IMPROVING THE DEFINITION OF EXERCISE MAINTENANCE:

EVALUATION OF CONCEPTS RELATED TO ADHERENCE

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Physical activity has been demonstrated in the literature as an effective way to reduce the risk for development of chronic disease. The Transtheoretical Model (TTM) of behavior change has been developed as a means to predict and facilitate movement into healthier lifestyle behaviors. The model is centered on "stages of change", which describe a continuum of readiness to engage in a health behavior change. Stages contain temporal, qualitative, and quantitative characteristics. This was a six-month study that evaluated the effectiveness of stage-matched (theorized to be pertaining only to the maintenance stage of change) vs. generic (theorized to be pertaining to anyone, regardless of stage) newsletters in assisting subjects to attain the Maintenance stage of change. It also sought to identify further qualitative characteristics that can differentiate between the Action and Maintenance stages of change. Results indicated that monthly stage-matched newsletters were no more effective in helping subjects reaching Maintenance than were the generic newsletters. Exerciser self-schema was related to stages of change, but those relationships differed from baseline to six-month follow-up, indicating development of exerciser self-schema during the study period. Implications of this are discussed. Other concepts discussed included "structure" of change process, in that three new scores were developed and correlated with self-efficacy as well as intercorrelated. Motivation was also evaluated and compared across levels of success at adhering to exercise during a three-month period. Limitations of the study and implications are discussed.

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CHAPTER I

INTRODUCTION

It is well established in the research literature that physical activity is an effective way to reduce the risk of chronic and acute diseases such as heart disease, colon cancer, diabetes, and falls/fractures (USDHHS, 1996; Sallis & Owen, 1999). Proper amounts of regular physical activity have been defined in terms of frequency, intensity and duration for maximal health benefits (ACSM, 1978; USDHHS, 1990). However, only a small percentage of the American and Texas populations are engaging in enough exercise to receive long-term health benefits (USDHHS, 1996; TDH, 1999), and many are not engaging in any at all. For this reason, scientists and public health practitioners have sought effective methods to promote physical activity in populations, and many of the programs that have been developed have been based in worksites (O'Donnell, 1994).

Many of the programs offered in worksites have been action-oriented, in that they aim to get sedentary people to suddenly become active (O'Donnell, 1994), often by providing incentives such as cash or prizes (Leonard, 1999) for initiating an exercise program. However, this approach has drawbacks. For example, by encouraging adoption of regular physical activity, it is assumed that individuals understand the benefits of and are interested in increasing their levels of exercise. The problem is that many people are uninterested in making that change and would benefit from an intervention which is more

informational in order to prepare them for the action-oriented approach (Prochaska, Redding & Evers, 1997). Another drawback of this approach is the utilization of extrinsic motivators, which are removed at the end of the program, thus leaving participants with no motivation to continue. Results of this type of program indicate that 2/3 of participants who adopt an exercise routine during one of these programs are not active after one year (Leonard, 1999). Therefore,. researchers and practitioners should develop community-level interventions that address the intentional and motivational levels in potential participants in order to facilitate adoption and long-term adherence to regular physical activity.

The Transtheoretical Model (TTM) of behavior change (Prochaska & DiClemente, 1983 has been widely used in recent years within health promotion and health education as a guide for developing interventions which address the intentional needs of sedentary populations. There are a number of main components within the model, which include stages of change, processes of change, self-efficacy and decisional balance. Stages of change address five levels of readiness toward making a change in behavior such as adopting an exercise routine. They are (Prochaska, et al, 1983):

1) *Precontemplation* is "the stage in which a person has no intention to take action within the next six months."
2) *Contemplation* is "the stage when the person intends to take action within the next six months."
3) *Preparation* is "the stage when the individual intends to take action within the next 30 days and has taken some behavioral steps in this direction."
4) *Action* is "the stage in which the person has changed overt behavior for less than six months."
5) *Maintenance*, is "the stage when the individual has changed the overt behavior for more than six months."

Within the five stages of change, there are differences in content within the early stages (precontemplation through preparation) that distinguish them from each other. In the later stages (action and maintenance), however, the content within them is essentially the same, with the difference being duration as the distinguishing element. This approach differs from stage-based theories, such as those in the field of psychology, whose stages are "…qualitatively distinct organizations of thought, feelings, and behavior at a particular period of development (Berk, 1991, p.6)". As a result, in order to improve the definition of the maintenance stage, a difference in content within the stage which sets it apart from the action stage should be identified. If this can be done, better interventions can be developed which target the specific content of the stage and thus increase rates of adherence to regular exercise.

Self-efficacy, as defined by Sallis & Owen (1999) is "…a person's confidence in his or her ability to do specific physical activity in specific circumstances (p. 117)." This concept is considered content which is positively related to the defined stages in terms of greater amounts in higher stages, and is considered the strongest predictor of exercise maintenance (Sallis & Owen, 1999). Despite the fact that self-efficacy is a predictor of maintenance, it cannot be considered a variable which distinguishes between individuals in the action and maintenance stages, since it is present in all stages. For this reason, it is important to identify content variables that are present in the maintenance stage but not other stages for purposes of prediction and intervention.

Other lines of research have identified variables related to adherence to exercise over a longer term. Locus of motivation and exercise self-schema (Kendzierski, 1988)

are both concepts with discrete components (intrinsic vs. extrinsic motivation; "schematic for exercise", "aschematic for exercise", and "nonexerciser schematic") which can predict exercise maintenance and resumption of exercise after a brief relapse. This study will attempt to investigate the relationship between these discrete variables and ability to maintain an exercise routine for at least six months. In doing so, an improvement in the definition of the maintenance stage can be achieved.

Research on the relationship between self-efficacy and the exercise adherence has revealed (Bock, et al, 1997), that higher amounts of self-efficacy and the use of certain processes are related to adherence. These processes are an integral part of the TTM, and are known as *processes of change*.

As individuals move in and out of the five stages of change, researchers have found that they tend to engage in certain cognitions and behaviors, known as processes of change (Prochaska & DiClemente, 1983). These processes of change were found to have two higher order factors, which are cognitive/experiential and behavioral. The processes of change related to exercise are (Marcus, et al., 1996, p. 197):

Experiential/cognitive:

1) Consciousness Raising – Efforts by the individual to recall and seek new information related to exercise and adoption of activity (e.g., the benefits of exercise).
2) Dramatic Relief - Affective or intense emotional experiences related to sedentary lifestyle (e.g., thinking about the negative health consequences of inactivity).
3) Environmental reevaluation - Consideration and self-assessment of how a behavior impacts others in the physical and social environment.
4) Social liberation - Awareness, availability and acceptance by the individual of societal and social influences on encouraging and promoting exercise.
5) Self-reevaluation - Emotional and cognitive reappraisal by the individual with respect to exercise activity.

Behavioral:

1) Counterconditioning - The use of healthy behaviors that can substitute for problem behaviors.
2) Helping relationships - Trusting, accepting, and using the support of caring others to enhance and assist with the individual's exercise activity.
3) Contingency management – Provides consequences for taking steps in a particular direction.
4) Stimulus control - Control of situations and other causes which trigger inactivity.
5) Self-liberation - The individual's belief that one can engage in the healthy behavior and the commitment to act on that belief, i.e., maintain exercise.

Research on the use of processes of change related to stage of change has revealed that individuals in early stages tend to rely more on the cognitive processes of change to move themselves forward, while those in the later stages typically use the behavioral processes of change (Marcus, et. al, 1996). From this finding, it has been a common recommendation to create health promotion interventions targeting stage of change by incorporating stage-appropriate processes of change into the interventions. In addressing this recommendation, researchers have found that in fact one exposure to a stage-relevant intervention addressing processes of change is more effective than a generic intervention that is unspecific to stage, or no intervention at all over a six-week period (Peterson, 1999).

However, the Peterson (1999) study was only of six-week duration, and provided only one exposure to the intervention, it is possible that the intervention may have only produced changes in the short-term rather than long-term. Another study (Herzog, et al., 1999) found that utilization of processes of change (with no intervention) are predictive

of exercise adoption in the short-term, but not of adherence after one year. Two possibilities arise from this line of thinking:

1) By providing the stage-specific intervention on a repetitive basis over a longer period of time, as in studies on "booster sessions" for improving maintenance of behavior change (El-Bassel, et al., 1997; Malkinson, et al., 1997; Melin & Fagerstroem, 1996), adherence is possible over a longer period; or
2) The definition of maintenance is insufficient for developing appropriate stage-matched interventions and can be improved by identifying content relevant to that stage (possibly locus of motivation and exercise self-schema).

Thus, the current study will seek to identify which of the two possibilities is more helpful in determining an improvement in the ability to promote long-term adherence of physical activity.

CHAPTER 2

LITERATURE REVIEW

Physical Activity and Exercise

There are a variety of ways in which physical activity can be conceptualized, but a number of authors have agreed on a particular definition. *Physical activity* has been described as any bodily movement produced by skeletal muscles that requires energy to produce (Caspersen, Powell, & Christenson, 1985; USDHHS, 1996; Fahey, Insel & Roth, 1999). It can be performed at a range of intensity levels. For example, *light* physical activity includes sustained rhythmic muscular action such as in walking, gardening, yard work, domestic occupational activities, and games, performed at less than 60% of maximal heart rate (220 minus one's age). *Moderate* intensity activity can also be considered as that which requires approximately 3 to 6 times as much energy at rest. Examples of moderate activity include brisk walking, climbing stairs, leisure swimming, and leisurely bicycling. *Vigorous* activity makes an individual sweat or breathe hard for at least 20 minutes and is performed at more than 60% of maximal heart rate, or requires 7 times as much energy as at rest (Sallis & Owen, 1999; USDHHS, 1996; Collingwood, 1994). Examples of vigorous activity include jogging, aerobics, swimming, fast cycling, and dancing.

Physical activity can be further classified into several types according to the context in which they are performed, described by Marttila et al. (1998). *Occupational activity* "…includes activities that are directly connected to work performance, thus excluding transportation to and from work (p. S33)". Examples include office work, construction work, cleaning, and carrying mail. A second classification is termed *lifestyle activity*, of which the "…main interest is something other than physical activity. It is connected to the fluency of daily living… (p. S35)". It consists of those activities which are not done for the purpose of increasing activity or to complete work necessary for one's occupation. These include things like walking or bicycling for basic transportation, walking in shopping malls, climbing stairs and household chores. *Recreational activities* are defined by the authors as hose which "produce pleasure or some other form of subjective positive outcome for the participant (p. S35) ", with the main interest not being physical activity per se, but the actual enjoyment of doing it. Typical examples of recreational activities are horseback riding, sailing, dancing, and hiking. Finally, *fitness activities* are those which are "… carried out mainly for health or fitness purposes… (S36)". They include walking, jogging, running, fitness club activities, and swimming. Another term used for fitness activities is exercise.

Exercise designates physical activity which is planned, structured, and repetitive bodily movement done to improve or maintain one or more components of physical fitness (Caspersen, et al. 1985; USDHHS, 1996; Fahey, Insel & Roth, 1999). Generally, experts recognize five categories of exercise, which vary according to the method, physiological effect, and purpose. *Isometric exercise* is "…done by contracting muscles

against an immovable object, producing muscle contraction but no movement… Pushing hard against a solid wall is an example of isometric exercise (Feist and Brannon, 1988, p.12)." The purpose of this type of exercise would mainly be to gain strength in muscles used.

Isotonic exercises require the contraction of muscles and the movement of joints. Weight lifting and calisthenics such as push ups fit into this category, and are used to build muscle strength as well as endurance, and often used in body building for improvement of physical appearance rather than toward fitness.

Isokinetic exercise involves exertion for lifting, with an additional effort to return to the starting position. This type of exercise often uses equipment such as Nautilus machines, which adjust the amount of resistance according to the amount of force applied. Feist and Brannon (1988) cite research that this type of exercise has been shown to be most effective in building muscle strength and endurance (Pipes & Wilmore, 1975).

Anaerobic exercise, (Kenneth Cooper, 1968, cited in Feist and Brannon, 1988, p. 341) is "…exercise that does not require an increased amount of oxygen… and …includes short-distance running, some calisthenics, softball, and other exercises that require short, intensive bursts of energy". Feist and Brannon (1988) state that this type of exercise is similar to the previous ones, but are also helpful in increasing speed as well as endurance.

Aerobic exercise refers to "…any type of exercise that requires dramatically increased oxygen consumption over an extended period of time" (Feist & Brannon, 1988, p. 341), or "…exercise in the presence of oxygen (Sears, 1995, p.57)". The important

elements of this type of exercise are intensity and duration, as it must be of sufficient intensity to increase the heart rate, and keep it elevated for 15 to 30 minutes. Common forms of aerobic exercise include jogging, brisk walking, cross-country skiing, rope skipping, swimming, and cycling (Feist & Brannon, 1988). The oxidative (aerobic) energy system is defined by Fahey, Insel & Roth (1999) as an "…energy system that supplies energy to cells through the breakdown of glucose, glycogen, fats, and amino acids; also called the aerobic system because chemical reactions require oxygen (p. 42)".

Recommended levels of physical activity have been established by several organizations, but there are two sets of guidelines that are most commonly referred to. The first was established by the American College of Sports Medicine (ACSM), which defined regular physical activity as: engaging in aerobic exercise 3- 5 times per week at an intensity level of 60-90% of maximum heart rate for 15-60 minutes. These guidelines (1978, 1990) focused on increasing moderate to vigorous intensity activity, and were originally derived with the purpose of increasing cardiovascular fitness. However, very few people were able to meet these guidelines, and health benefits beyond cardiovascular fitness were not addressed.

Later epidemiological and laboratory studies (Haskell, 1994) determined that morbidity and mortality risk could be reduced by engaging in light to moderate intensity activity, but on a more frequent basis. In addition, the amount of time spent engaging in physical activity could be broken into 10 minute increments, which occurs in activities such as gardening, climbing stairs, walking, and doing household chores. In fact, it has

been stated that a consistent pattern of results indicates the greatest health benefits occur when increasing activity levels from sedentary to moderate (Sallis & Owen, 1999).

Therefore, the U.S. Department of Health and Human Services (US DHHS, 1990) developed a set of recommendations which defined regular physical activity as either: a minimum of 30 minutes total of light to moderate intensity activity, 5 or more days per week; *OR*, 30 minutes of vigorous activity 3 or more days per week. This definition is preferable due to the flexibility it allows in terms of working light to moderate activity into one's daily routine, and can include activity in any context, such as occupational, lifestyle, or recreational. When offering these guidelines, people are more likely to become physically active. In order to understand how physical activity affects our health, it is necessary to review its effects on the body systems.

Activity, Fitness, and Physiological Processes

Physical activity beyond activities that require little to no exertion creates responses in the cardiovascular system (heart, blood vessels, and blood) which is directly proportional to the skeletal muscle oxygen demands for any given rate of work. Responses include increased cardiac output (Q), which is the total volume of blood pumped by the left ventricle of the heart per minute. It is the product of heart rate (HR, number of beats per minute) and stroke volume (SV, volume of blood pumped per beat) (USDHSS, 1996). These responses in cardiorespiratory function are for the most part the same for men and women, given equivalent levels of activity (USDHHS, 1996).

Blood flow patterns also change when someone goes from resting to exercise. During exertion, a larger blood volume is directed to active muscles and away from areas with low demand such as internal organs. When the body temperature rises, more blood is also sent to the skin to release heat. During normal activity levels as well as during exertion, the heart muscle depends highly on good oxygen supply, extracting approximately 70 to 80 per cent from each unit of blood crossing the myocardial capillaries as opposed to approximately 25 per cent used by skeletal muscles at rest. According to the USDHHS (1996), evidence suggests that with regular physical activity, capillaries within the heart become denser, thus allowing for more oxygen to be extracted from each muscle fiber. This is likely to aid in reducing the chance of myocardial ischemia, or a reduction in the amount of oxygenated blood available for the heart muscle (Cohen, 1985 in USDHHS, 1996).

Also during exertion, systolic arterial blood pressure increases due to increased volume with each beat. This increase is positively related to rate of work, often reaching 200 to 240mm Hg in normotensive people. Within 2 to 3 hours after exercise, blood pressure drops below preexisting levels, known as "postexercise hypotension" (USDHHS, 1996). “Exercise training has the ongoing effect of lowering blood pressure by attenuating sympathetic nervous system activity (Leon 1991; ACSM 1993; Fagard et al., 1990 in USDHHS, 1996, p. 111).” “The reduced sympathetic activity may reduce renin-angiotensin system activity, reset baroreceptors, and promote arterial vasodilatation-all of which help control blood pressure. Improved insulin sensitivity and the associated reduction in circulating insulin levels may also contribute to blood pressure

reduction by decreasing insulin-mediated sodium reabsorption by the kidney (Tipton, 1984 in USDHHS, 1996, p. 111)."

Respiration changes also take place during physical activity. For example, pulmonary ventilation increases almost immediately. At lower intensities, this means an increase in tidal volume, or amount of air inhaled with each breath. In addition, at higher intensities, the increased volume is accompanied by increased rate of respiration, or more rapid breathing.

Oxygen uptake (VO_2), or the amount of oxygen consumed by the body, increases linearly with increasing rates of work (USDHHS, 1996 p.62), and VO2 max is the maximal oxygen uptake, or the maximal capacity for oxygen consumption by the body during maximal exertion. It is also known as aerobic power, maximal oxygen consumption, and cardiorespiratory endurance capacity (Wilmore & Costill, 1994).

After engaging in regular exercise over a prolonged period of time, changes in the body systems can be measured through one's level of physical fitness. Physical fitness can be observed in a variety of body systems, and in the overall body composition.

As cited by USDHHS (1996, p. 21) and Sallis and Owen (1999, p. 10) Caspersen et al. (1985) define physical fitness is "a set of attributes that people have or achieve that relates to the ability to perform physical activity". It is directly related to physical activity in that the more someone engages in physical activity, the more physically fit he/she is, even though the measures of activity have differed across studies (USDHHS, 1996). "Studies using fitness measures often show a stronger association between physical activity and health outcomes, probably because there is less error in fitness

measures (Sallis & Owen, 1999, p. 17).” Typically health-related physical fitness is measured by cardiorespiratory endurance, skeletal muscular endurance and strength, flexibility, and body composition (weight control) (USDHHS, 1996; Feist & Brannon, 1988).

Cardiorespiratory endurance as defined by Fahey, Insel and Roth (1999), is "the ability of the body to perform prolonged, large-muscle, dynamic exercise at moderate-to-high levels of intensity (p.23)." It also "…depends on such factors as the ability of the lungs to deliver oxygen from the environment to the bloodstream, the heart's capacity to pump blood, the ability of the nervous system and blood vessels to regulate blood flow, and the capability of the body's chemical systems to use oxygen and process fuels for exercise (p.23)". The Surgeon General's Report on Physical Activity (USDHHS, 1996) cites a definition by Corbin & Lindsey (1994) that cardiorespiratory endurance is "…a health-related component of physical fitness that relates to the ability of the circulatory and respiratory systems to supply oxygen during sustained physical activity (p. 21)". When cardiorespiratory endurance increases, the heart's ability to pump a larger volume of blood in each beat is enhanced, which slows down the resting heart rate (Ornish, 1990), increases the overall flow into the body, thus increasing the supply to the tissues and reducing blood pressure. This measure of fitness is often used to compare mortality rates between low and high levels of fitness.

Pulmonary ventilation volume can also increase, from approximately 100 liters of air per minute in an untrained adult, up to 200 liters per minute in a highly trained male adult. This type of fitness is considered to be of central importance, as it is necessary for

muscular endurance (USDHHS, 1996) and useful in reducing risk of heart disease (Fahey, Insel & Roth, 1999).

Skeletal muscular strength can be described as "how strongly a muscle can contract" (Feist & Brannon, 1988, p.342), or "the ability of the muscle to exert force (Wilmore, & Costill, 1994 in USDHHS, 1996, p. 21)." When a skeletal muscle encounters an increased demand, it changes its ability to extract oxygen, choose energy sources, and rid itself of waste products (USDHHS, 1996).

Muscular endurance is defined as "the ability of the muscle to continue to perform without fatigue (Wilmore, & Costill, 1994 in USDHHS, p. 21)." "Endurance training also increases the number of capillaries in trained skeletal muscle, thereby allowing a greater capacity for blood flow in the active muscle (Terjung, 1995, in USDHHS, 1996, p. 69).

Flexibility has been described as "a health related component of physical fitness that relates to the range of motion available at a joint (Wilmore & Costill, 1994 in USDHHS, 1996, p.21). According to Collingwood, (1994), it pertains to range of motion and can serve purposes which include: reducing muscle tension, assisting in the coordination of movement, preventing injuries, helping to saturate the tissue with oxygen, and increasing circulation.

Body composition is defined by Corbin & Lindsey (1994, in USDHHS, 1996, p. 21) as "…a health-related component of physical fitness that relates to the relative amounts of muscle, fat, bone, and other vital parts of the body". It is measured in terms of body mass index (BMI), which is equal to total body weight divided by (height^2). The

BMI is a way of determining if an individual has excess body fat, or is classified as overweight or obese. Difficulty with BMI is found when an individual increases muscle mass at the same time as losing fat. This will in effect either increase the BMI, or stabilize it, rendering it less effective for measuring change in fitness level.

Not only can physical activity create improvements in observable physical body systems, but in mental/emotional functioning as well. Controlled experiments have involved the use of physical activity for treating psychological disorders such as depression (Sallis & Owen, 1999). In a study which randomly assigned 28 depressed patients to either individual psychotherapy or running for 12 weeks (Greist, Klein, Eischens, Gurman, & Morgan, 1979), it was found that at posttest, the groups had comparable levels of symptom reduction. At 12-month follow-up, the running group had better maintenance of improved mood (Morgan, 1994). Sallis & Owen (1999) report that this study triggered a series of other studies, in which exercise was at least as effective as a variety of other treatments for depression including relaxation, meditation, group psychotherapy, cognitive therapy, and a wait-list control group.

Detraining is a term used for "changes the body undergoes in response to a reduction or cessation of regular physical training (Wilmore and Costill, 1994 in USDHHS, 1996, p. 21)", which occurs within two weeks of stopping regular physical activity. After prolonged physical inactivity, a reduction in stroke volume occurs, which creates a need for increased heart rate to compensate for the smaller volume (USDHHS, 1996). Studies have found decrements in a variety of measures of cardiorespiratory

function after extended periods of physical inactivity (Shephard, 1994; Saltin et al., 1968).

In addition, reduced energy expenditure, loss of muscle protein, loss of bone mass (Bloomfield & Coyle, 1993), as well as increased insulin resistance (Lipman, et al, 1972), and decreased plasma volume, which affects aerobic power, (USDHHS, 1996) all occur. The greatest amount of deterioration occurs when an individual goes through prolonged bed rest or when immobilized by a cast, which can occur in direct proportion to the duration of bedrest. This is shown in studies placing young male athletes and sedentary volunteers in bed for up to 3 weeks after a control period and measuring aspects of physical fitness at baseline and after the rest period (USDHHS, 1996).

Measurement Issues and Physical Activity

In order to determine how physical activity is related to health and improvements in health, research has grappled with a variety of methods and issues in attempting to resolve the problem of how to measure physical activity. In research, physical activity has been measured in a variety of ways, including physiological monitoring, activity monitoring, observational methods, and self-report. At this point in time, there is no "gold standard" for measuring physical activity, since each method has clear advantages and disadvantages.

Physiological monitoring: This includes assessment of energy expenditure as well as direct measures of changes in physiology, which accompany exertion. Energy expenditure is most often measured by a method called *doubly labeled water*, which is

considered the gold standard for measuring energy expenditure, although not for physical activity (Montoye, 1996). This type of measure requires subjects to ingest a known amount of isotopes of hydrogen and oxygen. These isotopes become distributed throughout the body water in a matter of hours, and a baseline reading of their concentration is taken from a urine sample. One to 3 weeks later, participants provide another urine sample, and based on these samples, energy expenditure can be calculated for the entire interval. Labeled hydrogen leaves the body as water, through urine, and moisture in respiration. Labeled oxygen leaves the body in the same way, plus as carbon dioxide from respiration. Because the amount of carbon dioxide lost through respiration is very closely related to oxygen consumption, energy expenditure can be calculated based on the difference between rates of loss of hydrogen and oxygen. This method is highly accurate as a measure of energy expenditure, can be utilized in laboratory and field studies, and is equally reliable for adults and children. However, the cost of the equipment necessary for its measurement can be more than $250,000. Also, this type of analysis "…does not provide data on the type, frequency, intensity or duration of physical activity (Sallis & Owen, 1999, p. 90)", thus reducing its usefulness in monitoring physical activity.

Heart rate monitoring consists of wearing a small device that is strapped around the chest and contains an electrode or transmitter. A receiving unit is worn like a wristwatch with a memory that can store minute-by-minute data. The data available from this method is considered a sensitive and valid measure of increases and decreases in heart rate, which is correlated with oxygen uptake, especially during exercise. However,

a drawback of this method is that it is unable to distinguish between levels of intensity of exercise, since a given heart rate for one person does not indicate the same amount of work as the same heart rate for another person (Sallis & Owen, 1999). Also, increases in heart rate due to stressors, which may occur when the individual is not engaging in exercise, are indistinguishable from bouts of exercise.

Activity monitors include devices such as pedometers, which measure distance by counting steps mechanically or electronically by assessing vertical movement of the body. Sallis & Owen (1999) indicate that pedometers "…are small in size, relatively low cost, and do not interfere with ongoing activity (p. 85)." They generally have a high level of reliability when two are worn simultaneously (r=.89-.94; Montoye et al. 1996), and have correlated with heart rate (r=.54), doubly labeled water (r=.55), with direct observation of adults (r=.69) and with direct observation of children (r=.40) (Montoye et al. 1996). This type of device is useful only if subjects' main method of exercise is walking or running, but not for activities such as bicycling, swimming, skating, and weight lifting.

