, 1984). The major deterrent to use of the HBM in gathering knowledge about exercise participation may reside in its theoretical foundations (Sonstroem, 1988). The variables of the HBM were developed essentially to predict a single instance of one specific behavior. Therefore, the

model may be ineffective in anticipating later, on-going compliant behaviors (e.g., exercise adherence) in healthy adults (Slenker et al., 1984). Furthermore, active individuals often perceive their health as good rather than vulnerable to disease, yet the HBM emphasizes a motivational orientation of illness avoidance (Janz and Becker, 1984; Lindsay-Reid and Osborne, 1980; Olson and Zanna, 1982). The HBM may be better employed with individuals concerned about health problems (e.g., cardiac rehabilitation patients). Certain components of the model, most notably "perceived barriers", have been associated with adherence or lack of it, and therefore warrant further study.

### **Theory of Reasoned Action**

Fishbein and Ajzen (1975) have developed a model that predicts behavior based upon a person's intention to actually perform the specific behavior in question. Behavioral intention in turn can be predicted by a combination of the person's attitude toward performing the behavior, and the subjective norm (i.e., normative external pressures concerning performance of the behavior). Fishbein and Ajzen



(1975) believe that attitude can predict behavior via intention when the two measures of attitude and behavior are congruent in terms of action, target, context, and time. An impressive collection of research is cited to support this position (Fishbein and Ajzen, 1977). Their model has merit because it incorporates the contemporary psychological tenet of interactionism. That is, by using narrow, situation-specific attitude and intention measures, interactions between personal determinants and the situation are promoted (Sonstroem, 1988). The model also utilizes a particular situational variable, the subjective or social norm. Social support has been one of the better situational predictors of physical activity participation (Dishman et al., 1985; Heinzelmann and Bagley, 1970). The theory has been applied successfully to a variety of health-related behaviors such as weight loss behavior (Saltzer, 1982); adolescent smoking intentions (Sherman, Presson, Chassin, Bensenberg, Corty, and Olshavsky, 1982) and college student alcohol use intentions (Budd and Spencer, 1984; Kilty, 1978).

In an incomplete test of the model of exercise adherence, Olson and Zanna (1982) found that regular

attenders, as compared to occasional attenders and dropouts, reported stronger intentions to exercise regularly and stronger motivations to comply with the wishes of significant others. Inverse relationships held true for dropouts in comparison with the other groups (Olson and Zanna, 1982). Riddle (1980) separated males and females who returned a questionnaire into two groups of 149 joggers and 147 nonexercisers. Subjects were telephoned 2 weeks later to determine interim jogging behavior. The correlation between intentions and actual behavior was established at .82 (Riddle, 1980). The combination of attitudes toward the behavior and the subjective norm explained 55% of the variance in intentions. The attitude component was a better predictor of behavioral intent than the subjective norm component (Riddle, 1980). The superiority of attitude over subjective norm at predicting exercise intentions has been replicated by Godin, Cox, and Shephard (1983) and by Godin and Shephard (1985) in separate samples. The survey instrument which Riddle (1980) employed included 19 items which measured the participants beliefs concerning the consequences of their participation in jogging. A distinct result of the study was that 17



of the 19 beliefs significantly differentiated joggers from nonexercisers.

Sonstroem (1982) employed the same 19-item belief set in comparing high and low attenders in a faculty fitness program. The two attendance groups were significantly distinguished by 5 of the 19 items. These five items included: 1) "required too much discipline", 2) "takes too much time", 3) "tires the individual unduly", 4) "is unpleasant", and 5) "makes them feel good mentally" (Sonstroem, 1982). The first four items were negated in a more pronounced manner by habitual exercisers, compared to nonexercisers. The fifth item, "makes me feel good mentally", was supported by habitual exercisers but not nonexercisers. Each of these five beliefs were included in Riddle's (1980) set of six major differentiators, thus affording replication. Further unpublished research by Sonstroem (1988) and colleagues has identified four of these six beliefs that significantly discriminate between recruits and adherers to exercise from nonexercisers. Evidence supporting these six belief items has been fully or partially replicated in three different studies (Sonstroem, 1988). These items include: "takes too much time", "requires



too much discipline", "makes me feel too tired", "is unpleasant", "makes me feel good mentally", and "helps me work off tensions and frustrations" (Sonstroem, 1988). It is interesting that four of these six items refer to barriers which have been mentioned repeatedly as major determinants of adherence (Andrew and Parker, 1979; Dishman, 1985; and Shephard, 1988).

Recent research has questioned the validity of predicting behavior by the model contained in the Theory of Reasoned Action (Sonstroem, 1988). Controversy clusters around the necessity of employing a mediating variable (behavioral intention) in explaining attitude-behavior associations, and on the nature of previous behavior's influence on present attitudes, intentions, and behavior (Bentler and Speckart, 1981; Fazio and Zanna, 1981; Liska, 1984; Sherman et al., 1982). In college students Bentler and Speckart (1981) found that attitudes rather than intentions provided a better prediction of exercise behavior. In general, however, behavioral intention "has been demonstrated to be one of the most important and one of the most consistently relevant predictors of continued participation in health improvement programs" (Davis, Jackson, Kronenfeld, and Blair, 1984,

p. 362). Ajzen and Fishbein (1980) argue that attitudes based on experience are better predictors of future behavior because of greater stability. In addition, Fazio and Zanna (1981) state that "direct experience attitudes are more clearly defined, held with greater certainty, more stable over time, and more resistant to counter-influence" (p. 185). Additionally, they have been found to be more available and accessible, hence more substantial (Sherman et al., 1982).

The model would appear to offer a variety of advantages in acquiring a greater understanding of other exercise predictors (Sonstroem, 1988). Its limited use has generally provided significant, and at times sizeable predictions of immediate or subsequent short-term exercise. However, no direct examination of longer term activity adherence has been made to date (Sonstroem, 1988).

### **Locus of Control**

One theoretical construct of potential relevance to the study of exercise adherence is locus of control. This concept was originally conceived as a person's generalized expectancy to perceive reinforcements as being either dependent upon one's own beha-



avior (internal control) or contingent upon forces beyond one's control (external control) (Rotter, 1966). Internal controllers, as opposed to external controllers, would be expected to maintain more positive behaviors in the areas of preventive and corrective medicine. Locus of control has been found to predict weight loss in a program emphasizing self-control techniques (Weinberg, Hughes, Critelli, England, and Jackson, 1984). While certain studies have associated internality and smoking cessation, results have been much more equivocal in the area of weight loss (Wallston and Wallston, 1978). Subsequent to Levinson's (1974) partitioning of external expectancies into Powerful Others and Chance components, Wallston et al. (1978) included these plus internality in a scale specific to health behavior (i.e., the Multidimensional Health Locus of Control Scale). Winefield's (1982) factor analysis of the Multidimensional Health Locus of Control Scale (MHLC) found four rather than three factors. Utilization of the original three components revealed a lack of relationship to health habits in medical and dental students and failed to predict compliance with medical advice (Winefield, 1982). Lack of factor replication was



also observed by Coelho (1985).

One study has found that college males with an internal locus of control and positive attitude toward exercise were more fit and more physically active than the remainder of the college male population (Sonstroem and Walker, 1973). There have been attempts to examine the relationship between exercise adherence and locus of control (Dishman, et al., 1980). Results of these investigations have demonstrated little or no relationship between these two factors. However, there are two possible reasons for this: failure to take the value of exercise reinforcement into account and use of health-specific locus of control measures (McCready and Long, 1985). Based on Rotter's (1966) concept of locus of control, exercise adherence should be greatest among those who value exercise reinforcements and have an internal locus of control.

The locus of control construct must be regarded as only one of a host of factors influencing exercise behaviors. Using an interactional model, Wallston, Wallston, Kaplan, and Maides (1976) found that internals in a self-directed program and externals in a group program tended to lose more weight and be more

satisfied with the program than other subjects. Carrying the concept of specificity further, Saltzer (1982) developed a four-item Weight Locus of Control (WLOC) scale. Over a six-week weight loss program the correlation between behavioral intention and actual behavior in WLOC internals with high values for physical appearance was .77 (Saltzer, 1982). In WLOC externals, however, the correlation was only .24 (Saltzer, 1982). In and of themselves, none of the three MHLC scales significantly related to program completion. This research illustrates the prediction improvement that may be realized by examining interactions of several personal determinants (Sonstroem, 1988).

According to Sonstroem (1988), use of the locus of control construct in physical activity research could best be pursued with the development of an exercise-specific control measure. However, there is little evidence that the use of exercise-specific locus of control measures improves prediction of exercise adherence (McCreedy and Long, 1985). Noland (1981) did develop one such inventory, the Exercise Locus of Control Scale, which was used to examine the exercise behavior of women in two age groups (25-45



years and 45-65 years). The older group demonstrated a significant positive relationship between internality and exercise behavior, and a negative relationship between exercise behavior and the chance and powerful others scales (Noland, 1981). While the title of this exercise-specific inventory and the findings of the study suggest that the Exercise Locus of Control Scale may be appropriate for examining locus of control in an exercise adherence study, closer inspection of the instrument reveals that the scales are aimed at individuals' perceptions of what controls their exercise behavior rather than their perceptions of what controls their reinforcements (McCready and Long, 1985).

McCready (1984) developed a more theoretically sound measure of exercise locus of control (i.e., the Exercise Objectives Locus of Control scales). While the Exercise Objectives Locus of Control instrument appears theoretically sound, its generalizability may be limited because it was developed using data from a primarily female sample, all of whom were voluntary participants in community exercise programs (Whitehead and Corbin, 1988). In addition, McCready and Long (1985) found that a general measure of locus of con-



trol predicted adherence better than the specific measure for participants in 8-to-12-week aerobic exercise programs.

In another attempt, Whitehead and Corbin (1988) designed multidimensional scales for the measurement of locus of control of reinforcement beliefs specifically related to physical fitness behaviors. Results of an initial study indicated preliminary supportive evidence for the multidimensionality of the fitness locus of control construct (Whitehead and Corbin, 1988). However, further evidence of the reliability and validity of the Fitness Locus of Control scales is needed to establish its potential in future research. In conclusion, exercise-specific measures and reinforcement value have received little attention and inconsistent relationships have been found (Dishman and Gettman, 1980; Long and Haney, 1986; McCreedy and Long, 1985; Noland and Feldman, 1985).

### **Psychological Model for Physical Activity**

#### **Participation**

The Psychological Model for Physical Activity Participation was the first model developed specifically for the prediction of exercise involvement (Sonstroem, 1978). The model assumes that self perception of

physical ability (i.e., "estimation") influences an individual's interest in physical activity (i.e., "attraction"), and attraction provides the greater influence on exercise participation (Sonstroem, 1978). This model also takes into account the manner in which exercise and ultimate physical fitness contribute to psychological benefit, which in this case is enhanced self-esteem.

In accord with the model, Sonstroem (1974) developed the Physical Estimation and Attraction Scale (PEAS) for adolescent boys. The Estimation Scale contains 33 items assessing perceived physical ability and the Attraction Scale measures interest in, or attraction to, physical activity (Sonstroem, 1974). The model has been uniformly successful in providing correlational evidence that associates physical activity and psychological health in adolescent males (Sonstroem, 1988). Estimation has been related to physical fitness scores (Dishman, 1978; Morgan and Pollock, 1978; Neale, Sonstroem, and Metz, 1969; Sonstroem, 1974, 1976) and to global self-esteem (Fox, Corbin, and Couldry, 1985; Neale et al., 1969; Sonstroem, 1974, 1976).

The model has been less effective in predicting



exercise behavior than in demonstrating positive correlates of exercise (Sonstroem, 1988). Early associations were developed between attraction and self-reports of physical activity (Neale et al, 1969; Sonstroem, 1978) and between attraction and interscholastic athletic participation in high school boys (Sonstroem, 1974). In a prospective study, Sonstroem and Kampper (1980) were able to predict the interscholastic cross-country recruitment in junior high school males by attraction first and estimation second. However, these variables failed to significantly predict adherence over the entire season (Sonstroem and Kampper, 1980). Using an adult form of the PEAS, Morgan and Pollock (1978) and Morgan (1976) failed to show a significant relationship between attraction and exercise adherence in prisoners and police officers, respectively. In a study of 45 healthy, nonrisk adults and 21 cardiac patients, Dishman and Gettman (1980) did not find a significant attraction effect on adherence over a 20-week program. Overall, in studies of adult fitness programs, weak relationships have been found between PEAS scores and sustained participation, but suggest an influence on initial adoption (Dishman, 1982a; Morgan, 1977).



A summary of the preceding research could conclude that the Psychological Model for Physical Activity Participation is ineffective in predicting exercise adherence. This suggests that interest in exercise and beliefs about one's capabilities provides insufficient motivation for adhering to exercise, but may explain initiation (Dishman, 1982a). Failures of the model to predict adherence could be a result of the present form of PEAS items (Sonstroem and Kampper, 1980). For example, newer attitude theory questions the effectiveness of measuring attitude toward a general object such as exercise. Ajzen and Fishbein (1977) have argued that an individual's attitude toward actually performing a specified behavior should be assessed. However, exercise adherence literature has discounted the ability of attitudes to predict activity maintenance (Andrew and Parker, 1979; Dishman, 1982a; Dishman et al., 1985).

The model is attractive because it provides a link between past activity history, fitness self-perceptions, and attitude (Dishman and Dunn, 1988). These components offer potential for future, more complex models. Recent data from college students have identified superior shortened PEAS scales which may

lead to the development of more valid adult scales (Safrit, Wood, and Dishman, 1985).

### **Self-Motivation and the Psychobiologic Model**

Dishman and Gettman (1980) proposed a psychobiologic model using self-motivation, body fat, and body weight as predictor variables. "Self-motivation is conceptualized as a generalized, nonspecific tendency to persist in the absence of extrinsic reinforcement and is thus largely independent of situational influence" (Dishman and Gettman, 1980, p. 297). This construct has been interpreted as a disposition to persevere in a task after the task has been initiated (Dishman et al., 1980). The model was developed in a 20-week prospective study of 21 male cardiac patients and 45 male healthy nonrisk subjects (Dishman and Gettman, 1980). Self-motivation, percent body fat, and body weight were assessed at the onset of the program and were able to distinguish the 43 adherers and 23 dropouts with 78.8% accuracy (Dishman and Gettman, 1980). Dishman et al. (1980) reported similar data in an additional study and indicated that adherers tend to be leaner, weigh less, and more self-motivated than dropouts. In a more recent study, Ward and Morgan (1984) tested the model which successfully predicted

88% of program adherers but failed to predict dropouts accurately. They concluded that factors influencing adherence differ between the sexes and over time (Ward and Morgan, 1984).

The small sample size ( $n=66$ ) employed in the model's development undermines confidence in the reliability or generalizability of predictive relationships (Sonstroem, 1988). Research results have been extremely inconsistent because of variability in measuring body weight and body fat variables accurately (Dishman, 1981; Massie and Shephard, 1971; Morgan, 1977; Olson and Zanna, 1982). Although studies by Dishman (1981) and Massie and Shephard (1971) have found body weight and body fat to be significantly associated with exercise adherence, a discounting amount of evidence has been summarized by Morgan (1977) and Olson and Zanna (1982).

The self-motivation construct is used more frequently as a single predictor than as a model component (Sonstroem, 1988). To measure this construct, Dishman and Ickes (1981) constructed the 40-item Self-Motivation Inventory (SMI). SMI scores have correlated significantly with self-reports of exercise frequency in college students (Dishman and Ickes, 1981).



It successfully predicted length of adherence in college women novice (i.e., team rowing) crew members over an 8-month season (Dishman and Ickes, 1981), and adherence in adult males (Dishman and Gettman, 1980). The results of Dishman and colleagues (1980, 1981) in obtaining SMI scores which significantly predict exercise and athletic adherence have been replicated by several investigators. Freedson, Mihevic, Loucks, and Girandola (1983) reported higher SMI scores in competitive female bodybuilders as compared to college students. Olson and Zanna (1982) found that SMI scores significantly differentiated regular attenders and occasional attenders from dropouts in an adult exercise program. In another study, Thompson, Wyatt, and Craighead (1984) predicted the number of weeks a group of college students would adhere to an aerobic exercise program based on SMI mean scores. Dishman (1983) found that SMI scores significantly predicted the number of sessions and minutes of participation in a 12-week walk/run program for young adults. High SMI scores have also predicted adherence to training of Olympic speedskaters (Knapp, Gutmann, Foster, and Pollock, 1984). Low SMI scores have predicted poor adherence in cardiac exercise therapy programs

(Snyder, Franklin, Foss, and Rubenfire, 1982). Furthermore, Stone (1983) found that SMI scores and smoking behavior significantly differentiated participants of corporate aerobic programs and recreational participants from dropouts with 82% accuracy.

However, several research investigations have found nonsignificant or ambiguous results. In a study of 106 healthy adults, SMI scores significantly differentiated early dropouts from occasional attenders and adherers in males, but not in females (Gale, Eckhoff, Mogel, and Rodnick, 1984). It failed to separate occasional attenders and nonadherers from adherers in both sexes (Gale et al., 1984). Robinson and Carron (1982) found that SMI scores failed to distinguish between starters, squad members, and dropouts in high school football squads. In a study by Ward and Morgan (1984), SMI scores of adherers and dropouts were similar. Two studies have examined the interaction of self-motivation and intervention factors (Wankel, Yardley, and Graham, 1985). The investigators hypothesized that low self-motivators would be influenced by external motivation, whereas high self-motivators would be relatively unaffected by psychological interventions. The intervention factors were a

decision balance sheet in one study and social support in the other study (Wankel et al., 1985). Both motivational interventions improved program attendance. However, attendance reports collected from adult females in two separate exercise programs failed to reveal significant self-motivation main effects or interactions with intervention factors (Wankel et al., 1985).

The items of the SMI show high face validity for adherence to exercise (Sonstroem, 1988). The SMI has exhibited a high test-retest reliability (i.e., .86 over a 20-week period) which implies that it is relatively resistant to change (Dishman and Ickes, 1981). Further convergent and discriminant validation efforts are needed to provide a better understanding of the variable and to improve prediction of its interaction with other variables (Sonstroem, 1988). Conceivably, its construction as a measure of perseverance should predict adherence to an exercise program once initiated. As a result, its use as a prediction and screening measure for exercise adherence is strongly recommended.

### **The "Self" in Exercise**

In our culture, exercise is generally perceived



as beneficial and to have therapeutic value. Moreover, due to the support for exercise and its therapeutic and beneficial properties, exercise is considered "good" and many people initiate it with the hope of achieving personal growth (Sonstroem, 1988). Feelings of confidence, mastery, competence, and self-esteem are often mentioned as anticipated outcomes of exercise participation (Sonstroem, 1984).

Self-esteem has been regarded as a fundamental variable in exercise research because of its appeal for defining anticipated psychological benefits (Folkins and Sime, 1981; Sonstroem, 1984). Sonstroem (1984) reviewed 16 studies testing the hypothesis of enhanced self-esteem and exercise. He concluded that significant increases in self-esteem are related to exercise performance. Unfortunately, methodological limitations of these studies have impaired an understanding of the factors involved (Sonstroem, 1988). Sonstroem (1984, 1988) has recommended the use of repeated measurement to examine the degree of changes in self-esteem associated with adherence, as well as, exercise-specific scales. Theoretical models that explain enhanced relationships between self-esteem and exercise are lacking. Furthermore, self-esteem theory

is complex, all-encompassing, and vague which results in conceptual and operational problems in research. At this time, it does not appear that self-esteem, as a variable, is useful in predicting adherence to exercise.

Bandura (1977a) proposed a perceived self-efficacy theory which is more situation-specific than self-esteem. Self-efficacy expectations influence persistence, thought patterns, arousal, and ultimately behavior. Perceived self-efficacy is thought to determine behavioral outcomes when sufficient incentives and the required skills are present (Bandura, 1977a). This construct is similar to that measured by the Estimation Scale of the PEAS which was developed as part of Sonstroem's (1978) Psychological Model for Physical Activity Participation.

DiClemente (1981) found that self-efficacy for smoking avoidance significantly predicted maintenance at 5 months. In a study of weight loss, preprogram self-efficacy levels predicted weight loss, and subjects treated with self-efficacy enhancement methods lost more weight than those who were only exposed to the program (Weinberg, et al., 1984). The motivational and responsive capabilities of self-efficacy were.

demonstrated in a study with myocardial infarction patients where increased posttest self-efficacy levels indicated the facilitative effect of performance feedback (Ewart, Taylor, Reese, and DeBusk, 1983).

