Self-efficacy, decision making, and the stages of exercise behavior change
by Jennifer Carol Haas

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Health and Human Development
Montana State University
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Abstract:
Based on the Transtheoretical Model of Behavior Change, an understanding of the determinants of exercise behavior is beginning to emerge. In this study exercise behavior was examined to determine its association with self-efficacy and decisional making. One hundred seventy four freshman college students answered three questionnaires to assess their stage of exercise behavior, self-efficacy and decisional balance (i.e., pros and cons). Frequency counts were used to determine the distribution of freshman students among the stages of adoption. Stage of exercise adoption was the independent variable, and self-efficacy and decisional balance were the dependent variables in the analysis. Analysis of variance showed that self-efficacy and decision making were able to significantly differentiate one's stage of exercise change. Understanding the states of exercise behavior change may yield important information for designing physical education curriculum that would enhance exercise adoption and adherence.
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APPROVAL

of a thesis submitted by

Jennifer Carol Haas

This thesis has been read by each member of the thesis committee and has been found to be satisfactory regarding content, English usage, citations, bibliographic style, and consistency, and is ready for submission to the College of Graduate Studies.

Peter Rudolph Rehor, PhD
(Signature) 06/14/1996

Approved for the Department of Health and Human Development

Ellen Kriechbaum, PhD
(Signature) 06/21/1996

Approved for the College of Graduate Studies

Robert Brown, PhD
(Signature) 06/21/1996
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ABSTRACT

Based on the Transtheoretical Model of Behavior Change, an understanding of the determinants of exercise behavior is beginning to emerge. In this study exercise behavior was examined to determine its association with self-efficacy and decisional making. One hundred seventy four freshman college students answered three questionnaires to assess their stage of exercise behavior, self-efficacy and decisional balance (i.e., pros and cons). Frequency counts were used to determine the distribution of freshman students among the stages of adoption. Stage of exercise adoption was the independent variable, and self-efficacy and decisional balance were the dependent variables in the analysis. Analysis of variance showed that self-efficacy and decision making were able to significantly differentiate one's stage of exercise change. Understanding the states of exercise behavior change may yield important information for designing physical education curriculum that would enhance exercise adoption and adherence.
Chapter 1

INTRODUCTION

The most prominent causes of death in the United States today are lifestyle related. According to the U.S. Department of Health and Human Services (1993), approximately seventy percent of all deaths in the United States are caused by either cardiovascular disease or cancer. Nearly eighty percent of these deaths could be prevented through the adoption of healthy lifestyle behaviors. Researchers have shown an inverse relationship between exercise and premature cardiovascular mortality rates (Paffenbarger, Hyde, Wing & Steinmetz, 1984). Blair et al. (1989) found that death rates from cardiovascular disease and from all causes of mortality, were lower in individuals who were fit than in individuals who were unfit. Additionally, physically inactive people were almost twice as likely to develop coronary heart disease than people who engaged in regular physical activity (Powell, Thompson, Casperson, & Kendrick, 1987).

Consequentially, risk reduction is a major focus of the national health promotion and disease prevention objectives for the Year 2000. The objectives were proposed to ensure
that health related dimensions of physical activity become part of regular behavior patterns (U.S. Department of Health and Human Services, Public Health Service, 1996). Three important elements were addressed: personal responsibility, health benefits for all people, and health promotion and disease prevention. It was recommended that the predisposing, enabling, and reinforcing determinants leading to a physically active lifestyle be known by the turn of the century. One goal presented in the Year 2000 objectives is to increase the number of young adults who engage in vigorous physical activity that promotes the development and maintenance of cardiorespiratory fitness. In 1995, less than ten percent of adults were active in their leisure time at the intensity, frequency and duration recommended by the American College of Sports Medicine (ACSM, 1995).

Over the last decade, a sizable decline in the fitness levels of American youth has been reported (Heath, Pratt, Warren, & Kann, 1994). Fifty percent of our children do not receive appropriate physical activity, i.e. activity most likely to ensure cardiorespiratory fitness and to establish life-long exercise patterns (U.S. Department of Health and Human Services, 1987). Prevalence rates of known risk factors for chronic disease, including cardiovascular disease and mortality in adults, are alarmingly high in
childhood and adolescence. Risk factors linked to behavior, such as smoking, obesity, hypertension, diabetes and stress have been detected in children as young as seven years of age (Berenson, 1980).

The prevalence of physical inactivity increases with age, especially during adolescence and adulthood (U.S. Department of Health and Human Services, 1986). In a review of physical activity patterns in North America, Stephens (1980) suggested that the most remarkable decrease in participation occurs in late adolescence as activity patterns in the school environment change. It was estimated that only forty six percent of our young population, 18-35 years of age, continued an active lifestyle beyond the school years (US Department of Health and Human Resources, 1990). This is not a new problem. Miller (1963) acknowledged the poor fitness levels of college students and emphasized that physical education programs at the college level offer a student the "final opportunity" to develop necessary attitudes toward exercise and to establish habits of regular exercise participation.

The Problem

It seems as though our young adults are not being properly prepared to accept responsibility for their own
well-being. In their review of physical activity promotion programs in the United States, Iverson, Fielding, Crow, & Christenson (1985) concluded:

It appears that a major opportunity to influence favorable physical activity in the United States is being missed in schools. A large majority of students are enrolled in physical education classes, but the classes appear to have little effect on the current physical fitness levels of children, and furthermore, have little impact on developing lifelong physical activity skills. (p. 212)

Traditionally, college physical education activity classes offered a student a chance to learn and play a particular sport or activity. Curriculum emphasis was on the "how" rather than on "the why" (Dishman, Falls & Baylor, 1980). Skill, technique, and rules were taught, and once mastered, the students spent the rest of the semester "playing." Sage (1987) described this as the "roll out the ball" or recess approach. Those who still hold rigidly to the notion of exposing students only to sports, skill development and games, insist that by this means students will be prepared to play and exercise throughout life (Deam, 1973). Unfortunately, this method provided the student with very little basis for making intelligent future decisions in regard to his or her personal exercise habits (Deam, 1973).

Exercise program interventions in the school can be effective in increasing fitness and leisure activity
adoption (Dishman, 1988). A number of factors make schools a desirable vehicle for fitness/wellness education. First, classes provide an opportunity to ensure a minimal, regular amount of physical activity and help to establish physical activity patterns that may extend into adulthood. Secondly, if the class is required for graduation, virtually all of the population can be reached, therefore ensuring that proper health habits are taught and behavior modification strategies are implemented. Most people attend college to learn how to make a living, but a fitness and wellness course will teach people how to live.

Statement of the Problem

In this study it will be determined if exercise behavior can be associated with self-efficacy and the perceived benefits and costs of exercise for freshman students at Montana State University.

Significance

Exercise adherence research has received a great deal of attention in the past several years. However, investigators are still unable to successfully predict adherence (Dishman, 1982; Sonstroem, 1988). We do know that approximately 50% of individuals who start an exercise program will stop within the first six months, even though
it is well known that to obtain health benefits associated with physical activity, participation must be maintained (Carmody, Senner, Manilow, & Matarazzo, 1980; Dishman, 1988). Programs involving the use of behavioral management techniques appeared to increase short term adherence to exercise, however long term follow-up of behavioral intervention methods and their effects on exercise adherence was generally lacking (Robison & Rogers, 1994). A number of psycho-social models have been developed to describe exercise adoption and maintenance. Researchers use these models to reveal the decision making process that underlies and precedes an action. Psycho-social models are employed to examine how attitudes, beliefs, expectations, self-efficacy, social norms, and behavioral skills affect the barriers to activity and the reinforcement of participation.

The Transtheoretical Model of Behavioral Change (Prochaska & DiClemente, 1983) has recently been applied to health behaviors. Prochaska and DiClemente (1983) developed the "stages-of-change" framework to describe the different phases involved in the acquisition and maintenance of a behavior. Researchers suggested that individuals engaging in a new behavior move in an orderly progression through the stages of precontemplation (thinking about starting a behavior), contemplation (deciding to begin a new behavior), preparation (preparing to start a new behavior), action
(actively incorporating a new behavior into one's lifestyle), and maintenance (maintaining the behavior over time) (Dishman, 1982; Marcus & Simkin, 1993; Martin & Dubbert, 1992; Sonstroem, 1988). Two important constructs, self-efficacy and decisional balance, have been integrated into the stage dimension of the Transtheoretical Model. Self-efficacy is a personal belief as to how easy or difficult adoption of a new behavior is likely to be (Ajzen & Madden, 1986). Researchers found that self-efficacy was an important predictor of exercise behavior in the Transtheoretical Model (Prochaska & DiClemente, 1983; Marcus, Selby, Niaura, & Rossi, 1992). Across the stages of change, self-efficacy scores increase linearly from precontemplation to maintenance. Decisional balance involves assessing the pros and cons (benefits and costs) of specific behaviors (O'Connell & Velicer, 1988). The Pros focus on enhanced confidence, feeling good about oneself, and having more energy for one's family and friends, and the Cons focus on the perception of being too tired, being concerned about the weather, and feeling uncomfortable (Velicer, DiClemente, Prochaska, & Brandenburg, 1985). The Pros and Cons were clearly relevant for understanding and predicating transitions between the stages of change (DiClemente et al., 1991; Marcus, Rakowski, Rossi, 1992) and support the work of Dishman, Sallis and Ornstein on the
determinants of exercise behavior (1985). Prochaska, et al. (1994) reported that the Cons of changing a behavior always outweigh the Pros during the early stages (precontemplation and contemplation, and the opposite is true in the later stages of action and maintenance. By assessing an individual's stage of change, one can predict their self-efficacy and decisional balance measures. Specific interventions, designed to increase self-efficacy and decisional balance, applied during each stage may facilitate the change in behavior. This would appear to have promise for increasing our understanding of the process of exercise initiation and maintenance.

Educators may choose to include behavioral strategies designed to increase self-efficacy and increase the knowledge about the benefits of exercise in the curriculum design of physical education (Dishman, 1994). Additionally, educators may wish to use the Transtheoretical Model of Behavior Change framework to begin testing the efficacy of stage specific physical activity interventions used in physical/wellness education courses.

Purpose

The researcher examined three theoretical models to help understand exercise behavior in college freshman. The purposes of this study were 1) To investigate the
applicability of the Transtheoretical Model to exercise behavior; 2) To examine how self-efficacy applied to the stages of exercise behavior; and, 3) To examine how decisional balance applied to the stages of exercise behavior.

Hypothesis

1. There is a difference in self reported self-efficacy among individuals as identified by the five stages of behavior change: precontemplation, contemplation, preparation, action and maintenance.

2. There is a difference in self reported self-efficacy between the active (Preparers, Actors and Maintainers) and inactive (Precontemplators and Contemplators) individuals.

3. There will be an increase in self-efficacy along the continuum from precontemplation to maintenance.

4. There is a difference in self reported exercise beliefs among individuals identified by the five stages of behavior change.

5. There is a difference in self reported exercise beliefs between the active and inactive groups.

6. The perceived benefits of exercise the (Pros) will increase along the continuum from precontemplation to maintenance, while the perceived costs of exercise
(Cons) will decrease along the continuum from the precontemplation to maintenance.

**Delimitations of the Study**

1. All subjects were volunteers.

**Limitations of the Study**


**Assumptions**

1. The questionnaires were valid measures of assessing exercise behavior.
2. The subjects adhered to the researcher’s instructions and were honest in answering the questions.
3. The subjects understood and answered the questions according to the researcher’s definitions.

**Definition of Terms**

**Decisional Balance Model** - a model used to assess the pros and cons of decision making in regards to behavior change (Janis & Mann, 1977).

**Self-Efficacy** - a personal belief as to how easy or difficult adoption of exercise behavior is likely to be (Ajzen & Madden, 1986).
Stages of Change - the temporal dimension of the Transtheoretical Model indicating an individual's readiness to change (Prochaska & DiClemente, 1983).

Transtheoretical Model of Change - a theoretical construct used to describe how individuals change their behavior (Prochaska, 1979).

Operational Definitions

Actors - include those who exercise regularly, but who have done so for less than six months.

Appropriate regular physical activity - exercise which involves large muscle groups in dynamic movement for periods of 20 minutes or longer, three or more days per week, and which is performed at an intensity requiring 60% or greater of an individual's cardiorespiratory capacity.

Contemplators - include those who do not exercise, but who intend to start in the next six months.

Determinant - used to denote a reproducible association or predictive relationship other than cause and effect.

Exercise Adherence - maintaining a regular exercise program for at least six months.

