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Leisure-Time Physical Activity as a Moderator of the Association Between Stress and Depression Among Low-Income Primary Care Female Population.

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LEISURE-TIME PHYSICAL ACTIVITY AS A MODERATOR OF
THE ASSOCIATION BETWEEN STRESS AND DEPRESSION
AMONG LOW-INCOME PRIMARY CARE FEMALE POPULATION

A Dissertation
Submitted to the Graduate Faculty of the
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Doctor of Philosophy

in

The Department of Psychology

by
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## TABLE OF CONTENTS

- **ACKNOWLEDGMENTS** .......................................................... ii
- **LIST OF TABLES** .............................................................. v
- **ABSTRACT** ........................................................................... vi
- **INTRODUCTION** ............................................................... 1
- **REVIEW OF LITERATURE** .................................................. 4
  - Depression ........................................................................... 4
  - Depression in Primary Care .................................................. 4
  - Etiology of Depression ......................................................... 6
  - Stress .................................................................................. 11
  - Stress and Depression .......................................................... 14
  - Moderator Variables in the Stress-Depression Relation .......... 17
  - Physical Activity ................................................................ 18
  - Physical Activity and Physical Health ................................. 20
  - Physical Activity and Mental Health ................................... 23
  - Physical Activity as a Stress-Depression Moderator ........... 27
- **PURPOSE OF THE STUDY** .................................................... 30
- **METHOD** .......................................................................... 33
  - Subjects .............................................................................. 33
  - Measures ............................................................................. 34
  - Procedure ............................................................................ 38
- **RESULTS** ........................................................................... 40
- **DISCUSSION AND CONCLUSION** ......................................... 49
- **REFERENCES** ................................................................. 59
- **APPENDIX A: DEMOGRAPHIC QUESTIONNAIRE** ................. 77
- **APPENDIX B: CONSENT FORM** ........................................... 78
- **VITA** ................................................................................ 81

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LIST OF TABLES

1. Demographic Information for the Total Sample . . . . 40
2. Dependent and Independent Variables: Descriptive Statistics . 43
3. Correlational Matrix: CES-D, DIS-IV, Demographic Variables, Number of Chronic Illnesses, and Predicting Variables . 44
4. Mean (±SD) of the Dependent and Independent Variables by Subject Group According to Engagement in Leisure-Time Physical Activity . . . . 46
5. Multiple Regression Results for Predictors of Depressive Symptoms According to the CES-D . . . . 46
6. Logistic Regression Results for Predictors of Major Depressive Disorder . . . . . . . . 48

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ABSTRACT

The present study used a longitudinal design in an attempt to answer the following questions: (a) what is the prevalence of sedentary lifestyle in a low-income primary care female population? (b) does minor stress predict depressive symptoms after controlling for major stress? and (c) does leisure-time physical activity moderate the association between stress and depressive symptoms?

The sample included 150 randomly selected adult female patients recruited from primary care clinics at a public hospital in the state of Louisiana. This sample consisted predominantly of uninsured, African American, low-income, middle-aged females. The results indicated that prevalence of sedentary lifestyle (58%) was above both national and state estimates. Major stress predicted depressive symptoms as measured by a self-report instrument (i.e., Center for Epidemiologic Studies - Depressed Mood Scale [CES-D]) as well as the diagnosis of major depressive disorder based on a psychiatric interview (Diagnostic Interview Schedule - IV [DIS-IV]). Although minor stress contributed a unique amount of variance to the prediction of depressive symptoms on the CES-D after controlling for major stress, it failed to predict the diagnosis of major depressive disorder. Hierarchical regression analyses failed to support the hypothesis that leisure-time physical activity would moderate the association between stress and depressive symptoms.
INTRODUCTION

Depressive disorders have been the focus of public health concern due to their excessive mortality, morbidity, and their association with health care utilization (Black, Warrack, & Winokur, 1985; Klerman & Weissman, 1992; Murphy, Monson, Oliver, Sobol, & Leighton, 1987; Regier, Golberg, & Taube, 1978). The incidence of depressive disorders among adult Americans is higher than 10 percent in any given year (U.S. Department of Health and Human Services, 1996). In a recent national survey, Kessler, et al. (1994) found that 17 percent of the respondents reported a lifetime history of major depressive disorder, and 10 percent experienced at least one major depressive episode in the 12 months prior to the survey. In addition, they found a higher prevalence of major depressive disorder and dysthymic disorder among females as compared to males.

Other studies have shown a high prevalence of depressive disorders in primary care settings (Pérez-Stable, Miranda, Muñoz, & Ying, 1990; Von Korff, Shapiro, Burke, et al., 1987). A recent study showed that the prevalence of depressive disorders in primary care settings is greater among females and low-income individuals (Sherbourne, Jackson, Meredith, Camp, & Wells, 1996).

Although it is extremely difficult to establish a temporal relation between major life events and depression, researchers have found a positive association between major life events and depressive symptoms (Billings & Moos, 1982; Hammen, Mayol, deMayo, & Marks, 1986; Rowlinson & Felner, 1988). Furthermore, there is considerable evidence that a relation exists between stress and physical/psychological health (Atkinson, Slater, Grant, Patterson, & Garfin, 1988; Benedittis & Lorenzetti, 1992; Benedittis, Lorenzetti, 1987).
Interestingly, not all individuals who experience high levels of stress develop physical or psychological symptoms. Social support and coping have been the most extensively studied variables that possibly moderate the association between stress and physical and mental illness (Cobb, 1976; Lazarus & Folkman, 1984). More recently, several studies have begun to investigate the moderating properties of physical activity and physical fitness on the association between stress and psychological/physical symptoms (Brown, 1991; Carmack, 1995; Roth & Holmes, 1985).

beneficial effects on mental health, especially anxiety and depression (Blumenthal, Williams, Needels, & Wallace, 1982; King, Taylor, Haskell, & DeBusk, 1989; Roth, 1989; Taylor, Sallis, & Needle, 1985).

A review of the literature in this paper will provide an overview of depression and its etiology. This will be followed by an overview of major and minor stress and their relation to physical illness and psychopathology. Finally, the moderator variables in the stress-depression relation will be examined with particular emphasis on physical activity.
Depression

Depression can be examined in two ways: as a symptom (i.e., depressed or sad mood) or as a syndrome which involves the interaction of cognitive, behavioral, biological, and motivational symptoms leading to impairment in social and/or occupational functioning. According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; 1994), depressive disorders are a sub-category of mood disorders which includes major depressive disorder, dysthymic disorder, and depressive disorder not otherwise specified. The common denominator in all three depressive disorders is depressed mood.

A detailed description of the diagnostic criteria for depressive disorders is beyond the scope of this paper. The focus of the current study was depressive symptoms that are not substance-induced or due to any medical condition. Therefore, the description of the symptomatology of depressive disorders according to the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; 1994) is particularly relevant.

Major depressive disorder is characterized by one or more major depressive episodes which are defined by the presence of a depressed or sad mood or loss of interest for at least two weeks. These symptoms must be accompanied by four or more of the following: significant decrease or increase in appetite, insomnia or hypersomnia, psychomotor agitation or retardation, fatigue, feelings of worthlessness or inappropriate guilt, concentration difficulties, and suicidal ideation or intent. Dysthymic disorder is
characterized by at least two years of depressed mood for more days than not
accompanied by the presence of at least two of the following symptoms: significant
decrease or increase in appetite, insomnia or hypersomnia, fatigue, low self-esteem,
concentration difficulties, and feelings of hopelessness. Finally, Depressive Disorder Not
Otherwise Specified may include the presence of some of the depressive symptoms
described above, but the full criteria for major depressive disorder or dysthymic disorder
is not met.

The lifetime prevalence of major depressive disorder in the general population is
reported to be 10 to 25 percent for females and 5 to 12 percent for males. Point
prevalence of this disorder in community samples has varied from 5 to 9 percent for
females and 2 to 3 percent for males (American Psychiatric Association, 1994). A recent
large study conducted in the United States among 8098 noninstitutionalized persons aged
15 to 54 years indicated that the lifetime prevalence of dysthymic disorder was 8 percent
for females and 4.8 percent for males. When the 12-month prevalence was examined, the
results indicated a prevalence of 3 percent for females and 2.1 for males (Kessler et al.,
1994).

With regard to differences in prevalence rates of depressive disorders when race
and socio-economic status are compared, Rehm and Tyndall (1993) indicated that the
data are inconclusive due to conflicting results from different studies and methodological
flaws. However, it has been well established that females display a higher lifetime and
point prevalence rates of depressive disorders than males (Rehm & Tyndall, 1993).
The largest study that examined the relation between depression and socio-economic status was performed among 1,536 residents of three small-town rural communities in Upper Bavaria. Results indicated that depression was significantly associated with female gender, increasing age, low socio-economic status, and somatic complaints (Weyerer, 1992).

Depression in Primary Care

Studies have demonstrated a high prevalence of psychiatric disorders in primary care settings, especially anxiety and depression (Barrett, Barrett, Oxman, & Gerber, 1988; Kessler, Burns, et al., 1987; Marsland, Wood, & Mayo, 1976; Simon, Ormell, Von Korff, & Barlow, 1995; Von Korff, et al., 1987). Prevalence rates of depressive disorders among primary care patients have been reported to range from 6 to 26 percent (Barrett, Barrett, Oxman, & Gerber, 1988; Katon, & Shulberg, 1992; Pérez-Stable, Miranda, Muñoz, & Ying, 1990; Shulberg, & Burns, 1988). In a sample of primary care patients composed largely of low-income African American females, Adams (1994) found that 29 percent met DSM-III-R criteria for major depressive disorder, and 17 percent met criteria for dysthymic disorder.

Regier, Golberg, and Taube (1978) hypothesized that high prevalence rates of psychiatric disorders in primary care settings are the result of patients using primary care settings for mental health problems. Katon et al. (1990) reported that patients with one or more depressive disorders utilize primary care services more often than patients without depressive disorders.
It has been estimated that the baseline costs of primary care patients who experience anxious or depressive symptoms at clinical or sub-clinical levels are higher than primary care patients without these symptoms after adjusting for medical comorbidity. These differences in costs were primarily due to costs of medical service utilization rather than costs associated with mental health treatment (Simon, Ormel, Von Korff, & Barlow, 1995). Unfortunately, the authors did not differentiate between the costs associated with anxiety or depression considered separately.

The costs mentioned above do not include social and occupational disability associated with depression such as unemployment, missed work days, lack of participation in social gatherings, etc. Wells et al. (1989) performed a large study among 11,242 patients in three American health care provision systems. They found that patients with clinical and sub-clinical levels of depressive symptoms displayed significantly more limitations with regard to social, occupational, and physical functioning than patients without depressive symptoms. In addition, patients with depressive symptoms tended to rate their current health worse and to have greater bodily pain than patients without depressive symptoms.