Behavioral observation: This "is the straightforward process of watching and recording what a person does (USDHHS, 1996; p. 31)," and can be utilized in several ways. Montoye (1996, p. 26) reports that it has been used in studying people on the job to measure efficiency or fatigue, and very often with children in school as well as a method to evaluate other techniques of physical activity or energy expenditure. One type of observational method is momentary time sampling. In this type,

> "activity level is coded at the moment the observation interval ends, providing a snapshot or sample of the activity level. Partial time sampling requires observers to code all activities that occur during a short interval, usually measured in seconds. Observers code the main activity that occurs during brief intervals, such as 10 seconds. Duration recording requires observers to note the beginning and ending time of each activity (Sallis & Owen, 1999, p.88)."

According to Montoye (1996), use of these methods has never been adequately validated, but when observations are carefully made and recorded it gives the appearance of an accurate measure. Sallis and Owen (1999) indicate that accuracy can be enhanced when a coding system is set up for numerous behaviors with detailed accounts of activity.

Interrater reliability has been demonstrated with the Fargo Activity Timesampling Survey (FATS). In observations of children, agreement between raters has ranged from 90 - 98% for various activity components during a two-hour observation period. A month later, the children were observed again, with a test-retest correlation of .59 (Montoye, 1996). Disadvantages of this method are; it is labor intensive, impractical for measuring activity patterns over a long period of time, expensive, and multiple trained observers are needed for verification. These objective approaches at monitoring physical activity

> "…eliminate the problems of poor memory and biased self-reporting but are themselves limited by high cost and the burden on participants and staff. Consequently, these measures have been used primarily in small-scale studies, though they have been used recently in some large-scale studies (Lakka, Nyyssonen, Salonen, 1994 in USDHHS, 1996, p. 31)."

Self-report measures: These are the most widely used in research (Sallis & Owen, 1999). They generally require participants to recall their activities over a particular time frame, anywhere between one day and one year. They can be administered by interview

in person or via telephone, or can be self-administered in person or through the mail. Usually respondents are asked to recollect activity during leisure time or in combination with occupational physical activity. Amount of detail varies, from simply asking about frequency of participation to inquiring about specific duration and/or intensity per bout of exercise. The main techniques of gathering self-report data include diaries and logs, and questionnaires which include recall surveys, retrospective quantitative histories, and global self-reports (Kannel, Wilson, Blair, 1985; Wilson, et al., 1986; Powell, et al 1987; Caspersen, 1989).

First, diaries are used because they can provide a highly detailed account of an individual's exercise behavior during a specified period, most commonly during a span of a few days. This method of assessing physical activity consists of logging one's own activities periodically. The period of measurement can vary from minute-by-minute (Riumallo, Schoeller, Barrera, Gattas, & Vauy, 1989) to less frequent time periods such as every four hours (La Porte, 1979). The time that activity was started and stopped may be recorded, either soon after participation or at the end of the day. Information can be used to determine energy expenditure or short-term patterns of physical activity. Drawbacks of this method are that they are often inconvenient for the participant, and by using a diary, patterns of activity may be altered from what normally would occur. In addition, diaries cannot provide information on long-term patterns since they are often only used for short duration (USDHHS, 1996).

A recall survey is a type of questionnaire that can be administered either in paper and pencil format or by interview in person or on the telephone. The Seven-Day Recall

Questionnaire is an example of an interview format recall survey that was originally developed in 1979 for use in the Stanford Five-City Project (Sallis, 1985 in Sallis & Owen 1999; Montoye, 1996). This survey took less than 15 minutes to administer, and assessed occupational and leisure time physical activities. Respondents were asked to identify the activities in which they participated over the previous 7 days and to report the total amount of time spent at each activity, including the average number of hours slept per night. Activities were classified as moderate, hard, very hard, and assigned numeric values according to energy expenditure in metabolic equivalents.

Interrater reliability has been found to be *r*=.86 (Gross, Sallis, Buono, Roby & Nelson, 1990), and significant test-retest correlations have ranged from r=.67 (Sallis, 1985) to .84 (Williams, Klesges, Hanson, & Eck, 1989) when assessing kilocalories expended per day. A problem with assessing test-retest reliability of self-reported physical activity is that many surveys address a relatively short period of time, such as one week rather than habitual exercise. It is likely that variation occurs in activity level, which would make this type of instrument appear unreliable if administration periods are too far apart.

In validity studies comparing energy expenditure as measured by the Seven-Day Recall questionnaire to physiological measures, its correlation with doubly-labeled water was *r*=.30, and with pedometers *r*=.49 over a 7 day period, (Gretebeck et al., 1993) and *r*=.30 after 14 two-day sessions (Jacobs, et al., 1993). It was also significantly correlated with pedometers when measuring body movement in several studies, although there was a wide range in strength of relationships, *r*'s = .12 - .79 (Montoye et al. 1996). This

variation is likely due to differences in the type of exercise subjects engaged in, since pedometers are most accurate when movement is primarily vertical. Finally, the questionnaire correlates moderately with measures of physical fitness such as treadmill endurance, (*r*=.17, Dishman, 1988) and $V0_2$max (*r*=.32, Jacobs et al, 1993). Sallis & Owen, (1999) consider these relationships as indication of validity.

The main disadvantage of recall surveys is the possibility of inaccurate recall about details of past participation (Baranowski, 1985; Montoye, 1996). Subjects may overestimate time or intensity (Montoye, 1996), or as Matt, et al. (1999) found, overestimate frequency but underestimate duration as compared to diaries.

"Retrospective quantitative histories are the most comprehensive form of physical activity recall survey, generally requiring specific detail for time frames of up to 1 year (LaPorte, Montoye, & Caspersen, 1985 in USDHHS, 1996, p. 30)." An example of this type of measurement method is the Minnesota Leisure Time Physical Activity Questionnaire (Montoye, 1975) which was revised in 1988 (Jacobs & Montoye, 1988). In a structured interview, respondents were asked to recall their participation in 63 leisure time physical activities over the preceding 12 months. Typical energy expenditure values for each type of activity were derived, then summed to provide total leisure time activity energy expenditure.

As reported by Sallis & Owen (1999), test-retest correlations were lower for light activity (*r*=. 79) and highest for total energy expenditure (*r*=. 88). Correlational studies with physiological measures have revealed *r*=. 26 with doubly labeled water (Gretebeck,

Montoye, & Porter, 1993), and LaPorte (1982) reported r's=-.06, .18 and .40 with pedometers, and r=.45 with a larger movement detection device.

Validity coefficients were moderate (*r*=.45 and .41) with treadmill endurance (Taylor, et al., 1978; Leon, Jacobs, DeBacker, & Taylor, 1981), and *r*=.43 with $V0_2$ max (Jacobs, et al., 1983). Sallis & Owen (1999) state that these results are generally supportive of validity, particularly since physical fitness measures should reflect activity over an extended period of time. However, obtaining this abundance of data is a heavy demand on the respondent's memory, and the complexity of the survey generates additional expense (LaPorte, Montoye, & Caspersen, 1985).

Overall, recall surveys are often used because they are the least likely of all self-report measures to influence behavior and generally require less effort by the respondent than either diaries or logs. Surveys and questionnaires are relatively inexpensive, and at present are the best methods feasible for large population surveys (Montoye, 1996) and as a result self-report surveys address time periods of short duration, as in the case of personal logs, and the Seven Day Recall Questionnaire, or much longer periods such as with the Minnesota Leisure Time Physical Activity Questionnaire. Surveys of short duration are useful in that they are quick and easy to administer, or can give an accurate description of activity during a short period of time, but are not helpful for addressing longer term activity patterns. Longer duration questionnaires, on the other hand, such as the Minnesota Leisure Time Physical Activity Questionnaire are useful for determining long-term patterns, but are undesirable due to the extensive time required to complete them. A survey which addresses a period of time which is long enough to determine

patterns of regular activity, but is short and simple to administer would be the most desirable.

Surveys have been useful in epidemiological studies conducted by government institutions, and are used for the national and state-based information systems such as the Behavioral Risk Factor Surveillance System (USDHHS, 1996). The information derived from these measures has been useful in offering population descriptions of rates of physical activity and sedentary lifestyle. This information is used in further research to determine the relationship to chronic diseases.

Sedentary Lifestyle and Health

A sedentary lifestyle is one which is marked by "keeping one seated much of the time" (Webster's dictionary, 1984, p.1288). In considering the different types of physical activity as described by Marttila et al. (1998), a sedentary lifestyle would include not getting regular moderate to vigorous physical activity in an occupational, lifestyle, or recreational context. Individuals who do not necessarily "exercise" may be considered to engage in physical activity if they reach criteria for moderate to vigorous physical activity in occupational or lifestyle settings. And likewise, someone who would be considered sedentary is not engaging in regular physical activity in any of these situations.

According to national surveys of physical activity and inactivity rates, such as the National Health Interview Survey (NHIS), the Behavioral Risk Factor Surveillance System (BRFSS), and the Third National Health and Nutrition Examination Survey

(NHANES III), *physical inactivity* is conceptualized as "no reported leisure-time physical activity in the previous 2 to 4 weeks (USDHHS, 1996 p177)." The Surgeon General's Report on Physical Activity (USDHHS, 1996) defines it as "…performing no vigorous activity (exercise or sports participation that made the respondent 'sweat or breathe hard' for at least 20 minutes) and performing no light to moderate activity (walking or bicycling for at least 30 minutes) during any of the 7 days before data collection (p. 189)." Data based on this concept indicated that up to 30.9% of American adults over 18 years of age were not engaging in physical activity (BRFSS, 1994).

According to data from the Behavioral Risk Factor Surveillance System (BRFSS, 1994), in 1992 between 28.3 to 29.1 of Americans were participating in no leisure time physical activity at all. Within the population, rates of sedentary lifestyles increase with decreasing income ($50,000+ at 17.7%, $35,000-49,999 at 23.0%, $20,000-34,999 at 26.9%, $10,000-19,999 at 34.6%, and <$10,000 at 41.5%,). Similarly, inactivity also increases with decreasing education levels (at least a college degree at 17.8%, some college at 22.6%, 12 years at 32.8%, and <12 yrs. at 46.5%). Conversely, inactivity levels coincide with increasing age (18-29 year old males at 18.9% and females at 25.4%, 30-44 year old males 25.0% and females 26.9%, 45-64 year old males at 32.0% and females 32.1%, 65-74 year old males at 33.2%, and females at 36.6%, and finally, males above 75 years at 38.2% and females at 50.5%).

In the state of Texas, it was found that 57 percent of adults do not practice the recommended level of physical activity (USDHHS, 1996) or engage in no exercise at all (27.8%), with prevalence on the rise since 1990 (TDH, 1999; BRFSS, 1994). Only

approximately 33.7% of adult Texans engage in regular, sustained or vigorous activity (BRFSS, 1994).

Prior to the industrial age, people required large amounts of physical activity for sustenance, since hunting and gathering were necessary for survival. Also, recreational activities prior to the industrial age required people to spend rest periods traveling to see friends and family due to smaller and more widespread communities, which increased their leisure time activity level as well (USDHHS, 1996). Although some physical activity is present in all work, during the previous century most occupations in modern Western nations have required very little, due to increased mechanization, automation, and more job specialization (Marttila et al. 1998). In addition, with the use of labor-saving devices such as automobiles for transportation and leisure time activities such as television viewing, non-active lifestyles have for the most part been reinforced (FIMS, 1999). This combination of less physically demanding work and increase in sedentary leisure activities gave rise to changes in overall patterns of activity to more inactive ones (USDHHS, 1996; Friis & Sellers, 1996). This trend of sedentary behavior has occurred in relation to the rise in chronic diseases such as heart disease, cancer, and diabetes, and is considered an independent risk factor for such diseases (USDHHS, 1991).

Mortality Risks: In a longitudinal study of the relationship between physical activity and death rates in men who were sedentary at baseline (Paffenbarger, et al., 1993), of those who began moderately intense sport activity during the 11 year study period were less likely to die than those who remained sedentary throughout the study. These men, regardless of age, increased their length of life by 0.72 years.

> "Paffenbarger, Lee, and Leung (1994) evaluated several types of recalled activity (walking, stair climbing, all sports, moderate-level sports, and total energy expended in activity per week) as predictors of all-cause mortality among male Harvard alumni. Among these men, the relative risk of death within the follow-up period was reduced to 0.67 with walking 15 or more kilometers per week (reference group, <5 kilometers per week), to 0.75 with climbing 55 or more flights of stairs per week (reference group, <20 flights/week), to 0.63 with involvement in moderate sports (reference group, <1 hour per week). Most importantly, there was a significant trend of decreasing risk of death across increasing categories of distance walked, flights of stairs climbed, and degree of intensity of sports play (USDHHS, 1996, p. 86)."

Similarly, initially sedentary men who took part in the "Aerobics Center Longitudinal Study" (Blair, Kohl, et al., 1995; in USDHHS, 1996) who improved cardiorespiratory fitness, also reportedly had a reduced rate of death by up to 44% as compared to those who remained in the lowest fitness levels.

These results have also been shown in women. For example, a study which followed 40,000 postmenopausal women for seven years found a strong relationship between physical activity and risk of death: the more frequent the activity, the lower the relative risk of death (Kushi et al, 1997). "Blair, Kohl, and Barlow (1993) showed that low levels of cardiorespiratory fitness were strongly associated with overall mortality for both women and men (USDHHS, p. 86)."

Taken together, a series of longitudinal studies comparing sedentary people to physically active counterparts, there has been a 1.2-fold to a 2-fold increased risk of dying during follow-up measures (Slattery & Jacobs, 1988; Slattery, Jacobs, & Nichaman, 1989; Leon & Connett, 1991; Stender et al., 1993; Sandvik et al., 1993; Kaplan et al., 1987; Arraiz, Wigle, & Mao, 1992; Paffenbarger, et al., 1993), with many

associating better cardiorespiratory fitness with reduction in mortality (Blair, Kohl, & Paffenbarger, 1989).

Cardiovascular disease risks: Several cohort studies have indicated a strong negative relationship between activity level and risk, with the largest risk reduction occurring when moving from sedentary behavior to light or moderate activity (USDHHS, 1996). From that point on, gains are less pronounced, but there is still a dose-response relationship between amount of exercise and risk reduction (Kannel & Sorlie, 1979; Paffenbarger, et al., 1984; Kannel, et al., 1986; LaCroix, et al., 1996). For example, being physically inactive doubles one's risk for heart disease (USDHHS, 1990) and has been shown to be approximately equal to moderate smoking and elevated cholesterol in terms of risk (Powell, et al., 1987). For this reason, Sallis and Owen (1999) state that it should be treated with the same level of concern as smoking, blood cholesterol, and obesity. Similarly, cardiovascular disease mortality has been found inversely related to cardiorespiratory fitness levels (Ekelund, et al., 1988; Blair, et al., 1989; 1995; Arraiz, Wigle, & Mao, 1992; and Sandvik, et al., 1993).

Coronary heart disease (CHD) also has been extensively studied in relation to physical inactivity and cardiorespiratory fitness levels (USDHHS, 1996). When considering occupational physical activity, coronary heart disease was inversely related to more physically active job duties (Morris, et al., 1953; Morris & Crawford, 1958; Taylor, et al., 1962; Kahn, 1963; Morris, et al., 1966; Cassel, et al., 1971; Morris, et al., 1973; Brunner, et al., 1974; Paffenbarger & Hale, 1975; Paffenbarger, et al., 1977;

Salonen, et al., 1982; Pomrehn, et al., 1982; Menotti & Seccareccia, 1985; Kannel, et al., 1986; Pekkanen, et al., 1987; Salonen, et al., 1988; Seccareccia & Menotti, 1992).

In relation to lifestyle and leisure time physical activity, fatal and nonfatal heart disease also has been negatively related (Chave, et al., 1978; Paffenbarger, Wing, & Hyde, 1978; Morris, et al., 1980; Garcia-Palmieri, et al., 1982; Paffenbarger, et al., 1984; Yano, Reed, & McGee, 1984; Lapidus & Bengtsson, 1986; Leon, et al., 1987; Donahue, et al., 1988; Johannson, et al., 1988; Slattery, Jacobs, & Nichaman, 1989; Morris, et al., 1990; Hein, Suadicani, & Gyntelberg, 1992; Shaper, Wannamethee, & Walker, 1994; Rodriguez, et al., 1994). Finally, cardiorespiratory fitness as related to heart disease further indicates an inverse relationship (Peters, et al., 1983; Lie, Mundal, & Erikssen, 1985; Erikssen, 1986; Sobolski, et al., 1987; Ekelund, et al., 1988; Slattery, et al., 1988; Hein, Suadicani, & Gyntelberg, 1992).

Cancer risks:

> "A growing body of literature indicates that the incidence of some infections may be influenced by the exercise history of the individual (Nieman, 1994; Hoffman-Goetz & Pedersen, 1994). Moderate exercise has been shown to bolster the function of certain components of the human immune system, such as natural killer cells, circulating T- and B- lymphocytes, and cells of the monocyte macrophage system. It has been concluded that as a result, the incidence of some infections is thus decreased (Keast, Cameron, & Morton 1988; Pedersen & Ullum, 1994; Woods & Davis, 1994) and perhaps certain types of cancer (Shephard & Shek, 1995)."

Colon Cancer has often been investigated in relation to occupational and leisure-time physical activity. Studies have found that people with physically active occupations have a significantly reduced risk of this type of cancer (Garabrant, Peters, Mack, & Bernstein, 1984 in Dishman, 1994; Brownson, et al., 1989; Brownson, et al., 1991;

Chow, et al., 1993; Dosemeci, et al., 1993; Fraser & Pearce, 1993; Fredriksson, Bengtsson, & Hardell, 1989; Garabrant, et al., 1984; Gerhardsson, et al., 1986; Kato, Tominaga, & Ikari, 1990; Lynge & Thygesen, 1988; Marti & Minder, 1989; Peters, et al., 1989; Vena, et al., 1985; Vena, et al., 1987). Leisure time physical activity was also shown to be protective from colon cancer in the Harvard alumni study (Lee, Paffenbarger, & Hsieh, 1991), in that the highly active alumni had approximately half the risk of developing it than inactive alumni.

Diabetes risks: Dishman (1994) described a study in which 5,990 male University of Pennsylvania alumni were followed for a period of 14 years (Helmrich, Ragland, Leung, & Paffenbarger, 1991). Those with the highest weekly energy expenditure had lower age-adjusted risk of developing non-insulin dependent diabetes mellitus (NIDDM) than those expending the least amount of energy. This relationship was not weakened when adjusted for obesity, hypertension, or parental history of diabetes. In fact, subjects with the above risk factors received the highest apparent protection from high levels of physical activity (Dishman, 1994).

Women in the Nurses' Health Study (Manson, et al., 1991) who were followed for eight years demonstrated a similar relationship. Age-adjusted risk for NIDDM in physically active women was only 67% of the risk of sedentary women. Findings from these studies are consistent with results related to bed rest studies in which subjects were found to have increased insulin resistance, which was reversible when subjects were allowed to increase their activity levels again (Lipman, et al., 1972).

Falls and fracture risk: Osteoporosis has been implicated in hip and other fractures, which are often followed by hospitalization and death (Dishman, 1994). It has been suggested that reduction in bone density is more a function of physical inactivity than advanced age. According to Chestnut (1993), total inactivity results in loss of bone mineral and mass. Persons who are sedentary generally have less bone mass than do those who exercise, but the increases in bone mineral and mass that result from either endurance or resistance training are relatively small. However, even small increases in bone mass gained from endurance or resistance training can help prevent or delay the process of osteoporosis (Drinkwater, 1994).

Tipton and Vailas (1990) state that "total inactivity results in muscle atrophy. Connective tissues such as ligaments and tendons become weaker and smaller with several weeks of immobilization". According to the USDHHS, (1996), loss of muscle tone and reduced coordination place an individual at increased risk for falls and fractures.

When considering the research on sedentary lifestyle as a risk factor for morbidity/mortality and the high rates of inactivity in the American and Texas populations, health professionals have focused on the development of empirically-based programs which promote health-sustaining activity within the population. Numerous health promotion programs have been implemented both at worksites and in communities.

Health Promotion and Physical Activity

Health Promotion is defined by Green and Kreuter (1991 in Glanz, et al., 1997, p. 8) as "…any combination of health education and related organizational, economic, and environmental supports for behavior of individuals, groups, or communities conducive to health". O'Donnell (1989 in Glanz, et al., 1997, p. 8) defines it as "…the science and art of helping people change their lifestyle to move toward a state of optimal health…" and that "…lifestyle change can be facilitated by a combination of efforts to enhance awareness, change behavior, and create environments that support good health practices."

In considering the detrimental effects of sedentary lifestyle as described above, it is concluded that health promotion programs that include or emphasize an increased level in one's physical activity are useful in reducing mortality rates within a population. In recognition of the public health problem posed by sedentary lifestyles, the USDHHS declared health promotion and disease prevention a priority (Sullivan, 1990). A document called *Healthy People 2000* was created to establish national goals and objectives for reducing risk of disease in Americans. Nationally, only 22 percent of adults over the age of 18 were engaging in light to moderate daily physical activity (USDHHS, 1991) at the time the *Healthy People 2000* objectives were set. Since then, population rates of physical activity have improved very little, if at all (Shalala, 1999). The risk reduction objectives for *Healthy People 2000* focusing on physical activity were as follows: light to moderate intensity physical activity, 5 or more times per week for at least a total of 30 minutes, OR vigorous activity for at least 30 minutes, 3 times per week in at least 30% of the American population (USDHHS, 1991).

In addition, the objectives for Healthy People 2000 (USDHHS, 1991) included goals to increase the percentage of workplaces which offer physical activity programs in order to facilitate an increase in population rates of exercise. O'Donnell (1994) describes three levels of health promotion programs that can be offered in workplaces. Level I focuses on awareness, which is meant to simply increase an employee's level of awareness or interest in a health topic. The second level (Level II) is what he describes as a combination of health education, behavior modification, experiential practice, and feedback opportunities. The difficulty with Level II programs is that they fail to sustain long-term behavior change. He notes that the best way to facilitate sustained changes in behavior is by providing a third level (Level III) of health promotion program. He calls this third level a "supportive environment" in which an environment within the work setting encourages a healthy lifestyle, which he states is critical to maintain the changes.

Workplace health promotion efforts that include physical activity have begun to report their results in terms of cost savings (Bly, Jones, & Richardson 1986; Gibbs, Mulvaney, Henes, & Reed, 1985). For example, Johnson & Johnson's Live for Life? Program resulted in fewer inpatient hospital admissions, lengths of stay, and costs as compared to a non-program worksite (Bly, Jones, & Richardson, 1986). Specifically, inpatient health care costs for participants "… approximately doubled during the 5-year study period, while they grew fourfold in the control groups" who did not participate in the Live for Life? Program (Breslow, et al., 1990 p. 18).

Other benefits resulting from the Live for Life Program include significantly greater physical fitness, energy expenditure, smoking cessation, seat-belt use, self-

esteem, opinions of working conditions, organizational commitment, morale, adjusted absentee hours and job satisfaction. Participants also reported fewer sick days than did nonparticipants (Wilbur, Hartwell, & Piserchia, 1986; Breslow, Fielding, Herrmann, & Wilbur, 1990).

However, these programs were comprehensive, and specific benefits of physical activity within those programs have not been isolated. Collingwood (1994) also noted that the studies themselves were not well controlled, and he emphasized the need for longitudinal, well-controlled studies.

Health promotion programs have historically been action oriented, in that they encourage participants to engage in healthy behaviors such as exercise. This does not take into consideration the varying levels of readiness for change of potential participants. For example, some people have no intention to start exercising. These individuals would not derive much benefit from a workplace that provides flexible scheduling and a fitness facility. Or consider an individual who is aware that exercise is important for reducing risk for disease, but is either unmotivated or believes the costs of having an exercise routine outweigh the benefits. Some people may still be aware that exercise is useful for long-term health, and have even initiated a routine, but have had difficulty with situational demands interfering or interrupting their routine.

In addition, many worksite health promotion programs offer an external incentive such as money or time off for participating in the program. One such example is the "March into May" program, which has more recently been termed the "Take Charge Challenge" (Leonard, 1999; Cole, et al., 1998). This program has been offered in

growing numbers of state- and federal-based organizations as well as private institutions. It involves the use of a team concept and goal setting which is rewarded at the end of a 10-week period. Participants are encouraged by a team captain in their department to participate, and the team subsequently competes with other teams within the organization to attain the highest percentage of individual goals for members of each team with external rewards offered as the incentive. Upon completing the time-limited program, external incentives are no longer offered, and despite initial success at increasing activity levels, long-term maintenance of the exercise routine becomes a problem. Leonard (1999) reported that preliminary data of the program indicates that only about 1/3 of participants is still active one year later. This may be due to situational demands, social obligations, or heavy workload interfering with the routine. Some people may have simply enrolled in a health promotion program to gain the incentive, but have no motivation to continue beyond the program. Considering the high rate of premature dropouts and recidivism, researchers (Marcus & Rossi, et al., 1992, Marcus, et al.,1996; Peterson, et al., 1999; Kendzierski, 1988; Ryan, 1997; Ingledew, et al., 1998) have directed their attention to factors associated with maintenance of regular physical activity.

The Transtheoretical Model of Change:

Stages of Change: By applying a health promotion program that is not specific to the current needs of potential participants, a relatively low number of people will make and sustain change in their lifestyles. As a result, more precise methods of promoting the adoption as well as maintenance of exercise need to be established. In addition, by

introducing elements that will make the exercise itself more intrinsically rewarding, adherence to the routine will improve.

Prochaska and DiClemente (1983) attempted to establish a model that would provide a description of how people change health habits or behaviors. Since its inception, its developers and other researchers have found it can be applied to health promotion efforts which target populations of smokers, sedentary people, and a variety of populations who are putting their health at risk through leading an unhealthy lifestyle. Individuals very often fluctuate in their frequency, intensity, and duration of physical activity. If one were to move in a linear progression from being sedentary to physically active, there would be a logical order of steps in that process. For example, one may have no interest or desire to become active on one end of the line, all the way to being active on a regular basis and maintaining that behavior without relapsing to a sedentary pattern at the other end of the line. Of course, in reality, people do not always move in accordance with the logical sequence, but rather back and forth among the different points on the continuum.