Precontemplators - include individuals who do not exercise, and who are not planning to start exercising in the next six months.

Preparers - those who exercise some, but not regularly.
Maintainers - include those who exercise regularly and have done so for six months or longer.

Regular Exercise - exercise executed at least 3 times per week for 30 minutes or more.
Chapter 2

REVIEW OF LITERATURE

Health Benefits of Physical Fitness, Physical Activity, and Exercise

Participation in a regular exercise program has been confirmed to be beneficial in the prevention of most lifestyle related diseases (Dishman, 1994). Exercise is conducive to physiological and psychological well-being. The protective effect of physical activity was detected in the decreased death rate from cardiovascular disease (Blair, Kohl, Barlow, & Gibbons, 1991; LaPorte, et al, 1984; Powell, Thompson, Casperson, & Kendrick, 1987; Williams, Ekers, Collins, & Lee, 1991) and a substantial amount of evidence established exercise as a helpful treatment for psychological problems (King, Taylor, Haskell, & DeBusk, 1989; Martinsen, 1990; Steptoe & Cox, 1988).

Regular exercise can help enhance the quality of life for people of all ages (Katz, et al., 1983). However, improving the quality of life is a matter of personal choice. Therefore, the greatest challenge is no longer documenting the benefits of regular exercise, but rather teaching individuals how to take control of their health
habits to ensure a better, healthier, more productive life (Marcus, Banspach et al., 1992).

Before revealing the physiological and psychological benefits of exercise, it is important to clarify the terms physical fitness, physical activity and exercise. **Physical activity** is defined as any bodily movement produced by skeletal muscles that results in energy expenditure (Casperson, Powell, & Christenson, 1985). Physical activity can be categorized as either occupational, sports, conditioning, or household activities (Casperson, et al., 1985). Individuals are classified as inactive, active or highly active, depending on their daily or weekly energy expenditure. **Exercise** is a subset of physical activity and is defined as a planned, structured, and repetitive movement for the purpose of improving or maintaining one or more components of physical fitness (Casperson, et al., 1985). **Physical fitness** is defined as the general capacity to adapt and respond favorably to physical effort, implying that individuals are physically fit when they can meet the ordinary as well as the unusual demands of daily life safely and effectively without being overly fatigued, and still have energy left for leisure and recreational activities (Koplan, Casperson, & Powell, 1989). Although it is widely accepted that appropriate activity exerts a positive
influence on health and longevity, much less certainty exists about the type and quantity of appropriate exercise.

**Physiological Benefits**

**Physical Activity**

Individuals who are sedentary and unfit make up nearly 30% of the United States population (ACSM, 1993). Such a high prevalence constitutes a major public health problem (US Department of Health and Human Resources, 1996). Inactivity is listed as one of the major risk factors of coronary heart disease (CHD) (ACSM, 1995). Blair, Wells, Weather, and Paffenbarger (1994) reported that "there is substantial evidence that regular physical activity reduces the risk of chronic suffering and premature death from cardiovascular diseases, diabetes, some cancers, obesity, and osteoporosis" (p. 35). In a review of 43 epidemiological studies, physical activity was said to have a "protective effect" on coronary heart disease (Powell, et al., 1987).

Paffenbarger and Hale (1975) assessed the relationship between work activity and coronary health disease mortality of San Francisco longshoremen. The researchers reported that the risk for CHD mortality was higher for workers with lower levels of work-related activity, less than 2,000 kcal/week, compared with workers who were more vigorous at
work, greater than or equal to 2,000 kcal/week. Similarly, Paffenbarger, Hyde, Wing, & Hsieh (1986) conducted a study among 16,936 Harvard Alumni, relating physical activity habits and mortality rates. The researchers reported that as the amount of weekly physical activity increased, the risk of cardiovascular deaths decreased. Blair et al. (1989) substantiated the previous findings based on the data from 13,344 people who were studied for an average of eight years. The researchers confirmed that the level of cardiovascular fitness was related to mortality from all causes and that regular physical activity indirectly affected the risk of coronary heart disease by moderating the risk factors. The relative risk of CHD was reduced among persons who engaged in high levels of physical activity compared with their sedentary counterparts both in the presence and absence of risk factors such as hypertension, obesity and smoking (Paffenbarger, Wing, Hyde, & Jung, 1983; Siscovick, Weiss, Fletcher, Schoenbach, & Wagner, 1984). Paffenbarger et al. (1993) indicated that the benefits of starting a moderate to vigorous physical activity program, by previously inactive adults, were as important as quitting smoking, managing blood pressure, or controlling cholesterol. The increase in physical activity led to the same decrease as quitting smoking in the relative risk for death from CHD.
Epidemiologists have identified a lower prevalence of hypertension in individuals who were more physically active (Paffenbarger et al., 1983; Sellier, 1995; Tipton, 1991). Tipton (1991) reported that people who exercise have systolic blood pressures of 5-25 mmHg lower than non-exercisers and diastolic blood pressures of 3-15 mmHg lower. In an 18-year follow-up study on exercising and non-exercising subjects, researchers found lower blood pressures in the active group (Kash, Boyer, VanCamp, Verity, & Wallace, 1990). The exercise group had an average resting blood pressure of 120/78 mmHg as compared to 150/90 mmHg for the non-exercise group. Not only did regular physical activity reduce the risk of developing hypertension, but it also may reduce the mortality from stroke. Hypertension often leads to the incidence of stroke, therefore several researchers have investigated stroke in relation to physical activity (Kannel & Sorlie, 1979; Fiebach, et al., 1989). Fiebach, et al. (1989) found an inverse relationship between self-reported physical activity and the incidence of stroke.

It has been shown that increased activity level may have a protective effect from certain forms of cancer in both men and women (Kohl, LaPorte, & Blair, 1988). Kohl, LaPorte, and Blair (1988) reported that an increase in physical activity may reduce risk of colon cancer in men and reproductive cancer in women. Inactive women had a greater
risk for developing cervical and breast cancer (Albanes, Blair, & Taylor, 1989). Physical activity may offer one means for the primary prevention of breast cancer through its influence on ovarian hormones (Friedenreich & Rohan, 1995). Friedenreich and Rohan reported that there was a decreased risk of breast cancer among those women who were more physically active. Lee, Paffenbarger and Hseih (1991) reinvestigated the data from the Harvard alumni study (Paffenbarger, et al., 1986) and reported that the highly active males had half the risk of developing colon cancer than the inactive male alumni. Additionally, former athletes were found to have a lower rate of non-reproductive system cancers when compared to non-athletes (Frisch, Wyshak, Albright, Albright, & Schiff, 1989).

When summarizing the physiological effects of physical activity, Blair, et al. (1994) stated that the "health benefits of changing one's activity from doing nothing to doing something often exceed those gained by increasing from moderate to high levels of activity" (p. 50). While high levels of physical activity were associated with the lowest risks of disease, individuals also received benefits from low levels of physical activity (Blair, et al, 1994).

**Exercise**

Exercise is the regular and planned performance of
physical activity with the final or intermediate objective of improving or maintaining levels of physical fitness (Casper, et al., 1985). Participation in a regular exercise regimen has been confirmed to be beneficial in the prevention of most lifestyle related diseases and was reported to be conducive to physiological well-being (Blair, et al., 1994; Brown, 1990) The benefits of regular exercise may be manifested in terms of primary prevention or via the use of exercise as a treatment for an already diagnosed disease (Powell, 1988). Regular exercise indirectly affects the risk of coronary heart disease by moderating the risk factors (Ekelund, et al., 1988). Researchers who conducted longitudinal research found that increased aerobic activity was effective in controlling several cardiac risk factors such as obesity, (Epstein & Wing, 1980; Wood, et al., 1991), hypertension (Paffenbarger, et al., 1983), and osteoporosis (Gutin & Kasper, 1992). Even when individuals possessed numerous risk factors, their risk for CHD was higher if they did not exercise regularly (Siscovick, LaPorte, & Newman, 1985). Investigators revealed that by prescribing endurance training for patients with diagnosed coronary artery disease (CAD), there was a reduction in mortality and morbidity (Brown, et al., 1989; Ornish, et al., 1990). Hence, there appears to be a relationship between exercise and cardiovascular disease
mortality, as well as a relationship between regular exercise and longevity.

Boger (1970), and Choquette and Ferguson (1973) examined the effect of exercise training on the blood pressure levels of normotensive and hypertensive men. In both studies the researchers found that exercise training lowered systolic and diastolic blood pressures, and that the magnitude of the reductions in blood pressure was significantly greater for individuals with hypertension when compared to individuals with normal blood pressures. Hagberg & Seals (1986) found that individuals with hypertension showed a significant decrease in blood pressure after only 4-5 weeks of initiating training. They reported that this reduction would remain as long as an active lifestyle was continued. Regular exercise was beneficial to patients with mild hypertension with reported reductions of 5-8 mmHg diastolic and 8-10 systolic blood pressures (Siscovick, et al., 1985; ACSM, 1993). Blumenthal, Thyrum, Gullette, Sherwood, & Waugh (1995) confirmed that exercise along with weight loss offered promise as a non-pharmacological treatment for hypertension.

Obesity is a chronic disease possessed by an estimated 33% of the adult population (Kuczmarski, Flegal, Campbell, & Johnson, 1994). It is characterized by the accumulation of excessive levels of body fat and may contribute to heart
disease, hypertension, diabetes, and some cancers. It was reported that in the prevention of obesity, regular exercise was the most important factor influencing lifestyle change (J'ak'Op, 1995). Also, when controlled for other lifestyle changes, exercise was important for the overall reduction of body weight and subsequent maintenance of weight-loss (Zelasko, 1995). Exercise has been associated with improved body composition, preservation of lean body mass (ACSM, 1995; Hawks, 1989), and an increase in the oxidative capacity of muscle tissue (Kahahn & McMinn, 1990). Kahahn and McMinn (1990) found lower insulin levels and increased sensitivity to fat-mobilizing hormones in patients that exercised.

Researchers reported a strong association between the prevalence of obesity and cardiovascular risk factors (Kuczmarski, et al., 1994). The prevalence of hypertension was 2.9 times greater for individuals who were overweight than those individuals who were not overweight, and 2.1 times greater for cholesterolemia than that of the non overweight individuals. Additionally, the incidence for diabetes was 2.9 times greater in the individuals who were overweight. Regular aerobic exercise was shown to alter the lipoprotein profile in post menopausal women (Whitehurst & Menendez, 1991), and both men and women were reported to have lowered their cholesterol by an average of 23% in only
three weeks after following a low fat, low calorie diet, combined with regular aerobic exercise (Barnard, 1991). Anspaugh, Humter and Dignan (1996) reported lower levels of total cholesterol, LDL cholesterol, and triglycerides levels for exercisers than for non-exercisers. They also reported that blood levels of HDL cholesterol were significantly higher in those who exercised.

According to Helmrich, Raglund, Leung, and Paffenbarger (1991) aerobic exercise was helpful in preventing diabetes in middle-aged men. The protective effect was even greater in those with risk factors such as obesity, high blood pressure, and family propensity. The preventative effect was attributed to less body fat and better sugar and fat metabolism resulting from the regular exercise. Roos (1989) reported that exercise was useful in the treatment and management of type II diabetes, but to be beneficial, the exercise must be regular and aerobic.

Exercise has been correlated with bone mineral density, and in the prevention of osteoporosis (Snow-Harter & Marcus, 1991). Older people who had been active for many years were found to have enhanced bone mineral densities (Gutin & Kasper, 1992). Lohman et al. (1995) studied the effects of an 18 month resistance training program on regional and total bone mineral density in premenopausal women. The researchers supported the use of strength training for
increasing lean mass and muscular strength and regional increases in bone mineral density. Davee, Rosen, and Alder (1990) found that young women who supplemented aerobic exercise with weight training of only one hour per week had higher spine bone mineral densities than women who were sedentary or participated only in aerobic exercise. Additionally, athletes have been observed to have higher bone densities than non-athletes (Brewer, Meyer, Keele, Upton, & Hagan, 1983; Pirnay, Bodeux, Crielaard, & Franchimont, 1987). Jacobson, Beaver, Grubb, Taft and Talmage (1984) suggested that increased activity may be associated with a lower rate of age-related bone loss.