**Etiology of Depression**

In an attempt to explain the etiology of depressive disorders, a number of models have been proposed. These theoretical approaches have been grouped into two major categories: biological theories and psychological theories. An exhaustive review of these
models is beyond the scope of this paper (see review by Rehm and Tyndall, 1993), but the critical principles of the most cited theories will be highlighted below.

The biological explanation for the etiology of depressive disorders has been based on research from two general approaches: genetic and biochemical studies. Although studies have supported the hypothesis that genetic factors play a role in the development of bipolar disorder (i.e., major depressive episodes accompanied by one or more manic or mixed episodes), this support has not been as consistent with regard to the development of unipolar depression (Rehm & Tyndall, 1993).

Biochemical explanations for the development of depressive disorders are based on pharmacological studies in which investigators have found that certain drugs (e.g., monoamine oxidase inhibitors, tricyclic compounds, and serotonin reuptake inhibitors) have mood-elevating properties. The most accepted biochemical explanations have been the amine hypotheses that include the cathecolamine hypothesis and the indolamine hypothesis. The cathecolamine hypothesis posits that depressive disorders are associated with a deficiency of cathecolamines in the brain, especially norepinephrine and dopamine (Bunney & Davis, 1965; Schildkraut, 1965; see review by Van Praag, 1982b). The indolamine hypothesis states that depletion or lack of serotonin in the central nervous system lead to the emergence of depressive symptoms (Coppen et al., 1965; Glassman, 1969; see review by Van Praag, 1982a). Other studies have shown that acetylcholine, peptides, and other biochemical compounds may be involved in the etiology of
depressive disorders, but these investigations are in their early stages and the data are still inconclusive (Golden & Janowsky, 1990).

Investigators have also found that depressed individuals display a hypersecretion of cortisol from the adrenal cortex. Possibly this altered secretion of cortisol results from a dysfunction of the Hypothalamic-Adrenal-Pituitary axis (HPA axis; Gerner & Wilkins, 1983; Risch & Janowsky, 1985; Stokes & Sikes, 1987).

Although there are multiple biological explanations for the development of depressive disorders, a common denominator or specific biological marker has yet to be found. Golden and Janowsky (1990) suggested that possibly there is an overlap among these proposed biological theories and/or an interaction among several neurotransmitter systems.

With regard to psychological explanations, the most cited theories are the psychodynamic, behavioral, and cognitive models. From the psychodynamic point of view, Freud (1917, 1986) proposed that depression is a self-directed reaction to the loss of an object. This loss may be a real loss (i.e., mourning) or an emotional loss (i.e., melancholia). Although a variety of psychodynamic models of depression have been proposed since Freud's initial formulation, "mourning and melancholia" remains the basic paradigm for the development of depressive disorders (Mendelson, 1990).

The two most common behavioral approaches to explain the development of depressive disorders are the reinforcement models and the learned helplessness theory. Lewinsohn's reinforcement theory (Lewinsohn, 1974) states that depression is due to a
low frequency of response-contingent reinforcement. This low frequency of reinforcement may occur in three different ways: (a) impoverishment of the environment in providing appropriate reinforcement to maintain adequate functioning; (b) the environment provides the reinforcement but the individual lacks the appropriate skills to obtain it; or (c) the reinforcement is available but the individual is unable to enjoy it. In addition, the depressive behaviors are reinforced by others, contributing to the maintenance of these particular behaviors.

Learned helplessness theory (Abramson, Seligman, & Teasdale, 1978; Seligman, 1974) posits that depressed individuals attribute negative events to internal, stable, global causes and positive events to external, unstable, specific causes. Within this framework, a depressed individual usually attributes success to external causes and fails to generalize this accomplishment to other situations. However, the depressed individual attributes a failure to internal factors and will generalize this failure to other situations. Therefore, theory of learned helplessness hypothesizes that certain individuals have a characteristic attributional style that make them prone to develop depressive symptomatology.

The cognitive model of depression proposed by Beck (1963, 1964) suggests that individuals are susceptible to depression because they have dysfunctional schemata or attitudes regarding themselves and the environment. He proposed three specific elements to explain the cognitive set of depression: (a) cognitive triad which consists of a negative view of self, the world, and the future; (b) schemata or stable cognitive patterns which are derived from the individual's selective attention to specific stimuli; and (c) cognitive
errors or faulty information processing that maintain the individual's belief in the validity of his or her negative concepts. This theory proposes that an individual's early experiences provide the basis for forming the cognitive triad which, in turn, lead to the negative schemas. The negative schemas in combination with the cognitive errors contribute to maintain depressive behaviors (Beck, Rush, Shaw, & Emery, 1979).

The biological and psychological approaches to the etiology of depression have also been discussed in terms of the diathesis-stress model. This model states that the individual has a biological predisposition for the development of depression, however, stressful events contribute to the precipitation of depressive symptoms (Rehm & Tyndall, 1993). Therefore, from this perspective, depressive disorders are seen as a result of a combination of biological, psychological, and environmental factors.

Stress

Stress has been defined in a variety of ways throughout the literature. The two most common conceptualizations of stress are the stimulus-oriented model and the response model. The stimulus-oriented model researchers focus their investigations on the environmental stimuli (i.e., stressors). The response-oriented investigators focus on the mechanisms of response to stressors (e.g., general adaptation syndrome). Others theorists, like Lazarus and Folkman (1984), proposed an integration of these two approaches. They defined stress as "... a particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being" (p. 19).
There is considerable evidence that a relation exists between stress and illness. However, there is no conclusive model that explains the link between stress and illness. Brantley and Garrett (1993) reviewed four major models that have been proposed in the literature: (a) exposure to stressors induces an alteration in physiological functioning, increasing the probability of disease or illness; (b) stress may lead to reduction of the organism's resistance to disease; (c) stress may trigger a neurological hypersensitivity to excitation, leading to illness or arousal disorders; and (d) stress affects health indirectly through increased high risk behaviors or an inability to cope with stressful situations.

The most frequently used methodology to assess stress and its association with health is the measurement of major life events. Major life events have been defined as "...a class of stressful stimuli or situations to which everyone is exposed to a greater or lesser extent in the natural course of life" (Dohrenwend & Dohrenwend, 1974, p. 1). These events are also called major stress, and they include such experiences as the death of a spouse, change of residence, marriage, major change in financial status, etc. Previous research has demonstrated that major life events are associated with physical symptoms (Atkinson, Slater, Grant, Patterson, & Garfin, 1988; Benedittis, Lorenzetti, & Pieri, 1990; Hui, Shiu, & Lam, 1991; Benedittis & Lorenzetti, 1992; Leavitt, Garron, & Bieliauskas, 1980; Smith, Follick, & Ahern, 1985; Wyler, Masuda, & Holmes, 1971). With regard to the relation between major life events and psychopathology, researchers have suggested that major life events are associated with psychiatric disorders and psychological distress (Faravelli, 1985; Gillis, 1992).
More recently, researchers have begun to investigate the relation between minor stress and health. Lazarus (1984) referred to minor stressors as hassles which are "... experiences and conditions of daily living that have been appraised as salient and harmful or threatening to the endorser's well-being" (p. 376). These minor events include strains of daily living such as work load, car trouble, lack of privacy, etc.

Research comparing major and minor stressors has indicated that minor stressors have a greater impact on well-being than major stressors (DeLongis, Coyne, Dakof, Folkman, & Lazarus, 1982; Garrett, Brantley, Jones, & McKnight, 1991; Holahan & Holahan, 1987; Monroe, 1983; Weinberger, Hiner, & Tierney, 1987). Kanner, Coyne, Schaefer, and Lazarus (1981) suggested that the impact of everyday hassles may be independent of the impact of major life events, because minor stressors have their origin in the person's style of handling stressful situations, routine environment, or both, and are part of that individual's context.

Brantley and Jones (1993) recently reviewed the literature on the association of minor stress and disorders commonly presumed to be stress-related such as asthma, headaches, inflammatory bowel disease, and diabetes. They concluded that minor stress may be associated with an exacerbation of symptoms and signs of the physical condition. However, not all patients with these disorders displayed a relation between minor stress and an exacerbation of symptoms and signs associated with their medical disorders. These findings corroborate the conclusions of Lazarus (1984) and Kanner et al. (1981)
that individuals will psychobiologically respond to stress if they appraise the stimulus as threatening.

Stress and Depression

Studies have demonstrated a relation between stress and depressive symptoms (Billing & Moos, 1984; Brown & Harris, 1978; Bolger, DeLongis, Kessler, & Schilling, 1989; Eckenrode, 1984; Rowlinson & Selner, 1988). Holmes (1993) suggested that stress may result in a decrease in self-esteem or self-efficacy, which, in turn, will lead to depressive symptoms. Self-efficacy refers to a person's belief in his/her abilities to have control over events in his/her life (Bandura, 1989).

It has also been suggested that there is an association among stress, biochemical response, and depression (Gold, Goodwin, & Chrousos, 1988; Paul, 1988). Gruen (1993) summarized the literature on the biochemical effects of stress. He concluded that stress activates the sympathetic nervous system, the hypothalamic-pituitary-adrenal (HPA) axis, and the noradrenergic system in the central nervous system which results in increases in plasma norepinephrine and epinephrine, hypothalamic corticotrophin-releasing hormone (CRH), and adrenocorticortrophic hormone (ACTH). Studies have shown that depressed individuals display higher plasma levels of norepinephrine, epinephrine, CRH, and cortisol than nondepressed individuals suggesting a disturbance in the HPA axis activity (Gerner & Wilkins, 1983; Stokes, et al., 1984; Stokes, 1987). However, Cohen, Kessler, and Gordon (1995) have suggested that it is not clear whether the alterations in the HPA activity is a cause or effect of depression.
Cohen, Kessler, and Gordon (1995) proposed two possible explanations for this relation: (a) stressful experiences can be severe enough to lead to persistent sadness; or (b) stress leads to psychiatric disorders in individuals with a preexisting biological and/or environmental vulnerability. Although there is an indication in the literature that physiological and psychological factors play an important role in the relation between stress and depression, there is still a paucity of studies examining their interactions.

Similar to the literature on stress and illness, the relation between stress and depression has primarily been investigated by examining the occurrence and impact of major life events on the development of depressive symptoms. Billings and Moos (1982) studied the relation between major life events and depression in a community sample. They found that individuals who experienced more negative life events reported higher levels of depression. Sarason, Johnson, and Siegel (1978) found similar results with an undergraduate sample.

