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The Role of Major and Minor Stressors in Moderating the Transtheoretical Model of Exercise Behavior Among Predominantly Low-Income Patients Attending Primary Care Clinics.

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THE ROLE OF MAJOR AND MINOR STRESSORS IN MODERATING THE TRANSTHEORETICAL MODEL OF EXERCISE BEHAVIOR AMONG PREDOMINANTLY LOW-INCOME PATIENTS ATTENDING PRIMARY CARE CLINICS

A Dissertation

Submitted to the Graduate Faculty of the Louisiana State University and Agricultural and Mechanical College in partial fulfillment of the requirements for the degree of Doctor of Philosophy

in

The Department of Psychology

by

Shawn Kahlil Jeffries
B.A., Louisiana State University, 1993
M.A., Southeastern Louisiana University, 1995
December 2000
DEDICATION

I would like to dedicate this work to three very important women who have been instrumental during my personal and educational development, and have served as the three biggest independent influences on my life. My sister Colleen Jeffries Taylor has been a professional and personal role model for me, and also served as a large source of inspiration for the attainment and completion of this doctoral degree. Along the educational path I have followed, Colleen has offered words of encouragement, doses of reality, and most importantly an empathetic ear when I have needed one. My mother Joanne Jeffries Terrell has not only raised and guided me, but also always been a constant source of encouragement and positive reinforcement. Without her most important and continued influence on my development, I would not have accomplished all that I have to this point. Finally, my wife Shelly Doucet Jeffries has provided the consistent support and daily reinforcement instrumental for the actual completion of this project. I realize and appreciate the sacrifices she has made to encourage me along this graduate school path. She is my partner, my coach, and my love. To these three wonderful and loving women who have helped me to realize what is truly valuable and important, I thank you from the bottom of my heart.
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I would also like to acknowledge the many people who have helped me not only with this project in particular but also during my time in graduate school in general. First, I would like to thank my committee members, who have given their time and effort to assist me with the completion of this project. I have had the privilege of working with each of them in different and important contexts, and all of whom have contributed to my overall professional and personal development.

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provide many valuable suggestions along the way that were instrumental to the successful completion of this project. If my interactions with Ed to this point are any indication, I will have many future experiences and collaborations to look forward to with him.

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# TABLE OF CONTENTS

DEDICATION ............................................................................................................................ ii

ACKNOWLEDGMENTS............................................................................................................... iii

ABSTRACT .................................................................................................................................... viii

INTRODUCTION .......................................................................................................................... 1
  Definitional Issues ..................................................................................................................... 4
  Assessment of Physical Activity/Exercise ............................................................................ 5
  Determinants of Exercise Behavior ....................................................................................... 6
  Demographic Determinants ................................................................................................. 7
  Environmental/Social Determinants ..................................................................................... 10
  Summary of Determinants of Exercise Behavior .................................................................. 11
  Transtheoretical Model of Exercise Behavior ...................................................................... 12
  Related Transtheoretical Constructs ................................................................................... 15
  Decisional Balance .................................................................................................................. 16
  Self-Efficacy ............................................................................................................................ 17
  Movement through the SOC ................................................................................................. 18
  Conceptual Models of Stress ............................................................................................... 21
  Major and Minor Stressors ................................................................................................. 22
  Stress and Illness .................................................................................................................... 23
  Stress and Health-Related Behaviors .................................................................................. 25
  Stress and Physical Activity ................................................................................................. 26
  Exercise SOC in Low-Income, Primary Care Patients ...................................................... 27
  Rationale for the Present Study ............................................................................................ 28
  Research Questions and Hypotheses .................................................................................... 30

METHOD .................................................................................................................................... 34
  Participants .............................................................................................................................. 34
  Measures ................................................................................................................................ 35
  Procedure ................................................................................................................................ 40

RESULTS .................................................................................................................................... 42
  Descriptive Analyses .............................................................................................................. 42
  Research Question (RQ) #1 ................................................................................................. 55
  Research Question (RQ) #2 ................................................................................................. 65
  Research Question (RQ) #3 ................................................................................................. 67

DISCUSSION ............................................................................................................................... 70
  Summary of Demographic Characteristics ........................................................................ 70
  Demographic Differences in Physical Activity .................................................................... 71
  Demographic Differences in Stressful Life Events .............................................................. 72
  Demographic Differences in Transtheoretical Variables .................................................. 73
  Major Research Questions of Interest ................................................................................ 75
  Limitations ............................................................................................................................... 80
  Conclusions/Future Directions .............................................................................................. 82

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ABSTRACT

A sedentary lifestyle is prevalent in the United States and is associated with poor health outcomes (Blair et al., 1989). While regular exercise has been shown to have numerous physical and mental health benefits, much of the population does not perform physical activity at a level necessary to achieve significant health benefits. Primary care settings have become increasingly targeted areas for physician-based exercise counseling. One popular theoretical model of exercise adoption is the transtheoretical model of exercise behavior (Prochaska & Marcus, 1994) which proposes that individuals progress through stages of exercise behavior. Researchers have explored constructs affecting movement through the stages of exercise behavior, such as decisional balance and self-efficacy (e.g. Marcus & Owen, 1992). However, connections between life events and the transtheoretical model of exercise behavior have not previously been examined in the literature. Recent research has shown the perception of stressful life events, particularly minor stressors, may mediate exercise behavior (Stetson et al., 1997). Minor stressors can lead to decreased ability to engage in exercise behavior in three ways: hindered performance of positive health behaviors such as exercise, increased perception of exercise as a stressor, and increased engagement in unhealthy coping behaviors (overeating, smoking, alcohol abuse, etc.). While minor life events may act as barriers to exercise behavior, no study has specifically examined their effect on exercise stage of change. In addition, the exercise stages of change model has not been validated among a low-income, primary care population. The current study examined cross-sectional and longitudinal relationships between major and minor life events and transtheoretical constructs for exercise behavior. This sample included predominantly low-income, primary care patients from across the state of Louisiana. Results provided some support for the use of the transtheoretical model.
among this population, as demonstrated by the replication of some of the relationship patterns between transtheoretical variables. While life events were positively correlated with some categories of physical activity, they failed to account for significant variance in stage movement across time. Shortcomings and strengths of the present study are discussed, and suggestions are made for future research.
INTRODUCTION

The benefits of regular physical exercise are associated with many positive health outcomes, including prevention and management of chronic diseases such as cardiovascular disease, hypertension, diabetes, osteoporosis, and obesity, as well as improved mood and self-esteem (King et al., 2000; USDHHS, 1991, 1995; Dubbert, Rappaport, & Martin, 1987; Martin & Dubbert, 1982; Dubbert, 1992). Rowe (1999) recently stated that lifestyle modifications such as regular exercise can prevent or delay disorders such as hyperglycemia, hyperinsulinemia, hyperlipidemia, and hypertension. In addition, Rowe (1999) stated that exercise can increase active life expectancy, decrease disability, and reduce health care costs. Many researchers as well as governmental and health organizations have emphasized the importance of exercise as a national health goal for all Americans (USDHHS, 1995; King et al., 1996; Marcus & Owen, 1992).

In addition to its relationship to positive health outcomes, regular exercise has also been shown to have a number of psychological benefits. Aldana, Sutton, Jacobson, and Quirk (1996) reported that individuals participating in a moderate amount of leisure time physical activity were significantly less likely to report levels of perceived stress than sedentary individuals. In a review of twelve randomized, controlled experiments regarding exercise and mood, Hughes (1984) found that, in general, exercise consistently improved individuals' self-concept. Some researchers have shown that regular participation in exercise is significantly related to subsequent decreases in anxiety and depression (King, Taylor, & Haskell, 1993). Crews & Landers (1987) found that aerobically fit subjects reported reduced amounts of stress as compared to aerobically unfit control subjects. Recently, in a review of exercise and stress, Applegate, Rohan, & Dubbert (1999) stated that even a single exercise session improves mood in normal and clinical populations.
Converging research appears then to support a positive relationship between exercise and mental health.

Conversely, the adverse medical consequences associated with a sedentary lifestyle have also been firmly established (Blair et al., 1989; Marcus, Bock, & Pinto, 1997; Dubbert, 1992; Hahn, Teutsch, Rothenberg, & Marks, 1990). In fact, approximately 250,000 deaths each year are estimated to be due directly to a lack of regular physical activity (Hahn, Teutsch, Rothenberg, & Marks, 1990; USDHHS, 1991). Research suggests that a sedentary lifestyle is an independent risk factor for the development of several chronic diseases including cardiovascular disease, osteoporosis, type II diabetes, and colon cancer (Blair et al., 1989; Pate et al., 1995; Dunn, Garcia, Marcus, Kampert, Kohl, & Blair, 1998).

A sedentary lifestyle also significantly impacts health care expenditures. The Centers for Disease Control and Prevention (CDC) mortality estimates for coronary artery disease showed that in 1989 alone, physical inactivity translated into 5.7 billion dollars, a cost higher than the individual presence of obesity, smoking, and hypertension during that year (CDC, 1993). The financial consequences of sedentary behavior have also been measured on a local level. A recent analysis of Louisiana Medicaid and Medicare expenditures revealed that Medicaid recipients with chronic illnesses caused in part by modifiable risk factors such as sedentary lifestyle accounted for a substantial portion of Medicaid expenditures in the 1994-1995 fiscal year (Brantley & Kumar, 1996). This study also showed that chronic diseases linked to high-risk behaviors such as a lack of regular exercise most commonly occurred among older, female, African-American, Medicaid recipients. When compared to the rest of the country, Louisiana was several hundred dollars per recipient above the national average in terms of Medicaid expenditures.
(Brantley & Kumar, 1996). This health care expenditure survey graphically demonstrated how the lack of regular physical activity (among other behavioral risk factors such as smoking and alcohol abuse) is associated with increased health care costs. It is clear that the lack of regular physical activity has significant implications not only for an individual’s physical health, but also for medical service delivery costs.

One of the growing forums of medical service delivery in which the importance of regular exercise has been increasingly emphasized over recent years is the primary care clinic (King et al., 1998). Will, Demko, and George (1996) have encouraged primary care physicians (PCPs) to become more committed to promoting the preventive benefits of regular exercise by developing a framework of exercise counseling strategies in primary care settings. Calfas and colleagues (1996) have stated that with nearly 60% of medical office visits occurring in a primary care setting, PCPs (through physician-based counseling) can play an important role in increasing the amount of physical activity of their patients.

Although PCPs can play an important part in promoting regular exercise, significant barriers have impeded the effectiveness with which they currently perform this role (Lewis, Clancy, Leake, & Schwartz, 1991). Some common factors interfering with effective exercise counseling by PCPs have included lack of time, appropriate behavioral counseling skills, adequate materials, and organizational support (Pinto, Goldstein, & Marcus, 1998). Many studies have begun to specifically address ways in which PCPs can become both more efficient and effective in counseling their patients regarding increased exercise behavior (Harris, Caspersen, DeFriese, & Estes, 1989; Williford, Barfield, Lazenby, & Olson, 1992, Calfas et al., 1996). In fact, three large-scale, multi-site projects have been undertaken in the 1990s to increase rates of exercise participation in primary care settings: Physician-Based Assessment and Counseling for Exercise (Project PACE; Calfas et al.,
1996; Patrick et al., 1994), Activity Counseling Trial (ACT; Blair et al., 1998; King et al., 1998), and Project Active (Dunn et al., 1998). It is therefore clear that attempts to empirically examine and promote exercise among patients attending primary care clinics have become increasingly emphasized in the scientific and medical community.

Despite the oft-cited benefits of physical exercise and many state and national programs designed to increase rates of exercise, approximately 60% of U.S. adults are not sufficiently active to achieve measurable health benefits, and 25% of adult Americans are totally sedentary (King et al., 1998; USDHHS, 1995). Many studies have confirmed the low rate of exercise among the U.S. population. Dishman, Sallis, and Orenstein (1985) have stated that 41-51% of the U.S. population is sedentary, and only 1/3 of all adults participate in exercise on a weekly basis. The CDC reported that approximately 30% of adults in 1994 did not complete any regular physical activity during the preceding month (CDC, 1996). Even among those who participate in regular exercise programs, long-term adherence to such programs is less than optimal. Research has shown that across various populations, approximately 50% of individuals who begin a structured exercise program drop out within the first 3 to 6 months (Dishman, 1988; Carmody, Senner, Manilow, & Matarazzo, 1980). Thus, initiation and maintenance of regular exercise behavior are challenging issues that continue to be the focus of multidisciplinary research efforts.

Definitional Issues

A critical issue and one of the inherent challenges in the exercise research field remains the manner in which exercise behavior is defined and measured. A joint commission of the CDC and the American College of Sports Medicine (ACSM), has stressed the importance of distinguishing between the terms physical activity, exercise, and physical fitness (Pate et al., 1995). Physical activity has been defined as "any bodily
movement produced by skeletal muscles that results in energy expenditure” (Caspersen, Powell, & Christenson, 1985, p. 126). Exercise is usually considered a subset of physical activity, and is traditionally defined as “planned, structured, and repetitive bodily movement done to improve or maintain one or more components of physical fitness” (Caspersen, Powell, & Christenson, 1985, p. 126). The most recent recommendation from the joint commission of the CDC and ACSM suggests that all adult Americans should engage in 30 minutes or more of moderate-intensity physical activity (e.g. walking, swimming, etc.) on most or all days of the week (Pate et al., 1995). Three generally accepted forms of physical activity cited in the literature that meet the criteria for exercise include: (1) leisure-time physical activity (i.e., walking, swimming, running); (2) job-related physical activity (i.e., walking, standing, and lifting heavy objects); and (3) housework-related physical activity (i.e., light and moderate household chores). Physical fitness is therefore defined as “a set of attributes that people have or achieve that relates to the ability to perform physical activity” (Caspersen, Powell, & Christenson, 1985, p. 129). The specific components of physical fitness include flexibility, body composition, muscular strength, muscular endurance, and aerobic and anaerobic capacity (Skinner, Baldini, & Gardner, 1990). Through delineating the specific components of what is generally considered “exercise,” researchers may more clearly develop specific measures to assess physical activity and effectively explore the connections to positive health outcomes.

**Assessment of Physical Activity/Exercise**

Some of the more common methods of physical activity/exercise assessment include: direct observation, physical activity records, self-report questionnaires, mechanical or electronic devices (e.g. pedometers, accelerometry instruments), and physiological assessment techniques such as heart rate monitoring and doubly labeled water (Ainsworth, 1993).
Montoye, & Leon, 1994). By far the most common methods of physical activity assessment in large-scale studies are *survey/self-report questionnaires*, due to ease of administration, unobtrusiveness, and nonreactiveness with subjects (Williams, Klesges, Hanson, & Eck, 1989). Validation studies have shown that some difficulties exist in reliably assessing physical activity over time, especially with moderate-intensity activities such as walking or gardening. In addition, data compiled from experiments using self-report questionnaires have been considered somewhat circumstantial and subject to bias (Wilson, Paffenbarger, Morris, & Havlik, 1986). However, many exercise studies have generally shown that self-report questionnaires possess adequate reliability and good association with other measures of health outcomes such as health status (Powell, Thompson, Caspersen, & Kendrick, 1987). While multiple methods of objective and subjective assessment of physical activity are ideal, many epidemiological studies tend to utilize self-report questionnaires due to their ease of administration and ability to quantify specific types of physical activity (Ainsworth, Montoye, & Leon, 1994).

**Determinants of Exercise Behavior**

Given the numerous physical and psychological benefits of regular exercise behavior, the high rate of sedentary behavior among the general U.S. population appears somewhat contradictory. Many researchers have focused on exactly which factors tend to determine regular exercise behavior in an attempt to explore the nature of the seeming contradiction between the benefits of exercise and the high rate of sedentary behavior (Dishman, Sallis, & Orenstein, 1985; King et al., 1992; Sallis et al., 1986; Dishman & Sallis, 1994; Sallis et al., 1997). Dishman (1994) has stressed the multiply-determined nature of exercise behavior, as well as the importance of increasing exercise among specialized populations. Understanding the relative importance of specific exercise
Determinants allows for an increased precision with which interventions may be delivered (Dishman, 1994). Methodological flaws and inadequate study design in previous exercise adherence studies have precluded the ability of researchers to make unambiguous, causal statements regarding exercise (Sallis et al., 1988; Dishman, Sallis, and Orenstein, 1985; Dishman, 1991). However, Dishman and Sallis (1994) have suggested that demographic, environmental, and social determinants tend to be most heavily associated with consistent exercise behavior. Each of these determinants will be now be discussed in turn.

**Demographic Determinants**

**Gender.** Many survey studies have consistently found that women exercise both less consistently and intensely than men (King et al., 1992; Lee, 1993). Dishman and Sallis (1994) examined 33 studies conducted over the past 12 years, and found male gender to be a consistent and powerful predictor of exercise behavior. Some researchers have hypothesized that women have traditionally encountered more barriers to involvement in exercise behavior than men, including increased domestic and vocational responsibilities, less access to financial resources, and traditional socialization stereotypes which de-emphasize the importance of physical activity among women (Lee, 1993). Other barriers proposed to explain the gender disparity in regular exercise have included lowered self-efficacy for exercise, perceived lack of knowledge or skill, higher proneness for injury due to lower muscle mass and higher body fat, and increased physiological and biological barriers such as regular menstrual cycles and pregnancy (Marcus, Dubbert, King, & Pinto, 1995). Thus, despite the many health benefits of exercise specific for women (decreased mineral loss, improved immune function, and reduced risk for certain types of cancer), they are less likely than their age-matched male counterparts to engage in regular exercise (CDC, 1993).
Age. Another important demographic determinant of exercise behavior is age. Physical activity has generally been shown to decline significantly with increasing age beginning in late adolescence and continuing through early adulthood across a number of samples (King et al., 1992; Zakarian et al., 1994). In addition, after age 50, rates of physical activity tend to decline even further. Large numbers of older individuals have reported little leisure-time physical activity (Rowe, 1999). A recent summary of the physical activity determinants literature has revealed that age is consistently negatively correlated with exercise behavior (Dishman, 1994).