Physical Fitness

Physical fitness is a set of attributes that people have or achieve that relates to the ability to perform physical activity (Casperson, et al., 1985). Without physical activity, there cannot be physical fitness. Paffenbarger (1988) concluded that the higher levels of physical fitness led to a delay in cardiovascular disease and cancer mortality. Blair, Goodyear, Gibbons, & Cooper, (1984) examined physical fitness levels and the incidence of hypertension in healthy normotensive men and women. They found that physical fitness, as assessed by maximal treadmill testing, was related to the incidence of
hypertension. When compared to individuals with high fitness levels, individuals with low fitness levels had a 52% greater risk for the development of hypertension and the largest difference in death rates was evident between people with the low and moderate fitness levels. Gibbons, Blair, Cooper, & Smith (1983) found an inverse relationship between physical fitness and systolic and diastolic blood pressures. Ekelund, et al. (1988) reported that low physical fitness was associated with an increased risk of cardiovascular disease.

Finally, there is a lower prevalence of osteoporosis among physically fit individuals. Chow, Harrison, Brown, & Hajek, (1986) compared bone mineral mass and physical fitness in post menopausal women and found that physical fitness correlated significantly with the bone mineral density. Subjects with average physical fitness had lower bone mineral densities, and bench press and leg press strength than did subjects with above average fitness. Also an increase in lumbar spine, femoral neck and total body bone mineral density has been correlated with physical activity (Aloia, Vaswani, Yeh, & Cohn, 1988; Pocock, Eisman, Yeates, Sambrook, & Eberl, 1986). In summary, physical activity, exercise and physical fitness all are key determinants of physiological well-being.
Psychological Benefits

Physical Activity and Exercise

Exercise and physical activity are increasingly being prescribed as a means to maintain and enhance good mental health. Therapeutic approaches emphasizing increased levels of energy expenditure draw on the beneficial effects of exercise in influencing mood and attitude (North, McCullagh, & Tran, 1990; Steptoe & Bolton, 1988; Taylor, Sallis, & Needle, 1985). Thirway and Benton (1992) found that physical activity rather than physical fitness was the factor associated with better mental health and mood, and that higher levels of physical activity were associated with better mood scores. Researchers have indicated that exercise produces both short and long term psychological benefits such as increased vigor and clearer thinking (Dishman, 1985; Morgan & Goldston, 1987; Ross & Hayes, 1988), psychological hardiness (Shephard & Shek, 1994), and reduced anxiety (Allchiter & Motta, 1994).

Weyerer and Kupfer (1994), and Ross and Hayes (1988) reported that low or moderate intensity activity reduced symptoms of depression, anxiety, and malaise in the general population. Also, individuals who were mildly or moderately anxious or depressed experienced positive mood changes with exercise (Ross & Hayes, 1988). King, et al. (1989) found
that acute vigorous activity resulted in reductions of anxiety (King, et al., 1989), whereas chronic activity led to lower levels of depression (Simons, McGowan, Epstein, Kuper, & Robertson, 1985). Martinsen (1990) reported that exercise had an antidepressive effect on patients with mild to moderate forms of depressive disorders, and patients who continued to exercise had lower depression scores than those who did not. Weyerer and Kupfer (1994) indicated that for individuals who were just beginning exercise, individuals who had low fitness levels, individuals who were elderly, and individuals suffering from psychiatric disorders, the psychological benefits of exercise were comparable to gains found with standard forms of psychotherapy and that aerobic exercise plus counseling was more effective than counseling alone.

In several studies investigators reported that regular exercise was an effective non pharmacological treatment for stress, depression and anxiety, (Klingman & Pepin, 1992; Martinsen, 1994; Shephard, 1991). The value of exercise in reducing stress is related to several factors such as decreased muscular tension, release of endorphins and monoamines, thermogenic response, and distraction (Morgan & O'Connor, 1988). Vigorous aerobic exercise, that is continuous in nature and lasts 30 minutes or longer, is associated with the release of endorphins from the pituitary
gland in the brain which may induce a calming effect (Steinberg & Sykes, 1985; Steptoe & Bolton, 1988). The theory of distraction is based on the concept that exercise gives a person a "time out" or distraction from the causes of stress experienced in their daily routine (Raglin & Morgan, 1987).

Researchers suggested that chronic exercise is associated with decreased depression (Klingman & Pepin 1992; Shephard, 1991; Simons, et al., 1985). Based on results from clinical studies, Weyerer and Kupfer (1994) supported the use of chronic exercise to treat depression. Consequentially, for healthy individuals the benefits of exercise may help in the prevention of psychological disorders, and for those individuals who suffer from mild to moderate emotional illness, exercise may function as a means of treatment.

**Physical Fitness**

Physically fit individuals have been found to respond more favorably to the psychological stressors experienced in daily life. Individuals who were cardiovascularily fit have been reported to have a reduced psychosocial stress response. This was particularly evident in prolonged exercise participation (Crews & Landers, 1987). Brandon and Loftin (1991) studied the relationship between physical
fitness and depression, state and trait anxiety, internal locus of control and self-control. Significant positive correlations were found between fitness and the depression scores, internal locus of control, and self-control. They theorized that there was a link between physical fitness and improved emotional response (Brandon & Loftin, 1991). Tucker (1990) examined the degree to which physical fitness contributed to the reduced prevalence of distress (perception of workload, anxiety, work pressures, family problems, and depression) in 4,032 adults. The author found that as physical fitness increased, the prevalence of psychological distress decreased. It appears that there is support for an associative (not causative) relationship between exercise and improved mental health (Sime, 1990).

Determinants of Exercise Participation

Knowledge about the factors related to physical activity is important in health planning and programming (Godin, 1994). Many studies have been conducted to uncover the determinants of physical activity and exercise. Dishman, Sallis, and Ornstein (1985) suggested that a variety of determinants predispose, enable, impede, and reinforce the exercise adoption process. Rehor (1991a) hypothesized associations between the personal, environmental and activity determinants of exercise and the
five stages of behavior change in relation to exercise (Appendix A). Exercise researchers have provided valuable data delineating factors associated with exercise participation. Most researchers have identified only correlates or potential determinants of exercise. The initial problem faced by those who studied exercise determinants was the difficulty in defining and measuring exercise and physical activity (Dishman, 1994). Measurement of physical activity is complicated by variations in type, intensity, frequency, duration and intermittency. The determinants of exercise maintenance rather than the determinants of exercise adoption were revealed in most literature on exercise participation (Dishman, 1994). However, the predictors of exercise adoption is a topic of great importance, and in need of serious investigation, considering the low percentage of Americans that participate in regular exercise (Sallis & Hovell, 1990). The determinants known today can be categorized into one of the following groups: Personal characteristics; knowledge, attitudes and beliefs; environmental factors; or social factors.

Personal characteristics were likely to play a major role in determining exercise participation (Sallis & Hovell, 1990). Investigators have reported that age, race, gender, and education all played a role in exercise participation.
Physical activity has been noted to decrease with age after late adolescence (Stephens, 1980) and again after the age of 50 (Reaven, McPhillips, Barrett-Connor, & Crack, 1990). Many researchers have reported lower activity levels among women than among men, particularly at younger ages (Sallis, Patterson, Buono, Atkins, & Nader, 1988; Schoenborn, 1986). Comparisons by race are said to be confounded by socioeconomic status and level of education (King, et al., 1992). However, in two studies, researchers reported that black women were found to be less active than white women (Folsom, et al., 1991; Ford, et al., 1991).

Occupation, education, and income may also determine exercise habits. "Blue collar" workers were less likely to engage in physical activity than white collar workers (King, Carl, Birkel, & Haskell, 1988). This may be due to the physical nature of the job, although, in the clinical area, blue collar occupation was also associated with poor adherence (Oldridge, 1982). The level of education has been positively associated with physical activity (Matthews, Kelsey, Meilhan, Kuller, & Wing, 1989; Stephens, Jacobs, & White, 1985), and a positive relationship was also reported between income and physical activity (Schoenborn, 1986; Stephens, et al., 1985).

Knowledge, attitudes, and beliefs positively correlate with exercise participation. (Dishman, 1982; Shephard,
Dishman et al. (1985) stated that while active individuals were knowledgeable about exercise, it was unclear whether such knowledge was an antecedent or a consequence of involvement. Additionally, people who believed that exercise was of little value exercised less than those who held exercise in high "regard" (Dishman, 1982). People who perceived their health as poor are unlikely to adopt or adhere to an exercise program (Sallis, 1986). Also one's self-efficacy (i.e., confidence in one's abilities) of being able to perform a specific activity or behavior has been associated with physical activity (Bandura, 1977; Dzewaltowski, Noble, & Shaw, 1990). Dzewaltowski et al. (1990) reported that the more confidence one has in their physical activity abilities, the more likely they will initiate and regularly participate in an exercise program.

The influence of environmental factors can affect physical activity. Lack of time, convenience of facilities and equipment, safety of the neighborhood, and weather are just a few factors that may have an influence on exercise participation. Dishman (1982) and Oldridge (1982) found that the most common reason of dropping out of an exercise program was lack of time. Environmental reinforcement and stimulus control via advertising and media have been successful in increasing adherence (Brownell, Stunkanrd, &
Additionally, the social factors appeared to be an important contributor in the adoption and maintenance of physical activity (Rosenthal & Bandura, 1978). Aspects of the social environment include the attitudes of family, peers, and health professionals, spouse support, and competing responsibilities. These aspects can either help or hinder participation. For example, Dishman (1984) found that social reinforcement from exercise staff or exercise partners helped individual's adherence (Wankel, 1985).

Numerous studies have been conducted for the purpose of understanding, predicting and facilitating exercise adherence (Ajzen, 1988; Bandura, 1977; Dishman, 1982; Gatch & Kendzierski, 1990; Oldridge & Streiner, 1990; Prochaska, et al., 1994) Though many techniques and constructs have been investigated, success has been limited and conclusive guidelines have not emerged. Several theorists believed this failure to determine predictable results could be due to the design and implementation of research without an underlying theoretical basis to explain the change processes involved in initiating and maintaining an exercise program (Dishman, 1994).

Exercise Adoption and Adherence

Despite the many benefits of exercise, retaining people
in an exercise program can be quite difficult. Dishman and Gettman (1980) affirmed that attrition rates may exceed 50% within the first six months of initial involvement. Helping people to stay regularly involved in physical activity is a challenge requiring the use of a sound theoretical approach on the part of the health educator. Finding ways to encourage the extremely sedentary to adopt a more active lifestyle represents an increasingly important public health goal. Dishman (1988) stated that "neither intention, willpower, commitment, nor knowledge will be adequate by themselves to change a sedentary lifestyle to an active one...." (p. 209).

A wide range of determinants contributing to participation in physical activity has been revealed in the past ten years. Investigators have examined factors that influence the decision to exercise (Dishman, 1982, Martin & Dubbert, 1982). Dishman (1982) examined the interaction between situational, biological, and psychological factors that lead an individual to make a decision about exercise participation. Dishman (1992) attributed decisions to be a product of abstract beliefs (thoughts) and concrete sensory perception (feelings) that a person brings to or experiences during exercise.

Situational factors were various components of a person's lifestyle outside of exercise that either
facilitated or competed with exercise, such as the enjoyment of the experience (Kravitz & Furst, 1991). Dishman (1982) reported that the average person will have a better chance of adhering to an exercise program that was conveniently located and easily accessible. Situational factors can be lifestyle related, such as support from "significant others," or can depend on the exercise setting, such as small group versus alone, and can be influenced by behavioral change strategies like using reinforcement techniques. Biological factors were described as traits which an individual possessed such as body composition, aerobic fitness level, and health status (symptomatic vs. asymptomatic). Biological factors can have a significant impact on one's decision to exercise. In addition, these factors may also interact with motivational factors or beliefs about the outcomes of exercise and may influence the choice of the mode, intensity and duration of the exercise that a person chooses (Dishman, 1984).

Finally, some psychological factors have an impact on one's willingness to exercise. Dishman (1984) reported that attitudes can predict a person's initial involvement and the type of exercise a person selects. Although, the fact that individuals viewed exercise as a rewarding experience did not ensure that they adhered to a program. The beliefs that
a person holds about the consequences of exercise and the expected outcomes he or she hopes to gain from the experience also influence the decision to exercise. A person who believes that a relationship exists between exercise and improved health is more likely to adopt fitness into their lifestyle. Additionally, personality traits affect one's decision to exercise. Dishman (1984) and Dishman, et al. (1985) revealed that extroversion and self-motivation are the two most common personality traits believed to enhance adaptability to the behavioral demands that exercise impose. Dishman (1984) noted that extroverts are more likely to adhere to an exercise program and tend to choose group exercise classes over individual routines, while introverts prefer exercising alone. Furthermore, exercise adoption can be increased by matching an individual's personality traits with a suitable exercise program. Self motivation is another psychological trait thought to influence adoption of exercise. Dishman (1984) concluded that self-motivated individuals are better suited to overcome environmental obstacles in an exercise setting, such as an inconvenient time or an un-supportive spouse. Dishman, et al. (1985) supported the principle that individual differences (psychological, biological and situational traits) must be accommodated for in program
planning, but stressed that each situation is unique and what succeeds for one individual may not succeed for another.

