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# The Interaction of Stress and Park Use on Psycho-physiological Health in Older Adults

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Stress can have a negative influence on psychological and physical health, particularly among older adults. However, park-based leisure experiences, can have a positive influence upon mood states, stress, and health of this population. This study examined the relationship between stress, park-based leisure, and physiological/psychological health among older adults (ages 50-86). There were significant interactive effects between: 1) stress and length of park stay and, 2) stress and desired health benefits in their relationship to the physiological health indicator, body mass index (BMI). There were also direct relationships between park companionship and perceived physical health and between length of park stay and lower systolic blood pressures. This study offers early evidence that park-based leisure experiences correspond with physiological health indicators among older adults. Implications for future health-based leisure research and policy are discussed.

KEYWORDS: *Stress, parks, leisure, physiological health, psychological health, older adults.*

## Introduction

Health professionals have long recognized the negative effects of stress upon psychological and physical health. According to the American Institute of Stress (2002), 43% of the adult U.S. population experience adverse health conditions due to stress. Moreover, an estimated 75% of all visits to primary care physicians are for stress-related complaints and disorders. Stress has also been linked to health indicators such as obesity (measured through indices such as body mass index and percentage body fat), high systolic blood pres-

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sure, and elevated heart rates (Bell, Summerson, Spangler, & Konen, 1998; Brand, Hanson, & Godaert, 2000). Stress is particularly problematic in the health of older adults, since aging is generally associated with changes in physical, psychological (e.g., cognitive, emotional), and social functions. A number of age-related changes (e.g., chronic disease, disability, loss of a loved one, care giving) can be viewed as potential stressors and have negative consequences for other aspects of personal health among older adults (Baltes & Baltes, 1990).

However, there are multiple definitions of stress. Stress can be conceptualized as both a positive (thought of as eustress) or a negative phenomenon (known as distress). For the purpose of this paper, stress will be considered as distress. While distress can be defined in a number of ways, one comprehensive definition suggests that it is a process in which people are unable to adapt to environmental demands (Cohen, Kessler & Gorgon, 1997). The instabilities within the human system create psychological and/or biological changes, which places individuals at an increased risk for poor health (Cohen et al., 1997). In particular, chronic (or daily) stressors can have a cumulative influence on psychological or physical health outcomes (Eckenrode & Bolger, 1997). Some scholars have argued that "everyday" stress or hassles have a greater impact on health and well-being than those life events which occur at relatively infrequent intervals (Folkman & Lazarus, 1988). As a result, a myriad of cognitive and behavioral strategies have been suggested to reduce or mitigate chronic stress and its health diminishing properties. Increasingly, scholars and social institutions are testing the efficacy of interventions designed to mitigate stress and, thus, improve the overall health of individuals and communities.

Physical activity has been investigated as a possible strategy for improving mental health, including stress. Physical activity (defined as any bodily movement) has been linked to improved health and decreased stress (Surgeon General's Report, 1996). Physical activity can be thought of as umbrella concept that encompasses exercise, household tasks, occupational or work related tasks, and leisure time activity (Casperson, Powell, & Christianson, 1985). Leisure activity is one type of physical activity purported to reduce chronic stress and improve health (Coleman & Iso-ahola, 1993; Iwaski & Manell, 2000; Kleiber, Hutchinson, & Williams, 2002).

Based on these relationships, there is a growing recognition that public park opportunities are an important part of the health care infrastructure (Crompton, 1999; Payne, 2002; Payne et al., 1999). However, there is currently a dearth of information concerning empirical relationships between leisure behavior in natural park settings, stress, and health.

Without such evidence, it will be difficult for park and recreation professionals to understand or quantify if and how their products/services reduce stress levels and improve the health of their constituents. Moreover, the small but growing body of leisure, stress, and health research has relied almost entirely on self-reported health data, rather than a comprehensive assessment of psychological and physiological health dimensions. That is, no

studies have explored the relationships between park-based leisure activity, stress, and objective measures of physiological health (e.g., blood pressure, body mass index, and heart rates). To address this gap, we examined the relationships between park-based leisure activity, stress levels, and health among older adults. A review of existing research on stress and aging, stress coping and health, as well as the role of leisure activity on stress and health follows.

## Literature Review

### *Stress and Aging*

Later life is associated with a host of physical, psychological, and social changes (e.g., role loss, chronic disease, disability, death of significant others, care-giving, fixed incomes) that are potential stressors and can often negatively impact one's health and well-being. In addition, chronic stress can negatively affect older people's perceptions of their well-being. For example, role loss resulting from retirement or the death of a spouse can reduce perceived self-worth and personal control (Stephens, 1990).

Kahana & Kahana (1996) examined the relationship between acute and chronic stress and mental health. They found that acute and chronic stressors were significantly related to poorer perceptions of mental health. Specifically, illness, death, not having enough to eat, quarrelling, debt, and being denied a job promotion were inversely related to perceived mental health. A similar study explored the relationship of ego-centric (i.e., situations that impact directly upon the individual) and non-ego centric (i.e., situations that impact directly on family members) stressors on perceived health. Results indicated that both types of stressors were negatively related to psychological well-being.

Overall, the literature suggests that older adults are subjected to stressful events (e.g., death, chronic illness), more frequently than younger adults. Despite the prevalence of stressful events in later life, life experiences can arm older people with numerous resources for coping with stress. For example, older people can utilize the experience, knowledge, and wisdom gained over their life time in order to cope with stress (Aldwin, Sutton, Chiara, & Spiro, 1996). Additionally, studies of coping across the life span reveal that, as we age, neurotic or maladaptive coping strategies (e.g., avoidance, hostility) are replaced by more mature coping styles (e.g., cognitive reappraisal, problem solving) (Aldwin, et al, 1996; Blanchard-Fields, Sulsky, & Robinson-Whelan, 1991). Moreover, there is evidence that effective social support networks are a useful strategy to restore feelings of personal control and self esteem, thereby buffering the effects of stress on health (Krause & Shaw, 2000; Krause, 1987).