Race. Many studies examining racial differences in exercise adherence have consistently demonstrated African-Americans to be less physically active than Caucasians (Washburn et al., 1992; Duelberg, 1992; Farrell, Hohl, & Rogers, 1987; Duelberg, 1992; Slattery et al., 1992). Some researchers have pointed out that educational and socioeconomic confounds have increased the difficulty of detecting true differences in physical activity (King et al., 1992; Ford et al., 1991). However, Farrell, Kohl, and Rogers, (1987) found that after adjustments for age, percentage of body fat, daily number of cigarettes smoked, activity level, resting heart rate, and blood pressure, a sample of female African-American teachers had a lower level of cardiovascular fitness compared to socioeconomically-matched female Caucasian teachers. Further, Washburn, Kline, Lackland, and Wheeler (1992) conducted telephone interviews with over 2,000 individuals using the Behavioral Risk Factor Surveillance Survey (BRFSS), and found that African-American women reported lower levels of leisure-time physical activity as compared to their white counterparts after controlling for age, income, and body mass index (BMI). Results from the 1994 BRFSS revealed that African-American women have the highest rates of physical inactivity compared to Caucasian and Hispanic women (CDC, 1994).
Eyler and colleagues (1998) reported that, in general, minority women demonstrate lower rates of physical activity than Caucasian women. Duelberg (1992) has shown that even after accounting for differences in socioeconomic status, African-Americans generally tend to have lower rates of physical exercise than other racial groups.

**Education/Income.** There has been remarkable consistency in the literature regarding the positive relationships between education and income level and exercise behavior (King et al., 1992). Individuals from lower socioeconomic status (SES) families are generally less active than more affluent individuals (Ford et al., 1991; Zakarian et al., 1994). Although sedentary behavior exists among all socioeconomic and educational strata, there appears to be a particularly strong inverse relationship between sedentary lifestyle and both income and education. In fact, 65% of individuals with an annual income of less than $15,000 reported the presence of sedentary lifestyles in the 1991 BRFSS (CDC, 1993). Ford and colleagues (1991) found that significantly greater numbers of higher SES women participated in significantly more leisure-time physical activity than lower SES women. In addition, higher SES women spent significantly more time each week in household-related physical activity than did lower SES women. In a study of educational differences in exercise among older adults, Clark (1995) found that individuals with 8 or fewer years of education were less active than individuals with 9 or more years of education. Some factors hypothesized to be associated with decreased exercise among individuals of a lower SES level have included limited disposable income for private health clubs, increased chance of residing in unsafe neighborhoods, decreased self-efficacy for exercising, and increased health and functional problems (Clark & Maddox, 1992).
Environmental/Social Determinants

Research in the exercise determinants literature has revealed multiple environmental variables significantly associated with exercise (Marcus, Bock, & Pinto, 1998; King et al., 1992). Variables such as blue-collar occupations and smoking behavior have been shown to create barriers to physical activity (Dishman, 1991). In an attempt to elucidate potential explanations for low community rates of exercise, Dubbert and colleagues (1994a,b) followed individuals in the community and asked them to keep diaries of their exercise behavior. After eight weeks of diaries, approximately half of the reported omissions from exercise episodes resulted from conflicting work and family demands. More direct determinants that influence exercise behavior negatively have included poor health (i.e. multiple chronic illnesses) and decreased functional status (i.e. Lee, 1993; Clark & Maddox, 1992).

Both physical and social environmental factors have been significantly associated with exercise and physical activity (Zakarian et al., 1994; Lee, 1993; Sallis et al., 1989). Consistent environmental factors shown to decrease exercise behavior include distance from exercise facilities, presence of children, lack of social support from others, and inclement weather conditions (King et al., 1992; Lee, 1993). The CDC (1999) has reported that one important barrier to consistent physical activity among high-risk groups (older adults, women, and minorities) is concern about neighborhood safety. The 1996 BRFSS examined perceived neighborhood safety and physical inactivity. Higher levels of perceived neighborhood safety were associated with lower levels of physical inactivity, especially among older individuals and racial minorities (Ford et al., 1991).

Social support has also been cited as having an effect on physical activity. In fact, Stephens and Craig (1990) reported that the percentage of people reporting receiving social
support or encouragement for exercise decreases markedly with age. Lee (1993) stated that only approximately 25% of women between ages 45-64 felt “encouraged” to exercise by others, drawing attention to the broader issue of societal influences on exercise behavior. Dishman (1991) stated that the most important characteristics of the environment associated with increased activity include accessibility of facilities, as well as those environments which remove real and perceived barriers to an exercise routine.

Summary of Determinants of Exercise Behavior

Nearly 60% of Americans have reported engaging in little or no exercise behavior (CDC, 1993). A closer look at recent reviews of exercise determinants literature has revealed that sedentary behavior is much higher in certain demographic subgroups (King et al., 1992, Dishman & Sallis, 1994; Marcus, Bock, & Pinto, 1998). Research has demonstrated that demographic variables such as gender, age, race, and income have strong associations with exercise behavior (Dishman & Sallis, 1994). Specifically, minority status, female gender, advanced age, and decreased educational and income level are highly negatively associated with exercise behavior (King et al., 1992). Environmental and social determinants of exercise such as neighborhood safety, access to facilities, and encouragement from others have also been shown to be heavily related to rate of exercise (Dubbert et al., 1994a,b, Dishman & Sallis, 1994; Sallis et al., 1989). While African-Americans, lower SES individuals, and older individuals appear to be among the most sedentary demographic subgroups in the United States population (King et al., 1992), few attempts have been made to develop methods to increase exercise behavior specifically among these demographic sub-groups. However, one theoretical model whose proponents claim has broad applications to a number of populations and has been gaining increasing empirical attention is the transtheoretical model of exercise behavior.
Transtheoretical Model of Exercise Behavior

Marcus and colleagues (1998) have suggested that understanding a complex behavior such as exercise is greatly facilitated through the use of theoretical models identifying constructs with predictive value. While many theoretical models have been developed to explain factors affecting rate and amount of exercise (Sonstroem, 1988), one of the more popular theories that has received increasing empirical attention is the transtheoretical model of behavior change (Prochaska & Marcus, 1994). The transtheoretical model combines an individual’s current behavioral status with his or her intention to maintain or change a particular behavior. Generally considered a model of cognition and behavior, the transtheoretical model received its name from the integration of aspects of the therapeutic change process across multiple theoretical systems of psychotherapy and behavior change, including psychodynamic, behavioral, and cognitive orientations (Prochaska, Johnson, & Lee, 1998). Original research with the transtheoretical model began in the area of smoking cessation (Prochaska & DiClemente, 1983), and has since expanded to include many health behaviors, such as illicit drug use, dietary fat consumption, condom use, and exercise behavior (Prochaska et al., 1994).

The transtheoretical model includes both the processes of change and the stages of change (SOC) (Prochaska & DiClemente, 1983). Processes of change tend to be either covert or overt processes that are used in the modification of a given behavior. Examples of the processes of change include consciousness raising, dramatic relief, environmental reevaluation, counterconditioning, reinforcement management, and stimulus control (Marcus, Bock, & Pinto, 1997). However, because it does not bear directly on the present study, the processes of change aspect of the transtheoretical model will not be reviewed.
Marcus, Rossi, Selby, Niaura, and Abrams (1992) provide a more thorough discussion of the processes of change aspect of the transtheoretical model as applied to exercise behavior.

The transtheoretical model of exercise behavior proposes that individuals engaging in exercise behavior progress through various stages of exercise adoption from Precontemplation (not currently exercising, and not intending to begin regular exercise in the next six months) to Contemplation (not currently exercising, but intending to start in the next 6 months), to Preparation (currently exercising occasionally, but not on a regular basis) to Action (currently exercising regularly but for less than 6 months) to Maintenance (currently exercising regularly for 6 months or longer; Marcus, Simkin, Rossi, & Pinto, 1996). Marcus and Simkin (1993) have commented that while individuals generally progress through these stages in a linear fashion, progress through the stages can occur in a cyclical manner, with individuals leaving and re-entering the stages at various points.

Proponents of the exercise SOC model (Prochaska & Marcus, 1994; Marcus & Simkin, 1993) have claimed that this theory has great predictive power in determining an individual's exercise behavior.

Increased attention has been devoted to quantifying and classifying an individual's stage of change for exercise behavior (Sonstroem, 1987; Sonstroem, & Amaral, 1986). Marcus, Selby, Niaura, and Rossi (1992) developed scales to measure SOC and self-efficacy for exercise behavior, and found both adequate internal consistency (.76) and high test-retest reliability (.90). Marcus and colleagues (1992) found that 34-39% of a sample of employees reported regularly participating in physical activity (Action or Maintenance stages). Marcus, Rossi, Selby, Niaura, and Abrams (1992) developed stages and processes of change questionnaires and administered them to a sample of 1172 participants in a worksite health promotion project.
Precontemplators used all ten processes significantly less than individuals in other stages. Subjects in the Preparation phase used behavioral processes more often than did subjects in the Contemplation phase. The use of experiential processes peaked in both the Action and Maintenance phases.

Research has shown that exercise SOC can directly predict exercise behavior. Specifically, Sonstroem (1988) classified 220 individuals into one of four modified stages of change (Precontemplators, Contemplators, Recruits, and Adherers) based on self-report of exercise history over the previous four years. Individuals who tended to be in a more active stage of exercise adherence also tended to have higher scores on belief statements about the utility of regular exercise. Marcus and colleagues (1992) showed that using the SOC model in designing an exercise intervention increased the effectiveness of the intervention, and actually led to a higher self-report level of exercise over a six-week period.

A main criticism of the transtheoretical model has been that evidence in support of this model was primarily limited to self-report data (Sutton, 1996, 1997; Marcus & Simkin, 1993; Prochaska & Marcus, 1994). However, recent evidence in support of the transtheoretical model has shown more objective evidence in support of the SOC model. For instance, Cardinal (1997) has demonstrated adequate construct validity of the SOC for exercise behavior using physiological data such as body mass index (BMI) and cardiorespiratory fitness.

Marcus & Simkin (1993) examined the concurrent validity of the exercise SOC instrument by comparing it with the Seven Day Physical Activity Recall Questionnaire (Blair, 1984), a common self-report measure of physical activity. Fifty-one percent of employees were participating in no exercise and 49% were participating in occasional or
regular exercise. Scores on physical activity behavior items significantly differentiated employees among the stages, demonstrating that this stage instrument had concurrent validity with a well-accepted physical activity instrument. Marcus, Eaton, Rossi, and Harlow (1994) conducted a study on 698 employees to examine the relationships among stage of exercise behavior, self-reported level of physical activity, self-efficacy for exercise, and decision-making for exercise. Level of physical activity at six months could be accurately predicted by knowledge of subjects’ stage of exercise behavior, perceptions of the costs and benefits of exercise, and self-efficacy for exercise.

The exercise SOC model has been used in practical applications as well. Marcus, Banspach, Lefebvre, Rossi, Carleton, and Abrams (1992) showed that using a subject’s stage of exercise adoption could be helpful in designing and conducting an activity intervention to enhance exercise adoption. Specifically, through enrollment in a six-week community-wide program designed to increase physical activity, written materials and activities specifically designed for an individual’s current stage of exercise participation were shown to move subjects through the stages of change. While this study did not include a control group of sedentary adults, Marcus and colleagues (1992) showed that targeting an individual’s stage of change can increase exercise behavior. Thus, the SOC model has been shown to have predictive power and practical utility. In an attempt to increase the predictive power of the SOC model, some researchers (Velicer et al., 1985; Marcus, Selby, Niaura, & Rossi, 1992) have integrated core constructs from other theoretical models.

Related Transtheoretical Constructs

Many adjunctive theoretical constructs have been used within the framework of the SOC model in an attempt to explore factors affecting an individual’s movement through the various stages of exercise behavior. Previous studies have concentrated on variables such
Decisional Balance

Decisional balance is a concept based on Janis and Mann's (1968, 1977) theoretical model of decision making. Initially applied to smoking by Velicer and colleagues (1985), decisional balance is a comparison of the perceived positive aspects (pros) and negative aspects (cons) of engaging or disengaging in a behavior. For smoking behavior, examples of pros might include the pleasure of smoking, tension reduction, and self-image factors, whereas cons might include health concerns, negative aesthetics, and lack of self-mastery (Velicer et al., 1985). Decisional balance variables were developed to describe and predict the salience of the patterns of use (pros) compared with the motivations for quitting (cons). Pros and cons of smoking have been shown to be successful in differentiating among the stages of change for smoking (Velicer et al., 1985). Decisional balance variables have also been applied to a wide variety of problem behaviors including illicit drug use, weight control, condom use, mammography screening, and exercise behavior (Prochaska et al., 1994).

Marcus, Rakowski, and Rossi (1992) developed a decisional balance measure for exercise similar to that used for smoking cessation (Velicer et al., 1985). A principal components analysis identified two factors: A 6-item component representing avoidance of exercise (Cons), and a 10-item component representing positive perceptions of exercise (Pros). Both the pros of exercise (increased health, energy, confidence, and positive feelings about one's body) and the cons of exercise (too tired, not enough time, physically...
uncomfortable) have been shown to be highly related to stage of change. Individuals in the Precontemplation phase have generally reported increased cons of exercise as opposed to pros, and individuals in the Action phase have generally reported higher rates of pros as opposed to cons of exercise behavior (Prochaska, 1994; Marcus, Eaton, Rossi, & Harlow, 1994). Decisional balance variables have been shown to lend prediction to the performance of exercise behavior in both cross-sectional and longitudinal studies (Marcus et al., 1994; Marcus, Rakowski, Rossi, 1992).

**Self-Efficacy**

Originally developed from Bandura’s (1977) theory, self-efficacy refers to an individual’s belief in his or her ability to execute a given behavior required to attain a specific outcome. Self-efficacy is believed to one critical component of behavior change (Bandura, 1986). As it related to health behaviors, self-efficacy is defined as an individual’s *behavior-specific* confidence in coping with high-risk situations without relapsing to unhealthy or high-risk behaviors (Prochaska, Johnson, & Lee, 1998). Many researchers have considered an individual’s self-efficacy to be highly related to the actual performance of that behavior (Bandura, 1986; Marcus & Owen, 1992; Clark & Nothwehr, 1999).

Self-efficacy has been hypothesized to be one of the essential self-regulatory skills necessary in the adoption and maintenance of exercise behavior (e.g., McAuley & Courneya, 1993; Dishman & Sallis, 1994). Self-efficacy has been linked to actual changes in physical activity in a number of studies. Sallis and colleagues (1986) showed self-efficacy to be important in predicting the adoption and maintenance of moderate and vigorous physical activity. Self-efficacy has been associated with higher levels of physical activity in both men and women (King et al., 1992; Marcus, Bock, & Pinto, 1997). Clark
and Nothwehr (1999) have stated that exercise self-efficacy is one of the most important and potentially modifiable predictors of physical activity. Researchers have pointed to the importance of self-efficacy as instrumental in predicting an individual’s readiness for exercise (McCauley, & Courneya, 1993; Courneya, 1995). The positive relationship between exercise and self-efficacy has been replicated in both cross-sectional and longitudinal models (Marcus et al., 1994). Those individuals with higher levels of self-efficacy for exercise are more likely to engage in exercise behavior irrespective of mood or presence of barriers (i.e. lack of facilities, not enough time). McCauley (1993) found that after controlling for biological and behavioral factors, exercise self-efficacy significantly predicted exercise behavior at a 4-month follow-up period among a sample of previously sedentary middle-aged adults. It thus appears that self-efficacy is a very important mediator of exercise behavior.

Movement through the SOC

The SOC model of behavior change was not designed solely to categorize an individual’s disengagement in high-risk behaviors (i.e. smoking) or engagement in health-promotion behaviors (i.e. exercise). Prochaska, Johnson, and Lee (1998) have stated that the SOC model should yield important practical applications about increasing (or decreasing) various health-related behaviors. Thus, the value of the exercise SOC model lies in its ability to predict and increase the level of exercise behavior among the general population. A theoretical model that claims to be able to predict behavior change should also consist of variables that will measurably clarify that prediction. In terms of predicting an individual’s movement through the SOC for exercise, the extant literature has focused primarily on decisional balance and self-efficacy variables (Marcus, Rakowski, & Rossi, 1992; Prochaska et al., 1994; Prochaska, 1994; Marcus, Eaton, Rossi, & Harlow, 1994).
Decisional balance constructs and the relative strength of the pros and cons of exercise behavior are factors that successfully predict movement through the stages of change (Prochaska, 1994). Prochaska, Johnson, and Lee (1988) have suggested that the pros of changing a behavior must increase twice as much as a decrease of the cons in order for an individual’s stage of change to progress forward. This is also known as the “strong” principle. Conversely, the “weak” principle states that progression from Precontemplation to Action is a function of an approximate .5 standard deviation change in the cons relative to the pros (Prochaska, 1994). The practical implication of these concepts is that twice as much emphasis should be placed on increasing the benefits of exercise as opposed to reducing the barriers to exercise.

Another construct shown to be associated with forward exercise stage movement is exercise self-efficacy. Marcus, Eaton, Rossi, and Harlow (1994) showed that an individual’s level of physical activity was predicted by knowledge of exercise self-efficacy. Exercise self-efficacy has also reliably differentiated between the various stages of change, with Precontemplators reporting the lowest self-efficacy and Maintainers reporting the highest self-efficacy (Marcus & Owen, 1992).

Despite the above-mentioned increasing body of knowledge on exercise behavior and SOC, relatively few studies have examined constructs outside of the transtheoretical model that may affect longitudinal movement through the exercise SOC (e.g., Marcus, Eaton, Rossi, & Harlow, 1994). Indeed, even internal transtheoretical variables (decisional balance and self-efficacy) have displayed limitations in predicting longitudinal movement through exercise SOC. Recently, Herzog and colleagues (1999) showed that the pros and cons of smoking failed to predict progressive stage movements at either a 1- or 2-year follow-up, leading to questions regarding the internal consistency of the SOC model. The
limitations of these theoretical constructs to adequately predict SOC movement has led to
strong criticism of the SOC model (Sutton, 1996, 1997).

As alluded to above, much of the published research on movement through the SOC
has focused on variables inherent in the trantheoretical model, such as processes of
change, pros and cons, and self-efficacy (Prochaska, Velicer, DiClemente, Guadagnoli, &
Rossi, 1991; Velicer, Rossi, Prochaska, & DiClemente, 1996; Prochaska, Johnson, & Lee,
1998). More recently, other lines of research have broadened the search for factors
important in moving people to a more active stage of exercise behavior (Reynolds et al.,
1990; Myers & Roth, 1997; Martin & Brantley, 1999). Myers and Roth (1997) found four
legitimate barriers to exercise (time effort, physical effort, social barriers, and specific
barriers such as bad weather, family obligations, and medical problems) that reliably
differentiated individuals across the stages of change for exercise behavior. These
researchers concluded that individuals with more practical barriers to exercise tended to be
in an earlier stage of change.