**Psychosocial Models Applied to Exercise**

An increasing amount of studies have failed to provide basic answers about who will exercise, why, or for how long (Dishman, 1982; 1985; Dzewaltowski, et al., 1990; Godin & Gionet, 1991). Researchers have studied several existing psychosocial models used with exercise in hopes to gain a better understanding of exercise adoption and adherence. The following models are based on the social/cognitive learning theories. Researchers using the social/cognitive theory identified the importance of people's ability to regulate their own behavior by goal setting, monitoring, and actively intervening to make their social and physical environment supportive of these goals. The social learning variables were identified as being important determinants in adult's and children's physical activity participation (Stucky & DiLorenzo, 1993). Stucky and DiLorenzo (1993) suggested that the social cognitive framework provides practitioners with a strong foundation on which to build interventions as well as to compare other theories and models. Social cognitive theories may differ in the interpretation of the causes of behavior, however, the same
or similar variables are detected in each of the theories.

A thoroughly studied construct is the Health Belief Model (HBM) (Becker & Maiman, 1975). Proponents of this model postulate that health-related behaviors can be understood in relation to their potential to protect against disease or improve health (King, et al., 1992). The perception of a health threat is determined by the strength of two underlying beliefs: personal susceptibility to a given disease and the potential severity of its impact on the individual's life. Therefore, an individual should decide to exercise regularly if a sedentary lifestyle is perceived as a threat to some aspect of health, and regular activity is seen as decreasing that risk.

When used to describe exercise participation, the HBM was thought to be inappropriate (King, et al., 1992). In two studies, authors reported no significant association between the HBM variables and exercise behavior (Mullen, Hersey, & Iverson, 1987; O'Connell, Rice, Roberts, Jurs, & McKinley, 1985). This may be explained by the uni-dimensional framework. The HBM is constructed on the supposition that an individual's motivation for changing a behavior stems from illness avoidance. However, the motivation of exercise participation was thought to be influenced by many factors (Dishman, et al., 1985). The exception to this may include the motivation for
rehabilitative exercise for a population already affected by
disease (Dishman, 1994). Physical activity was perceived as
requiring more time and effort than other health behaviors,
thus physical activity appeared to be unique among health-
related actions (Rehor, 1991b). The HBM model was designed
for risk avoidance behaviors not health enhancement
behaviors, therefore, its effectiveness may be less for
those who view physical activity as a health promoting
behavior than those who view exercise as an illness reducing
behavior.

The Protection Motivation Theory (PMT) (Rogers, 1975)
is similar to the HBM with the addition of the component of
self-efficacy. Self-efficacy involves people's degree of
confidence that they can abstain or engage in a behavior
(Bandura, 1977). The model was designed to explain how
people cope with a threatened danger. Maddux and Rogers
(1983) theorized that the intention to protect oneself
depends upon four factors:

1. The perceived severity of a threatened event
2. The perceived probability of the occurrence
3. The efficacy of the recommended preventative
   behavior
4. The perceived self-efficacy

Wurtle and Maddux (1987) applied the PMT to exercise
behavior and reported that perceived susceptibility to
cardiovascular disease and perceived self-efficacy enhanced intentions to exercise among a group of female undergraduates. Similarly, Desharnais, Godin, and Jobin (1987) found that all subjects who were exposed to persuasive communication increased their intention to exercise, regardless of their perceived susceptibility. Godin (1994) concluded that messages that convey a persuasive threat seemed effective in enhancing participants' intentions to change, but they are less effective in inducing and sustaining changes of actual behaviors. Godin (1987) found that subjects who had their physical fitness evaluated reported a stronger intention to exercise over the next three months than those who did not, however, the behavioral effect diminished after three months.

The authors of The Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975) assumed that social factors affected the decision to exercise. According to Fishbein and Ajzen (1975) the proximate determinants of the intent to adopt a given behavior are the individual's attitude about performing the behavior and the influence of social factors upon performance of the behavior. The model assists researchers in explaining the interaction of personal and environmental characteristics. The attitudes about a specific exercise prescription (i.e., time place, and type
of exercise) can predict behavior through its interaction with social norms, and both can predict intention (Ajzen & Fishbein, 1977). The model can be represented symbolically as follows:

\[ B-I = (A_{act})_w + (SN)_w \]

Where \( B \) behavior approximates \( I \) the intention, and is equal to \( (A_{act}) \) the attitudinal component plus \( (SN) \) the normative component. The attitudinal component is the person's attitude toward the behavior, and the normative component is a person's perception that the majority of "significant others" think that he or she should adopt the behavior. \( W_1 \) and \( W_2 \) are the weighing coefficients which show inter-situational and inter-individual differences. For some behaviors the attitudinal component is the major determinant of intention, whereas for other behaviors the normative component is the dominant component (Godin, 1994). "The personal attitude toward the behavior, is a function of the beliefs concerning the perceived consequences of carrying out a specific action, and a personal evaluation of these consequences" (Godin, in Dishman (Ed.), 1994, p. 118).

In a review of studies that used this theory, Godin (1994) reported that approximately 30% of the variance in intention to exercise was explained by the attitudinal component, and that the normative component did not appear to be a variable for the interpretation of exercise.
behavior. The weakness of the TRA in predicting exercise behavior from attitudes and social norms lies in its postulation that intentions are the sole predictors of behavior (Ajzen & Madden, 1986; Dzewaltowski, et al., 1990). While intentions are necessary for adoption of habitual exercise, they are not sufficient to predict physical activity. The TRA has proved helpful in clarifying the discriminating process that underlies exercise behavior (Dishman, et al., 1985).

**The Theory of Planned Behavior (TPB)** (Ajzen, 1985) extended beyond the theory of reasoned action by including the concept of perceived behavioral control (Godin, 1994).

\[ B-I = (A_{act})w_1 + (SN)w_2 + (PBC)w_3 \]

In this model, (B) is the behavioral component, (I) is the intention, (A_{act}) is the attitudinal component, (SN) is the normative component and (PBC) represents perceived behavioral control. \( w_1, w_2 \), and \( w_3 \) are the weighing coefficients affecting the strength of the attitudes, social norms and perceived behavioral control as they influence intentions.

Perceived behavioral control is determined by the perceived presence or absence of required resources and opportunities and of anticipated obstacles; the control belief and by the perceived power of a particular control factor to facilitate or inhibit performance of the behavior.
Investigators of this model postulated that most behaviors fall along a continuum that extends from total control to complete lack of control. The perception of control affects the decision to perform a specific behavior (Ajzen, 1985; 1991; Godin, 1994). Ajzen (1985, 1991) ascertained that individual's beliefs about how easy or difficult adoption of the behavior will be, and how their beliefs about the availability of resources and opportunities may be viewed, underlies their perceived behavioral control. The developers of the Theory of Planned Behavior accounted for the influence of the perceived barriers to action and self-efficacy as influencing behavior. One's perceived behavioral control, attitude, and subjective norms, all influence intentions to perform a behavior. Furthermore, perceived behavioral control reflects personal beliefs as to how easy or difficult adopting a behavior is likely to be.

Application of this model to exercise has been useful in describing exercise behavior as it helps researchers understand the formation of intention to exercise (Drewaltowski et al., 1990; Gatch & Kendzierski, 1990). Gatch and Kendzierski (1990) found that perceived behavioral control contributed to the prediction of the intention to do aerobics regularly. Similarly, Godin and Gionet (1991) determined that perceived behavioral control influenced the
intention to exercise among employees who suffered from coronary heart disease. Godin (1994) suggested that partial support be given to the usefulness of this model with exercise behavior, however, additional studies were needed before a final conclusion could be made.

Theory of Interpersonal Behavior (TIB) (Triandis, 1977) was developed to predict behavior from the interaction between the intentions to perform the behavior, and conditions facilitating or discouraging performance of the behavior. Triandis (1977) postulated that some behaviors became automatic and were performed with little conscious intervention. Therefore, the number of times a behavior was performed, the more likely it would become a habit. The theorists of interpersonal behavior indicated that intention is shaped by four components: a cognitive component; an affective component; a social component; and personal normative beliefs.

\[ B = (IxF)w_{i,f} = (HxF)w_{h,f} \]

\( B \) is the given behavior, \( I \) is the individual's intention to perform or not to perform the behavior, \( H \) is the evaluation of the habit of number of times the individual has performed the behavior, and \( F \) is the evaluation of conditions facilitating or discouraging performance of the behavior. \( w_{i,f} \) and \( w_{h,f} \) are the corresponding regression coefficients (Godin, 1994).
The cognitive component includes the analysis of the advantages and disadvantages of adopting a behavior. The affective component is described as the individual's emotional response to the thought of adopting a behavior. This component may be shaped by previous experiences of the behavior. The social component reflects the relationships between the individual and other people and the appropriateness of performing the behavior. Finally, personal normative beliefs are the measure of the individual's perceived obligation to perform the desired behavior.

Application of this model to exercise suggested that the affective component of attitude was more influential than the cognitive component (Godin, 1987; Wankel, 1985). Criticism of this model originates from the absence of recognizing variables such as self-efficacy, and perceived barriers to exercise participation (Godin & Gionet, 1991; Godin, Valois, Jobin, & Ross, 1991).

**Transtheoretical Model of Behavioral Change**

While traditional behavioral change theorists conceptualized behavioral change as a linear sequence, those who prescribed to the Transtheoretical Model of Behavioral Change (TMBC) recognized that acquisition and maintenance of a behavior was a dynamic process incorporating sequential
stages rather than a dichotomous event (Prochaska & DiClemente, 1983; Prochaska, Velicer, DiClemente, & Fava, 1988). These theorists have demonstrated the existence of stages and processes of change for a number of behaviors such as smoking cessation, dietary habits, weight reduction and health screening. Use of the TMBC has proven to be applicable to the acquisition and maintenance of a behavior and involves five stages: precontemplation, contemplation, preparation, action and maintenance (Prochaska, et al., 1994; Sonstroem, 1988). The Transtheoretical Model of Behavior Change (TMBC) has been recently applied to health behavior (Marcus, Rossi, Selby, Niaura, & Abrams, 1992; Marcus & Simkin, 1993). This model uses constructs from other theories such as self efficacy and decisional balance to examine the behavioral processes an individual goes through when adopting a new behavior. Behavioral theorists have examined the stages and processes that influence exercise participation (Marcus & Simkin, 1993; Prochaska & DiClemente, 1983; Sonstroem, 1988). Factors such as self efficacy and decision making were key components of this model (Godin, 1994).

Stages of Behavior Change

Dishman (1982) attributed the lack of success in exercise adherence research to a narrow focus of exercise
participation. Most researchers have investigated the predictive characteristics of exercise rather than the process characteristics of exercise. Dishman (1982) recommended placing more importance on the interaction between these two variables. Dishman (1982) along with other researchers have taken a theoretical approach to behavioral change (Marcus & Simkin, 1993; Prochaska, 1979; Prochaska & DiClemente, 1984).

Researchers have suggested that individuals engaging in a new behavior move through a series of stages of Precontemplation (not intending to make changes), Contemplation (considering change), Preparation (making small changes), Action (actively engaging in the new behavior), Maintenance (sustaining the change over time), and Termination (having no temptation to relapse) (Marcus & Simkin, 1993; Prochaska & DiClemente, 1983). The model of stages of change has been used to explain how an individual progresses through the stages of changing a behavior. Stages are characterized as being "dynamic in nature, and behavior change is not an "all-or-none phenomenon; individuals who perform a behavior may relapse and start again" (Dishman, 1994). In essence, each stage is open to change.

A stages of exercise adoption questionnaire (SEA) was developed in order to describe a person as being in one of
the five stages of change (Marcus, Rossi, et al., 1992). Six statements were designed to assess current stage of exercise behavior.

1. I do exercise now
2. In the next 6 months I plan to exercise
3. I exercise regularly now (regular exercise is defined as 3 or more times a week for 30 mins. or longer)
4. For the past 6 months I have exercised regularly
5. In the past, I have exercised regularly for a period of at least 3 months

Using an algorithm (Appendix C) researchers are able to evaluate the questionnaire in order to classify an individual as being in one of the five groups.