Ryckman, Robbins, Thornton, and Cantrell (1982) have constructed the Physical Self-Efficacy scale (PSE) which is generalizable to a wide variety of situations regarding physical skills. In a study of female gymnasts, McAuley and Gill (1983) found that four task-specific measures of self-efficacy and the gymnasts' prediction of how she would perform proved to be much more powerful variables, compared to the PSE, for predicting actual performance. It appears that very general measures of self-efficacy are incapable of predicting behavior in particular situations, but narrow, specific scales are able to do so (Sonstroem, 1988). However, specific scales are somewhat limited in portraying life adjustment changes. Safrit et al. (1985) administered the PEAS to several samples of college students and identified a smaller factor of nine estimation items which they have labeled General Competence. This scale has obtained somewhat greater association with self-esteem and fitness, and appears to offer a reliable measure of self-



efficacy in young adults (Sonstroem, 1988). The Self-Efficacy for Exercise Behaviors Scale has been developed and consists of two main factors: "resisting relapse" and "making time for exercise" (Sallis, Pinski, Grossman, Patterson, and Nader, 1988). However, the scale suffers from poor test-retest reliability and needs further validation (Sallis et al., 1988).

A construct similar to self-efficacy is that of perceived competence. Harter (1983) has developed a model for competence development in children with accompanying measurement procedures. The focus of this model is on goal-directed behavior and is similar to Sonstroem's (1978) model. The measurement tool has group competence perceptions in the broader areas of cognitive competence, social or interpersonal competence, physical competence, and general sense of worth (Harter, 1983). The theory includes the concept of intrinsic motivation versus extrinsic rewards. Roberts, Kleiber, and Duda (1981) found that the cognitive, physical, and general self-worth scales discriminated children athletes from non-athletes. Physical competence has differentiated participants from dropouts in junior high school athletics (Feltz and

Petlichkoff, 1983). Vallerand and Reid (1984) used path analysis, as a statistical test, to illustrate that increased self-competence led to an increase in intrinsic motivation. No known exercise studies have examined this construct with non-athletes, adults, or in exercise adherence situations (Sonstroem, 1988).

A specific attitude which is related to self-motivation and may help predict exercise behavior is commitment. Commitment is viewed as a process through which a contract with self is made (Deeter, 1989). This indirectly influences the way an individual evaluates and responds to various situations (Deeter, 1989). Nielsen and Corbin (1986) have presented a model of commitment to physical activity which is primarily based on beliefs of benefits of the activity. The model includes affective, cognitive, and behavioral components which are expected to relate to the degree of involvement in the activity as well as to situational and personal factors (Nielsen and Corbin, 1986). The Commitment to Physical Activity scale (CPA) consists of twelve Likert-type items and are the same as those in Carmack and Martens' (1979) Commitment to Running scale with the words "physical activity" substituted for "running" (Gruger, 1981;

Nielsen and Corbin, 1986). A study by Deeter (1989) indicated that attitudinal commitment to physical activity was related to behavioral measures of commitment to physical activity. Significant positive correlations were found between CPA scores, and frequency and duration of high intensity activities (Deeter, 1989). In contrast, limited relationships were found between CPA scores and behavioral records for class activities (Deeter, 1989). Results of the study also found attitudinal commitment to be a stronger predictor of activity than expectancy or competitive orientation (Deeter, 1989). However, one's level of perceived ability in physical activity was also a significant predictor of behavioral commitment (i.e., frequency, duration, and intensity) to physical activity (Deeter, 1989). Although commitment to exercise appears to be predictive of physical activity, other variables need to be considered when assessing the strength of these relationships.

All these self variables, (i.e., self-esteem, self-efficacy, perceived competence, and commitment), have strong theoretical and empirical links to total life adjustment, and therefore could offer several advantages to the study of exercise adherence



(Sonstroem, 1988). However, they have not been used systematically to study exercise adherence (Sonstroem, 1988). The major barrier to the immediate use of self variables is the lack of standardized measures applicable to different age groups and settings, and to specific types of physical activity.

#### **Summary of Psychological Models of Exercise Behavior**

According to Sonstroem (1988), a review of empirical data in the research of exercise adherence provide little guidance for recommending superior models for the study of exercise adherence. Non-standardized assessments and procedures, diverse populations, and the use of incomplete models have led to an increase in nonreplicated results (Sonstroem, 1988). In this review, certain models have been advocated, but these suggestions are based on methodological and theoretical considerations rather than on substantial research evidence. It is recommended that future research apply models in their theoretical entirety (Sonstroem, 1988).

#### **MODELS OF SELF-MANAGEMENT THEORY**

The term self-management, "generally signifies the gradual assumption of control by the individual

over cueing, directing, rewarding, and correcting his or her own behavior" (Kanfer and Karoly, 1982, p. 576). It suggests active participation by an individual "in goal selection and evaluation, in attention to internal and external responses, and in the use of cognitive processes to increase adaptive effectiveness" (Kanfer and Karoly, 1982, p. 576). Self-management can refer to specific theoretical models of processes by which people direct and control their behavior (Rehm and Rokke, 1988).

Although specific definitions of self-management may vary with models, certain common assumptions exist. To begin with, the models assume that individuals can behave essentially as if they are two persons: a controlled person and a controlling person (Rehm and Rokke, 1988). "A controlled person acts in an environment and responds to a variety of internal and external cues and consequences" (Rehm and Rokke, 1988, p. 137). "A controlling person is capable of manipulating internal and external cues and consequences for the purpose of obtaining long-term goals" (Rehm and Rokke, 1988, p. 137). This analogy assumes that such processes occur within every individual and, therefore, thinking in terms of such processes is

useful for purposes of intervention and treatment (Rehm and Rokke, 1988).

Self-management models emphasize the notion of the person in the person by situation interaction (Rehm and Rokke, 1988). That is, models have typically focused on problems of self-control behavior directed toward delayed reinforcers in conflict with immediate reinforcers (Rehm and Rokke, 1988). Traditional self-control or self-management problems include persistence (i.e., maintaining behavior toward a delayed positive reinforcement despite immediate punishments), or resistance to temptation (Rehm and Rokke, 1988). Self-management processes may be engaged when a new or changed environment is encountered to which the person may need to adapt. This suggests a need for a shift in the person's repertoire relevant to problem areas in a direction away from well-established, habitual, but ineffective responses toward systematic problem-solving and planning, long-term affective control, and behavioral persistence (Kanfer and Karoly, 1982). The goal is to obtain important distant rewards or reinforcers, or to optimize reinforcement in the long run. This requires effort, persistence, and resistance to temptation



(Rehm and Rokke, 1988). Self-management theories assume that individuals make inferences about external contingencies and consequences and that response strategies are based on these internal representations (Rehm and Rokke, 1988). The nature of these assumptions, however, vary among self-management models.

The central concept in self-management psychology is self-regulation. "The term is generally used to describe the integrated organization of a series of component processes that serve to achieve the person's objectives" (Kanfer and Karoly, 1982, p. 577). Beyond the specific definitions within various models, the self-regulation concept has generally denoted psychological processes by which an organism mediates its own functioning (Kanfer and Karoly, 1982). Self-control refers to processes required when an individual encounters situations in which it is necessary to alter a behavioral sequence rather than maintain it (Kanfer and Karoly, 1982). The term self-control is used to describe a person's actions in a specific situation, rather than a personality trait (Kanfer and Karoly, 1982).

This section of the review of literature will focus on the four prominent models of self-management

theory, and their essential features will be discussed. These models are: 1) Bandura's (1977a, 1977b) self-efficacy model, 2) Meichenbaum's (1977) self-instruction strategies, 3) Kanfer's (1970) self-control model, and 4) Rosenbaum's (1983) learned resourcefulness model. Other self-management models include Carver and Scheier's (1982) information processing model, Klinger's (1982) model of cognitive plans and concerns, and Lazarus' (1974) work on stress coping strategies.

#### **Albert Bandura's Self-Efficacy Model**

Bandura (1977a, 1977b) has written abundantly about social-cognitive factors that influence human learning and behavior change. The construct of self-efficacy has been given primary attention in his conceptual design. Although Bandura's self-efficacy model was mentioned in the previous section on models of exercise behavior, an extended account will be given here.

In regard to self-efficacy, Bandura distinguishes between efficacy expectancies and outcome expectancies (1977a). An outcome expectancy refers to a person's judgment of whether a given behavior will produce a particular outcome. On the other hand, efficacy

expectancies are defined as an individual's appraisal of whether or not he or she can successfully execute the behavior. According to Bandura (1977a), self-efficacy expectations are primarily formed as a result of direct experience with the behavior and situation of interest. Other influential factors in the formation of self-efficacy expectations include modeling, verbal persuasion, and perception of physiological arousal (Bandura, 1977a). Bandura (1980) suggests that perceived self-efficacy plays a major role in whether or not a person will initiate a behavior, the amount of effort they expend, and in how long they will persist in the face of an adverse situation.

Bandura and his colleagues (1977a, 1977b, 1980, 1982) have conducted several studies to validate the construct of self-efficacy. They have found a strong association between perceived self-efficacy and an individual's level of performance. In addition, Bandura and Adams (1977) contend that self-efficacy theory explains the level of change which can occur over time.

#### **Donald Meichenbaum's Self-Instruction Strategies**

Meichenbaum's (1977) self-instruction strategies are a form of self-management that focus on the



importance of an individual's self-instructions (i.e., self-statements). It is assumed that these self-instructions mediate behavior and behavior change (Meichenbaum, 1977). In accord, it is believed that maladaptive self-instructions may contribute to a person's problems. The development of self-instruction skills can play two primary roles in governing desired behaviors. Self-instructional skills can serve as useful cues for the recall of appropriate behavior sequences or for redirecting and correcting behavior errors in an effort to prompt the use of more adaptive responses (Meichenbaum, 1977). According to Meichenbaum (1977), well-developed self-instructional techniques are applicable to most situations.

#### **Frederick Kanfer's Self-Control Model**

The self-control model proposed by Kanfer (1970) describes a feedback-loop of self-management. In this model, self-control is viewed as a series of processes in which an individual engages in order to alter the probability of a response in the relative absence of immediate external supports (Kanfer, 1970). This process occurs when an individual perceives that his/her present behavior is not resulting in desired results.

The feedback-loop of self-management employed by Kanfer (1970) is based on a three-stage process. The first stage, the self-monitoring stage, involves the individual's observation of his/her behavior(s). This may involve the actual behavior, the behavior in accord with its antecedents and consequences, and/or internal events (i.e., thoughts and emotions). Self-monitoring implies conscious attention to some specific behavior and may be accomplished through an informal, unsystematic or systematic fashion (Kanfer, 1970).

Self-evaluation is the second stage in Kanfer's (1970) model and refers to comparison between one's performance and a standard. An index of performance is derived from self-monitoring, whereas standards may be derived from a variety of sources. Generalized standards may be derived from internalized rules which are a result of one's development or external sources of expertise (Kanfer, 1970). They may be relative or specific, differentiated or general, and they may or may not be realistic or appropriate (Kanfer, 1970). During the self-evaluation stage, an individual makes comparisons and then judges whether or not his/her behavior met the standards. This judgement is

evaluative and involves a determination of whether a behavior was good or bad, a success or failure (Kanfer, 1970).

The assumption of this model is that individuals control their own behavior through the employment of contingent rewards and punishments which may be covert or overt (Kanfer, 1970). As a result, self-reinforcement is the third stage of the feedback-loop. Self-reinforcement is viewed as the mechanism whereby individuals strengthen and maintain behavior in the face of conflicting external reinforcements (Kanfer, 1970). Persistence and resistance to temptation are essential to success and can be accomplished by self-administered reinforcement for attaining the behavior, and self-punishment for giving into temptation (Kanfer, 1970). The role of self-reinforcement is to maintain consistency in behavior and to link situations in which desirable external reinforcers are delayed and immediate reinforcers for alternative behavior are readily available (Kanfer, 1970).

In general, the intent of Kanfer's (1970) self-control feedback loop is to describe the behavior by which individuals exert control over and modify their own behavior. The model assumes that these are



processes that people engage in naturally, but also implies that the processes can be made explicit and externalized for therapeutic reasons (Rehm and Rokke, 1988).

Further assessment of this model indicates the need for the inclusion of two other concepts: commitment and attribution to causality (Kanfer, 1977). Basically, an individual needs to make a commitment to engage in self-correcting behavior. In other words, once an individual perceives the desirability of change, he/she must make a commitment to continue engaging in the self-control process to accomplish such a change (Kanfer, 1977). In addition, attributional processes are an important concept in the self-evaluation stage of the model because it is assumed that the behavior involved is under personal control (Kanfer and Hagerman, 1981). Therefore, attributions of causality must be internal before an individual can judge his/her behavior as good or bad, or as a success or failure.

#### **Michael Rosenbaum's Learned Resourcefulness Model**

In order to engage in self-control behavior an individual must have the necessary skills and behaviors in his or her basic behavioral repertoire

(Rosenbaum, 1983). In his model, Rosenbaum (1983) views learned resourcefulness as a personality repertoire which has been defined as "a set of behaviors and skills (mostly cognitive) by which individuals self-regulate internal responses that interfere with the smooth execution of an ongoing behavior" (Rosenbaum, 1988, p. 483). The concept of personality repertoires was introduced by Staats (1975), who used it interchangeably with the term "basic behavioral repertoires". A personality repertoire is not a personality trait, but rather a set of behaviors, cognitions, and affects that are in constant interaction with the social and physical environment of the person (Rosenbaum, 1988). The term learned resourcefulness was initially used by Meichenbaum (1977) in conjunction with his "Stress Inoculation Model". In "Stress Inoculation Training", individuals are instructed in cognitive and behavioral skills which enable them to cope effectively with stressful events (Meichenbaum, 1977). Meichenbaum (1977) found that persons who have acquired these skills develop a sense of learned resourcefulness (i.e., they believe that they can effectively deal with manageable levels of stress). The concept of learned resourcefulness is an outgrowth

from the conceptual models of self-control and self-regulation developed by Kanfer (1970) and Bandura (1977a, 1977b). The concept is also similar to Lazarus' theory of coping (1974) and, on the other hand is opposite to Seligman's (1975) concept of learned helplessness.

The personality repertoire which Rosenbaum (1983) labeled "learned resourcefulness" consists of a set of beliefs plus self-control skills and behaviors. Learned resourcefulness may involve a number of enabling skills, such as the ability to self-monitor internal events, verbal ability to label feelings, and self-evaluation skills (Rosenbaum, 1983). Underlying assumptions of the learned resourcefulness model include: 1) most people acquire these behaviors and skills without any formal training, 2) the amount of learned resourcefulness varies from one person to another, and 3) for any one person, it is fairly stable over time (Rosenbaum, 1983).

Rosenbaum (1989) has distinguished between two kinds of self-control behavior: redressive and reformative. Redressive self-control is directed at resuming normal functions that have been disrupted. Reformative self-control is directed at disrupting a



customary behavior and adopting a new behavior. A person who is engaged in controlled actions also has to engage in what Rosenbaum (1989) has labeled process-regulating cognitions (PRCs). PRCs precede any self-control behavior and function to regulate the processes by which individuals determine their own behavior. A person is engaging in PRCs whenever they monitor their behavior, assign meanings to events, attribute causality to what has happened, and develop expectancies for the future (Rosenbaum, 1989).

Based on Kanfer's (1977) model of self-regulation and on Lazarus' theory of stress (1974), Rosenbaum (1988) has proposed that the processes that lead to self-control behavior consist of three cognitive phases: representational, self-monitoring, and self-evaluation. In the representational phase, a person experiences emotional or cognitive reactions to real or imagined changes within him or herself or within the environment (Rosenbaum, 1988). These reactions occur automatically, without conscious effort. Following this automatic reaction, action shifts to one's own behavior and the person collects information on his or her behavior through the second phase, self-monitoring. The self-evaluation phase is when the

person engages in primary and secondary appraisals. In the primary appraisal, the person evaluates whether the disruption will have desirable or undesirable effects. During the secondary appraisal, the person develops expectations for the future. PRCs also include a person's causal attributions for past events and expectations of self-efficacy (Rosenbaum, 1988).

The conceptualization of learned resourcefulness assumes that high-resourceful (HR) and low-resourceful (LR) individuals are equally influenced by external aversive events, and that the difference between them is only in how they cope with these events in the long run (Rosenbaum, 1983). The model assumes that when an individual has a rich repertoire of resource skills to regulate certain internal events, he or she is likely to be effective in regulating other internal events (Rosenbaum, 1983). Previous research has indicated that HR people are more likely to attribute successful outcomes to their own efforts, even on tasks whose outcomes were independent of their efforts (Rosenbaum and Ben-Ari, 1985). Rosenbaum (1980) has developed a Self-Control Schedule (SCS) which has been found to be a valid and reliable instrument for assessing learned resourcefulness.

## A MODEL OF LEARNED RESOURCEFULNESS

### AND HEALTH BEHAVIORS

Rosenbaum (1989) has applied his model of learned resourcefulness to the study of health behaviors. He points out that self-control behavior is important mainly in two areas of health-related issues:

1) "coping with the physical discomforts of illness or painful medical procedures", and 2) "adoption of, and adherence to, health behaviors" (Rosenbaum, 1989, p. 13). Since this is a study of exercise adherence, this review will be limited to self-control behavior and adoption of, and adherence to, health behaviors. According to the model, the adoption of, and adherence to, health behaviors requires reformative self-control (i.e., disrupting a behavior and adopting a new one), as well as a repertoire of self-control skills and habits (i.e., learned resourcefulness).

According to Rosenbaum's (1989) model, a person must often abandon well-established habits and stressful interruptions in order to adopt or adhere to a health-promoting behavior. Individuals often adopt health behaviors to prevent illness or improve their health (e.g., physical fitness). In order to establish a new health behavior, an individual must be



able to plan, engage in problem-solving skills, and delay immediate gratification (Rosenbaum, 1989). The model proposes that an individual must be highly resourceful in order to acquire a health behavior (Rosenbaum, 1989). In addition, the individual must perceive a need for such behaviors and believe that he or she can attain them (i.e., self-efficacy).

Research of the learned resourcefulness model and health behaviors has focused primarily on coping with physical discomforts of illness or painful medical procedures (Groves, 1986; Gruber and Wildman, 1987; Piamenta, 1987; Rosenbaum and Palmon, 1984; Rosenbaum and Rolnick, 1983; Weisenberg, Wolf, Mittwoch, and Mikulincer, 1986). However, various studies have found that high resourceful individuals are more capable of adopting healthful behaviors than are low resourceful individuals. High resourceful (HR) individuals have been found to be more successful than low resourceful (LR) individuals in lowering their intake of alcohol (Carey, Carey, Carnrike, and Meisler, 1988), in changing their eating habits (Leon and Rosenthal, 1984; Smith, 1979), and in quitting smoking (Katz and Singh, 1986). Rosenbaum and Ben-Ari Smira (1986) have studied psychological factors that enable

ill people to adhere to health practices. In their study of dialysis patients who were required to limit their fluid intake, they found a very strong association between the patients' level of learned resourcefulness and his or her ability to restrict fluid intake. Those who adhered to the restrictions were those who demonstrated high resourcefulness, positive self-evaluations, and efficacy expectations (Rosenbaum and Ben-Ari Smira, 1986). The HR and LR patients did not differ in their understanding of the adverse consequences of failure to adhere or in their stated motivation to adhere. In another study, Amir (1985) reported that HR juvenile diabetics were more successful than LR juvenile diabetics in controlling their sugar intake. Fuller (1987) conducted a longitudinal study of heart attack patients and their spouses in order to evaluate the role learned resourcefulness may play in coping with a major illness. He found that HR subjects used significantly more problem-focused coping strategies than did LR subjects (Fuller, 1987). He also found learned resourcefulness to be the best predictor of ability to plan and maintain rehabilitation goals (Fuller, 1987).

In conclusion, there is a modest but promising

body of research evidence to support the model of learned resourcefulness in the study of health behaviors. To date, no known studies have assessed the relationship between learned resourcefulness and exercise adherence.



## CHAPTER THREE

### METHODOLOGY

#### POPULATION DESCRIPTION

This study focused on college students since this is a readily accessible population and because there are few studies which examine the determinants of physical exercise adherence in this population.