Dishman and Sallis (1994) have proposed that many environmental factors (i.e.
unsafe neighborhood, lack of time due to family responsibilities) as well as demographic
factors (such as low income or lack of access to facilities) may interfere with the
performance of exercise behavior. Likewise, Lepore (1995) has hypothesized that certain
populations (i.e. low-income individuals) tend to be exposed to chronically stressful,
environmental conditions, such as crowded households, persistent unemployment, unsafe
neighborhoods, and noise and air pollution. Lepore (1995) defines these persisting
conditions as chronic stressors, and notes the adverse effects these chronic stressors can
have in terms of maladaptive coping techniques and behavioral patterns. Among
individuals exposed to chronically stressful conditions, regular participation in exercise
behavior is likely to be quite limited. While these lines of research appear straightforward, conceptualization of environmental barriers to exercise as stressors has not been addressed in the exercise literature to date.

Alternatively, proponents of the SOC model have not addressed the manner in which external stressors may affect an individual’s readiness and aptitude for exercise. However, before demonstrating the empirical connections between stress and health-related constructs (such as illness, health behaviors, and physical activity), the commonly accepted conceptual models of stress will be reviewed.

**Conceptual Models of Stress**

Research on stress and its relationship to physical health has a long history that dates back to Cannon’s (1939) research on the “fight or flight” response, the concept of homeostasis, and the idea that an organism’s steady state of existence could be disrupted by strong emotional reactions. Selye (1950, 1956) originally coined the term “stress,” and conceptualized stress as a general, nonspecific response to external demands. Alternatively, Lacey (1950) emphasized the importance of the specificity of the stress response. He maintained that different individuals will respond to external demands with varying physiological reactions (i.e. cardiovascular, muscular, gastrointestinal), depending upon their dominant systemic response style. The popularity of “specificity” theories of stress and illness coincided with the development of Alexander’s (1950) specific-conflict hypothesis, in which individuals with certain personality features were predisposed to develop certain physical disorders. While empirical support for the specificity theory of stress response and the specific-conflict hypothesis has been inconclusive, it is clear that numerous definitions of stress in the literature have led to multiple methods of measuring the construct of stress.
Over the past 25-30 years, more recent attempts to define and measure the nature and effects of stress on individuals have encompassed a wide variety of perspectives. While some researchers have espoused the biological perspective of stress (Maier, Watkins, & Fleshner, 1994), others (Lazarus & Folkman, 1984) have emphasized the cognitive and environmental aspects of stress, such as appraisal of potential harm in the environment. Lazarus and Folkman (1984) have distinguished between primary appraisal (perception of a stimulus as threatening or non-threatening) and secondary appraisal (evaluation of coping resources to determine the extent to which the effects of a stressor may be minimized). According to this viewpoint, should the perception of threat be perceived to exceed coping and/or avoidance strategies, a negative emotional state will result. Viewed as a transaction between person and environment, stress is defined relative to an individual’s perception of his/her environment (Lazarus & Folkman, 1984). Cohen, Kessler, and Gordon (1995) have integrated many of the prevailing viewpoints of stress into a unifying definition encompassing many perspectives. These researchers state that stress involves “environmental demands (that) tax or exceed the adaptive capacity of an organism, resulting in psychological and biological changes that may place persons at risk for disease” (Cohen, Kessler, & Gordon, 1995, p. 3).

Major and Minor Stressors

Lazarus and Folkman (1984) and Cohen and colleagues (1995) have both emphasized the role of environmental factors in measuring stress. Frequently, those researchers attempting to test the environmental perspective of stress have employed a life events methodology (e.g., Zautra, Guarnaccia, & Dohrenwend, 1986; Turner, & Wheaton, 1995). Most environmental stress research over the past 15-20 years has examined the effects of major life events, such as the death of a family member, a divorce, or change of a
job, on individual functioning (Brown, 1989). Several important scales have been developed in this regard, including the Schedule of Recent Experience (SRE; Hawkins et al., 1957), the Social Readjustment Rating Scale (SRRS; Holmes & Rahe, 1967), and Life Experiences Survey (LES; Sarason, Johnson, & Seigel, 1977). Many studies have shown a significant relationship between major stressors and the development of medical and psychological disorders (Kobasa, 1979; Steptoe, 1997; Watson & Pennebaker, 1989).

While early literature (i.e., Dohrenwend & Dohrenwend, 1974) linking stress to adverse health outcomes heavily emphasized the impact of major life events on health status, more recent research has focused on the role of minor stressors in affecting health outcomes (e.g., Brantley & Jones, 1989; Kanner, Coyne, Schaefer, & Lazarus, 1981). Minor stressors (irritating, frustrating, and distressing events or demands characterizing everyday life) have received expanding research attention because of the frequency with which they occur relative to the occurrence of major stressors (Brantley & Jones, 1993). In addition, previous research comparing major and minor stressors has shown that minor stressors (such as driving in heavy traffic or having an argument with a spouse) have a greater impact on overall well-being than do major stressors (DeLongis, Coyne, Dakof, Folkman, & Lazarus, 1982; Holahan, & Holahan, 1987; Brantley & Jones, 1993).

Stress and Illness

Stressful life events are believed to be highly associated with the onset and development of various illnesses through both neuroendocrinological and behavioral pathways (Cohen, Kessler, & Gordon, 1995). In fact, Brantley & Garrett (1993) proposed four major paths between life events and illness. In their view, exposure to stressful life events may result in: (1) an alteration in physiological functioning, increasing the probability of disease or illness; (2) a reduction of the organism’s resistance to disease; (3)
a neurological hypersensitivity to excitation, leading to illness or arousal disorders; and (4) increased engagement in high risk behaviors or a subsequent inability to cope with stressful situations (Brantley & Garrett, 1993). While no definitive model of how stress may increase vulnerability to disease exists, the proposed pathways underscore the importance of considering multiple variables when exploring the stress-illness relationship.

Minor life events have also been shown to have a direct effect on illness symptom expression. Goreczny, Brantley, Buss, and Waters (1988) found that high-stress periods as identified by a minor stress inventory have been associated with a higher number of self-reported asthma and anxiety symptoms among asthmatics. An examination of stress and diabetes showed that blood glucose levels were significantly elevated on high-stress days (Goetsch, Abel, & Pope, 1994; Goetsch, Wiebe, Veltum, & Van Dorsten, 1990). A clear association has also been demonstrated between minor stressors and exacerbation of bowel signs and pain symptoms in Crohn’s disease patients (Garrett, Brantley, Jones, & McKnight, 1991). Other areas of symptom prediction and association in relation to the minor stress include migraine and muscle-contraction headaches (Mosley, Penzien, & Johnson, 1991), symptom exacerbation among lupus patients (Adams, Dammers, Saia, Brantley, & Gaydos, 1994), physical and emotional symptoms of post-concussive syndrome (Gouvier, Cubic, Jones, Brantley, & Cutlip, 1992), and general somatic complaints and symptoms of autonomic arousal among both college students (Waters, Rubman, & Hurry, 1993) and paramedics (Boudreaux et al., 1995). Therefore, the ability of minor stress measures to detect daily changes in symptoms of medical disorders has been adequately demonstrated in the literature. However, both minor and major stressors have also been hypothesized to have adverse effects on more general health-related behaviors.
Stress and Health-Related Behaviors

Previous research has suggested several potential connections between stressful life events and the practice of health behaviors (Griffin, Friend, Eitel, & Lobel, 1993). For the purposes of this review, health-related behaviors are conceptualized as behaviors performed with the intent of health promotion, (i.e. dieting, exercising, or preventive behavior such as sunscreen use), prevention or reduction of high-risk behaviors, (i.e. quitting smoking or decreasing alcohol use), or adherence to one’s medical regimen, (i.e., following through on medical appointments, taking prescription medication, etc.; Steptoe, 1997). Griffin, Friend, Eitel, and Lobel (1993) have suggested that stress indirectly affects overall health-related behaviors by increasing high-risk behaviors and decreasing health promotion behaviors. Previous studies have confirmed that individuals often engage in high-risk behaviors in an attempt to reduce the tension or aversive emotional state often associated with the experience of excessive stress (Roth, 1989; Wills, 1986; Carmody, 1989). Wills (1986) found that subjective measures of stress were positively associated with alcohol and cigarette use among adolescents. Schachter and colleagues (1977) found that smokers tended to smoke more during high-stress as opposed to low-stress situations. Hellerstedt and Jeffery (1997) found high levels of occupational stress to be positively associated with smoking and high-fat intake in men, and associated with higher BMI and increased smoking intensity in women.

Stress has also been suggested to hinder an individual’s performance of overall, global health behaviors (Wiebe & McCallum, 1986). The hypothesis that stress suppresses the performance of positive health behaviors has received substantial empirical support (Aldana, Sutton, Jacobson, & Quirk, 1996; MacLean, 1992; Stetson, Rahn, Dubbert, Wilner, & Mercury, 1997; Groer, Thomas, Droppleman, & Younger, 1994; Lindquist,
Beilin, & Knuiman, 1997; McCann, Retzlaff, Dowdy, Walden, & Knopp, 1990). In fact, attempts to reduce stress through a structured stress management have resulted in higher rates of health promotion behaviors, such as increased emphasis on proper nutrition, as well as increased fitness (Kantor, Schomer, & Louw, 1996).

**Stress and Physical Activity**

Stetson and colleagues (1997) have proposed one hypothetical relationship between stress and leisure-time physical activity. These researchers believe that coping with stressors drains an individual's overall resources, and thus people with chronically high levels of stress do not have the resources to engage in leisure-time physical activity on a regular basis. Thus, stress can affect overall quality of life and general functioning, as well as the willingness and capabilities of an individual to engage in leisure-time physical activity. Other researchers have theorized that stress may in fact lead to a priority shift in regard to health behaviors, and coping with immediate demands or threats may take precedence (Griffin, Friend, Eitel, & Lobel, 1993). In other words, during times of stress, individuals may perceive performance of leisure-time physical activity as simply another stressor. To support this contention, Stetson and colleagues (1997) examined the effects of major and minor stress prospectively on exercise adherence in community-residing women. These authors found that perceived obstacles to exercise, including lack of time and family demands, were associated with lower levels of self-reported activity. In addition, over an 8-week sampling period, this sample of women (during weeks of high perceived stress) omitted significantly more planned exercise sessions, indicated less enjoyment and satisfaction of exercise performed, and reported lower self-efficacy for meeting upcoming exercise goals. As this area of research has more fully developed, expanding numbers of studies have begun to support the concept that stressors negatively impact regular
participation in leisure-time physical activity (Aldana, Sutton, Jacobson, & Quirk, 1996; Myers & Roth, 1997; Kantor, Schomer, & Louw, 1996; Wiebe & McCallum, 1985; Martin & Brantley, 1999).

Exercise SOC in Low-Income, Primary Care Patients

As previously suggested, the primary care clinic has been increasingly recognized as an environment in which health professionals can work to promote regular physical activity (Lewis et al., 1991; Will, Demko, & George, 1996). Primary care patients not engaging in leisure-time physical activity have been shown to perceive their health as significantly poorer than primary care patients engaging in regular leisure-time physical activity (Scarinci, Jones, Mehan, & Brantley, 1997). However, the existing studies on exercise SOC have mainly been conducted using university students (Myers & Roth, 1997), employees in a workplace setting (Marcus & Owen, 1992), or highly educated Caucasian participants (Marcus, Banspatch, Lefebvre, Rossi, Carleton, & Abrams, 1992). These samples are clearly demographically specific, and thus may not generalize to other demographically specific segments of the U.S. population (i.e., lower-income, African-American, primary care patients; Solomon, Secker-Walker, Skelly, & Flynn, 1996).

Unfortunately, there appears to be a significant disparity between the characteristics of individuals least likely to engage in physical activity (i.e. older, African-American, low-income, females, with both limited access to exercise facilities and exposure to unsafe neighborhoods), and the characteristics of individuals on whom most studies conducted regarding exercise SOC have been conducted (e.g. Marcus et al., 1992). Clearly, while some research has been performed in this area (King et al., 1992; Dishman & Sallis, 1994; Duelberg et al., 1992), the continued need for more research regarding perceived obstacles to regular exercise among this demographic subgroup exists (Marin et al., 1995).
While proponents of the trantheoretical model claim that exercise SOC can facilitate the promotion of exercise behavior among many populations, there has been surprisingly little data collected on exercise SOC among a primary care population. Cowan, Logue, Milo, Britton, and Smucker (1997) examined whether exercise stage of change was positively associated with exercise self-efficacy in patients attending primary care clinics. These researchers found that among 182 primary care patients, 15% were in Precontemplation, 15% were in Contemplation, 50% were in Preparation, 7% were in Action, and 13% were in Maintenance stages of change. These data again demonstrate the surprisingly high amount of sedentary behavior in primary care setting (80% not exercising at the recommended standards). While Cowan and colleagues (1997) concluded that movement through the stages of exercise behavior could be encouraged by clinical interventions to increase exercise self-efficacy, they did not specifically examine determinants of movement to more active stages of change. In another study of exercise self-efficacy among primary care patients, Clark and Nothwehr (1999) found environmental barriers (including bad weather, crime, no place to sit down, and no or poor sidewalks) accounted for 31% of the variance in an individual’s self-reported self-efficacy for exercise. It thus appears that while preliminary factors have been examined among primary care patients, much research needs to be done to further elucidate the factors affecting exercise behavior in this population.

Rationale for the Present Study

The effect of positive health behaviors such as leisure-time physical activity on decreased self-reported stress has been firmly established in the medical and psychological literature (Steptoe & Cox, 1988; Nicoloff & Schwenk, 1995; Steptoe, Kimbell, & Basford, 1998; Applegate, Rohan, & Dubbert, 1999). However, few studies (e.g., Stetson et al.,
1997) have examined the converse of this proposition, namely the effect of stress on physical activity. However, mounting evidence appears to support the adverse impact of stressors on an individual’s health practices (Aldana, Sutton, Jacobson, & Quirk, 1996; MacLean, 1992; Groer, Thomas, Droppeleman, & Younger, 1994; Linquist, Beilin, & Knuiman, 1997). Preliminary connections made between stress and physical activity have suggested that stressful events may impact health behaviors by disrupting an individual’s ability to engage in physical activity or by increasing indulgence in negative health-related behaviors antithetical to exercise (Martin & Brantley, 1999). In addition, the lack of regular exercise behavior occurring among lower socioeconomic individuals attending primary care clinics may be explained to some degree by chronically stressful environmental and social factors limiting this participation.

As previously discussed, the exercise SOC model has been shown to be quite reliable and effective in predicting consistent exercise behavior (Marcus & Owen, 1992). However, examinations of the factors affecting forward stage movement have been mostly limited to the constructs of self-efficacy and decisional balance (Prochaska & Marcus, 1994; Marcus, Rakowski, & Rossi, 1992; Marcus, Selby, Niarua, & Rossi, 1992). Thus, the impact of more objective, discrete events (i.e., major and minor stressors) on stage movement has not yet been determined. In addition, previous studies in the area of exercise SOC have primarily focused on cross-sectional relationships between decisional balance and self-efficacy variables, to the exclusion of prospective analyses (i.e. Prochaska, 1994; DiClemente et al., 1991). Indeed, Herzog, Abrams, Emmons, Linnan, and Shadel (1999) recently reported that baseline processes of change as well as pros and cons of smoking failed to predict stage movement at 1- and 2-year follow-up points, displaying the limitations of the SOC model in predicting longitudinal stage movement.
It is clear that gaps currently exist in both the determinants of exercise literature as well as the exercise SOC literature. The current study attempted to address some of the previous limitations of these two lines of research by examining, through the framework of the transtheoretical model of exercise behavior, the relationships between major and minor stressors and physical activity. In addition, the current study attempted to examine the differences between the pattern of relationships of transtheoretical variables in a low-income, minority population.

**Research Questions and Hypotheses**

The present study investigated the following specific research questions (See Figure 1).

Research Question #1: Do low-income patients attending primary care clinics exhibit a similar pattern of relationships among exercise SOC, decisional balance, and self-efficacy variables that has been demonstrated with other samples? This research question was addressed in 3 parts:

1 A) To what extent is the distribution of stages for the exercise SOC model among a low-income primary care population similar to other populations on which previous research has been conducted (i.e., Marcus & Owen, 1992)? It was hypothesized that the nature and severity of the chronic stressors reported by this population would be reflected in a higher number of individuals being categorized in the “inactive” stages of exercise behavior (i.e. Precontemplation, Contemplation, Preparation). Previous studies of the SOC model for a variety of high-risk behaviors (e.g., Prochaska, 1994; Prochaska, Johnson, & Lee, 1998) have supported a general “rule of thumb” regarding (inactive) stage distribution of individuals engaging in high risk behaviors: 40% of the population is in Precontemplation, 40% in Contemplation, and 20% in Preparation. It was hypothesized that upon initial assessment, this population would be distributed such that approximately 60-70% of the
subjects fell in the Precontemplation and Contemplation stages, whereas approximately 10-15% fell in the Preparation stage, and 5-10% fell in the Action and Maintenance phases. This hypothesized distribution reflected previous studies conducted among these types of individuals which clearly show low-income individuals to be over-represented in the inactive stages of behavior change (i.e. Boudreaux, Carmack, Scarinci, & Brantley, 1998; Carmack, Scarinci, Boudreaux, Cahill, & Brantley, 1996).

1B) To what degree can the functional inter-relationships between exercise SOC, decisional balance, and self-efficacy for exercise serve as a higher-order validation of the transtheoretical model? It was hypothesized that the exercise SOC model validated among other populations (i.e. Marcus & Owen, 1992) would contain a similarly established level of inter-relationships among a low-income, primary care population. Previous research has shown that progress from Precontemplation to Contemplation involves an increase in the pros of changing, while progress from Contemplation to Action involves a decrease in the cons of changing (Prochaska, 1994; Prochaska, Johnson, & Lee, 1998). In addition, higher self-efficacy is associated with progress across the stages of change (Velicer, DiClemente, Rossi, & Prochaska, 1990). Decisional balance variables have also been identified as accurate predictor variables (Prochaska, DiClemente, Velicer, Ginpil, & Norcross, 1985). In the current study, two attempts were made to validate the transtheoretical model. First, the degree of association between the constructs of self-efficacy and decisional balance measures assessed at baseline and stage of change was determined. Second, the relationships between self-efficacy, decisional balance, and stage of change one month later were determined.