Processes of Behavior Change

Theorists proposed that individuals, while moving sequentially between the stages, used ten processes of change (Prochaska & DiClemente, 1983; Prochaska, Velicer, DiClemente, & Fava, 1988). Five processes are classified as experimental processes, and five are classified as behavioral processes (Table I). Experimental processes were used to explain the early behavior changes (precontemplation - preparation), while the behavioral processes were used to predict the later transitions (preparation - maintenance) (Marcus, Rossi, et al., 1992).
Transtheoretical Model and Exercise

Unlike other health behaviors, the habit of regular exercise involves factors that may be unique, and therefore required studying the processes that occur between exercise adoption and adherence (King & Martin, 1993). Researchers have indicated that factors influencing initial adoption and early participation in exercise may differ from those affecting subsequent maintenance (King & Martin, 1993; Marcus, Rakowski, & Rossi, 1992). Sonstroem (1988) was the first to apply the Transtheoretical Model to exercise. He believed that researchers should study processes of change in exercise adoption to enhance the design and delivery of exercise interventions.

Sonstroem classified two hundred and twenty males, as being in one of the stages of exercise change, by their self reported exercise history. Subjects answered statements concerning their beliefs about the outcome of regular exercise participation. Sonstroem (1988) found that beliefs were related to the stage of exercise behavior (Sonstroem, 1988). Selby (1989) examined the applicability of the Transtheoretical Model’s processes to exercise behavior.
Table 1. Processes of Change

**EXPERIMENTAL PROCESSES**

CONSCIOUSNESS RAISING - Increasing the information available to individuals;
ENVIRONMENTAL REEVALUATION - altering an individual's perception of his/her behavior's effects on the environment;
SELF-REEVALUATION - altering one's perceptions regarding the effects of a particular behavior on oneself;
SOCIAL LIBERATION - society changing to provide more alternatives for problem behaviors;
DRAMATIC RELIEF - releasing blocked emotions by extrinsic emotional observations;
SELF LIBERATION - freeing oneself of old beliefs and behaviors and becoming aware of new possibilities;

**BEHAVIORAL PROCESSES**

COUNTERCONDITIONING- altering the way we respond to a stimulus that had been controlling our behavior;
STIMULUS CONTROL - altering the environment;
REINFORCEMENT MANAGEMENT - altering the contingencies which reinforce and maintain a behavior;
HELPING RELATIONSHIPS- support from others during behavior change.
She hypothesized that individuals use similar change processes in developing exercise habits as those demonstrated in other problem behavior changes. A questionnaire was developed using the definitions of the ten processes related to behavior change and was administered to 443 college students. The author revealed that only seven of the ten change processes were employed by individuals in developing their exercise habits: Consciousness Raising, Dramatic Relief, Environmental Reevaluation, Helping Relationships, Stimulus Control, Counterconditioning, and Self-Reevaluation. As she predicted, individuals in the early stages used more of the experimental change processes, and those in the later stages used more of the behavioral processes. Also, Selby found that all processes were used most frequently by subjects in the maintenance stage.

Barke and Nicholas (1990) compared the stages between active and inactive groups of older adults. The researchers revealed that the active group's responses categorized the adults into either the action or maintenance stage, whereas the inactive group's responses were categorized as belonging to the precontemplation and contemplation stages. It was concluded that use of the stages of change model, is a way to differentiate adults by knowing the amount of their activity participation.

Selby and DiLorenzo (1991) administered a stages of
change and processes questionnaire to college students to
determine if there was a different application of the change
process by current stage of exercise. The authors found
that the processes used by the students were different
depending on their stage classification. It was reported
that the experiential processes were used in the earlier
stages (precontemplation and contemplation) and the
behavioral processes were used more in the later stages
(preparation, action, and maintenance).

Marcus, Rossi, et al (1992) applied the stages and
processes of change to exercise adoption and adherence.
Participants in a work-site health promotion project were
asked to complete two questionnaires dealing with the stages
and processes of exercise. The purposes of the
investigation were to develop a scale to measure stages of
change for exercise behavior, obtain prevalence information
regarding where individuals were distributed along the
exercise scale, and to test the ability of a self-efficacy
measure to differentiate individuals according to stage of
readiness to change. Participants were classified as being
in one of the five stages of behavior change. The Stages of
Change model developed for smoking (DiClemente & Prochaska,
1982) was modified to describe exercise behavior. A five-
item self-efficacy measure designed to measure confidence in
one's ability to persist with exercise in various situations
was also developed. Self-efficacy items represented the following areas: negative affect, resisting relapse, and making time for exercise. Based on the results, the authors reported that scores on the self-efficacy measure were significantly related to stage in the change process, and that self-efficacy was closely linked to stage of self-change in physical activity. They concluded that those in pre-contemplation and contemplation had the lowest self-efficacy scores and those in maintenance had the highest self-efficacy scores. Also, individuals at various stages had different degrees of exercise-specific self-efficacy. This difference suggests that individuals at the different stages might benefit from interventions that differ in their focus on enhancing efficacy expectations. They found that subjects in the various stages of change used the processes of change differently. Those in precontemplation used all 10 processes significantly less than subjects in other stages. Subjects in the earlier stages used more experimental processes, while those in the later stages used more of the behavioral processes (Marcus, Rossi, et al., 1992).

Marcus, Selby, et al. (1992) examined the application of the stages of change model to the study of exercise behavior as part of a work site health promotion project. Two hundred and thirty five (235) male and female employees
completed an exercise behavior questionnaire and a 7-day physical activity recall (self report) questionnaire. Subjects were categorized into five stages of exercise behavior and then classified into three categories (Precontemplation/Contemplation, Preparation, Action/Maintenance). The researchers performed a one-way analysis of variance to assess the correlation between the stages of exercise behavior and reported time spent in moderate and vigorous exercise. The authors revealed that there was a significant difference in participation in physical activity among the three stages. Subjects in the Action/Maintenance group reported significantly more vigorous and moderate physical activity compared to subjects in the Precontemplation/Contemplation group. Subjects in "Preparation" were also found to report more vigorous and moderate physical activity than those in "Precontemplation/Contemplation". Subjects in Action/Maintenance differed from those in Preparation in terms of vigorous activity. Marcus and Simkin (1993) concluded that one's stage of exercise behavior appeared to be differentiated by self-reported physical activity.

Rehor & McNeil (1993) evaluated the use of the Transtheoretical Model in relation to exercise behavior of senior citizens. The purpose of the study was to develop a health intervention strategy that would encourage senior
citizens to adopt and adhere to a regular exercise program. The participants self assessed their exercise behavior using the Exercise Questionnaire at baseline, three months and six months into the program. The investigators then classified the participants into one of the five stages of the Transtheoretical Model of Behavior Change. Stage specific, cognitive behavioral strategies were developed for each stage and administered to the participants at the beginning of the program and three months later in accordance with their classification within the model. Rehor and McNeil (1993) reported that the intervention was effective in increasing exercise participation. Examination of only those stages of the model where positive change was possible i.e. all stages except maintenance, revealed that for every two individuals who regressed within the stage model there were five who advanced to a higher level. In addition, over 50% of those individuals in stages where positive movement was possible, made positive movement to higher level of exercise adoption. They concluded that the interventions developed were successful in encouraging the senior citizens to adopt exercise (Rehor & McNeil, 1993).

In summary, the Transtheoretical Model has been helpful in the understanding of exercise and health behaviors. Assessing stages of change has been found to predict the likelihood of future effort to change (Prochaska, Velicer,
Roberson (1989) and Selby (1989) have developed reliable, valid instruments to assess the stages and processes involved in exercise acquisition and maintenance. Perhaps the most important application of this model allows researchers to identify strategies that will work best for individuals at different stages and levels of exercise participation.

Decisional Balance

Decision making theories have been helpful in the research of behavior change. Janis and Mann (1977) recommended that positive and negative outcomes should be recognized when investigating decision-making. They developed a decisional balance model that applied eight decision making constructs: instrumental benefits to self, instrumental benefits to others, instrumental costs to self, instrumental costs to others, approval from self, approval from others, disapproval from self, and disapproval from others (Janis & Mann, 1977). This decision-making process has been found to be highly related to current and future likelihood of participating in health behavior change (O’Connell & Velicer, 1988; Prochaska, et al., 1994). Before change can take place, one must perceive the behavior as having high benefits (Pros) and low costs (Cons).

Recently, researchers have simplified this model to a
two factor construct based on the comparison of the perceived positive aspects (Pros) and negative aspects (Cons) of a new behavior (O’Connell & Velicer, 1988; Prochaska, et al., 1994). This decision-making process has been found to be highly related to the current and future likelihood of participating in health behavior change (Marcus, Eaton, Rossi, & Harlow, 1994). This model has been valuable to the understanding of the Transtheoretical Model of Change.

The balance between the Pros and Cons varies depending on the stage of change. Prochaska et al. (1994) reviewed the stages of change of 12 problem behaviors and revealed that predictable patterns were applicable across the stages (Prochaska et al., 1994). In the Contemplation stage, the Cons of changing the behavior outweighed the Pros in all of the 12 samples. In the Action and Maintenance stages, the Pros outweighed the Cons of the problem behaviors. Researchers have applied the decisional balance model to smoking cessation and depicted the difference between pro/con across the stages of change (DiClemente et al. 1991). The pros and cons of a new behavior were most pertinent of movement in the first three stages of behavioral change (Precontemplation, Contemplation and Preparation) and was characterized as being predictive of behavior change (DiClemente et al., 1991; Marcus, Selby, et
al., 1992). Similar findings were reported in a study on mammography screening and decisional balance (Rakowski, et al., 1992).

The decisional balance model has been recently applied to health promoting behaviors such as exercise adoption (Marcus & Owen, 1992; Marcus, Rakowski, & Rossi, 1992; Marcus et al., 1994) and weight loss (O’Connell & Velicer, 1988). Marcus, Rakowski, & Rossi (1992) tested a 40-item questionnaire consisting of statements based on constructs from the Transtheoretical Model of Behavior Change. Using a principal component analysis, they identified two factors; a six item component that represented avoidance of exercise (Cons) and a ten item component that represented the positive perceptions of exercise (Pros). In addition, the Pros, Cons, and decisional balance measure (Pros minus Cons) were found to be significantly associated with stage of exercise adoption. Researchers have compared the sum of the Pro, Con and Pro/Con scores across the stages of the change process (Marcus & Owen, 1992; Marcus, Rakowski, & Rossi, 1992). By using the decisional balance measure, the researchers were successful in differentiating between five groups representing the stages of change in the adoption of exercise. The sum of the Pros were lowest for the Precontemplators and the highest for those in Maintenance. The opposite was true of the Con scores. The significant
imbalance of pros over cons appeared in the action group. Grimley, Riley, Bellis & Prochaska (1993) also found the imbalance of pros over cons to occur in the action stage for the behaviors of contraceptive and condom use. Similar findings have also been reported for exercise behavior (Prochaska et al., 1994). Prochaska et al. (1994) theorized that one's perceived exercise beliefs (Decisional balance) probably takes place during the preparation stage suggesting that for most problem behaviors the decision to change the behavior (Pros outweighing the Cons) will occur before an individual takes action. The progress from Precontemplation to Action involved both an increase in Pros (Precontemplation to Contemplation) and a decrease in Cons (Contemplation to Action). This transition facilitated the decisional crossover from Precontemplation to Action and is dependent on "how much and when the pros increase and how much and when the cons decrease" (Prochaska et al., 1994, p. 44). Marcus, Rakowski, & Rossi (1992) appropriately characterized the usefulness of the decisional balance measure stating that "knowing participant's beliefs may portend the degree of acceptance or reluctance encountered by attempts to produce behavioral change toward regular exercise behavior" (p. 260).
**Self-Efficacy**

Self-efficacy is the perception of one's ability to perform a task successfully (Bandura, 1977). It is a function of past learning and the judgement of the complexity or difficulty of the behavior required. Bandura (1977) developed the self-efficacy theory using the concepts of confidence and expectations. Bandura's theory places self-efficacy as a common cognitive mechanism for mediating motivation and behavior. Personal factors and personal attributes were thought to influence behavior and efficacy cognitions were theorized to be reciprocally determined by that behavior (Bandura, 1977). One's self-efficacy determines whether an individual attempts a given task, the degree of persistence when the individual encounters difficulties, and their ultimate mastery of the task. The use of the self-efficacy construct has been successful in predicking sport participation, (Feltz, 1988; McAuley & Gill, 1983) and health behaviors (Bernier & Avard, 1986).