The stress-theory-based model of successful aging developed by Kahana and Kahana (1996) is a useful framework from which to propose that park-based leisure opportunities are specific assets that adults can utilize to ameliorate stress and its negative effects on their health and well-being. Accord-

ing to Rowe and Kahn (1997), successful aging results from the intersection of three major factors: 1) avoiding disease and disability, 2) high cognitive and physical function, and 3) engagement in life. Baltes (1997) and Kahana & Kahana, (1996) have an expanded view of successful aging by incorporating adaptation and compensation into the concept of successful aging. Specifically, they posited that older adults can use cognitive and behavioral resources and strategies to adapt and/or compensate for age related changes, in a way that optimizes health and well-being.

Numerous studies support these assertions. For example, it is well known that biological systems decline with age (e.g., bone density, cardiac output, muscle mass). However, research indicates that with resistance training (e.g., weight training, weight bearing exercise) older people can significantly slow the decline of bone loss and improve cardiac output (Hagberg, Yerg, & Seals, 1988; Kohrt et al., 1991). Similarly, studies reveal that with training older people can improve working memory, perceptual speed and reasoning (Baltes, 1997). Other studies indicate that older people selectively invest in social relationships that offer the highest personal rewards (Carstensen, Hanson, & Freund, 1995). These are all examples how older people successfully adapt to age related change in a way that maintains and/or optimizes their health. Leisure experiences are becoming recognized as important to successful aging. For example, Lenartsson & Silverstein (2001) examined several factors associated with higher risk of mortality in an oldest old sample. They examined age, functional status, education, smoking and participation in physical, social and sedentary activities. While controlling for health and demographics, they found that an increase in solitary activities (e.g., reading, crossword puzzles) was associated with a significant decrease in risk of mortality. Similarly, Glass and colleagues (1999) demonstrated that social (e.g., group recreation, church attendance), productive (e.g., gardening, shopping), and fitness (e.g., walking, exercise) activities were associated with survival, even after controlling for health status and functional ability. These studies are important because they affirm the connection between leisure and successful aging. However, we know less about specific strategies and mechanisms that older people utilize to enhance their well-being. We propose that leisure activity within park settings is an effective stress coping mechanism that is positively related to both perceived physical and mental health as well as physiological health indicators (e.g., blood pressure, body mass index). We view the stress-based model of successful aging as an appropriate framework to understand how park based leisure experiences are associated with stress and stress coping strategies. Thus, literature that examines the role of leisure in stress coping and health warrants further consideration.

*Stress Coping and Health*

The role of leisure in stress coping and health has been examined from two perspectives: 1) stress coping as a buffer or moderator (Caltabiano, 1995;

Coleman & Iso-Ahola, 1993; Coleman, 1993; Iso-Ahola & Park, 1995) and 2) stress coping as a mediator or process oriented construct in the relationship between leisure and health (Iwasaki & Mannell, 2000). Caltabiano studied the main and buffering effects of leisure participation on illness symptoms. She found that outdoor physical activity (i.e., sports) had the strongest positive effect on health, regardless of stressful life events. Hobbies and social leisure were also found to significantly buffer the effect of stressful life events on perceived physical health. Coleman & Iso-Ahola (1993) also purported that leisure-based social support was important in reducing the impact of stress on health. Coleman (1993) tested this relationship based on a random sample of 104 men and women and found that leisure health benefits were experienced primarily during periods of high stress, and that perceived freedom interacted with stress in its relationship to physical health. Higher perceived leisure freedom was associated with higher levels of physical health, when stress was high, but this relationship didn't hold when stress was low. However, social support was not associated with improved physical health (Coleman, 1993).

More recently, Iwasaki and Mannell (2000) suggested that the stress coping research has not accounted for the role that leisure plays in alleviating stress. Using a leisure coping scale, Iwasaki (2002) examined the role of leisure participation and enjoyment on the relationship between stress, perceived health and immediate adaptational outcomes (i.e., perceived effectiveness of and satisfaction with stress coping) among emergency response professionals. He found that leisure travel, social leisure and cultural leisure (e.g., museums, ethnic visual, performing arts) interacted with stress in its impact on immediate adaptational outcomes. When stress levels were high, those who engaged in and enjoyed travel less had poorer immediate adaptational outcomes, whereas those who engaged in leisure more frequently and enjoyed leisure travel more had much higher perceptions of adaptional outcomes despite high stress levels. The pattern was also consistent between social and cultural leisure. One interesting finding was that physically-active leisure did not impact perceived health or adaptational outcomes. Iwasaki emphasized that a variety of leisure experiences have an impact on stress, and leisure experiences with high levels of physical activity may not always be the most effective strategy for reducing stress.

However, despite Iwasaki's findings, there is a strong body of evidence in the sport/exercise science literature that supports the notion that physical activity reduces stress and improves health (Surgeon General's Report, 1996). For example, epidemiological studies have demonstrated a decrease in all-cause mortality and morbidity for those adults who participated in regular and planned physical activity (Blair et al., 1995). Studies have also indicated inverse relationships between exercise and cardiovascular disease risk factors (Bjorntorp et al., 1972; Blair et al., 1995; Pavlou, Krey & Steffee, 1989), cancer (Lee & Paffenbarger, 1994), and osteoporosis (Snow-Harter & Marcus, 1991). In addition, participation in physical activity has been related to changes in psychological well-being including improvements in mood

(Emory & Blumenthal, 1990), positive affect (McAuley, 1991), and life satisfaction (Morgan et al., 1991). Stress is recognized as a significant predictor of increased exercise frequency of young populations (Buchman, Sallis, Criqui, Dimsdale, & Kaplan, 1991) and exercise duration and frequency in a population of female health club participants (Stetson, Dubbert, Rahn, Wilner, & Mercury, 1997). Such findings suggest that exercise (arguably, a form of physically active leisure) can have an impact on stress as well as individual physical and psychological health outcomes.