The subjects in this study were University of Maryland, College Park students. Participants were recruited from large academic classes in the Department of Health Education. Each of the three groups in this study (i.e., aerobic, non-aerobic, and non-exercise) consisted of 70-105 subjects. According to U.S. H.E.W. (1976), the size of this sample provides adequate statistical power for the discriminating variables included in this study. Physical Education activity courses were not included in the recruitment of subjects due to potential difficulties in assigning them to adherence groups.

#### PROCEDURE OUTLINE

Data was collected during the 1990 Spring Semester. The investigator of this study provided a brief explanation about the study and its voluntary aspects.

Each participant was requested to complete an anonymous questionnaire which included demographic information and four distinct instruments, (i.e., assessment of physical exercise, Self-Control Schedule, Self-Motivation Inventory, and Commitment to Aerobic Exercise scale), with a total of 100 questions. The questionnaire was administered during regularly scheduled class times and required approximately 20 minutes to distribute and complete. Data was only collected from each individual on one occasion. Questionnaire responses were anonymous as students were requested not to identify themselves.

### **INSTRUMENTATION**

The questionnaire in this study consisted of the following components.

#### **Demographics**

This portion of the questionnaire (see Appendix B) was designed by the investigator of this study and consisted of 9 items. Questions 1 (year of birth), 2 (athletic team participation), and 3 (physical disability) was used for screening purposes. If a subject was over 24 years old, a member of an

intercollegiate athletic team, and/or had a physical disability, he or she was eliminated from the data analysis in this study.

The remaining 6 items served as predictor variables. The questions regarding gender (#4), class standing (#5), and place of residence (#6), were included for their potential in planning exercise programs for college students. Weekly time commitments were assessed by items 7-9. In accordance with existing literature, it was hypothesized that weekly time commitments (i.e., perceived barriers) would not differ between exercise adherers and non-exercisers.

### **Assessment of Physical Exercise**

A limitation in the study of physical activity and exercise behavior has been the lack of valid, reliable, and practical assessments. More than 30 different techniques have been used to assess physical activity (LaPorte, Montoye, and Caspersen, 1985). These techniques can be grouped into seven major categories: calorimetry, job classification, survey procedures, physiological measures, behavioral observation, mechanical and electronic monitors, and dietary measures (LaPorte et al., 1985). The methods that are



most precise tend to be impractical in population studies. In large-scale exercise studies, surveys are the most practical means of assessment, although relatively little is known about their reliability and validity (LaPorte et al., 1985). Most surveys are conducted through the mail, telephone, or interviews. The delayed recall technique, in which subjects are asked to recall physical activity over a specific time period, is the most practical and commonly used approach in survey assessment (Washburn and Montoye, 1986). Self-administered questionnaires or interviews are the most practical in large-scale studies (Washburn and Montoye, 1986).

In regard to the validity of existing self-report instruments with external criteria (i.e., physiological measures), correlation coefficients are generally not very high (Baranowski, 1988). In an effort to improve their predictive ability, most surveys include formulas of metabolic equivalents (METs), caloric expenditure (kcal), and/or maximal oxygen uptake ( $\dot{V}O_{max}$ ) to calculate energy expenditure values (Baranowski, 1988; Blair, 1984). Inter-instrument reliability among various self-report instruments is also modest to nonexistent (Baranowski, 1988).

Test-retest reliability coefficients tend to be higher (generally .70 or greater for a two-month period). This is especially true of instruments that assess regular patterns of activities, as opposed to identifying specific events in specific time frames (Baranowski, 1988). Most of the present self-report questionnaires are imperfect, and the establishment of their validity and reliability appears to be difficult.

Most of the available self-report surveys measure physical activity in general, fitness level, and/or involve rather formidable procedures, and therefore may not be appropriate for many exercise adherence studies (Blair, 1984). A review of the literature suggests that several issues should be addressed prior to choosing or developing a questionnaire of exercise behavior (Baranowski, 1988; Blair, 1984; Perkins and Epstein, 1988; Washburn and Montoye, 1986). The first concern is the purpose of the study. For example, the purpose of an exercise study could be to examine physical activity in general, fitness levels, or a specific behavior; or it could attempt to categorize subjects and/or document a continuum of the more to less active. Another issue pertains to the characteristics

of the population being studied (i.e., age, educational level, and level of risk for disease). The third concern relates to the amount of time over which subjects are being asked to recall. The type of information subjects are asked to recall is also an important issue. Finally, the practicality of the data collection procedures must be taken into account in studies that involve a relatively large number of subjects.

In the present study, a questionnaire was needed that would categorize subjects as either aerobic exercise adherers, non-aerobic exercise adherers, or non-exercisers. Types of general physical activity and levels of fitness were not of interest in this study. Rather, this investigation examined characteristics of individuals who adhere to exercise behavior. According to Blair (1984), classifying individuals into categories is probably easier than attempting precise quantification of fitness levels. Indeed, the literature suggests that regular, vigorous exercise is that type of activity which is most accurately recalled since most individuals engage in relatively little vigorous exercise, and if they do, these activities are easy to remember (Blair, 1984).



The questionnaire developed for this study included information from a self-report assessment by Dishman and Steinhardt (1988). This assessment of physical exercise (see Appendix C) consisted of 3 items. The first question (item 10) asked subjects if they currently exercise on a regular basis. If not, they were requested to answer item 11 which asked whether or not the subject intends to begin a regular exercise program within the next year. If they replied "yes" to question 10, they continued with question number 12. Item 12 requested that the subjects describe the type(s) and amount (i.e., average frequency, duration, and miles/yards per occasion) of exercise activity, and how long they have been involved in this exercise program. Research suggests that individuals who are still active after 6 months are likely to remain active a year later (Dishman, 1981; Oldridge, 1982).

Although fitness level was not the purpose of this study, "guidelines" were needed to decide what is "aerobic exercise" and what is not. "Aerobic exercise" is based on type of activity, frequency, duration, and intensity. Since intensity was not directly measured in this study, and since several exercise

activities may or may not be conducted aerobically (e.g., tennis, swimming, etc.), Cooper's (1982) point system was used to assist this investigator in categorizing activities as regular aerobic exercise. The equations used in Cooper's (1982) point system are based on type of activity, frequency, duration, and distance. The equations were arrived at through ongoing research at the Aerobic Center in Dallas, Texas. Observations have been made of people's responses on treadmill tests and other situations. The person's physical responses, in light of intensity and duration of each activity were the key factors by which points were awarded. Then, "endurance points" were added as individuals exercised over longer periods of time (Cooper, 1982).

This study consisted of 3 groups: 1) aerobic exercise adherers, 2) non-aerobic exercise adherers, and 3) non-exercisers. Subjects were categorized as aerobic exercise adherers if: 1) as a women, they acquired at least 27 points a week based on Cooper's point system; 2) as a man, they acquired at least 32 points a week based on Cooper's point system; and 3) they participated in this activity (or activities) for at least 6 months. Individuals who exercised

regularly and had done so for at least 6 months, but did not meet the aerobic criteria based on Cooper's (1982) point system, were considered non-aerobic exercise adherers. Non-exercisers included those individuals who did not exercise on a regular basis but intended to begin a regular exercise program within the next year, as assessed by item 11 on the questionnaire. Those students who did not exercise on a regular basis and did not intend to begin a regular exercise program within the next year, were deleted from the data analysis in this study. Finally, subjects who exercised at least 3 days a week, for at least 15 minutes at a time, but did not meet the 6 month adherence criterion, and subjects who exercised less than 3 days a week and/or less than 15 minutes at a time (i.e., regular exercise criteria), were deleted from the data analysis in this study.

#### **Self-Control Schedule (SCS)**

The Self-Control Schedule (SCS) is a 36 item self-report questionnaire (see Appendix D). These items measure a person's tendencies to apply self-control methods to the solution of behavioral challenges (Rosenbaum, 1980). The behaviors assessed



by the SCS include the following: a) use of adaptive cognitions and self-instructions to cope with emotional and physiological responses; b) application of problem solving strategies (i.e., planning, defining problems, evaluating alternatives, and anticipating consequences); c) ability to delay immediate gratification; and d) a general belief in one's ability to self-regulate internal events (i.e., self-efficacy), (Rosenbaum, 1980). It is important to note that although these items were developed within these four different content areas, they should not be considered subscales of the SCS (Rosenbaum, 1980).

The SCS utilizes a six-point Likert-type scale, ranging from +3 ("very characteristic of me, extremely descriptive") to -3 ("very uncharacteristic of me, extremely non-descriptive"), (Rosenbaum, 1980). Individuals are instructed to indicate the degree to which each item is characteristic of them. A high composite score on the SCS is indicative of a richer repertoire of self-control skills (i.e., resourcefulness), (Rosenbaum, 1980). The SCS is scored by simply adding up the response numbers, with 11 of the items keyed in the reverse (see Appendix D).

The instrument was derived from various coping-

skills strategies proposed by proponents of cognitive-behavioral psychology (e.g., Goldfried, 1980; Meichenbaum, 1977). Coping-skills strategies are characterized by their emphasis on general management of everyday behavior. Based on the cognitive-behavioral conceptualization of self-control, Rosenbaum (1980) sampled a large number of situations in which self-controlling responses would most likely occur. Sixty items were generated, with 50 of them describing specific kinds of self-controlling behaviors and 10 items describing expectations for self-regulation. This list of items was then given to two cognitive-behavioral psychologists who were familiar with the concept of self-control as defined by Rosenbaum. Their evaluation was based on the following criteria: a) is the item comprehensible; b) does the item describe a situation that could be generalized to a wide range of people; c) does the item reflect an effective use of a self-controlling response; and d) to what extent do the last 10 items describe expectations for self-regulation (Rosenbaum, 1980). Based on the evaluation of the psychologists, 16 items were deleted. The remaining 44 items were then administered to a group of 152 (84 females; 68 males) college



students with a mean age of 22.7 years (Rosenbaum, 1980). Following an item analysis, eight additional items were deleted since they did not conform to a second set of criteria. This criteria included: a) all the points on the Likert-scale were employed across subjects, b) the standard deviation of the item was at least one, and c) the item contributed to the internal consistency of the scale. The result was the present 36-item Self-Control Schedule.

Rosenbaum (1980) and Redden, Tucker, and Young (1983) have reported normative data of the SCS for both Israeli and American college undergraduates, respectively. Across three samples of a total of 441 (197 males; 244 females) Israeli students, Rosenbaum (1980) reported a range of SCS mean scores from 23 to 27, with standard deviations ranging from 21 to 25. Although females tended to score slightly higher than males, there were no significant differences between the sexes (Rosenbaum, 1980; Rosenbaum and Ben-Ari, 1985). Redden et al. (1983) assessed a population of 388 male and 596 female American undergraduate students and found significant differences between males and females. The mean score on the SCS for males was 22.0 (SD=21.6), compared to a mean score of 29.9



(SD=22.3) for females.

Richards (1985) administered the SCS to 121 (49 males; 72 females) American college undergraduates in three samples and found a total male mean of 38.1 (SD=15.4) and a total female mean of 36.5 (SD=23.8). A one-way ANOVA revealed that scores across the three samples did not differ significantly. Furthermore, a t-test revealed that the mean scores of males and females did not differ significantly. The unusual high means in the Richards (1985) study may be due to the fact that the university sampled was a private, religious institution with strict policies and admission procedures. In a recent study, Lewinsohn and Alexander (in press) administered the SCS to an American sample of 450 males and 356 females ranging in ages from 50 years to 96 years ( $\bar{x}$ =63.7). The mean score for this sample was 24.6 (SD=15.2) with females scoring slightly higher. In conclusion, it appears that the mean scores are similar in the Israeli and American samples, with some sex differences in one of the American samples.

Two kinds of reliability assessments have been reported for the SCS: test-retest and internal consistency. Rosenbaum (1980) reported a test-retest

correlation of .86 after 4 weeks for Israeli students, while Leon and Rosenthal (1984) reported a correlation of .77 after an 11 month interval for American students. In 5 samples of Israeli college students totalling over 600 subjects, Rosenbaum (1980) obtained alpha coefficients ranging from .78 to .81 based on the Kuder-Richardson formula 20. Redden et al. (1983) reported a Cronbach's coefficient alpha of .82 among a sample of 984 American college undergraduates.

Numerous studies have attempted to establish the construct validity of the SCS. The convergent and discriminant validity of the SCS has been examined by comparing scores obtained on the SCS to scores obtained on a number of existing scales (Rosenbaum, 1983). Rosenbaum (1980) has reported that the SCS has low but statistically significant correlations with the following scales: Rotter's I-E Locus of Control Scale (Rotter, 1966), Jones' Irrational Beliefs Test (Jones, 1968), and the G factor (i.e., "self-control") of the Cattell 16 PF (Cattell, Eber, and Tatsuoka, 1970). SCS scores have also been found to correlate with Fitz's Self-Esteem Scale (Michelson, 1985) and with the Bachman and O'Malley Self-Esteem Inventory (MacLachlan, 1985). High correlations have been

obtained between SCS scores with the assessment of specific self-efficacy expectations in situations that require self-control behavior (Leon and Rosenthal, 1984; Rosenbaum and Ben-Ari Smira, 1985).

Correlations of the SCS and other scales have provided further evidence which supports the construct validity of the SCS. For example, Richards (1985) found significant negative correlations between the SCS and the Manifest Anxiety Scale (Taylor, 1953). Furthermore, the Intrinsic Scale of the Religious Orientation Scale (Allport and Ross, 1967) was positively correlated with the SCS, while there were nonsignificant correlations between the Extrinsic Scale of the Religious Orientation Scale and the SCS. Recently, Kadner (1987) correlated the SCS with the Jalowiec Coping Scale (JCS), (Jalowiec, Murphy, and Powers, 1984). The JCS assesses a person's means of coping with stressful events and covers the factors of confrontive coping, emotive coping, and palliative coping. The highest correlation ( $r=.49$ ) was found between the SCS and the confrontive factor. The emotive and palliative coping factors were negatively correlated with the SCS. Kadner (1987) also reported a moderate correlation between the SCS and the Barron



Ego-Strength Scale (Barron, 1953). Keinan and Melamed (1987) reported that the SCS did not correlate with a measure of Type A behavior. This is consistent with unpublished research by Rosenbaum (1980) indicating that the SCS is not related to Type A behavior as assessed by the Jenkins' Activity Scale (Jenkins, Rosenman, and Friedman, 1967).

Simons, Lustman, Wetzel, and Murphy (1985) studied a clinically depressed population and found no significant correlations between the SCS and the Beck Depression Inventory (Beck, Ward, Mendelson, Mock, and Erbaugh, 1961), or the Hamilton Rating Scale of Depression (Hamilton, 1969). However, Lewinsohn and Alexander (in press) have reported a low correlation ( $r = -.21$ ) between the SCS and scores of the Center for Epidemiologic Studies Depression Scale (Randolff, 1977) with a normal population. In a study by Lewinsohn and Alexander (in press), the SCS did not correlate with the Marlowe-Crowne Social Desirability Scale (Crowne and Marlowe, 1964), yet Rosenbaum (1980) reported a low ( $r = 0.21$ ) correlation with this scale.

#### **Self-Motivation Inventory (SMI)**

The Self-Motivation Inventory (SMI) is a 40 item

self-report questionnaire (see Appendix E). The SMI was developed to assess self-motivation, conceptualized as a behavioral tendency to persevere independent of situational reinforcements (Dishman, Ickes, and Morgan, 1980). The SMI utilizes a 5-point Likert-type format ranging from 1 ("very unlike me") to 5 ("very much like me"). Individuals are instructed to indicate the degree to which each statement best describes them. The SMI is scored by adding up the response numbers, with 21 of the items keyed negatively and 19 of the items keyed positively. A high score on the SMI is indicative of a high state of general self-motivation (see Appendix E).

The instrument was derived from an initial pool of 60 items (Dishman et al., 1980). Items were written in an effort to assess an individual's tendency to persevere or to be self-motivated. These items were administered to a group of 401 undergraduate college students (Dishman et al., 1980). Responses were collected from 399 of those subjects and items which correlated less than .30 with the summated score were deleted. As a result, 48 items were retained and then subjected to factor analysis with varimax rotation. This statistical analysis

revealed 11 factors which collectively accounted for 40.5% of the total variance. The varimax rotation revealed that 40 items loaded at least .30 on a factor and could be considered somewhat univocal (i.e., every item loaded on only a single factor). The result was the present Self-Motivation Inventory.

In the sample of 399 subjects, Dishman and Ickes (1981) reported a scoring range of 84 to 184, a mean of 140.5, and a standard deviation of 19.38. Preliminary studies have shown self-motivation to be significantly correlated with self-report of exercise frequency and to be unrelated to age, height, weight, or grade point average (Dishman and Ickes, 1981).

Reviews of reliability and validity data have been reported in Dishman (1981), Dishman and Gettman (1980), Dishman and Ickes (1981), and Dishman et al. (1980). Both internal consistency and test-retest reliabilities have been assessed. An item analysis of these 40 items revealed a Cronbach's coefficient alpha of .91 and a standard error of measurement of 5.84 (Dishman and Ickes, 1981). Dishman and Ickes (1981) report test-retest correlations ranging from .86 to .92 over intervals of 1 to 5 months.

Discriminant validity of the SMI has been



examined by comparing the SMI with other, conceptually relevant measures. The SMI was found to be correlated significantly with the Thomas-Zander Ego-Strength Scale (Thomas-Zander, 1973) and the Marlowe-Crowne Social Desirability Scale (Crowne and Marlowe, 1964). The correlation with the Marlowe-Crowne Social Desirability Scale is a matter of some concern, although it only accounted for 13% of the shared variance (Dishman et al., 1980).

In order to confront this concern, a study was conducted to demonstrate that the self-motivation measure predicts its criterion measures better than a measure of a general tendency to respond in a socially desirable way (Dishman and Ickes, 1981). The study consisted of 80 undergraduate female students who had voluntarily elected to participate in a women's crew training program. In an attempt to assess adherence to the program, a comparison of dropouts and nondropouts was made at three different breakpoints throughout the year. The mean self-motivation score of the dropouts was significantly lower than that of the nondropouts at all three breakpoints. In contrast, neither the mean ego-strength or mean social desirability scores differed significantly at any of the

breakpoints. These differences remained significant even when the data were reanalyzed using the subjects' social desirability and ego-strength scores as covariates. In addition, a stepwise multiple regression analysis, using the variables as predictors of adherence, revealed that self-motivation entered the regression equation first (Dishman and Ickes, 1981). These results suggest that self-motivation is an important factor underlying adherence to a program of habitual exercise and that related constructs such as ego-strength and social desirability do not account for these findings (Dishman et al., 1980).

In another validation study of 66 adult males enrolled in programs of habitual physical activity, an assessment was made on a number of biologic and psychologic variables (Dishman and Gettman, 1980). The biologic assessments intuitively relevant to exercise adherence included body weight, percent body fat, and metabolic capacity. Psychological variables were assessed by the following four instruments: 1) Self-Motivation Inventory; 2) Physical Estimation and Attraction Scales (Sonstroem, 1974), 3) Health Locus of Control Scale (Wallston et al., 1976), and 4) Attitude Toward Physical Activity Scales (Kenyon, 1968).

Results of a MANOVA test indicated a significant overall difference between dropouts and adherers on all the variables. A stepwise multiple discriminant analysis revealed that percent body fat, self-motivation, and body weight contributed significantly to the differences between program dropouts and adherers (Dishman and Gettman, 1980). The relationship between exercise adherence and self-motivation was substantial in this study (Dishman and Gettman, 1980). It appears that a general or trait-like measure of self-motivation possesses greater predictive ability than variables of a more "situation-specific" nature. Collectively, the data acquired suggests that the SMI represents a valid and reliable measure of self-motivation.

#### **Commitment to Aerobic Exercise (CAE) Scale**

The Commitment to Aerobic Exercise (CAE) scale is a 12 item self-report questionnaire (see Appendix F). The CAE was developed to assess attitudinal commitment to aerobic exercise. The name CAE was created by the investigator of this study. With the exception of the "type of exercise", the items in this scale are identical to those found in Carmack and Martens' (1979)



Commitment to Running scale and Gruger's (1981) and Nielsen and Corbin's (1986) Commitment to Physical Activity scale. In this study, the words "aerobic exercise" were substituted for the word "running", just as Gruger (1981) and Nielsen and Corbin (1986) substituted "physical activity". The CAE utilizes a 5 point Likert-type format ranging from 1 ("strongly disagree") to 5 ("strongly agree"). Individuals were instructed to indicate the degree to which each statement best describes their feelings most of the time. A definition of aerobic exercise and some examples were also provided. The CAE is scored by adding up the response numbers, with 6 of the items scored in reverse (see Appendix F). A high score on the CAE is indicative of commitment to aerobic exercise.

