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THE RELATIONSHIP BETWEEN PHYSICALLY ACTIVE LEISURE ACTIVITIES AND HEALTH FOR ADULTS AGE FIFTY AND OLDER

A Thesis in

Leisure Studies

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ABSTRACT

There are three purposes for this study: 1) To characterize seniors' leisure activities in terms of the physically active leisure index using the METs values, 2) To examine to what extent and in what ways three types of physical activity: leisure-time physical activity, household physical activity and occupational physical activity, are related to nine health dimensions: health perception, physical functioning, mental health, vitality, role functioning, pain, social functioning, number of doctor visits and obesity, and 3) To compare the physically active leisure index with the PASE scale in terms of explaining variance in older adults' health.

This study utilizes secondary data analysis from a study entitled--*The Relation of Local Government Recreation and Park Services to the Health of Older Adults.* The subjects were from Peoria, IL, San Diego, CA, Arlington, VA, Houston, TX, and Minneapolis, MN. The sample was predominately white and the majority of them were female with a mean age of 67. Half of the subjects were married and the sample had a diverse education level. Content analysis, one-way ANOVA, bivariate correlation, and multiple regression analyses were conducted to fulfill study objectives.

Study findings highlight the greater importance of leisure-time physical activity than household or occupational physical activity in predicting older adults' health. The content analysis from the open-ended leisure activities revealed that many older adults' leisure activities remain sedentary. Gender, ethnicity, and geographical location were significantly related to subjects' physically active leisure index. However, age, marital status, and education were not significantly related. Although the physically active leisure

index developed from this study did not explain as much variance in the health outcomes as the PASE scale, it was a pilot test of a method which was intended to incorporate quantative measures of physically active leisure in the field of leisure studies. These results should be considered in light of the study's limitations.

Results demonstrated that physically active leisure was a better predictor of older adults' health compared to other forms of physical activity and conclude that policy planning should concentrate on providing recreation and leisure opportunities to promote healthy active living for seniors. Moreover, leisure studies scholars should continue to collaborate with other disciplines and professionals to provide and examine the empirical evidence pertaining to leisure and its impact on advancing active lifestyles for older adults.

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Chapter 1

Introduction

The older population is increasing dramatically in the United States. According to the most recent data, in 2002, about 35.6 million people, or 12.3% of the U.S. population are 65 years or older, representing one in every eight Americans (Administration on Aging, 2004). This ratio will decrease over the next two decades as the Baby Boom Generation, those born from 1946 to 1964, reaches older age. In addition to the increasing size of the aging population, older adults are living longer. The number of adults 85 years and older is expected to increase faster than any other age group (Desai, et al., 1999). As projected, the 85+ population will increase from 4.6 million in 2002 to 9.6 million in 2030 (Administration on Aging, 2004).

Most older adults live with chronic diseases. It is reported that more than 80% of American seniors have one chronic condition, and 50% report two or more chronic conditions (Older Americans 2000*;* Teague, McGhee, Rosenthal, & Kearns, 1997). Chronic diseases result in considerable health expenditure to individuals as well as to society as a whole.

Health care costs are a burden for older adults and society as a whole. For instance, in 1995, 33.5 million adults who were 65 years and older (which represented 12.8% of the population) consumed one third (35.3%) of total personal health-care dollars (Desai, Zhang, & Hennessy, 1999). It has also been projected that personal health-care expenditure for older adults will double during 1994-2030 (Rice, 1996). These

expenditures are primarily funded by the Medicare and Medicaid programs (Desai, et al., 1999). In addition, older adults are also exposed to considerable out-of-pocket cost burdens. These costs accounted on average for 15 % of total health care expenditures for older Americans in 1995 (Crystal, Johnson, Harman, Sambamoorthi, & Kumar, 2000).

In order to reduce this huge expenditure, numerous studies have shown evidence of the positive relationship between physical activity and health (Bijnen, Feskens, Caspersen, Nagelkerke, Mosterd, et al., 1999; Blair, & Brodney, 1999, Campbell, Borrie, & Spears, 1989; Cauley, Petrini & LaPorte, Sandler, Bayles, et al. 1987; Lee, Hsieh, & Paffenbarger, 1995; Paffenbarger, Kampert, Lee, Hyde, Leung, et al., 1994). Most studies, however, considered physical activity generally as a combination of physical activity in all realms of daily life, including paid work, household chores, personal maintenance, and physically active forms of leisure. These studies did not consider the comparative impact of each individual component of physical activity on health. Moreover, few studies examined the extent to which physically active leisure activities, especially those that are self-motivated and freely chosen, contribute to personal health. By understanding the disaggregated contribution of leisure to physical activity among older adults, we may gain valuable knowledge in terms of social and policy planning by understanding the comparative contribution of leisure to physical activity.

The prevalence of chronic physical conditions among older adults is associated with a sedentary lifestyle (Corbin, Lindsey & Welk, 2001). Although there is mounting evidence about the inverse relationship between lack of physical activity and health, most adults remain sedentary. Studies showed that 60% of American adults do not engage in enough physical activity to achieve or maintain better health. Moreover, 25% of

American adults engage in no physical activity. This phenomenon becomes more severe as people age (Centers for Disease Control and Prevention [CDC], 2001).

In order to compensate for this sedentary phenomenon, the government has devoted considerable effort to promoting physical activity research and programs (CDC, 2001). Most research incorporated exercise or structured physical activity programs as interventions to investigate the relationship between physical activities and health. Although these findings indicated positive results initially, adults generally do not continue to perform these activities for a long time (Dishman, 1988; Thompson & Hoekenga, 1998; Wills & Campbell, 1992; Wankel, 1987). Approximately half of the people who start exercise programs quit within six months (Dishman, 1988; Wankel, 1987; Wills & Campbell, 1992). Older adults may encounter more constraints in maintaining exercise participation such as health problems or social norms (Harris, 1977). Therefore, consistent maintenance of physical activity at the desired level is a major issue promoting a physically active lifestyle.

Since maintaining long-term physical activity is an important issue for promoting public health, policy planners need to know more about which form(s) of physical activity is more efficient for older adults to sustain. In contrast to general physical activity and structured programs, leisure activity may contribute significantly to a solution to this problem because it is self-motivated, and therefore older adults are more likely to continue participating over the long term. Over the past few decades, several studies have confirmed that leisure activity has positive impacts on older adults' physical, psychological, social, and spiritual health (Atchley, 1976; Caldwell & Smith, 1994; Russienello, 1994; Mannell, 1999; Neulinger & Breit, 1971;Shary & Iso-Ahola, 1989).