*The Role of Park-based Leisure Settings on Stress, Mood, and Health*

Although prior studies have been useful to increase our knowledge of how leisure repertoires (i.e., the number/type of leisure activities one considers as part of his/her lifestyle) and physical activity shape the relationship between stress and health, it is less clear how these constructs relate to one another within the context of park environments. It has been suggested that natural park environments are important in promoting the well-being of citizens because they provide opportunities for restorative experiences in which one reports that being in nature facilitates a "clearing of the mind" and/or "clearing the head and re-energizing" in a way that enables self-restoration (Kaplan & Kaplan, 1989). Godbey and Blazey (1983) explored the leisure behavior of older adults (55 and above) who primarily participated in light to moderate physical activity in urban parks. Approximately half of the sample indicated that they were in a better mood after visiting the park. More and Payne (1978) found that participants' negative moods decreased after leaving a park and that park users reported lower levels of anxiety and sadness. Hull and Michael (1995) sought to determine if settings (indoor versus outdoor nature) played a significant role in shaping people's moods. Interviews of 186 outdoor recreationists revealed significant relationships between stress and length of stay in the park (Hull & Michael, 1995). The longer the participants stayed, the less stressed they became. Additionally, they found that respondents felt significantly less calm and more anxious at home than at a park.

Collectively, these studies suggest that leisure behaviors and lifestyles within natural park settings can have a positive influence on mood states, can reduce stress, and improve short-term health perceptions. There is growing evidence to suggest that the park environments play a unique role in promoting health and alleviating stress (Godbey & Blazey, 1983; Hull & Michael, 1995; Payne et al., 1998). Leisure experiences within park and recreation settings can be an effective stress coping strategy that is positively associated with both perceived physical and mental health, as well as physiological health indicators. According to Rowe and Kahn (1997), behavioral or lifestyle factors account for at least 50% our health and well-being. Yet, few park and recreation studies have empirically examined the relationships between stress, park use characteristics, and psychological and physical health. Moreover, previous studies have relied primarily on self-reports of

health (e.g., perceived health), without considering and testing physiological indicators of health (e.g., blood pressure, body mass index, blood pressure).

## Study Purpose and Research Questions

This investigation builds upon existing stress and health research by examining the relationship between stress, park-based leisure characteristics, daily stress, and physical, mental, and physiological health among a sample of older adults. These relationships are examined while controlling for the effects of sex and age. Findings may prove useful in understanding the impact of public parks in alleviating daily stress and improving health of older adults. More specifically, findings will identify if and which park use characteristics (i.e., length of stay, frequency of participation, participation style, and achieved benefits) are significantly related to daily stress levels and health among older adults.

The following research questions are addressed in this investigation:

Research Question #1a: Does the relationship between park-based leisure and perceived physical health depend on the daily stress level of older adults?
Research Question #1b: Does the relationship between park-based leisure and perceived mental health depend on the daily stress level of older adults?
Research Question #1c: Does the relationship between park-based leisure and physiological health (i.e., body mass and blood pressure) depend on the daily stress level of older adults?
Research Question #2: Is there a relationship between park-based leisure and the daily stress levels of older adults?
Research Question #3a: Is there a relationship between park-based leisure and the perceived physical health of older adults?
Research Question #3b: Is there a relationship between park-based leisure and the perceived mental health of older adults?
Research Question #3c: Is there a relationship between park-based leisure and the physiological health (i.e., blood pressure and body mass) of older adults?

## Methods

### *Park Setting and Study Participants*

The current investigation uses data from a larger study ($N = 1{,}515$) that examined the relationship between park use and personal health of individuals ages 50 and over. Participants for the present study included a subsample of older adults ages 50-86 ($N = 100$) who volunteered to participate in a five-day diary study. For the questionnaire study component of this study, participants were screened upon the entrance to a large metropolitan park district (Cleveland Metroparks) and were asked to complete a self-

administered questionnaire at home and return it in a pre-addressed postage paid envelope. Cleveland Metroparks is a special park district serving the City of Cleveland and surrounding Cuyahoga County communities. Its mission is to provide conservation, recreation, and education opportunities for all citizens. Currently, the Park District manages over 20,000 acres of park land that is devoted primarily to outdoor recreation (e.g., multi-purpose trails, picnic facilities, golf courses, nature centers) and nature conservation. While park amenities emphasize self-directed leisure such as walking, bicycling, and picnicking, a number of organized events and programs are also offered such as the Art & the Park festival and the Institute of the Great Outdoors program. The 14 different reservations within the Park District are day-use only. There is no entrance fee and most of their parks are located within a 15 minute driving distance of every resident in the tax district.

A flyer announcing the diary study was inserted into each questionnaire packet. Respondents checked a box to indicate an interest in participating in the diary study. A total of 311 individuals (20% response rate) initially expressed an interest in the diary study. Approximately 268 of those interested were contacted via phone and 129 individuals (48% response rate) agreed to participate in the diary study. Due to time and financial constraints placed upon data collection, only 77% of these individuals ($N = 100$) received final invitations to participate in the diary portion of this study. This was thought to be an adequate sample size for this study based on previous diary-based research (Steptoe, Roy, & Evans, 1996). All study participants signed an informed consent in compliance with the Institutional Review Board's stipulations of research with human subjects. Diary data were collected between June 15 and September 1, 1997. During this time, an average of 12 individuals per week were trained in and completed the diary. This dairy data was then linked to participant responses from the larger mail questionnaire.

*Data Collection Procedures*

All participants completed a diary training session that demonstrated and explained the necessary procedures to independently complete their diary entries. These training sessions ranged from 40 to 90 minutes depending on how quickly the participant learned the procedures. The equipment and supplies necessary to carry out the diary fit into a waist pack, therefore making it easy for participants to take the materials with them during shopping trips, park visits, and other leisure experiences.

The protocol consisted of participation in this diary study for a period of five consecutive days. The measurement strategy used in this study was in accordance to interval-contingent recording as described by Wheeler & Reis (1991). This type of measurement allows the data to be collected at specific intervals. Subjects were asked to record their blood pressure at various intervals during each day: upon waking, prior to lunch, prior to dinner, prior to going to bed, *and* before and after one selected leisure activity. At the end

of each day, participants were asked to complete a daily stress inventory assessing one's stress level over the past 24 hours. Despite this rigorous research protocol, each of the 100 participants completed all of the diary tasks (i.e., obtaining and recording blood pressure readings, completing daily questionnaires).