A model has been proposed and widely accepted as a descriptor of the different points on the continuum, known as the *Transtheoretical Model* (TTM) of behavior change. The TTM contains three basic dimensions; temporal, qualitative, and quantitative. These dimensions are represented by core constructs, which include: stages of change, processes of change, self-efficacy, and decisional balance.

A continuum of change is commonly described as a series of “stages of change" within the TTM, which were developed after a study comparing people who successfully

quit smoking with people who continue to smoke (Prochaska and DiClimente, 1983). In this study, elements from different theories about behavior change were compiled, and termed "processes of change". The two study groups were asked which processes they used, and an unexpected result was that all subjects consistently reported similar processes used at different points in the process of quitting. As a result, the authors concluded that this was a temporal component that is an integral part of understanding how people change behaviors. This temporal component was termed the "stages of change". They are:

1) *Precontemplation:* this is the stage in which a person has no intention to take action within the next six months. This may be a result of lack of information or a history of failed attempts to change.
2) *Contemplation:* this is the stage when the person intends to take action within the next six months. In this stage, an individual may be more aware of the benefits of change, but is reluctant to initiate a change because they consider the disadvantages of change to outweigh the advantages.
3) *Preparation:* this is the stage when the individual intends to take action within the next 30 days and has taken some behavioral steps in this direction. Examples of action steps in this stage including buying a self-help book, talking to a physician, joining a health facility, or beginning an exercise program which does not meet criteria for regularity set by experts in the relevant field, such as USDHHS or American College of Sports Medicine (ACSM) in the case of physical activity.

4) *Action:* this is the stage in which the person has changed overt behavior for less than six months. The change must be sufficient to meet criteria which professionals and scientists in the field agree is sufficient to reduce risk of disease.

5) *Maintenance:*, this is the stage when the individual has changed the overt behavior for more than six months (Prochaska, et al., 1983). At this point they "…work toward preventing relapse, but they do not apply change processes as frequently as do people in action. They are less tempted to relapse and increasingly more confident that they can continue their changes. Based on temptation and self-efficacy data from a variety of sources (for example, USDHHS, 1990), it is estimated that maintenance lasts from six months to about five years (Prochaska, Redding, & Evers, 1997, p.63)."

Cardinal (1997) sought to determine construct validity of the model by conducting a cross-sectional study comparing individuals in the various stages on measures of physical fitness such as VO_2 max and BMI. He found that there were large between-stage differences in VO_2 max, and moderate differences in BMI. For measures of self-reported exercise level, relapse, and exercise self-efficacy, large between-stage differences were also found. Cardinal (1997) reported that mean scores generally followed a linear pattern of improvement across the stages in a manner consistent with prediction. Measures of stage of change have also demonstrated concurrent validity with the Seven Day Recall Physical Activity Questionnaire (Marcus & Simkin, 1994) as well as moderate reliability (Donovan, et al., 1998) in terms of exercise behavior.

The TTM's stages of change represent both temporal and qualitative dimensions. Psychologically-based stages are conceived of as "qualitatively distinct organizations of thought, feelings, and behavior at a particular period of development (Berk, 1991, p.6)." The TTM is mixed with respect to how well each stage fits this prototype for psychological stages. In the early stages of the TTM, this conception of stage applies, since there are cognitive and behavioral differences. For example, an individual in the precontemplation stage has no interest in changing an unhealthy behavior. Someone in the contemplation stage, however, has an increased insight into how their lifestyle puts them at risk (and others, as in the case of smoking) and considers change as something that will occur "someday". Finally, those in the preparation stage are taking steps toward changing such as seeking information, joining a health facility, and exercising on an irregular basis.

The action and maintenance stages, however, refer to changes involving participation in a health-related behavior to criteria set by an expert organization in the respective field, such as the USDHHS or ACSM in the case of physical activity. The only distinction between these stages, however, is the duration of either less than six months (action) or at least six months (maintenance). Bandura (1997) argues that this makes the stages of change inappropriate for a stage model. Prochaska & Velicer (1997) has argued that his use of the concept of stage is not intended in the prototypical sense, but rather as a concept that is used to provide an integration of understanding the process of change. Despite Prochaska's reasoning, logic would dictate that there should still be a difference in content between the action and maintenance stages because not everyone progresses to

the maintenance stage. Whether or not Prochaska intended his use of stages of change as stages, researchers have come to utilize his model as though the temporal units are stages. The present study attempts to utilize this model as a stage theory. In doing so, both content and temporal characteristics are proposed that would be stage specific.

Content Characteristics of Stages: One content characteristic that is included within the TTM is *self-efficacy.* As defined by Prochaska, Redding, and Evers (1997) self-efficacy has two parts:

1. *Confidence*, the primary construct in self-efficacy, is the situation-specific confidence people have that they can cope with high-risk situations without relapsing to their unhealthy or high-risk habits. This construct was adapted from Bandura's self-efficacy theory (1977, 1982).

2. *Temptation* describes the intensity of urges to engage in a specific habit when in the midst of difficult situations. The three most common types of tempting situations are negative affect or emotional distress, positive social occasions, and cravings.

In considering the different domains of the model, self-efficacy can be considered a quantitative domain; in that people in higher stages within the model have greater self-efficacy. Sallis and Owen (1999, p.117) describe self-efficacy as:

> "…a person's confidence in his or her ability to do specific physical activity in specific circumstances. A person may have high self-efficacy about exercising in good weather, but not in rainy or cold weather. A person might report very different self-efficacy levels for jogging versus walking. Thus, the more specific the measure of self-efficacy, the more highly it should be related to the physical activity outcome. Bandura's theory has been strongly supported, because self-

efficacy is the strongest correlate of physical activity in virtually every study that includes it."

Cross sectional data such as Cardinal (1997) and Cowan's (1997) have found that mean self-efficacy scores for exercise increase along with stage of change. In identifying the relationship between baseline self-efficacy and exercise adherence in longitudinal studies, it has been shown that higher baseline self-efficacy can predict exercise maintenance. For example, Garcia and King (1991) found an increasing trend of correlations between baseline efficacy and adherence the longer the subjects had maintained the behavior. Results indicated that after three months, r=. 31, after 6 months, r=. 44, after 9 months, r=. 34 and after 12 months, r=. 50. The researchers also found a partial correlation of r=. 37, p<. 01 (N=60) between average adherence over a 12 month period and self-efficacy after 1 year of study, controlling for baseline self-efficacy. Adherence after one year was related to higher baseline self-efficacy than for those who relapsed prior to one year.

Self-efficacy research has repeatedly shown association with physical activity and has been proposed as the most powerful determinant of behavior (Sallis & Owen, 1999; Conn, 1997), and is positively related to stage of change (Herrick, et al., 1997; Armstrong, et al, 1993 in Herrick et al., 1997; Bernier, 1986; DiClemente et al., 1985; Cowan, et al., 1997). In particular, the largest correlations between health behaviors and self-efficacy expectations occur when using measures of self-efficacy specific to exercise. Researchers have subsequently reasoned that movement through the exercise stages of change could be encouraged by clinical interventions that increase exercise self-

efficacy (Conn, 1997). In a description of the relationship between self-efficacy and behavior, Bandura (1995) stated:

> "The substantial body of research on the diverse effects of perceived personal efficacy can be summarized as follows: People who have a low sense of efficacy in given domains shy away from difficult tasks, which they view as personal threats. They have low aspirations and weak commitment to the goals they choose to pursue. When faced with difficult tasks, they dwell on their personal deficiencies, the obstacles they will encounter, and all kinds of adverse outcomes rather than concentrate on how to perform successfully. They are slow to recover their sense of efficacy following failure or setbacks. Because they view insufficient performance as deficient aptitude, it does not require much failure for them to lose faith in their capabilities. They fall easy victim to stress and depression. In contrast, a strong sense of efficacy enhances human accomplishment and personal well-being in many ways. People with high assurance in their capabilities in given domains approach difficult tasks as challenges to be mastered rather than as threats to be avoided. Such an efficacious outlook fosters intrinsic interest and deep engrossment in activities. These people set themselves challenging goals and maintain a strong commitment to them. They heighten and sustain their efforts in the face of difficulties. They quickly recover their sense of efficacy after failures or setbacks. They attribute failure to insufficient effort or to deficient knowledge and skills that are acquirable. They approach threatening situations with assurance that they can exercise control over them. Such an efficacious outlook produces personal accomplishments, reduces stress, and lowers vulnerability to depression. Self-efficacy beliefs are the product of a complex process of self-persuasion that relies on cognitive processing of diverse sources of efficacy information conveyed enactively, vicariously, socially, and physically. Once formed, efficacy beliefs contribute importantly to the level and quality of human functioning (p.11)."

Self-efficacy can be considered one element of content within the stages of change, but is not anchored content-wise to a specific stage. Since it is present in each stage, to some degree, it is the *quantity* of self-efficacy that is related to stages and cannot clearly differentiate between the action and maintenance stages. Self-efficacy is expected to positively influence acquisition of behaviors across the stages, and is in turn also

strengthened with successful forward movement in stages. Thus, self-efficacy is descriptive of a type of content that is present across all stages.

Another content variable within the TTM is *decisional balance*, or the relative weight assignment of pros and cons of exercise (Janis & Mann, 1977). In comparing individuals in different stages of change, it has been found that people in lower stages (precontemplation and contemplation) have significantly lower scores on self-efficacy as well as perceived pros of exercise (King, et al., 1996), and higher scores on cons of exercise (Herrick, et al., 1996; Myers & Roth, 1997).

Individuals in the more active stages (preparation through maintenance) have higher self-efficacy (King, et al., 1996: Herrick, et al., 1996) and perceived pros of exercise (Herrick, et al., 1996; Myers & Roth, 1997). A "crossover" occurs at the preparation stage, in which pros begin to outweigh cons (Prochaska, et al., 1994). Thus, decisional balance is a type of content within stages that is relevant in varying degrees to all stages. Content variables which are *stage specific* and differentiate individuals across stages in terms of cognitions and behaviors (processes which they engage in) need to be clearly identified for the maintenance stage.

Other research has indicated that there are still more variables related to exercise adherence that are not included in the TTM. These other variables may be helpful in directing research to determine the missing qualitative distinction between the action and maintenance stages and thus improve health promotion program planning. Two lines of research on exercise adherence are *locus of motivation,* with discrete categories of intrinsic and extrinsic motivation, and *exercise self-schema,* with discrete categories

described as "schematic for exercise", "aschematic for exercise", and "nonexerciser schematic". If a differing relationship between the discrete categories within these two concepts and the action and maintenance stages can be established, then it is likely that these concepts are important components that should be included in the stage definitions.

Intrinsic motivation, as defined by Kalat (1996) is "a motivation to engage in an act for its own sake (p.463)", and Ryan et al. (1997) describe intrinsically motivated behaviors as "…those performed for the satisfaction one gains from engaging in the activity itself". A behavior driven by e*xtrinsic motivation* is described by Ryan et al. (1997) as being "… in order to obtain rewards or outcomes that are separate from the behavior itself". They commented that much sport and exercise behavior is motivated by a combination of intrinsic and extrinsic motivations, and that different forms of exercise may draw people who are driven by one or another type of motivation. It can also be reasoned that someone may participate in physical activity because they enjoy it, but are also motivated to continue after benefiting from weight control and health maintenance. On the other hand, they may initiate physical activity because they want to lose weight, but are able to consistently exercise because they enjoy it. Ryan et al. (1997) found that intrinsic motivators such as enjoyment of an activity, competence, and social interaction were more likely to predict adherence to an exercise program than extrinsic motivators, such as body related ones. This leads to the conclusion that by adopting an exercise routine which includes an activity that is enjoyable, successful maintenance is more likely.

The notion that enjoyment of the activity is related to adherence has been confirmed in cross-sectional studies using the stages of change. Mullan and Markland (1997) found that the higher the stage someone is classified in, the greater the reported intrinsic motivation. Similarly, Ingledew, et al. (1998) examined the different motives for exercise across stages of change. They found that exercise motive could discriminate between baseline stage of change, as well as stage movement over a three month period. They found that in general, people in early stages of change were more motivated by extrinsic (body related) variables, whereas people in action and maintenance were more likely to have intrinsic motives such as enjoyment. When considering the failure of many worksite health promotion programs to address intrinsic motivation, it is no wonder that so few people maintain the changes.

It is possible that when an individual regularly engages in an enjoyable activity, that activity becomes internalized as an important part of his/her self-image. A model termed *exercise self-schema* (Kendzierski, 1988) was proposed, and a similar concept, termed sport self-schema, has indeed been found to be related to enjoyment of an activity (Boyd & Yin, 1999).

Kendzierski's *exercise self-schema* (1988) was based on the concept of schema theory (Taylor & Crocker, 1981). Schema has been described as an organized body of knowledge (Fiske & Taylor, 1984) and "…includes general abstract knowledge regarding some domain and specific instances of the domain, as well as information about relationships among domain attributes (Taylor & Crocker, 1981, in Kendzierski, 1994, p. 139)." This knowledge then affects cognitions about the domain as it relates to the self.

Self-schemata are "…cognitive structures involving generalizations about the self that are derived from past experience and that are focused on those aspects of the self regarded by the individual as important (Markus, 1977 in Kendzierski, 1994, p.139)." Self-schema are related to specific domains as they relate or do not relate to the self, and as a result affect the content and speed of judgements about the behavior. In the case of exercise, an individual may consider that concept as being part of his/her self-image, or self-schema. Someone with an exercise self-schema (Kendzierski, 1990) would consider exercise as an attribute that is self-descriptive, would be faster to endorse words or phrases about exercise in addition to endorse more of them, and consider this an important part of their self-image. These individuals would be described as *schematic* for exercise. On the other hand, those who consider exercise to be either mildly descriptive or nondescriptive of the self, and do not consider this attribute to be an important part of their self-image would be termed *aschematic* for exercise. Individuals who consider being a nonexerciser as an important part of their identity would be termed *nonexerciser schematic* (Kendzierski, 1990).

Swann (1983) proposed that an individual's self-image is related to the motivational level to engage in a particular behavior. For example, an exercise schemata would promote exercise since, the individual would gain satisfaction from the knowledge that exercise is acting in accordance with the self-definition (Swann, 1983). This satisfaction would be present even before the extrinsic benefits such as weight loss or increased energy have emerged, which would keep the individual exercising without those reinforcers. After regular exercise, the exercise schematic would have further

benefit in those long-term rewards. Thus, exercise schematics would be more likely to adopt and maintain an exercise routine than aschematics or nonexercise schematics, and Kendzierski (1990) did find that exerciser schematics were more likely to begin participation in an exercise program within a period of 11 to 12 weeks than aschematics or nonexerciser schematics.

The notion that self-schema is related to maintenance of a behavior is evident in a variety of other areas, and that clinicians have found this concept important for maintaining behavior change. For example, Young (1999) reported that schema-focused treatment techniques have been utilized in preventing relapse with depression, anxiety disorders, and substance abuse, and in the treatment of physical and psychological abuse, eating disorders, and chronic pain. Avants et al. (1996) reported that newly abstinent cocaine abusers showed evidence of treatment readiness in that they reported greater self-efficacy in high-risk situations, and identified less with an "addict" self-schema. In the area of diet, intentions as related to behavior were also mediated by diet self-schema classification, in that being schematic for diet was predictive of better adherence over an eight-week period than being aschematic (1997).

A study by Boyd and Yin (1999) focused on the concept of self-schemata as related to participation in sports. They found that sport schematics expressed greater sport enjoyment than did nonschematics, and that they reported greater intent to participate in the future, than did either non-schematics or aschematics. This is consistent with the research on intrinsic motivation and adherence to exercise.

Other research by Kendzierski & Whitaker (1997) found that schematics and aschematic college students were comparable in initial attempts to act on their intentions at the beginning of a semester. However both groups lapsed during semester break, and only schematics recovered from their lapse. In another study, Kendzierski (1990) found that subjects who engaged in planning in regard to exercising were more likely to adopt an exercise program and to exercise more frequently. This may be an indication that they were using Prochaska's behavioral processes of change and may have contributed to their exercise self-efficacy. In a further study by Kendzierski (1988) exercise schematics reported being both interested in and committed to exercising regularly during the current semester. Taken together, results of these studies are strong evidence that self-schema related to a behavior such as exercise is a predictor of maintenance of that behavior.

As mentioned earlier, there is stage-specific content that can distinguish between individuals within each stage. That content becomes evident in the cognitions and behaviors (processes) that people experience and exhibit. The cognitions and behaviors are an integral part of the TTM as descriptions of what occurs as people move toward adoption and maintenance of a behavior change.

Processes of Change: As noted earlier, development of the stages of change was not the purpose of the original study by Prochaska and DiClemente (1983). Their original focus was on determining the processes by which smokers attempted to and successfully quit. The stages of change, according to Prochaska and Velicer (1997), are variables that describe which processes of health behavior change an individual is using along the temporal dimension. Those processes are what have been used in describing change, as

well as implemented as curricula in health promotion efforts to aid in movement toward successfully attempting and maintaining a behavior change.

According to the Transtheoretical Model, within the stages certain processes have been found to occur or not occur as one moves in and out of them (Prochaska and DiClimente, 1983). These have been termed simply "processes of change". These processes include elements from other models of behavior change such as self-efficacy theory (Bandura, 1977, 1982), decision making theory, (Janis & Mann, 1977), consciousness raising from Freudian theory, and helping relationships from the Rogerian tradition (Prochaska, Redding & Evers, 1997). "Processes of change provide important guidelines for intervention programs, because the processes are like independent variables that people need to apply to move from one stage to another. Ten processes have received the most empirical support to date (Prochaska, Redding, & Evers, 1997 p.63)." The ten processes have been divided into two higher order categories (Prochaska, et al., 1988 in Marcus, et al, 1996), *cognitive or experiential*, and *behavioral.*

Within the *experiential/cognitive* category, there were a number of processes such as (Marcus, et al., 1996, p. 197):

> "1) Consciousness Raising - Efforts by the individual to recall and seek new information related to exercise and adoption of activity (e.g., the benefits of exercise).
> 2) Dramatic Relief - Affective or intense emotional experiences related to sedentary lifestyle (e.g., thinking about the negative health consequences of inactivity).
> 3) Environmental reevaluation - Consideration and self-assessment of how a behavior impacts others in the physical and social environment, which is useful in the case of smoking, as it can clearly impact those around the smoker.
> 4) Social liberation - Awareness, availability and acceptance by the individual of societal and social influences on encouraging and promoting exercise.

5) Self-reevaluation - Emotional and cognitive reappraisal by the individual with respect to exercise activity. Individuals imagine themselves with and without a particular unhealthy habit, such as one's image as a couch potato and one's different image as an active person.

The *behavioral* category is comprised of:

6) Counterconditioning - The use of healthy behaviors that can substitute for problem behaviors. The use of exercise to cope with unpleasant emotions (e.g., stress and fatigue) is an example of this.
7) Helping relationships - Trusting, accepting, and using the support of caring others to enhance and assist with the individual's exercise activity. Buddy systems can be a source of social support for exercise.
8) Contingency management – Provides consequences for taking steps in a particular direction. Rewarding oneself for exercise, and not for sedentary behavior is a way this can be used.
9) Stimulus control - Control of situations and other causes which trigger inactivity.
   Removing cues for unhealthy behaviors and adding cues to the environment to exercise is how this can be used.
10) Self-liberation - The individual's belief that one can engage in the healthy behavior and the commitment to act on that belief, i.e., maintain exercise. Public testimonies are an example of a way one can increase the level of commitment to the behavior."

In Prochaska and DiClimente's (1983) original study on smokers' use of processes of change, they found those individuals early in the process of quitting (contemplation) to rely more on the cognitive processes of change, and those in later stages (preparation through maintenance) use more behavioral processes. In other words, when an individual is simply contemplating change, he/she is engaging in the cognitive processes as described in the model. At the same time, people who have already made a change in their behavior and are in the process of making (or attempting to make) the change permanent, as in the case of the action stage, are likely to be using the behavioral processes. Thus, the model indicates that there is a distinction between what early changers are doing and those who have begun to change. Gender differences in use of

processes have not been determined. O'Connor, et al., (1996) found that gender did not significantly contribute to use of the different processes.

Other researchers also have found significant differences in use of the processes in the early and later stages of change, and have attempted to predict stage movement from reported use of the processes of change. For example, Marcus, et al. (1996) studied the cognitive and behavioral processes as related to exercise adoption by utilizing a 40-item Exercise Processes of Change Questionnaire (Marcus & Rossi, et al., 1992). In their investigation, they assessed subjects' stage of change and processes of change used at pretest and six months later. At posttest, four groups were derived based on stage movement. These were 1) *stable sedentary*, comprised of individuals who remained in precontemplation or contemplation at both baseline and follow-up, 2) *stable active*, which was made up of subjects who remained in preparation, action, or maintenance at both assessments, 3) *adopters*, in which people moved from sedentary to active, and 4) *relapsers* which contained those who were active at baseline but were sedentary at follow-up. Results indicated that both stable groups did not change their frequency of using the processes of change. *Adopters* were found to have increased usage of the processes as a whole from pre- to post- testing, while *relapsers* were found to significantly decrease all the behavioral processes, but only one experiential (dramatic relief) process. This may indicate that the dramatic relief process is more applicable to people in any stage, since the model considers them to be relevant early in the change process, but it is apparent that it is relevant across stages. The researchers concluded that these results have important implications for relapse prevention. They stated that

ongoing behavioral skills training is critical for long-term exercise behavior and that in the case of a relapse, one does not lose the foundation (e.g., changed cognitions), but readily loses the skills critical to continuing the behavior (Marcus, et al., 1996). She indicated that "…the use of experiential processes is more critical in the earlier stages of readiness, and the behavioral processes are more important for those in the later stages (p. 196)."

Marcus's study (1996) was useful in predicting ability to adopt an exercise routine and maintain it for up to 6 months. However, Herzog, et al. (1999) tested the model with smokers and found that after 1- and 2-year follow-up, baseline processes of change were not predictive of adherence to the change. It should be noted that in neither of these studies was an intervention provided that would enable subjects to adhere to the change over time. One study (Peterson, et al., 1999) attempted to follow the common recommendation (Herrick, Stone, & Mettler, 1997; Laitakari & Miilunpalo, 1998; Cardinal, 1997; Ingledew, Markland, & Medley, 1998; Cole, et al., 1998; Marcus, et al., 1996; Prochaska & Velicer, 1997) to apply the processes of change in an intervention to assist progression toward adopting and maintaining behavior change.

Peterson's study (1999) compared a stage-matched health promotion intervention with a "generic" intervention and no intervention in a worksite setting. At baseline, subjects reported their current stage of change, and subsequently received a newsletter which focused on: a) processes of change specific to their stage, b) information based on the Surgeon General's Report on Physical Activity (USDHHS, 1996) and was unspecific to stage, or c) no newsletter. Six weeks later, subjects were reassessed on their reported

exercise pattern and stage of change, and it was found that subjects who received stage-matched newsletters had the greatest success in moving forward in stage, while the generic group had more success than the control group. These results are indicative that certain types of change processes or methods of intervention (e.g., specific behavioral processes) have greater utility for certain targeted content. In other words, behavioral processes such as contingency management or stimulus control are more salient for people who have made overt changes such as initiating an exercise program (the content within the stage) than for people who are contemplating initiating a program sometime in the future. This method of targeting stage-relevant content was shown to be more effective than content that is applicable across stages, or generic.

Peterson's study (1999) showed promise in that it was able to create greater change in the stage-matched group than the generic or control groups, although it only used one exposure to the intervention materials. As (Herzog, et al., 1999) had noted, processes of change were not useful in predicting long-term adherence. With only one administration of the intervention, it is possible that the effects of the intervention would not last much longer than the measurement period. According to Chapman (1994), providing a repetitive exposure to health promotion materials is a good strategy, in that it makes the "…unfamiliar become familiar (p. 179)." In addition, research on the use of "booster sessions" or follow-up interventions has been found useful in maintaining changes in HIV risk behavior (El-Bassel, et al., 1997), stress management and burnout prevention (Malkinson, et al., 1997) and hand warming (Melin & Fagerstroem, 1996). Using a series of newsletters over an extended period may be necessary to enhance ability

to maintain a change over a longer period. A disadvantage of Peterson's study was the short duration of the study, with the only follow-up occurring after six weeks. According to Marcus, et al. (2000), intervention studies typically operationalize maintenance of engaging in regular physical activity according to the recommendations by the USDHHS or the ACSM for at least six months. A six-month follow-up would be useful in determining the ability of subjects to maintain the changes.

Thus far, it is not clear that targeting the processes of change is responsible for facilitation of long-term adherence to a behavior change. It may be that an intervention which targets stage-specific content rather than simply processes may be necessary to promote utilization of processes, and thus transition from one stage to the next. This would be a good direction to take in program planning if it can be determined that there is indeed a relationship between content and processes.

When considering the similarities of the beliefs and subsequent behaviors exhibited in someone with high self-efficacy as described by Bandura (1995), a relationship between the cognitive and behavioral processes of change appears to emerge. This relationship between the processes of change and self-efficacy has been established (Bock, et al., 1997), and it may be that self-efficacy can influence the use of processes of change, and thus aid in adhering to regular exercise. It would seem logical that an individual who has planned how they will overcome certain situational barriers to a specific behavior will feel more confident that they can complete that behavior. Bock and others (1997) investigated this relationship between self-efficacy and the use of processes of change.