Leisure activity may also provide a buffer to help individuals cope with and reduce stress (Cohen & Wills, 1985, Coleman & Iso-Ahola, 1993).

In spite of the considerable research devoted to identifying the factors that increase the health status of older adults, most studies focus only on general physical activity. Overall, few studies focus on physically active leisure for older adults, as differentiated from physical activity which is part of paid work, housework, or other parts of life. Although considerable evidence demonstrates that there is a positive relationship between physical activity and health, we do not know which form(s) of physical activity contributes importantly to one's health and to what extent the active forms of leisure benefit seniors' health.

In addition to addressing these problems, this study seeks to compensate for two methodological concerns. First, existing literature in leisure studies does not provide scientific and objective measures of leisure participation in terms of the energy expenditures, a widely accepted practice in the field of Kinesiology. This study will utilize metabolic equivalent values (METs) provided by the Compendium of Physical Activities (Ainsworth, Haskell, Leon, Jacobs, Montoye, et al., 1993; Ainsworth, Haskell, Whitt, Irwin, Swartz, et al. 2000) to estimate the energy expenditure levels of older adults' leisure activity. METs represent the metabolic energy expenditure which reflects the intensity of a given physical activity. Energy expenditure for a given activity can be calculated from the METs of the activity, by its frequency and duration, and the individual's body weight in kilogram/pounds.

Second, most research has measured leisure based on an external vantage point, which means that what constitutes leisure in any study is determined by the researcher

and is based on viewpoints other than those of the individual or group being studied (Mannell & Kleiber, 1997). However, participants may define leisure differently. For example, gardening may not be on the researchers' list of leisure activities, but for some participants, gardening may indeed be viewed as a leisure activity. This issue is critical to address since leisure implies comparatively free choice and what is freely chosen in terms of human activity varies at the individual level. This variation in what activities are considered to be leisure may be more pronounced when age is taken into account because older adults tend to have personal lifelong hobbies which differ from individual to individual. The benefit of adopting an internal vantage point of leisure is:

> …, researchers will get a more accurate picture of how much leisure people feel they have and what is meaningful to them, which in turn may also allow a clearer understanding how leisure impacts on their lives (Mannell & Kleiber, 1997, p.57).

To conclude, leisure activities are subjective and meaningful to older adults. This study will provide a more objective evidence-based method to portray seniors' leisure activities in terms of their intensity level. It will also seek to determine the comparative value of leisure compared to other areas of life in providing physical activity and health benefits.

Purpose of Study

This study will first provide a profile of older adults' self-reported leisure activities in terms of both frequency and physical intensity using METs values—an index for calculating the physical activity level of a wide range of human activities. Additionally, several sociodemographic variables including gender, age, education, marital status, ethnicity, and geographical locations will be examined for their differences.

Second, this study will also compare the contributions of leisure-time physical activity with occupational and household physical activity from the Physical Activity Scale for the Elderly (PASE) to the following health dimensions among adults age fifty and older.

1. Health perception
2. Physical functioning
3. Mental health
4. Vitality
5. Role functioning
6. Pain
7. Social functioning
8. The number of physician visits
9. Obesity

Third, this study will use the physically active leisure index to predict the above nine health dimensions while controlling for sociodemographic variables and comparing

the results with those obtained using the PASE scale. The purpose of this procedure is to compare the strength of relationships between using quantitative measurement of the physically active leisure index and the standardized PASE score in predicting older adults' health status.

Research Objectives

In response to the previously mentioned problems, there were three specific objectives of this study. The first objective was to characterize seniors' leisure activities in terms of the physically active leisure index. The second objective was to examine to what extent and in what ways three types of physical activity—namely leisure-time physical activity, household physical activity, and occupational physical activity—relate to the nine health dimensions: health perception, physical functioning, mental health, vitality, role functioning, pain, social functioning, number of doctor visits, and obesity. The third objective was to compare the physically active leisure index with the PASE scale in predicting older adults' health.

The following are the study's hypotheses:

1 Hypotheses for Research Objective One

- 1.1 There is no difference between males and females in terms of their physically active leisure participation.
- 1.2 There is no difference among different age groups in terms of their physically active leisure participation.
- 1.3 There is no difference among subjects with different education levels in terms of their physically active leisure participation.
- 1.4 There is no difference among subjects with different marital status in terms of their physically active leisure participation.

1.5 There is no difference among different ethnic groups in terms of their physically active leisure participation.

1.6 There is no difference among subjects from different geographical locations characterized by differences in climate and urban size in terms of their physically active leisure participation.

2 Hypotheses for Research Objective Two

2.1 Leisure time physical activity contributes more than household and occupational physical activity in one's perceived health when controlling their age, gender, ethnicity, marital status, and education level.

2.2 Leisure time physical activity contributes more than household and occupational physical activity in one's level of physical functioning when controlling their age, gender, ethnicity, marital status, and education level.

2.3 Leisure time physical activity contributes more than household and occupational physical activity in one's mental health when controlling their age, gender, ethnicity, marital status, and education level.

2.4 Leisure time physical activity contributes more than household and occupational physical activity in one's vitality when controlling their age, gender, ethnicity, marital status, and education level.

2.5 Leisure time physical activity contributes more than household and occupational physical activity in one's role functioning when controlling their age, gender, ethnicity, marital status, and education level.

2.6 Leisure time physical activity contributes more than household and occupational physical activity in reducing one's pain when controlling their age, gender, marital status, ethnicity, and education level.

2.7 Leisure time physical activity contributes more than household and occupational physical activity in one's social functioning when controlling their age, gender, ethnicity, marital status, and education level.

2.8 Leisure time physical activity contributes more than household and occupational physical activity in reducing the number of doctor visits except physical checks when controlling their age, gender, ethnicity, marital status, and education level.

2.9 Leisure time physical activity contributes more than household and occupational physical activity in decreasing one's likelihood of obesity (measured by body mass index) when controlling their age, gender, ethnicity, marital status, and education level.