*Measurements*

This study assessed perceived daily stress levels as well as a variety of park use characteristics, perceived physical and psychological health, and physiological health indicators. The dependent variables in this study were 1) daily stress, 2) perceived physical health, 3) perceived mental health, and 4) physiological health (i.e., blood pressure and body mass index). The independent measures were 1) park-based leisure (i.e., frequency of park use, duration of park activity, and level of physical activity), 2) park companionship, and 3) perceived benefits (Figure 1). Park-based leisure variables and perceived physical and mental health were measured via the questionnaire while daily stress and physiological variables (body mass index, waist to hip

| **Independent Variables** | **Dependent Variables** |
|---|---|
| *Park-Based Leisure*<br><br>Frequency of Park Use<br>(number of visits over the past 12 months)<br><br>Duration of Park Visits<br>(hours typically spent during their park stay)<br><br>Park Activity Level<br>(active vs. sedentary)<br><br>Park-Based Leisure Companionship<br>(visit alone vs. visit with one or more people)<br><br>Perceived Park Benefits<br>(health benefits vs. other benefits) | Health<br><br>Perceived Mental Health<br>(RAND MOS-20)<br><br>Perceived Physical Health<br>(RAND MOS-20)<br><br>Physiological Measures of Health *<br>(Body Mass Index, Waist to Hip Ratio, Blood Pressure) |
| *Chronic Stress*<br><br>Daily Stress Inventory * | |

* Measured in diary component of this study

*Figure 1.* Study Constructs and Measurements

ratio and blood pressure) were measured in the diary component of the study.

*Chronic (daily) stress.* The Daily Stress Inventory or DSI (Brantly, Waggoneer. Jones, & Rappaport, 1987) was used to measure chronic stress in these study participants in the diary component of the study. This is an inventory of sixty of the most commonly reported daily stress events that included being hurried to meet a deadline, ignored by others, competed with others, experienced illness or physical discomfort, bad weather, concerned over personal appearance, and was late for work/appointment. Participants indicated if the event occurred within the past 24 hours, and, if so, how stressful the event was on a 7-point Likert type scale (1 = event occurred, but was not stressful, 7 = event caused me to panic). This inventory was completed at the end of each day over the 5-day period during the diary study. Measurement of daily stress with repeated measures of a stress inventory has been suggested to be the best way to measure daily stress (Eckenrode & Bolger, 1997). For this study, the average frequency of stressors was used in order to assess the frequency of exposure to daily stress events. The stressors that occurred during each day were tallied. After computing the number of stressors for each of the five days of participation, an average score of all five days was computed.

*Perceived physical health.* Perceived physical and mental health measures were sub-scales from the Rand Medical Outcomes Study Health Survey (MOS SF-20) (McDowell & Newell, 1996). The SF-20 is a validated scale that has been used in a number of population studies and is considered appropriate for older adults. In regards to perceived physical health, respondents were asked to describe the extent to which the following four statements were true: (a) "I am somewhat ill" (b) "I am as healthy as anybody I know" (c) "my health is excellent" (d) and "I have been feeling bad lately." Responses were coded on a five point scale in which 1 = definitely true, 2 = mostly true, 3 = don't know, 4 = mostly false, and 5 = definitely false. Items stated positively (e.g., my health is excellent) were later reverse coded so that a higher score would indicate better health. Responses were recoded into steps of 25 (from 0 to 100) where 1 = 0. 2 = 25, 3 = 50, 4 = 75 and 5 = 100. A composite score was then computed by averaging the four individual items.

*Perceived mental health.* Perceived mental health was measured with a six-item mental health scale from the Rand MOS SF-20. Participants responded to six hypothetical situations. Examples of the six hypothetical situations are as follows. How much of the time during the past month: (1) Has your health limited your social activities (like visiting with friends or close relatives)? (2) Have you been a very nervous person? Responses were coded on a six point scale in which 0 = all of the time, 1 = most of the time, 2 = a good bit of the time, 3 = some of the time, 4 = a little of the time, and 5 = none of the time. Again, positively phrased items were reverse coded so that higher score would indicate better health. Responses were then recoded into steps of 20 (from 0 to 100) where 1 = 0, 2 = 20, 3 = 40, 4 = 60, 5 = 80 and 6

= 100. A composite score was then computed by averaging the six individual items. Reliability analysis for both perceived physical and mental health scales yielded alpha scores of .85, indicating acceptable scale reliability.

*Physiological health.* Physiological health was based upon the blood pressure, height, weight, and body circumferences of study participants obtained during the diary portion of the study. Height and weight was used to compute the participant's *body mass index* (BMI) which is a calculation of weight (kg)/height * height (meters$^2$). Standing height was measured (with shoes off) using a Holtain Pocket Stadiometer. The participant was in a standardized posture standing erect, weight distributed evenly on both feet with heels together on the stadiometer board with the medial borders of the feet at a 60-degree angle, arms hanging freely by their sides with palms facing thighs. The subject was then instructed to inhale deeply and maintain a full erect position when the actual measurement was taken. Height was measured three times and recorded to the nearest 0.1 cm. The subject's weight was measured using a Healthometer Strain Gage digital weighing scale. The subject was weighed while standing (with shoes off) in an erect posture with hands at their side. Heels were together and the medial borders of their feet were placed at a 60-degree angle. Weight was recorded to the nearest 0.1 kg.

*Circumferences* around the waist and hips were used to calculate participants' waist-to-hip ratios (WHR) and were recorded to the nearest .25-inch. Finally, *blood pressure* and heart rate were self assessed by study participants and measured with A&D digital electric sphygmomanometer. These measurements were collected using a standard Riva-Rocci cuff and antecubital fossa transducer placement.