1C) How strongly are the constructs of exercise SOC, decisional balance, and exercise self-efficacy associated with self-reported physical activity among a low-income, primary care
minority population? It was hypothesized that individuals with lower self-efficacy and higher numbers of "cons" for exercise at an initial assessment would have lower levels of physical activity one month later. Alternatively, individuals with higher numbers of "pros" for exercise at initial assessment were hypothesized to have higher levels of physical activity at one-month follow-up. Regarding SOC, those individuals in the later stages of exercise behavior (i.e. Action and Maintenance) were hypothesized to have higher levels of physical activity than those individuals at earlier stages of exercise behavior (Precontemplation, Contemplation, and Preparation). Numerous studies have supported self-efficacy as an important construct in the initiation and maintenance of regular physical activity (Clark & Nothwehr, 1999; Marcus, Selby, Niaura, & Rossi, 1992). Thus, it appears a logical hypothesis that these constructs would be applicable to a variety of populations, including a low-income, primary care population.

Research Question #2: How are major and minor stressors associated with self-reported physical activity directly? It was hypothesized that, consistent with recent research in this area (Stetson et al., 1997), increased report of major and minor stressors would be concurrently associated with less self-reported physical activity.

Research Question #3: To what extent are the frequency and severity of major and minor stressors experienced over a 1-month period associated with directional stage membership change? It was hypothesized that higher amounts and/or more severe major and minor stressors would be associated with backward stage movement (i.e. moving from the Preparation to Contemplation stage). Additionally, lower amounts of stress were hypothesized to be associated with forward movement in the exercise SOC model. Previous research has suggested that the concepts of decisional balance and self-efficacy, while important to the prediction of stage membership, do not account for the majority of
the variance in forward stage movement (Herzog et al., 1999). In addition, SOC proponents have not addressed the role of tangible environmental variables as barriers to regular physical activity. Thus, a theoretical basis exists to support the hypothesized relationships between stressors and exercise SOC.
METHOD

Participants

Participants consisted of 554 predominantly low-income patients over the age of 18 attending primary care clinics from four separate sites in Louisiana. The sites included: Earl K. Long Medical Center in Baton Rouge, Louisiana; Baton Rouge General Medical Center in Baton Rouge, Louisiana; Conway Hospital in Monroe, Louisiana; and University Medical Center in Lafayette, Louisiana. Both government-insured (Medicare, Medicaid, or both) and indigent patients were eligible to participate. Subjects were chosen from these four settings to have an equal distribution from urban and rural settings. In addition, to avoid restriction of range, patients from non-charity hospitals (i.e. Baton Rouge General Hospital, which services a high number of patients with private insurance) were recruited as well. As can be seen from the Results section, subjects were predominantly low-income, though there was a substantial range of incomes, some of which were not low-income.

The U.S. Bureau of the Census has classified adults at or below 200% of the poverty line in the low-income bracket. In 1999, the poverty threshold was an annual income of $8,667 for one person under 65 years in the household (U.S. Bureau of the Census, 2000). Therefore, individuals earning $17,334 or less qualified as low-income. The poverty threshold for families has employed a formula that considers the total number of individuals in the family. For example, the poverty threshold for a family of three has been set at $13,032. Accordingly, a family of three has been considered low-income if their total annual income does not exceed $26,064.
Measures

Demographics Questionnaire. This questionnaire was designed for the purposes of the current study, and included information regarding age, gender, occupational status, marital status, race, educational level, number of people in household, monthly income, insurance status, height, weight, and contact information. Subjects completed this demographic questionnaire at Time 1.

Behavioral Risk Factor Surveillance Survey (BRFSS) (CDC, 1994). The BRFSS questionnaire has been widely used to measure high-risk behavior among adults over 18 years old. The BRFSS was developed from telephone surveys conducted by the CDC and others to assess the prevalence of high-risk behaviors on a population-wide scale (CDC, 1994). The BRFSS focuses on behaviors that are related to one or more of the 10 leading causes of death. The questionnaire has been divided into three major sections: (1) A series of core sections asked by all states; (2) standardized modules of questions on selected topics that are developed by the CDC and added at the discretion of each state; and (3) questions developed and administered by a particular state to meet its own needs (Siegel et. al., 1993).

Subjects completed a BRFSS at Time 1 that included information regarding health status, physical activity, tobacco use, nutrition, and dietary fat intake. At Time 2, subjects were again administered a modified version of the BRFSS that included these sections, plus sections regarding women's health, hypertension awareness, cholesterol awareness, and colorectal cancer screening. The reliability coefficients for the high-risk behaviors have been reported to be above .70 in a statewide sample (Stein, Lederman, & Shea, 1993). Test-retest reliability has also been reported to be high in a tri-ethnic population (Shea, Stein, Lantingua, & Basch, 1991). On the basis of responses to these three above-specified sections, the following categories of physical activity were identified as outcome variables:
(1) leisure-time physical activity, or engaging in any leisure-time physical activity (e.g.,
walking, swimming, running) in the previous month; (2) job-related physical activity, or
engaging in walking, standing, and lifting heavy objects in an occupational setting; (3)
housework-related physical activity, or engaging in light and moderate household chores;
and (4) total physical activity, or the total energy expenditure including leisure-time
physical activity, job-related physical activity, and housework-related physical activity
reported in the previous month. A particular metabolic equivalent (MET) was attributed to
each physical activity as proposed by Ford and colleagues (1991). The energy expenditure
was then calculated for each activity according to the formula: Kcal/week = METs X
hours/week X weight in kilograms (Ford et al., 1991). Therefore, kcals/week were
generated for each activity. In order to obtain a total of expenditure of energy/week by
each subject, a sum of the kcal/week for each activity was obtained. The definitional
criteria of regular exercise behavior for the 1994 BRFSS was based on the 1985 National
Health Interview Survey (NHIS; Caspersen, Christenson & Pollard, 1986) and the
American College of Sports Medicine’s (1990) recommendation that adult Americans
should engage in at least 20 minutes of moderate physical activity on three or more days per
week.

Life Experiences Survey (LES) (Sarason, Johnson, & Siegel, 1978). The LES was a
60-item questionnaire that asks subjects to indicate major stressors they have experienced
over the past 12 months, as well as over the two separate 6-month periods within that
inclusive year. In addition, the LES was designed to assess the extent to which each event
produced a positive, negative, or neutral impact when it occurred. Thus, the LES measured
both the number and intensity of stressors experienced over the past year. Sarason,
Johnson, and Siegel (1978) have reported reliability coefficients for scores associated with
negative events ranging from .56 to .88, and coefficients for total events ranging from .63 to .64. The following areas of major stress are sampled on the LES, and represent the typical nature of major life events surveyed: death of a spouse/close family member, detention in jail, changed work situation, serious illness/divorce, and leaving home for the first time. For purpose of the present study, only data regarding total number of life events experienced within a 6-month and 12-month period were collected. In addition, due to previously established relationships between events, intensity, and other psychological constructs, only event data were collected in the present study to minimize potential confounds with other measures (Brantley, Waggoner, Jones, & Rappaport, 1987).

The Hassles Scale (Kanner et al., 1981; DeLongis, Coyne, Dakof, Folkman, & Lazarus, 1982). A 117-item scale, the Hassles Scale was designed to measure the number of minor life events occurring over the past month. Items reflected aversive events in the following domains: work, health, family, friends, the environment, and chance occurrences. The Hassles Scale was designed to yield 3 summary scores: frequency, a simple count of the number of items checked (ranging from 0 to 117), cumulated severity, sum of the 3-point severity ratings (ranging from 0 to 351), and intensity (cumulated severity divided by frequency, ranging from 0 to 3). The intensity score was designed to be an index of how strongly the average hassle is experienced. Kanner and colleagues (1981) have reported a high test-retest reliability of .79 over a nine-month period for frequency of occurrence, and a reliability index of .48 for severity. The following topics appeared on the Hassles Scale, and represented the typical nature of minor life events surveyed: misplacing or losing things, problems getting along with fellow workers, concerns about money, not enough money for food/basic necessities, concerns about general health, neighborhood deterioration, declining physical abilities, and problems with one’s children.
The Hassles Scale was selected over other measures of minor stress such as the Daily Stress Inventory (DSI; Brantley & Jones, 1989; Brantley et al., 1988) and the Weekly Stress Inventory (WSI; Brantley, Jones, Boudreaux, & Catz, 1997) primarily due to the Hassles Scale's sampling period of one month, corresponding contiguously to the length of time between Time 1 and Time 2. For purposes of the present study, only data regarding frequency of minor life events experienced were collected. A similar rationale was used for this selective data collection as was used with the major life events data.

**[Exercise] Decisional Balance Questionnaire (DBQ)** (Marcus & Owen, 1992). The DBQ was designed to assess the nature and degree to which individuals consider the advantages (“pros”) and disadvantages (“cons”) of engaging in regular physical activity. A 16-item questionnaire, the DBQ was adapted from a larger measure developed by Marcus, Rakowski, and Rossi (1992). Internal consistencies of .70 for the Exercise Pros items and .56 for the Exercise Cons item have been reported in the literature (Marcus & Owen, 1992). The DBQ has been shown to have adequate psychometric properties (Marcus, Eaton, Rossi, & Harlow, 1994). Higher scores on the Exercise Pros subscale indicated the extent to which individuals consider the advantages of engaging in regular physical activity. The Exercise Cons subscale indicated the degree to which individual consider the disadvantages of engaging in regular physical activity. The Exercise Pros-Cons subscale was a reflection of the relative strength of an individual’s consideration of the advantages of regular physical activity when considering the disadvantages as well. The following items appeared on the DBQ, and were representative of the general nature of this questionnaire:

- I would have more energy for my family friends if I exercised regularly. (Pro)
- I think I would be too tired to do my daily work after exercising. (Con)
- I would feel less stressed if I exercised regularly. (Pro)
Regular exercise would take too much of my time. (Con)

Subjects answered on a Likert-type scale from 1 (Not Important) to 5 (Extremely Important), indicating how important these opinions were in the decision to regularly engage in exercise behavior.

**[Exercise] Self-Efficacy Questionnaire (SEQ)** (Marcus, Selby, Niaura, & Rossi, 1992). The SEQ was designed to assess the confidence that individuals have to engage in regular exercise behavior despite barriers that might exist. A 5-item measure, the SEQ has been shown to possess adequate internal validity (alpha = .82), high test-retest reliability over a two week period (alpha = .90), and high internal consistency (Marcus, Selby, Niaura, & Rossi, 1992). A sample SEQ item is “I am confident I can participate in regular exercise when I am tired.” A 7-point scale was used to rate each item ranging from not at all confident (1) to very confident (7). Subjects could also endorse does not apply to me (0). Higher scores indicated the increased confidence regarding the performance of regular exercise behavior in the face of potential obstacles.

**[Exercise] Stages of Change Questionnaire (SOCQ)** (Marcus & Owen, 1992). The full exercise SOCQ was a 13-item questionnaire designed to measure an individual’s readiness to engage in regular exercise behavior. This questionnaire was similar to one developed for smoking cessation (Prochaska & DiClemente, 1983), and has been shown to have adequate concurrent validity, as demonstrated by its significant association with the Seven-Day Recall Physical Activity Questionnaire (Marcus & Simkin, 1993). The kappa index of reliability over a 2-week period was .78 (Marcus, Selby, Niaura, & Rossi, 1992), thus demonstrating adequate reliability. The SOCQ was designed to place subjects into one of the following stages: Precontemplation, Contemplation, Preparation, Action, or
Maintenance. The present study used a modified version of the SOCQ, consisting of one question regarding engagement in regular exercise.

For purposes of the current study, the SOCQ was embedded among other questions regarding exercise behavior in the following way. Subjects were asked to respond to the following question: “Do you currently engage in regular exercise for 20 minutes or longer for 3 times or more per week?” Subjects were presented with the following choices, and placed into the stage corresponding to the item they endorsed:

Yes, I have been for MORE than 6 months. [Maintenance]
Yes, I have been, but for LESS than 6 months. [Action]
No, but I intend to in the next 30 days. [Preparation]
No, but I intend to in the next 6 months. [Contemplation]
No, and I do NOT intend to in the next 6 months. [Precontemplation]

Procedure

The current study was part of a larger, ongoing study funded by a State of Louisiana legislative grant regarding high-risk behaviors and health promotion among patients attending primary care clinics. Participants were randomly selected while attending scheduled clinic appointments. A table of random numbers was used to select patients based on their order on daily appointment lists at each clinic. Informed consent was obtained and information was given regarding the purpose of the study (see Appendix 4). The information given did not describe the study’s hypotheses and was written so as to minimize experimenter-demand bias. Participants were administered the demographics questionnaire, BRFSS, DBQ, SEQ, and SOCQ (Time 1). Participants were compensated $25 for participation in this part of the study. Participants were then phone-interviewed one month later and administered the BRFSS, Hassles Scale, LES, and SOCQ (Time 2).
Participants were given an additional $10 as compensation for participation in the follow-up phase of this study. Medical records were reviewed by graduate research assistants to record diagnosed chronic illnesses. Appendix 2 provides a summary of the questionnaires relevant to this study given at Time 1 and Time 2.
RESULTS

Descriptive Analyses

Descriptive analyses were performed to yield information regarding the demographics, physical activity categories, and scale scores. In addition, analyses were conducted to assess for the extent to which demographic variables were significantly related to the major outcome variables of interest.

Demographics. As Tables 1 and 2 indicate, the mean age was 45; approximately 60% of the sample were African American; 81% were female; 42% were unemployed; and 43% were married. The average amount of education completed was approximately 11 years, and nearly 50% of the sample reported not completing high school.

The percentage of the sample that was overweight was also calculated. The standard criteria for obesity has been based on an individual's body mass index (BMI) which equals weight in kilograms divided by height in meters squared (Van Itallie, 1985). The cutoff BMI scores for obesity have been established as 27.3 for females and 27.8 for males, based upon the second National Health And Nutrition Examination Survey (NHANES-II; Van Itallie, 1985). The mean BMI of the present sample was approximately 31, and analyses revealed that over 65% of the sample met criteria for obesity. Obesity rates among the general population have been estimated at approximately 33% (Williamson, 1995).

Also as Table 2 indicates, approximately 72% of the sample were diagnosed with at least one chronic medical illness (e.g., diabetes, hypertension, asthma), as determined through medical chart review. Many subjects met criteria for more than one chronic illness. In fact, over 22% of the subjects were diagnosed with three or more chronic illnesses. The mean household income was under $500 per month, indicating that this sample was
composed predominately of low-income individuals. An independent samples t-test revealed that African-American reported significantly less total monthly household income than did Caucasian subjects [$975 versus $1118, respectively; \( t(1, 484) = 2.33, p < .05 \)].

The majority of the sample had no medical insurance (70%), while 22% had Medicaid, Medicare, or both. A summary of other relevant demographic information is presented in Tables 1 and 2.

**Table 1: Demographic Data (Part 1)**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean (S.D.)</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>45.34 (14.08)</td>
<td>18 – 87</td>
</tr>
<tr>
<td>Educational Level (# of Years)</td>
<td>10.94 (2.84)</td>
<td>0 – 19</td>
</tr>
<tr>
<td>Avg. Monthly Household Income</td>
<td>$490 ($453)</td>
<td>$0 – 3000</td>
</tr>
<tr>
<td>Number of Chronic Illnesses</td>
<td>1.52 (1.46)</td>
<td>0 – 7</td>
</tr>
<tr>
<td>Body Mass Index (BMI)</td>
<td>30.98 (7.99)</td>
<td>16.15 – 65.29</td>
</tr>
</tbody>
</table>

S.D. = Standard Deviation

**Table 2: Demographic Data (Part 2)**

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>107</td>
<td>19%</td>
</tr>
<tr>
<td>Female</td>
<td>447</td>
<td>81%</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>217</td>
<td>39%</td>
</tr>
<tr>
<td>African-American</td>
<td>332</td>
<td>60%</td>
</tr>
</tbody>
</table>

(table continued)
<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other</td>
<td>5</td>
<td>1%</td>
</tr>
</tbody>
</table>

**Marital Status**

<table>
<thead>
<tr>
<th>Status</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single</td>
<td>139</td>
<td>25%</td>
</tr>
<tr>
<td>Married</td>
<td>238</td>
<td>43%</td>
</tr>
<tr>
<td>Separated</td>
<td>31</td>
<td>6%</td>
</tr>
<tr>
<td>Divorced</td>
<td>90</td>
<td>16%</td>
</tr>
<tr>
<td>Widowed</td>
<td>56</td>
<td>10%</td>
</tr>
</tbody>
</table>

**Employment Status**

<table>
<thead>
<tr>
<th>Status</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employed</td>
<td>218</td>
<td>39%</td>
</tr>
<tr>
<td>Unemployed</td>
<td>233</td>
<td>42%</td>
</tr>
<tr>
<td>Retired</td>
<td>43</td>
<td>8%</td>
</tr>
<tr>
<td>Disabled</td>
<td>55</td>
<td>10%</td>
</tr>
<tr>
<td>Student</td>
<td>5</td>
<td>1%</td>
</tr>
</tbody>
</table>

**Health Insurance**

<table>
<thead>
<tr>
<th>Insurance</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private</td>
<td>42</td>
<td>8%</td>
</tr>
<tr>
<td>Medicaid</td>
<td>60</td>
<td>11%</td>
</tr>
<tr>
<td>Medicare</td>
<td>32</td>
<td>6%</td>
</tr>
<tr>
<td>Medicaid &amp; Medicare</td>
<td>25</td>
<td>5%</td>
</tr>
<tr>
<td>None</td>
<td>394</td>
<td>70%</td>
</tr>
</tbody>
</table>

**# of Chronic Illnesses**

<table>
<thead>
<tr>
<th>Illnesses</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 Chronic Illnesses</td>
<td>153</td>
<td>28%</td>
</tr>
</tbody>
</table>

(table continued)
Demographic Differences in Physical Activity. Table 3 displays participants' reports of six categories of physical activity engaged in at Time 1 and Time 2. It should be noted that all data presented at Time 2 (N= 475) represents study subjects who could be contacted at follow-up via telephone assessment. As can be seen from Table 3, paired samples t-tests revealed significant differences in all categories of physical activity at Time 1 and Time 2. Specifically, at Time 2, subjects reported engaging in significantly more leisure-time physical activity, less job-related, light, moderate and total housework-related physical activity, and less overall physical activity (all categories combined) as compared to Time 1.