More recently, investigations have focused on the relation between minor stress and depression (Bolger, DeLongis, Kessler, & Schilling, 1989; Ganon & Pardie, 1989; Rowlinson & Felner, 1988). As mentioned earlier, Kanner and colleagues (1981) suggested that the impact of everyday events may be independent of the impact of major life events, because minor events may be a more proximal measure of stress than major life events. They found that the number of minor stressors was significantly related to psychological symptomatology even after controlling for the effects of major life events. Eckenrode (1984) prospectively studied the relation between major stress, daily stress and
mood among a community sample of 96 females with children. By using a path-analytic approach, he concluded that the occurrence of daily stressors was the most important direct predictor of daily mood states. The effects of major life events were mediated by changes in daily events as well as previous levels of psychological functioning.

However, investigators have suggested that there are a number of conceptual and methodological issues involved in the relation between stress and depressive symptoms (Dohrenwend, Dohrenwend, Dodson, & Shrout, 1984; Dohrenwend & Shrout, 1985; Gruen, 1993). Some have suggested that measures of stress are confounded with measures of psychological distress, and that the relation between stress and psychopathology should be examined independently of the individual's perception (Dohrenwend, Dohrenwend, Dodson, & Shrout, 1984; Dohrenwend & Shrout, 1985). Gruen (1993) proposed that this major methodological flaw should be addressed in future research by the demonstration that the individual was not involved in the causation of the event, and that the individual's appraisal of the event was not mediated by intrapsychic factors. Possibly, this disparity could be addressed by three methodological approaches: (a) longitudinal assessments of stressful events and their association to the development of depressive symptoms; (b) the use of measures that indicate event frequency rather than including subjective ratings of perceived stressfulness; and (c) the use of items that refer to observable stressors which do not overlap with symptoms of psychological distress.
Moderator Variables in the Stress-Depression Relation

Since not all individuals who experience high levels of stress develop physical or psychological symptoms, researchers have begun to investigate possible variables that may "buffer" the potentially harmful effects of stress on physical and psychological health. Social support and coping have been the most extensively studied variables that may moderate the association between stress and illness (Cobb, 1976; Cohen & Hoberman, 1983; Cohen & Wills, 1985; Lazarus & Folkman, 1984).

The stress-buffering hypothesis assumes that social support serves as a buffer mediating the effects of stressful events on illness (Cohen & Wills, 1985). In an extensive literature review on this topic Cobb (1976) concluded that social support decreases the effects of stress on pregnancy, arthritis, alcoholism, tuberculosis, and depression. He concluded that social support has a protective function by moderating the impact of stress and facilitating coping. Furthermore, Cohen and Hoberman (1983) found that social support moderates the relation between life events, depression, and physical complaints. Other studies have suggested that social support is negatively associated with depression (see Blaney, 1985, for review).

The relation between coping and depression has also been examined in the literature. According to Folkman and Lazarus (1991) "coping consists of cognitive and behavioral efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person" (p. 210). Based on this approach, it appears that appropriate coping skills can protect the individual from the effects of stress
since this allows the individual to have the ability to manage stressful situations.

Vitaliano et al. (1985) examined coping strategies in three distressed samples (psychiatric outpatients, spouses of patients with Alzheimer's disease, and medical students) and concluded that depression was positively associated with the Wishful Thinking scale and negatively related to the Problem Solving Scale of the Ways of Coping Checklist.

Physical Activity

Although the distinction between physical fitness and physical activity has been well defined, the definitions of exercise, physical activity, and leisure-time physical activity have been arbitrary across the literature, generating a great deal of confusion.

Physical fitness can be defined as "a set of attributes that represent the capacity to perform the physical activity" (Paffenbarger, Hyde, & Wing, 1990, p. 34). Physical fitness includes flexibility, body composition, muscular strength, muscular endurance, aerobic and anaerobic ability (Skinner, Baldini, & Gardner, 1990). It is believed that physical fitness is determined by both physical activity and genetic factors (Bouchard, 1990).

Exercise has been considered a subset of physical activity and refers to "planned, structured, and repetitive bodily movement done to improve or maintain one or more components of physical fitness" (Caspersen, Powell, & Christenson, 1985, p. 125). Physical activity has been defined as "any bodily movement produced by skeletal muscles that results in energy expenditure" (Caspersen, Powell, & Christenson, 1985, p. 125). Physical activity can occur during occupation (e.g., lifting heavy objects, standing...
while in the job, etc.), domestic activities (e.g., dusting, washing dishes, etc.), and leisure-time activities (e.g., walking, cycling, running, etc.).

According to the most recent recommendations from the Centers for Disease Control and Prevention and the American College of Sports Medicine, adult Americans should engage in at least 30 minutes of moderate-intensity physical activity (e.g., walking briskly, swimming, home care, general cleaning) on most or all days of the week (Pate et al., 1995). According to three independent population-based surveys, approximately one-fourth of adult Americans do not engage in any leisure-time physical activity (U.S. Department of Health and Human Services, 1996). The percentage of adult Americans reporting a sedentary lifestyle (no leisure-time physical activity) within a period of one month has been reported to be 27.9 percent for males and 31.5 percent for females. However, the frequency of sedentary lifestyle increases with age, lower income, and lower education. Specifically, 40.1 percent of individuals with an annual income of less than $15,000 report no leisure-time physical activity whereas only 18.6 percent of persons with an annual income above $50,000 denied engaging in leisure-time physical activity. With regard to education, 48.1 percent of persons with at least some high school have a sedentary lifestyle, while only 20.2 percent of persons with a college education met this criterion (U.S. Department of Health and Human Services, 1991). A recent study conducted with the target population of the present study indicated that 48 percent of low-income primary care females do not engage in leisure-time physical activity (Scarinci, 1996).
When racial differences are examined, studies have shown that African Americans are more sedentary than Caucasians, independent of income and education (Caspersen, Christenson, & Pollard, 1986; Farrell, Kohl, & Rogers, 1987). Washburn, Kline, Lackland, and Wheeler (1992) conducted telephone interviews with 2,005 individuals in South Carolina as part of the National Health Interview Surveys, and they reported that African American females had a significantly lower level of leisure time physical activity than Caucasian females after adjusting for age, income, and body mass index (BMI). However, there were no differences among males.

Physical Activity and Physical Health

It has been well established that individuals who engage in leisure-time physical activity are at a lower risk of mortality (Blair, Kohl, Paffenbarger, et al., 1989; Brill, Kohl, & Blair, 1992; Paffenbarger, Hyde, Wing, et al., 1986; Paffenbarger, Hyde, Wing et al., 1993; Wiley & Camacho, 1980). In addition, engagement in leisure-time physical activity has been negatively associated with mortality rates due to the leading cause of mortality in the U.S., coronary heart disease (Hagan, Parrish, & Licciardone, 1991; Leon, Connett, Jacobs, & Rauramaa, 1987; Morris, Clayton, Everitt, Semmence, & Burgess, 1990; Paffenbarger, Hyde, Wing, & Steinmetz, 1984).

Powell, Thompson, Caspersen, and Kendrick (1987) demonstrated that individuals that are physically inactive are approximately twice as likely to develop coronary heart disease than individuals who are physically active. Previous investigations have shown the protective effects of physical activity in risk estimates for a

The benefits of physical activity in the primary and secondary prevention of cardiovascular disease should also be emphasized. Studies have demonstrated a unique contribution of physical activity to the prediction of onset and management of cardiovascular disease (U.S. Department of Health and Human Services [Public Health Service], 1992). Fletcher et al. (1992) emphasized the benefits of physical activity among healthy individuals and patients with cardiovascular disease by stating that physical activity "... increases maximal ventilatory oxygen uptake by increasing both maximal cardiac output (the volume of blood ejected by the heart, which determines the amount of blood delivered to the exercising muscles) and the ability to extract oxygen from blood" (p. 340). Other studies have shown very encouraging results regarding the association between regular physical activity and survival rates among patients with myocardial infarction (O'Connor et al., 1989; Oldridge, Guyatt, Fischer, & Rimm, 1988).

A recent study showed that leisure-time physical activity accounted for the largest percentage of variance in self-reported excellent health (defined as the absence of self-
reported chronic illness or health complaint), followed by housing problems, age, and smoking (Mackenbach et al., 1994). Stewart et al. (1994) performed a prospective study examining the benefits of physical activity among patients with various chronic diseases. Their results suggested that higher baseline levels of physical activity were associated with a variety of indicators of physical and mental health (e.g., physical functioning, energy/fatigue, emotional and physical role limitations, depression, anxiety, sleep problems, etc.) at baseline and at a 2-year follow-up. A recent study conducted with the target population of the present study indicated that primary care patients who did not engage in leisure-time physical activity perceived their health as significantly poorer than primary care patients who engaged in leisure-time physical activity at or above the recommended level (i.e., at least 3.5 hours/week). In addition, patients who did not engage in leisure-time physical activity reported a significantly higher number of days of disability due to physical and/or mental health than patients who engaged in any leisure-time physical activity (below, at, or above the recommended level) (Scarinci, Jones, Mehan Jr., & Brantley, 1997).

Of particular interest here is the association between physical activity and females' physical health. Although most studies linking physical activity and physical health have been conducted among males, more recent studies have demonstrated a similar relation among females (Juneau, Rogers, De Santos, et al., 1987; Marcus et al., 1992; Nieman et al., 1993; Owens, Mathews, Wing, & Kuller, 1990; Pinto & Marcus, 1994). However, these studies have focused on particular illnesses (i.e., osteoporosis, cancer,
cardiovascular disease) or specific age groups (e.g., immune function among elderly females). There is an absence of studies focusing on physical activity and physical health among primary care female patients, especially low-income and African-American females, with an array of acute and chronic illnesses.

Physical Activity and Mental Health

Whereas the link between physical activity and physical health has been well established, there are relatively few studies examining the psychological benefits of naturally occurring physical activity. Studies have shown that single bouts of moderately intense exercise can reduce acute anxiety, anger, tension, depression, and confusion as well as increase feelings of vigor (Bahrke & Morgan, 1978; Boutcher & Landers, 1988; Farrell, Gustafson, Morgan, & Pert, 1987; Roth, 1989).