*Park-based leisure.* A variety of behavioral and contextual variables were chosen to represent park-based leisure (Figure 1). Many of these indicators have been examined in previous stress coping studies (Coleman, 1993; Iwasaki, 2002). *Frequency of park use* was measured by the number of times within the past twelve months that respondents visited the Cleveland Metroparks system. *Duration of the park visit* was measured by asking how long (in minutes) that participants stayed within that park during their most recent visit. *Park activity* was asked in an open-ended manner. Participants were asked to list up to six activities they undertook during their most recent visit and the number of minutes they spent doing each activity. Identified park activities were then reduced to four categories based upon subjective evaluation of their physical activity levels, considering the caloric expenditure of each activity (Ainsworth et al., 2000): sedentary activity (i.e. driving through the park, sitting on a bench), low physical activity (i.e., picnicking, bird watching), moderate physical activity (walking 30 minutes, hiking for 30 minutes), or heavy physical activity (i.e., jogging or running, riding a bike for 45 minutes or more, hiking for over an hour). Given the uneven and small sample sizes across these four categories, this data was further reduced into a dichotomous variable: physically active leisure and sedentary leisure activity. The social support variable of *park companionship* was also examined in this study. Specifically, respondents were asked if they visited Cleveland

Metroparks alone or with family or with friends or other people. Again, due to small sub-samples, responses were then reduced to reflect two categories of social support: visiting the park alone or visiting with other person(s).

*The perceived benefits* realized during respondents' park visits were measured with an open-ended item that asked respondents to list the benefits they received from visiting Cleveland Metroparks. Respondents were instructed to list the most important benefit first. All benefits reported were content analyzed and reduced to twenty categories (Figure 2). From here, we used a broad-based definition of health (i.e., physical, mental, social, spiritual) to further reduce perceived park benefits into two categories: One that reflected health related benefits and the other park–based benefits.

*Analysis*

Prior to statistical analyses, data manipulation was performed on the diary data. The diary examined five days in a subject's life. For each day, there were up to six blood pressure readings and one rating of daily stress. In analyzing the data, several steps were taken in an attempt to create a picture of the subject's health for each day of the five-day diary study period. Means and standard deviation levels of daily stress, blood pressure, and heart rate were calculated for each day. Univariate general linear modeling was used to examine the relationships between daily stress, leisure, and health. General linear model procedures allowed for the testing of interactions between factors as well as for the effects of covariates. All analyses controlled for age and gender by using those variables as covariates in the analyses. Consistent with linear modeling protocol, interaction terms were also created to examine the interaction of park use and daily stress on health. For all analyses, we used a .05 alpha *p*-value as the level of significance.

| General Park Benefit Categories | Health Oriented Park Benefit Categories |
|---|---|
| Accomplish | Exercise |
| Activity | Health |
| Appreciation | Learn |
| Challenge | Nature |
| Competition | Reflect |
| Concentration/stimulation | Renew |
| Enjoy | Social |
| Entertainment | |
| Escape | |
| Expression | |
| Help | |
| Novelty | |
| Utility | |

*Figure 2.* Reported Benefits of Park Use—Health Oriented and General Park Benefits

## Results

### *Descriptive Statistics*

The total sample included 100 older adults who completed *both* the questionnaire and the diary portion of this study. A demographic profile of this sample is presented in Table 1. The sample ranged in age from 50 to 86 years, with a mean age of 65 years. The sample was predominately female (62%) and white (99%). The majority of the sample reported incomes in the $20,001-39,000 category (33%). A majority of the sample was married (58%). About 24% of the sample was widowed, 12% were divorced or separated, and 6% were single. The majority of the sample was retired (56%). However, 11% worked part-time, 19% were employed full-time, and 4% were unemployed. The sample was high functioning with only 20% reporting a disability. The most common disabilities reported involved joint (e.g., arthritis), visual, and hearing impairments.

Stress scores were used to categorize the sample into either high or low stress groups based on the mean frequency of daily stressors. The group was split based on the mean whereas those who reported greater than the mean 5-day stress frequency were considered high stress and those at or below the mean were considered to be low stress. The average five-day stress frequency for this sample ranged from 0 to 31.2 with a mean of 9.19.

Multiple park use variables were examined in this investigation. The average frequency of park visits in the past 12 months was 43 visits with a range of 1 to 365 visits. Participants stayed in the park on average over an hour (85.3 minutes) with a range from 10 to 360 minutes. The majority of the sample (76%) participated in some type of active park-based leisure activity as opposed to sedentary park activities (24%). In addition, a majority of the sample visited the park with at least one other person (74%) while only 26% of the sample visited the park alone.

Overall, this sample was in good health. The average systolic blood pressure readings (128.83 mmHg) and diastolic blood pressure readings (76.08 mmHg) were within the normal limits. Body mass index scores (BMI) ranged from 18.33 to 47.01 with a mean of 27.80 characterizing the sample as overweight. The average perceived mental health perception score was 78.6 and the perceived physical health score was 75.0. According to McDowell and Newell (1996) cut-off points to define poor health were set based on the lowest 20% of scores in the medical outcomes study's population sample. A score of 67 or below is considered poor mental health, and a score of 70 or below is considered poor physical health.

### *Inferential Statistics*

*Research question #1a: Does the relationship between park-based leisure and perceived physical health depend on the daily stress level of older adults?* The relationship between leisure and perceived physical health did not depend on daily stress levels. That is, there were no interaction effects. Given, this finding,

*TABLE 1*
*Demographic Characteristics of the Sample*

| Demographic Variables | Frequency (*N*) | Percent |
|---|---|---|
| Age | | |
| 50-60 | 35 | 35 |
| 61-65 | 17 | 17 |
| 66-74 | 35 | 35 |
| 75-84 | 11 | 11 |
| 85 and over | 2 | 2 |
| Total | 100 | 100 |
| Gender | | |
| Females | 62 | 62 |
| Males | 38 | 38 |
| Total | 100 | 100 |
| Race | | |
| White | 99 | 99 |
| Asian-American | 1 | 1 |
| Total | 100 | 100 |
| Education | | |
| Grades 7-12 | 3 | 3 |
| H.S. Graduate | 24 | 24 |
| Some College | 29 | 29 |
| Associate Degree | 5 | 5 |
| Bachelor Degree | 23 | 23 |
| Graduate Degree | 17 | 17 |
| Total | 101 | 100 |
| Marital Status | | |
| Maried | 59 | 58 |
| Widow | 24 | 24 |
| Divorced | 12 | 12 |
| Single | 6 | 6 |
| Total | 101 | 100 |
| Employment Status | | |
| Retired | 57 | 56 |
| Homemaker | 5 | 5 |
| Part-Time Work | 11 | 11 |
| Full-Time Work | 19 | 19 |
| Unemployed | 4 | 4 |
| Other | 6 | 6 |
| Total | 101 | 100 |

the main effects between park-based leisure and perceived physical health could then be tested.