The initial instrument of 30 items was derived from popular running literature, and interviews of 10 runners and 5 runner-research colleagues (Carmack and Martens, 1979). The list of 30 items was then administered to 180 subjects. An item analysis was conducted for differences between extreme groups. The items which were retained each had a correlation coefficient of at least .78 with a mean coefficient of .83. The result was the 12 item Commitment to Running

(CR) scale.

Carmack and Martens (1979) collected normative data, as well as measures of reliability and validity, in a study of 315 runners (250 males; 65 females) between the ages of 13 and 60 ( $\bar{x}$ =28.8 years). In the study, the mean CR score was 48.3 (SD=6.3) for males and 45.7 (SD=7.1) for females. This significant difference between males and females may be a result of the significant difference in total running experience in this sample. Males averaged 6.3 years of experience as regular runners, compared to only 1.8 years for females.

Using the same sample, Carmack and Martens (1979) assessed the internal consistency of the CR by applying the Kuder-Richardson formula 20 in which a coefficient of .97 was obtained. No test-retest reliability was obtained in this study. With the Commitment to Physical Activity (CPA) scale, Gruger (1981) reported a Cronbach alpha of .91, with a test-retest reliability of .93 in a sample of 236 subjects over a 2-week interval. Deeter (1989) conducted a study of two samples of university students, totalling 461 subjects (126 males; 235 females). Internal consistency was assessed and yielded Cronbach's coefficient alphas

of .91 in sample one and .85 in sample two (Deeter, 1989).

Concurrent validity of the CR scale was assessed through analyses of subgroups (i.e., road racers, track camp, campus runners, and olympic athletes) and predictor variables (Carmack and Martens, 1979). The predictor variables included length of run, discomfort experienced when a run is missed, and perceived addiction to running. The predictor variables revealed significant differences in CR scores and length of run for all analyses (Carmack and Martens, 1979). The CR score was higher for the over-40-minute runners and for those who perceive themselves to be addicted to running (Carmack and Martens, 1979). In turn, time of run was greater for those who experience discomfort when a run is missed and for those who perceive running as an addiction (Carmack and Martens, 1979). In the same study, a regression analysis of the predictor variables and state of mind factors indicated that perceived addiction, state of mind, and length of run are significant predictors of CR scores. Concurrent validity of the CR scale is demonstrated by these obtained patterns. Furthermore, Deeter (1989) evaluated the relationship of attitudinal commitment



(as measured by the CPA) to behavioral indices of physical activity participation, and found that CPA scores were related to the frequency and duration of high intensity activities. This provides further evidence of concurrent validity of the instrument.

### **Pilot Study**

Prior to the formal collection of data, a pilot study using the above-described questionnaire was conducted by administering the instrument to approximately 60 students in a stress management Health Education class (HLTH 285). The pilot study was conducted in order to assess the explicitness of the instructions, the potential ambiguity in particular questions, the time needed to administer the questionnaire in a classroom setting, and the internal consistency of the instruments included in the questionnaire. In addition, the investigator of this study hoped to estimate the necessary sample size for this research project as a result of the pilot study. Based on the student feedback from the pilot study, the only problems with the questionnaire were related to characteristics of the instruments which could not be altered without compromising the psychometric

properties of the tests. For example, some students found the items of the SCS and the SMI to be redundant and tiresome. However, many students commented that they gained personal knowledge as a result of filling out the questionnaire. The questionnaire took an average of 20 minutes to complete. As a result of the pilot study, this investigator choose to sample approximately 700 students in an effort to obtain 70-105 subjects per group.

### DATA ANALYSIS

Analyses of variance (ANOVA) were employed to test the hypotheses proposed in this study. ANOVA addresses the question of whether or not observed differences in group means can be reasonably attributed to chance or to actual differences between the groups (Norusis, 1988). In addition, a Scheffe' multiple comparison procedure was performed. The Scheffe' procedure is a conservative method for pairwise comparisons of means since it requires larger differences between means for significance than most of the other multiple comparison methods (Norusis, 1988). The following variables were tested using

ANOVA and the Scheffe' multiple comparison procedure: weekly time commitments, SCS scores, SMI scores, and CAE scores.

In order to test for differences between aerobic exercise adherers, non-aerobic exercise adherers, and non-exercisers, a multiple discriminant function analysis was also used in this study. Discriminant function analysis is a statistical test in which a set of discriminating variables are assessed to determine the degree to which they distinguish between two or more known groups (Norusis, 1988). Among each of these known groups the potentially discriminating variables are measured. The scores that result from discriminant analysis are statistically weighted and combined in such a way as to make the groups as statistically distinct as possible. The primary purpose of discriminant analysis is to maximally differentiate between groups of subjects based upon selected discriminating variables (Norusis, 1988). The statistical procedure yields function coefficients that assess the relative ability of each discriminating variable to distinguish between known groups. As a result, the greater the value of a particular measure's



discriminant function coefficient, the greater its importance in distinguishing between groups.

In this study, multiple discriminant analysis, was used to test for differences between aerobic exercise adherers, non-aerobic exercise adherers, and non-exercisers. In an effort to distinguish between these three groups, the following discriminating variables were tested: 1) gender; 2) class standing; 3) place of residence; 4) weekly time commitments; 5) SCS scores; 6) SMI scores; and 7) CAE scores. A limitation of this study was that some of the discriminating variables were of a nominal scale, while others were of an interval scale (Norusis, 1988). Though the nominal variables were "dummy coded", this procedure (whereby variables of mixed scales are entered into a discriminant analysis) is considered problematic by some statistical experts (Norusis, 1988).

Furthermore, three chi-square analyses were performed in this study in order to test for significant differences between the three exercise groups and the following variables: gender, class standing, and place of residence.

## CHAPTER FOUR

### FINDINGS AND DISCUSSION

#### SAMPLE

The sample in this study consisted of 611 college students recruited from large classes in the Department of Health Education at the University of Maryland. Few students, if any, refused to participate in the study. Of this sample, 397 students (65%) met the criteria established for inclusion in the data analysis. The majority of those students excluded from the data analysis did not intend to begin a regular exercise program within the next year (n=57), did not meet the six-month adherence criterion (n=40), or did not complete the questionnaire accurately (n=35). Table 1 summarizes the various reasons students were excluded from the data analysis.

Table 1. Reasons for Excluding Students from the Data Analysis

Reason	Number of Males	Number of Females	Total Number	% of Total Surveyed
Did not intend to begin an exercise program	21	36	57	9
Did not meet six-month adherence criteria	20	20	40	7
Did not complete questionnaire accurately	20	15	35	6
Over 24 years of age	13	14	27	4
Did not meet regular exercise criteria	10	13	23	4
Member of an intercollegiate athletic team	15	4	19	3
Physical disability or injury	8	5	13	2
Totals	107	107	214	35



The mean age of the usable sample ( $n=397$ ) was 20.8 (range = 18-24 years old), and consisted of 54.4% ( $n=216$ ) females and 45.6% ( $n=181$ ) males. With respect to class standing, 24.2% ( $n=96$ ) were freshmen, 25.4% ( $n=101$ ) sophomores, 24.4% ( $n=97$ ) juniors, 25.7% ( $n=102$ ) seniors, and 0.3% ( $n=1$ ) other. Of the participants, 51.4% ( $n=204$ ) lived off-campus, 38.5% ( $n=153$ ) lived on-campus in a residence hall, and 10.1% ( $n=40$ ) in a fraternity or sorority house.

The aerobic exercise group consisted of 96 students (49 females, 47 males), while a total of 77 students (17 females, 60 males) met the criteria for the non-aerobic exercise group. The non-exercise group was comprised of 224 students (150 females, 74 males).

#### RELIABILITIES OF SCALES

Internal consistency estimates were assessed for the Self-Control Schedule (SCS), Self-Motivation Inventory (SMI), and Commitment to Aerobic Exercise (CAE) scale in both the pilot and actual study. Table 2 compares the pilot and actual study coefficient alphas, as well as those reported in the literature (Dishman and Ickes, 1981; Deeter, 1989; Gruger, 1981;

Redden et al., 1983).

**Table 2. Internal Consistency Reliabilities  
for the SCS, SMI and CAE**

Scale	Coefficient Alphas from Pilot Study	Coefficient Alphas from Actual Study	Coefficient Alphas from Literature
SCS	.82	.79	.82
SMI	.93	.92	.91
CAE	.94	.91	.85-.91

Although the coefficient alphas dropped slightly in the actual study compared to the pilot study, they remain consistent with the existing literature.

## **RESULTS**

In order to test the hypotheses in this study, one-way analyses of variance (ANOVA) and a multiple discriminant function analysis were conducted. Chi-square analyses were used to assess the relationship between three demographic variables and exercise group membership. Furthermore, a two-way analysis of

variance (group x gender) was performed on the Self-Control Schedule, Self-Motivation Inventory, and Commitment to Exercise (CAE) scale.

### **Hypothesis One**

Hypothesis number one stated that, "There will be no significant differences between the aerobic exercise adherence group, the non-aerobic exercise adherence group, and the non-exercise group relative to self-reported time commitments. This variable will be assessed by items 7-9 (i.e., weekly school/work/extracurricular time commitments) of the demographic portion of this study's questionnaire." The students in this study reported a mean of 27.1 (SD=12.8, range = 8-95) hours in weekly time commitments. Table 3 illustrates mean hours for weekly time commitments by the entire sample and exercise groups.



Table 3. The Mean Hours for Weekly  
Time Commitments

Group	$\bar{X}$	SD	N
Entire Sample	27.1	12.8	397
Classification			
Aerobic	27.8	11.7	96
Non-Aerobic	28.4	13.1	77
Non-Exercise	26.4	13.3	224

The results of an ANOVA indicated that time commitment varied for individuals within the same exercise group and the between group means did not differ substantially (see Table 4). Therefore, the ANOVA was not significant and the hypothesis was supported.

Table 4. ANOVA on Weekly Time Commitments  
by Exercise Group

Source	DF	SS	MS	F
Between				
Groups	2	297.8211	148.9105	.9001*
Within				
Groups	394	65182.3754	165.4375	
Total	396	65480.1965		
*NS				

### Hypothesis Two

Hypothesis number two proposed that, "The exercise adherence groups (i.e., aerobic and non-aerobic) will report a higher level of learned resourcefulness when compared to the non-exercise group, such that the former groups will have greater mean scores on the Self-Control Schedule (SCS) than the latter group." A sub-hypothesis (2A) stated that, "The SCS will discriminate significantly between the exercise adherence groups and the non-exercise group." Another sub-hypothesis (2B) stated that, "The aerobic exercise adherence group will report a higher level of learned

resourcefulness when compared to the non-aerobic exercise adherence group." With scores ranging from -21 to 94 (out of a possible range of -108 to +108), the mean score on the Self-Control Schedule (SCS) in this study was 30.3 (SD=16.9) which is slightly lower than the mean score among college students reported in the literature ( $\bar{x}$ =31.6; SD=20.8), (Redden et al., 1983; Richards, 1985). Table 5 illustrates the SCS mean scores by the entire sample and exercise groups.

**Table 5. Self-Control Schedule Mean Scores**

Group	$\bar{X}$	SD	N
Entire Sample	30.3	16.9	397
Classification			
Aerobic	35.6	17.7	96
Non-Aerobic	31.7	16.5	77
Non-Exercise	27.5	16.0	224

A one-way ANOVA was performed on the SCS. Table 6 shows the results of the ANOVA on the SCS by exercise group.



**Table 6. ANOVA on Self-Control Schedule  
Mean Scores by Exercise Group**

Source	DF	SS	MS	F
Between Groups	2	4611.1201	2305.5601	8.4042*
Within Groups	394	108087.6356	274.3341	
Total	396	112698.7557		
*p < .0003				

The SCS mean scores did not vary much for individuals within the same exercise group, but the between group means differed substantially. A Scheffe' multiple comparison procedure was performed and revealed that mean differences between the aerobic exercise group and the non-exercise group were significantly different at the 0.05 level. Thus, while the SCS did discriminate significantly between the aerobic exercise adherence group and the non-exercise group, the difference between the non-aerobic exercise adherence group and the non-exercise group did not attain significance. These findings partially support the second

hypothesis of this study. The sub-hypothesis, 2B, was not supported since no significant difference was found between the aerobic exercise adherence group and the non-aerobic exercise adherence group relative to learned resourcefulness.

### **Hypothesis Three**

Hypothesis number three stated that, "The exercise adherence groups (i.e., aerobic and non-aerobic) will report a higher level of self-motivation when compared to the non-exercise group, such that the former groups will have greater mean scores on the Self-Motivation Inventory (SMI) than the latter group." A sub-hypotheses (3A) proposed that, "The SMI will discriminate significantly between the exercise adherence groups and the non-exercise group." On the Self-Motivation Inventory (SMI), the sample in this study had scores ranging from 74 to 192 (out of a possible range of 40 to 200) with a mean score of 140.2 (SD=21.0). This mean score is consistent with those reported in the literature ( $\bar{x}$ =140.5; SD=19.4), (Dishman and Ickes, 1981). The SMI mean scores by the entire sample and exercise group are presented in Table 7.

Table 7. Self-Motivation Inventory Mean Scores

Group	$\bar{X}$	SD	N
Entire Sample	140.2	21.0	397
Classification			
Aerobic	148.0	22.1	96
Non-Aerobic	144.5	18.1	77
Non-Exercise	135.3	20.2	224

An ANOVA was performed on the SMI. As illustrated in Table 8, SMI scores did not vary much for individuals within the same exercise group, but the between group means differed substantially.



Table 8. ANOVA on Self-Motivation Inventory  
Mean Scores by Exercise Group

Source	DF	SS	MS	F
Between Groups	2	12467.7421	6233.8711	15.1581*
Within Groups	394	162035.2654	411.2570	
Total	396	174503.0076		
*p < .00001				

The Scheffe' multiple comparison procedure showed that the aerobic exercise and non-exercise groups, as well as the non-aerobic exercise and non-exercise groups were significantly different at the 0.05 level. These results fully support the third hypothesis of this study.

#### Hypothesis Four

The fourth hypothesis of this study proposed that, "The aerobic exercise adherence group will report a higher level of commitment to aerobic exercise when compared to the non-aerobic exercise

adherence group and the non-exercise group, such that the former group will have a greater mean score on the Commitment to Aerobic Exercise (CAE) scale than the latter groups." A sub-hypothesis (4A) stated that, "The CAE will discriminate significantly between the aerobic exercise adherence group and both the non-aerobic exercise adherence group and the non-exercise group." The Commitment to Aerobic Exercise (CAE) scale had a mean score of 39.6 (SD=9.3) among this sample, with scores ranging from 12 to 60 (out of a possible range of 12 to 60). Table 9 contains the CAE mean scores by the entire sample and exercise groups.

Table 9. Commitment to Aerobic Exercise Mean Scores

Group	$\bar{X}$	SD	N
Entire sample	39.6	9.3	397
Classification			
Aerobic	46.4	8.5	96
Non-Aerobic	40.9	8.3	77
Non-Exercise	36.2	8.3	224

As shown in Table 10, the results of an ANOVA

found that CAE scores did not vary much for individuals within the same exercise group, but the between group means differed substantially.

Table 10. ANOVA on Commitment to Aerobic Exercise  
Mean Scores by Exercise Group

Source	DF	SS	MS	F
Between Groups	2	7095.7432	3547.8716	50.8184*
Within Groups	394	27507.0074	69.8147	
Total	396	34602.7506		
*p < .00001				

Furthermore, the Scheffe' multiple comparison procedure showed that the aerobic and non-aerobic exercise groups, the aerobic and non-exercise groups, and the non-aerobic and non-exercise groups were all significantly different at the 0.05 level. As a result of this analysis, the fourth hypothesis of this study was fully supported. This study did not include a hypothesis regarding significant differences between the



non-aerobic adherence group and the non-exercise group.

### **Significance of Demographic Predictor Variables**

Although hypotheses were not generated for the demographic variables, gender, class standing, and place of residence, chi-square tests were conducted to examine their association with exercise group membership. Two chi-square tests indicated that there were no significant associations between class standing and exercise group or between place of residence and exercise group. Summary tables are not presented since no significant results were found and no hypotheses were generated for these two variables. However, a statistically significant association was found between gender and exercise group ( $p < .00001$ ). In Table 11, it can be observed that men were more likely to be exercise adherers (aerobically and non-aerobically) than women. The females were most likely to be non-exercisers.

Table 11. A Comparison of Gender  
by Exercise Group

Group	Male	Female
	(n=181)	(n=216)
	%	%
Aerobic	26.0	22.7
Non-Aerobic	33.1	7.9
Non-Exercise	40.9	69.4
$\chi^2$ (df=2) = 47.12, $p < .00001$		

The chi-square analysis found a significant interaction between gender and exercise group, and a series of ANOVA tests found significant differences between SCS, SMI and CAE scores among exercise groups. Therefore, a two-way ANOVA (group x gender) was performed on each of the above subscales.

In this study, the mean score on the Self-Control Schedule (SCS) was 29.9 (SD=16.9) for females and 30.7 (SD=16.9) for males. The results of the two-way ANOVA for the SCS are displayed in Table 12.

Table 12. ANOVA on Self-Control Schedule Scores  
by Group and Gender

Source	SS	DF	MS	F
Group	4596.668	2	2298.334	8.383*
Gender	39.047	1	39.047	.706
GroupxGender	855.872	2	427.936	1.561
Residual	107192.717	391	274.150	
*p < .0001				

The results of the analysis revealed a significant effect among the exercise groups, but did not reveal a significant effect for gender or an interaction effect.

In this study, the mean score on the Self-Motivation Inventory (SMI) was 139.9 (SD=21.1) for females and 140.4 (SD=21.0) for males. Table 13 illustrates the results of the two-way ANOVA for the SMI.



Table 13. ANOVA on Self-Motivation Inventory  
Scores by Group and Gender

Source	SS	DF	MS	F
Group	12992.711	2	6496.355	15.748*
Gender	549.892	1	549.892	1.333
GroupxGender	193.195	2	96.597	.234
Residual	161292.179	391	412.512	
*p < .0001				

Once again, the analysis revealed a significant effect among the exercise groups, but did not reveal a significant effect for gender or an interaction effect.

The mean score on the Commitment to Aerobic Exercise (CAE) scale was 40.1 (SD=9.3) for females and 39.0 (SD=9.3) for males. The results of a two-way ANOVA for the CAE revealed a significant effect among exercise groups and gender, but did not reveal a significant interaction effect (see Table 14).

Table 14. ANOVA on Commitment to Aerobic Exercise  
Scores by Group and Gender

Source	SS	DF	MS	F
Group	7718.257	2	3859.128	56.372*
Gender	732.052	1	732.052	10.693**
GroupxGender	7.990	2	3.995	.058
Residual	26766.965	391	68.458	

\*p < .0001  
\*\*p < .001

### Multiple Discriminant Function Analysis

In order to test the ability of the Self-Control Schedule (SCS), Self-Motivation Inventory (SMI), and Commitment to Exercise (CAE) scale, and various demographic variables to discriminate between the three exercise groups, a multiple discriminant function analysis was conducted in this study. Seven discriminating variables (i.e., gender, class standing, place of residence, weekly time commitments, SCS scores, SMI scores, and CAE scores) were entered simultaneously into the analysis in an attempt to distinguish between aerobic exercise adherers, non-aerobic exercise

adherers, and non-exercisers. Two demographic variables, class standing and place of residence, were "dummy-coded" because each variable consists of more than two categories on a nominal scale of measurement (Norusis, 1988). Thus, these two variables (class standing and place of residence) need to be interpreted in relation to the nominal category not entered into the discriminant analysis (i.e., freshman class standing or on-campus residence).

The multiple discriminant analysis produced two functions, the first accounting for 83.7% of common variance and the second 16.3%. The first discriminant function was extracted with an eigenvalue of .42,  $\chi^2(22)=167.1$ ,  $p < .00001$ , and the second with an eigenvalue of .08,  $\chi^2(10)=30.7$ ,  $p < .0007$ . These values indicate that the first function was clearly the most important in distinguishing between the three exercise groups (see Table 15).