In a population of 62 cardiac rehabilitation patients, exercise, self-efficacy, and processes of change were measured upon entry into the program, at the end of the 12-week program, and at three- month follow-up. Results at posttreatment indicated that patients increased their time spent exercising as well as the use of behavioral processes of change and showed improvements in self-efficacy. At three-month follow-up, a logistic regression analysis indicated that adherence to exercise was associated with self-efficacy and the use of behavioral processes, but not the use of the cognitive processes of change. This is consistent with Marcus' (1996) finding that relapsers are more likely to decrease use of behavioral processes of change and Prochaska and DiClemente's assertion that individuals in early stages utilize cognitive processes while those in later stages utilize behavioral processes. However, it cannot be determined whether the lack of using behavioral processes decreased self-efficacy beliefs, or if the individual stopped using the processes due to a low self-efficacy. Therefore, the directionality of this relationship needs to be determined. In other words, if the self-efficacy occurs first, it can be concluded that it assisted in producing the greater use of behavioral processes. On the other hand, if use of the behavioral processes occur first, it can be reasoned that those processes can increase a sense of self-efficacy.

In summary, the present study examined the transition from action to maintenance when interventions target stage-relevant vs. generic content. In addition, other content variables, which may be related to that transition, were tracked to determine if a discrete component can distinguish between the two stages.

Present Study

The purpose of the present investigation is to focus on the maintenance stage of the Transtheoretical Model of change as opposed to the action stage. Alternative views of this transitional period are that: 1) behaviors acquired or changed during previous stages are strengthened as manifest by continuity and stability, or 2) that new behaviors are acquired or changed that are intrinsic to this final era. If the former circumstance is the case, then maintenance would be facilitated or "boosted" by targeting all of the behavioral content relevant to the preceding stages. On the other hand, if there is content relevant to maintenance, then targeting stage-relevant content would be most efficacious. This study proposes that the salient transitional task of the maintenance stage is a change in self-schema with respect to exercise.

The TTM of behavior change has been found to be useful in its ability to predict what variables are related to adoption of a physical activity routine through its descriptions of qualitatively different cognitions and behaviors among the early stages of change (i.e., precontemplation, contemplation, and preparation). However, it has failed to produce a qualitative description of an individual who is able to maintain the change for at least a period of six months that is different from an individual who is initiating a program of regular exercise. This problem arises from the lack of a qualitative difference in cognition or behavior between the action and maintenance stage. This creates a problem in that it becomes more difficult to predict who will maintain the change over the long-term, and is unclear how to produce a health promotion intervention which enables someone to maintain a change, since there is no distinct content that can be

targeted. These problems have created difficulty in the model's ability to provide useful information to health promotion specialists attempting to develop programs that assist individuals go from being sedentary to regularly active for long periods of time.

Studies to date that have assessed cognitive and behavioral differences in subjects across the five stages of change have determined cross sectional differences in self-efficacy, intrinsic motivation, and use of cognitive and behavioral processes of change. Short-term studies providing stage-content specific and generic interventions have found that stage-specific interventions can most effectively promote forward stage movement over a six-week period (Peterson, et al., 1999). However, by using only one exposure to the intervention, the long-term results may be limited. Research on booster sessions (El-Bassel, et al., 1997; Malkinson, et al., 1997; Melin & Fagerstroem, 1996) has indicated that by repeating the intervention over time, adherence to the change can be enhanced.

> *Hypothesis #1*: By comparing stage-matched and generic intervention over a three-month period with repeated exposure to the intervention, subjects receiving stage-matched information will be more likely to be successful at adhering to their baseline exercise routine than those who receive generic information.

This study also sought to determine what qualitative difference is present in people who successfully maintain an increase in exercise from those who are unsuccessful. Cross- sectional and longitudinal studies have also indicated that individuals who consistently utilize behavioral processes of change are more likely to adhere to an exercise routine. However, no studies to date have shed any light on what

drives those individuals to continue utilizing the methods. The lack of definition of qualitative characteristics of a successful maintainer, has been demonstrated in a longitudinal study (Herzog, et al., 1999) which indicated that differences in uses of cognitive and/or behavioral processes of change cannot necessarily predict who will maintain that change for long periods of time. Thus, the distinction between the action and maintenance stages needs to be clarified in order to determine cognitive and behavioral predictors of long-term adherence, which can be incorporated into health promotion strategies.

One possible distinction between successful and unsuccessful maintainers is that in some, exercise may become such an integral part of the daily routine that it becomes internalized as part of the self-concept. Exercise self-schema is a term for this idea that has been proposed (Kendzierski, 1988). It has been found to predict initiation of exercise programs as well as ability to resume programs after a brief relapse, whereas subjects who are aschematic are unable to resume after relapse after initiation of an exercise program (Kendzierski, 1990). In addition, a positive relationship between self-schema and enjoyment of activity exists (Boyd & Yin, 1999), which has also been shown to predict adherence to an exercise program (Ryan, 1997; Mullan & Markland, 1997; Ingledew, et al., 1998).

Hypothesis #2: Subjects who are able to continue their exercise routine for at least three months will report an exercise self-schema more frequently than subjects who are not able to continue.

By attempting to bring a group of subjects to the TTM's maintenance stage through providing stage-matched information, corresponding changes in self-efficacy and intrinsic motivation can also be traced and compared with the utilization of behavioral processes of change. Self-efficacy specific to exercise has been consistently shown to predict adherence to an exercise routine (Sallis & Owen, 1999) and to use of behavioral processes of change (Bock, et al., 1997).

Hypothesis # 3: Exercise self-efficacy will be positively related to rate of utilization of the behavioral processes of change.

Hypothesis #4: Exercise self-efficacy will be significantly higher in those who maintain an exercise routine for at least three months, and will be even higher in those who received the stage-matched intervention.

The directionality of this relationship has never been determined, as it is possible that increasing a sense of self-efficacy may lead to greater use of behavioral strategies to maintain a routine, but it is also possible that by simply engaging in those processes and subsequently exercising regularly may increase self-efficacy. This study sought to answer this question by using repeated measures to assess whether utilization of processes of change precedes an increase in self-efficacy or vice versa. By determining the directionality of the relationship, health promotion efforts can be more precise.

Intrinsic motivation, or enjoyment of the activity, has been found to predict long-term adherence to an exercise routine (Ryan, 1997; Mullan & Markland, 1997; Ingledew, et al., 1998) and is related to sport self-schema (Boyd & Yin, 1999).

Hypothesis #5: Subjects who successfully continue regular exercise will report more intrinsic motives for exercise than those who are unsuccessful.

Due to the high rate of attrition in health promotion research, an attrition analysis will be conducted to address the poor rate of follow-up in long-term health promotion research. One final research question will address whether or not subjects received newsletters, read them and found them useful.

CHAPTER III

METHOD

Participants

Subjects were recruited on a volunteer basis from five locations within the Dallas/Fort Worth Metroplex. Locations included two university settings targeting students, faculty and staff, one hospital targeting staff, and two privately run-fitness centers, targeting members. Of the 121 total subjects recruited (26 males, 95 females), 77 were Caucasian (63.6%), 17 were African American (14%), 12 were Hispanic (9.9%), 6 were Asian (5%), 3 indicated more than one ethnicity (2.5%), 2 were Asian Indian (1.7%), and 3 did not indicate ethnicity (2.5%). Mean age was 32.9 years (range = 18-65, SD = 11.06). Of the 121 subjects, 7 left the study before any follow-up surveys were distributed due to leaving the institution from which they were recruited and were receiving newsletters, and one asked to be withdrawn from the study. Of the 113 subjects who remained in the study, 72 (63 % of sample) completed the three-month follow-up, and 55 (49% of sample) completed the six-month follow-up.

At baseline, thirty-five subjects were in the Preparation stage of change ("I currently exercise some, but not regularly"), 82 were in Action ("I currently exercise regularly, but I have only begun doing so within the last six months"), and 4 were in

Maintenance ("I currently exercise regularly, and have done so for longer than six months").

Upon follow-up, after three months, one subject was in Precontemplation ("I currently do not exercise, and I do not intend to start exercising in the next six months"), one was in Contemplation ("I currently do not exercise, but I am thinking about starting to exercise in the next six months"), 27 were in Preparation, 29 were in Action, and 14 were in Maintenance. After six months, one subject was in Contemplation (I currently do not exercise, but I am thinking about starting to exercise in the next six months), 24 were in Preparation, 16 were Action, and 14 were in Maintenance.

Procedure

Subjects were recruited via a university health fair display, announcements in academic and aerobic classes, flyers posted in central locations and inserted into departmental mailboxes, and campus-wide e-mail messages advertising a need for volunteers who have been exercising regularly for less than six months (see Appendix). Interested volunteers met individually or in groups with the researcher or an assistant. At that time, study criteria and design were explained, and they received and completed a baseline packet of surveys. All participants provided informed consent (see Appendix) and were allowed to withdraw from the study at any time. Upon completion of measures, subjects received a raffle ticket for a drawing at the end of the study for a gift card to a local sporting goods store. A small portion of the subjects (n = 9) did not receive raffle tickets due to IRB restrictions at their institution.

After completing the baseline measures, subjects were matched on the sum of "behavioral processes of change" scores and divided into two groups. All subjects received six monthly newsletters about exercise, however the specific newsletter content differed between the two groups. The first group (stage-matched) received newsletters that provided information specific to people who are early in exercise adoption (see Appendix). Stage-matched newsletters presented information in a brief introductory sentence or paragraph, with bullets highlighting specific strategies for exercise Maintenance. Brief written exercises were included in the newsletters for subjects to determine their own behaviors or attitudes, and to plan their own strategies for Maintenance.

The second group (generic) received information that was conceived to be relevant to anyone, regardless of their current stage of change (see Appendix). Information included topics ranging from health benefits of exercise and risks of sedentary lifestyle, to the recommended amounts of exercise necessary to achieve health benefits. Generic newsletters also included written exercises to increase personal awareness of cognitions and behaviors currently being used and what changes could occur with continued exercise. Newsletters for each group were nearly identical in appearance, with use of same color of paper, border, and use of bullets.

After signing up, volunteers received the newsletters monthly for six months in departmental mailboxes, at their home address, or at a specified location on campus. They also received the original survey packet after the third and sixth months, with one additional brief survey (see Appendix) with the six-month follow-up packet. This survey

asked subjects if they had received the newsletters, if they found them helpful, and if they had any additional comments or suggestions on how to improve the newsletters. Along with the follow-up surveys, subjects received additional raffle tickets, which they were instructed to return with completed surveys. Subjects were informed that raffle entries were contingent upon completion of packets, and not participation in exercise so as to encourage people to return the surveys, regardless of whether or not they were still exercising. Participants completed the surveys and returned them to the researcher in the envelope provided by the investigator.

Measures

Stage of Change. This is a 5-item measure with definitions for each stage provided (see Appendix). Subjects endorse which stage applies to them. The measure was devised by Marcus & Selby, et al. (1992), with test-retest reliability after a two-week period of .78, and concurrent validity was evident in its significant relationship to the 7-Day Physical Activity Recall Questionnaire (Marcus & Simkin, 1994). Regular exercise in this scale is based on the United States Department of Health and Human Services definition (1990) of regular physical activity.

Exercise Processes of Change. A 40-item scale developed by Marcus, Rossi and others (1992) provides four everyday examples of each process, which subjects indicate utilization patterns by rating them on a scale of 1-5 (*1 = never to 5 = repeatedly*) (see Appendix). Initial validation of this measure confirmed the two-factor structure (cognitive/behavioral) found by Prochaska, et al., (1983), and internal consistency for

each scale ranged from a=. 62 -. 88. ANOVA results indicated that each scale was able to differentiate among subjects in the different stages of change (Marcus & Rossi et al., 1992). Sum of behavioral process item ratings was used for matching subjects for placement into the two groups. This was done by summing totals for behavioral process items to derive a behavioral process score.

For this study, three new measures based on the Process of Change Scale were developed in order to shed light on the structure of the use of those processes, rather than the content of the processes. These scores were applied separately to both the behavioral and cognitive processes, and were as follows:

1) Breadth of Change Repertoire = number of items endorsed as being used, in which a high number of statements endorsed (seldom, occasionally, often or repeatedly) indicates a large repertoire of processes of change.

2) Investment in Change Process = sum of ratings of items endorsed as being used, in which higher scores indicate more investment in the change processes, and

3) Predominance of Change Processes = Investment/Breadth, which is an indicator of whether one is using a few predominant processes or many processes less frequently.

Exerciser Self-Schema. An instrument developed and validated by Kendzierski (1988, 1990) offers subjects phrases related to exercise interspersed with phrases unrelated to exercise, for a total of 18 items (see Appendix for Exerciser Self-Schema items). Participants described themselves along a descriptively anchored scale (1 = does

not describe me to 11 = describes me, and 1=*not at all important* and 11 = *very important*). Classifications are based on strength of endorsement of self-descriptive items as well as ratings of importance of the items to the self-image. Three categories which result are termed 1) exerciser schematic, in which exercise is considered a descriptive and important part of the self-schema; 2) nonexerciser schematic, in which being an exerciser is nondescriptive, and is an important part of the self-schema, and 3) aschematic, in which exercise is not strongly self-descriptive and is not important to the self-concept. Construct validity was established in its ability to discriminate between the three groups in terms of content of judgments about exerciser stimuli (Kendzierski, 1990). Concurrent validity was evident in that exercise schematics also supplied more behavioral evidence for their self-descriptions than aschematics or nonexerciser schematics (Kendzierski, 1990). Predictive validity was also demonstrated in that exerciser schematics were more likely to start an exercise program during a study period than aschematics and nonexerciser schematics (Kendzierski, 1997).

Exercise Self-Efficacy. A 5-item scale developed by Marcus & Selby, et al. (1992) provides situations which are considered triggers for relapse, and subjects reported on a scale of 1-5 (1 = *not at all confident* to 5 = *extremely confident*) about how confident they felt about their ability to exercise in spite of the circumstances (see Appendix for Exercise Self-Efficacy items). Internal consistency of the measure was a=.76 (Marcus & Selby, 1992), and test-retest reliability over a two-week period was r=.78 (Marcus & Selby, 1992). Total scores reliably differentiated subjects among stages of change. For this study, the sum of ratings on each item was used as the self-efficacy score.

Locus of Motivation. A 6-item measure was derived for this study. Items are based on concepts of intrinsic and extrinsic motivation found in the literature (Mullan & Markland, 1997; Ingledew, et al., 1998), and subjects rank ordered the importance of various motivators for their participation in exercise. Intrinsic and extrinsic motivators are included, and intrinsic and extrinsic items were to be compared for successful maintainers and unsuccessful maintainers.

Demographic Information. Subjects' age, gender, ethnicity and status as faculty/staff or student was asked. In addition, they were asked approximately how long they have been exercising.

Follow-Up Questions. Subjects were simply asked if they had received the newsletters, if they had read them, if they found them helpful, and to provide any additional comments or suggestions regarding the newsletters.

CHAPTER IV

RESULTS

The first hypothesis examined the relationship between group assignment and ability to sustain baseline exercise routines during a three-month period. It was predicted that subjects receiving the stage-matched intervention would be more likely to have continued exercising for three months. Based on responses to the Stage-of-Change measure, all subjects who completed the three-month follow-up surveys (n=72) were classified into one of three groups: Those who were able to at least sustain their baseline stage, were categorized as being "successful" (n=43), those who regressed from their baseline stage were categorized as "unsuccessful" (n=17), and those who began the study in Preparation and remained there at follow-up were categorized as "cannot say" (n=12), as the definition in itself is not enough information to determine if rates of exercise have changed or remained constant. This classification system was necessary at the three-month follow-up because in considering the progression from Action to Maintenance, an interval of at least six months is necessary to determine forward movement. Thus, after three months, remaining in Action cannot be assumed to mean failure to progress but it can be inferred that they at least are still on track for movement in the upcoming months. Chi square analysis, $?^2$ (2, N= 72)=4.15, p>.05, revealed that subjects who received the

stage-matched newsletters were no more likely to adhere to their baseline exercise routines than those who received the generic newsletters (See Table 1).

Although the attrition rate at the six-month follow-up was significantly high, the following results of an additional analysis are being reported with caution as to generalizability. Thirty-eight subjects who began in Action completed the follow-up at six months. Nineteen of those received stage-matched newsletters, 5 of which were able to reach the Maintenance stage of change, indicating they were able to sustain baseline exercise routines for at least six months. Nineteen subjects who began the study in Action received generic newsletters, and 7 of them were able to reach Maintenance after six months. Chi square $?^2(3, N=38) = 1.71, p>.05$, indicated that group assignment had no impact on ability to reach Maintenance. See Table 2 for contingencies for group assignment across six-month Stages of Change.

The second hypothesis involved exerciser self-schema and the successful continuation of an exercise routine after three months. The prediction was that individuals who continued to exercise would report an exerciser self-schema more frequently than those who regressed to an infrequent exercise routine or stopped exercising. For this analysis, the same groupings as previously described were used, which were, successful, unsuccessful, and "cannot say".

Chi square analysis, $?^2(2, N=121)=9.04, p<.01$, comparing exercise self-schema at baseline across three stages of change (Preparation, Action, and Maintenance) indicated that there is a difference in likelihood of having an exercise self-schema when taking stage of change into consideration. See Table 3 for contingency tables of

Preparation, Action and Maintenance for exerciser self-schema vs. no exerciser self-schema. However, since all subjects who began in Maintenance had an exerciser self-schema, they were removed and the analysis was repeated. When comparing only individuals in Preparation and Action, the significant difference disappears, $?^2(1, N=117) =. 01, p>. 05$, indicating that only subjects in Maintenance were accounting for the significant difference (see Table 4).

After three months, 70 of the individuals who began the study in Preparation or Action completed the follow-up, and the same definitions of success were used. Forty-two (60%) of the 70 subjects were successful, 16 (23%) were unsuccessful, and 12 (17%) were classified as "cannot say". At baseline, 25 (36%) were categorized has having an exerciser self-schema, and 45 (64%) were categorized has not having an exerciser self-schema. Chi squared analysis, $?^2(2, N= 70) =. 311, p>. 05$, indicated that individuals who had an exerciser self-schema at baseline were no more likely to be successful at continuing their exercise routine than those without an exerciser self-schema. See Table 5 for contingency tables for successful, unsuccessful, and "cannot say" subjects with baseline exerciser self-schema status.

However, when evaluating exerciser self-schema after three months, 26 (37%) were categorized as having an exerciser self-schema and 44 (63%) were categorized as not having an exerciser self-schema. Chi squared analysis, $?^2 (2, N=70) = 14.99, p<. 001$, revealed that those who were successful at continuing their exercise routine were more likely to have an exerciser self-schema after three months than those who were

unsuccessful. See Table 6 for Contingency table for successful, unsuccessful, and "cannot say" subjects as related to three-month exerciser self-schema.

After six months, the same evaluation was completed, but stage of change was the grouping variable rather than successful, unsuccessful or "cannot say". Since enough time had elapsed for individuals to move into Maintenance, self-schema across stages of change was feasible. At follow-up, 53 subjects completed both the stage of change scale and the exerciser self-schema scale. One subject (2%) was in Contemplation, 24 (45%) were in Preparation, 16 (29%) were in Action, and 12 (24%) were in Maintenance. Twenty-four subjects (47%) had an exerciser self-schema and 28 (53%) did not. See Table 7 for contingency tables for exerciser self-schema across six-month stages of change. Chi square analysis, $?^2(3, N=53) = 16.93$, $p<.001$, indicates that after six months, exerciser self-schema is significantly different across stages of change, with exerciser self-schema more likely in Action and Maintenance than in Contemplation or Preparation.

A second chi squared analysis was completed using pooled six-month stages (Contemplation with Preparation, and Action with Maintenance) and six-month exerciser self-schema status. Results indicate that when combining these stages, the relationship is consistent, $?^2 (1, N=53)= 16.38$, $p<.001$. See Table 8 for contingencies among pooled groups.

The third hypothesis focused on the relationship between exercise self-efficacy and the use of the processes of change. For this analysis, the three new process of change scores were used along with the total self-efficacy score. Correlational analyses (N=112)

indicated that exercise self-efficacy has a significant positive relationship to Investment, r=. 38, p<.01, and Predominance, r=.56, p<.001, of Behavioral Processes, as well as Predominance r=.32, p<.05, of Cognitive Processes of Change. Relationships among the Process of Change scores (n=117) indicated that Predominance of Behavioral Processes was strongly related to Investment in Behavioral Processes r=. 66, p<. 01 but unrelated to Breadth of Repertoire of Behavioral Processes r=.06, p>. 05. It was also less strongly related to Predominance of Cognitive Processes r=.55, p<.01 as well as Investment in Cognitive Processes r=.28, p<.01.

Relationships among the Cognitive Process scores indicated that Predominance of Cognitive Processes was strongly related to Investment in Cognitive Processes r=. 82, p<. 01, but moderately related to Breadth of Repertoire of Cognitive Processes r=. 27, p<. 01 (see Tables 9-11 for mean baseline scores, standard deviations and correlations).

The fourth hypothesis evaluated the relationship between exercise self-efficacy and successful continuation of baseline exercise routines, while holding baseline exercise self-efficacy constant. As in the previous research question, only subjects who began the study in the Action stage and completed the three-month self-efficacy survey (n=49) were included in this analysis due to between stage differences in self-efficacy. A Group X Success Status ANCOVA with repeated measures was used to evaluate main effects for group assignment and status of success on self-efficacy after three months, while controlling for baseline self-efficacy. Results indicated that there were no main effects for stage-matched vs. generic group assignment F(1, 44),= .03 p>.05, however, there was a main effect for success on self-efficacy F(1, 44)=12.35, p<.001. See Tables 12 and 13

for adjusted marginal mean exercise self-efficacy scores, and Table 14 for Group X Three-Month Success Status ANCOVA Comparing Self-Efficacy with Baseline Self-Efficacy Controlled.

After six months, self-efficacy was evaluated again (n=36) with a Group x Stage of Change ANCOVA, with baseline self-efficacy as covariate. Stage of Change rather than Success Status was used because enough time had elapsed to determine if those who began in Action could feasibly have made it to Maintenance. Results again indicated no main effects for group assignment $F(1, 28)=1.41$, $p>.05$. However, at six months there was also no main effect for stage of change $F(3,28)=1.32$, $p>.05$, but there was a main effect for baseline self-efficacy $F(1,28)=11.46$, $p<.01$ indicating that baseline self-efficacy contributes to stage after six months more than group assignment or self-efficacy at six months. See Tables 15 and 16 for Adjusted Marginal Mean Self-Efficacy Scores and Table 17 for Group X Six-Month Stage of Change ANCOVA Comparing Self-Efficacy with Baseline Self-Efficacy Controlled.

The fifth research question involved the difference between successful and unsuccessful individuals in ranking of six motivational reasons for exercise. Subjects rank ordered six reasons for exercising, with 1=most motivating to 6=least motivating. It was originally proposed that items would be categorized as either "intrinsic" or "extrinsic" and subjects' responses would be used to classify them as intrinsically or extrinsically motivated. The two groups would then be compared on ability to at least sustain baseline exercise routines.

Categorization of motivational items became problematic, in that there was no clear, theory-based, empirically derived classification of items available. Attempts were made to address this by consulting the literature for item categorization and comparing previous ratings (intrinsic or extrinsic) by an expert panel. Panel responses and examples from the literature were in disagreement regarding what should be considered "intrinsic" or "extrinsic". As a result, a factor analysis with a Varimax rotation was used to determine if a clear factor structure would emerge to clarify the most appropriate item categories. Results of the factor analysis (see Table 18) indicated no clear factor structure, and no agreement with the literature or the panel.

A revised research question was developed to ascertain if mean rank orders of motivational items could distinguish subjects' ability or inability to sustain baseline exercise routines, without categorizing subjects into intrinsically or extrinsically motivated groups. Based on responses to the Stage-of-Change measure, subjects who correctly completed the rank-order survey at three-month follow-up (n=65) were categorized as being successful (n=40), unsuccessful (n=14) or "cannot say" (n=11).

A Friedman's Chi-Square was used to determine if there were within group similarities in rankings, in that successful subjects were in agreement on the order they ranked items, and likewise for unsuccessful and "cannot say" subjects. Results indicated similarities within each successful $?^2$ (5, N=40)= 88.03, p<. 001, unsuccessful $?^2$ (5, N=14)= 24.45, p<. 001, and "cannot say" $?^2$ (5, N=11)= 22.95, p<. 001 groups, as well as the combined sample $?^2$(5, N=65) = 127.67, p<. 001. See Tables 19-22 for mean rankings on items for each group and for the combined sample.

Post-hoc Wilcoxon Signed-Rank tests were used to determine if within-group individual item mean rankings were significantly different from each other by comparing each pair of items separately. This was to verify that within group similarities on the order items were ranked were not simply because all items were ranked evenly from 1-6 in each group, and thus no distinction among the items in how motivating each is.

Among successful subjects, Wilcoxon statistics indicated that mean rankings between 11 out of 15 possible combinations of item pairs were significantly different from each other, in that one item within the pair was ranked as significantly more or less motivating than the other item(s). See Table 23 for Wilcoxon Test statistics among pairwise comparisons within successful subjects.

Among unsuccessful subjects, Wilcoxon statistics indicated that fewer pairs (7 out of 15) of mean rankings between combinations of pairs within the unsuccessful subjects were significantly different from each other. This means that mean ranking for one item in each pair was ranked as significantly more or less motivating than the other item(s). See Table 24 for Wilcoxon Test statistics within the unsuccessful subjects.

Among "cannot say" subjects, Wilcoxon statistics also indicated that fewer pairs of mean rankings between combinations of pairs within the unsuccessful subjects were significantly different from each other (8 out of 15). Mean ranking for one item in each pair was ranked as significantly more or less motivating than other item(s). See Table 25 for Wilcoxon Test statistics within the "cannot say" subjects.

An additional research question was to address the high rate of attrition at three- and six-month follow-up. Individuals who were known to withdraw from the study for

reasons unrelated to the study were not included in this analysis. In addition, those with incorrect or missing data from individual surveys within the packet were excluded from the respective analyses. At three-month follow-up, 72 (63%) returned survey packets. Chi square analyses of completion did not reveal a relationship between dropout and baseline Stage of Change $?^2$(2, *N*=113)=. 605, *p*>. 05, group assignment $?^2$=(1, *N*=113).= 14, *p*>. 05, baseline Exerciser Self-Schema $?^2$(1,*N*=113)=2.91, *p*>. 05, gender $?^2$(1, *N*=113)=. 11, *p*>. 05, nor ethnicity $?^2$(6, *N*=110)=3.84, *p*>. 05. See Tables 26-30 for Contingency tables.