*Research question #1b: Does the relationship between park-based leisure and perceived psychological health depend on the daily stress level of older adults?* The relationship between leisure and perceived mental health also did not depend on daily stress levels. For example, park companionship and length of park stay did not interact with daily stress in their relationship to mental health ($p < 0.997$ and $p < 0.517$ respectively). Thus, main effects between park-based leisure and perceived mental health could then be tested.

*Research question #1c: Does the relationship between park-based leisure and physiological health measures depend on the daily stress level of older adults?* The relationship between park-based leisure and the physiological health measure of body mass index (BMI) did depend on daily stress. However, the relationship between park-based leisure and physiological measures of blood pressure and waist-to-hip (WHR) ratios did not. Therefore, the direct effects between leisure and the latter two physiological health measures could then be tested. Interaction effects between various park-based leisure characteristics, daily stress, and BMI are now discussed.

There was a significant interactive effect of daily stress upon length of park stay in its relationship to body mass index ($F = 4.38$, $p < 0.05$). In other words, the relationship between length of stay and BMI depended upon daily stress levels. For low stress respondents, BMI scores did not differ across length of park stay (Table 2). However, in the high stress category, those with a higher body mass index (BMI = 35.28) tended to stay at the park for more than one hour, while those with a lower body mass index (BMI = 27.22) reported being at the park for less than one hour.

Similarly, there was a significant interaction effect of daily stress upon perceived health related benefits in their relationship to BMI ($F = 7.06$, $p < 0.01$). The low stress group did not differ on BMI regardless of reporting a health related benefit from their park activity (Table 3). However, among high stress respondents, there were differences in BMI depending on whether they reported health benefits from the park activity. Those reporting health benefits as a result of their park-based leisure participation had a lower body mass index (BMI = 27.23) than high stress respondents who did not report any health related benefits from park activity (BMI = 38.81).

*TABLE 2*
*Interactions between Stress and Length of Park Stay on BMI*

| Stress Level | Park Stay | Mean | Standard Error | *F*-value | Significance (2-tailed) |
|---|---|---|---|---|---|
| Low stress | <1 hour | 27.80 | 2.22 | 4.38 | .05 |
| | ≥1 hour | 25.96 | 2.01 | | |
| High stress | <1 hour | 27.22 | 2.49 | | |
| | ≥1 hour | 35.28 | 2.01 | | |

*TABLE 3*
*Interaction between Stress and Perceived Benefits on BMI*

| Stress Level | Leisure Benefits Type | Mean | Standard Error | *F*value | Significance (2-tailed) |
|---|---|---|---|---|---|
| Low | General | 25.54 | 2.85 | 7.06 | .01 |
| | Health | 27.35 | 1.78 | | |
| High | General | 38.81 | 3.16 | | |
| | Health | 27.23 | 2.07 | | |

Finally, BMI and leisure companionship interacted significantly in their relationship to daily stress (Table 4, F = 8.84, $p < 0.01$). Respondents from the low stress group had similar BMI scores regardless if they participated in the park alone or with a leisure companion. However, those from the high stress group who participated in their park activity with a leisure companion had a significantly lower body mass index (BMI = 28.29) than those who participated alone in a park activity (BMI = 41.10).

*Research question #2: Is there a direct relationship between park-based leisure and the daily stress levels of older adults?* Examination of the direct relationships between daily stress and park-based leisure revealed that there were group differences between high and low stress based upon the duration of the park visit ($p < 0.01$; Table 5). The higher stress group stayed longer in the park (105.94 minutes) compared with the lower stress group (73.45 minutes). However, we found no significant relationships between the frequency of park visits, the type of park activity (physical vs. sedentary), park companionship (alone or with someone), leisure benefits and daily stress level.

*Research question #3a: Is there a relationship between park-based leisure and the perceived physical health of older adults?* There was one significant relationship between park-based leisure and perceived physical health (Table 6). Those who participated in a park activity with a companion reported significantly higher ($p < 0.05$) physical health perception scores (Mean = 82.57) than those who participated alone (Mean = 71.98). Other non-significant relationships between park-based leisure and perceived physical health involved

*TABLE 4*
*Interaction between Stress and Leisure Companion on BMI*

| Stress Level | Leisure Companion | Mean | Standard Error | *F*value | Significance (2-tailed) |
|---|---|---|---|---|---|
| Low | Alone | 24.28 | 2.64 | 8.84 | .01 |
| | Someone | 27.54 | 1.63 | | |
| High | Alone | 41.02 | 4.02 | | |
| | *Someone* | 28.29 | 1.89 | | |

*TABLE 5*
*High/Low Stress Group Differences in Park-Based Leisure Frequency and Duration*

| Park Use Measure | Stress Level | Mean | Standard Deviation | *N* | *F*-value | Significance (2-tailed) |
|---|---|---|---|---|---|---|
| Leisure Behavior Frequency | Low | 38.07 | 76.77 | 59 | .96 | NS |
| | High | 55.56 | 97.02 | 34 | | |
| Leisure Behavior Duration (minutes) | Low | 73.45 | 36.71 | 49 | 6.19 | .01 |
| | High | 105.94 | 81.23 | 32 | | |

frequency of park visitation, type of park activity, and perceived leisure benefits.