Since the focus of this paper is depression, the discussion of relevant studies on the relation between physical activity and depression is warranted. The negative association between levels of physical activity and severity of depression has been a consistent finding in the literature (Cohen, Phil, Schwartz, Bromet, & Parkinson, 1991; Kaplan, Landa, Weinhold, & Shenker, 1984). Previous research has demonstrated that individuals who do not engage in physical activity are twice as likely to have depressive symptoms than are active individuals (U.S. Department of Health and Human Services, 1996). Some studies have also suggested that physical activity may be a valuable adjunct in the treatment of depression (Doyne et al., 1987; Sexton, Maere, & Dahl, 1989).
However, the conclusion that physical activity and depression are negatively associated may be interpreted as subjective since it depends on the variables examined in each study. For example, some studies have examined only moderate levels of depression or only one type of physical activity. North, McCullagh, and Tran (1990) addressed this issue by performing an objective and extensive meta-analysis on approximately 80 studies examining exercise and depression. This meta-analysis included cross-sectional, longitudinal, published, and unpublished studies. The authors concluded the following: (a) both a single bout of exercise and chronic exercise led to a significant decrease in depressive symptoms initially and at follow-up; (b) exercise is more effective at decreasing depressive symptoms than relaxation and pleasant activities; (c) although exercise was as effective as psychotherapy in decreasing depressive symptoms, exercise as an adjunct to psychotherapy was better than exercise alone; (d) individuals requiring medical and psychological assistance (i.e., clinical populations) displayed the largest decrease in depressive symptoms; (e) both state and trait depression scores decreased with exercise; (f) published studies showed a larger decrease in depression than unpublished studies; (g) medical rehabilitation patients showed the highest decrease in depressive symptoms, as compared to psychological rehabilitation, and individuals who engage in exercise to maintain their general health; (h) the longest exercise programs produced the greatest effects in diminishing depression; and (i) exercise decreased depression independent of the initial level of depression, health status, exercise location (e.g., home, medical facility, community center, university), or gender.
In addition, there are few community studies that have examined the association between physical activity and depression longitudinally. In a 23 to 27-year follow-up study among 10,201 Harvard alumni aged 35-74, Paffenbarger, Lee, and Leung (1994) found that incidence of physician-diagnosed depression was significantly lower among the physically active and sports players as compared to physically inactive participants. However, this study was conducted with males only. In a large community study performed among small communities in Upper Bavaria, Weyerer (1992) found that when the cross-sectional data was examined depression was significantly more frequent among the physically inactive participants than the regular exercisers. However, there were no significant differences with regard to the prevalence of depression between these two groups at five-year follow-up.

Farmer et al. (1988) indicated that most of the studies on the relation between physical activity and depression have used small and highly selected samples. Therefore, they performed a cross-sectional and prospective study on the relation between physical activity and depressive symptoms among healthy adult individuals as part of the National Health and Nutrition Examination Survey. They attempted to examine whether there is an association between physical activity and depression and whether this association is the same across gender and race. When the cross-sectional data were examined, they found that depressive symptoms were associated with little or no physical activity. Although this association was observed among both Caucasians and African Americans, the strength of this association was stronger among African Americans. At eight-year
follow-up, the authors concluded that a lack of physical activity may be a risk factor for depressive symptoms for the total sample. However, the strength of the association varied as a function of gender with regard to the number of depressive symptoms endorsed at baseline. Males who did not engage in leisure-time physical activity at baseline were 12 times more likely to report depressive symptoms at eight-year follow-up as compared to males who engaged in moderate or intense leisure-time physical activity at baseline. Among females, lack of leisure-time physical activity predicted depressive symptoms eight years later only for those who reported less than 16 depressive symptoms at baseline. The authors attributed this discrepancy among males and females to a variety of variables such as imprecision of the physical activity measure used, the idea that participation in leisure-time physical activity may have different meanings for males and females, or that high levels of depressive symptoms may be associated with different types of psychological distress among males and females.

Studies using females exclusively have indicated that physical activity is negatively associated with depressive symptoms among clinical and non-clinical samples (Labbe, Welsh, & Delaney, 1988; McCann & Holmes, 1984; Pappas, Golin, & Meyer, 1990; Ossip-Klein et al., 1989). However, these studies have several methodological limitations such as: (a) small sample sizes; (b) the outcome measure used was the Beck Depression Inventory which is heavily weighted with physical symptoms; and (c) the use of tailored exercise programs rather than naturally-occurring physical activity.
Physical Activity as a Stress-Depression Moderator

There is evidence in the literature supporting the stress reduction hypothesis of physical activity in laboratory settings (Hull, Young, & Ziegler, 1984; Keller & Seraganian, 1984; Perkins, Dubbert, Martin, Faulstich, & Harris, 1986; Roth & Holmes, 1987). In addition, other studies have shown that physical fitness may moderate the effects of stress on somatic complaints (Brown & Siegel, 1988; Norris, Carroll, & Cockrane, 1990; Roth & Holmes, 1985). Brown (1991) found that major life events were more significantly associated with poor health status among low-fit college students as compared to their high-fit counterparts.

However, the relation between minor stress and physical activity has not been extensively investigated. Carmack (1995) recently examined leisure-time physical activity as a moderator of the association between major/minor stress and physical/psychological symptoms among 135 college students. Her results indicated that minor stress predicted psychological and physical symptoms over and above major stress. With regard to the moderating properties of physical activity, she found that leisure-time physical activity moderated the association between minor stress and anxiety as well as the association between stress and physical symptoms; however, these associations were not found with depression. Although her study was cross-sectional and limited to college students, its results suggest that leisure-time physical activity may moderate the association between minor stress and physical or psychological symptoms. Therefore, future studies should address these relations in clinical and/or medical populations.
The most cited physiological mechanism proposed to explain how physical activity decreases depressive symptoms is the amine hypothesis. As discussed earlier, the amine hypothesis is based on the results of previous studies in which depressed individuals display decreased availability of amines (e.g., dopamine, norepinephrine, serotonin) in the brain; whereas, individuals who engage in physical activity show an increase in monoamine activity (Barchas & Freedman, 1963; Morgan, 1985; Ransford, 1982). Evidence for the amine hypothesis comes from studies which reveal that depressed patients display an increased excretion of the metabolites of norepinephrine, dopamine, and serotonin after physical activity (see review by Ransford, 1982). However, the mechanism involved in this process is still unknown. Ransford (1982) speculated three possible explanations for the antidepressant effect of physical activity in enhancing aminergic synaptic transmission that might work isolated or in combination: (a) long-term physical activity may result in physiological adaptation in synaptic transmission; (b) individual differences, i.e., only certain individuals are negatively affected by low levels of amines and they respond favorably to physical activity; and (c) cognitive factors. However, these speculations have yet to be investigated in the literature.

With regard to the psychological antidepressant effects of physical activity, two explanations have been more extensively studied in the literature: the cognitive-behavioral hypothesis and self-efficacy theory. The cognitive-behavioral hypothesis posits that physical activity leads to positive feelings and thoughts which, in turn, break
the cognitive set model of depression proposed by Beck (Beck, 1963, 1964; Beck, Rush, Shaw, & Emery, 1979; North, McCullagh, & Tran, 1990; Simmons et al., 1985). Self-efficacy theory posits that the antidepressant effects of physical activity are based on the enhanced feelings of control and mastery over oneself and the environment (Simmons, et al., 1985). However, Simmons et al. (1985) speculated that the self-efficacy explanation could be applied to any nonpharmacological intervention for depression since it promotes a sense of mastery.

Although studies have suggested that physical activity moderates the association between stress and depression, there is no well-researched physiological and/or psychological mechanism that explains the buffering properties of physical activity on depression. Further research is needed to examine these underlying physiological and psychological mechanisms presumed to be responsible for this association.
PURPOSE OF THE STUDY

If it has been well established that stress is positively associated with depressive symptoms, why do all individuals who experience high levels of stress not also experience depressive symptoms? Investigators have attempted to answer this question by examining a variety of variables that possibly moderate the relation between stress and depression, such as social support and coping. More recently, research has addressed the moderating properties of physical activity in this relation. Most studies have focused on physical activity as a moderator in the association between stress and depression in controlled-laboratory environments (Hull, Young, & Ziegler, 1984; Keller & Seraganian, 1984; Perkins, Dubbert, Martin, Faulstich, & Harris, 1986; Roth & Holmes, 1987). There is a lack of cross-sectional and prospective studies on naturally-occurring physical activity and its association with stress and depressive symptoms as measured by both a self-report questionnaire and a psychiatric interview.

Furthermore, most studies on naturally-occurring leisure-time physical activity have been conducted among Caucasian males. However, females seem to be more sedentary and to display higher a frequency of depressive disorders (Washburn, Kline, Lackland, & Wheeler, 1992). It has been estimated that 80 percent of patients who attend the primary care clinics in our setting are females (Brantley et al., 1996). In addition, it has been shown that 48 percent of these females do not engage in leisure-time physical activity (Scarinci, 1996), and 29 percent meet criteria for a Major depressive disorder (Adams, 1994).
With regard to the association between physical activity and mental health among females, Wykoff (1993) recently conducted an extensive review of the psychological effects of exercise on both a non-clinical and clinical sample of adult females. She reported that although engaging in physical activity has positive implications for anxiety, depression, mood, and cognition, these studies have been troubled by methodological flaws including small sample size, reliance on self-report and personality measures, and combination of data from both genders. In addition, she pointed out that there is a lack of research specific to minority and low socio-economic females as well as a lack of longitudinal and/or follow-up studies.

The present study represents the first investigation of naturally-occurring leisure-time physical activity as a moderator of the association between stress and depressive symptoms in a low-income primary care female population. It attempted to answer the following questions:

1) Does minor stress predict depressive symptoms after controlling for major stress? It was hypothesized that minor stress would contribute more to the regression equation than major life events. This hypothesis is based on the evidence provided by previous studies in which minor stress has been shown to be a better predictor of physical and psychological symptoms than major stress (DeLongis, Coyne, Dakof, Folkman, & Lazarus, 1982; Garrett, Brantley, Jones, & McKnight, 1991; Holahan & Holahan, 1987; Monroe, 1983; Weinberger, Hiner, & Tierney, 1987).
2) Does leisure-time physical activity moderate the association between stress and depressive symptoms? It was hypothesized that females who did not engage in leisure-time physical activity would endorse significant levels of depressive symptoms in a self-report measure as well as meet criteria for major depressive disorder in a psychiatric interview. Although most studies focusing on physical activity as a moderator in the association between stress and depression have been performed in controlled-laboratory environments (Hull, Young, & Ziegler, 1984; Keller & Seraganian, 1984; Perkins, Dubbert, Martin, Faulstich, & Harris, 1986; Roth & Holmes, 1987), they provide empirical evidence for this hypothesis.
METHOD

Subjects

The sample consisted of 150 randomly-selected adult female patients recruited from the Family Practice and General Medicine Clinics of Earl K. Long Medical Center (EKL). This population consists predominantly of patients from lower socio-economic status (95.3%), females (64.7%), and African Americans (77.2%).

A power analysis was conducted to determine the likelihood of detecting modest effects with alpha < .05 and N= 150 for all of the proposed hypotheses. For hypothesis 1, the analysis at Set 1 (major stress), assuming that this variable would account for 5 percent of the variance, would yield a power of .83. At step 2 (minor stress), assuming an increment variance of 5 percent, the power would be .83. Therefore, taking into account all analytic strategies proposed to test hypothesis 1, there was always an above 80 percent chance of detecting modest effects for each analysis.