Independent Samples t-tests indicated no relationships between completion of three month surveys and the following measures: baseline Self-Efficacy *t*(106)= -. 85 , *p*>. 05, age *t*(111)= -1.19, *p*>. 05, baseline length of exercise in weeks *t*(102)= -1.73, *p*>. 05, baseline scores on Investment in Behavioral Processes of Change *t* (107)=1.16, *p*>. 05, Breadth of Repertoire of Behavioral Processes *t*(107)=1.39, *p*>. 05, Predominance of Behavioral Processes *t*(107)=. 25, *p*>. 05, Investment in Cognitive Processes of Change *t*(107)=. 60, *p*>.05, Breadth of Repertoire of Cognitive Processes *t*(107)=1.21, *p*>.05, and Predominance of Cognitive Processes *t*(107)= -.35, *p*>.05. See Table 31 for means and standard deviations for these variables.

At six-month follow-up, 55 (49%) returned survey packets. Chi Square analyses of survey completion did not reveal a relationship between dropout and baseline stage of change $?^2$(2, *N*=113)=.95, *p*>.05, group assignment $?^2$(1.*N*=113)=.008, *p*>.05, baseline exerciser self-schema $?^2$(1, *N*=113)= .04, *p*>.05 , gender $?^2$(1, *N*=113)=.37, *p*>.05, nor ethnicity $?^2$(6, N=110)= 11.83, *p*>.05 (See Tables 32-36). Independent samples t-tests revealed that neither age *t*(111)=1.76, *p*>.05, baseline self-efficacy *t*(106)= -.63 *p*>.05, baseline scores on Breadth of Repertoire of Behavioral Processes *t*(107)=.64, *p*>.05, Investment in Behavioral Processes *t*(107)=.36, *p*>.05, Predominance of Behavioral Processes *t*(107)= -.18, *p*>.05] Breadth of Repertoire of Cognitive Processes *t*(107)= -.02, *p*>.05, Investment in Cognitive Processes *t*(107)=.11, *p*>.05, Predominance of Cognitive Processes *t*(107)=.25, *p*>.05, nor length of exercise as measured in weeks at baseline *t*(102)=.02, *p*>.05 predicted completion of surveys after six months (See Table 37).

The question of whether subjects received, read, and found newsletters helpful was also investigated. Forty-seven subjects completed the follow-up questionnaire after six months. See tables 38-40 for counts of subjects who received, read, and found newsletters helpful across group assignment. Chi square analyses revealed that group assignment was not related to receipt $?^2$(2, *N*=47)=.01, *p*>.05, reading $?^2$(2, *N*=47)= .187, *p*>.05 and reported usefulness $?^2$(2, *N*=46)=.37, *p*>.05 of newsletters. However, review of comments regarding newsletters revealed a difference in how appealing the newsletters were to subjects, in that Stage-Matched subjects appeared to give more favorable comments (36%)then Generic subjects (13%). See Appendix for list of comments regarding newsletters across group assignment.

CHAPTER V

DISCUSSION

This study attempted to demonstrate greater effectiveness of stage-matched newsletters than generic newsletters in assisting subjects to move toward long-term exercise maintenance, but was unable to do so. Studies such as Peterson's (1999) found stage-matched newsletters to be more effective than generic newsletters and no newsletter in assisting subjects in forward stage movement. There are several possible reasons for the discrepancy between Peterson's (1999) results and the current results.

One possibility is related to the definition of "regular" exercise, which would place people in one stage or another. The current study used a stringent definition of "regular" exercise, as it specified the criteria for regular exercise set by the *Healthy People 2000* guidelines (USDHHS, 1991), which included frequency, duration, and intensity. Subjects who did not meet that criteria in this study were classified as being in Preparation, whereas studies using less stringent criteria of "at least three times per week for at least 20 minutes" with no mention of intensity (Cardinal, 1997; Marcus, Simkin, Rossi, and Pinto, 1996; Peterson and Aldana, 1999) would have classified more people as being in Action or Maintenance, depending on the length of exercise routine. Thus, more people may have been considered successful, or classified as moving forward in stage in another study, which in this study were classified unsuccessful or "cannot say".

Another possibility for the discrepancy between the current findings and Peterson's (1999) involves the stage-matched newsletters, which primarily focused on the behavioral processes of change. In a meta-analysis published after the current data had been collected, Marshall and Biddle (2001) reported findings that indicate a flaw in narrative reviews of the relationship between processes and stages of change. They noted the dominant line of thinking has been that behavioral processes should "increase in a linear fashion" (p. 242)". However, their findings revealed that

> "precontemplation to contemplation and preparation to action are characterized by sharper increases in behavioral processes compared to other transitions" (p. 242), and "… the least busy stage transition appears to be action to maintenance, in which 9 of 10 processes had effect sizes that included zero. This suggests either that efforts to maintain physical activity habits do not require additional changes in behavioral and experiential strategies or that individuals are using techniques and strategies that are not measured by current instruments (p. 243)."

Marshall and Biddle's (2001) meta-analysis indicates that people in Action do not require an increase in behavioral processes to move into Maintenance. Thus, it is likely that different moderating variable(s) assist in that transition. Peterson's (1999) design included subjects from all stages, and pooled Action with Maintenance. Since behavioral processes are more likely to increase during movement in the lower stages (Marshall and Biddle, 2001), it is that early stage movement that may account for their results.

A possible direction for future research is to use a method similar to Prochaska and DiClemente (1983), in which they determined processes of change by surveying smokers in the course of quitting. It may be that the domain of physical activity has a set of processes that have not yet been identified, which necessitates a new factor-analyzed,

comprehensive survey of processes used by regular exercisers and those adopting an exercise routine.

The present study also attempted to identify additional moderators in order to establish the most effective method for moving subjects toward maintenance. Self-schema is a construct which has been demonstrated to be related to adherence to behavior change (Avants, 1996) and has been used in relapse prevention treatments (Young, 1999). Having a sport self-schema is related to enjoyment of sport participation (Boyd and Yin 1999), and having an exerciser self-schema has predicted adoption of a new exercise routine (Kendzierski, 1990) and resumption of previous exercise routines (Kendzierski, 1997).

The current results indicating no relationship between baseline exerciser self-schema and ability to adhere to exercise, are somewhat different to Kendzierski's (1990, 1997) results. One possible reason for the discrepancy is related to sample characteristics at the time of recruitment. Upon entering the current study, most subjects were reporting that they were involved in an exercise routine for *less* than six months. When considering a self-schema, behaviors that are newly present or are infrequently present are not likely to be incorporated as a core part of the "self". It is apparent from the current findings that after engaging in a behavior on a regular basis for as little as three months, even with lapses, the behavior becomes assimilated into the self-concept. Thus, Kendzierski's (1990, 1997) sample may have included people with long-term patterns of cyclical adoption and resumption, and had already incorporated exercise into the self-concept.

In considering the current findings as they relate to the definition of Maintenance within the stages of change, it seems that continuing a behavior for six months without lapse is not necessary to develop an exerciser self-schema. Since self-schema was significantly related to stage of change, with Action and Maintenance clustering together after six months, it may be that the transition from action to maintenance should be partly defined by the transition into having an exerciser self-schema. This would help the search for operationally definable attributes for the Maintenance stage other than length of time in it. It may be that that the portion of the current definition of Maintenance, which states the behavior must be consistently present for at least six months, may is worth reconsidering. Future research needs to be done to further describe the transition of the concept of exercise into the self-schema, in terms of timing and related changes that take place.

Another concept that this study sought to investigate as a possible addition to the definition of Maintenance was locus of motivation. The literature has described the constructs as "intrinsic" and "extrinsic" motivation, and has provided a line of logic to the meaning of those constructs (Ryan, et al., 1997). Ryan, et al. (1997), classified items such as enjoyment of an activity, competence, and social interaction as intrinsically motivating, Items related to body image were classified as extrinsically motivating. Their results demonstrated a relationship between their intrinsic items and adherence to exercise, whereas body image-related items were related to dropout. Ingledew, et al. (1998) used similar definitions of intrinsic and extrinsic, and found that intrinsically-

motivating items were related to the Action and Maintenance stages of change, and extrinsically-motivating items were related to earlier stages.

One can argue that items such as social interaction and feeling good about one's body can be intrinsically or extrinsically motivating, depending on the frame of reference. As a result, this study attempted to create a scale that operationally define and assess intrinsic and extrinsic motivation, and compare those with ability to maintain exercise. Items included in this scale were based upon similar items found in the literature (Ryan, et al., 1997; Ingledew, et al., 1998). However, in consulting with a panel of experts trained in behavioral medicine who sorted items as "intrinsic" or "extrinsic" motivators, there was disagreement with operational definitions of concepts in the literature for intrinsic and extrinsic. In addition, a factor analysis of study participants' evaluations of motivational sources was unsuccessful in factors that could be considered intrinsic and extrinsic motivation. As a result, this study was unable to evaluate the proposed hypothesis due to problems with measurement. Further work needs to be done on clarifying the construct, or researchers should seek another construct to use for distinguishing motivation to exercise in relapsers and maintainers. One such construct may be related to immediate vs. delayed reward for engaging in the behavior.

The relationship between exercise self-efficacy and the processes of change was also investigated. According to the current line of research, self-efficacy is related to stage movement (Marcus et al., 1996) and stage of change (Cardinal, 1997; Cowan, 1997; Herrick, et al., 1997), which in turn has been related to processes of change (Bock, et al. 1997). Marcus, et al. (1996) found that the frequency of using behavioral processes of

change decreased in people who relapsed from active to sedentary patterns, and those who remained active did not change in the frequency of processes of change use. This indicated a relationship between behavioral processes of change and ability to maintain physical activity routines.

The current study attempted to demonstrate a relationship between self-efficacy and the processes of change. The method of analysis of the processes of change was an expansion of Marcus' (1996) method. In the previous study, the frequency of behavioral and cognitive processes was assessed. This frequency score is analogous to our "Investment" score, which quantifies how frequently subjects are using the processes of change. Higher scores appear to be actively involved in the change process by dedicating greater cognitive and behavioral resources to this endeavor. The present study also sought to expand the conceptualization and measurement of processes of change. In addition to investment or how frequently change processes are used, two other measures are proposed: Breadth of Change Repertoire and Predominance. Breadth or change looks at the resourcefulness of the person with respect to how many different cognitive or behavioral processes appear in the person's repertoire and are applied. Predominance addresses over-reliance or inflexibility in the application of change processes. Our results demonstrated that not all of these new scores were related to self-efficacy, but predominance and investment in behavioral processes, as well as predominance of cognitive processes were related to self-efficacy. Our hypothesis was that there would be a relationship between the behavioral processes and self-efficacy, and it was determined that it was in fact related to how heavily subjects relied on certain behavioral processes,

as well as how invested they were in those processes. However, it was demonstrated that the number of different behavioral processes was not related to amount of self-efficacy. By evaluating this relationship in a new way, more details about *how* subjects used these processes was available, rather than simply *what* processes they were using.

In considering the relationships between self-efficacy and stage movement (Marcus et al., 1996) as well as stage of change (Cardinal, 1997; Cowan, 1997; Herrick, et al., 1997), this study also predicted a relationship between self-efficacy and stage of change as well as successful change. Participants who maintained their exercise program for three months showed concomitantly higher self-efficacy at that time, with baseline self-efficacy held constant. However, there was no difference in self-efficacy at six months between the different stages of change groups, also with baseline self-efficacy held constant, but baseline self-efficacy was related to stage of change both at baseline and after six months.

This study was able to demonstrate a relationship between self-efficacy, in which baseline self-efficacy was related to stages of change, which is consistent with the body of literature (Cardinal, 1997; Cowan, 1997; Herrick, et al., 1997). Our three-month results are similar to Garcia and King's (1991) study, in which adherence was predictive of self-efficacy after one year, also while holding baseline self-efficacy constant. However, our six-month results were not consistent with their findings. The reason for this discrepancy may lie in the method of measurement. Our three-month method used stage movement, regardless of whether or not subjects were meeting criteria for "regular" exercise. If subjects in our study held constant or increased their routines, they were

considered successful, similar to Garcia and King (1991). At six-months, however, we assessed stages of change, which entails a more strict definition. If one were to slip below that definition they would be counted as being in a lower stage than at baseline, thus not counted as adhering. These results are evidence that placing a strict definition of "regular" exercise in order to be classified as being in Action or Maintenance may need to also be reconsidered. Since the present findings also demonstrate increases in self-efficacy are more strongly related to movement rather than placement in stage, this may be evidence that the behavior precedes self-efficacy.

Limitations

Attrition in this study limited the attempts to test all the hypotheses. Additional analyses were meant to evaluate any possible biases in the sample in terms of variables assessed in the beginning. Among the variables accounted for, there were no significant differences in baseline variables that would have created a bias. Of note was that subjects who did complete follow-up surveys most often reported they were continuing to exercise at some rate after three- and six- months. This may be telling because if very few subjects who completed follow-up indicated no exercise, it may be that subjects who did not complete follow-up surveys may not have wanted to admit they were not exercising. However, this hypothesis cannot be tested without their completed surveys.

This study's most significant weaknesses include difficulty with two scales used. First, the stage of change scale was problematic because it lacked more specific information on length of exercise, in that different perceptions of when someone "began"

to exercise can vary. A standard definition of a "slip" should have been included with specific instructions on when to consider exercise to be "starting over" rather than continuous with a "slip" of a week or two. An additional question addressing how long participants have been exercising, taking the definition of "slip" into account, should be included. Second, the item indicating the Preparation stage, stating "I exercise some, but not regularly" can have a wide variety of meaning. The concept of "not regularly" can range from once every couple of months to several times per week but just below threshold to meet criteria for Action. When following subjects in this stage over time, there is no way to determine progress, stability or deterioration of exercise routines. Due to the loose definition, there can also be large within group differences on the other concepts within the TTM.

Another scale that created a weakness for this study was the Motivation scale. It was intended to determine between-group differences in motivational reasons for exercise, but locus of motivation groupings could not be determined due to disagreement in literature and practice regarding what is "intrinsic" and "extrinsic" motivation. Factor analysis of the scale was not helpful in clarifying a distinction. Future studies should include a longer, theoretically derived and empirically validated scale.

An additional weakness of this study was the sample size. Difficulty was encountered in recruiting a large sample of subjects all in the Action stage of change at baseline. This produced a more heterogeneous group in terms of baseline stage of change than anticipated. At three- and six- month follow-up, they became even more heterogeneous after subjects either remained stable or moved into different stages. This,

in addition to the high rate of attrition produced small cell sizes for follow-up analyses. Research questions focusing on stages of change required larger sample sizes within each stage to produce results with enough statistical power for adequate generalizability. Thus, the reader is cautioned to be aware of this limitation when attempting to relate these results to the real world.

Research to Practice

The current findings can be useful in developing exercise adherence programs. It is apparent that continuation of exercise, whether continuous or not, seems to bolster self-efficacy and help develop an exerciser self-schema. Thus, promoting the concept of a "slip" vs. relapse would be useful as a means to encourage individuals to resume exercise as quickly as possible. This will in turn assist in development of exerciser self-schema.

Another use of these findings would involve individual motivations to exercise. The finding that individuals who were successful at continuing exercise are clearer on what motivates them leads to the suggestion of tailoring interventions to include what personally motivates each participant. This would involve messages for people to identify and regularly remind themselves about what motivates them to exercise. One can argue that motivation is also related to investment in change, which is related to self-efficacy. Since self-efficacy is predictive of success, this provides further rationale for focusing on personal motivations for exercise.

This study was unique in a number of ways. First, no other studies have been identified in the literature that incorporate an intervention based on the TTM and

continue for a six-month period. This gives an advantage because movement from Action to Maintenance can be isolated, whereas shorter studies can only evaluate forward movement among earlier stages. Those studies may only identify movement to Maintenance in the portion of subjects who had been in Action long enough for the transition to take place within the limited study period.

In addition, this study utilized two methods of measuring physical activity patterns. After three months, success status was used, which was a measure of relative movement from baseline stage. After six months, stage of change was used, which provided a description of activity at a particular point in time. Having two different methods of measurement allowed for greater understanding of the relationships between moderator variables and exercise.

Finally, this study attempted to isolate further content characteristics that separate Action from Maintenance, to better explain and predict who adheres to an exercise routine for at least six months. These characteristics include exerciser self-schema, which appears to be a promising addition to the TTM. A second concept that may be useful in the future to incorporate into the TTM is motivation, in terms of individuals having a clear understanding of their own motivations to exercise. This study has provided a new direction for research on the TTM to further identify and understand exercise adherence, and has reinforced the need for research on preventing attrition in health promotion research and practice.

Appendix A
Stage of Change

Please indicate which statement applies to you.

___

____ I currently do not exercise, and I do not intend to start exercising in the next six months.

____ I currently do not exercise, but I am thinking about starting to exercise in the next six months.

____ I currently exercise some, but not regularly.*

____ I currently exercise regularly*, but I have only begun doing so within the last six months.

____ I currently exercise regularly, and have done so for longer than six months.

Regular exercise =

A) Moderately intense activity (*i.e., brisk walking, climbing stairs, leisurely bicycling, doubles tennis, gardening, slow swimming, and household chores*), 5 or more times per week for a total of 30 minutes or more in increments of at least 10 minutes per episode.

OR

B) Vigorously intense activity (*i.e., aerobics, jogging, dancing, singles tennis, and fast swimming or bicycling),* 3 more days per week for a total of 30 minutes or more in increments of at least 10 minutes per episode.

Appendix B
Exercise Confidence Items

Please blacken the oval to indicate how confident you are that you could exercise in each of the following situations.

1=Not at all Confident; 2=Slightly Confident; 3=Moderately Confident; 4=Very Confident; 5=Extremely Confident

1. When I am tired	1	2	3	4	5
2. When I am in a bad mood	1	2	3	4	5
3. When I feel I don't have time	1	2	3	4	5
4. When I am on vacation	1	2	3	4	5
5. When it is raining or snowing	1	2	3	4	5

Appendix C

Exercise Processes of Change Items

The following experiences can affect the exercise habits of some people. Think of any similar experiences you may be currently having or have had ***during the past month***. Then rate how frequently the event occurs. Please blacken the oval that best describes your answer for each experience. How frequently does this occur?

1=never; 2=Seldom; 3=Occasionally; 4=Often; 5= repeatedly.

Instead of remaining inactive I engage in some physical activity.

I tell myself I am able to keep exercising if I want to.

I put things around my home to remind me of exercising.

I tell myself that if I try hard enough I can keep exercising.

I recall information people have personally given me on the benefits of exercise.

I make commitments to exercise.

I reward myself when I exercise

I think about information from articles and advertisements on how to make exercise a regular part of my life.

I keep things around my place of work that remind me to exercise.

I find society changing in ways that make it easier for the exerciser.

Warnings about health hazards of inactivity affect me emotionally.

Dramatic portrayals of the evils of inactivity affect me emotionally.

I react emotionally to warnings about inactive lifestyle.

I worry that inactivity can be harmful to my body.

I am considering the idea that regular exercise would make me a healthier, happier person to be around.

I have someone on whom I can depend when I am having problems with exercising.

I read articles about exercise in an attempt to learn more about it.

I try to set realistic goals for myself rather than setting myself up for failure by expecting too much.

I have a healthy friend that encourages me to exercise when I don't feel up to it.

When I exercise, I tell myself that I am being good to myself by taking care of my body.

Exercise is my special time to relax and recover from the days worries, not a task to get out of the way.

I am aware of more and more people encouraging me to exercise these days.

I do something nice for myself for making efforts to exercise more.

I have someone who points out my rationalizations for not exercising.

I have someone who provides feedback about my exercising.

I remove things that contribute to my inactivity.

I am the only one responsible for my health, and only I can decide whether or not I will exercise.

I look for information related to exercise.

I avoid spending long periods of time in environments that promote inactivity.

I feel I would be a better role model for others if I exercised regularly.

I think about the type of person I will be if I keep exercising.

I notice that more businesses are encouraging their employees to exercise by offering fitness courses and time off to work out.

I wonder how my inactivity affects those people who are close to me.

I realize that I might be able to influence others to be healthier if I would exercise more.

I get frustrated with myself when I don't exercise.

I am aware that many health clubs now provide free babysitting services to their members.

Some of my close friends might exercise more if I would.

I consider the fact that I would feel more confident in myself if I exercised regularly.

When I feel tired I make myself exercise anyway because I know I will feel better afterward.

When I'm feeling tense, I find exercise a great way to relieve my worries.

Appendix D

Exercise Self-Schema Questionnaire

Below are some questions regarding the way you view yourself. Please answer each question honestly. Indicate your answer by circling the appropriate number on the scale below the question.

1. **FRIENDLY**

1 2 3 4 5 6 7 8 9 10 11

Does not describe me **Describes me**

2. How important is **BEING FRIENDLY** to the image you have of yourself, regardless of whether or not the trait describes you?

1 2 3 4 5 6 7 8 9 10 11

Not at all important **Very important**

3. **SOMEONE WHO EXERCISES REGULARLY**

1 2 3 4 5 6 7 8 9 10 11

Does not describe me **Describes me**

4. How important is **BEING SOMEONE WHO EXERCISES REGULARLY** to the image you have of yourself, regardless of whether or not the trait describes you?

1 2 3 4 5 6 7 8 9 10 11

Not at all important **Very important**

5. **DISCIPLINED**

1 2 3 4 5 6 7 8 9 10 11

Does not describe me **Describes me**

6. How important is **BEING DISCIPLINED** to the image you have of yourself, regardless of whether or not the trait describes you?

1 2 3 4 5 6 7 8 9 10 11

Not at all important **Very important**

7. **SPONTANEOUS**

1 2 3 4 5 6 7 8 9 10 11

Does not describe me **Describes me**

8. How important is **BEING SPONTANEOUS** to the image you have of yourself, regardless of whether or not the trait describes you?

1 2 3 4 5 6 7 8 9 10 11

Not at all important **Very important**

9. **SOMEONE WHO KEEPS IN SHAPE**

1 2 3 4 5 6 7 8 9 10 11

Does not describe me **Describes me**

10. How important is **BEING SOMEONE WHO KEEPS IN SHAPE** to the image you have of yourself, regardless of whether or not the trait describes you?

1 2 3 4 5 6 7 8 9 10 11

Not at all important **Very important**

11. **PERSISTENT**

1 2 3 4 5 6 7 8 9 10 11

Does not describe me **Describes me**

12. How important is **BEING PERSISTENT** to the image you have of yourself, regardless of whether or not the trait describes you?

1 2 3 4 5 6 7 8 9 10 11

Not at all important **Very important**

13. **SOMEONE WHO CONSCIOUSLY SETS GOALS**

1 2 3 4 5 6 7 8 9 10 11

Does not describe me **Describes me**

14. How important is **BEING SOMEONE WHO CONSCIOUSLY SETS GOALS** to the image you have of yourself, regardless of whether or not the trait describes you?

1 2 3 4 5 6 7 8 9 10 11

Not at all important **Very important**

15. **PHYSICALLY ACTIVE**

1	2	3	4	5	6	7	8	9	10	11
Does not describe me										**Describes me**

16. How important is **BEING PHYSICALLY ACTIVE** to the image you have of yourself, regardless of whether or not the trait describes you?

1	2	3	4	5	6	7	8	9	10	11
Not at all important										**Very important**

17. **SOMEONE WHO CONSCIOUSLY SCHEDULES TIME**

1	2	3	4	5	6	7	8	9	10	11
Does not describe me										**Describes me**

18. How important is **BEING SOMEONE WHO CONSCIOUSLY SCHEDULES TIME** to the image you have of yourself, regardless of whether or not the trait describes you?

1	2	3	4	5	6	7	8	9	10	11
Not at all important										**Very important**

Appendix E

Locus of Motivation

Please rank in order of importance the following reasons for being motivated to engage in physical activity, with 1 being the strongest motivator, 2 the second strongest, and so on.

---

a. _____ Physical activity provides me with an opportunity for social interaction
b. _____ To feel stronger, improve my mood, and/or increase my energy
c. _____ To help control blood pressure, improve immune function and/or increase my "good" cholesterol"
d. _____ I enjoy physical activity
e. _____ By being physically fit, other people will find me more attractive
f. _____ Because I want to improve my body shape

Appendix F

BASIC INFORMATION

Please indicate the following*:

Age: _____

Gender: _____

Ethnicity _____

Are you: Faculty/Staff or Student (circle one)

If you are faculty/staff, please indicate your department, in order to receive your newsletters and follow-up surveys.

_____

Approximately how long have you been exercising? _____

***** This information is only to be used in group analyses for descriptive purposes, you will not be identified individually by providing any of this information, with the exception of your department which is only for delivery purposes.

Appendix G
Follow-Up Questionnaire

Thank you for participating in the "Beginner Exerciser" Study. We hope you found the newsletters informative and helpful. We would like to verify if you received the newsletters, and your opinion of them.

1) Did you receive the monthly newsletters?

Yes No Yes, but not all six

2) Did you read the newsletters?

Yes No Yes, but not all six

3) Did you find the newsletters informative or helpful?

Yes No Yes, but not all six

4) Please provide any comments you may have about the newsletters you received.

_____

_____

_____

_____

_____

_____

_____

_____

_____

Appendix H

Generic Newsletter/Month 1

WELCOME TO THE BEGINNER EXERCISER STUDY!

? ? The Surgeon General recommends regular exercise for maximum health benefits.

? ? Regular exercise is defined as:
- ? ? Light to moderate exercise
  - ? ? Examples are walking, brisk walking, gardening, house cleaning, climbing stairs, leisurely swimming, and leisurely bicycling.
- ? ? Five or more days per week
- ? ? At least 30 minutes total per day of exercise:
  - ? ? This can be one 30 minute episode, or can be broken into 3 or more 10 minute episodes.