### Table 3: Comparison of Time 1 and Time 2 Physical Activity

<table>
<thead>
<tr>
<th>Physical Activity Category*</th>
<th>T1 Mean (S.D.)</th>
<th>T2 Mean (S.D.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>517.28** (1174.18)</td>
<td>640.75 (1230.85)</td>
</tr>
<tr>
<td>b</td>
<td>2236.47** (4119.70)</td>
<td>2069.98 (3580.41)</td>
</tr>
<tr>
<td>c</td>
<td>1856.43** (1958.46)</td>
<td>1634.26 (2402.25)</td>
</tr>
<tr>
<td>d</td>
<td>833.60** (2226.72)</td>
<td>472.76 (1337.62)</td>
</tr>
<tr>
<td>e</td>
<td>2695.65** (3370.56)</td>
<td>2107.01 (2941.61)</td>
</tr>
<tr>
<td>f</td>
<td>5458.49** (5712.81)</td>
<td>4778.44 (4906.43)</td>
</tr>
</tbody>
</table>

(table continued)
The data were examined to determine if differences in physical activity existed across demographic variables, specifically gender, race, age, years of education, monthly income, and BMI. Males were found to engage in significantly more leisure-time physical activity and job-related physical activity as compared to females. Females reported engaging in higher amounts of light and total housework-related physical activity. Tables 4 and 5 illustrate these gender-based differences in self-reported kilocalorie expenditure at Time 1 and Time 2.

**Table 4: Gender Differences in Physical Activity (Time 1)**

<table>
<thead>
<tr>
<th>Physical Activity Category*</th>
<th>Males</th>
<th>Females</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>1061.02</td>
<td>385.85</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>b</td>
<td>3360.46</td>
<td>1941.88</td>
<td>.001</td>
</tr>
<tr>
<td>c</td>
<td>1075.54</td>
<td>1973.07</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>d</td>
<td>836.52</td>
<td>906.15</td>
<td>.767</td>
</tr>
<tr>
<td>e</td>
<td>1877.94</td>
<td>2886.30</td>
<td>.004</td>
</tr>
<tr>
<td>f</td>
<td>6234.76</td>
<td>7658.74</td>
<td>.114</td>
</tr>
</tbody>
</table>

* a - kilocalories expended during leisure-time physical activity  
  b - kilocalories expended during job-related physical activity  
  c - kilocalories expended during light housework-related physical activity  
  d - kilocalories expended during moderate housework-related physical activity  
  e - kilocalories expended during total housework-related physical activity  
  f - kilocalories expended during total physical activity
Table 5: Gender Differences in Physical Activity (Time 2)

<table>
<thead>
<tr>
<th>Physical Activity Category*</th>
<th>Males</th>
<th>Females</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>1217.13</td>
<td>509.98</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>b</td>
<td>3510.41</td>
<td>1951.88</td>
<td>.001</td>
</tr>
<tr>
<td>c</td>
<td>900.32</td>
<td>1796.05</td>
<td>.003</td>
</tr>
<tr>
<td>d</td>
<td>319.23</td>
<td>504.41</td>
<td>.281</td>
</tr>
<tr>
<td>e</td>
<td>1219.55</td>
<td>2297.69</td>
<td>.004</td>
</tr>
<tr>
<td>f</td>
<td>6009.11</td>
<td>4779.19</td>
<td>.063</td>
</tr>
</tbody>
</table>

* a - kilocalories expended during leisure-time physical activity  
  b - kilocalories expended during job-related physical activity  
  c - kilocalories expended during light housework-related physical activity  
  d - kilocalories expended during moderate housework-related physical activity  
  e - kilocalories expended during total housework-related physical activity  
  f - kilocalories expended during total physical activity

When physical activity variables were examined for racial differences through the use of independent samples t-tests, no significant differences were found between the two largest racial groups (Caucasians and African-Americans) at Time 1 or Time 2. Additionally, the data were analyzed to account for possible differences in physical activity due to attrition between assessments. Thus, only participants with physical activity data from both assessments (Time 1 and Time 2) were included in a comparison of means across the various types of physical activity. No significant differences in the pattern of results were found as compared to analyses that included all subjects at Time 1 and Time 2.

To determine other significant relationships among physical activity at Time 1 and Time 2, correlational analyses were performed among the various continuous demographic...
variables. As Tables 6 and 7 display, BMI, educational level, monthly income, and age all had a significant association with physical activity.

**Table 6: Correlations Between Cont. Vars and Physical Activity (Time 1)**

<table>
<thead>
<tr>
<th>Physical Activity†</th>
<th>BMI</th>
<th>Yrs. Ed.</th>
<th>Mont. $</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>-.044</td>
<td>.109*</td>
<td>.008</td>
<td>-.071</td>
</tr>
<tr>
<td>b</td>
<td>.110*</td>
<td>.127**</td>
<td>.378**</td>
<td>-.154**</td>
</tr>
<tr>
<td>c</td>
<td>.260**</td>
<td>.066</td>
<td>-.087*</td>
<td>-.003</td>
</tr>
<tr>
<td>d</td>
<td>.065</td>
<td>.103*</td>
<td>.008</td>
<td>-.182**</td>
</tr>
<tr>
<td>e</td>
<td>.198**</td>
<td>.107*</td>
<td>-.043</td>
<td>-.122**</td>
</tr>
<tr>
<td>f</td>
<td>.199**</td>
<td>.180**</td>
<td>.246**</td>
<td>-.209**</td>
</tr>
</tbody>
</table>

† a - kilocalories expended during leisure-time physical activity  
† b - kilocalories expended during job-related physical activity  
† c - kilocalories expended during light housework-related physical activity  
† d - kilocalories expended during moderate housework-related physical activity  
† e - kilocalories expended during total housework-related physical activity  
† f - kilocalories expended during total physical activity  
* Correlation is significant at the .05 level (2-tailed)  
** Correlation is significant at the .01 level (2-tailed)  
BMI = Body Mass Index; Yrs. Ed. = Years of Education; Mont. $ = Monthly Income

**Table 7: Correlations B/W Cont Vars and Physical Activity (Time 2)**

<table>
<thead>
<tr>
<th>Physical Activity†</th>
<th>BMI</th>
<th>Yrs. Ed.</th>
<th>Mont. $</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>.016</td>
<td>.060</td>
<td>-.003</td>
<td>-.014</td>
</tr>
<tr>
<td>b</td>
<td>.108*</td>
<td>.147**</td>
<td>.320**</td>
<td>-.266**</td>
</tr>
<tr>
<td>c</td>
<td>.159**</td>
<td>-.071</td>
<td>-.057</td>
<td>-.020</td>
</tr>
<tr>
<td>d</td>
<td>.090</td>
<td>.077</td>
<td>.006</td>
<td>-.206**</td>
</tr>
</tbody>
</table>

(table continued)
Forward stepwise regression analyses were performed to further analyze the strength of the associations between demographic variables and total physical activity. The following variables were entered into the regression equation based on previously determined significant relationships: gender, age, educational level, monthly income, and BMI. As Table 8 shows, monthly income, BMI, age, and educational level explained a significant amount of independent variance in self-reported total physical activity kilocalories assessed at Time 1.

**Table 8: Regression On Total Physical Activity Kilocalories (T1)**

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>S.E.</th>
<th>DF</th>
<th>Sig.</th>
<th>Adj. R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mont. $</td>
<td>2.92</td>
<td>.525</td>
<td>(1, 501)</td>
<td>p &lt; .01</td>
<td>.059</td>
</tr>
<tr>
<td>BMI</td>
<td>151.23</td>
<td>28.13</td>
<td>(1, 501)</td>
<td>p &lt; .01</td>
<td>.097</td>
</tr>
<tr>
<td>Age</td>
<td>-70.40</td>
<td>16.92</td>
<td>(1, 501)</td>
<td>p &lt; .01</td>
<td>.142</td>
</tr>
<tr>
<td>Yrs Ed.</td>
<td>194.30</td>
<td>84.27</td>
<td>(1, 501)</td>
<td>p &lt; .05</td>
<td>.149</td>
</tr>
</tbody>
</table>

*B* = Beta weight; *S.E.* = Standard Error; *DF* = Degrees of Freedom; *Sig.* = Significance level; *Adj. R²* = Adjusted R-squared
Descriptive analyses were also performed on the transtheoretical variables (exercise decisional balance and exercise self-efficacy). Scores on the following subscales were reported: Exercise Pros subscale, Exercise Cons subscale, and total decisional balance scale score (Exercise Pros – Cons subscale). For most analyses, exercise decisional balance subscales and exercise self-efficacy scale scores were converted to T-scores with a mean of 50 and standard deviation of 10 for ease of interpretation and consistency with previous research (Marcus, Rakowski, & Rossi, 1992; Marcus, Pinto, Simkin, Audrain, & Taylor, 1994). Table 9 displays the non-standardized means, standard deviations, and ranges of the above-mentioned scales.

**Table 9: Means, Standard Deviations, and Range of TTM Scales**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean (S.D.)</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise Pros Subscale</td>
<td>40.84 (7.49)</td>
<td>10 – 50</td>
</tr>
<tr>
<td>Exercise Cons Subscale</td>
<td>13.82 (4.78)</td>
<td>6 – 29</td>
</tr>
<tr>
<td>Exercise Pros-Cons Subscale</td>
<td>27.01 (8.55)</td>
<td>-6 – 44</td>
</tr>
<tr>
<td>Exercise Self-Efficacy</td>
<td>12.99 (4.85)</td>
<td>4 – 25</td>
</tr>
</tbody>
</table>

Demographic Variables and Major and Minor Life Events. Descriptive analyses were performed on the life-events measures and are displayed in Table 10. An examination of the life-events measures across the entire sample revealed that participants reported experiencing approximately five major life events over the course of the year up to and including the one-month study period. Subjects reported experiencing three major life events in the most recent half of that year. In addition, participants reported experiencing approximately 24 minor life events in the month between the two assessment periods. This event frequency is similar to other normative groups with which the Hassles Scale has
previously been used (mean event total = 22.4, as reported by Kanner et al., 1981). In terms of major life events, the present sample was compared with and found to be similar to another primary care sample on which the LES has previously used, in terms of event frequency over the past 12 months (Brantley et al., 1997).

Table 10: Means, Standard Deviations, and Range of Stress Scales

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean (S.D.)</th>
<th>Range</th>
<th>Med. Comparison Samp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>LES 0-6 Months (Event Total)</td>
<td>3.31 (3.01)</td>
<td>0 -21</td>
<td>-</td>
</tr>
<tr>
<td>LES Total 1 Year (Event Total)</td>
<td>5.15 (4.07)</td>
<td>0 - 22</td>
<td>5.20</td>
</tr>
<tr>
<td>Hassles Scale (Event Total)</td>
<td>24.39 (18.89)</td>
<td>0 - 80</td>
<td>-</td>
</tr>
</tbody>
</table>

LES = Life Experiences Survey
Medical Comparison Sample taken from Brantley and colleagues (1997)

The next analyses were conducted in order to determine if major and minor life events scores differed as a function of the demographic variables. Significant gender-related differences in number of life events reported were found in the present sample, as Table 11 demonstrates. Specifically, females reported experiencing more major life events over the past six months than did their male counterparts. In addition, females reported experiencing significantly more minor life events over the most recent month than did males. There were no significant differences in number of major or minor life events reported by either racial category or marital status.

Table 11: Life Event Scores by Gender

<table>
<thead>
<tr>
<th>Stress Score</th>
<th>Male</th>
<th>Female</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>LES (past 6 months)</td>
<td>2.65</td>
<td>3.45</td>
<td>.033</td>
</tr>
<tr>
<td>LES (total 1 year)</td>
<td>4.42</td>
<td>5.30</td>
<td>.077</td>
</tr>
</tbody>
</table>

(table continued)
As Table 12 indicates, age, educational level, and number of chronic illnesses were also significantly associated with life events scores. Specifically, age was significantly negatively correlated with major and minor life event scores, whereas educational level was significantly positively correlated with all stress scores. Number of chronic illnesses was negatively correlated only with major life events reported over the most recent six months.

**Table 12: Demographic Variables and Major/Minor Life Event Scores**

<table>
<thead>
<tr>
<th>Stress Score</th>
<th>BMI</th>
<th>Age</th>
<th>Yrs. Ed.</th>
<th># Chr.Ill</th>
<th>Mont. $</th>
</tr>
</thead>
<tbody>
<tr>
<td>LES (past 6 months)</td>
<td>.037</td>
<td>-.336**</td>
<td>.195**</td>
<td>-.143**</td>
<td>.064</td>
</tr>
<tr>
<td>LES (total 1 year)</td>
<td>.015</td>
<td>-.341**</td>
<td>.199**</td>
<td>-.064</td>
<td>.033</td>
</tr>
<tr>
<td>Hassles Scale (past month)</td>
<td>.077</td>
<td>-.151**</td>
<td>.103*</td>
<td>.082</td>
<td>.029</td>
</tr>
</tbody>
</table>

* Correlation is significant at the .05 level (2-tailed)
** Correlation is significant at the .01 level (2-tailed)

BMI = Body Mass Index; Yrs. Ed. = Years of Education
# Chr. Ill. = # of Chronic Illnesses; Mont. $ = Monthly Income

Demographic Variables and the Transtheoretical Model (TTM) variables.

Relationships between demographic variables and the TTM variables were examined to assess for potential confounding relationships when investigating the primary research questions of interest. Pearson product-moment correlations were computed between the TTM variables and continuous demographic variables such as age, educational level, monthly income, and BMI. ANOVAs and chi-square analyses were also performed between the TTM variables and categorical demographic variables such as race, gender, and marital status. As Table 13 indicates, BMI was significantly negatively correlated with exercise self-efficacy (-.092; p < .05), and significantly positively correlated with Exercise...
Pros subscale (.096; p < .05). Table 14 also shows that males obtained significantly lower scores on the Exercise Pros and Cons subscale scores respectively than did their female counterparts. No significant differences were found within the TTM variables (self-efficacy or decisional balance) among the various racial or marital status categories.

**Table 13: Correlations between TTM Constructs and Dem. Vars.**

<table>
<thead>
<tr>
<th>TTM Variable</th>
<th>BMI</th>
<th>Age</th>
<th>Yrs. Ed.</th>
<th>Mont. $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise Self-Efficacy</td>
<td>-.092*</td>
<td>.059</td>
<td>.050</td>
<td>.020</td>
</tr>
<tr>
<td>Exercise Pros Subscale</td>
<td>.096*</td>
<td>-.062</td>
<td>.012</td>
<td>.047</td>
</tr>
<tr>
<td>Exercise Cons Subscale</td>
<td>.023</td>
<td>-.017</td>
<td>-.071</td>
<td>.019</td>
</tr>
<tr>
<td>Exercise Pros-Cons Subscale</td>
<td>.070</td>
<td>-.045</td>
<td>.050</td>
<td>.031</td>
</tr>
</tbody>
</table>

*Correlation is significant at the .05 level (2-tailed)

TTM = Transtheoretical Model; BMI = Body Mass Index; Yrs. Ed. = Years of Education; Mont. $ = Monthly Income

**Table 14: TTM Constructs* and Gender Differences**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Males</th>
<th>Females</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise Self-Efficacy</td>
<td>51.01</td>
<td>49.76</td>
<td>.256</td>
</tr>
<tr>
<td>Exercise Pros Subscale</td>
<td>47.17</td>
<td>50.66</td>
<td>.001</td>
</tr>
<tr>
<td>Exercise Cons Subscale</td>
<td>47.88</td>
<td>50.49</td>
<td>.018</td>
</tr>
<tr>
<td>Exercise Pros-Cons Subscale</td>
<td>48.70</td>
<td>50.30</td>
<td>.146</td>
</tr>
</tbody>
</table>

* Scores have been converted to t-scores with a mean of 50 and S.D. of 10

TTM = Transtheoretical Model

The next set of data analyses investigated differences in continuous demographic variables (e.g., BMI, age, educational level) across exercise SOC Time 1. Significant relationships were found for age [F (4, 535) = 2.75, p < .05] and BMI [F (4, 529) = 8.34, p < .01]. Post-hoc analyses using the Tukey HSD procedure revealed that individuals in the
Action stage were found to be significantly younger than in the Precontemplation stage. In terms of BMI post-hoc tests, individuals in the Precontemplation phase had significantly lower BMIs than individuals in the Contemplation and Preparation phases ($p < .05$). In addition, individual in the Maintenance phase had significantly lower BMIs than subjects in both the Contemplation and Action phases ($p < .05$).

Next, the roles that categorical demographic variables (i.e., race, gender, and marital status) played in relationship to exercise stages of change as assessed at Time 1 and Time 2 were examined. Therefore, chi-square analyses were used to examine potential differential proportions of subjects in the various stages of change for exercise behavior at both Time 1 and Time 2 in terms of race, gender, and marital status. At Time 1, both race [$X^2 (16) = 27.02, p < .05$] and gender [$X^2 (4) = 11.92, p < .05$] were found to be significant. At Time 2, race was the only variable found to be significant [$X^2 (16) = 30.04, p < .05$], indicating a differential proportion of individuals assigned to the various stages of exercise SOC based on race at Time 2.

The racial differences in exercise stage of change distribution were further analyzed for their differential make-up. All percentages reported below in this paragraph have been rounded to the nearest whole number. Further chi-square analyses revealed that at Time 1, significantly more Caucasians than African-Americans were in the Precontemplation stage [23% versus 13%, $X^2 (1) = 15.89, p < .01$]. In addition, significantly more African-Americans were in the Preparation stage as compared to their Caucasian counterparts [20% versus 11%, $X^2 (1) = 10.20, p < .01$]. These differences remained significant at SOC Time 2, with more Caucasians in Precontemplation than African-Americans [25% versus 10%, $X^2 (1) = 51.31, p < .01$], and more African-Americans in Preparation as compared to Caucasians [22% versus 15%, $X^2 (1) = 5.44, p < .05$]. In terms of gender distribution at
Time 1, significantly more females were in the Contemplation stage than males [37% versus 27%, \(X^2 (1) = 15.89, p < .01\)]. In addition, more males were in the Maintenance stage than females [28% versus 17%, \(X^2 (1) = 9.87, p < .01\)].

**Research Question (RQ) #1**

The primary aim of Research Question 1 was to examine the extent to which low-income patients attending primary care clinics exhibited a similar pattern of relationships among exercise stages of change, decisional balance, and self-efficacy variables that have previously been demonstrated with other samples (i.e. Marcus & Owen, 1992). This research question was analyzed in three ways:

*Distribution of Exercise Stages of Change.* The aim of Research Question 1A (RQ1A) was to determine potential differences between the study sample and the general population regarding the distribution of individuals across the various exercise stages of change. To this end, percentages of the study sample in each stage of exercise behavior were calculated both at Time 1 and Time 2, and compared to a separate sample (Marcus & Owen, 1992). Table 15 illustrates the percentage of the sample falling into each of the exercise stages of change both at Time 1 and Time 2.