3 Hypotheses for Research Objective Three

3.1 There is no relationship between the physically active leisure index and the PASE score.

3.2 There is no relationship between the physically active leisure index and the leisure–time PASE score.

3.3 There is no relationship between the physically active leisure index and the household PASE score.

3.4 There is no relationship between the physically active leisure index and the occupational PASE score.

3.5 There is no difference in the predictive value of the physically active leisure index compared to the PASE scale in regard to subjects' perceived health when controlling their age, gender, ethnicity, marital status, and education level.

3.6 There is no difference in the predictive value of the physically active leisure index compared to the PASE scale in regard to subjects' physical functioning when controlling their age, gender, ethnicity, marital status, and education level.

3.7 There is no difference in the predictive value of the physically active leisure index compared to the PASE scale in regard to subjects' mental health when controlling their age, gender, ethnicity, marital status, and education level.

3.8 There is no difference in the predictive value of the physically active leisure index compared to the PASE scale in regard to subjects' vitality when controlling their age, gender, ethnicity, marital status, and education level.

3.9 There is no difference in the predictive value of the physically active leisure index compared to the PASE scale in regard to subjects' role functioning when controlling their age, gender, ethnicity, marital status, and education level.

3.10 There is no difference in the predictive value of the physically active leisure index compared to the PASE scale in regard to subjects' perception of reducing pain when controlling their age, gender, ethnicity, marital status, and education level.

3.11 There is no difference in the predictive value of the physically active leisure index compared to the PASE scale in regard to subjects' social functioning

when controlling their age, gender, ethnicity, marital status, and education level.

3.12 There is no difference in the predictive value of the physically active leisure index compared to the PASE scale in regard to subjects' numbers of doctors visit except physical checks when controlling their age, gender, ethnicity, marital status, and education level.

3.13 There is no difference in the predictive value of the physically active leisure index compared to the PASE scale in regard to subjects' likelihood of being obese (measured by body mass index) when controlling their age, gender, ethnicity, marital status, and education level.

3.14 There is no difference in the predictive value of the physically active leisure index compared to the PASE scale in regard to subjects' overall health when controlling their age, gender, ethnicity, marital status, and education level.

Delimitations

In 2000, a *National Blueprint: Increasing Physical Activity among Adults Age 50 and Older* (The Robert Wood Johnson Foundation, 2001) was developed as a guide for various organizations to collaboratively support an increase in physical activity among aging adults and improve the health and well-being of all Americans. The report states its purpose as follows:

> We envision a society in which all people age 50 and older enjoy health and quality of life, which is enhanced through regular physical activity. We will inspire an approach to aging that encourages physical activity in all aspects of people's lives (p 5.).

Thus, this study is delimited to people age 50 and older. In addition, because the participants were recruited from various settings (such as parks, recreation facilities/agencies, shopping malls, senior centers, and supermarkets), homebound and institutionalized older adults may not be proportionately represented in this sample.

Limitations

Since the data of this study is generated from self-report questionnaires, we cannot avoid the inherent limitations of subjectivity. However, the instrument measuring health outcomes (which include health perception, physical functioning, mental health, vitality, role functioning, pain, social functioning) has been tested with high validity and reliability in previous studies (McDowell & Newell, 1996; Stewart, Hays, & Ware, 1988). In addition, this instrument is also valid in population-based surveys (McDowell & Newell, 1996). Therefore, it is a valid and reliable instrument for this study.

Participants were asked to self-report up to six leisure activities in which they participate regularly. As it involves the process of recall, some participants, especially those older adults with cognitive impairments, may not be able to recall every activity. However, as suggested by Rikli (2000), prolonging the time for participants to respond may reduce the level of this problem. Hence, this problem may be less severe because, instead of collecting data on site, the participants filled out this questionnaire at home and mailed it back to the researchers, thus giving them more time to remember.

The level of participants' physically active leisure was converted to energy expenditures (METs) based on the Compendium of Physical Activities (Ainsworth,

Haskell, Leon, et al., 1993; Ainsworth, Haskell, Whitt, et al., 2000). Although the Compendium has 21 categories for major types of physical activity, and more than 600 specific physical activities listed, it does not incorporate all the activities reported by study participants. For those activities which were not included in the compendium list, or for those activities which did not refer to a "general" intensity, we asked three expert reviewers to judge the categories of the leisure time physical activity independently. In order to be consistent with the previous coding system from the Compendium of Physical Activities, a copy must be provided to the reviewers as a reference. However, responses such as "enjoy outdoors," "be creative," or "clear mind" were eliminated because it was not possible to identify the intensity of these "activities."

Two other limitations in this study should be noted. First, this study utilizes a cross sectional method. Therefore, the results cannot be generalized to longitudinal situations in the aging process. Second, the relationship between physically active leisure and health are likely reciprocal (Herzog, Ofstedal, & Wheeler, 2002). That is, health problems may restrict or constrain physically active leisure participation, and physically active leisure participation may influence health. However, the main focus of this study was to examine the contribution of physically active leisure participation to elders' health. Therefore, only the one directional hypothesis was examined.

Definitions

The following served as operational definitions within the context of this study:

Health Status

As a multi-dimensional construct, health is not merely the absence of disease or infirmity (World Health Organization, 1948). In this study, the participants' health is assessed from both subjective and objective measurements. Health was measured by the following indexes: health perception, physical functioning, mental health, vitality, role functioning, pain, social functioning, and health status. Each dimension is described more specifically as following:

Health Perception:

The subject's rating of their overall current health (Wagner, LaCroix, Grothqus, & Hecht, 1993).

Physical Functioning:

The extent to which health limits physical activities (e.g., lifting, climbing stairs, walking 1-block, bathing or dressing).

Mental Health:

Amount of time during past month that participants felt very nervous, downhearted, down in dumps, happy, calm, and/or peaceful.

Vitality:

Amount of time in the past month that participants felt full of pep, worn out, tired, or had a lot of energy.

Role Functioning:

Unable to work or do housework due to health problems.

Pain:

How participants rated pain intensity on a scale from none to severe during the past four weeks.

Social Functioning:

The perceived extent of limitations by health in normal social activities.

Physician Visit

The number of doctor visits during the last twelve months with the exception of routine physical checks.