OR

- ? ? Vigorous exercise
  - ? ? Examples are jogging, running, aerobics, fast cycling, fast swimming and dancing.
- ? ? Three or more days per week
- ? ? At least 30 minutes total per day of exercise.
  - ? ? This can be in one 30 minute bout, or can be broken into 3 or more 10 minute bouts.

? ? What type(s) of exercise are you doing?

_____

_____

? ? How often are you exercising? _____

? ? Is there another type you might try? _____

_____

Appendix I
Generic Newsletter/Month 2

EXERCISE CAN IMPROVE YOUR HEALTH AND PREVENT DISEASE!

? ? Regular exercise can do lots of things to improve the way your body works in the short-term. Here are some examples:
- ? ? Exercise can help control your blood pressure.
- ? ? Exercise can help control your cholesterol.
- ? ? Exercise can help increase your lung capacity.
- ? ? Exercise can help increase your muscular strength and flexibility.
- ? ? Exercise can improve your body composition, by reducing fat and increasing muscle mass.
- ? ? Exercise can help keep your blood sugar levels in control.

? ? How can this all make you feel?
- ? ? You can feel stronger and more confident.
- ? ? You can have less muscle tension and pain.
- ? ? Your mental functioning can improve.
- ? ? Your mood can improve.

? ? Physical inactivity is a risk factor for some chronic diseases. Regular exercise can help prevent them. Here are some examples:
- ? ? Your risk of heart disease can be reduced.
- ? ? Your risk of certain types of cancer can be reduced.
- ? ? Your risk of diabetes can be reduced.
- ? ? Your risk of falls and fractures can be reduced.

? ? What are some benefits you've noticed so far? _____
_____

? ? What additional benefits would you like to strive for? _____
_____

Appendix J

Generic Newsletter/Month 3

REDUCE YOUR RISK FOR EXERCISE DROPOUT!

? ? According to the American College of Sports Medicine, certain groups of people are at higher risk of exercise dropout than others. Here are some examples of factors that are related to increased risk:

- ? ? Smoking
- ? ? Inactive leisure time or occupation
- ? ? Being overweight
- ? ? Feeling depressed
- ? ? Having a blue-collar job
- ? ? Not having a convenient time/location to exercise
- ? ? Exercising alone
- ? ? Not having variety in exercise
- ? ? Not enjoying an exercise routine
- ? ? Lack of spouse support
- ? ? Job change/move
- ? ? Injury/Illness

? ? Are you at risk for dropout? _____

? ? What steps can you take to prevent yourself from dropping out?

_____
_____
_____
_____

Appendix K

Generic Newsletter/Month 4

SET YOURSELF GOALS FOR EXERCISE!

? ? Many people who are successful in maintaining an exercise routine set goals for themselves.

? ? Goals can be set in terms of length of time, days per week, or level of intensity.

- ? ? For example, you can start by exercising for 20 minutes per day, and set a goal for 40 minutes per day within a month.
- ? ? You can start by exercising three days per week, and shoot for five days per week by the end of the month.
- ? ? Or, you can work towards increasing your speed when you walk or cycle.
- ? ? You can set a goal for a certain amount of repetitions or a certain weight you can lift

? ? You can also set your goals in terms of physical fitness.

- ? ? For example, you can strive to reduce your resting heart rate or blood pressure, or decrease your amount of body fat.

? ? Always be sure to set your goals realistically, so they can be achieved!

? ? What would you like to achieve? _____

_____

When will you achieve your goal?_____

Appendix L

Generic Newsletter/Month 5

A SAFE EXERCISER
IS A SMART EXERCISER!

? ? According to the American College of Sports Medicine, there are three phases of a safe exercise session.

- ? ? The warm-up phase - It helps increase blood flow, stretch muscles, and increases metabolism in order to prepare the body for the next phase. Take 5-10 minutes to engage in lower-intensity aerobic and stretching exercises such as brisk walking to prepare for jogging, or slow walking to prepare for brisk walking. Without this there is an increased risk of muscle injuries or irregular heartbeats during the next phase.
- ? ? The endurance phase - This includes 20-60 minutes of continuous or intermittent (10 minute segments to accumulate throughout the day) aerobic activity. Engage in moderate intensity exercises (brisk walking, climbing stairs, casual bicycling) for at least 30 minutes in a day, or higher intensity activities (jogging, aerobics, fast cycling) for at least 20 minutes in a day for the same amount of benefit.
- ? ? The cool-down phase - It provides a gradual recovery and involves decreasing the intensity of your exercise, such as slower walking or jogging, and stretching exercises. This permits the heart rate and blood pressure to return to resting levels and reduces the chances of dizziness and prevents muscle soreness.

? ? Is your current routine safe? _____

? ? What do (can) you do to warm up before you exercise? _____
_____

? ? What do (can) you do to cool down after you exercise? _____
_____

Appendix M

Generic Newsletter/Month 6

KEEP TRACK OF YOUR EXERCISE ROUTINE!

? ? Many people who are successful at continuing an exercise routine keep close track of what they're doing. Just by seeing on paper what you're doing can motivate you to continue!

? ? There are a number of ways you can keep track of what you're doing:

- ? ? Record how many minutes per day you are active. You can even record on the same page the amount of time you're inactive, as a quick comparison for more motivation.
- ? ? Record how many different ways you were active and list them. You may be surprised how many opportunities you have to be active!
- ? ? Keep track of how many flights of stairs you climb and compare that to how much you use an elevator or escalator.

? ? Have you been keeping track of your physical activity levels?
_____

? ? What do (can) you do to record what you're doing? __
_____

? ? What can you compare your activity level to as a way to increase your motivation?
_____
_____

Appendix N

Stage-Matched Newsletter/Month 1

WELCOME TO THE BEGINNER
EXERCISER STUDY!

? ? The Surgeon General recommends regular exercise for maximum health benefits.

? ? By making regular exercise an important part of your lifestyle, your routine will be more easily maintained.

? ? For example, the use of healthy behaviors, such as exercise can be used to substitute for problem behaviors.

? ? For example, exercise can be used to cope with stress and fatigue.

? ? By exercising when you are worried, angry, sad, tense, or feel like you have low energy, you can make yourself feel better.

? ? Exercise is also a good substitute for some unhealthy things you may do when you're bored.

? ? Can you think of an example of when you exercised while you felt stressed, tired, or bored?_____
_____

? ? How did you feel afterward?_____
_____

? ? How can you plan to use this strategy in the future? _____
_____

Appendix O

Stage-Matched Newsletter/Month 2

FIND EXERCISE BUDDIES!

? ? People who exercise with a variety of people in a variety of settings are more likely to continue with their routine by having more than one person to get together with for exercise when they are tempted to be inactive.

- ? By having different buddies, you can commit to meet at a certain time and place to exercise on a regular schedule. The more people you commit to, the more consistent you'll remain.
- ? ? By having different buddies, you can have someone who encourages you to exercise when you don't feel like it.
- ? ? By having people you exercise with, you can have someone who provides you with feedback about what and how you are doing during exercise.
- ? ? By having different buddies, you can do exercises which need a partner, OR exercises you can do alone.
  - ? ? For example, you can play tennis, racquetball, basketball, frisbee, and more!
  - ? ? You can also walk, jog, swim, lift weights, or bicycle with someone.

? ? What if you don't have one buddy to exercise with every time?

- ? ? Join an exercise class or club that meets regularly.
- ? ? Find a variety of activities you like, then you will be more likely to find people who you like to exercise with.

? ? What are a few activities you can do with people?_____
_____

? ? Who can your exercise buddies be in those activities?_____
_____
_____

Appendix P

Stage-Matched Newsletter/Month 3

REWARD YOURSELF
FOR EXERCISING!

? ? Many people who are successful at maintaining an exercise routine reward themselves for being active.

? ? Reward yourself weekly for sticking to the routine. For example, take a night out, rent a movie, or phone a friend you haven't talked to in a while.

? ? Give yourself something bigger, such as a new pair of running shoes or sports equipment, a new outfit, or a weekend away when you meet your personal exercise goals, such as losing five pounds or sticking with it for a whole month.

? ? What are some simple things you find rewarding and can give yourself weekly?
_____

_____

_____

? ? What are some greater rewards you can give yourself for meeting your goals?
_____

_____

_____

Appendix Q

Stage-Matched Newsletter/Month 4

MAKE YOUR ENVIRONMENT
EXERCISE FRIENDLY!

? ? Very often people find that making small changes in their surroundings can help them continue to exercise when they are tempted to be inactive.

- ? ? Put things around your home or office that remind you to exercise:
  - ? ? You can put your athletic shoes by the door, or in your car.
  - ? ? Bring a gym bag to work with your exercise clothes and equipment.
  - ? ? Put a note on the refrigerator or on your mirror reminding you to exercise.
- ? ? Remove things in the environment that trigger inactivity.
  - ? ? You can put the T.V. remote control out of reach.

? ? Take notice of new things in your environment. You may find new and interesting opportunities to increase your activity!

- ? ? For example, is there a path near your home or workplace which you can bicycle or walk/jog on?
- ? ? Where are the stairways in your work place?
- ? ? What are the people around you doing for exercise?
- ? ? Are there any exercise classes available to join?

? ? What can you add to your environment to trigger you to exercise?

_____
_____

? ? What can you do to remove cues to remain inactive?_____
_____

? ? What is something new you've noticed that you can incorporate into your exercise routine?_____
_____

Appendix R

Stage-Matched Newsletter/Month 5

SAY POSITIVE THINGS TO YOURSELF
WHEN YOU EXERCISE!

? ? Many people who successfully maintain an exercise routine often say positive things to themselves when they exercise.

- ? ? For example, telling yourself "I am doing something good for myself" or "By doing this my energy will increase" will give you a better sense of well-being during exercise. This will make you feel good about what you're doing and will motivate you to exercise when you are tempted to be inactive.
- ? ? Remind yourself often about the reasons you increased your activity level when you exercise.

? ? People who consider physical activity as an important part of their self-image are more likely to remain active for the long-term.

- ? ? When you're exercising (and when you're not), imagine yourself strong and healthy, and think of yourself as a physically active person who enjoys being that way. The more you think about this, the more easily physical activity will become part of your self-image.

? ? Be aware that a slip in your routine is part of the process. Each time you are inactive instead of exercising, consider it a learning experience.

? ? What are the reasons for exercising you can remind yourself of when you are being physically active?_____
_____
_____

? ? How would you describe yourself looking, feeling, and acting as a physically active person?_____
_____

Appendix S

Stage-Matched Newsletter/Month 6

INCREASE YOUR CONFIDENCE ABOUT EXERCISE!

? ? Having self-confidence about your ability to exercise when you are tempted to be inactive is important for helping you maintain your routine.

? ? The most commonly reported situations that people report having low self-confidence about exercising are:

- ? ? When they feel a high level of stress
- ? ? When they are tired
- ? ? When the weather is bad
- ? ? When the seasons change
- ? ? When they have family obligations
- ? ? When they have social activities
- ? ? When they are very busy at work
- ? ? When they go on vacation

? ? It is important to be aware of what situations in which you feel most tempted to relapse to inactivity.

? ? When do you feel most tempted to be inactive? _____
_____
_____

? ? What can you do to be more confident that you will exercise in those situations?
_____
_____
_____

Appendix T

Informed Consent Form for UNT Health Science Center Subjects

UNIVERSITY OF NORTH TEXAS/UNIVERSITY OF NORTH TEXAS HEALTH SCIENCE CENTER
COMMITTEE FOR THE PROTECTION OF HUMAN SUBJECTS
RESEARCH CONSENT FORM

Subject Name:_____ Date: _____

Title of Study:__ Improving the Definition of Maintenance of Exercise Behavior Change: An Evaluation of Factors Associated with Successful Change_____

Principal Investigator: __Robert Kaman, Ph.D.

Co-Investigators: _ ,____ Susan E. Wilcox, and Joseph Doster, Ph.D._____

Before agreeing to participate in this research study, it is important that you read and understand the following explanation of the proposed procedures. It describes the procedures, benefits, risks, discomforts of the study. It also describes the alternative treatments that are available to you and your right to withdraw from the study at any time. It is important for you to understand that no guarantees or assurances can be made as to the results of the study.

PURPOSE OF THE STUDY AND HOW LONG IT WILL LAST:

This study is intended to investigate 1) what variables are associated with maintenance or discontinuation of regular exercise and 2) a comparison of the effectiveness of two forms of monthly newsletters related to exercise. The study period will be six months.

DESCRIPTION OF THE STUDY INCLUDING THE PROCEDURES TO BE USED:

As a volunteer, you will be asked to complete a small packet of surveys (should take no more than 10 minutes to complete) related to your exercise routine, as well as attitudes and behaviors related to exercise. If you meet criteria for enrollment in the study, you will be assigned to one of two groups. By indicating that you are participating in a regular exercise routine for less than six months, you are eligible for the study. If you indicate you are not exercising regularly, or have been exercising for more than six months, you will not be included in the study. Children are also ineligible because this study focuses on variables that are related to exercise in adults. Each of the groups will receive short monthly newsletters which can help you maintain your new exercise routine. Responses on surveys will be compared for the two groups throughout the study, and you will receive the newsletters for six months.

Newsletters will be delivered to your departmental mailbox, and will be folded with the printed side in, and
stapled. Either your box number or your name only will be written on the outside, and there will be no other information visible that can indicate you are a subject in a research study.

At the end of three months and again at the end six months, you will be asked to complete the surveys again. After six months, the surveys you receive will be the same as the original surveys, with the addition of one that asks about your opinion of the newsletters you received, and two that ask about emotional experiences, and the way you express them. It is estimated you will need up to 30 minutes to complete the follow-up packets. You will receive the packet in a large envelope, which also will include an addressed envelope to put your completed surveys in. Please put the completed surveys into the envelope, and return it through the intercampus mail.

All the data obtained from your survey responses will be included only in a group analysis, and you will in no way be identified individually in any of the results that are reported from this study. Data from this study will likely be submitted for publication in a professional journal. Your participation in this study is completely voluntary, and you have the right to withdraw from this study at any time with no penalty. Withdrawal from the study will not affect employment or academic standing.

If you would like more information about the benefits of exercise, a good resource is: U.S. Department of Health and Human Services (1996) Physical Activity and Health: A Report of the Surgeon General. Atlanta, Georgia: Centers for Disease Control and Prevention. The information in this manuscript is often used for programs focusing on increasing exercise, and can be considered a form of treatment which is alternate to the one in this study.

DESCRIPTION OF PROCEDURES/ELEMENTS THAT MAY RESULT IN DISCOMFORT OR INCONVENIENCE:

There is no anticipated discomfort to any elements of the study, but the survey packet may require up to 10 minutes of your time to complete.

DESCRIPTION OF THE PROCEDURES/ELEMENTS THAT ARE ASSOCIATED WITH FORESEEABLE RISKS:

There are no foreseeable risks associated with this study design. Although, since you report you are currently in a new exercise program, the following information is provided: With any lifestyle or recreational activity that is physical in nature, there is a very low level of risk to the individual of injury or other complications. For example, muskuloskeletal injuries can include muscle strains and tears, and even fractures. These can be prevented by gradually working up to a desired level of activity and avoiding excessive amounts of activity. Cardiac events, which are rare, can occur in sedentary people who suddenly begin to exercise vigorously, who smoke, or have previous heart conditions such as history of multiple heart attacks, blocked arteries, impaired left ventricular function, and serious heartbeat irregularities. In addition, individuals who show a disregard for appropriate warm-up and cool-down and consistently exceed prescribed training heart rate put themselves at risk. However, with regular physical activity following guidelines set by your physician, cardiac function can be improved and risk of further heart problems can be reduced.

It is STRONGLY advised that you consult your physician before continuing with your exercise routine if you have not already done so. It is important to always coordinate your

program with your family physician, who is best informed about your health care needs. This research project is not intended to prescribe or advise on an exercise program.

BENEFITS TO THE SUBJECTS OR OTHERS:

Subjects can benefit from this study by receiving valuable information related to exercise and as a result may improve or maintain their exercise routine, which has been consistently associated with reduction of risk for disease.

CONFIDENTIALITY OF RESEARCH RECORDS:

You will be assigned an identification number upon initial agreement to participate in the study. This identification number is in no way connected to your identity, and is simply assigned in the order that you sign up. Names and identification numbers will be kept on a master list, which will only be used by members of the IRB-approved research team, and will be kept in a locked drawer in a locked room. All surveys that are completed will have only the identification number, and no name listed. Please do not write your name on any surveys. No other identifying information will be on the surveys you will complete. Your records will be kept as confidential as possible under current local, state, and federal laws. However, representatives of federal regulatory agencies and the Institutional Review Board may examine your records and the study data. In case the final study data should be prepared for publication, your name will not appear in any published material.

UNIVERSITY OF NORTH TEXAS/UNIVERSITY OF NORTH TEXAS HEALTH SCIENCE CENTER

COMMITTEE FOR THE PROTECTION OF HUMAN SUBJECTS
RESEARCH CONSENT FORM

Subject Name: _____ Date: _____

Title of Study:__ _:__ Improving the Definition of Maintenance of Exercise Behavior Change: An Evaluation of Factors Associated with Successful Change

_____

Principal Investigator: _ _ Robert Kaman, Ph.D _____
Co-Investigators: ____ Susan E. Wilcox. and Joseph Doster, Ph.D _____

REVIEW FOR PROTECTION OF PARTICIPANTS:

This research study has been reviewed and approved by the UNT Committee for the Protection of Human Subjects (940) 565-3940 and (817) 735-5483.

RESEARCH SUBJECTS' RIGHTS: I have read or have had read to me all of the above.

_____ has explained the study to me and answered all of my questions. I have been told the risks or discomforts and possible benefits of the study. I have been told of other choices of treatment available to me.

I understand that I do not have to take part in this study, and my refusal to participate will involve no penalty or loss of rights to which I am entitled. I may withdraw at any time without penalty or loss of benefits to which I am entitled. The study personnel can stop my participation at any time if it appears to be harmful to me, if I fail to follow directions for participation in the study, if it is discovered that I do not meet the study requirements, or if the study is canceled.

In case there are problems or questions, I have been told I can call Dr. Robert Kaman at telephone number
(817) 735-2252 or Dr. Joseph Doster at telephone number (940) 565-2671. If you have questions about your rights as a participant in this study, you may contact Dr. Jerry McGill, Chairman Institutional Review Board at (817) 735-5483 or Sheila Bourns, Institutional Review Board at (940) 565-3940.

I understand my rights as a research subject, and I voluntarily consent to participate in this study. I understand what the study is about and how and why it is being done. I will receive a signed copy of this consent form.

_____ __ _____
Subject's Signature Date

_____ _____
Signature of Witness Date

For the Investigator or Designee:

I certify that I have reviewed the contents of this form with the person signing above, who, in my opinion, understood the explanation. I have explained the known benefits and risks of the research.

_____ _____

Principal Investigator's Signature Date

Appendix U

Informed Consent form for University of North Texas Subjects

UNIVERSITY OF NORTH TEXAS/UNIVERSITY OF NORTH TEXAS HEALTH SCIENCE CENTER
COMMITTEE FOR THE PROTECTION OF HUMAN SUBJECTS
RESEARCH CONSENT FORM

Subject Name:_____ Date: _____

Title of Study:__ Improving the Definition of Maintenance of Exercise Behavior Change: An Evaluation of Factors Associated with Successful Change_____

Principal Investigator: __Robert Kaman, Ph.D.

Co-Investigators: _ ._____Susan E. Wilcox, and Joseph Doster, Ph.D

Before agreeing to participate in this research study, it is important that you read and understand the following explanation of the proposed procedures. It describes the procedures, benefits, risks, discomforts of the study. It also describes the alternative treatments that are available to you and your right to withdraw from the study at any time. It is important for you to understand that no guarantees or assurances can be made as to the results of the study.

PURPOSE OF THE STUDY AND HOW LONG IT WILL LAST:

This study is intended to investigate 1) what variables are associated with maintenance or discontinuation of regular exercise and 2) a comparison of the effectiveness of two forms of monthly newsletters related to exercise. The study period will be six months.

DESCRIPTION OF THE STUDY INCLUDING THE PROCEDURES TO BE USED:

As a volunteer, you will be asked to complete a small packet of surveys (should take no more than 10 minutes to complete) related to your exercise routine, as well as attitudes and behaviors related to exercise. If you meet criteria for enrollment in the study, you will be assigned to one of two groups. By indicating that you are participating in a regular exercise routine for less than six months, you are eligible for the study. If you indicate you are not exercising regularly, or have been exercising for more than six months, you will not be included in the study. Children are also ineligible because this study focuses on variables that are related to exercise in adults. Each of the groups will receive short monthly newsletters which can help you maintain your new exercise routine. Responses on surveys will be compared for the two groups throughout the study, and you will receive the newsletters for six months.

Newsletters will be delivered to your departmental mailbox, and will be folded with the printed side in, and stapled. Either your box number or your name and department will be written on the outside, and there will be no other information visible that can indicate you are a subject in a research study. These newsletters are intended for you to keep as a source of information and/or motivation. *Please do not send them back to the researchers*.

At the end of three months and again at the end six months, you will be asked to complete the surveys again. You will receive the packet in a large envelope which also will include an addressed envelope to put your completed surveys in. Please put the completed surveys into the envelope, and return it through campus mail.

Each time you complete the surveys, you will be entered into a drawing that will be held at the end of the study. After the drawing, the winner will be contacted personally and will receive a gift certificate to a sporting goods store.

All the data obtained from your survey responses will be included only in a group analysis, and you will in no way be identified individually in any of the results that are reported from this study. Data from this study will likely be submitted for publication in a professional journal. Your participation in this study is completely voluntary, and you have the right to withdraw from this study at any time with no penalty. Withdrawal from the study will not affect employment or academic standing.

If you would like more information about the benefits of exercise, a good resource is: U.S. Department of Health and Human Services (1996) Physical Activity and Health: A Report of the Surgeon General. Atlanta, Georgia: Centers for Disease Control and Prevention. The information in this manuscript is often used for programs focusing on increasing exercise, and can be considered a form of treatment which is alternate to the one in this study.

DESCRIPTION OF PROCEDURES/ELEMENTS THAT MAY RESULT IN DISCOMFORT OR INCONVENIENCE:

There is no anticipated discomfort to any elements of the study, but the survey packet may require up to 10 minutes of your time to complete.

DESCRIPTION OF THE PROCEDURES/ELEMENTS THAT ARE ASSOCIATED WITH FORESEEABLE RISKS:

There are no foreseeable risks associated with this study design. Although, since you report you are currently in a new exercise program, the following information is provided: With any lifestyle or recreational activity
that is physical in nature, there is a very low level of risk to the individual of injury or other complications. For example, muskuloskeletal injuries can include muscle strains and tears, and even fractures. These can be prevented by gradually working up to a desired level of activity and avoiding excessive amounts of activity. Cardiac events, which are rare, can occur in sedentary people who suddenly begin to exercise vigorously, who smoke, or have previous heart conditions such as history of multiple heart attacks, blocked arteries, impaired left ventricular function, and serious heartbeat irregularities. In addition, individuals who show a disregard for appropriate warm-up and cool-down and consistently exceed prescribed training heart rate put themselves at risk. However, with regular physical activity following guidelines set by your physician, cardiac function can be improved and risk of further heart problems can be reduced.

It is STRONGLY advised that you consult your physician before continuing with your exercise routine if
you have not already done so. It is important to always coordinate your program with your family physician, who is best informed about your health care needs. This research project is not intended to prescribe or advise on an exercise program.

BENEFITS TO THE SUBJECTS OR OTHERS:

Subjects can benefit from this study by receiving valuable information related to exercise and as a result may improve or maintain their exercise routine, which has been consistently associated with reduction of risk for disease.

CONFIDENTIALITY OF RESEARCH RECORDS:

You will be assigned an identification number upon initial agreement to participate in the study. This identification number is in no way connected to your identity, and is simply assigned in the order that you sign up. Names and identification numbers will be kept on a master list, which will only be used by members of the IRB-approved research team, and will be kept in a locked drawer in a locked room. All surveys that are completed will have only the identification number, and no name listed. Please do not write your name on any surveys. No other identifying information will be on the surveys you will complete. Your records will be kept as confidential as possible under current local, state, and federal laws. However, representatives of federal regulatory agencies and the Institutional Review Board may examine your records and the study data. In case the final study data should be prepared for publication, your name will not appear in any published material.

UNIVERSITY OF NORTH TEXAS/UNIVERSITY OF NORTH TEXAS HEALTH SCIENCE CENTER

COMMITTEE FOR THE PROTECTION OF HUMAN SUBJECTS
RESEARCH CONSENT FORM

Subject Name: _____ Date: _____

Title of Study:__ _:__Improving the Definition of Maintenance of Exercise Behavior Change: An Evaluation of Factors Associated with Successful Change
Principal Investigator: _ _ Robert Kaman, Ph.D _____
Co-Investigators: ____ Susan E. Wilcox. and Joseph Doster, Ph.D

REVIEW FOR PROTECTION OF PARTICIPANTS:

This research study has been reviewed and approved by the UNT Committee for the Protection of Human Subjects (940) 565-3940 and (817) 735-5483.

RESEARCH SUBJECTS' RIGHTS: I have read or have had read to me all of the above.

_____ has explained the study to me and answered all of my questions. I have been told the risks or discomforts and possible benefits of the study. I have been told of other choices of treatment available to me.

I understand that I do not have to take part in this study, and my refusal to participate will involve no penalty or loss of rights to which I am entitled. I may withdraw at any time without penalty or loss of benefits to which I am entitled. The study personnel can stop my participation at any time if it appears to be harmful to me, if I fail to follow directions for participation in the study, if it is discovered that I do not meet the study requirements, or if the study is canceled.