Behavior can be interpreted by use of the self-efficacy theory by examining outcome expectations or efficacy expectations. Outcome expectations are beliefs that a certain action will result in a desired outcome. Efficacy expectations are beliefs that one can perform a desired behavior (Bandura, 1977). Researchers supported the relevance of self-efficacy in influencing and predicting
health promoting behaviors such as, smoking cessation, weight loss, and dietary changes (Bandura & Simon, 1977; Contento & Murphy, 1990). Kelly, Zyzanski, and Alemango (1991) examined the constructs of self-efficacy, health beliefs, and social support and their relationship to smoking, stress, eating behavior, and seat belt use. The authors evaluated how well the constructs were able to predict motivation for change. Self-efficacy and perceived benefits were reported to have the strongest influence on behavior change.

In a cross-sectional study, self-efficacy was regarded as an important determinant of quitting smoking among pregnant women (DeVries & Backbier, 1994). The investigators reported that individuals in the Action and Maintenance stages possessed greater self-efficacy than Precontemplators and Contemplators.

Self-efficacy is also a strong predictor of exercise adoption and adherence. The attempt to increase exercise behavior is influenced by self judgement of the expected beliefs of regular exercise and the perceived ability to exercise regularly (Dishman, 1994). A low self-efficacy may lead to early attrition, whereas a high self-efficacy should strengthen future expectations (McAuley & Jacobson, 1992).

Marcus et al. (1991) examined the self-efficacy and decisional balance in 431 employed women. The authors
revealed that women in pre-contemplation scored the lowest on the self-efficacy, Pro, and decisional balance indices. Women in maintenance scored the highest on these measures. They concluded that women may be better served by stage-method interventions to increase physical activity.

McAuley (1992) employed a social cognitive framework to examine self-efficacy and exercise behavior in sedentary middle-aged adults. The author found self-efficacy was a reliable predictor of exercise adoption. Additionally, the influence of self-efficacy was strongest in the adoption phase of exercise behavior, a stage where how often one exercises and the degree of perceived exertion expended are related to one's beliefs concerning their physical abilities and confidence to continue exercising despite a myriad of barriers. In this phase, exercise participation may be "tiring, painful, inconvenient, and stressful to the system" (McAuley, 1991). McAuley (1992) suggested that as the desired behavior becomes more difficult, self-efficacy plays a more portentous role.

McAuley, Courneya and Lettunich (1991) examined the self-efficacy of sedentary males and females when they participated in various types of exercise. The authors found that both males and females demonstrated a significant increase in efficacy following acute and long term exercise. Likewise, McAuley, Lox and Duncan, (1993)
reported that self-efficacy was the only variable that significantly predicted adherence to a 5-month structured program. Similarly, self-efficacy was found to be the strongest predictor of physical activity in a population of rural homemakers (Horne, 1994). Horne examined the variables related to the intention and behavior. Perceived social support, attitude and self-efficacy predicted future intention in active homemakers. Only self-efficacy and attitude were cited as predictors in inactive homemakers.

Marcus, Selby, et al. (1992) administered the stage of exercise adoption and self-efficacy of exercise to 1,492 employees. The researchers found that the scores on efficacy items significantly differentiated employees at most stages. Further, employees who had not yet begun to exercise, were found to have little confidence in their ability to exercise in comparison with regular exercisers.

Interventions based on self-efficacy have been reported to enhance exercise adherence and modify behavior (McAuley, Courneya, Rudolph & Lox, 1994; Strecher, DeVellis, Becker & Rosenstock, 1986). McAuley et al., (1994), explored the function of an efficacy-based information intervention on exercise adoption in sedentary, middle-aged males and females. Subjects were assigned to either an adherence-intervention group or an attention-control group. The efficacy-based intervention group had better adherence to
the exercise program than did the control group. The authors found that by knowing one's self-efficacy they were able to predict exercise behavior. However, the intervention did not have an direct effect on the participants self-efficacy.

Marcus, et al. (1994) conducted a similar study with the inclusion of a predication analysis. Subjects answered three questionnaires, stage of exercise adoption, self-efficacy and decisional balance at baseline, and again six months later. The researchers indicated that an individuals' level of physical activity could be predicted by knowing their self-efficacy, stage of readiness, and their perceptions of costs and benefits of exercise. Researchers concluded that individuals who placed a high importance on engaging in exercise, and have high self-efficacy can be expected to feel a greater readiness for exercise than individuals with low self-efficacy. Knowing the self-efficacy beliefs of individuals is important in the understanding of how one perceives physical activity will personally benefit them. Self-efficacy factors are associated with initial participation in physical activity, however, it does not appear to influence how long an individual maintains an exercise regimen (Prochaska & Marcus, 1994).
In summary, researchers have clearly established the benefits of exercise, physical activity and physical fitness to physiological and psychological health. In spite of this evidence, participation and adherence to exercise is still quite low. Therefore, researchers should no longer be primarily concerned with documenting the benefits of exercise, but concentrate on understanding exercise behavior so that effective intervention programs can be designed.

Research into the determinants of physical activity participation has typically attempted to predict which individuals are or will be active or inactive at a given point of time. This approach has met some success, but has not provided a level of understanding that would allow for the development of precise and effective interventions. As a result there has been a proliferation of theoretical models applied to exercise. Although various theoretical approaches have achieved some success in understanding exercise behavior, these approaches have also met some criticism. Exercise researchers have suggested that we need to shift from predictive to process models to better understand behavior change.

The Transtheoretical Model of Behavior Change appears to be a model that has taken us one step ahead of the
traditional unidimensional model to a more dynamic model. The TMBC posits that a person moves through a series of stages when changing a behavior. In these stages, certain processes and variables appear to facilitate the movement to a higher stage. The TMBC defines a set of outcomes or intermediate variables that includes decisional balance, the pro and cons of behavior change, and self-efficacy both of which have been helpful in the understanding of exercise behavior.
The purpose of this study was to examine self-efficacy and decision making in relation to the stages of exercise adoption. The investigator hypothesized that there would be a difference in self reported self-efficacy and decisional balance among individuals in the stages of exercise change.

This study analyzes two empirical models to examine the association between exercise behavior and two outcome measures, self-efficacy and decisional balance. The two models are described in the following mathematical notation:

\[ y = x \] and \[ z = x \]

Where \( x \) equals the stages of exercise adoption, (precontemplation, contemplation, preparation, action, and maintenance) \( y \) equals self-efficacy, and \( z \) equals decisional balance.

The investigator also hypothesized that there would be a significant difference in self-efficacy and decisional balance between the inactive (precontemplation and contemplation) and active (preparation, action and maintenance) individuals. These models are described in the following mathematical notation:
$y_i = x_i$ and $z_i = x_i$

Where $i$ equals active or inactive, $y$ equals self-efficacy, and $z$ equals decisional balance.

**Design**

The investigator used a cross-sectional design to examine if the self-efficacy and decisional balance measures differentiated one's stage of exercise adoption. Since this type of study is descriptive in nature, the investigator cannot presume a cause-and-effect relationship. However, the investigator will be able to conclude whether an association exists between the independent and dependent variables. This type of design is also prone to the threat of selection bias which occurs from using volunteers, who may not be representative of anyone but other volunteers (Campbell & Stanley, 1963). The volunteers may differ considerably from non-volunteers in their motivation for participating in the experimental task. It was possible that only those students that had an interest in exercise were willing to participate in the study. Students who did not exercise, and or had a poor perception of exercise may not have been equally represented in this study.

**Assessment Instruments**

The following instruments were administered:
The Stages of Exercise Adoption Questionnaire (SEA) (Selby, 1989) was used to determine the present stage of readiness of exercise behavior (Appendix B). The questionnaire included five statements designed to discriminate among the stages of change. Subjects were asked to answer either "yes" or "no" to each statement. This information was used to categorize subjects into one of the five stages of behavior change via an algorithm designed to assess stage of exercise adoption in accordance with the method of Prochaska & DiClemente (1983) (Appendix C). Reliability of the stages of exercise adoption measure has been examined by Marcus, Selby, et al., (1992) who reported the kappa index of reliability over a 2-week period was .78 (N = 20). Concurrent validity for this measure has been demonstrated by its association with the Seven Day Recall Activity Questionnaire (Marcus & Simkin, 1993). This measure has also been shown to be significantly related to instruments measuring self-efficacy and decision making (Marcus & Owen, 1992; Marcus, Rakowski, & Rossi, 1992; Marcus, Selby, et al., 1992).

The Self-Efficacy Questionnaire was employed to measure confidence in one's ability to persist with exercising in various situations. The questionnaire contained five items that measured "resisting relapse" and seven items that measured "making time for exercise." Subjects were asked to
indicate, on a 5-point Likert scale; (1) always (2) often (3) occasionally (4) rarely (5) never, how frequently each statement applied to them. The lower the sum of the scores on the Likert scale, the lower the self-efficacy. Internal consistency of this measure was reported to be 0.85 for the "resisting relapse" component and 0.83 for the "making time for exercise component" (Sallis, Pinski, Grossman, Patterson, & Nader, 1988) (Appendix D).

The Decisional Balance Questionnaire contained sixteen questions designed to assess exercise beliefs (Marcus, Rakowski, Rossi, 1992) (Appendix E). Ten questions represented the positive beliefs (Pros) about exercise and six questions represented the negative beliefs or obstacles (Cons) of exercise. A decisional balance measure was created by subtracting the Cons from the Pros. Subjects were asked to indicate, on a 5-point Likert scale; (1) strongly agree (2) agree (3) unsure (4) disagree and (5) strongly disagree, how important each statement was with respect to their decisions to exercise, or not. Internal consistency for this measure was reported to be satisfactory (Cons = .70, Pros = .95) (Marcus, Rakowski, & Rossi, 1992). The lower the sum of the Pro scores the lower the perceived benefits, and the lower the sum of the Con scores the lower the perceived costs.
Data Collection

Three hundred students were randomly selected from first time freshmen who were living on campus. All selected students were mailed a letter describing the purpose of the study. Students were invited to participate in one of three sessions. As an incentive, free pizza and soda were supplied. After providing a brief description of the purpose of the study and the procedures involved, the researcher administered three questionnaires: Stages of Exercise Adoption (SEA), Self-Efficacy Questionnaire, and Decisional Balance Questionnaire.

Initially, fifty of the three hundred students contacted responded to the questionnaire, a 16% return rate. The researcher attributed bad weather and an inconvenient location to the low percentage of response. The researcher then contacted the remaining selected students by phone and offered an additional time to meet. This time, the researcher chose a more convenient location. An additional 124 participants completed the questionnaires. The final response rate was 57%.

Data Analyses

Frequency counts were used to determine the distribution of freshman students among the stages of
adoption. Stage of exercise adoption was the independent variable, and self-efficacy and decisional balance were the dependent variables in the analysis. Scale scores were calculated for each subject on the self-efficacy measure. The scores are the un-weighted sum of the twelve items. A coefficient alpha was calculated for the self-efficacy scale to estimate internal consistency (Allen & Yen, 1979).

A one-way analysis of variance (ANOVA) was used to examine if there was a significant difference in self-efficacy among the stages of change. In addition, post hoc comparisons using the Newman Keuls procedure to determine which stages the self-efficacy measure was able to differentiate was employed. The researcher applied an ANOVA to determine if there was a difference in the self-efficacy scores of the active groups (Action, Preparation and Maintenance) and inactive groups (Precontemplation, Contemplation).

A one way analysis of variance was used to examine if there was a significant increase in the Pros scores and a significant decrease in the Con scores between the stages of exercise adoption. In addition, the Decisional Balance measure was created by subtracting the Cons from the Pros. Scale scores were calculated for each subject on both the Pro and Con indices. The scores were the un-weighted sum of the 10 items composing the Pro scale and the 6 items
composing the Con scale. Internal consistency was calculated for each scale to estimate reliability. The raw scores were converted to standardized T scores ($M = 50, SD = 10$) in order to provide a standard metric for use in further analysis. In addition, post hoc comparisons using the Newman Keuls procedure were applied to determine which stages the Pros, Cons and Decisional Balance indices were significantly different. This same procedure was applied to determine if there was a difference in decisional balance between the active and inactive groups.