Obesity

Obesity is defined as the condition of being obese, or increased body weight caused by excessive accumulation of fat. Observational judgments for obesity are inadequate and subjective. Instead, using body mass index (BMI), which is the ratio of weight (kg) divided by the square of the height (m^2), has been recommended because it is practical, objective, consistent, and biologically meaningful (Reilly, Wilson, Summerbell, & Wilson, 2002).

Physical Activity

Physical activity is defined as any bodily movement produced by skeletal muscles that result in caloric expenditure (Caspersen, et al., 1985). In the present study, physical activity is classified into three different types: leisure-time, occupational, and household physical activity. The above three classifications are based on participants' responses to a list of questions that are already defined in the questionnaire. In addition, participants also report leisure activity in an open-ended format.

Leisure-time Physical Activity

Leisure-time physical activity refers to the activities that subjects participate in during their free time. The activities include walking outside the home, light, moderate, and strenuous sport or recreational activities, and muscle strengthening exercises.

Occupational Physical Activity

Occupational physical activity is associated with one's job. It includes hauling, lifting, pushing, carpentry, shoveling, packing boxes, etc.

Household Physical Activity

Household physical activity includes activities that are primarily performed in the domestic areas such as sweeping floors, scrubbing, washing windows, and raking the lawn.

Physically Active Leisure Index

Generally, leisure can be defined as free time, activity, or a state of existence or a state of mind (Godbey, 2003). Leisure can also be classified by type of phenomenon (objective or subjective) and the definitional vantage point (external or internal) (Mannell & Kleiber, 1997). The subjective and internal definition of leisure—which means participants' "experience, satisfaction or meaning associated with involvement is defined

by the participant as leisure or nonleisure" (Mannell & Kleiber, 1997, p.54)—is adopted in the present study because it can better reflect older adults' leisure. Therefore, participants indicated their leisure in an open-ended format in this study as opposed to an existing checklist of leisure activities. In the present study, the physically active leisure index refers to those self-defined leisure activities which are converted into an index using an objective physical intensity indication (METs value) and frequency.

Chapter 2

Literature Review

This chapter reviews the literature on the relations between physical activity and leisure activity for older adults. The chapter is divided into four sections. In the first section, I present a currently accepted definition of physical activity, describe different types of physical activity, and discuss the ways physical activity is commonly assessed. In the second section, I first discuss the negative consequences of inactivity and the benefits associated with physical activity. Then, I discuss the benefits of physically active leisure for older adults by reviewing the literature on nine health dimensions, namely: health perception, physical functioning, mental health, vitality, role functioning, pain, social functioning, number of physician visits and obesity. The third section focuses on the prevalence of leisure activities among older adults. In the fourth section, I analyze relevant social demographic variables associated with leisure participation and health.

Physical Activity

Physical Activity: Definition and Types

A widely accepted definition in sport and exercise science defines physical activity as “any bodily movement produced by skeletal muscles that results in caloric expenditure” (Caspersen, et al., 1985). Physical activity has multiple dimensions. According to the World Health Organization, physical activity includes work, recreation, exercise and sporting activities (World Health Origination [WHO], 1997). Physical activity can also be divided into exercise, leisure-time physical activity, occupational physical activity, household physical activity, and, transportation physical activity.

Generally, exercise refers to physical activity that is planned or structured and involves repetitive bodily movement done to improve or maintain one or more of the components of physical fitness—cardiorespiratory fitness, muscular strength, muscular endurance, flexibility, and body composition. Leisure-time physical activity is physical activity performed during exercise, recreation, or any additional time other than that associated with one's regular job duties, occupation, or transportation. Occupational physical activity is associated with one's job. It includes hauling, lifting, pushing, carpentry, shoveling, packing boxes, etc. Household physical activity is activity primarily performed in domestic areas, such as sweeping floors, scrubbing, washing windows, and raking the lawn. Transportation physical activity is acquired while moving from one place to another such as walking, biking or wheeling (for wheelchair users), or similar

activities used to get to work, school, shops, etc. (United States Department of Health and Human Services [HHS], 1996).

There are no standard categories for physical activity. Some components overlap with each other. For example, sometimes exercise is thought of as separate from leisure-time physical activity; sometimes, exercise is treated under the umbrella of leisure-time physical activity. For the purpose of this study, physical activity will be classified into three primary components, namely, leisure-time physical activity, occupational physical activity, and household physical activity.

Physical Activity: Assessment

In order to accurately determine the relationship between physical activity level and health outcome, physical activity must be quantified precisely. Several techniques serve to assess physical activity, such as self-reported techniques, pedometers, heart rate monitors, activity monitors, direct observation, indirect calorimetry, and doubly labeled water measurement.

Each technique has its own advantages and disadvantages. For example, activity monitors and heart rate monitors could provide an objective indicator of body movement, including intensity, frequency, and duration. However, the financial cost hampers the assessment of a larger number of participants. Also, they may produce a "Hawthorn Effect," in which the subject fitted with an activity monitor changes their level of exercise because they are aware of being monitored. The methods of indirect calorimetry and doubly labeled water offer the most precise information on the energy expenditure of

physical activity, though these techniques are invasive to the participants (Dale, Welk, & Matthews, 2002).

Among these, self-reported techniques are the most common measure of physical activity due to their low financial cost, low participant burden, and capacity to handle a large sample size. The limitations of self-reported techniques, however, are their inherent subjectivity, which leads to reliability and validity problems as discussed above (Dale, et al., 2002).

Physical Activity and Health

Relationship Between General Physical Activity and Health

Increasingly, evidence shows that a number of diseases are directly associated with physical inactivity and can be viewed as “hypokinetic” conditions (Corbin, Lindsey & Welk, 2001), or conditions at least partially attributable to a lack of movement. Studies demonstrate that adequate physical activity is positively related to mobility (Blair, & Brodney, 1999; HHS, 1996) and inversely related to mortality (Bijnen,et al., 1999; Blair, & Brodney, 1999; Paffenbarger, et al. 1994; Lee, et al. 1995). More specifically, lack of physical activity can increase the incidence of coronary heart disease (Berlin, & Colditz, 1990; Powell, Thompson, Caspersen, & Kendricks, 1987; Thompson, Buchner, Pina, Balady, Williams, et al. 2003), amplify risk for falls and fractures (Campbell, et al., 1989; Sorock, Bush, Golden, Fried, Breuer, et al. 1988), and worsen muscular strength (Cauley, et al. 1987).