**Table 15. Discriminant Function Analysis Predicting Membership  
in One of Three Exercise Groups**

Function	% of Variance	Canonical Correlation	Eigenvalue	Chi- Square	DF	Sig.
Function 1	83.7	0.54	0.42	167.1	22	0.00001
Function 2	16.3	0.27	0.08	30.7	10	0.0007

**Pooled Within-Groups Correlations (Structure Coefficients)**

Characteristics	Function 1	Function 2
Commitment to Aerobic Exercise (CAE)	.741	-.576
Self-Motivation (SMI)	.426	-.090
Learned Resourcefulness (SCS)	.307	-.194
Fraternity/Sorority (vs. On-Campus)	-.116	-.010
Time Commitment	.097	.084
Senior (vs. Freshman)	.097	.071
Other (vs. Freshman)	-.068	-.017

**continued**

(Table 15 continued)**Pooled Within-Groups Correlations (Structure Coefficients)**

<b>Characteristics</b>	<b>Function 1</b>	<b>Function 2</b>
Gender	.433	.825
Sophomore (vs. Freshman)	.006	.248
Junior (vs. Freshman)	.039	-.152
Off-Campus (vs. On-Campus)	.046	.068

**Group Centroids**

<b>Group</b>	<b>Function 1</b>	<b>Function 2</b>
Aerobic	.828	-.348
Non-Aerobic	.608	.516
Non-Exercise	-.564	-.028

Using the weights from these functions, a classification analysis procedure correctly classified 62.2% of the students into one of the three groups (a 33% level of correct classification would be expected by chance).

In discriminant analysis, the structure coefficients (the pooled within-groups correlations between the discriminating variables and the derived function as shown in Table 15) represent the unique contribution of each discriminating variable to the discriminant solution. An inspection of the structure coefficients revealed that the variable "commitment to aerobic exercise" (.74), was most strongly correlated with the first discriminant function, followed in order of importance by "self-motivation" (.43), "learned resourcefulness" (SCS), (.31), fraternity/sorority house versus on-campus residence hall (-.12), time commitments (.10), senior versus freshman class standing (.10), and other versus freshman class standing (-.07). Gender (.82), sophomore versus freshman class standing (.25), junior versus freshman class standing (-.15), and off-campus versus on-campus residence hall (.07) loaded on the second function, with gender clearly having the highest order correlation.



The group centroids for the two functions (see Table 15) showed that the first function clearly separated the three groups. They indicated that the greatest disparity existed between the aerobic exercise group (.83) and the non-exercise group (-.56). The most similar ones, according to the group centroids, were the aerobic exercise group (.83) and the non-aerobic exercise group (.61). The second function was unable to clearly distinguish between the three groups. Furthermore, an examination of the intercorrelations among the discriminating variables suggested that multicollinearity (redundant contribution to the total variance) was not a significant problem in the analysis. Self-motivation (SMI) and learned resourcefulness (SCS) were correlated at .54. No other intercorrelations reached .35.

### DISCUSSION OF FINDINGS

Of the hypotheses generated for this study, three were fully supported and one was partially supported by the data. The first hypothesis proposed that there would be no significant differences between the aerobic exercise adherence group, the non-aerobic exercise adherence group, and the non-exercise group

relative to self-reported time commitments. This hypothesis was supported as evidenced by a one-way ANOVA which showed that no two groups were significantly different based on time commitments. Though not statistically significant, it is interesting to note that the exercise adherence groups actually reported higher levels of time commitments than the non-exercise group. These results were consistent with a number of other research efforts which have found that regular exercisers are as likely as, or even more likely than, sedentary individuals to view time as a barrier to exercise (Canada Fitness Survey, 1983; Dishman et al., 1985).

The second hypothesis of this study stated that the exercise adherence groups (i.e., aerobic and non-aerobic) would report a higher level of learned resourcefulness when compared to the non-exercise group. Based on a one-way ANOVA and Scheffe' post-hoc comparison procedure, this hypothesis was partially supported in that the SCS did discriminate significantly between the aerobic exercise adherence group and the non-exercise group, but did not discriminate significantly between the non-aerobic exercise adherence group and the non-exercise group. A sub-

hypothesis stated that the aerobic exercise adherence group would report a higher level of learned resourcefulness than the non-aerobic exercise adherence group. Although the mean scores indicate that the aerobic exercise adherence group was higher on this measure than the non-aerobic exercise adherence group ( $\bar{x}=35.6$ ,  $SD=17.7$  versus  $\bar{x}=31.7$ ,  $SD=16.5$ ), no significant difference was found. No previous research is known to have assessed the relationship between learned resourcefulness in exercise adherence.

The third hypothesis in this investigation concerned self-motivation. It was proposed that the exercise adherence groups (i.e., aerobic and non-aerobic) would report a higher level of self-motivation when compared to the non-exercise group. As the result of a one-way ANOVA and Scheffe' post-hoc comparison procedure, this hypothesis was supported with the aerobic and non-aerobic adherence groups reporting significantly higher levels of self-motivation ( $\bar{x}=148.0$ ,  $SD=22.1$  and  $\bar{x}=144.5$ ,  $SD=18.1$ , respectively) than the non-exercise group ( $\bar{x}=135.3$ ,  $SD=20.2$ ). These results were in agreement with a number of other research efforts which have found self-motivation to be strongly associated with exercise



adherence (Dishman, 1983; Dishman and Gettman, 1980; Dishman and Ickes, 1981; Freedson et al., 1983; Knapp et al., 1984; Olson and Zanna, 1982; Snyder et al., 1982; Stone, 1983; Thompson et al., 1984).

Evidence to confirm the final hypothesis in this study was also found resulting from a one-way ANOVA and Scheffe' post-hoc comparison procedure. This hypothesis proposed that the aerobic exercise adherence group would report a higher level of commitment to aerobic exercise when compared to the non-aerobic exercise adherence group and the non-exercise group. The hypothesis was supported with the aerobic exercise adherers reporting a significantly higher level of commitment ( $\bar{x}=46.4$ ,  $SD=8.5$ ) than both the non-aerobic adherers ( $\bar{x}=40.9$ ,  $SD=8.3$ ) and the non-exercisers ( $\bar{x}=36.2$ ,  $SD=8.3$ ). Although it was not hypothesized, the CAE also discriminated significantly between the non-aerobic exercise adherence group and the non-exercise group suggesting that exercise adherers (regardless of the type of exercise, i.e., aerobic or non-aerobic) are more committed to exercise in general. No previous research has assessed the relationship between commitment to aerobic exercise and exercise adherence. However, a small number of

investigations have studied commitment to running and commitment to physical activity generally, and found them to be predictive of exercise behavior (Carmack and Martens, 1979; Deeter, 1989; Gruger, 1981; Nielsen and Corbin, 1986).

No hypotheses were generated regarding gender, class standing, and place of residence. However, associations between these three variables and membership in the exercise groups were explored. No significant interactions were found between class standing and place of residence by exercise group membership. A chi-square analysis demonstrated significant findings between exercise group and gender. This is a result of a greater percentage of males in the non-aerobic exercise adherence group (77.9%) and a greater percentage of females in the non-exercise group (67.0%). Two-way ANOVAs showed that there was a significant difference in mean scores on the SCS and SMI scales between exercise groups, but not between males and females. CAE scale mean scores were significantly different between both exercise groups, and males and females. In regard to the SCS, SMI, and CAE, no two-way ANOVA interaction effects were found between group and gender.

Multiple discriminant analysis revealed that the psychological variables (i.e., learned resourcefulness, self-motivation, and commitment to aerobic exercise) were the strongest discriminators of exercise behavior. They accounted for a large portion (83.7%) of the variance explained by the first function. Commitment to aerobic exercise best distinguished between the exercise groups (55% of the variance explained by function one), followed by self-motivation (18%) and learned resourcefulness (10%). The second function, which includes only demographic variables, accounted for just 16.3% of the total variance in the multiple discriminant analysis. Gender explained 68% of the variance within function two.

To summarize the analyses of this study, the psychological variables were stronger discriminators of exercise adherence behavior than the demographic variables assessed in this study. Commitment to aerobic exercise was the most powerful psychological discriminator of exercise behavior. Self-motivation and learned resourcefulness were psychological variables of somewhat lesser importance. Among the demographic variables, only gender appeared to be significantly



related to exercise adherence. Weekly time commitments, class standing, and place of residence explained little of the variance in this study. These findings support the need to focus on psychological aspects and motivational determinants of exercise maintenance rather than on situational barriers (Dishman, 1985; Dishman, 1988; Sonstroem, 1982).

## CHAPTER FIVE

### CONCLUSIONS AND RECOMMENDATIONS

#### CONCLUSIONS

This study attempted to identify characteristics which distinguish between individuals who adhere to regular aerobic exercise, those who adhere to regular non-aerobic exercise, and those who do not exercise regularly but intend to do so within the next year. More specifically, an attempt was made to assess the relative importance of learned resourcefulness, self-motivation, commitment to aerobic exercise, and various demographic variables to discriminate between three patterns of exercise adherence. The participants were traditional-age college students (i.e., 18-24 years old). The instruments employed in the study were a demographic questionnaire, the Self-Control Schedule (Rosenbaum, 1980), the Self-Motivation Inventory (Dishman and Ickes, 1981), and the Commitment to Aerobic Exercise scale.

Based on the findings of this study, it is concluded that:

- 1) weekly time commitments do not appear to be a barrier to exercise adherence among college students;

- 2) aerobic exercise adherers report a significantly higher level of learned resourcefulness compared to non-exercisers;
- 3) non-aerobic exercise adherers do not report a significantly higher level of learned resourcefulness compared to non-exercisers;
- 4) aerobic exercise adherers do not report a significantly higher level of learned resourcefulness compared to non-aerobic exercise adherers;
- 5) aerobic exercise adherers and non-aerobic exercise adherers report significantly higher levels of self-motivation compared to non-exercisers;
- 6) aerobic exercise adherers do not report a higher level of self-motivation compared to non-aerobic exercise adherers;
- 7) aerobic exercise adherers report a significantly higher level of commitment to aerobic exercise compared to non-aerobic adherers and non-exercisers; and
- 8) non-aerobic exercise adherers report a significantly higher level of commitment to aerobic exercise compared to non-exercisers.

An apparent strength of this study is that it employed a relatively rigid criteria for membership in



the aerobic exercise adherence group, the non-aerobic exercise adherence group, and the non-exercise group. This criteria was largely based on Cooper's (1982) aerobic point system. This was the first study known to rely on this system for assigning individuals to different types of exercise adherence groups. Previous research has primarily focused on general physical activity levels, rather than on specific types of exercise adherence (Dishman et al., 1985). For example, in this study's non-exercise group, only those individuals who intended to exercise were included. This specificity of groups appears to be important in identifying those characteristics that predict exercise adherence. Dishman et al. (1985) support this notion by contending that broad and diffuse concepts of exercise are weak at explaining adherence behavior. This may be one reason why a great deal of previous exercise adherence research has failed to identify important predictors in exercise adherence behavior. Furthermore, this lack of specificity has probably contributed to the dearth of theory development in this area.

One weakness of this study pertains to its reliance on unverified student self-reports. The

degree to which students responded to the questionnaire in a "socially desirable" manner is not known. Unfortunately, previous exercise adherence research indicates that validation of self-report data is exceedingly difficult (Baranowski, 1988). It seems reasonable to assume that some degree of overreporting physical activity levels did occur. However, since there is not a strong social stigma in this culture against non-exercisers, it could be speculated that the findings in this study are biased only to a minimal degree.

Another important issue addressed in this study concerns the relative efficacy of the three psychological variables (i.e., commitment to aerobic exercise, self-motivation, and learned resourcefulness) in their ability to distinguish between exercise behavior. No previous research is known to have compared the efficacy of these three psychological variables in an exercise adherence study. As demonstrated in this work, commitment to aerobic exercise was the most important discriminator of exercise adherence, followed in order by self-motivation and learned resourcefulness. All three variables appeared to make a meaningful contribution to the discriminant solution



(i.e., structure coefficients  $> .30$ ). In addition, the inter-correlations between these variables indicate that there is relatively little overlap between them. That is, they appear to be relatively independent of each other. This suggests that each variable needs to be considered in the future development of an exercise adherence model.

Although previous research has focused little attention on the concept of commitment, it obviously plays an important role in understanding exercise adherence. Unfortunately, it also poses new problems. For example, a review of the scale's items raises the question of whether it actually assesses this construct, or variables related to "attraction to", or "enjoyment of" aerobic exercise.

Another problem with the commitment concept pertains to intervention strategies. Commitment to exercise is viewed as a process through which a contract with "self" is made (Deeter, 1989). Health educators would presumably want to find ways to intervene with commitment by understanding what evokes it. It seems reasonable to assume that commitment develops at some point in time during an individual's life, and therefore could be influenced by timely interventions.



Yet, it may be that a concept as broad and individualistic as commitment can not be easily influenced or altered. Perhaps, commitment to exercise is central and basic to many exercisers' personal identity or sense of "self", and can not be reasonably understood within a cognitive or reductionistic model. Commitment to exercise may develop independent of barriers to exercise and factual knowledge of the beneficial effects of physical fitness. These conditions suggest that health educators had best explore affective intervention strategies in an effort to promote exercise adherence.

Previous research has supported the importance of self-motivation in the assessment of exercise behavior (Dishman, 1983; Dishman and Gettman, 1980; Dishman and Ickes, 1981; Freedson et al., 1983; Knapp et al., 1984; Olson and Zanna, 1982; Snyder et al., 1982; Stone, 1983; Thompson et al., 1984). Self-motivation is similar to the concept of commitment in that it may not be easily influenced or altered. Health educators need to have a better understanding of what stimulates self-motivation prior to developing successful intervention strategies. Furthermore, it is important to assess whether self-motivation is a predictor, or

outcome of exercise adherence.

This was the first known study to use learned resourcefulness in the assessment of exercise behavior. The findings from this study indicate that learned resourcefulness does account for a relatively small, but meaningful portion of the variability in exercise adherence. This suggests that a specific subset of college students could benefit from intervention strategies based on self-control skills. For example, skill building strategies could focus on identifying positive self statements which promote exercise adherence, use of reinforcers to maintain exercise behavior, self-monitoring to increase awareness of current exercise behavior, and problem solving skills to overcome personal barriers to exercise. In order for these strategies to be effective they would have to be targeted to those individuals who intend to exercise, but fail to do so because of poorly developed self-control skills. It should be recognized that intervention strategies based solely on this approach would probably not be successful. Many college students probably fail to maintain exercise regimens for reasons other than just a lack of learned resourcefulness.



The present study was successful in establishing a relationship between exercise adherence and the variables commitment, self-motivation, and learned resourcefulness. Currently, it is not clear whether these variables are predictors, or outcomes of exercise adherence. Therefore, future research should attempt to identify the direction of the relationship between these psychological variables and exercise adherence. Appropriately designed prospective studies would be useful to this end.

Four demographic variables were included in this study. They include gender, weekly time commitments, class standing, and place of residence. Of these four, gender was the only variable that discriminated significantly between the three exercise groups. Compared to the three psychological discriminating variables in this study (i.e., commitment to aerobic exercise, self-motivation, and learned resourcefulness), gender was of lesser importance in the discriminant analysis. Thus, demographic variables, including weekly time commitments and place of residence which have been described as barriers in the literature, do not seem to be of paramount importance in understanding exercise adherence behavior among



college students. These findings suggest that health education can potentially impact exercise adherence behavior since it does not seem to depend upon relatively unchangeable demographic characteristics such as time commitments. Moreover, these findings suggest that health educators should view students' perceived barriers to maintaining an exercise regimen (e.g., time commitments, place of residence) with skepticism and probe for more fundamental causes.

### RECOMMENDATIONS

An examination of the group centroids that resulted from the discriminant function analysis, suggests that the aerobic exercise adherence group and the non-aerobic exercise adherence group were relatively similar to each other in terms of the discriminating variables assessed in this study. The non-exercise group appeared to be quite dissimilar from these two groups relative to the discriminating variables.

Such findings suggest that at least a fourth exercise group could be identified. Future studies could attempt to develop a continuum of exercise involvement. This kind of effort would likely

identify numerous categories of exercisers and non-exercisers extending from those who engage in frequent, long-term, intense aerobic exercise to those who never exercise and are attitudinally opposed to ever doing so. In this way, future studies may be able to explain a great deal more of the variance than that accounted for in this study. Individuals in the following two categories probably need to be appraised in an effort to fully understand exercise adherence:

- 1) people who presently exercise but do not meet the six-month adherence criterion; and 2) people who perceive themselves as regular exercisers but do not meet some external criteria for being considered regular exercisers.

Based on the results and conclusions of this study, other recommendations include the following.

- 1) Future exercise adherence research should include an assessment of commitment to exercise, self-motivation, and learned resourcefulness.
- 2) Attempts should be made to understand factors that may influence commitment to exercise. Some possibilities worthy of further study include an examination of the impact of childhood experiences (e.g., past activity, modelling, reinforcement,

- etc.), "attraction to" or "enjoyment of" aerobic exercise, fitness self-perceptions (e.g., perceived ability, physical competence), self-evaluation (i.e., comparison between performance and a standard), and exercise-specific locus of control on exercise adherence behavior.
- 3) Future research should explore those conditions that foster self-motivation and learned resourcefulness.
  - 4) The validity of the "Commitment to Aerobic Exercise" scale should be assessed to determine whether it is measuring the construct of commitment, or variables related to "attraction to" or "enjoyment of" aerobic exercise.
  - 5) Subscales for the Self-Control Schedule should be developed to assess the predictive value of each in the study of exercise adherence. The Self-Control Schedule was developed to measure four specific behaviors, but subscales have not been developed. The development of subscales would assist researchers in assessing those learned resourcefulness skills which correlate with exercise adherence.
  - 6) The three psychological variables in this study



need to be included in a prospective study which assesses young people as they move from intention to exercise, to initiation of exercise behavior, to various stages of exercise adherence. Such a study would help determine whether these variables are predictors, or outcomes of exercise adherence.

- 7) Path analysis should be employed to determine which, if any, psychological variables predict commitment to exercise.
- 8) Other discriminating variables which may effect exercise involvement and/or adherence should be assessed (e.g., overweight and smoking measures).

## APPENDIX A

## LIST OF 1990 OBJECTIVES FOR PHYSICAL ACTIVITY

- 1) "By 1990, the proportion of children and adolescents ages 10 to 17 participating regularly in appropriate physical activities, particularly cardio-respiratory fitness programs which can be carried into adulthood, should be greater than 90 percent."
- 2) "By 1990, the proportion of children and adolescents ages 10 to 17 participating in daily school physical education programs should be greater than 60 percent."
- 3) "By 1990, the proportion of adults 18 to 64 participating regularly in vigorous physical exercise should be greater than 60 percent."
- 4) "By 1990, 50 percent of adults 65 years and older should be engaging in appropriate physical activity, e.g., regular walking, swimming, or other aerobic activity."
- 5) "By 1990, the proportion of adults who can accurately identify the variety and duration of exercise thought to promote most effectively cardiovascular fitness should be greater than 70 percent."
- 6) "By 1990, the proportion of primary care physicians who include a careful exercise history as part of their initial examination of new patients should be greater than 50 percent."
- 7) "By 1990, the proportion of employees of companies and institutions with more than 500 employees offering employer-sponsored fitness programs should be greater than 25 percent."
- 8) "By 1990, a methodology for systematically assessing the physical fitness of children should be established with at least 70 percent of children and adolescents 10 to 17 participating in such an assessment."
- 9) "By 1990, data should be available with which to evaluate short and long term health effects of participating in programs of appropriate physical activity."

- 10) "By 1990, data should be available to evaluate the effects of participation in programs of physical fitness on job performance and health care costs."
- 11) "By 1990, data should be available for regular monitoring of national trends and patterns of participation in physical activity, including participation in public recreation programs in community facilities."

Note. From Promoting health/preventing disease: Objectives for the nation by U.S. Department of Health and Human Services, 1980. Washington, D.C.: Government Printing Office.