*Research question #3b: Is there a relationship between park-based leisure and the perceived mental health of older adults?* There were no significant, direct relationships between any of the park-based leisure characteristics measured in this study and perceived mental health.

*Research question #3c: Is there a relationship between park-based leisure and the physiological health of older adults?* Direct main effect relationships between park-based leisure and physiological health measures were significant. In particular, blood pressure was related to a number of park-based leisure characteristics. Those who reported that they received health-related benefits from their park activity had a lower average diastolic blood pressure (74.1 mmHg) than those who did not report receiving health related benefits from their park-based leisure activity (78.6 mmHg, $F = 3.75$, $p < 0.05$). There were no significant relationships between any park-based leisure characteristics and waist-to-hip (WHR) ratios. Those who stayed in the park more than

*TABLE 6*
*Health Variations by Park-Based Leisure Companionship and Duration*

| Measure | Group | Mean | Standard Deviation | *N* | *F*-value | Significance (2-tailed) |
|---|---|---|---|---|---|---|
| Perceived Physical Health | Alone | 71.98 | 16.21 | 19 | 4.00 | .05 |
| | Someone | 82.57 | 25.43 | 60 | | |
| Systolic Blood Pressure | <1 hour | 131.53 | 20.24 | 43 | 3.53 | .06 |
| | ≥1 hour | 125.23 | 15.90 | 39 | | |

one hour had a nearly significantly ($F = 3.53$, $p = 0.06$) lower systolic blood pressure (125.23 mmHg) than those who stayed less than one hour (131.3mmHg) (Table 6). Given that body mass indices involved an interaction effect based on daily stress level, we did not examine direct effects of BMI on the length park stay, health benefits, and leisure companionship. However, frequency of park visits and BMI did not have any significant interaction effects (Research Question 1c.). Direct main effect relationships between these variables were subsequently tested and no significant relationships were found.

## Discussion

Leisure behavior is increasingly being linked with its role in reducing stress and improving mental and physical health. In particular, park-based leisure participation provides opportunities to reduce stress and its negative health consequences. However, few studies have examined whether (and how) park-based leisure and stress interacts with a comprehensive battery of physical and mental health indicators among older adults. This study provides evidence that park-based leisure, daily stress, and health are significantly related. However, such relationships were modest, and in some cases, depended upon stress levels. The theoretical and practical implications of these findings are now discussed.

### *Research Implications*

Study findings highlight the importance of daily stress in moderating relationship between park-based leisure behavior and physiological health. While these relationships were limited, a few patterns were consistent with prior research conducted by Coleman (1993) and others (Iwasaki, 2002: Iwasaki & Mannell, 2000). For example, when controlling for age and gender, we found that relationships between park-based leisure characteristics and health (as measured through BMI) were only statistically significant among high stress populations. Among high stress populations, those who had a higher body mass stayed at parks longer than those with lower body mass. This finding is consistent with studies conducted by Iwasaki (2002) and others who found that emergency service personnel engaged in leisure activities longer when their stress levels were higher. Park agencies that wish to address the public health issues related to obesity and hypertension might consider the role of length-of-stay and companionship in the leisure behavior of older adults. One argument that has received partial support from Iwasaki (2002) is that those who are obese participate longer in the leisure in order to reduce stress. Here, longer length of stay might be part of a compensatory strategy to reduce stress or to improve their physical condition Iwasaki (2002). Unfortunately, the design of the current study made it impossible to determine causality between body mass and duration of visit. In other words, we were unable to link prior park use patterns with prior BMI scores. Testing

this proposition will require longitudinal tracking, rather than cross-sectional measurement, to examine if a pattern of park duration is linked to any changes in body mass over time.

In addition, the two other interactive relationships among high stress respondents indicated that leisure companionship and self-reported leisure health benefits were also significantly related to lower BMI scores. Among high stress park users, those who visited the parks with a companion (or several) were more likely to have a lower body mass, as were those reporting benefits from their park visit. This evidence is consistent with existing stress and health research, which emphasizes the importance of social support in creating satisfactory leisure experiences and environments. For example, Coleman & Iso-Ahola (1993) posited that leisure-based social support is an important asset in reducing the impact of stress upon physical health. Unlike, Coleman's (1993) empirical analysis, our analyses indicated that there was a significant relationship between social park experiences and physiological health (BMI) only among those higher stress individuals. Physical activity and public health scholars have also identified social support as a key determinant of continued physical activity participation (Dishman & Sallis, 1994; King, 1997). However these researchers did not examine the role of stress in mediating the relationship of social support and physical activity. Moreover, leisure researchers had not previously tested the relationships between stress, leisure, and physiological health indicators. Our research findings combined with prior evidence supports the growing movement to promote the health of older adults through both structured and unstructured leisure socialization.

While not originally specified as a research question, we did find a number of significant relationships between daily stress and health (Table 7). These findings are consistent with a number of studies within the public health literature and lend support to concurrent validity of both our daily

*TABLE 7*
*High/Low Stress Group Differences in Health Measures*

| Physical Measure | Stress Level | Mean | Standard Deviation | *N* | *F*-value | Significance (2-tailed) |
|---|---|---|---|---|---|---|
| Systolic Blood Pressure | Low | 125.90 | 17.29 | 61 | 4.14 | .05 |
| | High | 133.26 | 18.43 | 35 | | |
| BMI | Low | 26.87 | 4.54 | 53 | 4.36 | .05 |
| | High | 31.41 | 3.72 | 32 | | |
| Perceived Mental Health | Low | 76.73 | 13.71 | 60 | 4.57 | .05 |
| | High | 82.29 | 13.70 | 35 | | |

stress and our health measurements. Several other direct relationships were also significant. First, we found a significant relationship between park-based leisure and physiological health, independent of daily stress level. Those who stayed longer in the parks were also likely to have lower systolic blood pressure. These findings extend the work of Bell et al. (1998) and Brand et al. (2000) and provide evidence that park-based leisure use is related to both objective and perceived health indicators.