Beyond the effects on mobility and mortality, research confirms that physical activity participation is associated with reduced risk of cardiovascular disease, diabetes, obesity, selected cancers, and musculoskeletal conditions (Bouchard, Shephard, & Stevens, 1994). Many studies provide evidence that physical activity has positive physiological effects on the cardiovascular, respiratory, and central nervous systems. Such physical activity also improves muscular strength and flexibility, body composition, and metabolism (Chodzko-Zajko, 1998).

Older adults who participate in regular physical activity not only improve their quality of life, but also increase their life span (Blair, & Brodney, 1999; Buchner, 1997; Washburn, 2000). As for the physiological benefits, there are immediate and long term benefits of physical activity. Older persons who participate in regular physical activity can immediately improve their sleep, improve insulin sensitivity and glucose regulation, and increase their catecholamine activity. Regarding long-term effects, regular activity helps older adults retain cardiovascular endurance, improve muscular strength, achieve better flexibility and balance, and postpone age-related physiological decline (WHO, 1997).

In addition to the physiological benefits, older people who participate in regular physical activity also benefit psychologically. Benefits include increased relaxation, reduced stress, anxiety and distress (Cooper-Patrick, Ford, Mead, Chang, & Klag, 1997), enhanced mood state, improved cognitive function, heightened motor control and performance, boosted skill acquisition, and ameliorated general well-being (WHO, 1997).

Currently, considerable attention is focused on the importance of regular physical activity as a means of enhancing health and effective functioning in old age. The reason for this is to better understand the positive preventative mechanisms to compensate for the sensory, motor and cognitive declines that typically occur with advancing age. Consequently, a better understanding of these mechanisms will contribute to decreasing chronic diseases associated with inactivity and reducing health care costs.

The Contribution of Different Types of Physical Activity to Health

Most studies considered physical activity as a whole while examining the relationship between physical activity and health, rather than assessing different kinds of physical activities' impact on health. Or, as a recent study pointed out, the traditional promotion of physical activity is focused on vigorous activities. People may also benefit from some daily activities, such as yard work, housework, or commuting (Macera, Ham, Yore, Jones, Ainsworth, et al., 2005), that have not traditionally been considered as formal physical activity. In other words, physical activity is a complex behavior that occurs in multiple domains of life. However, most studies simply use leisure-time physical activity as an indicator of overall physical activity to predict health (Evenson, Rosamond, Cal, Pereira, & Ainsworth, 2003; He & Baker, 2005). There are a few researchers who recognized that other forms of physical activity could also benefit one's health (He & Baker, 2005; Coogan, et al., 1997; Rantanen, Era, & Heikkinen, 1997; Evenson, Rosamond, Cal, Pereira, & Ainsworth, 2003).

For example, an occupational physical activity may benefit the health of both sexes. One study revealed that men who have sedentary occupations have a higher incidence of colon and rectum cancer; in contrast, men who have higher levels of occupational physical activity have lower risk of developing such cancers (Fraser & Pearce, 1993). Similarly, studies (Coogan, et al., 1997; Zheng, et al, 1993) showed that women whose work requires higher levels of physical activity are more likely to reduce the incidence of hormone-dependent cancers, such as breast, uterine, and ovarian cancers.

However, some studies revealed negative associations between occupational activities and health (Koenig, Sund, Döring, & Ernst, 1997; Rothenbacher, Hoffmeister, Brenner, & Koenig, 2003; Sobti, Cooper, Inskip, Searle, & Coggon, 1997). For example, some occupational activities that required heavy physical labor, such as lifting, have been associated with hip pain, shoulder pain, and low back pain (Sobti, Cooper, Inskip, Searle, & Coggon, 1997). Another study demonstrated that the characteristics of occupational physical activity which is "long-lasting and mainly static" increased the incidence of coronary artery diseases (Rothenbacher, Hoffmeister, Brenner, & Koenig, 2003).

The relationship between occupational physical activity and obesity is inconsistent. For example, King and his colleagues (2001) found that a high level of occupational activity is associated with a decreased likelihood of being obese. However, Gutierrez-Fisac et al. (2002)'s research contrasts King et al.'s findings, which claim that work-related physical activity is not associated with obesity.

In addition, less leisure-time physical activity corresponds to higher occupational physical activity and vice versa. People with higher occupational physical demands are less likely to be involved in leisure physical activity to benefit their health because they have performed substantial physical activities in their jobs (He & Baker, 2005).

Household physical activity also plays an important role in shaping one's health, especially for older people who may not have the opportunity to participate in structured sports or exercise programs. They can get substantial physical activities and health benefits from daily physical activities, such as household chores, walking, or gardening, which are common activities for this cohort (Rantanen, et al., 1997).

For instance, Lawlor, Taylor, Bedford, & Ebrahim (2002) claim that domestic activity which requires similar energy expenditure as other forms of physical activity could also benefit one's health, especially for older women. Although their study showed that heavy house work is not associated with reducing the risk of being overweight, in part because women who need to do heavy house work are more likely to have low socioeconomic status and poor health, the study also demonstrated that older women who do moderate housework reduce the risk of being overweight.

In summary, considerable evidence demonstrates that there is a positive relationship between physical activity and health among older adults. Moreover, correlational studies suggest that not only leisure-time physical activity, but also occupational and household physical activities can benefit one's health. However, we do not know which form of physical activity contributes most to the health of older adults. In this study, three types of physical activities were examined simultaneously to examine which types of physical activity contribute most to the older people's health.

Leisure and Associated Health Benefits for Older Adults

There is an emerging concept assuming that health improvement is the outcome of several interrelated aspects of not only our physical fitness but also our psychological state, mental health, spirit, and the environment in which we live (Kelly & Godbey, 1992). Leisure activity provides a context to satisfy these needs because it involves free choice, self-determination, and provides a potentially pleasurable experience to the participants. Several studies have established that leisure plays a crucial role in different

dimensions of older adults' health (Atchley, 1976; Coleman, & Iso-Ahola, 1993; Mannell, 1999; Neulinger & Breit, 1971; Russienello, 1994; Santiago & Coyle, 2004). These results are discussed below.