## APPENDIX B

## DEMOGRAPHICS

PLEASE RESPOND TO THE FOLLOWING INFORMATION ABOUT YOURSELF BY FILLING IN THE BLANK(S) OR CIRCLING THE CORRECT RESPONSE. **ALL ANSWERS ARE CONFIDENTIAL!**

1. In what year were you born? 19 \_\_\_\_
2. Are you presently a member of an intercollegiate athletic team?
  - a. Yes
  - b. No

If yes, what team? \_\_\_\_\_
3. Do you have a physical disability or injury which prevents you from exercising?
  - a. Yes
  - b. No

If yes, please specify: \_\_\_\_\_
4. What is your gender? \*
  - a. Female
  - b. Male
5. What is your class standing? \*
  - a. Freshman
  - b. Sophomore
  - c. Junior
  - d. Senior
  - e. Other
6. Where do you live? \*
  - a. On-campus in a residence hall (dorm)
  - b. In a fraternity/sorority house
  - c. Off-campus
7. How many credit hours are you registered for this semester? \* \_\_\_\_\_  
 How many of those hours are physical education activity courses? \_\_\_\_\_
8. Approximately how many hours a week do you work at a paid job? \* (NOTE:  
 If you do not work, put 0). \_\_\_\_\_
9. On the average, how many hours a week do you spend in volunteer work, or non-athletic, non-social extracurricular commitments (for example, fraternity/sorority meetings, R.A., student government, academic societies, etc.)? \* \_\_\_\_\_

\* = predictor variables

## APPENDIX C

## ASSESSMENT OF PHYSICAL EXERCISE

10. Do you currently exercise on a regular basis?
  - a. Yes (if you answered yes, continue with question **number 12**)
  - b. No (if you answered no, continue with question **number 11**)
11. Do you intend to start a regular exercise program sometime within the next year?
  - a. Yes (if you answered yes, continue with question **number 13**)
  - b. No (If you answered no, continue with question **number 13**)
12. Please describe the type(s) and amount of exercise activity that you have been involved in within the past year below:

How long

[illegible]

## APPENDIX D

## THE SELF-CONTROL SCHEDULE

THIS QUESTIONNAIRE IS DESIGNED TO FIND OUT HOW DIFFERENT PEOPLE VIEW THEIR THINKING AND THEIR BEHAVIOR. A STATEMENT MAY RANGE FROM VERY CHARACTERISTIC OF YOU TO VERY UNCHARACTERISTIC OF YOU.

THERE ARE **NO RIGHT OR WRONG ANSWERS**. WE SIMPLY WANT TO KNOW **HOW YOU FEEL** EACH STATEMENT APPLIES TO YOU.

PLEASE ANSWER EVERY ITEM, AND CIRCLE ONLY ONE ANSWER FOR EACH ITEM. USE THE FOLLOWING CODE TO INDICATE WHETHER A STATEMENT DESCRIBES YOUR THINKING OR BEHAVIOR

- 3 = very uncharacteristic of me, extremely uncharacteristic  
 -2 = rather uncharacteristic of me, quite uncharacteristic  
 -1 = somewhat uncharacteristic of me, slightly uncharacteristic  
 +1 = somewhat characteristic of me, slightly descriptive  
 +2 = rather characteristic of me, quite descriptive  
 +3 = very characteristic of me, extremely descriptive

13. When I do a boring job, I think about the less boring parts of the job and about the reward I will receive once I am finished. +3  
 -3 -2 -1 +1 +2
14. When I have to do something that is anxiety arousing for me, I try to visualize how I will overcome my anxieties while doing it. +3  
 -3 -2 -1 +1 +2
15. By changing my way of thinking, I am often able to change my feelings about almost anything. +3  
 -3 -2 -1 +1 +2
16. I often find it difficult to overcome my feelings of nervousness and tension without any outside help. +3  
 -3 -2 -1 +1 +2
17. When I am feeling depressed, I try to think about pleasant events. +3  
 -3 -2 -1 +1 +2
18. I cannot avoid thinking about mistakes I have made in the past. +3  
 -3 -2 -1 +1 +2
19. When I am faced with a difficult problem, I try to approach its solution in a systematic way. +3  
 -3 -2 -1 +1 +2
20. I usually do my duties quicker when someone is pressuring me. +3  
 -3 -2 -1 +1 +2
21. When I am faced with a difficult decision, I prefer to postpone making a decision even if all the facts are at my disposal. +3  
 -3 -2 -1 +1 +2
22. When I find that I have difficulties in concentrating on my reading, I look for ways to increase my concentration. +3  
 -3 -2 -1 +1 +2
23. When I plan to work, I remove all the things that are not relevant to my work. +3  
 -3 -2 -1 +1 +2



24. When I try to get rid of a bad habit, I first try to find out all the factors that maintain this habit. -3 -2 -1 +1 +2 +3
25. When an unpleasant thought is bothering me, I try to think about something pleasant. -3 -2 -1 +1 +2 +3
26. If I would smoke two packages of cigarettes a day, I probably would need outside help to stop smoking. -3 -2 -1 +1 +2 +3
27. When I am in a low mood, I try to act cheerful so my mood will change. -3 -2 -1 +1 +2 +3
28. If I had the pills with me, I would take a tranquilizer whenever I felt tense and nervous. -3 -2 -1 +1 +2 +3
29. When I am depressed, I try to keep myself busy with things that I like. -3 -2 -1 +1 +2 +3
30. I tend to postpone unpleasant duties even if I could perform them immediately. -3 -2 -1 +1 +2 +3
31. I need outside help to get rid of some of my bad habits. -3 -2 -1 +1 +2 +3
32. When I find it difficult to settle down and do a certain job, I look for ways to help me settle down. -3 -2 -1 +1 +2 +3
33. Although it makes me feel bad, I cannot help thinking about all sorts of possible catastrophes in the future. -3 -2 -1 +1 +2 +3
34. First of all I prefer to finish a job that I have to do and then start doing the things I really like. -3 -2 -1 +1 +2 +3
35. When I feel pain in a certain part of my body, I try not to think about it. -3 -2 -1 +1 +2 +3
36. My self-esteem increases once I am able to overcome a bad habit. -3 -2 -1 +1 +2 +3
37. In order to overcome bad feelings that accompany failure, I often tell myself that it is not so catastrophic and that I can do something about it. -3 -2 -1 +1 +2 +3
38. When I feel that I am too impulsive, I tell myself "stop and think before you do anything". -3 -2 -1 +1 +2 +3
39. Even when I am terribly angry at somebody, I consider my actions very carefully. -3 -2 -1 +1 +2 +3
40. Facing the need to make a decision, I usually find out all the possible alternatives instead of deciding quickly and spontaneously. -3 -2 -1 +1 +2 +3
41. Usually I do first the things I really like to do even if there are more urgent things to do. -3 -2 -1 +1 +2 +3

- |     |   |    |    |    |    |    |    |
|-----|---|----|----|----|----|----|----|
| 42. | When I realize that I cannot help but be late for an important meeting, I tell myself to keep calm.                         | -3 | -2 | -1 | +1 | +2 | +3 |
| 43. | When I feel pain in my body, I try to divert my thoughts from it.   | -3 | -2 | -1 | +1 | +2 | +3 |
| 44. | I usually plan my work when faced with a number of things to do.  | -3 | -2 | -1 | +1 | +2 | +3 |
| 45. | When I am short of money, I decide to record all my expenses in order to plan more carefully for the future.                | -3 | -2 | -1 | +1 | +2 | +3 |
| 46. | If I find it difficult to concentrate on a certain job, I divide the job into smaller segments.                             | -3 | -2 | -1 | +1 | +2 | +3 |
| 47. | Quite often I cannot overcome unpleasant thoughts that bother me.   | -3 | -2 | -1 | +1 | +2 | +3 |
| 48. | Once I am hungry and unable to eat, I try to divert my thoughts away from my stomach or try to imagine that I am satisfied. | -3 | -2 | -1 | +1 | +2 | +3 |

## SELF-CONTROL SCHEDULE

## Scoring Key

	"very uncharacteristic of me" to "very characteristic of me"					
13. -3	-2	-1	+1	+2		+3
14. -3	-2	-1	+1	+2		+3
15. -3	-2	-1	+1	+2		+3
16. +3	+2	+1	-1	-2		-3
17. -3	-2	-1	+1	+2		+3
18. +3	+2	+1	-1	-2		-3
19. -3	-2	-1	+1	+2		+3
20. +3	+2	+1	-1	-2		-3
21. +3	+2	+1	-1	-2		-3
22. -3	-2	-1	+1	+2		+3
23. -3	-2	-1	+1	+2		+3
24. -3	-2	-1	+1	+2		+3
25. -3	-2	-1	+1	+2		+3
26. +3	+2	+1	-1	-2		-3
27. -3	-2	-1	+1	+2		+3
28. +3	+2	+1	-1	-2		-3
29. -3	-2	-1	+1	+2		+3
30. +3	+2	+1	-1	-2		-3
31. +3	+2	+1	-1	-2		-3
32. -3	-2	-1	+1	+2		+3
33. +3	+2	+1	-1	-2		-3
34. -3	-2	-1	+1	+2		+3
35. -3	-2	-1	+1	+2		+3
36. -3	-2	-1	+1	+2		+3
37. -3	-2	-1	+1	+2		+3
38. -3	-2	-1	+1	+2		+3
39. -3	-2	-1	+1	+2		+3
40. -3	-2	-1	+1	+2		+3
41. +3	+2	+1	-1	-2		-3
42. -3	-2	-1	+1	+2		+3
43. -3	-2	-1	+1	+2		+3
44. -3	-2	-1	+1	+2		+3
45. -3	-2	-1	+1	+2		+3
46. -3	-2	-1	+1	+2		+3
47. +3	+2	+1	-1	-2		-3
48. -3	-2	-1	+1	+2		+3



APPENDIX E

SELF-MOTIVATION INVENTORY

READ EACH OF THE FOLLOWING STATEMENTS AND CIRCLE THE APPROPRIATE NUMBER TO THE RIGHT OF THE STATEMENT TO INDICATE HOW IT BEST DESCRIBES YOU. PLEASE BE SURE TO ANSWER EVERY ITEM AND TRY TO BE AS HONEST AND ACCURATE AS POSSIBLE IN YOUR RESPONSES. THERE ARE NO RIGHT OR WRONG ANSWERS. YOUR ANSWERS WILL BE KEPT IN THE STRICTEST CONFIDENCE.

	Very unlike me	Somewhat unlike me	Neither like me nor unlike me	Somewhat like me	Very much like me
49. I'm not very good at committing myself to do things ..... 1		2	3	4	5
50. Whenever I get bored with projects I start, I drop them to do something else ..... 1		2	3	4	5
51. I can persevere at stressful tasks, even when they are physically tiring or painful ..... 1		2	3	4	5
52. If something gets to be too much of an effort to do, I'm likely to just forget it ..... 1		2	3	4	5
53. I'm really concerned about developing and maintaining self-discipline ..... 1		2	3	4	5
54. I'm good at keeping promises, especially the ones I make to myself ... 1		2	3	4	5
55. I don't work any harder than I have to ..... 1		2	3	4	5
56. I seldom work to my full capacity ..... 1		2	3	4	5
57. I'm just not the goal-setting type ..... 1		2	3	4	5
58. When I take on a difficult job, I make a point of sticking with it until its completed ..... 1		2	3	4	5
59. I'm willing to work for things I want as long as it's not a big hassle for me ..... 1		2	3	4	5
60. I have a lot of self-motivation ..... 1		2	3	4	5

61. I'm good at making decisions and standing by them .....	1	2	3	4	5
62. I generally take the path of least resistance .....	1	2	3	4	5
63. I get discouraged easily .....	1	2	3	4	5
64. If I tell somebody I'll do something, you can depend on it being done .....	1	2	3	4	5
65. I don't like to overextend myself .....	1	2	3	4	5
66. I'm basically lazy .....	1	2	3	4	5
67. I have a very hard-driving, aggressive personality .....	1	2	3	4	5
68. I work harder than most of my friends .....	1	2	3	4	5
69. I can persist in spite of pain or discomfort ...	1	2	3	4	5
70. I like to set goals and work toward them .....	1	2	3	4	5
71. Sometimes I push myself harder than I should ....	1	2	3	4	5
72. I tend to be overly apathetic .....	1	2	3	4	5
73. I seldom, if ever, let myself down .....	1	2	3	4	5
74. I'm not very reliable ...	1	2	3	4	5
75. I like to take on jobs that challenge me .....	1	2	3	4	5
76. I change my mind about things quite easily .....	1	2	3	4	5
77. I have a lot of willpower .....	1	2	3	4	5
78. I'm not likely to put myself out if I don't have to .....	1	2	3	4	5
79. Things just don't matter much to me .....	1	2	3	4	5
80. I avoid stressful situations .....	1	2	3	4	5
81. I often work to the point of exhaustion .....	1	2	3	4	5

82. I don't impose much structure on my activities .....	1	2	3	4	5
83. I never force myself to do things I don't feel like doing .....	1	2	3	4	5
84. It takes a lot to get me going .....	1	2	3	4	5
85. Whenever I reach a goal, I set a higher one .....	1	2	3	4	5
86. I can persist in spite of failure .....	1	2	3	4	5
87. I have a strong desire to achieve .....	1	2	3	4	5
88. I don't have much self-discipline .....	1	2	3	4	5

Copyright 1978 by Rod K. Dishman. Reproduction of this test or any portion thereof by any process without written permission of the copyright holder is prohibited.

Note. Reprinted by permission by Dr. Rod K. Dishman, Department of Physical Education, The University of Georgia



## SELF-MOTIVATION INVENTORY

## Scoring Key

	a	b	c	d	e
49.	5	4	3	2	1
50.	5	4	3	2	1
51.	1	2	3	4	5
52.	5	4	3	2	1
53.	1	2	3	4	5
54.	1	2	3	4	5
55.	5	4	3	2	1
56.	5	4	3	2	1
57.	5	4	3	2	1
58.	1	2	3	4	5
59.	5	4	3	2	1
60.	1	2	3	4	5
61.	1	2	3	4	5
62.	5	4	3	2	1
63.	5	4	3	2	1
64.	1	2	3	4	5
65.	5	4	3	2	1
66.	5	4	3	2	1
67.	1	2	3	4	5
68.	1	2	3	4	5

	a	b	c	d	e
69.	1	2	3	4	5
70.	1	2	3	4	5
71.	1	2	3	4	5
72.	5	4	3	2	1
73.	1	2	3	4	5
74.	5	4	3	2	1
75.	1	2	3	4	5
76.	5	4	3	2	1
77.	1	2	3	4	5
78.	5	4	3	2	1
79.	5	4	3	2	1
80.	5	4	3	2	1
81.	1	2	3	4	5
82.	5	4	3	2	1
83.	5	4	3	2	1
84.	5	4	3	2	1
85.	1	2	3	4	5
86.	1	2	3	4	5
87.	1	2	3	4	5
88.	5	4	3	2	1

## APPENDIX F

## COMMITMENT TO AEROBIC EXERCISE SCALE

THE FOLLOWING STATEMENTS MAY OR MAY NOT DESCRIBE YOUR FEELINGS ABOUT AEROBIC EXERCISE. READ EACH STATEMENT AND THEN CIRCLE THE APPROPRIATE NUMBER TO INDICATE HOW WELL THE STATEMENT DESCRIBES **YOUR FEELINGS MOST OF THE TIME**. THERE ARE **NO RIGHT OR WRONG ANSWERS**. DO NOT SPEND TOO MUCH TIME ON ANY ONE ITEM, BUT GIVE THE ANSWERS WHICH SEEM TO DESCRIBE HOW YOU **GENERALLY FEEL** ABOUT AEROBIC EXERCISE.

**AEROBIC EXERCISE** is any physical exercise which causes you to **breath heavy** and work at **65-90% of your maximum heart rate**, for **15 to 60 minutes** at a time, at **least 3 days a week**. Some examples include, running, walking vigorously, swimming vigorously, bicycling vigorously, aerobic dance, etc.

	Strongly disagree	disagree	uncertain	agree	Strongly agree
89. I look forward to exercising (aerobically) ..... 1	1	2	3	4	5
90. I wish there were a more enjoyable way to stay fit ..... 1	1	2	3	4	5
91. Aerobic exercise is drudgery ..... 1	1	2	3	4	5
92. I do not enjoy exercising (aerobically) ..... 1	1	2	3	4	5
93. Aerobic exercise is vitally important to me ..... 1	1	2	3	4	5
94. Life is so much richer as a result of exercising (aerobically) ..... 1	1	2	3	4	5
95. Aerobic exercise is pleasant ..... 1	1	2	3	4	5
96. I dread the thought of exercising (aerobically) ..... 1	1	2	3	4	5
97. I would arrange or change my schedule to meet the need to exercise (aerobically) ..... 1	1	2	3	4	5
98. I have to force myself to exercise (aerobically) ..... 1	1	2	3	4	5
99. To miss a day of aerobic exercise is sheer relief ..... 1	1	2	3	4	5
100. Aerobic exercise is the high point of my day ..... 1	1	2	3	4	5

COMMITMENT TO AEROBIC EXERCISE SCALE

Scoring Key

	<u>a</u>	<u>b</u>	<u>c</u>	<u>d</u>	<u>e</u>
89.	1	2	3	4	5
90.	5	4	3	2	1
91.	5	4	3	2	1
92.	5	4	3	2	1
93.	1	2	3	4	5
94.	1	2	3	4	5
95.	1	2	3	4	5
96.	5	4	3	2	1
97.	1	2	3	4	5
98.	5	4	3	2	1
99.	5	4	3	2	1
100.	1	2	3	4	5



### REFERENCES

- Ajzen, I. and Fishbein, M. (1980). Understanding attitudes and predicting social behavior. Englewood Cliffs, New Jersey: Prentice-Hall.
- Albinson, J.G. (1974). Life styles of physically active and physically inactive college males. International Journal of Sport Psychology, 5, 93.
- Allen, R.J. (1983). Human stress: Its nature and control. Minneapolis, Minnesota: Burgess.
- Allport, G.W. and Ross, J.M. (1967). Personal religious orientation and prejudice. Journal of Personality and Social Psychology, 5, 432-443.
- American College of Sports Medicine (1986). Guidelines for exercise testing and prescription (3rd edition). Philadelphia, Pennsylvania: Lea and Febiger.
- American Council on Education and Higher Education Research Center at the University of California at Los Angeles (1988). Freshmen survey results. Author.

- Amir, S. (1985). Prediction of compliance and control in juvenile diabetes through self-control, perceptions and assertive behavior determinants. Unpublished master's thesis, Tel Aviv University, Tel Aviv.
- Andrew, G.M. and Parker, J.O. (1979). Factors related to dropout of post myocardial infarction patients from exercise programs. Medicine and Science in Sports and Exercise, 11, 376-378.
- Andrew, G.M., Oldridge, N.B., Parker, J.O., Cunningham, D.A., Rechnitzer, P.A., Jones, N.L., Buck, C., Kavanaugh, T., Shephard, R.J., Sutton, J.R., and McDonald, W. (1981). Reasons for dropout from exercise programs in post coronary patients. Medicine and Science in Sports and Exercise, 13, 164-168.
- Bakal, D.A. (1979). Psychology and medicine: Psychological dimensions of health and illness. New York: Springer.
- Bandura, A. (1977a). Self-efficacy: Towards a unifying theory of behavioral change. Psychological Review, 84, 192-215.
- Bandura, A. (1977b). Social learning theory. Englewood Cliffs, New Jersey: Prentice-Hall.

- Bandura, A. (1980). Gauging the relationship between self-efficacy judgment and action. Cognitive Therapy and Research, 4, 263-268.
- Bandura, A. (1982). Self-efficacy mechanism in human agency. American Psychologist, 37, 122-147.
- Bandura, A. and Adams, N.E. (1977). Analysis of self-efficacy theory of behavioral change. Cognitive Therapy and Research, 1, 287-308.
- Baranowski, T. (1988). Validity and reliability of self report measures of physical activity: An information-processing perspective. Research Quarterly for Exercise and Sport, 59 (4), 314-327.
- Barron, F. (1953). An ego-strength scale which predicts response to psychotherapy. Journal of Consulting Psychology, 17, 327-333.
- Bartley, D.A.R. and Belgrave, F.Z. (1987). Physical fitness and psychological wellbeing in college students. Health Education, June/July, 57-59.
- Beck, A.T., Ward, C.H., Mendelson, M., Mock, J.E., and Erbaugh, J.K. (1961). An inventory for measuring depression. Archives of General Psychiatry, 5, 561-571.



- Becker, M.H. and Maiman, L.A. (1975). Sociobehavioral determinants of compliance with health care and medical care recommendations. Medical Care, 13, 10-24.
- Beeler, K.D. (1986). Wellness education in higher education and student affairs. The College Student Affairs Journal, VI (3), 10-22.
- Bentler, P.M. and Speckart, G. (1981). Attitudes "cause" behaviors: A structural equation analysis. Journal of Personality and Social Psychology, 40, 226-238.
- Blackburn, H. (1976). Physical activity as primarily preventive in coronary disease. Proceedings of the International Congress of Physical Activity Sciences. Quebec City, Canada.
- Blair, S.N. (1984). How to assess exercise habits and physical fitness. In J.D. Matarazzo, S.M. Weiss, J.A. Herd, and N.E. Miller (Eds.), Behavioral Health: A handbook of health enhancement and disease prevention (pp. 424-446). New York: John Wiley and Sons.