Although, the investigator assumed that there would be equal variance between the five stages of change it should be noted that unequal cell numbers are common in nonexperimental studies where the investigator uses survey data to make comparisons. When using ANOVA it is assumed that the five groups have equal variances. Based on this assumption, two groups may be statistically similar (not significantly different) when using a more conservative procedure. Therefore, it may be necessary to apply an unbiased estimate such as the Satterthwaite approximation (1946) where an approximate (i.e., lower) number of degrees of freedom are assigned so that an ordinary analysis of variance table can be used. The Satterthwaite approximation was not used in this study.
Chapter 4

ANALYSIS AND DISCUSSION OF DATA

The purpose of this study was to examine self-efficacy and decision making in relation to the stages of exercise adoption. Exercise behavior was assessed by the stage of exercise adoption (SEA) (Prochaska & DiClemente, 1983). Self-efficacy was assessed using a measure developed by Sallis, et al. (1988), and decisional balance was assessed using questionnaire designed by Marcus, Rakowski, & Rossi, (1992). An analysis of variance (ANOVA) was applied to test the following hypotheses: (1) There is a difference in self reported self-efficacy among individuals as identified by the five stages of change. (2) There is a difference in self reported self-efficacy between the active and inactive individuals. (3) There will be an increase in self-efficacy along the continuum from the precontemplation to maintenance stage. (4) There is a difference in self reported exercise beliefs among individuals identified by the five stages of behavior change. (5) There is a difference in self reported exercise beliefs between the active and inactive groups. (6) The perceived benefits of exercise (Pros) will increase along the continuum from precontemplation to maintenance,
while the perceived costs of exercise will decrease. An alpha level of .05 was used for all statistical tests.

Results

Stage of Exercise Adoption

The stage of exercise adoption was assessed using the algorithm for determining stage of exercise behavior, originally developed for the assessment of smoking behavior (Prochaska & DiClemente, 1983). Subjects were classified into one of the five stages of exercise adoption: Precontemplation (n = 7, 4%), Contemplation (n = 34, 19.5%), Preparation (n = 33, 18.9%), Action (n = 24, 13.7%), and Maintenance (n = 76, 43.6%). Figure 1 displays the frequency distributions of individuals in each of the five stages (precontemplation, contemplation, preparation, action and maintenance for the total sample (n = 174).

Self-Efficacy

For the twelve item self-efficacy measure, internal consistency was 0.89 (n = 174). Results revealed that total scores on self efficacy items differentiated students at different stages $F (4, 169) = 33.42, p < .0001$. The proportion of variance explained by the model was .44, greatly exceeding Cohen's (1977) definition of a large effect size. Table 2 provides the means and standard
Figure 1. Frequency Distribution of Subjects in Stages of Exercise Adoption
Table 2. Means and Standard Deviations on the Self-Efficacy Measure

<table>
<thead>
<tr>
<th>Stage</th>
<th>Self-Efficacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precontemplation</td>
<td>21.28 (9.0)</td>
</tr>
<tr>
<td>Contemplation</td>
<td>33.70 (7.3)</td>
</tr>
<tr>
<td>Preparation</td>
<td>38.42 (8.4)</td>
</tr>
<tr>
<td>Action</td>
<td>42.04 (7.4)</td>
</tr>
<tr>
<td>Maintenance</td>
<td>46.27 (6.2)</td>
</tr>
</tbody>
</table>

Note. Standard deviations are given in parentheses.

Table 3. Newman-Keuls Post Hoc Comparisons for Self-Efficacy and Stages of Exercise Change

Newman-Keuls Results
Significant Differences (p < .05) Between:

<table>
<thead>
<tr>
<th>Precontemplation</th>
<th>Contemplation</th>
<th>Preparation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contemplation</td>
<td>Preparation</td>
<td>Maintenance</td>
</tr>
<tr>
<td>Preparation</td>
<td>Action</td>
<td></td>
</tr>
<tr>
<td>Action</td>
<td>Maintenance</td>
<td></td>
</tr>
</tbody>
</table>

Note. $R^2 = .44; F(4,173) = 33.42$ (p ≤ .0001)
deviations for all five groups and Table 3 presents the Newman Keuls post hoc comparisons of scores. Precontemplators were significantly different from subjects in all other stages. A clear pattern emerged, with Precontemplators scoring the lowest and Maintainers scoring the highest on the self-efficacy measure, revealing that those in Maintenance had greater self-efficacy than those in the lower stages.

Further results based on the Newman Keuls analysis, revealed that total scores on the self-efficacy items differentiated inactive students (precontemplators and contemplators) from active students (preparers, actors and maintainers) $F (1, 172) = 69.81, p < .0001, r^2 = .29$ (Table 4).

Table 4. Newman Keuls Post Hoc Comparison Results for Active and Nonactive Subjects

<table>
<thead>
<tr>
<th>Newman Keuls Test Results</th>
<th>Significant Differences ($p &lt; .05$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity Status</td>
<td>Mean Self-Efficacy</td>
</tr>
<tr>
<td>Inactive</td>
<td>31.58</td>
</tr>
<tr>
<td>Active</td>
<td>43.56</td>
</tr>
</tbody>
</table>

Note. $R^2 = .29 \ F (1, 172) = 69.81, p < .0001$

The scores on the self-efficacy measure were significantly related to the stages of exercise behavior.
This finding supports the work of DiClemente et al., (1985) who found that Precontemplators and Contemplators had lower self-efficacy compared to those in Maintenance, although no clear differentiation between all stages was revealed.

Decisional Balance

A one way analysis of variance was used to examine the association among stages of exercise adoption and the Pros and Cons indices. In order to provide a standard metric, Pros and Cons indices were converted to T scores (M = 50, SD = 10). In addition, the decisional balance measure was created by subtracting Cons from Pros. Table 5 presents the T-score means and standard deviations by stage of exercise adoption. Differences on the decisional balance measures by stage of exercise adoption were significant for the Pros, $F(4, 169) = 7.16, p < .0001, r^2 = .14$, Cons $F(4, 169) = 6.25, p < .0001, r^2 = .12$, and Decisional Balance $F(4, 169) = 10.4, p < .0001, r^2 = .19$. Coefficient alpha reliability (internal consistency) was .89 for the Pro scores and .78 for the Con scores.

Table 6 presents the results from the Newman Keuls analysis. Precontemplators were significantly different from subjects in all other stages but contemplation on the Pro measure, however, Precontemplators were only significantly different from the action and maintenance
groups. A clear pattern emerged with Precontemplators scoring the lowest and Maintainers scoring the highest on the decisional balance measure. Precontemplators had more negative beliefs about exercise than members of all other stages. Figure 2 presents a pictorial view of the Pro and Con scales by stage of exercise adoption. When comparing the active groups with the inactive groups, the total scores on the Pros, Cons, and Decisional Balance items significantly differentiated the active and inactive students, Pros, $F(1, 172) = 19.99, p < .0001, r^2 = .10$; Cons, $F(1, 172) = 16.20, p < .0001, r^2 = .09$; Dbal, $F(1, 172) = 27.03, p < .0001, r^2 = .14$ (Table 7).

Table 5. Means and Standard Deviations of the Pros, Cons, and Decisional Balance Scales by Stage of Exercise Change

<table>
<thead>
<tr>
<th>Stage of Adoption</th>
<th>Precontemplation</th>
<th>Contemplation</th>
<th>Preparation</th>
<th>Action</th>
<th>Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>TPROS</td>
<td>41.07 (12.08)</td>
<td>44.84 (11.92)</td>
<td>49.39 (9.51)</td>
<td>49.12  (9.34)</td>
<td>53.65 (7.57)</td>
</tr>
<tr>
<td>TCONS</td>
<td>56.70 (9.91)</td>
<td>54.98 (7.69)</td>
<td>52.10 (10.95)</td>
<td>49.05 (6.86)</td>
<td>46.55 (10.06)</td>
</tr>
<tr>
<td>TDBAL</td>
<td>-15.62 (9.30)</td>
<td>-10.14 (15.66)</td>
<td>-2.71 (16.67)</td>
<td>0.07   (14.28)</td>
<td>-7.10 (14.99)</td>
</tr>
</tbody>
</table>

Note. Standard deviations are in parentheses.
Table 6. Newman Keuls Results for Pro, Con, and Decisional Balance Indices

Newman Keuls Results
Significant Differences ($p < .05$) Between:

<table>
<thead>
<tr>
<th>Stage:</th>
<th>Precontemplation</th>
<th>Contemplation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PRO</strong></td>
<td>Preparation</td>
<td>Preparation</td>
</tr>
<tr>
<td></td>
<td>Action</td>
<td>Maintenance</td>
</tr>
<tr>
<td></td>
<td>Maintenance</td>
<td></td>
</tr>
<tr>
<td><strong>CON</strong></td>
<td>Action</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maintenance</td>
<td></td>
</tr>
<tr>
<td><strong>DBAL</strong></td>
<td>Preparation</td>
<td>Maintenance</td>
</tr>
<tr>
<td></td>
<td>Action</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maintenance</td>
<td></td>
</tr>
</tbody>
</table>

Note. 

<table>
<thead>
<tr>
<th></th>
<th>$r^2$</th>
<th>$F(4,169)$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRO</td>
<td>.14</td>
<td>7.16</td>
<td>&lt; .0001</td>
</tr>
<tr>
<td>CON</td>
<td>.12</td>
<td>6.25</td>
<td>&lt; .0001</td>
</tr>
<tr>
<td>DBAL</td>
<td>.19</td>
<td>10.4</td>
<td>&lt; .0001</td>
</tr>
</tbody>
</table>

Table 7. Newman Keuls Post Hoc Comparisons for the Active and Nonactive Subjects

Newman Keuls Results
Significant Differences ($p < .05$)

<table>
<thead>
<tr>
<th>Activity Status</th>
<th>Mean Pro Score</th>
<th>Mean Con Score</th>
<th>Mean Dbal Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inactive</td>
<td>44.20</td>
<td>55.27</td>
<td>-11.07</td>
</tr>
<tr>
<td>Active</td>
<td>51.77</td>
<td>48.38</td>
<td>3.39</td>
</tr>
</tbody>
</table>

Note. 

<table>
<thead>
<tr>
<th></th>
<th>$r^2$</th>
<th>$F(1,172)$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pro</td>
<td>.10</td>
<td>19.99</td>
<td>&lt; .0001</td>
</tr>
<tr>
<td>Con</td>
<td>.08</td>
<td>16.20</td>
<td>&lt; .0001</td>
</tr>
<tr>
<td>Dbal</td>
<td>.13</td>
<td>27.03</td>
<td>&lt; .0001</td>
</tr>
</tbody>
</table>
Figure 2. The PROS and CONS (in T scores) by stage of exercise change (PC = precontemplation; C = contemplation; P = preparation; A = action; M = maintenance)
Discussion

The study was conducted to explore the cognitive and motivational aspects related to the progression through the stages of change in exercise. Self-efficacy and decisional balance of exercise are two underlying cognitions that have been identified as consistently discriminating individuals at different stages of readiness (Marcus & Owen, 1992; Marcus, Rakowski, & Rossi, 1992). The self-efficacy and decisional balance measure reflected the hypothesized differences across the stages of exercise adoption.

Self-Efficacy

The primary interest in this study was to determine the association between the individual's self-efficacy and their exercise behavior. The results derived from this study revealed that the self-efficacy measure significantly differentiated the stages of exercise behavior. This measure reliably differentiated seven out of the ten possible pairings of stages. This finding supports the work of DiClemente et al., (1985) in the area of smoking and Marcus, Selby, et al. (1992) in the area of exercise, who found Precontemplators and Contemplators had the lowest scores on self-efficacy and those in Maintenance had the highest scores on the self-efficacy measure. The contrasts between the stages of preparation and action, and action and
maintenance were statistically insignificant in this study. However, a perusal of the means from the preparation to maintenance stage (Table 2) shows that the trends for the self-efficacy construct were in the expected direction. It appears that individuals at various stages have different degrees of exercise-specific self-efficacy. This suggests that individuals at the different stages might benefit from interventions techniques that differ in their focus on enhancing self-efficacy expectations.

Decisional Balance

The Pro, Con, and Decisional balance scores were compared across the groups representing five stages in the change process: Precontemplation, Contemplation, Preparation, Action, and Maintenance. The present study did not find that Precontemplators could be differentiated from participants in all other stages as did previous studies using the same measures (Marcus & Owen, 1992;, Marcus, Rossi, et al., 1992; Marcus, Selby, et al., 1992). Five of the ten possible pairwise contrasts were significant for the Pros and only two of the possible pairwise contrasts were significant for the Cons. Four of the ten possible pairwise contrasts were significant for the decisional balance measure.