Leisure Participation and Health Perception

Perceived personal health is a highly reliable indicator of health status and is determined by psychological well-being, economic status, and social engagement (Wagner, LaCroix, Grothaus, & Hecht, 1993). As Schaie and Willis (2002) stated, "People's subjective appraisal of their health influences how they react to their symptoms, how vulnerable they consider themselves, and when they decide to obtain treatment" (p. 423). Many studies acknowledge that better self-assessed health was associated with higher rates of leisure participation (Ragheb, 1993; Searle, & Iso-Ahola, 1988).

Leisure Participation and Physical Functioning

With increased aging, the decline of biological functions is expected. The decline is not necessarily unidirectional; rather, adequate engagement in physical activity can delay the consequences of the aging process. Study has confirmed that leisure participation decreases the decline of physical functioning in later life (Leino-Arjas, Solovieva, Riihimaki, Kirjonen, & Telama, 2004). Among all types of leisure activities,

physically active leisure provides substantial, positive benefits for the older adults' physical functioning.

Leisure Participation and Mental Health

In general, leisure can improve psychological health in a number of ways. First, it keeps people busy; people are often happier when they are busy than when they are idle or bored. Moreover, when people are engaged, they are less likely to get involved in risky health behaviors such as smoking or alcohol abuse (Caldwell & Smith, 1994). In other words, people will feel happier and fulfilled when they engage in more activities (Hooyman & Kiyak, 1996). Second, leisure provides opportunities for "growth or self-actualization" (Mannell, 1999, p.8). Freedom of choice, the main characteristic of leisure, allows people to have the chance and capacity to do those things that contribute most to self-actualization. Finally, there is preliminary evidence that leisure serves as a "buffer" for stress because people obtain social support and gain a sense of self-determination, which helps people to cope with stresses (Baum, 1991; Cohen & Wills, 1985; Coleman & Iso-Ahola, 1993).

Specifically, leisure activity provides seniors with a source of identity after retirement (Atchley, 1976), creates meaning in their lives (Neulinger & Breit, 1971), and allows having a sense of control, which contributes to increased self-esteem and competency (Shary & Iso-Ahola, 1989). In addition, these benefits of leisure not only help people successfully pass the transient phases of life crisis events which is common in older age, such as losing a spouse (Carpenter, 1994), but might also contribute to long-

term emotional health. Consequently, regular leisure participation leads people to achieve higher life satisfaction (Mannell, 1999).

Leisure Participation and Social Functioning

People have more interactions with others through leisure involvement. Leisure activity offers a structural context to develop and maintain friendships (Adams, 1993). This leisure interaction is especially important for seniors, as they might encounter several transitions that would isolate them from society, such as retirement, an empty nest, or losing a spouse. Leisure provides a context for communication and interaction with significant others, such as family and friends. In addition, social support generated from leisure activity also benefits older adults in that they can remain active in social situations (Coleman, & Iso-Ahola, 1993; Kelly, Steinkamp, & Kelly, 1987).

Leisure Participation and Role Functioning

Role functioning refers to one's ability to work, do housework, or go to school. According to the most recent health statistics for the US population, people who are 45 to 64 and 65 to 69 years old were three to four times as likely to be unable to work as other age groups because of their health constraints (Schiller, Adams, & Coriaty, 2005). Regarding role functioning, leisure activity offers a resource for gaining a sense of competence and self-confidence, and gives older adults a sense of meaning and commitment that contributes to their role functioning. Furthermore, although many older

adults do not have the obligations of work or raising children, Atchley (1976) argued that leisure can offer a legitimate source of identity after retirement. This argument has also been supported by other studies (Riddick & Daniel, 1984, Tinsley, Colbs, Teaff & Kaufman, 1987).

Leisure Participation and Self-perception of Pain

Self-perception of pain severity is a good indicator of health status, especially for older adults who have chronic conditions. In the exercise and sports literature, Sharpe and colleagues (1997) evaluated a physical activity intervention for older adults and found that the participants perceived pain reduction following their participation in the program. Hughes, Seymour, Campbell, Pollak, Huber, et al. (2004) tested a physical activity intervention for older adults with osteoarthritis, and found that physical activity contributes significantly to the reduction of musculoskeletal pain symptoms. However, no previous research in the leisure or recreation field has examined the relationship between leisure and self-perception of pain for older adults.

Leisure Participation and Vitality

Santiago and Coyle (2004) studied leisure-time physical activity among women aged 22 to 65 with mobility impairments, and found a strong positive relationship between engagement in regular leisure-time physical activity and energy level. However, to the best of the researcher's knowledge, no research specifically addresses the

relationship between leisure participation and vitality for older adults. As vitality is under the big umbrella of physical health, we can speculate that leisure participation and vitality has a positive relationship for the elderly as well.

Leisure Participation and Physician Visits

A good index for health care expenditures is the number of visits to a physician, other than for a vaccination or a check-up, in the past 12 months. Godbey, Roy, Payne, & Orsega-Smith (1998) demonstrated that the benefits of visiting local parks related directly to the health of seniors. Moreover, for the older adults in that study, more frequent park visits and more vigorous activities resulted in fewer physician visits for non-check-up purposes.

Leisure Participation and Obesity

Previous studies have linked obesity with adverse cardiovascular outcomes (Willett, Manson, Stampfer, Colditz, Rosner, et al., 1995), life expectancy (Fontaine, Redden, Want, Westfall, & Allison, 2003; Peeters, Barendregt, Willekens, Mackenbach, Mamun, et al., 2003), mortality (Allison, Fontaine, Manson, Stevens, VanItallie, 1999; Manson, Willett, Stampfer, Colditz, Hunter, et al. 1995) and the risk of cancer (Calle, Rodriguez, Walker-Thurmond, & Thun, 2003; Giovannucci, et al. 1995; Michaud, Giovannucci, Willett, Colditz, Stampfer, et al. 2001). Physical activity has been advocated as an important element in preventing obesity (Fogelholm, & Kukkonen-

Harjula, 2000; Glenny, O'meara, Melville, Sheldon, & Wilson, 1997; Wing, 1999). For example, Fogelholm, & Kukkonen-Harjula (2000) systematically reviewed research on associations between activity and weight gain and concluded that there is an inverse relationship between physical activity and long-term weight gain. Similarly, leisure time physical activity serves the same function. Older adults who report no leisure activity tend to be overweight (Andersen, Franckowiak, Christmas, & Walston, 2001).