In case there are problems or questions, I have been told I can call Dr. Robert Kaman at telephone number
(817) 735-2252 or Dr. Joseph Doster at telephone number (940) 565-2671. If you have questions about your rights as a participant in this study, you may contact Dr. Jerry McGill, Chairman Institutional Review Board at (817) 735-5483 or Sheila Bourns, Institutional Review Board at (940) 565-3940.

I understand my rights as a research subject, and I voluntarily consent to participate in this study. I understand what the study is about and how and why it is being done. I will receive a signed copy of this consent form.

_____ __ _____
Subject's Signature Date

_____ _____
Signature of Witness Date

For the Investigator or Designee:

I certify that I have reviewed the contents of this form with the person signing above, who, in my opinion, understood the explanation. I have explained the known benefits and risks of the research.

_____ _____

Principal Investigator's Signature Date

Appendix V

Informed Consent form for Health Club Member Subjects

UNIVERSITY OF NORTH TEXAS/UNIVERSITY OF NORTH TEXAS HEALTH SCIENCE CENTER
COMMITTEE FOR THE PROTECTION OF HUMAN SUBJECTS
RESEARCH CONSENT FORM

Subject Name:_____ Date: _____

Title of Study:__ Improving the Definition of Maintenance of Exercise Behavior Change: An Evaluation of Factors Associated with Successful Change_____

Principal Investigator: _ Robert Kaman, Ph.D.

Co-Investigators: _ . ____ Susan E. Wilcox, and Joseph Doster, Ph.D._____

Before agreeing to participate in this research study, it is important that you read and understand the following explanation of the proposed procedures. It describes the procedures, benefits, risks, discomforts of the study. It also describes the alternative treatments that are available to you and your right to withdraw from the study at any time. It is important for you to understand that no guarantees or assurances can be made as to the results of the study.

PURPOSE OF THE STUDY AND HOW LONG IT WILL LAST:

This study is intended to investigate 1) what variables are associated with maintenance or discontinuation of regular exercise and 2) a comparison of the effectiveness of two forms of monthly newsletters related to exercise. The study period will be six months.

DESCRIPTION OF THE STUDY INCLUDING THE PROCEDURES TO BE USED:

As a volunteer, you will be asked to complete a small packet of surveys (should take no more than 10 minutes to complete) related to your exercise routine, as well as attitudes and behaviors related to exercise. If you meet criteria for enrollment in the study, you will be assigned to one of two groups. By indicating that you are participating in a regular exercise routine for less than six months, you are eligible for the study. If you indicate you are not exercising regularly, or have been exercising for more than six months, you will not be included in the study. Children are also ineligible because this study focuses on variables that are related to exercise in adults. Each of the groups will receive short monthly newsletters which can help you maintain your new exercise routine. Responses on surveys will be compared for the two groups throughout the study, and you will receive the newsletters for six months.

Newsletters will be delivered to your home address, and there will be no other information visible that can indicate you are a subject in a research study. These newsletters are intended for you to keep as a source of information and/or motivation. *Please do not send them back to the researchers*.

At the end of three months and again at the end six months, you will be asked to complete the surveys again. You will receive the packet in a large envelope which also will include an addressed, stamped envelope to put your completed surveys in. Please put the completed surveys into the envelope, and return it through the mail.

Each time you complete the surveys, you will be entered into a drawing that will be held at the end of the study. After the drawing, the winner will be contacted personally and will receive a gift certificate to a sporting goods store.

All the data obtained from your survey responses will be included only in a group analysis, and you will in no way be identified individually in any of the results that are reported from this study. Data from this study will likely be submitted for publication in a professional journal. Your participation in this study is completely voluntary, and you have the right to withdraw from this study at any time with no penalty. Withdrawal from the study will not affect employment or academic standing.

If you would like more information about the benefits of exercise, a good resource is: U.S. Department of Health and Human Services (1996) Physical Activity and Health: A Report of the Surgeon General. Atlanta, Georgia : Centers for Disease Control and Prevention. The information in this manuscript is often used for programs focusing on increasing exercise, and can be considered a form of treatment which is alternate to the one in this study.

DESCRIPTION OF PROCEDURES/ELEMENTS THAT MAY RESULT IN DISCOMFORT OR INCONVENIENCE:

There is no anticipated discomfort to any elements of the study, but the survey packet may require up to 10 minutes of your time to complete.

DESCRIPTION OF THE PROCEDURES/ELEMENTS THAT ARE ASSOCIATED WITH FORESEEABLE RISKS:

There are no foreseeable risks associated with this study design. Although, since you report you are currently in a new exercise program, the following information is provided: With any lifestyle or recreational activity that is physical in nature, there is a very low level of risk to the individual of injury or other complications. For example, muskuloskeletal injuries can include muscle strains and tears, and even fractures. These can be prevented by gradually working up to a desired level of activity and avoiding excessive amounts of activity. Cardiac events, which are rare, can occur in sedentary people who suddenly begin to exercise vigorously, who smoke, or have previous heart conditions such as history of multiple heart attacks, blocked arteries, impaired left ventricular function, and serious heartbeat irregularities. In addition, individuals who show a disregard for appropriate warm-up and cool-down and consistently exceed prescribed training heart rate put themselves at risk. However, with regular physical activity following guidelines set by your physician, cardiac function can be improved and risk of further heart problems can be reduced.

It is STRONGLY advised that you consult your physician before continuing with your exercise routine if you have not already done so. It is important to always coordinate your

program with your family physician, who is best informed about your health care needs. This research project is not intended to prescribe or advise on an exercise program.

BENEFITS TO THE SUBJECTS OR OTHERS:

Subjects can benefit from this study by receiving valuable information related to exercise and as a result may improve or maintain their exercise routine, which has been consistently associated with reduction of risk for disease.

CONFIDENTIALITY OF RESEARCH RECORDS:

You will be assigned an identification number upon initial agreement to participate in the study. This identification number is in no way connected to your identity, and is simply assigned in the order that you sign up. Names and identification numbers will be kept on a master list, which will only be used by members of the IRB-approved research team, and will be kept in a locked drawer in a locked room. All surveys that are completed will have only the identification number, and no name listed. Please do not write your name on any surveys. No other identifying information will be on the surveys you will complete. Your records will be kept as confidential as possible under current local, state, and federal laws. However, representatives of federal regulatory agencies and the Institutional Review Board may examine your records and the study data. In case the final study data should be prepared for publication, your name will not appear in any published material.

UNIVERSITY OF NORTH TEXAS/UNIVERSITY OF NORTH TEXAS HEALTH SCIENCE CENTER
COMMITTEE FOR THE PROTECTION OF HUMAN SUBJECTS
RESEARCH CONSENT FORM

Subject Name: _____ Date: _____

Title of Study:__ _:__Improving the Definition of Maintenance of Exercise Behavior Change: An Evaluation of Factors Associated with Successful Change _____

Principal Investigator: _ _ Robert Kaman, Ph.D _____

Co-Investigators: ____Susan E. Wilcox. and Joseph Doster, Ph.D _____

REVIEW FOR PROTECTION OF PARTICIPANTS:

This research study has been reviewed and approved by the UNT Committee for the Protection of Human Subjects (940) 565-3940 and (817) 735-5483.

RESEARCH SUBJECTS' RIGHTS: I have read or have had read to me all of the above.

_____ has explained the study to me and answered all of my questions. I have been told the risks or discomforts and possible benefits of the study. I have been told of other choices of treatment available to me.

I understand that I do not have to take part in this study, and my refusal to participate will involve no penalty or loss of rights to which I am entitled. I may withdraw at any time without penalty or loss of benefits to which I am entitled. The study personnel can stop my participation at any time if it appears to be harmful to me, if I fail to follow directions for participation in the study, if it is discovered that I do not meet the study requirements, or if the study is canceled.

In case there are problems or questions, I have been told I can call Dr. Robert Kaman at telephone number (817) 735-2252 or Dr. Joseph Doster at telephone number (940) 565-2671. If you have questions about your rights as a participant in this study, you may contact Dr. Jerry McGill, Chairman Institutional Review Board at (817) 735-5483 or Sheila Bourns, Institutional Review Board at (940) 565-3940.

I understand my rights as a research subject, and I voluntarily consent to participate in this study. I understand what the study is about and how and why it is being done. I will receive a signed copy of this consent form.

_____ _____
Subject's Signature Date

_____ _____
Signature of Witness Date

For the Investigator or Designee:

I certify that I have reviewed the contents of this form with the person signing above, who, in my opinion, understood the explanation. I have explained the known benefits and risks of the research.

_____ _____

Principal Investigator's Signature Date

Appendix W

Informed Consent Form for Methodist Medical Center Subjects

UNIVERSITY OF NORTH TEXAS/UNIVERSITY OF NORTH TEXAS HEALTH SCIENCE CENTER
COMMITTEE FOR THE PROTECTION OF HUMAN SUBJECTS
RESEARCH CONSENT FORM

Subject Name:_____ Date: _____

Title of Study: Improving the Definition of Maintenance of Exercise Behavior Change: An Evaluation of Factors Associated with Successful Change

Principal Investigator: Susan E. Wilcox, M.S., M.P.H. , Ph.D. candidate
.

Co-Investigators: . Les Rodriguez, R.N., M.P.H. candidate, and Joseph Doster Ph.D., committee chair

Before agreeing to participate in this research study, it is important that you read and understand the following explanation of the proposed procedures. It describes the procedures, benefits, risks, discomforts of the study. It also describes the alternative treatments that are available to you and your right to withdraw from the study at any time. It is important for you to understand that no guarantees or assurances can be made as to the results of the study.

PURPOSE OF THE STUDY AND HOW LONG IT WILL LAST:

This study is intended to investigate 1) what variables are associated with maintenance or discontinuation of regular exercise and 2) a comparison of the effectiveness of two forms of monthly newsletters related to exercise. The study period will be six months.

DESCRIPTION OF THE STUDY INCLUDING THE PROCEDURES TO BE USED:

As a volunteer, you will be asked to complete a small packet of surveys (should take no more than 10 minutes to complete) related to your exercise routine, as well as attitudes and behaviors related to exercise. If you meet criteria for enrollment in the study, you will be assigned to one of two groups. By indicating that you are participating in a regular exercise routine for less than six months, you are eligible for the study. If you indicate you are not exercising regularly, or have been exercising for more than six months, you will not be included in the study. Children are also ineligible because this study focuses on variables that are related to exercise in adults. Each of the groups will receive short monthly newsletters which can help you maintain your new exercise routine. Responses on surveys will be compared for the two groups throughout the study, and you will receive the newsletters for six months.

Newsletters will be delivered to your departmental address, and there will be no other information visible that can indicate you are a subject in a research study. These newsletters are intended for you to keep as a source of information and/or motivation. *Please do not send them back to the researchers.*

At the end of three months and again at the end six months, you will be asked to complete the surveys again. After six months, the surveys you receive will be the same as the original surveys, with

the addition of one that asks about your opinion of the newsletters you received, and two that ask about emotional experiences, and the way you express them. It is estimated you will need up to 30 minutes to complete the follow-up packets. You will receive the packet in a large envelope, which also will include an addressed envelope to put your completed surveys in. Please put the completed surveys into the envelope, and return it through the interhospital mail.

All the data obtained from your survey responses will be included only in a group analysis, and you will in no way be identified individually in any of the results that are reported from this study. Data from this study will likely be submitted for publication in a professional journal. Your participation in this study is completely voluntary, and you have the right to withdraw from this study at any time with no penalty. Withdrawal from the study will not affect employment standing.

If you would like more information about the benefits of exercise, a good resource is: U.S. Department of Health and Human Services (1996) Physical Activity and Health: A Report of the Surgeon General. Atlanta, Georgia: Centers for Disease Control and Prevention. The information in this manuscript is often used for programs focusing on increasing exercise, and can be considered a form of treatment which is alternate to the one in this study.

DESCRIPTION OF PROCEDURES/ELEMENTS THAT MAY RESULT IN DISCOMFORT OR INCONVENIENCE:

There is no anticipated discomfort to any elements of the study, but the survey packet may require 10 to 30 minutes of your time to complete.

DESCRIPTION OF THE PROCEDURES/ELEMENTS THAT ARE ASSOCIATED WITH FORESEEABLE RISKS:

There are no foreseeable risks associated with this study design. Although, since you report you are currently in a new exercise program, the following information is provided: With any lifestyle or recreational activity that is physical in nature, there is a very low level of risk to the individual of injury or other complications. For example, muskuloskeletal injuries can include muscle strains and tears, and even fractures. These can be prevented by gradually working up to a desired level of activity and avoiding excessive amounts of activity. Cardiac events, which are rare, can occur in sedentary people who suddenly begin to exercise vigorously, who smoke, or have previous heart conditions such as history of multiple heart attacks, blocked arteries, impaired left ventricular function, and serious heartbeat irregularities. In addition, individuals who show a disregard for appropriate warm-up and cool-down and consistently exceed prescribed training heart rate put themselves at risk. However, with regular physical activity following guidelines set by your physician, cardiac function can be improved and risk of further heart problems can be reduced.

It is STRONGLY advised that you consult your physician before continuing with your exercise routine if you have not already done so. It is important to always coordinate your program with your family physician, who is best informed about your health care needs. This research project is not intended to prescribe or advise on an exercise program.

BENEFITS TO THE SUBJECTS OR OTHERS:

Subjects can benefit from this study by receiving valuable information related to exercise and as a result may improve or maintain their exercise routine, which has been consistently associated with reduction of risk for disease.

CONFIDENTIALITY OF RESEARCH RECORDS:

You will be assigned an identification number upon initial agreement to participate in the study. This identification number is in no way connected to your identity, and is simply assigned in the order that you sign up. Names and identification numbers will be kept on a master list, which will only be used by members of the IRB-approved research team, and will be kept in a locked drawer in a locked room. All surveys that are completed will have only the identification number, and no name listed. Please do not write your name on any surveys. No other identifying information will be on the surveys you will complete. Your records will be kept as confidential as possible under current local, state, and federal laws. However, representatives of federal regulatory agencies and the Institutional Review Board may examine your records and the study data. In case the final study data should be prepared for publication, your name will not appear in any published material.

UNIVERSITY OF NORTH TEXAS/UNIVERSITY OF NORTH TEXAS HEALTH SCIENCE CENTER

COMMITTEE FOR THE PROTECTION OF HUMAN SUBJECTS
RESEARCH CONSENT FORM

Subject Name: _____ Date: _____

Title of Study:__ _:__ Improving the Definition of Maintenance of Exercise Behavior Change: An Evaluation of Factors Associated with Successful Change

_____

Principal Investigator: ___ Susan E. Wilcox, M.S., M.P.H., Ph.D. candidate
Co-Investigators: ____ Les Rodriguez, R.N., M.P.H. candidate, and Joseph Doster, Ph.D, committee chair

REVIEW FOR PROTECTION OF PARTICIPANTS:

This research study has been reviewed and approved by the UNT Committee for the Protection of Human Subjects (940) 565-3940 and (817) 735-5483. It has also been reviewed and approved by the Methodist Medical Center Institutional Review Board.

RESEARCH SUBJECTS' RIGHTS: I have read or have had read to me all of the above.

_Les Rodriguez_____ has explained the study to me and answered all of my questions. I have been told the risks or discomforts and possible benefits of the study. I have been told of other choices of treatment available to me.

I understand that I do not have to take part in this study, and my refusal to participate will involve no penalty or loss of rights to which I am entitled. I may withdraw at any time without penalty or loss of benefits to which I am entitled. The study personnel can stop my participation at any time if it appears to be harmful to me, if I fail to follow directions for participation in the study, if it is discovered that I do not meet the study requirements, or if the study is canceled.

In case there are problems or questions, I have been told I can contact Les Rodriguez at extension 71699, or call the principal investigator, Susan Wilcox at (940) 484-7961. I can also call the research chairman, Dr. Joseph Doster at telephone number (940) 565-2671. If you have questions about your rights as a participant in this study, you may contact the University of North Texas Institutional Review Board at (940) 565-3940 or the Methodist Hospital Institutional Review Board at (214) 947-3500.

I understand my rights as a research subject, and I voluntarily consent to participate in this study. I understand what the study is about and how and why it is being done. I will receive a signed copy of this consent form.

_____ __ _____
Subject's Signature Date

_____ _____
Signature of Witness Date

For the Investigator or Designee:

I certify that I have reviewed the contents of this form with the person signing above, who, in my opinion, understood the explanation. I have explained the known benefits and risks of the research.

_____ _____

Principal Investigator's Signature Date

Appendix X

Advertisements for Subject Recruitment at UNT Health Science Center Health Fair

ATTENTION BEGINNER EXERCISERS!

- ARE YOU INTERESTED IN VOLUNTEERING FOR A STUDY WHICH WILL PROVIDE YOU WITH INFORMATION THAT CAN HELP YOU MAINTAIN YOUR EXERCISE ROUTINE?

- SIGN UP AND RECEIVE A LOW-FAT TREAT!

- RECEIVE A MONTHLY NEWSLETTER THAT CAN HELP YOU LEARN WAYS TO CONTINUE EXERCISING!

- VOLUNTEERS WILL TAKE ABOUT 5-10 MINUTES TO COMPLETE SURVEYS ABOUT ATTITUDES AND BEHAVIORS RELATED TO EXERCISE.

- SURVEYS WILL BE COMPLETED AGAIN AFTER THREE AND SIX MONTHS, AND WITH EACH COMPLETED PACKET YOU WILL RECEIVE A RAFFLE TICKET FOR A DRAWING FOR A GIFT CERTIFICATE TO A SPORTING GOODS STORE.

SIGN UP ON MAY 17TH AT THE HEALTH FAIR, ON THE MEZZANINE LEVEL OF THE ATRIUM OR AT KIVA ON MAY 18TH FROM 1:00 TO 5:00, OR THE ATRIUM ON MAY 19TH FROM 9:00 - 12:00.

Appendix Y

Advertisements for Subject Recruitment at UNT Health Science Center

VOLUNTEERS NEEDED

For Dissertation Research

Did you begin to exercise regularly within the last six months?

Or are you exercising more often than you were before?

Many people who answer "yes" to these questions experience difficulty with maintaining this routine for the long-term and need help with continuing.

If you answered "yes" to either of these questions, you might be eligible for a study that will provide you with six monthly newsletters with information and tips that may help you maintain your routine.

What is involved?

> Completion of a packet of surveys on attitudes and behaviors related to physical activity, which takes about 10 minutes to complete.
>
> Receive an informative monthly newsletter in your on-campus mailbox for six months.
>
> Complete the survey at the beginning of the study, then again after three and six months.

If you think you fit this criterion, please contact sew0010@unt.edu or call extension 0460 to schedule a time to sign up. Your help would be greatly appreciated!

Appendix Z

Advertisements for Subject Recruitment at UNT Health Science Center

MARCH INTO MAY PARTICIPANTS

?? Were you sedentary before you joined March into May?

?? Did participating in March into May help you begin to exercise regularly?

?? If so, a study on beginner exercisers needs your help!

?? Volunteers are needed for a study that involves completing a packet of surveys about attitudes and behaviors related to exercise, which takes about 10 minutes to complete.

?? Volunteers will then receive a monthly newsletter for six months with valuable information about exercise that can be helpful in continuing an exercise routine.

?? The surveys would be completed again in September and then in December.

?? Each time surveys are completed volunteers will receive a raffle entry for a drawing at the end of the study. The winner will receive a gift certificate to a sporting goods store.

?? If interested, sign up at the Activity Center on Monday, May 22 and Wednesday May 24 from 3:30 to 7 pm, or Wednesday May 31 from 11 am to 7pm. You can also send an e-mail to sew0010@unt.edu for information about signing up if the Activity Center times are inconvenient for you.

?? ***Non-March into May participants are more than welcome to sign up if they have begun to exercise regularly within the past six months***!

*** Regular exercise means you exercise for a total of at least 30 minutes in a day, at least 3-5 days per week.**

Appendix AA

Advertisements for Subject Recruitment at University of North Texas

VOLUNTEERS NEEDED

For Dissertation Research

Did you begin to exercise regularly within the last six months?

Or are you exercising more often than you were before?

Many people who answer "yes" to these questions experience difficulty with maintaining this routine for the long-term and need help with continuing.

If you answered "yes" to either of these questions, you might be eligible for a study that will provide you with six monthly newsletters with information and tips that may help you maintain your routine.

What is involved?

> Completion of a packet of surveys on attitudes and behaviors related to physical activity, which takes about 10 minutes to complete.
>
> Receive an informative monthly newsletter in your on-campus mailbox for six months.
>
> Complete the survey at the beginning of the study, then again after three and six months.

If you think you fit this criterion, please contact sew0010@unt.edu to schedule a time to sign up. Your help would be greatly appreciated!

Appendix AB

Advertisements for Subject Recruitment at Health Club

VOLUNTEERS NEEDED

For Dissertation Research at UNT

Did you begin to exercise regularly within the last six months?

Or are you exercising more regularly than you were before?

Many people who answer "yes" to these questions experience difficulty with maintaining this routine for the long-term and need help with continuing.

If you answered "yes" to either of these questions, you might be eligible for a study that will provide you with six monthly newsletters with information and tips that may help you maintain your routine.

What is involved?

Completion of an initial packet of surveys on attitudes and behaviors related to physical activity, which takes about 10 minutes to complete.

Receive an informative monthly newsletter in your departmental mailbox for six months.

Complete the same surveys after three months. After six months, complete the same surveys, plus two that ask about the experience and expression of emotions, which takes about 30 minutes.

If you think you fit these criteria, please sign up with your aerobics instructor or at the front desk to schedule a time to get started. Your help would be greatly appreciated!

Appendix AC

Advertisements for Subject Recruitment at Methodist Medical Center

ATTENTION STAFF:

VOLUNTEERS NEEDED

For Dissertation Research at UNT

Did you begin to exercise regularly within the last six months?

Or are you exercising more often than you were before?

Many people who answer "yes" to these questions experience difficulty with maintaining this routine for the long-term and need help with continuing.

If you answered "yes" to either of these questions, you might be eligible for a study that will provide you with six monthly newsletters with information and tips that may help you maintain your routine.

What is involved?

> Completion of a packet of surveys on attitudes and behaviors related to physical activity, which takes about 10 minutes to complete.
>
> Receive an informative monthly newsletter in your departmental mailbox for six months.
>
> Complete the survey at the beginning of the study, then again after three and six months complete the same ones, plus some additional ones. Follow-up surveys should take approximately 30 minutes.

If you think you fit this criterion, please contact Les Rodriguez, RN, at extension 71699 or e-mail lesrodriguez@mhd.com to schedule a time to sign up. Your help would be greatly appreciated!

Appendix AD

Subjects' Comments about Newsletters

Stage-Matched Group:

- I enjoyed them, but I'm not sure how much they influenced me.
- I have gone through a period of non-exercise and my friends couldn't get me to go. A newsletter wasn't going to help either. With the weather changing it may help me to start again.
- They made me feel motivated and excited for the first day or two after I received them.
- They were interesting in their relation to maintaining diet and exercise. However, I would have enjoyed more pointed information on specific exercises, exercising trends, new techniques to improve fitness training and more information about setting diet and fitness goals to maximize your workouts.
- They made you look at points of focus for exercising (motivations) and help you realize your strengths and weaknesses.
- The newsletter format - questions instead of information was very helpful - motivated me more.
- Maybe include a challenge (for example, beginning newsletter might challenge the reader to contact 1 or 2 persons (or more) to be "exercise buddies" for a certain period of time and set certain days to get together for a specific exercise OR sport.)
- The newsletters helped a little, but I found that my own mindset mainly determined whether or not I exercised. For instance, if I didn't feel like exercising nothing the newsletters said could change my mind. But when I mentally committed myself to exercise, I stuck with it. In the end, it was up to me & I had to decide when I was ready for the lifestyle change.
- Newsletters were just one more thing to do in an overwhelming amount of things to do.
- They had some good ideas and helped to motivate me. I really liked the "make your environment exercise friendly." It would be helpful to give more examples of exercise activities.
- More regular.

Generic Group:

- The newsletters were not as detailed as they might have been. I recognized most of the information as the same sort of level one might find in popular magazines. However, the newsletters were short & to the point so I did not have to invest much time in reading them. The information was good, but the messages they conveyed did not really stick with me.

- For me (someone with a health background) I already knew the newsletter content; however it was a good reminder (triggered action.)
- Thank you very much.
- Helped me to acknowledge various aspects of exercise while I was reading the newsletter, but none of the suggestions were put into practice. Perhaps if log sheets were provided with the newsletter, the suggestions would be easier to put into practice.
- I didn't use them at all. They were too vague, and I already knew the information they included.
- Information not new.
- Seemed a bit trite and too simple for my exercise knowledge.
- I really liked the last one suggesting that people write down activity and inactivity.
- They seemed very general and short. However, they were quick, easy reading which is good for me.
- Sometimes they kept repeating the same values over and over again. while they were okay in the first couple, as time went on I found myself getting tired of reading certain ideas over and over (an example-recording everything).
- I think the newsletters did not have enough regularity to really impact me - I totally forgot about them in the interim. Also the info was really basic - I know all that stuff and still cannot stick to an exercise program. I needed something new & motivating.
- I think the newsletters were informative, but not motivators to keep myself motivated in exercise. Maybe adding a list or schedule to follow in each newsletter and increase part of the routine every distribution of the newsletters would have been more helpful. Have surveys to be returned each month also to get feedback on members progress. Just a suggestion.

