



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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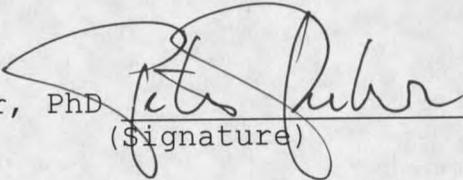
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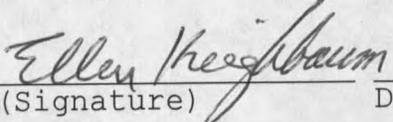
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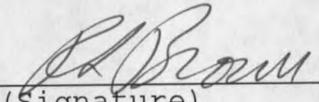
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ABSTRACT

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

1. The assessment of exercise behavior relied exclusively on the self-reporting of exercise.

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 heart 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 (Casperson, 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, Hunter 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 cardiovascularly 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,

1978). 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, Stunkard, &

Albaum, 1980).

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* affects 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:

$$B \sim I = (A_{act})_{w1} + (SN)_{w2}$$

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. W1 and W2 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).

$$B \sim I = (A_{act})w_1 + (SN)w_2 + (PBC)w_3$$

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. W₁, W₂ and W₃ 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

(Godin, 1994). 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.

$$B = (I \times F) W_{i.f} = (H \times F) W_{h.f}$$

(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 1). 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 subject 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,