Summary

Overall, the relation of leisure activity to health is becoming increasingly evident. As the aging population is increasing dramatically, leisure must be increasingly understood as a critical variable in older people's health. Leisure can be a critical contributing factor to preventing illness. As Godbey (1997) stated, recreation and leisure will increasingly be accepted as a central element in sustaining and improving good health. Furthermore, leisure has become a key variable in determining state of health. From the evidence received in this section, we could conclude that leisure and health are highly correlated to each other. However, most previous studies examining the relationship between leisure and health only examined health in a broad view. Limited research addresses leisure's contribution to specific health dimensions such as perception of pain or vitality. Moreover, we also do not know if physically active leisure serves the same function as general leisure, regarding older adults' health.

Leisure Lifestyles for Older Adults

Studies have shown that older adults' leisure activities are generally stationary (Horgas, Wilms & Baltes, 1998; Strain, Grabusic, Searle, & Dunn, 2002). Horgas, Wilms, & Baltes' (1998) analysis of very-old age older adults' daily life found that leisure activities occupy a considerable proportion of older adults' daytime activities. However, most of these activities are restricted to stationary activities such as watching television or reading. The reasons might be that elders encounter some functional barriers, so that they stop some activities.

A study by Strain et al. (2002) was also consistent with Horgas et al. (1998). Moreover, they found that most studies examining leisure activity among older adults used a cross-sectional method which does not directly address change for older adults later in their lives. Thus, Strain et al. conducted an eight-year (1985-1993) longitudinal study of changes in leisure activities for adults age 60 to 85. They found that some solitary activities such as watching television or reading were the activities that were most likely to be continued. On the contrary, theater/movies/spectator sports and travel were the least likely activities to be continued. This study confirmed earlier studies, which were conducted in the 1970's, and the recent studies, all of which showed leisure participation decreases as people age, especially for higher intensity physical activities (See Mannell & Kleiber, 1997, pp. 247-248).

In addition, older adults tend to maintain the activities they are familiar with rather than begin new ones. Searle, Mactavish, and Brayley (1993) reported that the

majority of people's leisure participation change patterns are represented by "continuers" or those who neither added nor quit activities. The other two groups are "quitters," people who quit an activity and do not begin a new one, or "adders," people who did not quit an activity but added an activity. In addition, with aging, people become more likely to be continuers.

Overall, although health policy advocates moderate or a high intensity of physical activity for older adults to achieve better health, the prevalence of older adults' lifestyles remains very much sedentary. However, if the activity is inherently self-motivated and enjoyable, the elders are more likely to sustain their participation.

For example, studies (Godbey, Graefe, & James, 1992; Godbey, Payne, & Orsega-Smith, 2002) revealed that adults age 50 and over are among the most frequent users of local government park and recreation services. Recent discussion from the exercise science field also calls for "gathered new impetus over recent recommendations to incorporate necessary daily physical activity into 'active living' rather than formal exercise classes" (Shephard, 2001, p. 401). Therefore, physically active leisure may contribute more than physical activity in other spheres of life to older adults' health.

Social Demographic Variables

Several social demographic variables have been shown to have an impact on older adults' physically active leisure participation and health (Griffin & Mckenna, 1998; Kelly, 1996; Mobily et al. 1984; CDC, 2000; Stanley, & Freysinger, 1995; Strain, et al., 2002). Those variables are discussed below:

Age

Age is highly related to older adults' physically active leisure participation and health. With advancing age, most of our body's physiological functional systems exhibit a decline. Slower and less accurate movements, reduced strength and stability, decreased coordination and endurance are all associated with the aging process. With this decay and decline of body functioning, several studies indicate that leisure participation decreases as age increases (Griffin & Mckenna, 1998; Mobily et al. 1984; Stanley & Freysinger, 1995).

A great deal of research shows that older adults' participation rates in leisure activities decrease with age (Armstrong & Morgan, 1998; Bennett, 1998). The model of leisure repertoire, which is the number of leisure activities available to or participated in by an individual peaks in middle adulthood (Iso-Ahola, 1980). After middle age, leisure participation decreases.

For example, Harvell (1990) examined the leisure participation of seniors before and after the age of 60. Three hundred and forty nine older adults around 60 years old, selected randomly from the Dallas area, were asked to complete the questionnaire including the Leisure Participation Scales and basic demographics variables. This research revealed that leisure participation changes significantly by the age of 60 during the life cycles. The determinants of leisure participation change include age, ethnic background, and mode of transportation. In a more recent study, researchers sought to identify the correlates of physical activity among several demographic variables and found that overall age is the strongest predicator of physical activity participation (Plotnikoff, Mayhew, Birkett, Loucaides, & Fodor, 2004).

Education

Education has been found to influence health and leisure participation in many studies (Strain, et. al. 2002). Education and continuing pursuit for knowledge is crucial to one's health because it enables individuals to access and absorb the knowledge that affects health. The link between health and knowing and understanding the factors that influence our health is evident.

In several studies, higher educational attainment was also associated with higher leisure participation (Kelly, 1996; CDC, 2000; Strain, et al., 2002). This is because higher education enables individuals to have more opportunities developing leisure skills and interacting with others through leisure socialization. For instance, Lee, Scott and Floyd (2001) asserted that individuals who attend college have more opportunities to develop

and cultivate a variety of knowledge and interests in terms of leisure pursuit than those who do not attend college. Iso-Ahola (1980) also claimed that people who have higher education are less likely to be restricted accessing leisure activities.

Past studies also indicated that income level influences the opportunities of the elderly to participate in leisure activities (Tinsley, et al. 1987). However, education could also be used as a proxy for socioeconomic status because one's education level is highly related to one's level of income. This compensates for the limitation of reporting one's income, since it is a sensitive issue for some participants that results in a greater number of missing data on self-reported questionnaires.

Gender

Gender is another influential factor in the relationship of physically active leisure and health. Women tend to participate in physical activity less than men throughout all ages (Caspersen, Pereira, & Curran, 2000; Lee, 2005). The reasons could be attributed to both personal and environmental factors. For example, women often lack the opportunity to participate in structured sports and exercise because of their multiple responsibilities for family, job and community (Ainsworth, Sternfeld, Slattery, Daguise, & Zahm, 1998).

As people age, they tend to decrease their leisure involvement. However, men showed more decline than women. Decline in sport participation is significant both for men and women. On the contrary, participation in social activities does not show significant decline for both men and women (Stanley, & Freysinger, 1995).