In order to test hypothesis 2, an additional power analysis was performed. Minor and major stress were entered as a set in the power analysis, assuming a variance of 10 percent, the expected obtained power would be .97. The regression analysis at step 2 consisted of the main effect of leisure-time physical activity, the three two-way interactions (minor stress* leisure-time physical activity and major stress*leisure-time physical activity), and the three-way interaction (minor stress*major stress*leisure-time physical activity). An increment variance of 10 percent was assumed, and the obtained power was .92. In summary, taking into account all analytic strategies proposed to test
hypotheses 2, there was an above 90 percent chance of detecting modest effects, i.e., a combined $R^2$ of .20.

Measures

Demographic Questionnaire. This is a 16-item questionnaire designed specifically for use in the present study. It includes items referring to age, sex, race, marital status, educational level, occupation, income, previous mental health contact, history of treatment for drug and/or alcohol abuse, and insurance coverage. The demographic questionnaire is presented in Appendix A.

Life Experiences Survey (LES) (Sarason, Johnson, & Siegel, 1978). The LES is a 60-item inventory that assesses the number of major stressful events (number) subjects have experienced during the past 6 and 12 months, as well as the extent to which each event produced a positive, negative, or neutral impact when it occurred (intensity). This study used only the total number of events in the previous 6 months. Based on the results of two separate studies, Sarason, Johnson, and Siegel (1978) reported that the reliability coefficients for scores associated with negative events ranged from .56 to .88. The coefficients for total events ranged from .63 to .64.

Weekly Stress Inventory (WSI) (Jones & Brantley, 1990). The WSI is an 87-item inventory of weekly minor stressors/hassles. Subjects are asked to rate events that happened in the past week on an eight-point Likert-type scale ranging from "did not occur" to "extremely stressful." This questionnaire yields two scores: (1) the Event score (WSI-E) -- the number of minor stressful events that occurred in the past week and (2) the
Impact score (WSI-I) — the intensity associated with the week's events, i.e., subject's perception of minor stressful events. Since previous researchers (Dohrenwend, 1974; Dohrenwend, Dodson, Dohrenwend, & Shrout, 1984) have argued that intensity score can be confounded with psychological distress, the intensity score was not used in the present study. Brantley and Jones (1993) have reported that the WSI has concurrent validity with the monthly Hassles scale ($r=.65$) and with the Daily Stress Inventory (WSI-E with DSI-Event $r=.77$ and WSI-I with DSI-Impact $r=.84$). Its test-retest reliability has been shown to be adequate: WSI-E $r=.83$, WSI-I $r=.80$ (Brantley & Jones, 1993). The WSI has been previously used in predicting dietary compliance among hemodialysis patients (Hitchcock, Brantley, Jones, & McKnight, 1992), headache activity among chronic headache sufferers (Mosley et al., 1991), and psychological distress in cardiac patients (Mosley et al., 1993).

**1994 Behavioral Risk Factor Surveillance System (BRFSS)** (Centers for Disease Control, 1994a). The BRFSS is a survey schedule that has been widely used to identify high risk behaviors among noninstitutionalized adults (18 years of age or older) in 47 states and the District of Columbia. The BRFSS evolved from telephone surveys developed by the Centers for Disease Control (CDC) and state health departments in the early 1980s with the purpose of developing a system for estimating, with the use of random digit-dialed telephone surveys, the prevalence of high risk behaviors in the population (Remington, et al., 1988). Currently, the data obtained through the BRFSS are a central component of federal and state activities designed to monitor progress toward
achieving the health objectives for the year 2000 (U.S. Department of Health and Human Services [Public Health Service], 1992). The system focuses on behaviors that are related to one or more of the 10 leading causes of death. The questionnaire is divided into three major sections: (1) a series of core sections asked in 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). The core sections covered by the 1994 BRFSS include: demographics, health status, health care access, diabetes, leisure-time physical activity, cigarette smoking, nutrition, weight control, women's health, and AIDS knowledge and testing. 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 triethnic population (Shea, Stein, Lantigua, & Basch, 1991). The present study included only the section on leisure-time physical activity. A particular MET (metabolic equivalent) was attributed to each physical activity as proposed by Ford, et al. (1991). Ford, et al. (1991) proposed the following formula to calculate energy expenditure: Kcal/week = METs X hours/week X weight in kilograms.

**Center for Epidemiologic Studies - Depressed Mood Scale (CES-D)** (Radloff, 1977). The CES-D is a 20-item questionnaire that was developed by the National Institute of Mental Health to be used as a screening instrument in the assessment of depressive symptomatology. A total score may range from 0 to 60, and it is obtained by the sum of
the endorsed responses. Subjects are asked to indicate the occurrence and frequency of depressive symptoms in a one-week period using a four-point Likert-scale ranging from "rarely or none of the time" to "most or all of the time." Previous studies have indicated that the CES-D has good internal consistency with alpha levels of approximately .85 for the general population and .90 for psychiatric samples. Test-retest reliability range from .51 to .67 in two to eight-week periods. In terms of validity, the CES-D has shown to be significantly correlated with a variety of depression measures (Radloff, 1977). Studies have used a standard cut-point of 16 as indicative of clinical levels of depression (Roberts, Rhoades, & Vernon, 1990; Roberts & Vernon, 1983; Schulberg et al., 1985).

**Diagnostic Interview Schedule for the DSM-IV (DIS-IV)** (Robins, Cotler, Bucholz, & Compton, 1995). The DIS-IV is a structured psychiatric interview designed to derive reliable and valid diagnoses based on the Diagnostic and Statistical Manual of Mental Disorders-IV (American Psychiatric Association, 1994). The DIS-IV is a revised and expanded version of the original DIS (Robins, Helzer, Croughan, & Ratcliff, 1981). It provides information regarding symptoms, course, onset, recency, and impairment of a variety of Axis I disorders, e.g., generalized anxiety disorder, major depressive disorder, anorexia nervosa, etc. The number of symptoms endorsed in the sections on major depressive disorder and dysthyemic disorder as occurring in the past 12 months were used in the present study. Although there are a lack of studies using the DIS-IV version, there are a large number of studies that have examined the test-retest reliability and validity of the DIS. Test-retest reliability for lifetime psychiatric diagnoses has been reported to
range from .37 to .59. With regard to validity, previous studies indicated high concordance between psychiatrists and diagnoses obtained through the administration of the DIS by lay interviewers. They reported kappa coefficients ranging from .47 to 1.00 (Helzer, Spitznagel, & McEvoy, 1987; Robins, Helzer, Croughan, & Ratcliff, 1981; Vandiver & Sher, 1991; Wells, Burnam, Leake, & Robins, 1988).

**Patient's Global Health Status Rating.** For each subject, a primary care physician rated the number of chronic illnesses and the patient's global health status using a seven-point Likert scale, ranging from zero (patient is in good physical health) to six (patient has a terminal illness). This physician rating form has been adapted from questionnaires used in previous studies (Barsky, Wyshak, & Klerman, 1986; Davis, 1994; Hitchcock, 1993; Jones, Mabe, & Riley, 1989; Mabe, Hobson, Jones, & Jarvis, 1988). Jones, Mabe, and Riley (1989) reported that this scale has adequate inter-rater reliability. Only the number of chronic illnesses was used in the present study.

**Procedure**

This study was conducted as part of a larger, ongoing study of stress and psychopathology in medical utilization funded by the National Institute of Mental Health (1 R01 MH51194-01A1). Patients were approached in the waiting rooms and asked to participate in the study. Prospective subjects were offered an explanation of the study and all questions were answered. Subjects who agreed to participate were asked to sign a consent form (Appendix B) indicating that they understood the procedures involved and their rights and privileges as research participants. If subjects were unable to follow...
written instructions, then the questionnaires were administered verbally. Participants were administered the demographic questionnaire and other measures which were relevant to the NIMH study. Participants completed the WSI and BRFSS bimonthly over the telephone for four months (i.e., two phone calls). For each subject, a day during every other month was randomly selected and he/she was contacted by a research assistant to collect the data. Once the phone call was completed, participants were mailed a check for $10.00 for their participation.

At the end of this six-month period, participants were scheduled for a face-to-face interview. At this time, they were administered the DIS-IV, and they completed the WSI, BRFSS, LES, and CES-D. Participants were paid $50.00 upon completion of the interview and all questionnaires. At this time, chart reviews were performed by a primary care physician in order to determine the presence and number of chronic illnesses.
RESULTS

Descriptive statistics were used in order to generate a profile of the sample based on the demographic information (e.g., race, age, marital status, educational level, insurance coverage, and monthly income). Monthly income was calculated by dividing the reported family income by the number of people in the household (Table 1).

Table 1: Demographic Information for the Total Sample

<table>
<thead>
<tr>
<th>Variable</th>
<th>%</th>
<th>N</th>
<th>Mean(± SD)</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>African American</td>
<td>74</td>
<td>111</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>25</td>
<td>37</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marital Status</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>29</td>
<td>43</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>38</td>
<td>57</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Separated</td>
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<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Divorced</td>
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<td>32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Widowed</td>
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<td>12</td>
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<td></td>
</tr>
<tr>
<td>Insurance Coverage</td>
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<td></td>
</tr>
<tr>
<td>None</td>
<td>73</td>
<td>110</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medicare</td>
<td>9</td>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medicaid</td>
<td>7</td>
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<tr>
<td>Private</td>
<td>9</td>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medicare/Medicaid</td>
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<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (Years)</td>
<td>45.58 (±13.70)</td>
<td>20-77</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education (Years)</td>
<td>11.41 (±2.35)</td>
<td>2-16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monthly Income ($)</td>
<td>373.88 (±284.69)</td>
<td>0-1750.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The table above shows that the present sample consisted predominantly of African American, uninsured, low-income, middle-aged females. Since 99 percent of this sample consisted of African Americans and Caucasians, chi-square analysis was used to test
whether there were significant differences between these two groups with regard to insurance coverage. However, no significant differences were found. The assumption that these two racial groups were similar regarding education, income, and age were tested through t-tests. Caucasians were significantly older than African Americans (50.19±14.47 versus 44.14±13.21, P<.02). Caucasians also reported a significantly higher monthly income than African Americans (489.42±292.34 versus 334.96±272.05, P<.004), but there were no other significant differences between the two groups regarding the remaining demographic variables.