A number of limitations of this study should be noted.
This research was based on a cross-sectional study that used self-report data, therefore, no objective information on actual exercise behavior was utilized. However, the present results do provide some evidence that participants' reports of current exercise behavior (i.e., stages of adoption) correspond to beliefs about favorable and unfavorable features (i.e., pros, cons, and decisional balance) and self-efficacy.

Secondly, the self-efficacy and decisional balance questionnaires used a Likert-scale format, where equal response intervals were assumed. In addition, the Likert scale data is discrete rather than continuous. This study utilized ANOVA, which assumes data is continuous and normally distributed. Other statistical methods could have been employed which would have recognized the discontinuous and non-normally distributed data.

Finally, use of the ANOVA with the Transtheoretical Model of Behavioral Change may have been inappropriate due to the framework of the model. The TMBC describes cyclical movement between the stages of change, therefore, a person may have been in between a stage. An analysis of variance assumes that there is a definite position and that movement is linear. In a longitudinal design, where movement is studied, the use of an ANOVA may not adequately describe change. Analyzing the TMBC in this way has been
scrutinized, however, presently a more appropriate method has not been revealed.

Summary

It appears that students at various stages have different degrees of self-efficacy and decisional balance. This suggests that individuals at the different stages might benefit from interventions that differ in their focus on enhancing efficacy expectations and the awareness of the benefits (Decisional balance) of exercise. The combination of the decisional balance, self-efficacy and stages of change models appears to offer a powerful tool for relating three important elements (stage of exercise adoption, self-efficacy, and decisional balance) in an integrated theory of how change occurs naturally, and how it could be facilitated through specialized interventions. Specifying relationships among constructs may facilitate a more integrated and systematic understanding of a complex behavior such as exercise.
Chapter 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary.

The purposes of this study were 1) to examine the association of the self-efficacy measure and the stages of exercise behavior, and 2) to examine the association of the decisional balance and the stages of exercise behavior. The investigator sought to determine if self-efficacy and decisional balance measures could be used to differentiate the stages of exercise change of the subjects.

Researchers have clearly established the importance of regular exercise to physiological and psychological well-being. Researchers have also provided evidence demonstrating that only a small percentage of young adults participate in regular exercise that will significantly benefit their health. Unfortunately, the behavioral patterns seen in young adults may exert influences on both health and exercise behavior in their later life (Dishman, 1988).

Many colleges and universities have begun to offer a physical/wellness education course as a graduation
requirement. Rehor (1991a) suggested that the curriculum of a physical education should be focused on the development of a habit of regular exercise rather than on the enhancement of physical performance. The acquisition of knowledge, fitness gain, and behavioral skills should comprise the foundation of the curriculum where behavioral change is the outcome of a fitness program and exercise adoption and adherence are the primary objectives. Physical education programs should prepare students for a lifetime of physical activity (Rehor, 1991b).

Although extensive research has been directed toward understanding and facilitating exercise adherence, most research attempts have not provided a model capable of predicting successful results. The Transtheoretical Model has been helpful in the understanding of many health behaviors (Marcus et al., 1994). More recently, several exercise adherence researchers have used the Transtheoretical Model of behavior change in predicting exercise adoption and adherence. Roberson (1989) and Selby (1989) hypothesized that individuals pass through a hierarchy of stages in the acquisition of exercise behavior. Further, each stage has unique processes and characteristics necessary for successful movement to the next stage, such as self-efficacy and decision making.

Reliable and valid instruments have been designed to
assess the stages and processes involved in exercise acquisition and maintenance. Researchers have even reported that by knowing an individual’s self-efficacy or decisional balance measure they can predict the likelihood of future effort to change (Prochaska, Velicer, Guadagnoli, Rossi, & DiClemente, 1991). Perhaps the most important application of this model is that it allows educators to use stage specific strategies that will work best for individuals at different levels of exercise participation.

In the current study, the investigator used a cross-sectional design to examine if the self-efficacy and decisional balance measures were different for individuals in each of the five stages of exercise adoption. The subjects studied were freshman students from Montana State University. It was anticipated that the students would present a normal distribution across the continuum of exercise behavior.

After providing a description of the procedures, the investigator administered three questionnaires, stages of exercise adoption, self-efficacy, and decisional balance. Frequency counts were used to classify the scores into one of the five stages of change. Using the stages of exercise change as the independent variable and the self-efficacy measure as the dependent variable, analysis of variance was employed to ascertain differential use of the stages of
exercise behavior change. A Newman Keuls post hoc comparison was conducted to determine which stages were different. The same method was used to determine the association between the stages and the decisional balance measures. An analysis of variance was conducted to ascertain the differential use of the Pros, Cons, and Decisional balance indices, which was followed by the Newman Keuls post hoc comparison to determine which stages were significantly different from all other stages.

Justification was given to the applicability of the Transtheoretical Model to exercise behavior. The self-efficacy measure and decisional balance measures reflected the hypothesized differences across stages of exercise adoption indicating differential use of these constructs across the five stages of change. These findings are consistent with the work of Marcus, Rakowski and Rossi (1992) and Marcus, Selby et al. (1992). The results of this study may have implications for exercise behavior in other college populations. If the present findings are replicated in longitudinal investigations, physical educators may be assisted in designing and testing specific interventions to help students move more quickly from one stage of exercise adoption to another. Development of more successful interventions, in turn, will help us reach the goals of increasing the level of physical activity of young adults in
the United States and attaining the fitness objectives that have been established for the year 2000 (U.S. Department of Health and Human Services, 1991).

Conclusions

Based upon the findings of this study, the following conclusions are justified:

1. There exists a hierarchy of stages through which individuals progress in the acquisition and maintenance of exercise behavior. This hierarchy of stages is consistent with the work of other researchers, who have applied the Transtheoretical Model to health behaviors.

2. Self-efficacy increases as individuals move from Precontemplation to Maintenance stage.

3. Individuals engaged in the adoption and maintenance of exercise behavior have significantly different beliefs (Pros and Cons) about exercise.

4. The Cons of exercise outweigh the Pros of exercise in the early stages, whereas, the Pros outweigh the Cons in the later stages. This suggests that as one moves through the stages of change, their beliefs about the drawbacks of exercise are overcome by their beliefs about the benefits of exercise.

6. The combination of the self-efficacy measure and decisional balance measure with the stages of change.
model appears to offer a powerful tool for relating three important constructs in an integrated theory of how change occurs.

Recommendations for Future Research

The following recommendations are offered for future research of exercise behavior:

1. Future researchers should continue to examine the application of the Transtheoretical Model to exercise behavior in a variety of settings and populations;

2. Investigators should use the same instruments in a longitudinal design;

3. Additional investigations should examine the reliability and validity of the self-efficacy and decisional balances measures;

4. Additional determinants of exercise participation should be examined, such as social support, access to facilities, and locus of control;

5. Research designs and assessment tools need to be standardized to allow researchers to examine whether the results of behavioral patterns and determinants can be generalized across different settings and populations;
Recommendations for Practical Application

1. As the applicability of the Transtheoretical Model to exercise behavior becomes further understood, researchers can begin to design and implement intervention programs based on the model.

2. Physical education programs should focus on teaching behavioral skills that would increase one's self-efficacy and decision making, which in turn may enhance the probability of forming a habit of regular exercise that will last a lifetime.

3. Colleges need to support the inclusion of a required fitness/wellness course that will teach lifetime health-promoting behaviors.
REFERENCES CITED


APPENDICIES
APPENDIX A

ASSOCIATION BETWEEN SELECTED DETERMINANTS
AND STAGES OF EXERCISE ADOPTION
Association Between Selected Determinants and Stages of Exercise Adoption

<table>
<thead>
<tr>
<th>DETERMINANT</th>
<th>CHANGE STAGES</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>PC</td>
</tr>
<tr>
<td><strong>Personal attributes</strong></td>
<td></td>
</tr>
<tr>
<td>Past Program</td>
<td></td>
</tr>
<tr>
<td>Participation</td>
<td>++</td>
</tr>
<tr>
<td>Blue Collar</td>
<td></td>
</tr>
<tr>
<td>Occupation</td>
<td>0</td>
</tr>
<tr>
<td>Smoking</td>
<td>0</td>
</tr>
<tr>
<td>Overweight</td>
<td>0</td>
</tr>
<tr>
<td>Locus of Control</td>
<td>++</td>
</tr>
<tr>
<td>Education</td>
<td>+</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>0</td>
</tr>
<tr>
<td>Behavior Skills</td>
<td>0</td>
</tr>
<tr>
<td><strong>Environmental Factors</strong></td>
<td></td>
</tr>
<tr>
<td>Spouse Support</td>
<td>+</td>
</tr>
<tr>
<td>Perceived lack</td>
<td></td>
</tr>
<tr>
<td>of time</td>
<td>--</td>
</tr>
<tr>
<td>Facilities access</td>
<td>0</td>
</tr>
<tr>
<td>Social Support</td>
<td>0</td>
</tr>
<tr>
<td>Physical Influence</td>
<td>++</td>
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<td>Contracts</td>
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<td>Benefit &amp; Cost</td>
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<td>Relapse Prevention</td>
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<td>Training</td>
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<tr>
<td><strong>Physical Activity Characteristics</strong></td>
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<td>Activity Intensity</td>
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<tr>
<td>Activity Type</td>
<td>0</td>
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<tr>
<td>Perceived Effort</td>
<td>0</td>
</tr>
</tbody>
</table>

++ Strong increased probability
+ Increased probability
0 No relationship
- Decreased probability
-- Strong decreased probability
(Adapted from Dishman, Sallis, & Ornstein, 1985)

PC = precontemplation, C = contemplation, P = preparation, A = action, M = maintenance
APPENDIX B

STAGE OF EXERCISE ADOPTION QUESTIONNAIRE
Stage of Exercise Adoption Questionnaire

1. I do exercise now
   Yes No
2. In the next 6 months I plan to exercise.
   Yes No
3. I exercise regularly now.
   Yes No
4. For the past 6 months I have
   exercised regularly.
   Yes No
5. In the past, I have exercise regularly
   for a period of at least 3 months.
   Yes No
APPENDIX C

ALGORITHM FOR STAGE OF EXERCISE ADOPTION
Algorithm for Stage of Exercise Adoption

<table>
<thead>
<tr>
<th>Question Number</th>
<th>Stage of Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1   Q2   Q3   Q4   Q5</td>
<td></td>
</tr>
<tr>
<td>1. NO</td>
<td>Precontemplation</td>
</tr>
<tr>
<td>2. NO YES NO</td>
<td>Contemplation</td>
</tr>
<tr>
<td>3. YES YES YES NO</td>
<td>Preparation</td>
</tr>
<tr>
<td>4. YES YES YES YES NO</td>
<td>Action</td>
</tr>
<tr>
<td>5. YES YES YES YES YES</td>
<td>Maintenance</td>
</tr>
</tbody>
</table>
APPENDIX D

SELF-EFFICACY QUESTIONNAIRE
Self-Efficacy Questionnaire

1. Stick to your exercise program when your friends are demanding more time from you.
2. Stick to your exercise program when you have chores to attend to.
3. Stick to your exercise program when social obligations are time consuming.
4. Read or study less in order to exercise more.
5. Get up early, even on weekends to exercise.
6. Exercise after a long day at school or work.
7. Exercise even though you are feeling depressed.
8. Exercise while it is cold, humid or hot.
9. Exercise even though you are feeling tired.
10. Set aside at least 30 minutes, three times a week for exercising.
11. Continue to exercise with others even though they are too fast or too slow for you.
12. Stick to your exercise program when undergoing a stressful life change.
APPENDIX E

DECISIONAL BALANCE QUESTIONNAIRE
Decisional Balance Questionnaire

1. I would have more energy for my family and friends if I exercised regularly.
2. Regular exercise would help me relieve tension.
3. I would feel more confident if I exercised regularly.
4. I would sleep more soundly if I exercised regularly.
5. I would feel good about myself if I kept my commitment to exercise regularly.
6. I would like my body better if I exercised regularly.
7. It would be easier for me to perform routine physical tasks if I exercised regularly.
8. I would feel less stressed if I exercised regularly.
9. I would feel more comfortable with my body if I exercised regularly.
10. Regular exercise would help me have a more positive outlook on life.
11. I think I would be too tired to do my daily work after exercising.
12. I would find it difficult to find an exercise activity that I enjoy that is not affected by bad weather.
13. I feel uncomfortable when I exercise because I get out of breath and my heart beats very fast.
14. Regular exercise would take too much of my time.
15. I would have less time for my family and friends if I exercised regularly.
16. At the end of the day, I am too exhausted to exercise.