**Table 15: Exercise SOC T1 & T2, and Comparison Sample**

<table>
<thead>
<tr>
<th>Exercise SOC</th>
<th>Time 1 (%)</th>
<th>Time 2 (%)</th>
<th>Comp. Sample* (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precontemplation</td>
<td>91 (17%)</td>
<td>75 (16%)</td>
<td>29 (7%)</td>
</tr>
<tr>
<td>Contemplation</td>
<td>187 (35%)</td>
<td>116 (24%)</td>
<td>92 (23%)</td>
</tr>
<tr>
<td>Preparation</td>
<td>89 (16%)</td>
<td>88 (19%)</td>
<td>121 (30%)</td>
</tr>
<tr>
<td>Action</td>
<td>68 (13%)</td>
<td>111 (23%)</td>
<td>66 (17%)</td>
</tr>
</tbody>
</table>

(table continued)
Results indicated that at Time 1, approximately one third of the sample reported engaging in regular exercise, as defined by three days per week for at least 20 minutes each day (ACSM, 1990). At Time 2, the percentage of individuals engaging in regular exercise increased to 41%. Chi square analyses were conducted to determine if the percentages of subjects in each of the stages of change differed significantly from Time 1 to Time 2. All percentages reported below in this paragraph have been rounded to the nearest whole number. Results revealed no significant differences in the proportion of subjects in the Precontemplation, Preparation, and Maintenance phases at Time 1 and Time 2 ($p > .05$). However, a significantly lower percentage of subjects were assigned to the Contemplation phase at Time 2 as compared to Time 1 [24% versus 35%, $X^2 (1) = 22.82, p < .01$]. In addition, a significantly higher percentage of subjects were assigned to the Action phase at Time 2 as compared to Time 1 [23% versus 13%, $X^2 (1) = 48.42, p < .01$]. Levels of sedentary behavior at Time 1 and Time 2 as defined by the proportion of subjects classified in the Precontemplation, Contemplation, or Preparation phases were also compared. Frequency analyses revealed that 68% of the sample were classified as sedentary at Time 1 and 59% were classified as sedentary at Time 2. Through the use of the chi-square statistic, this difference was found to be statistically significant [$X^2 (1) = 20.60, p < .01$].

For purposes of comparing the present sample to a sample with which previous research in this area has been conducted (Marcus et al., 1992) a comparison stage
percentage distribution is given for a separate sample, as can be seen in Table 15. Chi-square analyses were conducted to compare the distribution of exercise SOC at Time 1 in the present study to that of the Marcus and colleagues (1992) study. Results of the chi-square analyses revealed that, as compared with the comparison sample, a significantly higher percentage of the present study’s subjects were in the Precontemplation \( \chi^2 (1) = 73.84, p < .01 \) and Contemplation \( \chi^2 (1) = 41.55, p < .01 \) phases. Alternatively, a significantly lower percentage of the present study’s subjects were in the Preparation \( \chi^2 (1) = 48.52, p < .01 \), Action \( \chi^2 (1) = 6.01, p < .05 \), and Maintenance \( \chi^2 (1) = 3.99, p < .05 \) phases as compared to the percentage distribution in these respective stages found in the Marcus et al. (1992) study. When comparing percentages of sedentary individuals between the present sample and the Marcus and colleagues (1992) sample, the difference was significant at Time 1 [68% versus 61%, \( \chi^2 (1) = 12.82, p < .01 \)], but not at Time 2 [59% versus 61%, \( \chi^2 (1) = .848, p = .357 \)]. In general at Time 1, the present sample was considerably more sedentary than the Marcus and colleagues (1992) study sample.

**Interrelationships between Exercise SOC, SE, and DB variables.** Research Question 1B (RQ1B) examined the nature of the relationships among exercise SOC, self-efficacy, and decisional balance variables in the present sample. Correlational analyses were initially conducted between the transtheoretical variables collected at Time 1 and Time 2. The results of these correlational analyses can be seen in Table 16. As expected, the Exercise Pros subscale was highly correlated with both exercise self-efficacy and the total decisional balance score (Exercise Pros – Cons). The Exercise Cons subscale was significantly negatively correlated with exercise self-efficacy and the Exercise Pros-Cons subscales.
Table 16: Correlations between TTM Variables

<table>
<thead>
<tr>
<th></th>
<th>Exercise Pros</th>
<th>Exercise Cons</th>
<th>Pros — Cons</th>
<th>Ex Self-Efficacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise Pros</td>
<td></td>
<td>.080</td>
<td>.831**</td>
<td>.353**</td>
</tr>
<tr>
<td>Exercise Cons</td>
<td></td>
<td>-.488**</td>
<td>-.195**</td>
<td></td>
</tr>
<tr>
<td>Pros — Cons</td>
<td></td>
<td></td>
<td>.418**</td>
<td></td>
</tr>
</tbody>
</table>

** = Correlation significant at the .01 level
TTM = Transtheoretical Model

A one-way ANCOVA was conducted to test for differences in exercise self-efficacy across the stages of change for exercise behavior both at Time 1 and Time 2. Results indicated that after controlling for the effects of age, sex, BMI, and monthly income, exercise-self-efficacy significantly differentiated participants across the different stages of change for exercise behavior, both at Time 1 \( F (4, 535) = 38.32, p < .001 \) and Time 2 \( F (4, 469) = 21.08, p < .001 \). As shown in Tables 17 and 19, exercise self-efficacy generally increased in a linear fashion as an individual’s stage of change moved from the inactive to active stages (i.e. from Precontemplation and Contemplation to Action and Maintenance). Data are also provided from a comparison sample from Marcus and Owen (1992). Specific significant group differences found through post-hoc analyses using the Tukey HSD can be seen in Table 18 and 20.

Table 17: Self-Efficacy Scores By Ex SOC T1

<table>
<thead>
<tr>
<th>Ex SOC T1</th>
<th>Exercise Self-Efficacy*</th>
<th>Comp. Sample*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precontemplation</td>
<td>42.02</td>
<td>45.67</td>
</tr>
<tr>
<td>Contemplation</td>
<td>48.71</td>
<td>46.98</td>
</tr>
<tr>
<td>Preparation</td>
<td>50.86</td>
<td>50.36</td>
</tr>
</tbody>
</table>

(table continued)
### Table 18: Tukey HSD Comparisons on Ex Self-Efficacy Scores by SOC T1

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

* p<.05. **Note: Stages appearing in the respective columns differ significantly from the stage that serves as the column header.

### Table 19: Self-Efficacy Scores By Ex SOC T2

<table>
<thead>
<tr>
<th>Ex SOC T2</th>
<th>Exercise Self-Efficacy*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precontemplation</td>
<td>42.62</td>
</tr>
<tr>
<td>Contemplation</td>
<td>47.78</td>
</tr>
<tr>
<td>Preparation</td>
<td>49.18</td>
</tr>
<tr>
<td>Action</td>
<td>52.18</td>
</tr>
<tr>
<td>Maintenance</td>
<td>54.76</td>
</tr>
</tbody>
</table>

* Scores have been converted to t-scores with a mean of 50 and S.D. of 10
Ex SOC T2 = Exercise Stage of Change Time 2 (1-month follow-up)

### Table 20: Tukey HSD Comparisons on Ex Self-Efficacy Scores by SOC T2

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

(table continued)
To investigate differences in decisional balance variables across SOC T1 and T2, ANCOVAs were performed using the three decisional balance subscales as outcome measures, and statistically controlling for the effects of age, sex, race, and BMI. Tables 21 and 22 display means scores of the three subscales of the Exercise Decisional Balance Scale across the 5 separate stages of change for exercise behavior at Time 1 and Time 2. Normative data from a different sample is shown in bold and italics (Marcus, Rakowski, and & Rossi, 1992).

**Table 21: Decisional Balance Scores By Ex SOC T1**

<table>
<thead>
<tr>
<th>Ex SOC T1</th>
<th>Ex Pros$^+$</th>
<th>Ex Cons$^+$</th>
<th>Ex Pros – Cons$^+$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precontemplation</td>
<td>42.76/36.75*</td>
<td>51.06/50.46*</td>
<td>43.07</td>
</tr>
<tr>
<td>Contemplation</td>
<td>51.49</td>
<td>51.36/53.79*</td>
<td>50.51</td>
</tr>
<tr>
<td>Preparation</td>
<td>51.00/50.72*</td>
<td>49.55/50.32*</td>
<td>51.13</td>
</tr>
<tr>
<td>Action</td>
<td>51.58/52.97*</td>
<td>48.53/47.97*</td>
<td>52.20</td>
</tr>
<tr>
<td>Maintenance</td>
<td>52.05/53.02*</td>
<td>47.71/44.10*</td>
<td>53.05</td>
</tr>
</tbody>
</table>

$^*$Scores have been converted to t-scores with a mean of 50 and S.D. of 10
$^*$Comparison sample taken from Marcus, Rakowski, and Rossi (1992)

Ex SOC T1 = Exercise Stage of Change Time 1

**Table 22: Decisional Balance Scores By Ex SOC T2**

<table>
<thead>
<tr>
<th>Ex SOC T2</th>
<th>Ex Pros</th>
<th>Ex Cons</th>
<th>Ex Pros – Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precontemplation</td>
<td>41.57</td>
<td>51.30</td>
<td>41.89</td>
</tr>
</tbody>
</table>

(table continued)
As can be seen in Tables 21 and 22, a general linear increase was found in the decisional balance scores from the inactive to active stages of exercise behavior for Exercise Pros and Pro-Cons subscales at both Time 1 and Time 2. In addition, a general linear decrease was found for the Exercise Cons subscale at both Time 1 and Time 2. Regarding exercise SOC Time 1, post-hoc analyses using the Tukey HSD procedure revealed that for the Exercise Pros subscale, subjects in the Precontemplation phase had significantly lower scores than subjects in Contemplation, Preparation, Action, and Maintenance phases (p < .05). Regarding the Exercise Cons subscale, subjects in the Precontemplation phase had significantly higher scores than subjects in the Maintenance phase (p < .05); and subjects in the Contemplation phase had significantly higher scores than subjects in the Action and Maintenance phase (p < .05). Regarding the Exercise Pros-Cons score, subjects in the Precontemplation phase again had significantly lower scores than subjects in all other stages (p < .01); subjects in the Contemplation phase had significantly lower scores than did subjects in the Maintenance phase (p < .01).

As Table 22 demonstrates, the trend towards a linear increase in Exercise Pros subscale scores across the Stages of Change was duplicated in SOC T2. Post-hoc analyses using the Tukey HSD procedure revealed that for the Exercise Pros subscale, subjects in the

<table>
<thead>
<tr>
<th>Ex SOC T2</th>
<th>Ex Pros</th>
<th>Ex Cons</th>
<th>Ex Pros – Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contemplation</td>
<td>51.78</td>
<td>51.22</td>
<td>50.88</td>
</tr>
<tr>
<td>Preparation</td>
<td>49.74</td>
<td>50.07</td>
<td>49.73</td>
</tr>
<tr>
<td>Action</td>
<td>52.36</td>
<td>49.51</td>
<td>52.33</td>
</tr>
<tr>
<td>Maintenance</td>
<td>52.09</td>
<td>48.09</td>
<td>52.89</td>
</tr>
</tbody>
</table>

* Scores have been converted to t-scores with a mean of 50 and S.D. of 10

Ex SOC T2 = Exercise Stage of Change Time 2

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Precontemplation phase, subjects had significantly lower scores than did subjects in the other 4 stages (Contemplation, Preparation, Action, and Maintenance, \( p < .01 \)). No significant mean differences were detected for the Exercise Cons subscale. For the Exercise Pros-Cons subscale, subjects in the Precontemplation phase again had significantly lower scores than did subjects in the other four stages (Contemplation, Preparation, Action, and Maintenance, \( p < .01 \)).

A discriminant function analysis was also performed to measure the extent to which exercise self-efficacy and decisional balance variables collected at Time 1 were associated with exercise SOC membership both at Time 1 (cross-sectional) and Time 2 (longitudinal). This analysis was performed after controlling for potentially confounding variables such as BMI, race, age, educational level, and gender. Table 23 shows that this analysis produced 3 canonical variables. The first of these variables accounted for most of the dispersion (73.2%). The second and third variables accounted for an additional 26.3% and .5% of the spread, respectively. Exercise self-efficacy had the largest correlation with the first canonical variable (.961), followed by the Exercise Pros subscale (.549). BMI correlated the highest with the second canonical variable. The Exercise Pros subscale also correlated highly with the second canonical variable (.616). None of the three variables appearing in Table 23 had its largest correlation with the third canonical variable.

**Table 23: DFA of Demographic and TTM Variables Classifying SOC T1**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise SE</td>
<td>27.57</td>
<td>.831</td>
<td>( p &lt; .001 )</td>
<td>.486</td>
</tr>
<tr>
<td>Ex Pros</td>
<td>8.30</td>
<td>.729</td>
<td>( p &lt; .001 )</td>
<td>.317</td>
</tr>
</tbody>
</table>

(table continued)
As Table 24 indicates, a similar pattern of results was found with the longitudinal aspect of this research question. Specifically, a discriminant function analysis was performed in order to determine whether transtheoretical variables would prove useful in classifying individuals into the exercise stages of change at Time 2. This analysis was performed after controlling for potentially confounding variables such as BMI, race, age, educational level, and gender. This analysis produced three canonical variables. The first of these variables accounted for most of the dispersion (85.2%). The second and third variables accounted for an additional 13.3% and 1.5% of the spread, respectively. Again, exercise self-efficacy had the largest correlation with the first canonical variable (.961), followed by the Exercise Pros subscale (.715). Race also correlated the highest with the first canonical variable (.656).

Table 24: DFA of Demographic and TTM Variables Classifying SOC T2

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise SE</td>
<td>14.19</td>
<td>.831</td>
<td>p &lt; .001</td>
<td>.473</td>
</tr>
<tr>
<td>Ex Pros</td>
<td>10.93</td>
<td>.810</td>
<td>p &lt; .001</td>
<td>.207</td>
</tr>
<tr>
<td>Race</td>
<td>4.34</td>
<td>.767</td>
<td>p &lt; .001</td>
<td>.071</td>
</tr>
</tbody>
</table>

 Relationships between transtheoretical constructs and exercise behavior (RQ1C). In order to continue the process of validating of the exercise stages of change, a one-way
ANOVA was conducted to examine group differences by SOC T1 in terms of the various categories of self-reported physical activity kilocalories expended at Time 1 and Time 2.

For Time 1, significant main effects by SOC T1 were found for both leisure-time physical activity kilocalories \( [F (4, 513) = 38.38, \ p < .01] \) and total physical activity kilocalories \( [F (4, 499) = 2.35, \ p < .05] \). Post-hoc analyses using the Tukey HSD procedure revealed that subjects in the Action and Maintenance stages reported expending significantly more leisure-time physical activity kilocalories per week than those in the Precontemplation, Contemplation, or Preparation stages \( (p < .01) \). In terms of total physical activity kilocalories expended, post-hoc analyses using the Tukey HSD procedure revealed that subjects in the Precontemplation phase reported expended significantly less total kilocalories than did subjects in the Action phase \( (p < .05) \).

At Time 2, significant main effects by SOC T2 were again found for leisure-time physical activity \( [F (4, 467) = 23.83, \ p < .01] \). Post-hoc analyses using the Tukey HSD procedure revealed that, as with Time 1, subjects in the Action and Maintenance stages reported expending significantly more leisure-time physical activity kilocalories per week than those in the Precontemplation, Contemplation, or Preparation stages \( (p < .01) \).

A multiple regression analysis was performed to analyze the extent to which exercise SOC, self-efficacy, and decisional balance variables were associated with self-reported leisure-time physical activity. This analysis statistically controlled for demographic variables previously found to be significantly associated with either the predictor and/or criterion variables (i.e., age, race, gender, BMI, years of education, medical clinic, and monthly income). Table 25 shows the results of this multiple regression analysis, where these potential confounding variables were entered in a forward manner, so that unique variance associated with the knowledge of the transtheoretical constructs could
be accurately determined. As can be seen, after accounting for the effects of demographic variables, exercise self-efficacy accounted for an additional 4.7% of the variance in leisure-time physical activity.

### Table 25: Regression of TTM Vars. On Physical Activity (T2)

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>S.E.</th>
<th>Sig.</th>
<th>Adj. R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>-3.143</td>
<td>3.68</td>
<td>.394</td>
<td>-</td>
</tr>
<tr>
<td>Race</td>
<td>48.12</td>
<td>96.80</td>
<td>.619</td>
<td>-</td>
</tr>
<tr>
<td>Gender</td>
<td>-697.99</td>
<td>12.788</td>
<td>&lt;.01</td>
<td>-</td>
</tr>
<tr>
<td>BMI</td>
<td>-0.256</td>
<td>6.06</td>
<td>.966</td>
<td>-</td>
</tr>
<tr>
<td>Yrs. Ed.</td>
<td>41.03</td>
<td>18.28</td>
<td>.025</td>
<td>.058</td>
</tr>
<tr>
<td>Med Clin.</td>
<td>45.66</td>
<td>34.49</td>
<td>.186</td>
<td>-</td>
</tr>
<tr>
<td>Mont. S</td>
<td>-.102</td>
<td>1.10</td>
<td>.357</td>
<td>-</td>
</tr>
<tr>
<td>Ex-SE</td>
<td>24.64</td>
<td>4.69</td>
<td>&lt;.05</td>
<td>.105</td>
</tr>
</tbody>
</table>

*B* = Beta weight; *S.E.* = Standard Error; *DF* = Degrees of Freedom; *Sig.* = Significance level; *Adj. R²* = Adjusted R-squared; *BMI* = Body Mass Index; *TTM* = Transtheoretical Model; *Ex-SE* = Exercise Self-Efficacy

Research Question (RQ) #2

A correlation matrix was derived to assess for relationships between life event scores and self-reported physical activity variables. As Table 26 shows, LES scores over the past 6 months were significantly associated with self-reported kilocalories expended during job-related activities, moderate housework activities, and total physical activities. In addition, total LES scores over the past year were significantly associated with higher amounts of moderate household activities.
Table 26: Correlations between Stress and Physical Activity Variables (T2)

<table>
<thead>
<tr>
<th>Ex. Category*</th>
<th>LES (past 6 months)</th>
<th>LES (total 1 year)</th>
<th>Hassles</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>.020</td>
<td>.020</td>
<td>-.033</td>
</tr>
<tr>
<td>b</td>
<td>.125*</td>
<td>.062</td>
<td>.008</td>
</tr>
<tr>
<td>c</td>
<td>.053</td>
<td>.025</td>
<td>.057</td>
</tr>
<tr>
<td>d</td>
<td>.100*</td>
<td>.120*</td>
<td>.020</td>
</tr>
<tr>
<td>e</td>
<td>.090</td>
<td>.076</td>
<td>.056</td>
</tr>
<tr>
<td>f</td>
<td>.145**</td>
<td>.097</td>
<td>.041</td>
</tr>
</tbody>
</table>

* a - kilocalories expended during leisure-time physical activity  
  b - kilocalories expended during job-related physical activity  
  c - kilocalories expended during light housework-related physical activity  
  d - kilocalories expended during moderate housework-related physical activity  
  e - kilocalories expended during total housework-related physical activity  
  f - kilocalories expended during total physical activity  

** = Correlation is significant at the .01 level (2-tailed)  
*  = Correlation is significant at the .05 level (2-tailed)

Regression analyses were conducted to determine the extent to which major and minor life event scores measured at Time 2 accounted for significant variance in self-reported total physical activity at Time 2. The major and minor life events scales did not account for a significant portion of the explained variance in this regression equation. Table 27 shows the results of this regression analysis.