Unlike prior stress, leisure, and health research, we did not find significant relationships between stress and park-based leisure. Nor did we find any significant relationships between park-based leisure and perceived physical or mental health. One possible explanation for these non-significant findings may be related to our sample. This self-selected sample was relatively homogeneous. The members of this group were mostly park users who frequently participated in leisure activities. If our sample was more diverse (i.e. including more non-participants who were less active) findings may have been different.

One challenge currently facing the park and recreation profession is the lack of conclusive empirical evidence, that identifies the unique and separate health contributions of leisure activity from other forms of daily physical activity such as household chores, work, etc. (Crompton 1999, p. 42; King, 2001). Unfortunately, our study was not designed to examine the separate and independent effects of park-based leisure from these other forms of physical activity. Nevertheless, we did find a connection between park-based leisure activity and a series of physiological measures such as body mass and blood pressure. The strategic and policy implications of these findings are now discussed.

*Strategic and Policy Implications*

The role of leisure companionship and length of park stay were important factors in contributing to the physiological health of older adults. Park organizations who wish to promote physiological health such as reducing blood pressures might consider strategies to promote group socialization among older adults and to encourage a longer length of stay during their trips to local parks. In our study environment (e.g. Cleveland Metroparks), older adults were more likely to be frequent visitors, but their length of stay was considerable shorter than other age groups (TRIAD Research, 2002).

There are a number of practical suggestions from facilitating leisure companionship and length-of-stay among older adults. First, to increase park length-of-stay of older adults, comfort and safety concerns should to be addressed. The shift to serve an older adult clientele might be as simple as creating more comfort stations (i.e., restrooms, water stations), creating more frequent rest areas, or designing more age-appropriate walking trails supported through social programming opportunities. Park professionals might also consider offering a wider range of "light activity" opportunities that are enjoyable and personally meaningful to older adults. Historically,

municipal park and recreation agencies have emphasized programs and facilities that are more suited to the physical capabilities and interests of younger visitors. Second, parks can promote leisure companionship by encouraging older adults to join leisure clubs sharing a common interest. Such clubs need not involve strenuous physical activity, but should provide opportunities for socialization to ensure that visitors with chronic health conditions (i.e., arthritis flare-ups) can be group participants.

Finally, our study found a direct relationship between reported leisure benefits and lower blood pressure. Those who indicated that they visited the parks for health benefits were also more likely to have lower blood pressure. In short, they were realizing the health outcomes that they sought. Park and recreation organizations that wish to expand this impact to a broader constituency could re-position and promote their services not as a series of activities and programs, but rather as cost-effective health outcomes (Crompton, 1999; Payne, 2002; Payne et al., 1999). However, promoting the cost-efficiency of local parks as a health promotion strategy will be challenging at the local level because some park organizations are not fully aware of their health promotion role and how their services are more cost-effective than the current non-preventative health care system (Crompton, 1999).

One study limitation involved a measurement incongruity between reported stress levels and park-related leisure activity. More specifically, stress was measured over a five-day period, while park use was measured across a longer time-frame (i.e., the past twelve months). Our findings become more tenuous if there is a significant disconnect between respondents' stress reported during the study week and their stress levels over the past twelve months. Another study limitation, that hindered our ability to empirically test more complex relationships (based upon a comprehensive stress-leisure-health model), was the low sample size of the diary sample ($N = 100$). Indeed, many statistical relationships that were significant in the larger survey sample ($N = 1{,}506$) were not statistically significant in this particular diary sub-sample. Smaller sample sizes are not unusual among diary studies because of the commitment needed to accurately report and complete the daily health measurement protocols. Additionally, our study results should be interpreted with caution because of a potential reciprocal relationship between health and park-based leisure. That is, people who are healthy may be better able to use parks. Those who suffer from chronic conditions (i.e. arthritis, severe cardiovascular disease, ambulatory problems) are less likely to use the parks because their conditions limit them from participation. Nevertheless, it is likely that park use results in some degree of improved health. Using diverse panel groups over time is one option to generate a more substantial sample and determine causality. However, the effects of aging and external events must also be accounted for with this method.

*Suggestions for Future Research*

Future studies could improve upon this research by delineating and measuring physical activity across all domains of daily life including, park-

based leisure, household chores, and employment. Our study delimited its analyses to the contribution of local parks on the stress and health of older adults. By making more clear-cut distinctions between other forms of physical activities, park and recreation researchers might be better able to define the relative influence of park-based leisure upon the health of older adults.

Future studies examining the role of stress in mediating or moderating the relationship between leisure and health could also measure the impact of acute stress as opposed to daily or chronic stress. While people may be using local parks in order to minimize travel, they may also visit parks to reduce stress associated with episodic negative life events (Kleiber et al., 2002). The growing concern over terrorism has brought increased attention to local park opportunities and their role in providing leisure benefits during periods of acute social stress. Quality-of-life perceptions may also aid in our understanding of how park use affects chronic stress and health. For older adults, health-related quality of life could be an outcome of park-based physical activity participation. Finally, given the growth in "community-dwelling" active adults above the age of 65 (Robinson & Godbey, 1997), future research might also test whether the relationships between stress, park use, and health are experienced any differently across older adult age cohorts (e.g., younger old and the oldest old).

## Conclusion

Park and recreation agencies are currently debating how they can become more relevant in facilitating health and wellness in their communities. Increasingly, park agencies are attempting to reposition themselves as an important partner in battling the most pressing health issues such as obesity, stress, hypertension, and arthritis. However, for the profession to enhance its position with health professionals and policy makers (e.g., elected officials, lobbyists, non-governmental organizations), more evidence concerning the contribution of park environment to physical activity and health is needed. Such evidence should be based not only upon perceived measures of physical and mental health, but also more objective measures of physiological health including, but not limited to, body mass, blood pressure, and cortisol levels. This study provides some evidence that a significant relationship between park-based leisure and physiological health exists. As public health and park and recreation professionals continue to form hypotheses and test these relationships, communities will be better able to develop environments, policies, and collaborative programs to promote health and well-being for their citizens.

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