According to a screening measure of depression (CES-D), 46 percent of participants endorsed significant levels of depressive symptoms. However, according to the DSM-IV criteria, the prevalence of major depressive disorder in the past 12 months in this sample was 21 percent. Prevalence of leisure-time physical activity was reported to be 43 percent on the first phone call, 44 percent in the second phone call, and 40 percent at the third assessment. However, there were no significant differences across these three measurements with regard to prevalence of leisure-time physical activity. Furthermore, there were no significant differences in prevalence of leisure-time physical activity with regard to age, income, educational level, and race for each of the three measurements. Interestingly, only 18 percent of participants reported that they engaged in leisure-time physical activity in all three measurements, 20 percent reported engaging in this activity at least in one measurement, and 27 percent in two measurements. Out of the participants who reported engaging in leisure-time physical activity, 11 percent
reported engaging in more than one leisure-time physical activity in the first phone call, 8 percent in the second phone call, and 10 percent in the third measurement. Approximately one third of the sample reported walking as their leisure-time physical activity of choice. Other activities reported by participants include gardening, calisthenics, aerobics, biking, basketball, running, swimming, and others.

A final score was obtained by averaging the three administrations of the WSI and BRFSS, and reliability analyses were performed in order to obtain an unbiased estimate of reliability across these measurements. For the WSI the obtained reliability estimate was .86, and for the BRFSS was .68.

The mean energy expenditure associated with leisure-time physical activity was 428.86 (±838.12) Kcal/week. Interestingly, as an aside, the total energy expenditure (i.e., leisure-time, occupational, and domestic physical activity) was examined. The mean energy expenditure for this sample was 7696.53(±7238.52) Kcal/week. Ninety-five percent of participants reported engaging in light household chores, and mean kilocalories expended for these activities was 4394.69(±3468.46). With regard to occupational physical activity, 41 percent reported walking on the job and the mean kilocalories associated with this activity was 4635.32(±3283.52). Thirty percent reported standing on the job and the mean kilocalories expenditure was 1729.33(±1900.61). Nineteen percent reported lifting objects on the job with an obtained mean kilocalories expenditure of 4394.69(±3468.46).
Pearson correlation coefficients for all demographic and experimental variables including the LES, WSI, CES-D, BRFSS, DIS-IV, and number of chronic illnesses were obtained. Table 2 displays the mean and standard deviation of the dependent and independent variables included in the correlational analyses.

Table 2: Dependent and Independent Variables: Descriptive Statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean (±SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent Variables</td>
<td></td>
</tr>
<tr>
<td>CES-D</td>
<td>14.83(±11.29)</td>
</tr>
<tr>
<td>DIS-IV</td>
<td>1.43(±3.04)</td>
</tr>
<tr>
<td>Independent Variables</td>
<td></td>
</tr>
<tr>
<td>Number of chronic illnesses</td>
<td>2.62(±1.22)</td>
</tr>
<tr>
<td>Major stress (LES)</td>
<td>3.75(±3.41)</td>
</tr>
<tr>
<td>Minor stress (WSI)</td>
<td>21.29(±14.38)</td>
</tr>
<tr>
<td>Total kilocalories (BRFSS)</td>
<td>428.86(±838.12)</td>
</tr>
</tbody>
</table>

Table 3 displays the correlation matrix between CES-D, DIS-IV, continuous demographic variables (i.e., age, educational level, and income), number of chronic illnesses, and the predictor variables (i.e., major stress, minor stress, and leisure-time physical activity). The CES-D was positively correlated with the DIS-IV (r=.30, P<.0001). In addition, using the standard cutoff of 16, the CES-D correctly identified clinical levels of depression in 70 percent of the females. Eleven percent of females with a score of less than 16 on the CES-D met criteria for major depressive disorder in the past 12 months. The CES-D displayed a high percentage of false positives (69%), i.e., 47 females obtained a score of 16 or higher on the CES-D but they did not endorse clinical levels of depression on the DIS-IV.
Table 3: Correlational Matrix: CES-D, DIS-IV, Demographic Variables, Number of Chronic Illnesses, and Predicting Variables

<table>
<thead>
<tr>
<th></th>
<th>CES-D</th>
<th>DIS-IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>-.26*</td>
<td>-.10</td>
</tr>
<tr>
<td>Educational Level</td>
<td>-.03</td>
<td>-.07</td>
</tr>
<tr>
<td>Monthly Income</td>
<td>-.21*</td>
<td>-.12</td>
</tr>
<tr>
<td>Number of Chronic Illnesses</td>
<td>-.03</td>
<td>-.04</td>
</tr>
<tr>
<td>LES</td>
<td>.37*</td>
<td>.24*</td>
</tr>
<tr>
<td>WSI</td>
<td>.42*</td>
<td>.15</td>
</tr>
<tr>
<td>BRFSS (Total Kilocalories)</td>
<td>.06</td>
<td>-.04</td>
</tr>
</tbody>
</table>

* p<.01

Since the present study included two outcome variables (i.e., depressive symptoms according to the CES-D and DIS-IV), two independent statistical analyses were performed to test hypotheses 1 and 2. Therefore, in order to control for Type I error only p < .025 were considered significant (i.e., p = .05/2).

Hierarchical regression analyses were used to assess how well the independent variables of major stress, minor stress, and leisure-time physical activity predicted depressive symptoms according to the CES-D. Since age and income were significantly correlated with the CES-D, they were entered as Set 1 in the regression equation in order to control for possible confounds.

It was hypothesized that minor stress would contribute unique variance to the prediction of depressive symptoms on the CES-D after controlling for major stress. Therefore, the following sets of predictor variables were entered separately: (a) Set 2: major stress; and (b) Set 3: minor stress.
It was also hypothesized that leisure-time physical activity would moderate the association between stress and depression. Therefore, leisure-time physical activity was entered as a fourth Set in the regression. These sets represented the main effects of these variables. They were followed by Set 5 which consisted of two and three interaction terms of major stress, minor stress, and leisure-time physical activity in order to examine the potential moderating properties of leisure-time physical activity.

However, the energy expenditure associated with leisure-time physical activity (BRFSS) was not normally distributed. This distribution was positively skewed since approximately half of the sample did not engage in leisure-time physical activity. Pate et al. (1995) have recommended that adult Americans should engage in at least 30 minutes of moderate physical activity on most or all days of the week which is equivalent to 3.0 to 6.0 METs or 4 to 7 Kcal.min\(^{-1}\). Therefore, we took the lower end of the recommended frequency of physical activity (i.e., 4 Kcal.min\(^{-1}\)) as an ideal energy expenditure associated with leisure-time physical activity which corresponds to 840 Kcal/week. Based on this rationale, the sample was divided into three groups: (a) Group 1: 51 females who did not engage in leisure-time physical activity; (b) Group 2: 66 females who engaged in leisure-time physical activity at a level below the recommended (i.e., less than 840 Kcal/week); and (c) Group 3: 20 females who engaged in leisure-time physical activity at or above the recommended (i.e., at or above 840 Kcal/week). Table 4 displays the mean and standard deviation of the dependent and independent variables within each group.
Table 4: Mean (±SD) of the Dependent and Independent Variables by Subject Group According to Engagement in Leisure-Time Physical Activity

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group 1 (N=51)</th>
<th>Group 2 (N=66)</th>
<th>Group 3 (N=20)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>46.02±14.29</td>
<td>45.33±12.89</td>
<td>44.65±13.45</td>
</tr>
<tr>
<td>Income</td>
<td>396.72±330.85</td>
<td>369.92±282.55</td>
<td>374.92±235.40</td>
</tr>
<tr>
<td>LES</td>
<td>4.06±3.61</td>
<td>3.24±3.13</td>
<td>4.60±3.65</td>
</tr>
<tr>
<td>WSI</td>
<td>19.26±13.73</td>
<td>21.61±14.03</td>
<td>25.40±16.78</td>
</tr>
<tr>
<td>CES-D</td>
<td>14.84±12.19</td>
<td>15.14±10.89</td>
<td>13.80±10.68</td>
</tr>
</tbody>
</table>

As shown on Table 5 below, the results indicated that age and income, as a Set, significantly predicted depressive symptoms according to the CES-D. That is, younger age and lower income predicted depressive symptoms. Major stress also accounted for a small, but significant, proportion of the variance in the prediction of depressive symptoms. As hypothesized, minor stress added unique variance, after controlling for demographic variables and major stress, to the prediction of depressive symptoms on a screening instrument of depressive symptomatology. However, leisure-time physical activity failed to demonstrate any moderation in the association between stress and depressive symptoms.

Table 5: Multiple Regression Results for Predictors of Depressive Symptoms According to the CES-D

<table>
<thead>
<tr>
<th>Variable</th>
<th>R²</th>
<th>Change</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, Income</td>
<td>.10</td>
<td></td>
<td>7.81</td>
<td>.001</td>
</tr>
<tr>
<td>LES</td>
<td>.09</td>
<td></td>
<td>10.37</td>
<td>.000</td>
</tr>
<tr>
<td>WSI</td>
<td>.06</td>
<td></td>
<td>10.92</td>
<td>.002</td>
</tr>
<tr>
<td>BRFSS</td>
<td>.005</td>
<td></td>
<td>8.89</td>
<td>.36</td>
</tr>
<tr>
<td>BRFSS<em>LES</em>WSI</td>
<td>.01</td>
<td></td>
<td>5.81</td>
<td>.52</td>
</tr>
</tbody>
</table>
According to the DIS-IV criteria, only 24 percent (N=36) of participants indicated that they experienced depressive symptoms in the past 12 months. Out of these 36 participants, only 5 participants reported experiencing sub-clinical levels of depression according to the DSM-IV criteria (i.e., less than 5 depressive symptoms). Therefore, these five participants were excluded from the analysis resulting in 114 participants (79%) who did not endorse any depressive symptoms in the past 12 months and 31 participants (21%) who met DSM-IV for major depressive disorder in this time period. A list of eleven depressive symptoms were asked which included depressed mood, loss of interest, significant decrease or increase in appetite, insomnia or hypersomnia, psychomotor agitation or retardation, lack of energy, concentration difficulties, feelings of worthlessness or inappropriate guilt, suicidal ideation or intent, low self-esteem, and hopelessness. Out of the participants who endorsed clinical levels of depressive symptoms, 84 percent endorsed more than seven symptoms, and 14 percent more than ten symptoms. Most symptoms were endorsed by over 92 percent of the participants reporting depressive symptoms, except for hopelessness (86%) and low self-esteem (86%).

Since only 21 percent of participants reported experiencing depressive symptoms in the past 12 months, the distribution was very positively skewed. Therefore, the most suitable statistical approach in analyzing the data was logistic regression. The outcome variable (i.e., DIS-IV) was conservatively dichotomized into two categories: (a) absence
of depressive symptoms, and (b) presence of a major depressive disorder according to the DSM-IV criteria.