- Blair, S.N. (1988). Exercise within a healthy lifestyle. In R.K. Dishman (Ed.), Exercise adherence: Its impact on public health (pp. 75-89). Champaign, Illinois: Human Kinetics.
- Blair, S.N., Jacobs, D.R., Jr., and Powell, K.E. (1985). Relationships between exercise or physical activity and other health behaviors. Public Health Reports, 100, 172-180.
- Blumenthal, J., Williams, R.S., Williams, R.B., and Wallace, A. (1980). Effects of exercise on type A behavior pattern. Psychosomatic Medicine, 42, 289-296.
- Boothby, J., Tungatt, M.F., and Townsend, A.R. (1981). Ceasing participation in sports activity: Reported reasons and their implications. Journal of Leisure Research, 13, 1-14.
- Boyer, J.L. and Kasch, F.W. (1970). Exercise therapy in hypertensive men. Journal of the American Medical Association, 211, 1668-1671.
- Brownell, K.D. (1982). Obesity: Understanding and treating a serious, prevalent, and refractory disorder. Journal of Consulting and Clinical Psychology, 50, 820-840.

- Bucher, C.A. (1974). National adult physical fitness survey: Some implications. Journal of Health, Physical Education, and Recreation, 45, 25-31.
- Budd, R. and Spencer, C. (1984). Latitude of rejection, centrality, and certainty: Variables affecting the relationship between attitudes, names and behavioral intentions. British Journal of Social Psychology, 23, 1-8.
- Byrd, O.E. (1963). The relief of tension by exercise and a survey of medical viewpoints and practices. Journal of School Health, 43, 238-239.
- Calnan, M.W. and Moss, S. (1984). The Health Belief Model and compliance with education given at a class in breast self-examination. Journal of Health and Social Behavior, 25, 198-210.
- Canada Fitness Survey (1983). Fitness and lifestyle in Canada. Ottawa: Fitness and Amateur Sport.
- Carey, M.P., Carey, K.B., Carnrike, C.L.M., and Meisler, A.W. (1988, November). Learned resourcefulness, drinking, and smoking. Paper presented at the annual meeting of the Association for the Advancement of Behavior Therapy, New York, New York.



- Carmack, M.A. and Martens, R. (1979). Measuring commitment to running: A survey of runner's attitudes and mental states. Journal of Sport Psychology, 1, 25-42.
- Carver, C.S. and Scheier, M.F. (1982). An information processing perspective on self-management. In P. Karoly and F.H. Kanfer (Eds.), Self-management and behavior change: From theory to practice (pp. 93-128). New York: Pergamon.
- Cattell, R.B., Eber, H.W., and Tatsuoka, M.M. (1970). Handbook for the 16 PF questionnaire. Champaign, Illinois: Institute for Personality and Ability Testing.
- Clarke, H.H. (Ed.). (1973, May). National adult physical fitness survey. President's Council on Physical Fitness and Sports Newsletter. Washington, D.C.
- Coelho, R.J. (1985). A psychometric investigation of the multidimensional health locus of control scales with cigarette smokers. Journal of Clinical Psychology, 41, 372-376.
- Cooper, K.H. (1968). Aerobics. New York: M. Evans and Company.

- Cooper, K.H. (1970). The new aerobics. New York: M. Evans and Company.
- Cooper, K.H. (1982). The aerobics program for total well-being. New York: Bantam.
- Cox, M.H. (1984). Fitness and life-style programs for business and industry: Problems in recruitment and retention. Journal of Cardiac Rehabilitation, 4, 136-142.
- Crowne, D.P. and Marlowe, D. (1964). The approval motive: Studies in evaluative dependence. New York: John Wiley and Sons.
- Davis, K.E., Jackson, K.L., Kronenfeld, J.J., and Blair, S.N. (1984). Intent to participate in worksite health promotion activities: A model of risk factors and psychosocial variables. Health Education Quarterly, 11, 361-377.
- Deeter, T.E. (1989). Does attitudinal commitment predict physical activity participation? Journal of Sport Behavior, 11 (3), 177-192.
- deVries, H.A. (1968). Immediate and long-term effects of exercise upon resting muscle action potential level. Journal of Sports Medicine and Physical Fitness, 8, 1-11.

- Diclemente, C.C. (1981). Self-efficacy and smoking cessation maintenance: A preliminary report. Cognitive Therapy and Research, 5, 175-187.
- Dishman, R.K. (1978). Aerobic power, estimation of physical ability, and attraction to physical activity. Research Quarterly for Exercise and Sport, 49, 285-292.
- Dishman, R.K. (1981). Biologic influences on exercise adherence. Research Quarterly for Exercise and Sport, 52, 143-159.
- Dishman, R.K. (1982a). Compliance/adherence in health-related exercise. Health Psychology, 1, 237-267.
- Dishman, R.K. (1982b). Contemporary sport psychology. Exercise and Sport Sciences Reviews, 10, 120-157.
- Dishman, R.K. (1982c). Health psychology and exercise adherence. Quest, 33 (2), 166-180.
- Dishman, R.K. (1983). Predicting exercise compliance using psychometric and behavioral measures of commitment. Medicine and Science in Sports and Exercise, 15, 118.



- Dishman, R.K. (1985). Medical psychology in exercise and sport. Medical Clinics of North America, 69 (1), 123-143.
- Dishman, R.K. (1987). Exercise adherence and habitual physical activity. In W.P. Morgan and S.N. Goldston (Eds.), Exercise and mental health (pp. 57-83). Washington, D.C.: Hemisphere.
- Dishman, R.K. (1988). Exercise adherence: Its impact on public health. Champaign, Illinois: Human Kinetics.
- Dishman, R.K. and Dunn, A.L. (1988). Exercise adherence in children and youth: Implications for adulthood. In R.K. Dishman (Ed.), Exercise adherence: Its impact on public health (pp. 155-200). Champaign, Illinois: Human Kinetics.
- Dishman, R.K. and Gettman, L.R. (1980). Psychobiologic influences on exercise adherence. Journal of Sport Psychology, 2, 295-310.
- Dishman, R.K. and Ickes, W. (1981). Self-motivation and adherence to therapeutic exercise. Journal of Behavioral Medicine, 4, 421-438.

- Dishman, R.K., Ickes, W., and Morgan, W.P. (1980). Self-motivation and adherence to habitual physical activity. Journal of Applied Social Psychology, 10, 115-131.
- Dishman, R.K., Sallis, J.F., and Orenstein, D.R. (1985). The determinants of physical activity and exercise. Public Health Reports, 100, 158-171.
- Dishman, R.K. and Steinhardt, M. (1988). Reliability and concurrent validity for a 7-day recall of physical activity in college students. Medicine and Science in Sports and Exercise, 20 (1), 14-25.
- Engs, R.C. and Mulhall, P.F. (1981). Again - let's look before we leap: The effects of physical activity on smoking and drinking patterns. Journal of Alcohol and Drug Education, 26 (2), 65-74.
- Ewart, C.K., Taylor, C.B., Reese, L.B., and DeBusk, R.F. (1983). Effects of early postmyocardial infarction exercise testing on self-perception and subsequent physical activity. The American Journal of Cardiology, 51, 1076-1080.



- Fazio, R.H. and Zanna, M.P. (1981). Direct experience and attitude-behavior consistency. Advances in Experimental Social Psychology, 14, 161-202.
- Feltz, D.L. and Petlichkoff, L. (1983). Perceived competence among interscholastic sport participants and dropouts. Canadian Journal of Applied Sport Sciences, 8, 231-235.
- Fishbein, M. and Ajzen, I. (1975). Belief, attitude, intention, and behavior: An introduction to theory and research. Reading, Massachusetts: Addison-Wesley.
- Fitness Ontario (1981). Physical activity patterns in Ontario. Toronto, Canada: Ministry of Culture and Recreation, Government of Ontario.
- Folkins, C.H. (1976). Effects of physical training on mood. Journal of Clinical Psychology, 32, 385-388.
- Folkins, C.H., Lynch, B., and Gardner, M. (1972). Psychological fitness as a function of physical fitness. Archives of Physical Medicine and Rehabilitation, 53, 503-508.
- Folkins, C.H. and Sime, W.E. (1981). Physical fitness training and mental health. American Psychologist, 36 (4), 373-389.



- Fox, K.R., Corbin, C.B., and Couldry, W.H. (1985). Female physical estimation and attraction to physical activity. Journal of Sport Psychology, 7, 125-136.
- Fox, S.M. and Haskell, W.L. (1978). Physical activity and the prevention of coronary heart disease. New York Academic Medical Bulletin, 44, 950-965.
- Frazier, S.E. and Nagy, S. (1989). Mood state changes of women as a function of regular aerobic exercise. Perceptual and Motor Skills, 68, 283-287.
- Freedson, P.S., Mihevic, P.M., Loucks, A.B., and Girandola, R.N. (1983). Physique, body composition, and psychological characteristics of competitive female body builders. The Physician and Sports-Medicine, 11 (5), 85-93.
- Fuller, S.R. (1987). Learned resourcefulness and other predictors of planning and beliefs in self-efficacy of cardiac patients and their spouses. Unpublished master's thesis, Tel Aviv University, Tel Aviv.
- Gale, J.B., Eckhoff, W.T., Mogel, S.F., and Rodnick, J.E. (1984). Factors related to adherence to an exercise program for healthy adults. Medicine and Science in Sports and Exercise, 16, 544-549.

- Gauvin, L. (1989). The relationship between regular physical activity and subjective well-being. Journal of Sport Behavior, 11 (3), 107-114.
- Gillum, R.F. and Barsky, A.J. (1974). Diagnosis and management of patient noncompliance. Journal of the American Medical Association, 228, 1563-1567.
- Godin, G., Cox, M.H., and Shephard, R.J. (1983). The impact of physical fitness evaluation on behavioral intentions towards regular exercise. Canadian Journal of Applied Sport Science, 8, 240-245.
- Godin, G. and Shephard, R.J. (1985). Psycho-social predictors of exercise intentions among spouses. Canadian Journal of Applied Sport Science, 10, 36-43.
- Goldfried, M.R. (1980). Psychotherapy as coping skills training. In M.J. Mahoney (Ed.), Psychotherapy process: Current issues and future directions (pp. 89-119). New York: Plenum.
- Green, L.W., Kreuter, M.W., Deeds, S.G., and Partridge, K.B. (1980). Health education planning: A diagnostic approach. Palo Alto, California: Mayfield.



- Greenberg, J.S., Ramsey, S.A., and Hale, J.F. (1987). A portable self-instructional stress management program for college students. Journal of School Health, 57 (2), 53-55.
- Greist, J.H., Klein, M.H., Eischens, R.R., and Faris, J.W. (1978). Antidepressant running: Running as a treatment of non-psychotic depression. Behavioral Medicine, June, 19-24.
- Groves, S. (1986). The effect of "learned resourcefulness" and birth "expectancies" on coping with the birth process. Unpublished master's thesis, Tel Aviv University, Tel Aviv.
- Gruber, V.A. and Wildman, B.G. (1987). The impact of dysmenorrhea on daily activities. Behavior Research and Therapy, 25, 123-128.
- Gruger, C.E. (1981). Measuring commitment to physical activity. Unpublished master's thesis, Kansas State University.
- Hamilton, M. (1969). A rating scale for depression. Journal of Neurology, Neurosurgery and Psychiatry, 23, 56-61.



- Harris, L. (1978). Fitness in America (Perrier Study). Vital and health statistics of the National Center for Health Statistics. Hyattsville, MD: National Center for Health Statistics.
- Hart, M.E. and Shuey, C.T. (1964). Relationship between physical fitness and academic success. Research Quarterly, 35, 443-445.
- Harter, S. (1983). Developmental perspectives on the self system. In E.M. Hetherington (Ed.), Handbook of child psychology (Vol. 4, pp. 275-385). New York: John Wiley.
- Haskell, W.L. (1984). Cardiovascular benefits and risks of exercise: The scientific evidence. In R.H. Strauss (Ed.), Sports medicine (pp. 57-75). Philadelphia: W.B. Saunders.
- Heaps, R.A. (1978). Relating physical and psychological fitness: A psychological point of view. Journal of Sports Medicine and Physical Fitness, 18, 399-408.

- Heinzelmann, F. (1973). Social and psychological factors that influence the effectiveness of exercise programs. In J. Naughton and H. Hellerstein (Eds.), Exercise testing and exercise training in coronary heart disease (pp. 275-287). New York: Academic.
- Heinzelmann, F. and Bagley, R. (1970). Response to physical activity programs and their effects on health behavior. Public Health Reports, 85, 905-911.
- Hilyer, J. and Mitchell, W. (1979). Effect of systematic physical fitness training combined with counseling on the self-concept of college students. Journal of Counseling Psychology, 26, 427-436.
- Hughes, J.R. (1984). Psychological effects of habitual exercise: A critical review. Preventive Medicine, 13, 66-78.
- Ismail, A.H. and Young, R.J. (1977). Effect of exercise on the personality of adults. Annals of the New York Academy of Science, 301, 958-969.
- Jalowiec, A., Murphy, S., and Powers, M. (1984). Psychometric assessment of the Jalowiec Coping Scale. Nursing Research, 33, 157-161.

Janz, N.K. and Becker, M.H. (1984). The Health Belief Model: A decade later. Health Education Quarterly, 11 (1), 1-47.

Jenkins, C.D., Rosenman, R.H., and Friedman, M. (1968). Development of an objective psychological test for the determination of the coronary-prone behavior pattern in employed men. Journal of Chronic Diseases, 20, 371-379.

Jones, R.G. (1968). A factored measure of Ellis' irrational belief systems. Wichita, Kansas: Test Systems.

Kadner, K.D. (1987). Resiliency in nursing: The relationship of ego strength, social intimacy, and resourcefulness to coping. Unpublished doctoral dissertation, The University of Texas, Austin.

Kanfer, F.H. (1970). Self-regulation: Research, issues, and speculations. In C. Neuringer and J.L. Michael (Eds.), Behavior modification in clinical psychology. New York: Appleton-Century-Crofts.

Kanfer, F.H. (1977). Self-regulation and self-control. In H. Zeir (Ed.), The psychology of the 20th century. Zurich: Kindler Verlag.



- Kanfer, F.H. and Hagerman, S. (1981). The role of self-regulation. In L.P. Rehm (Ed.), Behavior therapy for depression: Present status and future directions. New York: Academic Press.
- Kanfer, F.H. and Karoly, P. (1982). The psychology of self-management: Abiding issues and tentative directions. In P. Karoly and F.H. Kanfer (Eds.), Self-management and behavior change: From theory to practice (pp. 571-599). New York: Pergamon.
- Karvonen, M.J. and Barry, A.J. (Eds.). (1967). Proceedings of the Symposium on Physical Activity and the Heart. Springfield, Illinois: Charles C. Thomas.
- Katz, R.C. and Singh, N. (1986). A comparison of current smokers and self-cured quitters on Rosenbaum's Self-Control Schedule. Addictive Behaviors, 11, 63-65.
- Keinan, G. and Melamed, S. (1987). Personality characteristics and proneness to burnout: A study among internist. Stress Medicine, 3, 1-9.
- Keller, S. (1980). Physical fitness hastens recovery from emotional stress. Medicine and Science in Sports, 12, 118.

- Kenyon, G.S. (1968). Six scales for assessing attitude toward physical activity. Research Quarterly, 39, 566-574.
- Kilty, K.M. (1978). Attitudinal and normative variables as predictors of drinking behavior. Journal of Studies on Alcohol, 39, 1178-1194.
- Klinger, E. (1982). On the self-management of mood, affect, and attention. In P. Karoly and F.H. Kanfer (Eds.), Self-management and behavior change: From theory to practice (pp. 129-164). New York: Pergamon.
- Knapp, D., Gutmann, M., Foster, C., and Pollock, M. (1984). Self-motivation among 1984 Olympic speed-skating hopefuls and emotional response and adherence to training. Medicine and Science in Sports and Exercise, 16, 114.
- Kraus, H. and Raab, W. (1961). Hypokinetic disease. Springfield, Illinois: Charles C. Thomas.
- LaPorte, R.E., Montoye, H.J., and Caspersen, C.J. (1985). Assessment of physical activity in epidemiologic research: Problems and prospects. Public Health Reports, 100 (2), 131-146.

- Lazarus, R.S. (1974). Psychologist stress and coping in adaptation and illness. International Journal of Psychiatry in Medicine, 5, 321-333.
- Lee, C. and Owen, N. (1986a). Exercise persistence: Contributions of psychology to the promotion of regular physical activity. Australian Psychologist, 21, 427-466.
- Lee, C. and Owen, N. (1986b). Uses of psychological theories in understanding the adoption and maintenance of exercising. Australian Journal of Science and Medicine in Sport, 18, 22-25.
- Leon, G.R. and Rosenthal, B.S. (1984). Prognostic indicators of success of relapse in weight reduction. International Journal of Eating Disorders, 3, 15-24.
- Leonardson, G.R. and Gargiulo, R.M. (1978). Self-perception and physical fitness. Perceptual and Motor Skills, 46, 338.
- Levinson, H. (1974). Activism and powerful others: Distinctions with the concept of internal-external control. Journal of Personality Assessment, 3, 377-383.



- Lewinsohn, P.M. and Alexander, C. (in press). Learned resourcefulness and depression. In M. Rosenbaum (Ed.), Learned resourcefulness: On coping skills, self-regulation, and adaptive behavior. New York: Springer.
- Lindsay-Reid, E. and Osborn, R.W. (1980). Readiness for exercise adoption. Social Science and Medicine, 14A, 139-146.
- Liska, A.E. (1984). A critical examination of the causal structure of the Fishbein/Ajzen attitude-behavior model. Social Psychology Quarterly, 47, 61-74.
- Long, B.C. and Haney, C.J. (1986). Enhancing physical activity in sedentary women: Information, locus of control, and attitude. Journal of Sport Psychology, 8, 8-24.
- MacLachlan, I.M. (1985). Learned resourcefulness, depression and self-esteem. IRCS Medical Science, 13, 816-817.
- Martin, J.E. (1981). Exercise management: Shaping and maintaining physical activity. Behavioral Medicine Advances, 4, 3-5.

- Martin, J.E. and Dubbert, P.M. (1982a). Exercise and health: The adherence problem. Behavioral Medicine Update, 4, 16-24.
- Martin, J.E. and Dubbert, P.M. (1982b). Exercise applications and promotion in behavioral medicine: Current status and future directions. Journal of Consulting and Clinical Psychology, 50, 1004-1017.
- Martin, J.E., Dubbert, P.M., Katell, A.D., Thompson, J.K., Raczynski, J.R., Lake, M., Smith, P.O., Webster, J.S., Sikora, T., and Cohen, R.E. (1984). The behavioral control of exercise in sedentary adults: Studies 1 through 6. Journal of Consulting and Clinical Psychology, 52 (5), 795-811.
- Mason, J.O. and Powell, K.E. (1985). Physical activity, behavioral epidemiology and public health. Public Health Reports, 100, 113-115.
- Massie, J.F. and Shephard, R.J. (1971). Physiological and psychological effects of training: A comparison of individual and gymnasium programs, with a characterization of the exercise "drop-out". Medicine and Science in Sports, 3, 110-117.

- Mayer, J. (1968). Overweight: Causes, cost, and control. Englewood Cliffs, New Jersey: Prentice-Hall.
- McAuley, E. and Gill, D. (1983). Reliability and validity of the physical self-efficacy scale in a competitive sport setting. Journal of Sport Psychology, 5, 410-418.
- McCready, M.L. (1984). Locus of control and adherence to exercise programs. Unpublished master's thesis, University of British Columbia, Vancouver.
- McCready, M.L. and Long, B.C. (1985). Locus of control, attitudes toward physical activity, and exercise adherence. Journal of Sport Psychology, 7, 346-359.
- McGlynn, G., Franklin, B., Lauro, G., and McGlynn, I. (1983). The effect of aerobic conditioning and induced stress on state-trait anxiety, blood pressure, and muscle tension. Journal of Sports Medicine, 23, 341-351.