Appendix AE

Tables

Table 1
Comparison of Group Assignment and Three-Month Success Status

			Stage-Matched	Generic	Total
Success Status					
	Successful	Observed	22(61%)	21(58%)	43(60%)
		Expected	21.5	21.5	43.0
	Unsuccessful	Observed	9(25%)	8(22%)	17 (24%)
		Expected	8.5	8.5	17.0
	Cannot Say	Observed	5(14%)	7(20%)	12(16%)
		Expected	6.0	6.0	12.0
Total		Observed	36	36	72
		Expected	36.0	36.0	72.0

$?^2$ (2, *N*= 72) =4.15, *p*>.05

Table 2
Comparison of Group Assignment and Six-Month Stage of Change

			Stage-Matched	Generic	Total
Stage of Change					
	Contemplation	Observed	0(0%)	1(5%)	1(3%)
		Expected	.5	.5	1.0
	Preparation	Observed	6(32%)	5(26%)	11(29%)
		Expected	5.5	5.5	11.0
	Action	Observed	8(42%)	6(32%)	14(37%)
		Expected	7.0	7.0	14.0
	Maintenance	Observed	5(26%)	7(37%)	12(31%)
		Expected	6.0	6.0	12.0
Total		Observed	19	19	38
		Expected	19.0	19.0	38.0

$?^2$(3, *N*=38) = 1.71, *p*>. 05

Table 3
Exerciser Self-Schema vs. No Exerciser Self-Schema Across Stages of Change at Baseline.

			Exerciser Schema	Not Exerciser Schema	Total
Stage of Change					
	Preparation	Observed	10(26%)	25(30%)	35(29%)
		Expected	11.0	24.0	35.0
	Action	Observed	24(64%)	58(70%)	82(68%)
		Expected	25.8	56.2	82.0
	Maintenance	Observed	4(10%)	0(0%)	4(3%)
		Expected	1.3	2.7	4.0
Total		Observed	38	83	121
		Expected	38.0	83.0	121.0

?2 (2, *N*=121) = 9.04, *p*<.01

Table 4
Exerciser Self-Schema vs. No Exerciser Self-Schema at Baseline Across Preparation and Action.

Stage of Change			Exerciser Schema	Not Exerciser Schema	Total
	Preparation	Observed	10(29%)	25(30%)	35
		Expected	10.2	24.8	35.0
	Action	Observed	24(71%)	58(70%)	82
		Expected	23.8	58.2	82.0
Total		Observed	34	83	117
		Expected	34.0	83.0	117.0

?2 (1, *N*=117) = .01, *p*>.05

Table 5
Exerciser Self-Schema vs. No Exerciser Self-Schema at Baseline for Successful and Unsuccessful Exercise Three Months Later.

			Exerciser Schema	Not Exerciser Schema	Total
Success Status					
	Successful	Observed	14(56%)	28(62%)	42(60%)
		Expected	15.0	27.0	42.0
	Unsuccessful	Observed	6(24%)	10(22%)	16(23%)
		Expected	5.7	10.3	16.0
	Cannot Say	Observed	5(20%)	7(16%)	12(17%)
		Expected	4.3	7.7	12.0
Total		Observed	25	45	70
		Expected	25.0	45.0	70.0

?2 (2, *N*=70) = .31 *p*>.05

Table 6
Concurrent Self-Schema (Exerciser verses No Exerciser) and Exercise Status (Successful and Unsuccessful) Three-Months Later.

			Exerciser Schema	Not Exerciser Schema	Total
Success Status					
	Successful	Observed	23(88%)	19(43%)	42(60%)
		Expected	15.6	26.4	42.0
	Unsuccessful	Observed	3(12%)	13(30%)	16(23%)
		Expected	5.9	10.1	16.0
	Cannot Say	Observed	0(0%)	12(27%)	12(17%)
		Expected	4.5	7.5	12.0
Total		Observed	26	44	70
		Expected	26.0	44.0	70.0

?2 (2, *N*=70) = 14.99. *p*<.001

Table 7
Counts of Exerciser Self-Schema vs. No Exerciser Self-Schema Across Six-Month Stages of Change.

			Exerciser Schema	No Exerciser Schema	Total
Stage					
	Contemplation	Observed	0(0%)	1(3%)	1(2%)
		Expected	.5	.5	1.0
	Preparation	Observed	4(17%)	20(69%)	24(45%)
		Expected	10.9	13.1	24.0
	Action	Observed	11(46%)	5(17%)	16(30%)
		Expected	7.2	8.8	16.0
	Maintenance	Observed	9(37%)	3(11%)	12(23%)
		Expected	5.4	6.6	12.0
Total		Observed	24	29	53
		Expected	24.0	29.0	53.0

?2 (3, *N*=53) = 16.93, *p*<.001

Table 8
Self-Schema Status at Six Months with Pooled Stages

			Exerciser Schema	No Exerciser Schema	Total
Stage of Change					
	Contemplation + Preparation	Observed	4(17%)	21(72%)	25(47%)
		Expected	11.3	13.7	25.0
	Action + Maintenance	Observed	20(83%)	8(28%)	28(53%)
		Expected	12.7	15.3	28.0
Total		Observed	24	29	53
		Expected	24.0	29.0	53.0

?2 (1, *N*=53) = 16.38, *p*<.001

Table 9
Mean Self-Efficacy Scores Across Baseline Stages of Change

Stage of Change	Mean	N	SD
Preparation	12.21	33	3.36
Action	14.59	79	3.33
Maintenance	18.50	4	3.70
Total	14.05	116	3.59

Table 10
Mean Scores on Baseline Structure of Behavioral and Cognitive Change Processes

	Mean	SD
Breadth of Repertoire of Behavioral Processes	16.17	3.13
Investment in Behavioral Processes	58.34	14.7
Predominance of Behavioral Processes	3.49	.54
Breadth of Repertoire of Cognitive Processes	17.63	2.54
Investment in Cognitive Processes	61.32	13.7
Predominance of Cognitive Processes	3.45	.48

Note. N = 80

Table 11
Relationships Among Baseline Structure of Process of Change Scores and Baseline Exercise Self-Efficacy

	1.	2.	3.	4.	5.	6.	7.
1. Exercise Self-Efficacy		.06	.38**	.56**	-.03	.17	.32*
2. Breadth of Repertoire (B)			.78**	.06	.63**	.56**	.28**
3. Investment (B)				.66**	.41**	.59**	.59**
4. Predominance (B)					-.09	.28**	.55**
5. Breadth of Repertoire (C)						.82**	.34**
6. Investment (C)							.82**
7. Predominance (C)							

Note. ** = p<.01 (2-tailed); *=p<.05 (2-tailed); Correlations between Exercise Self-Efficacy and Structure of Process of Change Scores (*n*=112); Intercorrelations among Structure of Process of Change Scores (*n*=117)

Table 12
Adjusted Marginal Mean Three-Month Self-Efficacy Scores Across Group Assignment

			95% Confidence Interval	
Group Assignment	Mean	Standard Error	Lower Bound	Upper Bound
Stage-Matched (N=25)	13.43	.647	12.13	14.73
Generic (N=24)	13.59	.690	12.20	14.98

Note. Evaluated at covariates appeared in the model: Baseline Self-Efficacy Score = 14.86

Table 13
Adjusted Marginal Mean Three-Month Self-Efficacy Scores for Successful vs.Unsuccessful Subjects

			95% Confidence Interval	
Able to Sustain Baseline Exercise	Mean	Standard Error	Lower Bound	Upper Bound
Successful (N=34)	15.36	.537	14.28	16.45
Unsuccessful (N=15)	11.65	.851	9.94	13.37

Note. Evaluated at covariates appeared in the model: Baseline Self-Efficacy Score = 14.86

Table 14
Group X Three-Month Success Status ANCOVA Comparing Self-Efficacy with Baseline Self-Efficacy Controlled

Source	SS	df	Mean Square	F	Sig	Eta Squared
Corrected Model	328.58[a]	4	82.15	9.08	.00	.45
Intercept	97.65	1	97.65	10.80	.01	.20
BL Self Efficacy	64.98	1	64.98	7.18	.01	.14
Group Assignment	.25	1	.25	.028	.87	.01
Success Status	111.68	1	111.68	12.35	.01	.22
Group X Success	1.07	1	1.07	.12	.73	.01
Error	397.95	44	9.04			
Total	10641.0	49				
Corrected Total	726.53	48				

Note. a. R Squared = .452 (Adjusted R Squared = .402)

Table 15
Adjusted Marginal Mean Six-Month Self-Efficacy Scores Across Group Assignment

			95% Confidence Interval	
Group	Mean	Standard Error	Lower Bound	Upper Bound
Stage-Matched (N=18)	12.880	.705	11.435	14.325
Generic (N=18)	14.209	.932	12.299	16.118

Note. Evaluated at covariates appeared in the model: Baseline Self-Efficacy Score = 14.64

Table 16
Adjusted Marginal Mean Self-Efficacy Scores Across Six-Month Stages of Change

			95% Confidence Interval	
Stage of Change	Mean	Standard Error	Lower Bound	Upper Bound
Contemplation (N=1)	14.578	2.997	8.439	20.716
Preparation (N=11)	11.953	.950	10.006	13.900
Action (N=12)	14.456	.878	12.658	16.255
Maintenance (N=12)	14.039	.881	12.235	15.844

Note. Evaluated at covariates appeared in the model: Baseline Self-Efficacy Score = 14.64

Table 17
Group X Six-Month Stage of Change ANCOVA Comparing Self-Efficacy with Baseline Self-Efficacy Controlled

Source	SS	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	274.95	7	39.28	4.48	.01	.53
Intercept	30.66	1	30.66	3.45	.07	.11
Baseline Self-Efficacy	100.39	1	100.39	11.46	.01	.29
Six-Month Stage of Change	34.72	3	11.57	1.32	.29	.12
Group Assignment	12.33	1	12.33	1.41	.25	.05
Stage X Group	28.56	2	14.28	1.63	.22	.10
Error	245.36	28	8.76			
Total	7217.0	36				
Corrected Total	520.31	35				

Table 18
Factor Analysis of Rank-Ordered Motivation Items

	Component	
	1	2
Social Interaction	.176	-.621
Feel Stronger, Improve Mood and Energy	.576	.417
Physiological Improvements	.546	-.602
Enjoyment of Exercise	.483	.701
To Be More Attractive	-.807	.104
To Improve Body Shape	-.798	7.141E-02

Note: Rotated Component Matrix

Table 19
Mean Rankings on Motivational Items for Successful Subjects After Three Months

	N	Mean	SD	Minimum	Maximum
Feel Stronger, Improve Mood and Energy	40	1.92	1.02	1	4
To Improve Body Shape	40	2.17	1.01	1	5
Physiological Improvements	40	3.63	1.60	1	6
Enjoyment of Exercise	40	3.68	1.38	1	6
To Be More Attractive	40	4.35	1.39	1	6
Social Interaction	40	5.23	1.14	1	6

Note. Lower mean ranking indicates more motivating.

Table 20
Mean Rankings on Motivational Items for Unsuccessful Subjects After Three Months

	N	Mean	SD	Minimum	Maximum
Feel Stronger, Improve Mood and Energy	14	1.79	.97	1	4
To Improve Body Shape	14	2.79	1.58	1	5
Physiological Improvements	14	3.57	1.83	1	6
Enjoyment of Exercise	14	3.79	1.53	1	6
To Be More Attractive	14	4.07	1.33	2	6
Social Interaction	14	5.00	1.18	2	6

Note. Lower mean ranking indicates more motivating.

Table 21
Mean Rankings on Motivational Items for "Cannot Say" Subjects After Three Months

	N	Mean	SD	Minimum	Maximum
Feel Stronger, Improve Mood and Energy	11	2.18	.87	1	4
Physiological Improvements	11	2.36	1.36	1	5
To Improve Body Shape	11	2.73	1.27	1	4
To Be More Attractive	11	4.27	1.68	1	6
Enjoyment of Exercise	11	4.55	1.63	1	6
Social Interaction	11	4.91	1.22	3	6

Note. Lower mean ranking indicates more motivating.

Table 22
Mean Rankings on Motivational Items for All Subjects After Three Months

	N	Mean	SD	Minimum	Maximum
Feel Stronger, Improve Mood and Energy	65	1.98	1.01	1	4
To Improve Body Shape	65	2.38	1.21	1	6
Physiological Improvements	65	3.40	1.66	1	6
Enjoyment of Exercise	65	3.85	1.47	1	6
To Be More Attractive	65	4.27	1.41	1	6
Social Interaction	65	5.12	1.15	1	6

Note. Lower mean ranking indicates more motivating.

Table 23
Pairwise Comparisons of Relative Ranking Frequencies and Wilcoxon Statistics Among Successful Subjects

	(1)	(2)	(3)	(4)	(5)	(6)
Social Interaction (1)		1>2 = 37 2>1 = 3 Z=-5.34**	1>3 = 33 3>1 = 7 Z=-4.01**	1>4 = 31 4>1 = 9 Z=-3.76**	1>5 = 28 5>1 = 12 Z=-2.34^{+}	1>6 = 39 6>1 = 1 Z=-5.49**
Feel Better (2)			2>3 = 8 3>2 = 328 Z=-3.62**	2>4 = 4 4>2=36 Z=-4.89**	2>5 = 5 5>2 = 35 Z=-4.91**	2>6 = 20 6>2 = 20 Z=-1.14
Physiological (3)				3>4 = 22 4>3 = 18 Z=-.18	3>5 = 13 5>3 = 27 Z=-1.69	3>6 = 29 6>3 = 11 Z=-3.30**
Enjoyment (4)					4>5 = 15 5>4 = 25 Z=-2.21^{+}	4>6 = 27 6>4 = 13 Z=-3.53**
Attractive (5)						5>6 = 36 6>5 = 4 Z=-4.96**
Improve Body Shape (6)						

Note. Lower ranking indicates more motivating. N = 40. **=p<.001; *=p<.01; $^{+}$=p<.05.

Table 24
Pairwise Comparisons of Relative Ranking Frequencies and Wilcoxon Statistics Among Unsuccessful Subjects

	(1)	(2)	(3)	(4)	(5)	(6)
Social Interaction (1)		1>2 = 14 2>0 = 0 Z=-3.32**	1>3 = 10 3>1 = 4 Z=-1.94	1>4 = 10 4>1 = 4 Z=-2.13^{+}	1>5 = 11 5>1 = 3 Z=-1.53	1>6 = 11 6>1 = 3 Z=-2.78*
Feel Better (2)			1>3 = 2 3>1 = 12 Z=-2.79*	1>4 = 2 4>1 = 12 Z=-2.82*	1>5 = 3 5>1 = 11 Z=-2.94*	1>6 = 4 6>1 = 10 Z=-1.46
Physiological Effects (3)				1>4 = 6 4>1 = 8 Z=-.29	1>5 = 7 5>1 = 7 Z=-.69	1>5 = 7 5>1 = 7 Z=-1.09
Enjoyment (4)					1>5 = 5 5>1 = 9 Z=-.35	1>6 = 10 6>1 = 4 Z=-1.43
Attractiveness (5)						1>6 = 13 6>1 = 1 Z=-2.52^{+}
Improve Body Shape (6)						

Note. Lower ranking indicates more motivating. N = 14. **=p<.001; *=p<.01; $^{+}$=p<.05.

Table 25
Pairwise Comparisons of Relative Ranking Frequencies and Wilcoxon Statistics Among "Cannot Say" Subjects

	(1)	(2)	(3)	(4)	(5)	(6)
Social Interaction (1)		1>2 = 11 2>1 = 0 Z=-2.95*	1>3 = 11 3>1 = 0 Z=-2.96*	1>4 = 5 4>1 = 6 Z=-.226	1>5 = 7 5>1 = 4 Z=-.582	1>6 = 9 6>1 = 2 Z=-2.59*
Feel Better (2)			2>3 = 5 3>2 = 6 Z=-.42	2>4 = 1 4>2 = 10 Z=-2.78*	2>5 = 2 5>2 = 9 Z=-2.33^{+}	2>6 = 5 6>2 = 6 Z=-.10
Physiological Effects (3)				3>4 = 3 4>3 = 8 Z=-2.23^{+}	3>5 = 2 5>2 = 9 Z=-2.01^{+}	3>6 = 4 6>3 = 7 Z=-.635
Enjoyment (4)					4>5 = 6 5>4 = 5 Z=-.450	4>6 = 9 6>4 = 2 Z=-1.98^{+}
Attractiveness (5)						5>6 = 9 6>5 = 2 Z=-2.35^{+}
Improve Body Shape (6)						

Note. Lower ranking indicates more motivating. N=11. **=p<.001; *=p<.01; $^{+}$=p<.05.

Table 26
Comparison of Baseline Stage of Change and Completion of Surveys at Three Months

Stage of Change			Dropouts	Completers	Total
	Preparation	Observed	13(32%)	20(28%)	33(29%)
		Expected	12.0	21.0	33.0
	Action	Observed	26(63%)	50(69%)	76(67%)
		Expected	27.6	48.4	76.0
	Maintenance	Observed	2(5%)	2(3%)	4(4%)
		Expected	1.5	2.5	4.0
Total		Observed	41	72	113
		Expected	41.0	72.0	113.0

?2 (2, *N*=113) = .60, *p*>.05

Table 27
Comparison of Group Assignment and Completion of Surveys at Three Months

Group Assignment			Dropouts	Completers	Total
	Stage-Matched	Observed	19(46%)	36(50%)	55(49%)
		Expected	20.0	35.0	55.0
	Generic	Observed	22(54%)	36(50%)	58(51%)
		Expected	21.0	37.0	58.0
Total		Observed	41.0	72	113
		Expected	41.0	72.0	113.0

?2 (1, *N*=113) = .14, *p*>.05

Table 28
Comparison of Baseline Exerciser Self-Schema and Completion of Surveys at Three Months

Exerciser Self-Schema			Dropouts	Completers	Total
	Exerciser Schema	Observed	9(22%)	27(38%)	36(32%)
		Expected	13.1	22.9	36.0
	Not Exerciser Schema	Observed	32(78%)	45(62%)	77(68%)
		Expected	27.9	49.1	77.0
Total		Observed	41	72	113
		Expected	41.0	72.0	113.0

?2 (1, *N*=113) = 2.91, *p*>.05

Table 29
Comparison of Gender and Completion of Surveys at Three Months

Gender			Dropouts	Completers	Total
	Male	Observed	8(20%)	16(22%)	24(21%)
		Expected	8.7	15.3	24.0
	Female	Observed	33(80%)	56(78%)	89(79%)
		Expected	32.3	56.7	89.0
Total		Observed	41	72	113
		Expected	41.0	72.0	113.0

?2 (1, *N*=113) = .11 *p*>.05

Table 30
Comparison of Ethnicity and Completion of Surveys at Three Months

Ethnicity			Dropouts	Completers	Total
	Caucasian	Observed	22(56%)	50(70%)	72(65%)
		Expected	25.5	46.5	72.0
	African American	Observed	7(18%)	8(12%)	15(14%)
		Expected	5.3	9.7	15.0
	Asian	Observed	3(8%)	2(3%)	5(4%)
		Expected	1.8	3.2	5.0
	Hispanic	Observed	5(13%)	7(10%)	12(11%)
		Expected	4.3	7.7	12.0
	South Asian/Middle Eastern	Observed	1(2.5%)	1(1%)	2(2%)
		Expected	.7	1.3	2.0
	Native American	Observed	0(0%)	1(1%)	1(1%)
		Expected	.4	.6	1.0
	Other/Biracial	Observed	1(2.5%)	2(3%)	3(3%)
		Expected	1.1	1.9	3.0
Total		Observed	39	71	110
		Expected	39.0	71.0	110.0

?2 (6, *N*=110) = 3.84, *p*>.05

Table 31
Comparison of Completers and Dropouts at Three Months on Baseline Self-Efficacy, Age, Baseline Length of Exercise in Weeks, and Structure of Change Process Scores

Measure	Dropouts			Completers			
	N	Mean	SD	N	Mean	SD	t
Self-Efficacy	38	13.68	3.51	70	14.31	3.74	-.85
Age	41	31.22	10.58	72	33.77	11.23	-1.19
Length of Exercise	38	9.16	7.1	66	11.8	7.8	-1.73
Breadth of Repertoire (Behavioral)	40	17.18	3.20	69	16.30	3.13	1.39
Investment (Behavioral)	40	60.33	15.26	69	56.94	14.41	1.16
Predominance (Behavioral)	40	3.51	.54	69	3.48	.54	.25
Breadth of Repertoire (Cognitive)	40	18.05	2.29	69	17.46	2.54	1.20
Investment (Cognitive)	40	62.60	14.65	69	61.00	12.84	.59
Predominance (Cognitive)	40	3.44	.55	69	3.47	.44	-.35

Table 32
Comparison of Baseline Stage of Change and Completion of Surveys at Six Months

Stage of Change			Dropouts	Completers	Total
	Preparation	Observed	17(29%)	16(29%)	33(29%)
		Expected	16.9	16.1	33.0
	Action	Observed	38(66%)	38(69%)	76(67%)
		Expected	39.0	37.	76.0
	Maintenance	Observed	3(5%)	1(2%)	4(4%)
		Expected	2.1	1.9	4.0
Total		Observed	58	55	113
		Expected	58.0	55.0	113.0

?2 (2, *N*= 113) = .95, *p*>.05

Table 33
Comparison of Group Assignment and Completion of Surveys at Six Months

Group Assignment			Dropouts	Completers	Total
	Stage-Matched	Observed	28(48%)	27(49%)	55(49%)
		Expected	28.2	26.8	55.0
	Generic	Observed	30(52%)	28(51%)	58(51%)
		Expected	29.8	28.2	58.0
Total		Observed	58	55	113
		Expected	58.0	55.0	113.0

?2 (1, *N*=113) = .01, *p*>.05

Table 34
Comparison of Baseline Exerciser Self-Schema and Completion of Surveys at Six Months

Exerciser Self-Schema			Dropouts	Completers	Total
	Exerciser Schema	Observed	18(31%)	18(33%)	36(32%)
		Expected	18.5	17.5	36.0
	Not Exerciser Schema	Observed	40(69%)	37(67%)	77(68%)
		Expected	39.5	37.5	77.0
Total		Observed	58	55	113
		Expected	58.0	55.0	113.0

?2 (1, *N*=113) = .04, *p*>.05

Table 35
Comparison of Gender and Completion of Surveys at Six Months

Gender			Dropouts	Completers	Total
	Male	Observed	11(19%)	13(24%)	24(21%)
		Expected	12.3	11.7	24.0
	Female	Observed	47(81%)	42(76%)	89(79%)
		Expected	45.7	43.3	89.0
Total		Observed	58	55	113
		Expected	58.0	55.0	113.0

?2 (1, *N*=113) = .37, *p*>.05

Table 36
Comparison of Ethnicity and Completion of Surveys at Six Months

Ethnicity			Dropouts	Completers	Total
	Caucasian	Observed	30(54%)	42(78%)	72(65%)
		Expected	36.7	35.3	72.0
	African American	Observed	12(21%)	3(5%)	15(14%)
		Expected	7.6	7.4	15.0
	Asian	Observed	4(7%)	1(2%)	5(4%)
		Expected	2.5	2.5	5.0
	Hispanic	Observed	8(14%)	4(7%)	12(11%)
		Expected	5.9	5.9	12.0
	South Asian/Middle Eastern	Observed	1(2%)	1(2%)	2(2%)
		Expected	1.0	1.0	2.0
	Native American	Observed	0(0%)	1(2%)	1(1%)
		Expected	.5	.5	1.0
	Other/Biracial	Observed	1(2%)	2(4%)	3(3%)
		Expected	1.5	1.5	3.0
Total		Observed	56	54	110
		Expected	56.0	54.0	110.0

?2 (6, *N*=110) = 11.83, *p*>.05

Table 37
Comparison of Completers and Dropouts at Six Months on Baseline Self-Efficacy, Age, Length of Exercise in Weeks, and Structure of Change Process Scores

Measure	Dropouts			Completers			
	N	Mean	SD	N	Mean	SD	T
Self-Efficacy	54	14.31	3.76	54	13.87	3.57	-.63
Age	58	31.08	10.59	55	34.71	11.25	1.76
Length of Exercise in Weeks	54	10.83	7.90	50	10.86	7.38	.02
Breadth of Repertoire (Behavioral)	57	16.44	3.29	52	16.83	3.05	.64
Investment (Behavioral)	57	57.70	15.37	52	58.71	14.17	.36
Predominance (Behavioral)	57	3.50	.58	52	3.48	.49	-.18
Breadth of Repertoire (Cognitive)	57	17.68	2.41	52	17.67	2.52	-.02
Investment (Cognitive)	57	61.46	14.53	52	61.73	12.38	.11
Predominance (Cognitive)	57	3.45	.56	52	3.47	.40	.25

Table 38
Comparison of Group Assignment and Reported Receipt of Newsletters

Group Assignment		Receive Newsletters?			
		Yes	No	Yes, But Not All Six	Total
Stage-Matched	Observed	19(49%)	1(50%)	3(50%)	23(49%)
	Expected	19.1	1.0	2.9	23.0
Generic	Observed	20(51%)	1(50%)	3(50%)	24(51%)
	Expected	19.9	1.0	3.1	24.0
Total	Observed	39	2	6	47
	Expected	39.0	2.0	6.0	47.0

?2 (2, *N*= 47) = .004 *p*>.05

Table 39
Comparison of Group Assignment and Reported Reading of Newsletters

Group Assignment		Read Newsletters?			
		Yes	No	Yes, But Not All Six	Total
Stage-Matched	Observed	16(47%)	1(50%)	6(54%)	23(49%)
	Expected	16.6	1.0	5.4	23.0
Generic	Observed	18(53%)	1(50%)	5(46%)	24(51%)
	Expected	17.4	1.0	5.6	24.0
Total	Observed	34	2	11	47
	Expected	34.0	2.0	11.0	47.0

?2 (2, *N*= 47) = .187, *p*>.05

Table 40
Comparison of Group Assignment and Reported Usefulness of Newsletters

Group Assignment		Find Newsletters Informative?			
		Yes	No	Yes, But Not All Six	Total
Stage-Matched	Observed	15(54%)	4(44%)	4(44)	23(50%)
	Expected	14.0	4.5	4.5	23.0
Generic	Observed	13(46%)	5(56%)	5(56%)	23(50%)
	Expected	14.0	4.5	4.5	23.0
Total	Observed	28	9	9	46
	Expected	28.0	9.0	9.0	46.0

Note. One subject did not respond to this question. ?2 (2, *N*= 46) = .365, *p*>.05

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