As shown on Table 6 below, the results indicated that major stress predicted the diagnosis of major depressive disorder according to the DSM-IV criteria. However, minor stress did not add unique variance after controlling for major stress to the prediction of this diagnosis. Furthermore, leisure-time physical activity failed to demonstrate any moderation in the association between stress and diagnosis of major depressive disorder in the past 12 months.

Table 6: Logistic Regression Results for Predictors of Major Depressive Disorder

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE</th>
<th>Wald</th>
<th>R</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>LES</td>
<td>.19</td>
<td>.07</td>
<td>8.52</td>
<td>.22</td>
<td>.004</td>
</tr>
<tr>
<td>WSI</td>
<td>.009</td>
<td>.02</td>
<td>.31</td>
<td>.00</td>
<td>.58</td>
</tr>
<tr>
<td>BRFSS</td>
<td></td>
<td></td>
<td>2.12</td>
<td></td>
<td>.35</td>
</tr>
<tr>
<td>Group 2</td>
<td>.28</td>
<td>.47</td>
<td>.36</td>
<td>.00</td>
<td>.54</td>
</tr>
<tr>
<td>Group 3</td>
<td>-.75</td>
<td>.75</td>
<td>1.03</td>
<td>.00</td>
<td>.31</td>
</tr>
<tr>
<td>BRFSS<em>LES</em>WSI</td>
<td></td>
<td></td>
<td>4.04</td>
<td></td>
<td>.13</td>
</tr>
<tr>
<td>Group 2</td>
<td>.02</td>
<td>.01</td>
<td>3.85</td>
<td>.12</td>
<td>.05</td>
</tr>
<tr>
<td>Group 3</td>
<td>.01</td>
<td>.01</td>
<td>.06</td>
<td>.00</td>
<td>.80</td>
</tr>
</tbody>
</table>

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DISCUSSION AND CONCLUSION

This study was the first to examine the association between stress, leisure-time physical activity, and depressive symptoms in a low-income primary care female population. It was found that major stress predicts depressive symptoms in this population according to both a screening instrument of depression and a psychiatric interview. As hypothesized, minor stress added unique variance to the prediction of depressive symptoms endorsed on a screening instrument of depression. However, this finding was not replicated when a more strict outcome variable was used, i.e., diagnosis of major depressive disorder based on a structured psychiatric interview. Furthermore, the present study failed to support the hypothesis that leisure-time physical activity moderates the association between stress and depressive symptoms.

The present sample consisted mostly of uninsured, African American, middle-aged females. The prevalence of major depressive disorder in this sample (21%) was consistent with previous studies conducted among similar primary care patients (Adams, 1994; Barrett, Barrett, Oxman, & Gerber, 1988; Katon, & Shulberg, 1992; Pérez-Stable, Miranda, Muñoz, & Ying, 1990; Shulberg, & Burns, 1988).

Katon and Roy-Byrne (1991) reported that primary care patients more often report sub-clinical levels of depression than the actual disorder which is consistent with the findings of the present study. Although prevalence of major depressive disorder was 21 percent, 46 percent endorsed significant levels of depressive symptoms on a screening instrument for depression (CES-D).
The prevalence of sedentary lifestyle (i.e., no leisure-time physical activity) in the current sample was approximately 58 percent. This frequency was higher than national frequency rates reported for females (32%), low-income individuals (40%), and individuals without a high school degree (48%) (U.S. Department of Health and Human Services, 1991). Furthermore, the frequency of sedentary lifestyle found in the current study was almost three times the goal set by the U.S. Department of Health and Human Services for the year 2000 for low-income individuals, which is to reduce the prevalence of sedentary lifestyle to less than 17 percent (U.S. Department and Health and Human Services, 1991). Previous population-based studies have suggested that younger participants, those with more years of education, and Caucasians tend to engage in more frequent leisure-time physical activity than older, less educated, African American participants (Caspersen, Christenson, & Pollard, 1986; Garrison, Gold, Wilson, & Kannel, 1993; Washburn, Kline, Lackland, & Wheeler, 1992). Interestingly, the present study failed to confirm these findings in that there were no significant differences in the prevalence rates of sedentary lifestyle with regard to age, educational level, and race. This discrepancy may be attributed to the fact that this sample was composed predominantly of African American females (74%). Previous studies have shown that African Americans are more sedentary than Caucasians, independent of income and education (Caspersen, Christianson, & Pollard, 1986; Farrell, Kohl, & Rogers, 1987). For example, Washburn, Kline, Lackland, and Wheeler (1992) conducted telephone interviews with 2,005 individuals in South Carolina as part of the National Health
Interview Survey, and they reported that African American females had a significantly lower level of leisure-time physical activity than Caucasian females after adjusting for age, income, and Body Mass Index (BMI). No differences were found for leisure-time physical activity in males.

The mean total kilocalories expended per week through leisure-time physical activity (428.86 Kcal/week) was well below the recommended level for physical health benefits (1155 Kcal/week; Pate et al., 1995). However, when the total energy expenditure (i.e., leisure-time, occupational, and domestic physical activity) was examined, the mean total kilocalories expenditure for this sample was 7696.53(±7238.52). Unfortunately, there are a lack of studies examining energy expenditure associated with occupational and domestic physical activity which makes it difficult to compare the obtained results with previous research. Nevertheless, these results suggest that this population may be compliant with the physical activity recommendations. Perhaps, the energy expenditure is not associated with leisure-time physical activity, but occupational or domestic activities. However, these results should be interpreted with caution since the standard deviations associated with mean kilocalories expenditure for every activity mentioned above are extremely high. In addition, a previous study with primary care patients in the state of Louisiana showed a positive association between physical activity and social desirability (Brantley, Carmack, Scarinci, & Boudreaux, 1997). Therefore, participants may have overestimated the amount of energy expenditure associated with occupational and domestic activities.
With regard to the type of leisure-time physical activity engaged in, results from this study indicated that walking was the most commonly reported activity which is consistent with data obtained in the National Health Interview Survey. In that survey, of those females who reported engaging in leisure-time physical activity 43.6 percent indicated that walking was their activity of choice followed by stretching exercises (26%), and gardening (25.1%) (U.S. Department of Health and Human Services, 1996).

Although minor stress did not predict the diagnosis of major depressive disorder, minor stress added unique variance to the prediction of depressive symptoms in a screening measure of depression after controlling for major stress. Most epidemiologic and intervention studies focusing on the association between leisure-time physical activity and depression have relied on self-report questionnaires (e.g., CES-D, Beck Depression Inventory, etc.). However, Fechner-Bates, Coyne, and Schwenk (1994) showed that the identification of depressive symptoms through self-report questionnaires often do not correspond to the results obtained through a structured psychiatric clinical interview (e.g., SCID, DIS-IV, etc.). To address this concern, the present study used a clinical interview as well as a self-report questionnaire that does not rely heavily on physical symptoms of depression since the target population was composed of medical patients. Fechner-Bates, Coyne, and Schwenk (1994) suggested that the CES-D is a measure of distress rather than a measure of depressive symptoms exclusively. According to these authors, although the CES-D displays good sensitivity, it has a very poor specificity in nonpsychiatric populations. In the present study, the CES-D as
compared to the DIS-IV displayed high sensitivity (70%) and specificity (60%). This was confirmed by another measure of psychological distress (General Health Questionnaire [GHQ]). As compared to the DIS-IV, the GHQ also displayed high sensitivity (83%) and specificity (64%). The correlation between the CES-D and DIS-IV was .30, between the GHQ and the DIS-IV was .44, and between the CES-D and the GHQ was .50.

Another possible explanation for these negative findings is that previous research on the relation between minor stress and depressive symptoms was plagued with a variety of methodological limitations that have been addressed in the present study. Retrospective and biographical recall of events have been criticized as introducing a source of bias into the measurement of self-reported stress. To address this criticism, multiple measurements were employed and participants were requested to recall only major events that occurred in the past six months or minor events that happened in the previous week. The reliability across the three measurements of minor stress was very high. As previously stated, measures of stress, particularly those that employ stress ratings, may be confounded with measures of psychological distress (Gruen, 1993). Therefore, the present study used only the occurrence of major and minor events rather than participants' perception regarding the impact of these events. In summary, the findings of the present study suggest that the assessment of depression is a complex issue, and a multi-method assessment should be used in order to validate the obtained results in future studies.
Previous studies have also suggested a negative association between physical activity and mental health, particularly anxiety and depression (Blumenthal, Williams, Needels, & Wallace, 1982; King, Taylor, Haskell, & DeBusk, 1989; Taylor, Sallis, & Needle, 1985). However, the results of the present study failed to support a relation between leisure-time physical activity and depressive symptoms among low-income primary care female patients.

Several theoretical and methodological limitations may have contributed to the lack of significant results in the present study. First, the present study was conducted in a low-income, poorly educated, primary care female population that may have had some difficulty responding accurately to the psychosocial measures. Although an extra effort was made to select assessment tools that were appropriate for this population, most psychosocial measures have been validated among individuals with at least a high school education. It was observed during data collection that some participants had difficulty understanding the concepts tapped by these measures. When this problem was detected, data collectors "paraphrased" the information for the participants. Future studies should address the validity of psychosocial measures among individuals with limited education.

The second shortcoming of the present study is one that is common to most published studies on naturally-occurring leisure-time physical activity. That is, leisure-time physical activity is typically measured through self-report. Unfortunately, research in this area is in the early stages and a more objective "gold-standard" criterion measure of physical activity has yet to be established. According to Phillips (1997), there are...
three direct methods that can be used in the assessment of leisure-time physical activity: self-report questionnaires, diary annotation, and electronic devices (e.g., pedometers, accelerometers, large-scale integrators, heart rate monitors, motion sensors, etc.). However, the correlation among these methods exhibit considerable variability (range - .06 to .81) (Phillips, 1997; Pruitt, 1997). The correlation coefficients between self-report measures of physical activity with physiologic measures of caloric exchange (e.g., submaximal heart rate, doubly labeled water, treadmill endurance, VO₂ max, etc.) have ranged from .10 to .59 with a median of .41, suggesting only moderate external validity (U.S. Department of Health and Human Services, 1996). The results of the present study indicated that the BRFSS is a reliable measure (r=.68 across three measurements), although its validity appears questionable. However, lack of acceptable validity has been a common denominator across all the measures of physical activity, including electronic devices.

Although self-report measures have some advantages (inexpensive, practical for large samples, appropriate for a wide range of ages, participants’ activities are less likely to be influenced by daily monitoring or direct observation), they do have some limitations (possibility of inaccurate recall, participants’ subjective estimate of intensity and frequency of their activities, etc.) (Pruitt, 1997). However, an attempt was made in the present study to control for these limitations. In order to address problems of single measurement and inaccurate recall, the BRFSS was administered three times, and patients
were requested to recall leisure-time physical activities that they engaged in the previous week (i.e., short-term recall).