- McPherson, B.D., Paivio, A., Yhasz, M.S. , Rechnitzer, P.A., Pickard, H.A., and Lefcoe, N.B. (1967). Psychological effects of an exercise program for post-infarction and normal adult men. Journal of Sports and Medicine and Physical Fitness, 7, 95-102.
- Meichenbaum, D.H. (1977). Cognitive-behavior modification: An integrative approach. New York: Plenum.
- Michelson, S. (1985). Private self-consciousness interactive effect on the causation of anxiety and depression: Three possible mediating variables. Unpublished master's thesis, Tel-Aviv University.
- Miller Brewing Company. (1983). The Miller Lite report on American attitudes toward sports. Milwaukee: Author.
- Morgan, W.P. (1976). Influence of chronic physical activity on selected psychological states and traits of police officers. Gaithersburg, Maryland: International Association of Chiefs of Police, Inc.

- Morgan, W.P. (1977). Involvement in vigorous physical activity with special reference to adherence. In L.I. Gedvilas and M.E. Kneer (Eds.), National College Physical Education Association Proceedings (pp. 235-246). Chicago: University of Illinois-Chicago, Office of Public Services.
- Morgan, W.P. (1979). Anxiety reduction following acute physical activity. Psychiatric Annals, 9, 36-45.
- Morgan, W.P. (1981). Psychological benefits of physical activity. In F.J. Nagle and H.J. Montoye (Eds.), Exercise in health and disease (pp. 299-314). Springfield, Illinois: C.C. Thomas.
- Morgan, W.P. and Horstman, D. (1976). Anxiety reduction following acute physical activity. Medicine and Science in Sports, 62, 62.
- Morgan, W.P. and Goldston, S.E. (Eds.). (1987). Exercise and mental health. New York: Hemisphere.
- Morgan, W.P. and Pollock, M.L. (1978). Physical activity and cardiovascular health: Psychological aspects. In F. Laundry (Ed.), Physical activity and human well-being (pp. 163-181). Miami: Symposium Specialists.

- Morgan, W.P., Roberts, J.A., Brand, F.R., and Feinerman, A.D. (1970). Psychological effect of chronic physical activity. Medicine and Science in Sports, 2, 213-217.
- Morgan, W.P., Shephard, R.J., and Finucane, R. (1984). Health beliefs and exercise habits in an employee fitness programme. Canadian Journal of Applied Sport Sciences, 9 (2), 87-93.
- National Center for Health Statistics (1980). Health, United States, 1970-1978. Washington, D.C.: U.S. Government Printing Office.
- National Institute of Health (1981). Exercise and your heart. Washington, D.C.: U.S. Department of Health and Human Services.
- Neale, D.C., Sonstroem, R.J., and Metz, K.F. (1969). Physical fitness, self-esteem, and attitudes towards physical activity. Research Quarterly, 40, 743-749.
- Nielsen, A.B. and Corbin, C.B. (June, 1986). Physical activity commitment. Paper presented at the North American Society for Psychology of Sport and Physical Activity conference, Scottsdale, Arizona.



- Noland, M.P. (1981). The efficacy of a new model to explain leisure exercise behaviors. Unpublished doctoral dissertation, University of Maryland.
- Noland, M.P. and Feldman, R. (1984). Factors related to the leisure exercise behavior of "returning" women college students. Health Education, 15, 32-36.
- Noland, M.P. and Feldman, R. (1985). An empirical investigation of leisure exercise behavior in adult women. Health Education, 16, 29-34.
- Norusis, M.J. (1988). SPSS-X introductory statistics guide for release 3. Chicago, Illinois: SPSS Inc.
- Oldridge, N.B. (1982). Compliance and exercise in primary and secondary prevention of coronary heart disease: A review. Preventive Medicine, 11, 56-70.
- Oldridge, N.B. and Spencer, J. (1985). Exercise habits and perceptions before and after graduation or dropout from supervised cardiac exercise rehabilitation. Journal of Cardiopulmonary Rehabilitation, 5, 313-319.

- Olson, J.M. and Zanna (1982). Predicting adherence to a program of physical exercise: An empirical study. Toronto: Government of Ontario, Ministry of Tourism and Recreation.
- Paffenbarger, R.S. and Hyde, R.T. (1984). Exercise in the prevention of coronary heart disease. Preventive Medicine, 13, 3-22.
- Paffenbarger, R.S. and Hyde, R.T. (1988). Exercise adherence, coronary heart disease, and longevity. In R.K. Dishman (Ed.), Exercise adherence: Its impact on public health, (pp. 41-73). Champaign, Illinois: Human Kinetics Books.
- Paffenbarger, R.S., Wing, A.L., Hyde, R.T. (1978). Chronic disease in former college students. XVI. Physical activity as an index of heart attack risk in college alumni. American Journal of Epidemiology, 108, 161-175.
- Paffenbarger, R.S., Wing, A.L., Hyde, R.T., and Jung, D.L. (1983). Physical activity and incidence of hypertension in college alumni. American Journal of Epidemiology, 117, 245-257.

- Palm, J. (1978). Mass media and the promotion of sports for all. In F. Landry and W. Orban (Eds.), Physical activity and human well being (pp. 273-279). Miami, Florida: Symposium Specialists.
- Pate, R.R. and Blair, S.N. (1978). Exercise in the prevention of atherosclerosis: Pediatric implications. In W.B. Strong (Ed.), Atherosclerosis: Its pediatric aspects. New York City: Grune and Stratton.
- Pauly, J., Palmer, J., Wright, C., and Pfeiffer, G. (1982). The effect of a 14-week employee fitness program on selected physiological and psychological parameters. Journal of Occupational Medicine, 24, 457-463.
- Perkins, K.A. and Epstein, L.H. (1988). Methodology in exercise adherence research. In R.K. Dishman (Ed.), Exercise adherence: Its impact on public health (pp. 399-416). Champaign, Illinois: Human Kinetics.
- Perrin, B. (1979). Survey of physical activity in the regional municipality of Waterloo. Recreation Research Review, 6 (4), 48-52.



- Piamenta, R. (1987). The effect of learned resourcefulness and style of coping on adjustment to surgery under local or general anesthesia.  
Unpublished master's thesis, Tel Aviv University, Tel Aviv.
- Pistacchio, T., Weinberg, R., and Jackson, A. (1989).  
The development of a psychobiologic profile of individuals who experience and those who do not experience exercise related mood enhancement.  
Journal of Sport Behavior, 12 (3), 151-166.
- Pollock, M.L., Wilmore, J.H., and Fox, S.M. (1978).  
Health and fitness through physical activity.  
New York: John Wiley and Sons.
- Powell, K.E. (1988). Habitual exercise and public health: An epidemiological view. In R.K. Dishman (Ed.), Exercise adherence: Its impact on public health (pp. 15-39). Champaign, Illinois: Human Kinetics.
- Powell, K.E. and Paffenbarger, R.S. (1985). Workshop on epidemiologic and public health aspects of physical activity and exercise. Public Health Reports, 100, 118-126.

- Randolff, L.S. (1977). The CES-D scale: A self-report depression scale for research in the general population. Applied Psychological Measurement, 1, 385-401.
- Redden, E.M., Tucker, R.K., and Young, L. (1983). Psychometric properties of the Rosenbaum schedule for assessing self-control. The Psychological Record, 33, 77-86.
- Rehm, L.P. and Rokke, P. (1988). Self-management therapies. In K.S. Dobson (Ed.), Handbook of cognitive-behavioral therapies (pp. 136-166). New York: The Guilford Press.
- Rich, S. (1985, June 10). Inside health and human services. The Washington Post, p. A 11.
- Richards, P.S. (1985). Construct validation of the Self-Control Schedule. Journal of Research in Personality, 19, 208-218.
- Riddle, P.K. (1980). Attitudes, beliefs, behavioral intentions, and behaviors of men and women toward regular jogging. Research Quarterly for Exercise and Sport, 51, 663-674.

- Roberts, G.C., Kleiber, D.A., and Duda, J.L. (1981).  
An analysis of motivation in children's sport:  
The role of perceived competence in participation. Journal of Sport Psychology, 3, 206-216.
- Robinson, T.T. and Carron, A.V. (1982). Personal and  
situational factors associated with dropping out  
versus maintaining participation in competitive  
sport. Journal of Sport Psychology, 4, 364-378.
- Rosenbaum, M. (1980). A schedule for assessing self-  
control behaviors: Preliminary findings.  
Behavior Therapy, 11, 109-121.
- Rosenbaum, M. (1983). Learned resourcefulness as a  
behavioral repertoire for the self-regulation of  
internal events: Issues and speculations. In M.  
Rosenbaum, C.M. Franks, and J. Jaffe (Eds.),  
Perspectives on behavior therapy in the eighties  
(pp. 54-73). New York: Springer.
- Rosenbaum, M. (1988). Learned resourcefulness,  
stress, and self-regulation. In S. Fisher and J.  
Reason (Eds.), Handbook of life stress, cognition  
and health (pp. 483-496). Chichester, UK: John  
Wiley and Son.



- Rosenbaum, M. (1989). The role of learned resourcefulness in self-control of health behavior. Research Reports on Behavioral Medicine. Schwartz Research Center for Behavioral Medicine.
- Rosenbaum, M. and Ben-Ari, K. (1985). Learned helplessness and learned resourcefulness: Effects of noncontingent success and failure on individuals differing in self-control skills. Journal of Personality and Social Psychology, 48, 198-215.
- Rosenbaum, M. and Ben-Ari Smira, K. (1986). Cognitive and personality factors in the delay of gratification of hemodialysis patients. Journal of Personality and Social Psychology, 51 (2), 357-354.
- Rosenbaum, M. and Palmon, N. (1984). Helplessness and resourcefulness in coping with epilepsy. Journal of Consulting and Clinical Psychology, 52, 244-253.
- Rosenbaum, M. and Rolnick, A. (1983). Self-control behaviors and coping with seasickness. Cognitive Therapy and Research, 7, 93-98.
- Rosenstock, I.M. (1974). Historical origins of the health belief model. Health Education Monographs, 2, 328-335.

- Roth, D.L. and Holmes, D.S. (1985). Influence of physical fitness in determining the impact of stressful life events on physical and psychological health. Psychosomatic Medicine, 47 (2), 164-173.
- Rotter, J.B. (1966). Generalized expectancies for internal versus external control of reinforcement. Psychological Monographs, 80, 609.
- Rowland, T.W. (1981). Physical fitness in children: Implications for the prevention of coronary heart disease. Current Problems in Pediatrics, 11, 1-54.
- Ryckman, R.M., Robbins, M.A., Thornton, B., and Cantrell, P. (1982). Development and validation of a physical self-efficacy scale. Journal of Personality and Social Psychology, 42, 891-900.
- Safrit, M.J., Wood, T.M., and Dishman, R.K. (1985). The factorial validity of the physical estimation and attraction scales for adults. Journal of Sport Psychology, 7, 166-190.

- Sallis, J.F., Pinski, R.B., Grossman, R.M., Patterson, T.L. and Nader, P.R. (1988). The development of self-efficacy scales for health-related diet and exercise behaviors. Health Education Research, 3 (3), 283-292.
- Saltzer, E.B. (1982). The weight locus of control (WLOC) scale: A specific measure for obesity research. Journal of Personality Assessment, 46, 620-628.
- Seeman, J. (1978). Change in state anxiety following vigorous exercise. Master's thesis, University of Arizona.
- Seligman, M.E.P. (1975). Helplessness: On depression, development, and death. San Francisco, California: W.H. Freeman and Company.
- Shangold, M.M. and Mirkin, G. (1988). Women and exercise: Physiology and sports medicine. Philadelphia: F.A. Davis Company.
- Shephard, R.J. (1988). Exercise adherence in corporate settings: Personal traits and program barriers. In R.K. Dishman (Ed.), Exercise adherence: Its impact on public health (pp. 305-319). Champaign, Illinois: Human Kinetics Books.



- Sherman, S.J., Presson, C.C., Chassin, L., Bensenberg, M., Corty, E., and Olshavsky, R.W. (1982). Smoking intentions in adolescents: Direct experience and predictability. Personality and Social Psychology Bulletin, 8, 376-383.
- Simon, H.B. (1984). The immunology of exercise. Journal of the American Medical Association, 252, 2735-2738.
- Simons, A.D., Lustman, P.J., Wetzel, R.D., and Murphy, G.E. (1985). Predicting response to cognitive therapy of depression: The role of learned resourcefulness. Cognitive Therapy and Research, 9, 79-90.
- Simons, A.D., McGowan, C.R., Epstein, L.H., Dupfer, D.J., and Robertson, R.J. (1985). Exercise as a treatment for depression: An update. Clinical Psychology Review, 5, 553-568.
- Siscovick, D.S., LaPorte, R.E., and Newman, J.M. (1985). The disease-specific benefits and risks of physical activity and exercise. Public Health Reports, 100, 180-188.

- Slenker, S.E., Price, J.H., Roberts, S.M., and Jurs, S.G. (1984). Joggers versus non-exercisers. Research Quarterly for Exercise and Sport, 55, 371-378.
- Smith, S. and Smith, C. (1988). The college student's health guide. Los Altos, California: Westchester.
- Smith, T.V.G. (1979). Cognitive correlations of response to a behavioral weight control program. Unpublished doctoral dissertation, Queen's University, Kingston, Canada.
- Snyder, G., Franklin, B., Foss, M., and Rubenfire, M. (1982). Characteristics of compliers and non-compliers to cardiac exercise therapy programs. Medicine and Science in Sports and Exercise, 14, 179.
- Sonstroem, R.J. (1974). Attitude testing examining certain psychological correlates of physical activity. Research Quarterly, 45, 93-103.
- Sonstroem, R.J. (1976). The validity of self-perceptions regarding physical and athletic ability. Medicine and Science in Sports, 8, 126-132.

- Sonstroem, R.J. (1978). Physical estimation and attraction scales: Rationale and research. Medicine and Science in Sports, 10, 97-102.
- Sonstroem, R.J. (1982). Attitudes and beliefs in the prediction of exercise participation. In R.C. Cantu and W.J. Gillepsie (Eds.), Sports medicine, sports science: Bridging the gap (pp. 3-16). Lexington, Massachusetts: Collomore Press.
- Sonstroem, R.J. (1984). Self-esteem and physical activity. In R.J. Terjung (Ed.), Exercise and sport sciences reviews (Vol. 12, pp. 123-155). Lexington, Massachusetts: Collomore Press.
- Sonstroem, R.J. (1988). Psychological models. In R.K. Dishman (Ed.), Exercise adherence: Its impact on public health (pp. 125-153). Champaign, Illinois: Human Kinetics.
- Sonstroem, R.J. and Kampper, K.P. (1980). Prediction of athletic participation in middle school males. Research Quarterly in Exercise and Sport, 51, 685-694.
- Sonstroem, R.J. and Morgan, W.P. (1989). Exercise and self-esteem: Rationale and model. Medicine and Science in Sports and Exercise, 21 (3), 329-337.



- Sonstroem, R.J. and Walker, M.I. (1973). Relationship of attitudes and locus of control to exercise and physical fitness. Perceptual and Motor Skills, 36, 1031-1034.
- Staats, A.W. (1975). Social behaviorism. Homewood, Illinois: Dorsey Press.
- Stephens, T., Jacobs, D.R., and White, C.C. (1985). A descriptive epidemiology of leisure time physical activity. Public Health Reports, 100, 147-158.
- Stone, W.J. (1983). Predicting who will drop out. Corporate Fitness and Recreation, August-September, 31-36.
- Strickland, B.R. (1978). Internal-external expectancies and health related behaviors. Journal of Clinical Psychology, 46, 1192-1211.
- Taylor, C.B., Sallis, J.F., and Needle, R. (1985). The relation of physical activity and exercise to mental health. Public Health Reports, 100, 195-202.
- Taylor, J.A. (1953). A personality scale of manifest anxiety. The Journal of Abnormal and Social Psychology, 48, 285-290.

- Teraslinna, P.T., Partanen, T., Koskela, A., and Oja, P. (1969). Characteristics affecting willingness of executives to participate in an activity program aimed at coronary heart disease prevention. Journal of Sports Medicine and Physical Fitness, 9, 224-229.
- Thomas, P. and Zander, A. (1973). Thomas-Zander ego strength scales. In J.P. Robinson and P.R. Shaver (Eds.), Measures of psychological attitudes. Ann Arbor: Institute for Social Research.
- Thompson, J.K., Jarvie, G.J., Lahey, B., and Cureton, K. (1982). Exercise and obesity: Etiology, physiology, and intervention. Psychological Bulletin, 91, 55-79.
- Thompson, J.K., Wyatt, J.T.B., and Craighead, L.W. (1984). Three theoretically based interventions to increase exercise adherence in a health-promotion regimen. Psychosomatic Medicine, 46 (1), 80.

- Tirrell, B.E. and Hart, L.K. (1980). Patient perceptions in critical care: The relationship of health beliefs and knowledge to exercise compliance in patients after coronary bypass. Heart and Lung, 9, 487-493.
- U.S. Department of Health, Education, and Welfare (1976). Research issues 13: Data analysis strategies and designs for substance abuse research (DHEW Publication No. ADM 77-389). Washington, D.C.: U.S. Government Printing Office.
- U.S. Department of Health and Human Services (1980). Promoting health/preventing disease: Objectives for the nation. Washington, D.C.: U.S. Government Printing Office.
- Vallerand, R.J. and Reid, G. (1984). On the causal effects of perceived competence on intrinsic motivation: A test of cognitive evaluation theory. Journal of Sport Psychology, 6, 94-102.



- Vitelli, R. and Frische, R.G. (1982). Relationship between trait anxiety and leisure time activities: A comparison of the unidimensional and multidimensional models of anxiety. Perceptual and Motor Skills, 54, 371-376.
- Wallston, B.S. and Wallston, K.A. (1978). Locus of control and health: A review of the literature. Health Education Monographs, 6, 107-117.
- Wallston, B.S., Wallston, K.A., Kaplan, G.D., and Maides, S.A. (1976). Development and validation of the health locus of control (HLC) scales. Journal of Consulting Clinical Psychology, 44, 580-585.
- Wallston, K.A., Wallston, B.S., and DeVellis, R. (1978). Development of the multidimensional health locus of control (MHLC) scales. Health Education Monographs, 6, 160-170.
- Wankel, L.M. (1985). Personal and situational factors affecting exercise involvement: The importance of enjoyment. Research Quarterly for Exercise and Sport, 56 (3), 275-282.

- Wankel, L.M. (1988). Exercise adherence and leisure activity: Patterns of involvement and interventions to facilitate regular activity. In R.K. Dishman (Ed.), Exercise adherence: Its impact on public health, pp. 369-396. Champaign, Illinois: Human Kinetics Books.
- Wankel, L.M., Yardley, J.K., and Graham, J. (1985). The effects of motivational interventions upon the exercise adherence of high and low self-motivated adults. Canadian Journal of Applied Sport Sciences, 10 (3), 147-156.
- Wanzel, R.S. (1977). Factors related to withdrawal from an employee fitness program. Paper presented at the American Association for Leisure and Recreation National Conference, Seattle, Washington.
- Wanzel, R.S. (1978). Toward preventing dropouts in industrial and other fitness programmes. Recreation Canada, 36 (4), 39-42.
- Ward, A. and Morgan, W.P. (1984). Adherence patterns of healthy men and women enrolled in an adult exercise program. Journal of Cardiac Rehabilitation, 4, 143-152.

- Washburn, R.A. and Montoye, H.J. (1986). The assessment of physical activity by questionnaire. American Journal of Epidemiology, 123 (4), 563-576.
- Weber, J. and Wertheim, E.H. (1989). Relationships of self-monitoring, special attention, body fat percent, and self-motivation to attendance at a community gymnasium. Journal of Sport and Exercise Psychology, 11, 105-114.
- Weinberg, R.S., Hughes, H.H., Critelli, J.W., England, R., and Jackson, A. (1984). Effects of pre-existing and manipulated self-efficacy on weight loss in a self-control program. Journal of Research in Personality, 18, 352-358.
- Weisenberg, M., Wolf, Y., Mittwoch, T., and Mikulincer, M. (1986). Learned resourcefulness and perceived control of pain. Unpublished manuscript, Bar-Ilan University, Ramat Gan, Israel.
- Whitehead, J.R. and Corbin, C.B. (1988). Multidimensional scales for the measurement of locus of control of reinforcement for physical fitness behaviors. Research Quarterly for Exercise and Sport, 59 (2), 108-117.



Wifley, D. and Kunce, J. (1986). Differential physical and psychological effects of exercise. Journal of Counseling Psychology, 33 (3), 337-342.

Winefield, H.R. (1982). Reliability and validity of the health locus of control scale. Journal of Personality Assessment, 46, 614-619.