Table 27: Regression of Stress On Total Physical Activity Kilocalories (T2)

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>S.E.</th>
<th>DF</th>
<th>Sig.</th>
<th>Adj. R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>-93.57</td>
<td>16.75</td>
<td>(3,395)</td>
<td>P&lt;.01</td>
<td>.064</td>
</tr>
<tr>
<td>BMI</td>
<td>124.27</td>
<td>30.27</td>
<td>(3,395)</td>
<td>P&lt;.01</td>
<td>.103</td>
</tr>
<tr>
<td>Monthly S</td>
<td>2.11</td>
<td>.536</td>
<td>(3,395)</td>
<td>P&lt;.01</td>
<td>.135</td>
</tr>
</tbody>
</table>

(table continued)
<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>S.E.</th>
<th>DF</th>
<th>Sig.</th>
<th>Adj. R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ed. Level</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>p&gt;.05</td>
<td>-</td>
</tr>
<tr>
<td>LES 6 mo.</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>p&gt;.05</td>
<td>-</td>
</tr>
<tr>
<td>LES 1 yr.</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>p&gt;.05</td>
<td>-</td>
</tr>
<tr>
<td>Hassles</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>p&gt;.05</td>
<td>-</td>
</tr>
</tbody>
</table>

*B* = Beta weight; *S.E.* = Standard Error; *DF* = Degrees of Freedom; *Sig.* = Significance level; *Adj. R²* = Adjusted R-squared; *Monthly S* = Monthly Income; *Ed Level* = Educational Level; *LES* = Life Experiences Survey

Research Question (RQ) #3

To address potential relationships between life events and stage movement from Time 1 to Time 2, it was first necessary to determine how many subjects had moved between assessment periods, as well as the direction of this movement. Table 28 shows the percentage of subjects who did not change stages (45%), progressed forward (35%), and regressed backwards (20%) between Time 1 and Time 2.

**Table 28: Change in SOC from Time 1 to Time 2**

<table>
<thead>
<tr>
<th>Status</th>
<th>N</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Change</td>
<td>211</td>
<td>45%</td>
</tr>
<tr>
<td>Stage Progression</td>
<td>163</td>
<td>35%</td>
</tr>
<tr>
<td>Stage Regression</td>
<td>92</td>
<td>20%</td>
</tr>
</tbody>
</table>

N = 466

A discriminant function analysis was conducted to examine the extent to which major and minor stress scale scores were associated with stage movement from Time 1 to Time 2. Again, stage movement was defined trichotomously as no change, progression, or regression from Time 1 and Time 2. The results of the discriminant function analysis revealed none of the stress-related variables to be a significant discriminator of an
individual’s movement through the stages of change in either a forward or backward
manner. Table 29 shows the results of this discriminant function analysis.

Table 29: DFA of Stress Variables Classifying Stage Movement

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>LES past 6 months</td>
<td>.654</td>
<td>.997</td>
<td>p&gt;.05</td>
<td>-</td>
</tr>
<tr>
<td>LES past year</td>
<td>.421</td>
<td>.998</td>
<td>p&gt;.05</td>
<td>-</td>
</tr>
<tr>
<td>Hassles Scale</td>
<td>1.037</td>
<td>.996</td>
<td>p&gt;.05</td>
<td>-</td>
</tr>
</tbody>
</table>

Canon. Corr. = Canonical Correlation; LES = Life Experiences Survey

An additional discriminant function analysis was performed to assess the degree to
which baseline self-efficacy and decisional balance variables classified an individual’s
stage movement from Time 1 to Time 2. No transtheoretical variable served as a
significant classifier of movement through the stages of exercise behavior. Table 30 shows
the results of this discriminant function analysis.

Table 30: DFA of Transtheoretical Variables Classifying Stage Movement

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise SE</td>
<td>1.06</td>
<td>.995</td>
<td>p&gt;.05</td>
<td>-</td>
</tr>
<tr>
<td>Exercise Pros</td>
<td>2.07</td>
<td>.991</td>
<td>p&gt;.05</td>
<td>-</td>
</tr>
<tr>
<td>Exercise Cons</td>
<td>.113</td>
<td>1.00</td>
<td>p&gt;.05</td>
<td>-</td>
</tr>
<tr>
<td>Pros – Cons</td>
<td>1.30</td>
<td>.994</td>
<td>p&gt;.05</td>
<td>-</td>
</tr>
</tbody>
</table>

SE = Self-Efficacy; Canon. Corr. = Canonical Correlation

One-way ANOVAs were performed to see if the three groups representing
movement across the SOC between Time 1 and Time 2 (no change, progression, or
regression) showed differences in the number of life events, decisional balance scores, or
exercise self-efficacy. Again, no significant main effects were detected (p > .05), indicating no meaningful group differences on these outcome measures.
DISCUSSION

The present study was among the first to apply the transtheoretical model of exercise behavior to a low-income, primary care population. In addition, this project also examined relationships among major and minor life events, physical activity, and transtheoretical constructs. Taken as a whole, results confirmed the general applicability of the transtheoretical model of exercise behavior to this population, with some important caveats. Significant relationships were found between demographic variables and transtheoretical constructs that may affect the applicability of the transtheoretical model to this population. In addition, life event scores were found to be modestly associated with some categories of physical activity in this sample. A summary of the demographic characteristics will now be presented, followed by a discussion of how these characteristics were related to the theoretical constructs. The remainder of the discussion will center on findings related to the three primary research questions of interest.

Summary of Demographic Characteristics

Examination of demographic variables revealed the sample to be composed primarily of African-American females with approximately 11 years of education. Participants' income levels were markedly low, and the majority of the sample did not possess medical insurance. Approximately 68% of this sample (all individuals categorized in the Precontemplation, Contemplation, and Preparation stages) reported exercising at neither the recommended frequency nor duration (ACSM, 1990). In addition, over 65% of the sample met criteria for obesity, as defined by a BMI of greater than 27.3 for females and 27.8 for males (Pi-Sunyer, 1993). Approximately 72% of the sample were diagnosed with at least one chronic illness, and approximately 22% of the sample were diagnosed with three or more chronic illnesses. Thus, obese, sedentary, minority females with chronic
medical conditions, significant financial hardships, and educational limitations primarily characterized this sample.

**Demographic Differences in Physical Activity**

Several of the above-mentioned demographic variables (i.e., age, gender, educational level, monthly income, and BMI) were significantly associated with physical activity in a manner consistent with previous literature (Dishman & Sallis, 1994; King et al., 1992). These associations, which continue to support the importance of these demographic factors when examining physical activity, will now be discussed.

The overall sample displayed a general tendency to report higher amounts of most categories of physical activity kilocalories at Time 2 as compared to Time 1, with the notable exception of leisure-time physical activity, which was greater at Time 1 as compared to Time 2. One potential hypothesis to explain these differential reports may be related to an over-reporting/overestimation issue present at Time 1. This overestimation may have led subjects to more closely monitor their physical activity over the course of the following month, resulting in a more conservative estimate of their physical activity in general. One implication of this explanation is that a self-report as a sole indicator of physical activity may be a somewhat unreliable method of capturing true exercise behavior over time.

Significant differences in self-reported physical activity were also found among demographic variables such as gender, age, educational level, BMI, and monthly income. Regarding gender, women reported less leisure-time physical activity than men and also reported expending less job-related kilocalories. They did, however, profess significantly higher levels of housework-related physical activity. Also, younger and more educated subjects endorsed higher levels of physical activity. These findings are consistent with
previously mentioned research supporting differences in physical activity by age (Zakarian et al., 1994) gender (Lee, 1993; Dishman & Sallis, 1994) and socioeconomic status (Ford et al., 1991).

Subjects with higher BMIs tended to report higher levels of most categories of non-leisure-time related physical activity (i.e., job-related and housework physical activity). However, it is important to note that they did not engage in higher rates of leisure-time physical activity. This is consistent with previous research suggesting that overweight individuals tend to have lower adherence to an exercise adherence program (Marcus, Bock, & Pinto, 1997; Oldridge, Donner, Buck, & Jones, 1983).

Demographic Differences in Stressful Life Events

Demographic differences also appeared in the examination of major and minor life events measures. Females reported experiencing significantly more major life events over the past six months, as well as significantly more minor life events over the past month, as compared to their male counterparts. The current findings may be related to the hypothesized tendencies of females to demonstrate increased awareness of the presence of stressful events as compared to males (Solomon & Rothblum, 1986; Turner & Avison, 1989; Scarinci, Ames, & Brantley, 1999).

Age and educational level differences were also found among life event scores. Specifically, older individuals reported experiencing fewer major and minor stressors, and more highly educated individuals tended to report more stressors than less educated individuals. Potential explanations for this may include the hypothesis that younger individuals with higher educational levels may be more likely to engage in daily activities placing them in environmental conditions conducive for the occurrence of daily hassles.
Demographic Differences in Transtheoretical Variables

Significant demographic-related differences also appeared during the analyses of transtheoretical variables. Regarding exercise SOC, subjects in the Action stage were significantly younger than individuals in other stages. One possible interpretation for this age difference may lie in the decreased likelihood of younger individuals to have diagnosed chronic illnesses as compared to older individuals. Many chronic illnesses are physically debilitating and/or disabling and thus may be associated with decreased physical activity. In fact, in the current sample, age was significantly positively correlated with chronic illness ($r = .540, p < .01$). Race and gender were other demographic variables significantly related to exercise stages of change, indicating a differential pattern of distribution among the various stages of change. Interestingly, more Caucasian subjects were found to be in the Precontemplation phase than African-American subjects; likewise, more African-American subjects were found to be in the Preparation phase as compared to Caucasian subjects. Given the lack of studies on this topic, the current study may indicate that low-income African-Americans may be more likely to consider an exercise program, but are more limited by financial constrictions as compared to their Caucasian counterparts. This hypothesis is particularly tenable in light of the finding that African-Americans reported significantly less total income than Caucasians in the present sample.

Regarding gender and stages of change, further analysis revealed more women to be in the Contemplation phase at Time 1 than men. In a similar fashion, more men than women were in Maintenance at Time 1. This finding is consistent with previous exercise literature indicating men are generally more physically active than women (King et al., 1992; Lee, 1993). However, there are no published studies focusing exclusively on gender and SOC, so this may represent another novel finding in the transtheoretical literature.
Regarding decisional balance variables, females appeared to perceive both the pros and cons of regular exercise as more important than did males in the present sample. This is an interesting finding, given that men reported exercising significantly more than did women in the current sample. Previous research has theorized that increased emphasis on the pros and cons of exercise should be positively related to actual exercise behavior (Marcus, Eaton, Rossi, & Harlow, 1992). However, this theory was not replicated in the current sample. A potential reason for this may include the fact that despite being sensitized to popular media’s current emphasis on the benefits of exercise for women, women continue to be affected by the awareness and limitations of practical and social barriers to exercise (i.e. less time, physical limitations, increased domestic responsibilities, traditional stereotypes; Lee 1993). This explanation may account for the increased awareness of the barriers and benefits of exercise to a greater degree than that of the men in the current sample, despite less reported physical activity.

Self-efficacy was significantly negatively associated with BMI as well. A potential explanation for this finding lies in the negative self-image that may be associated with obesity, leading to lowered self-efficacy (e.g., Brownell & O’Neil, 1993). Alternatively, individuals with higher BMI tended to have higher appreciation and emphasis on exercise pros, meaning that they place a high value on the benefits of exercise. This finding may exist due a possible acute sensitization process to references in the media and popular culture demonstrating the positive benefits of exercise.

In summary, the above-highlighted demographic differences in outcome variables show the importance of considering demographic variables in research on predictors of physical activity. Demographic variability has played a significant role in mitigating the application and interpretation of theoretical models among minority populations in past
studies (Rimer, 1992). The demographic differences highlighted above may have increased the amount of statistical "noise" (or error variance) present as distinguished from the "signal" (or true effect) hypothesized to exist.

**Major Research Questions of Interest**

**Research Question 1A:** The purpose of RQ1A was to determine the distribution of the five exercise stages of change (both at Time 1 and Time 2) independent of each other and compared to another sample representative of a population with whom a great deal of this type of research has been conducted (i.e. Marcus et al., 1992). As previously mentioned, the SOC distribution in the present sample indicated a high degree of sedentary behavior both at Time 1 (68%) and at Time 2 (59%), though sedentary behavior was found to be significantly less at Time 2 than at Time 1.

While the presence of potential demand characteristics may have served to increase the amount of subjects classified in the Action phase at Time 2 relative to Time 1, it is important to note that the average leisure-time physical activity kilocalorie expenditure was only 9% of the total physical activity kilocalorie expenditure at Time 1. In addition, average physical activity expenditure consisted of only 13.4% of the total physical activity kilocalorie expenditure at Time 2. Both of these percentages represent a significantly smaller proportion of total physical activity kilocalorie expenditure relative to the other categories used in the current study. Therefore, demand characteristics may not explain the entire reason for this difference in leisure-time physical activity between Time 1 and Time 2. It is clear that one limitation to drawing more substantial conclusions about these data is the primary outcome variable was subjective self-report. Future studies should address exercise with a multidimensional approach to their assessment procedure (i.e. an objective
physiological fitness test or recording equipment such as motion detectors) to validate self-report in a more objective manner.

When compared to the Marcus and colleagues (1992) study, several interesting differences emerged in regards to differential stage distribution. Significantly more individuals in the present study were categorized in Precontemplation and Contemplation phases as compared with subjects in the Marcus and colleagues (1992) study. This indicates a significantly higher degree of sedentary behavior in the present sample when assessed at Time 1 as compared to the Marcus and colleagues (1992) study. Potential explanations for this difference in sedentary behavior may include decreased neighborhood safety inherent in many low-income areas, decreased access to exercise facilities, perceived lack of time, and decreased financial resources (CDC, 1999; King et al., 1992). Unfortunately, these factors were not directly addressed in this project, and therefore cannot be confirmed in the present study.

Research Question 1B: RQ1B attempted to validate the application of exercise stages of change among this sample of individuals by examining the inter-relationships between transtheoretical constructs (e.g., exercise stages of change, exercise self-efficacy, and decisional balance variables). Overall, the decisional balance and self-efficacy variables were correlated with each other in the expected manner. Specifically, exercise self-efficacy was highly positively correlated with exercise pros but highly negatively correlated with exercise cons. These relationships have been found in previous exercise SOC literature (Marcus, Rakowski, & Rossi, 1992) as well as with other health behaviors (Prochaska, Johnson, & Lee, 1998).

Another significant finding is that self-efficacy scores increased in a linear manner as subjects were classified into more active stages of exercise behavior. Subjects in the
Maintenance phase showed the highest amount of self-efficacy as compared with the less active stages of exercise behavior. Clear differentiation across the other stages was not present, however this finding has been reported frequently in the literature (e.g., Marcus & Owen, 1992), and may represent a limitation of the model.

Inspection of the exercise decisional balance scores revealed a significant differentiation between subjects in the Precontemplation phase and those in the other phases, indicating a greater emphasis on the perceived advantages of exercise in the more active stages of exercise behavior. Subjects in the Precontemplation phase also had significantly higher exercise con scores than individuals in other stages, which was also expected. While the decisional balance findings were not as robust as the stage differentiation found with exercise self-efficacy, they did indicate that individuals either contemplating or performing exercise behavior for an extended period of time tended to evaluate the benefits and costs of exercising more strongly than do individuals in less active stages of exercise performance.

In terms of classification of stage membership based on transtheoretical constructs in the current study, the results of a discriminant function analysis revealed that that both exercise self-efficacy and exercise pros possessed a significant degree of classification accuracy regarding SOC both at Time 1 and Time 2. The classification power of these two variables was statistically significant, showing the importance of these factors when making causal classification decisions.

Research Question 1C: RQ1C involved the examination of the cross-sectional and longitudinal relationships between self-reported exercise behavior and transtheoretical variables such as exercise stage of change, exercise self-efficacy, and decisional balance variables. In terms of stages of exercise behavior, significant differences were found in the
self-reported kilocalories expended across several categories of physical activity for subjects classified in the active versus inactive stages. Specifically, subjects in the Action and Maintenance stages expended more leisure-time physical activity kilocalories than did subjects in the inactive stages of change (i.e. Precontemplation, Contemplation, and Preparation stages). While this effect was not replicated for all categories of physical activity, general trends supported the transtheoretical model, since lower amounts of kilocalorie expenditure emerged among inactive as compared to active stages of exercise behavior.

Multiple regression analyses revealed that exercise self-efficacy was significantly associated with self-reported physical activity. This is consistent with previous literature (i.e. McCauley, 1993; McCauley & Courneya, 1993) and is a further indication of the importance of considering self-efficacy when designing and implementing exercise programs with this population.

**Research Question 1 General Conclusions:** Reviewing the research findings of the three parts of Research Question 1, some general conclusions can be drawn. Previous relationships among the transtheoretical variables appear to have continued to exist in a low-income, primary care population. In addition, these transtheoretical variables showed clear and unambiguous associations with many categories of physical activity, most notably leisure-time physical activity. These associations are in the predicted direction and are consistent with previous literature in this area (Marcus & Owen, 1992). In addition, self-efficacy is more strongly associated with exercise behavior as compared to other transtheoretical variables, highlighting the need to emphasize and enhance this construct when working with patients in clinical settings. Many of the hypothesized relationships among the transtheoretical variables were not as strong as initially anticipated, clearly
indicating that further research attention should be devoted to examining these relationships. However, many of the results suggest the general applicability of this model among a low-income population.