Third, it is possible that other variables such as coping and/or social support account for most of the variance with regard to the moderation of the association between stress and depressive symptoms. A recent cross-sectional study performed with the target population indicated that social support moderates the association between minor stress (as measured by the WSI) and distress (as measured by the GHQ) (Brantley, Applegate, Scarinci, Jeffries, Jones, & Jennings, 1997).

Fourth, although previous studies have shown that physical activity has beneficial effects on mental health, most of these studies did not focus on naturally-occurring leisure-time physical activity. They have focused primarily on tailored exercise programs in which subjects are assigned to experimental and control conditions. It may be speculated that subjects' awareness of the purpose of these studies (i.e., examination of the association of physical activity and depressive symptoms) may have influenced the outcome. In fact, studies have shown that exercise is as effective as psychotherapy in decreasing depressive symptoms (North, McCullagh, & Tran, 1990).

Despite the limitations mentioned above, the present study has three major clinical implications. First, it displays the prevalence rate of sedentary lifestyle in a specific primary care female population. This provides the health care professionals dealing with this population with crucial information regarding the low frequency of leisure-time physical activity in this population. It has been shown that most patients
seek advice from their physicians on lifestyle changes (Moorhead, 1992). One of the objectives for the year 2000 designed to assist in promoting physical activity includes enlisting the involvement of primary care providers. The primary goal is to increase the proportion of these providers who render routine assessment and counseling to their patients regarding frequency, duration, type, and intensity of patient’s physical activity to at least 50 percent (U.S. Department of Health and Human Services, 1991). Currently, internists and nurse practitioners are reported to assess exercise habits in 40 percent and 30 percent of their patients, respectively, and establish exercise prescriptions for 25 percent and 14 percent respectively. Rates for family practitioners are 19 percent for assessment and 18 percent for formulating an exercise plan (U.S. Department of Health and Human Services, 1995). A study by Williford and colleagues (1992) found that physicians support exercise for promoting health, but indicated only 23 percent of their physician sample was familiar with the American College of Sports Medicine guidelines for exercise prescription. Increasing physician knowledge of these guidelines may assist in increasing patient counseling on leisure-time physical activity. Additionally, increased knowledge may result in physicians providing more specific recommendations regarding physical activity, as opposed to just telling patients to engage in leisure-time physical activity, which in turn, may assist in decreasing the prevalence of sedentary lifestyle.

Second, the results of the present study confirmed that minor stress is a more important predictor of depressive symptoms based on a screening measure than major stress among a low-income primary care female population. Although minor stress does
not predict the diagnosis of major depressive disorder, it may be speculated that minor stress may contribute to the prediction of sub-clinical levels of depression or distress which can be socially and/or occupationally impairing. These findings are encouraging since one may not have control over major events (e.g., death of a spouse, major illness of a family member, etc.), but one may have control over minor events (e.g., argument with spouse, lack of money for basics, etc.). Programs may be developed to assist these patients in dealing with minor stressful events. We have examined the most frequent minor events endorsed by this population and we have found that most of their stressors are related to financial and interpersonal issues (Scarinci, Ames, & Brantley, 1997). Therefore, interventions focusing on education regarding availability of community resources as well as interpersonal skills may have an impact on these patients’ mental and physical health.

In summary, the present study found a high prevalence of sedentary lifestyle in a low-income primary care female population. This study also supported previous findings that major stress is an important predictor of depressive symptoms. It was found that minor stress adds unique variance to the prediction of depressive symptoms according to a screening measure of depression, but not a structured psychiatric interview. Furthermore, the regression analysis failed to support the moderating properties of leisure-time physical activity in the association between stress and depressive symptoms in this population.
REFERENCES


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APPENDIX A:
DEMOGRAPHIC QUESTIONNAIRE

DEMOGRAPHIC INFORMATION

1) Subject Number: __________

2) Age: ________

3) Medical Record #: __________

4) Clinic: ( ) Medicine Clinic ( ) Family Practice

5) Sex (circle one): Male Female

6) Job/Occupation: ____________________________

7) Marital Status (circle one):
   a. Single
   b. Married
   c. Separated
   d. Divorced
   e. Other (specify): _______

8) Race (circle one):
   a. White
   b. African-American
   c. Hispanic
   d. Other (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
   Other education (please specify type and number of years): ____________________________

10) What is your average monthly income? $ ______

10a) Where does this money come from (circle the one that applies to you and indicate the amount of money you receive from that source each month)?
   a. My job/career $ _______________ b. Public assistance/welfare $ __________________
   c. Unemployment $ _____________ d. Child support/alimony $ __________________
   e. Social security/disability $ __________ f. Allowance $ _________________
   g. List other sources of income: ________________________________ $ ______________

11) How many people live in your home? ___________

12) What is the total monthly income including everyone in your home?
12a) Where does this money come from (circle the one that applies to you and indicate the amount of money the people who live with you receive from that source each month)?
   a. Job/career $ _______________ b. Public assistance/welfare $ _______________
   c. Unemployment $ _____________ d. Child support/alimony $ ______________
   e. Social security/disability $ __________ f. Allowance $ _________________
   g. List other sources of income: ________________________________ $ ______________

13) Have you ever received treatment for a mental health problem? Yes No
   What kind of problem? _________________________________________________

14) Have you ever received treatment for a drug or alcohol problem? Yes No
   What kind of problem? _________________________________________________

15) Do you have health insurance? Yes No. If so, what kind? ________________________

16) Address: _____________________________________________

17) Phone number: ____________________________________________

77

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APPENDIX B:
CONSENT FORM
LOUISIANA STATE UNIVERSITY MEDICAL CENTER IN NEW ORLEANS
CONSENT FORM

1. Study Title: The Roles of Stress, Social Support, and Psychopathology in Primary Care Utilization.

2. Performance Sites: Family Practice and General Medicine Clinics, Earl K. Long Medical Center, Baton Rouge, LA.

3. Names and Telephone Numbers of Investigators:
For 24-hour access, please contact Isabel Scarinci or Annette Springer at 358-1105.
Phillip J. Brantley, Ph.D. .........................................................(504) 358-1105
John Howe, M.D. .................................................................(504) 358-1103
Glenn N. Jones, Ph.D. ...........................................................(504) 358-1105

4. Purpose of the Study: This is research study to determine the roles of stress, mental health, social support, and coping strategies in primary care utilization.

5. Subject Inclusion Criteria: Male and female volunteers ages 18 and older who are patients in the EKL Department of Family Medicine or EKL General Medicine Clinic will qualify as subjects in this research project.

6. Subject Exclusion Criteria: Subjects will be excluded from Phase II of the project for not having a phone at home.

7. Description of the Study: This is a research study to determine the roles of stress, mental health, social support, and coping strategies in primary care utilization. Subjects will participate in the study in two phases. Subjects do not have to participate in Phase II to participate in Phase I. Subjects must participate in Phase I to participate in Phase II.
In Phase I, subjects will be chosen from waiting rooms at the EKL Department of Family Medicine and General Medicine Clinic. Subjects who agree to participate will complete the demographic questionnaire and the General Health Questionnaire (GHQ).
Phase II of this project will be divided into 4 tasks:
(1) Subjects will complete the following questionnaires on the same day: the Interpersonal Support Evaluation List (ISEL) (a measure of social support), the Ways of Coping Questionnaire (WOC) (a measure of coping strategies), the Weekly Stress Inventory (WSI) (a measure of minor stress), the 1994 Behavioral

78
Risk Factor Questionnaire (a measure of health risk behaviors), and the Ways of Religious Coping Scale (a measure of religious coping).

(2) Subjects will be asked to complete the WSI and a self-report hospital utilization questionnaire (SRU) bimonthly for one year, and in the sixth month the Life Experiences Survey (LES) (a measure of major stressors) will be added to the phone interview. A research assistant will contact subjects by phone once every other month in order to collect the responses to these questionnaires and to answer any questions subjects may have.

(3) One year after the initial contact, subjects will be scheduled to complete the following at the Center for Primary Care Research at EKL: (a) Composite International Diagnostic Interview (CIDI) (a mental health interview), (b) ISEL; (c) WOC, and (d) SRU.

(4) Subjects will be contacted by phone 3, 6, 9, 12 months following the interview and asked to answer the SRU.

8. **Benefits to Subject:** At the end of study, subjects will be provided with a summary report of findings and their relevance to primary care utilization, at their request. If needed, subjects will receive a referral to an appropriate agency.

9. **Risks to Subject:** No known physical risks. 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 will be removed from the study if they fail to complete (1) Phase I; (2) part 1 of Phase II; (3) 80% or more of requested bimonthly interviews; (4) part 3 or 4 of Phase II. There is no risk involved in being removed from the study.

12. **Subject’s Right to Refuse to Participate:** Study subjects may refuse to participate or withdraw from the study at any time without jeopardizing, in any way, their medical treatment at this institution in the present or future. Should significant new findings develop during the course of the research that may relate to the subject’s willingness to continue participate, 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. Information provided during the course of the study is confidential. The only exceptions are in cases where subjects indicate suicidal desires, homicidal desires, or child abuse. In these instances the researchers are ethically and legally required to inform their supervisors regarding the subject’s desires.

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 study related and unforeseen complications must be met by subjects.
   C. Subject Payment: Subjects will be paid $15 (fifteen dollars) for completing Phase I of the study. Subjects will be paid $20 (twenty dollars) for completing part 1 of Phase II. Subjects will be paid $10 (ten dollars) for each phone interview completed during part 2 Phase II. Subjects will be paid $50 (fifty dollars) for completing part 3 of Phase II and $10 (ten dollars) for each phone interview completed during part 4 of Phase II.

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
VITA

Isabel Cristina Scarinci was born June 16, 1962 in Cambara, Parana, Brazil. She attended the State University of Londrina, Londrina, Parana, Brazil, where she graduated in 1984 with a bachelor of science degree in Psychology. Isabel Cristina earned her master of Public Health degree from the University of Alabama at Birmingham in 1993. She earned her master of arts degree in Psychology from Louisiana State University in 1996. She completed an internship in clinical psychology at Harvard Medical School/Massachusetts General Hospital and received a doctor of philosophy degree in Clinical Psychology at Louisiana State University in August, 1998.
Candidate: Isabel Cristina Scarinci

Major Field: Psychology

Title of Dissertation: Leisure-Time Physical Activity as a Moderator of the Association between Stress and Depression among Low-Income Primary Care Female Population

Approved:

[Signatures]

Major Professor and Chairman
Dean of the Graduate School

EXAMINING COMMITTEE:

[Signatures]

Date of Examination:

06/23/1997