**Research Question 2:** RQ2 assessed for relationships between stressful life events and physical activity. In general, life events were modestly associated with some categories of physical activity. Neither major life events nor minor life events were significantly associated with either leisure-time physical activity or total physical activity in the present sample. Major life events experienced in the past six months were significantly positively correlated with job-related physical activity, moderate housework-related physical activity, and overall physical activity. However, major and minor life events did not account for significant independent variance in physical activity in the current sample. Several reasons exist to explain the lack of significant associations between these two concepts. One reason is that the current measures do not accurately capture the nature of exercise behavior and other psychological constructs, such as stress, among this population. Many practical barriers to physical activity that exist among low-income, minority populations (Lee, 1993) were not specifically assessed in this study, and may have accounted for the failure to find results consistent with expected hypotheses. Another explanation may lie in the restricted range of physical activity in the current sample. Perhaps the lack of adequate leisure-time physical activity may have decreased the likelihood that a true relationship between stress and exercise could be established. In addition, despite the fact power analyses were conducted to reveal that the appropriate number of subjects were used to detect differences in the outcome variables, the current sample size may still have been too small to detect minimal differences. Previous research in the area of psychological constructs and exercise
(i.e. Marcus et al., 1994) has included substantially larger sample sizes than the current sample.

**Research Question 3:** The primary focus of RQ3 was to explore relationships between stress and exercise SOC movement (as well as relationships between stress and other transtheoretical variables). A discriminant function analysis revealed no consistent relationships between stress and movement across the stages of change over time. In addition, results did not support the hypothesis that baseline self-efficacy and decisional balance variables would be associated with stage movement. One factor that may explain the lack of significant findings may be the short contiguous interval between the times of assessment (i.e., one month). Longer time intervals may have maximized that chance of detecting significant differences between the groups (i.e. 1-2 year follow-up points, i.e., Herzog et al., 1999).

Another potential explanation is that experiencing the major and minor life events does not significantly impact the functioning of exercise as it might other behaviors and areas of functioning (i.e., substance use, marital functioning, illness symptomatology, etc.). However, these other psychological dimensions were not assessed in the present study, and the extent to which stress may affect these constructs cannot be answered with the present data. Another explanation for the lack of effects may be related to the generally low level of exercise behavior performed among this sample. Perhaps the aforementioned existence of a “basement effect” resulted in an insufficient level of exercise behavior to detect significant differences.

**Limitations**

The present study, while contributing unique aspects to the literature, did possess methodological and conceptual limitations. For instance, the current sample was part of a
larger study of health behaviors among this population. Thus, there was limited flexibility with regard to the experimental methodology that may have hampered the extent to which the impact of life events on exercise could be detected. Another more general issue concerns the nature in which life events are experienced among low-income, primary care patients. One reason for the lack of findings regarding stress and exercise may lie in the inadequacy of current psychometric measures to capture the true nature and impact of stressors among low-income patients. It is theoretically possible that the items listed on the current measures used (i.e. Hassles Scale and Life Experiences Survey) do not accurately describe the events that are the most salient, prevalent, and stressful to the current population. Further, the most appropriate psychometric tools to assess these constructs may not yet exist. One implication of this hypothesis is that current psychometric instruments assessing the quantity and quality of stress among this population are inadequate, and new measures need to be created to most accurately answer some of the hypotheses generated from the current study.

Another limitation of the current study is that stage of change movement was assessed in the absence of an exercise intervention, other than a follow-up telephone assessment at the one-month interval. Other studies examining longitudinal SOC movement (Solomon et al., 1996; Herzog et al., 1999) have included some form of intervention such as a structured exercise regimen. A higher rate of stage movement might have occurred in the presence of a clear attempt to motivate subjects to exercise, thereby enhancing their self-efficacy. An example of such an intervention would be the use of an incentive-based physical activity program administered through the primary care clinic. The opportunity to detect an effect of stress on exercise SOC might have been increased if a more intensive intervention had been used to facilitate higher rates of stage movement.
Conclusions/Future Directions

Despite the above-mentioned limitations, the present study has important empirical and clinical implications. Several preliminary conclusions can be drawn from the present study, potentially leading to future directions in the exercise literature. First, support was garnered for the use of many transtheoretical constructs among an underserved population. Next, the modestly significant relationships that were found between stress and exercise behavior, though preliminary in nature, do point to previously specified areas for future research. While significant associations between stage movement and life events, self-efficacy, and decisional balance constructs were unable to be established, the current study highlighted the importance of self-efficacy as a variable with significant association to self-reported physical activity.

Several directions for future research are implicated in light of the current study’s findings. First, longer follow-up longitudinal points (1-2 year follow-ups i.e., Herzog et al., 1999) using some of the same theoretical hypotheses may help to more clearly detect the subtle differences in the experience of major and minor stressors, as well as the nature in which these experiences affect both the duration and course of exercise behavior. In addition, future research should focus on more objective measures of physical activity. Another potential future area of research is related to the assessment and management of stressful life events among low-income, primary care patients. Stress management programs administered in primary care clinics may facilitate the extent to which low-income patients can heed the exercise recommendations of their primary care physician without undue environmental and personal factors acting as barriers to this behavior.

In summary, the current project represents an important first step in the application of the transtheoretical model to a low-income, minority, primary care population. In
addition, the present study also identified psychological constructs worthy of further refinement and study. Exploration and application of these constructs may eventually lead to increased rates of exercise behavior, and a resultant decrease in the long-term negative health outcomes associated with sedentary behavior. It is hoped that future studies of this type will be generated focusing more exclusively on the transtheoretical constructs, using longer longitudinal models, and obtaining convergent, objective validation of exercise behavior among low-income, minority patients attending primary care clinics.
REFERENCES


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96

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APPENDIX 1: SUMMARY OF RESEARCH QUESTIONS
Stress and the Exercise Stages of Change Model: 
A Summary of the Major Research Questions

**Research Questions/Hypotheses**

- **RQ1A:** What is the distribution of SOC in this population?
- **RQ1B:** What are the inter-relationships between SOC, DB, & SE?
- **RQ1C:** Do SOC, SE, & DB predict exercise behavior?
- **RQ2:** How does stress affect exercise directly?
- **RQ3:** How does stress affect exercise?

(+) or (-) indicates direction of the hypothesized relationship

**Abbreviations**

- **PC:** Precontemplation
- **DB:** Decisional Balance
- **C:** Contemplation
- **SE:** Self-Efficacy
- **P:** Preparation
- **SOC:** Stages of Change
- **A:** Action
- **M:** Maintenance

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APPENDIX 2: SUMMARY OF MEASURES GIVEN
<table>
<thead>
<tr>
<th><strong>ASSESSMENT</strong></th>
<th><strong>1-MONTH FOLLOW-UP</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise Self-Efficacy (SEQ)</td>
<td>Major Life Events (LES)</td>
</tr>
<tr>
<td>Decisional Balance Questionnaire (DBQ)</td>
<td>Minor Life Events (Hassles Scale)</td>
</tr>
<tr>
<td>Exercise Pros</td>
<td></td>
</tr>
<tr>
<td>Exercise Cons</td>
<td></td>
</tr>
<tr>
<td>Exercise Pros-Cons</td>
<td></td>
</tr>
<tr>
<td>Exercise Behavior (BRFSS)</td>
<td></td>
</tr>
<tr>
<td>Stages of Change (SOCQ)</td>
<td></td>
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<tr>
<td>Stages of Change (SOCQ)</td>
<td></td>
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</tbody>
</table>
**DEMOGRAPHIC INFORMATION**

1) Subject Number: ________________

2) Age: _______

3) Medical Record #: ________________

4) Hospital: ________________ Clinic: ________________

5) Sex (circle one): Male Female

6) Job/Occupation: ________________

7) Marital status (circle one):
   a. Single
   b. Married
   c. Separated
   d. Divorced
   e. Other (please specify): ________________

8) Race (circle one):
   a. White (Non-Hispanic)
   b. African-American
   c. Hispanic
   d. Asian
   e. Other (please specify): ________________

9) Please circle the highest grade you have completed:
   Grade School:
   1 2 3 4 5 6 7 8 9 10 11 12
   College/Trade School:
   1 year 2 years 3 years 4 years More than 4 years
   Have you completed high school? (circle one):
   Yes No
   If you have not graduated from high school, do you have a GED? (circle one): Yes No

10) Other education (please specify type and number of years): ________________

11a) What is your average monthly income? $ ______

12a) How many people live in your home? ______

12b) What is the total monthly income including everyone in your home? $ ______

12c) Where does this money come from? (circle each one that applies to your family and indicate the amount of money your family receives from that source each month)
   a. Jobs/Careers $ ______
   b. Public assistance/Welfare $ ______
   c. Social Security/Disability $ ______
   d. Unemployment $ ______
   e. Child support/Alimony $ ______
   f. Allowance $ ______
   g. List other sources of income below: ________________ amount: $ ______

13) Do you have any health insurance? Yes No If so, What kind: _______________________


15) Address: ________________

16) Phone number: ________________

17) Height: ________________ Weight: ________________

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APPENDIX 4: CONSENT FORMS
Louisiana State University Medical Center in New Orleans Consent Form

1. **STUDY TITLE:** Assessment of Preventive Health Care Needs of Rural and Urban Indigent Populations in Primary Care Settings.

2. **PERFORMANCE SITES:** Earl K. Long Medical Center, Baton Rouge, LA; Baton Rouge General Medical Center, Baton Rouge, LA; University Medical Center, Lafayette, LA; Conway Hospital, Monroe, LA.

3. **NAMES AND TELEPHONE NUMBERS OF INVESTIGATORS:** For 24-hour access, please contact Phillip J. Brantley at (504) 763-3046 or Cindy Carmack at (504) 763-3052.
   - Phillip J. Brantley, Ph.D. ..................................(504) 763-3046
   - Donna Ryan, M.D. .............................................(504) 763-2514
   - Cindy L. Carmack, Ph.D. .................................(504) 763-3052

4. **PURPOSE OF THE STUDY:** This is a research study to determine health costs of diseases caused by smoking, high fat diets, and lack of exercise. The study also will try to determine factors which might help people change to a healthier lifestyle.

5. **SUBJECT INCLUSION CRITERIA:** This study includes patients present at out-patient clinic appointments at 4 hospitals in Louisiana and older than 18 years of age who agree to participate.

6. **SUBJECT EXCLUSION CRITERIA:** Patients younger than 18 years of age and those who do not wish to participate are excluded.

7. **DESCRIPTION OF THE STUDY:** Approximately 600 volunteers will be interviewed while waiting for their clinic appointments. Questions will be asked concerning various lifestyle factors that may be related to health including smoking, high fat diets, and lack of exercise. Additionally, subjects will be asked to participate in a follow-up phone interview one month later asking questions regarding smoking, high fat diets, and lack of exercise. A review of Medicaid and/or medical records will be conducted to gather information related to current medical diagnoses.

8. **BENEFITS TO SUBJECT:** The results of the study may not benefit the patient directly, but may benefit others by providing information which may help people change unhealthy lifestyle habits.

__________________________
Subject's Initials
9. RISKS TO SUBJECTS: There are no known physical risks to participating in this study. Participation in this study may involve unforeseen risks.

10. ALTERNATIVES TO PARTICIPATION IN THE STUDY: Since no treatment is involved in this study, the only alternative to participation in the study is not to participate.

11. SUBJECT REMOVAL: Subjects who do not complete the initial interview will be removed from the study. There are no special risks involved in being removed from the study.

12. SUBJECT’S RIGHT TO REFUSE TO PARTICIPATE OR WITHDRAW: Study subjects may refuse to participate or withdraw from the study at anytime without jeopardizing, in any way, their medical treatment in this institution in the present or future. Should significant new findings develop during the course of the research which may related to the subject’s willingness to continue participation, that information will be provided to the subject. There are no special risks involved in withdrawal from the study.

13. SUBJECT’S RIGHT TO PRIVACY: The results of the study may be released to the funding agency. The results of the study may be published. The privacy of subjects will be protected and they will not be identified in any way.

14. RELEASE OF INFORMATION: The medical records related to the study are available to the sponsoring agency and the Food and Drug Administration. Information provided during the course of the study is confidential.

15. FINANCIAL INFORMATION:
   A. Participation in this study will not result in any extra charges above and beyond those routinely incurred by patients with similar illnesses.
   B. The costs of all drugs, visits, procedures and study related and unforeseen complications must be met by the subject.
   C. Subject payment: Subjects will be paid $25.00 for completing the initial interview of the study. Subjects will be paid $10.00 for completing the one-month follow-up phone interview.

Subject’s Initials
16. SIGNATURES: The study has been discussed with me and all my questions have been answered. I understand that additional questions regarding the study should be directed to investigators listed on page 1 of this consent form. I understand that if I have questions about subjects’ rights, or other concerns, I can contact the Chancellor of LSU Medical Center, at (504) 568-4801. I agree with the terms above and acknowledge I have been given a copy of the consent form.

_____________________________    __________________
Signature of Subject                Date

_____________________________    __________________
Signature of Witness                Date

The study subject has indicated to me that the subject is unable to read. I certify that I have read this consent form to the subject and explained that by completing the signature line above the subject has agreed to participate.

_____________________________    __________________
Signature of Reader                 Date

The study subject is a child and I certify that I am his/her legal guardian.

_________________________     __________________
Legal Guardian Name             Legal Guardian Signature    Date

_________________________     __________________
Child’s Name and Age             Child’s Signature    Date

Reason for not obtaining child assent: ________________________________
Consent Form

Assessment of Preventive Health Care Needs of Rural and Urban Indigent Populations in Primary Care Settings

INVITATION TO PARTICIPATE: I am being asked to participate in this research study because the results of the study may benefit others by providing information on how to help people lead healthier lives.

PURPOSE: I understand that the purpose of the study is to determine health costs of diseases caused by smoking, high fat diets, and lack of exercise. The study also will try to determine factors which might help people change to a healthier lifestyle.

PROCEDURES: I will be interviewed while waiting for my clinic appointment. Questions will be asked concerning various lifestyle factors that may be related to my health. Additionally, I will be asked to participate in a follow-up phone interview one month later. I understand that researchers may review my medical and/or Medicaid records for the purposes of gathering information related to my current medical diagnoses.

RISKS: I understand that the risks associated with participating in this study are minimal, but may include distress associated with answering questions. However, I understand researchers have minimized this risk by restricting questions and not including those of a sensitive or highly personal nature.

BENEFITS: I understand that the results of the study may not benefit me directly, but may benefit others by providing information which may help people change unhealthy lifestyle habits.

ALTERNATIVES: I understand that the study does not involve treatments; therefore, there are no treatment options. I understand that all participants will follow the same procedures.

COMPENSATION: I will receive a total $35.00 for compensation for participation in this study. I will receive $24.00 for completing the initial interview and $10.00 after completing a phone interview one month later.

(Patient's Signature)
Assessment of Preventive Health Care Needs of Rural and Urban Indigent Populations in Primary Care Settings

CONFIDENTIALITY: I understand that all information collected in this study will be kept strictly confidential, except as may be required by law. If any publication results from this research, I will not be identified by name.

DISCLAIMER/WITHDRAWAL: I agree that my participation in this study is completely voluntary and that I may withdraw at any time without prejudicing my standing within the General Health Inc. system. Whether I participate or not, my care or medical expenses will not be affected.

INJURY/COMPLICATIONS: I understand that there are minimal risks involved in the study. Injury and/or complications resulting from the study are highly unlikely.

SUBJECT RIGHTS: I understand that if I wish further information regarding my rights as a research subject, I may contact the Director in the Office of Research Administration at the Baton Rouge General Medical Center by telephoning (504) 387-7736.

I also understand that if I have any questions pertaining to my participation in this particular research study, I may contact the researchers by calling the telephone numbers(s) listed at the top of each page.

I have been given the opportunity to ask questions and have had them answered to my satisfaction.

CONCLUSION: I have read and understand the consent form. I agree to participate in this research study. Upon signing below, I will receive a copy of the consent form.

Name of Subject ___________________________ Signature of Subject ___________________________ Date ____________

Name of Investigator ________________________ Signature of Investigator ________________________ Date ____________

Name of Witness ____________________________ Signature of Witness ____________________________ Date ____________
VITA

Shawn Kahlil Jeffries was raised in Tuscaloosa, Alabama, and upon graduating from high school in 1989, he enrolled at Louisiana State University (LSU). Shawn obtained his bachelor of science degree in psychology from LSU in 1993 with honors. Following graduation, Shawn obtained a master of arts degree in psychology from Southeastern Louisiana University in Hammond, Louisiana, where he completed his thesis project entitled "The Effect of Failure Feedback on the Self-Awareness of Restrained Eaters."

Following the completion of his master's degree, Shawn was accepted into the doctoral program in clinical psychology at LSU, where he worked under the tutelage of Phillip J. Brantley in the area of behavioral medicine and primary care psychology. After four years at LSU, Shawn was offered an internship at the University of Mississippi Medical Center/ Jackson Veterans Affairs Clinical Psychology Consortium in Jackson, Mississippi. During his internship year, Shawn was fortunate enough to serve as chief psychology resident, and received valuable clinical experience in the area of nicotine addiction, cardiovascular rehabilitation, eating disorders, trauma recovery, chemical dependency, and behavioral pediatrics. Shawn also became involved in smoking cessation research and other issues relating to various health behaviors.

Recently, Shawn accepted a behavioral medicine post-doctoral fellowship at the University of Kansas Medical Center in the Department of Preventive Medicine. In Kansas City, Shawn plans to continue his research with underserved populations in the area of public health and behavioral medicine through his association with his supervisor Jasjit Ahluwalia in the context of a smoking cessation grant based in public housing developments. Shawn’s ultimate plans include pursuing a faculty position in an academic
medical setting, perhaps in the Department of Family and/or Preventive Medicine. In this setting, Shawn hopes to continue not only conducting clinical research in the areas of primary care and health behavior, but also developing and refining his supervisory and clinical skills.
Candidate: Shawn Kahlil Jeffries

Major Field: Psychology

Title of Dissertation: The Role of Major and Minor Stressors in Moderating the Transtheoretical Model of Exercise Behavior Among Predominantly Low-Income Patients Attending Primary Care Clinics

Approved:

[Signature]

Major Professor and Chairman

[Signature]

Dean of the Graduate School

EXAMINING COMMITTEE:

[Signatures]

Date of Examination:

17 August 2000