Ethnicity

Ethnicity also interacts with health and leisure participation in significant ways. The cultures of ethnic minority groups provide many rich and unique resources for leisure (Allen, & Chin-Sang, 1990; Allison & Geiger, 1993). As studies showed, Caucasian women are more likely to participate in physical activity than their African-American counterparts (Fitzgerald, Singleton, Neale, Prasad, & Hess, 1994). A recent study also showed that Hispanics are physically inactive compared to other races while controlling for their age and education (Ahmed, et al., 2005). Some ethnic differences in participation in leisure are confounded with income, education levels and with the experience of prejudice.

Marital Status

Marital status is associated with one's health and leisure participation. The most recent health statistics for the US population revealed that married people were healthier than other marital status such as widowed, divorced or separated, never married, and living with a partner (Schoenborn, 2004). In addition, married people are more active than unmarried people (Kaplan, Newsom, McFarland, & Lu, 2001).

Geographic Location

Different geographical locations also influence older adults' physically active leisure participation because of different city population sizes, climates and the

percentage of the population that consists of ethnic/racial minorities. First, individuals from larger cities with higher populations tend to be constrained in participating in leisure activities because of crowding, traffic congestion, and waiting characteristics associated with big cities. Second, cold weather is more likely to restrict older adults' leisure participation. Third, the culture based variety characteristics associated with ethnicity such as exercise levels, use of parks or recreation services, and the cultural expectations of women also play an important role in shaping people's leisure participation (Godbey, Payne, & Orsega-Smith, 2001).

Summary

In summary, age and education are inversely related to older adults' leisure participation. Additionally, men, Caucasians, and married older adults are more likely than women, unmarried, and racial minorities to participate in physically active leisure, respectively. All five of these factors have been identified as important in shaping older adults' leisure and health. Therefore, these five factors should be included in addressing the hypotheses of the present investigation.

Chapter 3

Methods

Introduction

The purpose of this chapter is to present the procedures employed to investigate the relationship of physically active leisure and health for older adults. As I used secondary data analysis, I will describe how the original study has been developed, including the development of the instruments and data collection. Then, I will specify the variables and statistical methods I used in the present study.

Original Study: Overview

This study utilizes secondary data analysis. The original study -- *The Relation of Local Government Recreation and Park Services to the Health of Older Adults* -- was sponsored by the Robert Wood Johnson Foundation. The primary purpose of the original study was to examine the relationship between use of local government park and recreation services (LGPRS) and individual health among adults age 50 and over. The secondary purpose was to better understand what knowledge and attitudes exist toward developing a collaborative, integrative approach to program design and delivery among local groups identified as stakeholders in the promotion of physical activity.

The original study was conducted in five cities: Peoria, Illinois; San Diego, California; Arlington, Virginia; Houston, Texas; and Minneapolis, Minnesota. The

selection of study sites was based on three criteria: city population, the percentage of the ethnic/racial minority populations, and climate (Godbey, Payne, & Orsega-Smith, 2001). These three factors are highly associated with the use of LGPRS for older adults. Five cities were selected in order to improve generalizability.

Original Study: Instruments

The original study developed a questionnaire entitled, "*Park/Recreation Use and Personal Health.*" The development of the instrument included an extensive literature review, consultation with The Pennsylvania State University's College of Health and Human Development Methodology Center, experts in related fields, and pilot participants' critiques. It consisted of the following sections: use of recreation and park service, leisure activities, environmental effects on exercise, stress questions, questions about health and health status, exercise perception, leisure constraints, support and exercise questions, satisfaction with life, physical activity questions, and additional questions.

In order to fulfill the purpose of the present study, I selected a series of questions within various sections from the original questionnaire and converted the responses into data for further analysis.

Original Study: Data Collection

Data were collected from July 2002 to September 2003 in five cities: Peoria, Illinois; San Diego, California; Arlington, Virginia; Houston, Texas; and Minneapolis, Minnesota. Before collecting data, a training session was conducted for all site coordinators in order to standardize data collection procedures across the five cities. Data were collected in a variety of settings such as parks, senior centers, supermarkets, shopping malls and other places to increase the likelihood of a diverse sample of adults age 50 and over.

This study recruited participants who were fifty years old and older. A systematic random sampling method was employed at the study sites to sample participants. In other words, interviewers systematically approached potential participants at regular intervals (Lewin, 2005).

Present Study: Operationalization of Variables

Based on the original study, the following sections describe the variables chosen and the methods utilized in the present study. The main purpose of this study is to present a profile of seniors' leisure activities in terms of the physically active leisure index using METs values. Three physical activity domains (leisure-time physical activity, occupational physical activity, and household physical activity) that contribute to seniors' health were examined. Finally, the physically active leisure index was compared with the PASE scale in predicting older adults' health status. Hence, only those related variables have been chosen in the present study. Those variables are described below.

Health Status

As a multi-dimensional construct, health is not merely the absence of disease or infirmity (World Health Organization, 1948). In this study, participants' health was assessed from both subjective and objective measurements. There are nine indicies: health perception, physical functioning, mental health, vitality, role functioning, pain, social functioning, physician visit and obesity. The questions from the original study were derived partially from the short-form Rand Medical Outcomes Study (MOS) and the short-form Health Status Assessment Questionnaire, which indicate individuals' health status and behaviors. The MOS short form is widely used in population studies and is appropriate for use by a sample of older adults (McDowell & Newell, 1996). It also demonstrates moderately high reliability (.81-.87) and validity in previous studies (McDowell & Newell, 1996).

Health Perception

Health perception was measured by five-point Likert scales. For example, one question, "In general, how would you rate your health?" was rated from 1="excellent" to 5= "poor." Participants also responded to statements such as "I am somewhat ill;" "I am as healthy as anybody I know;" "My health is excellent;" and "I have been feeling bad lately" (1=definitely true to 5= definitely false).

Physical Functioning

The respondents' physical health was measured by a series of questions regarding how their health limited them in the following activities: "vigorous activities," "moderate activities," "lifting or carrying groceries," "climbing several flights of stairs," "climbing one flight of stairs," "bending, lifting, stooping," "walking more than a mile," "walking several blocks," "walking one block," and "bathing or dressing" (1=yes, limited a lot to 3=no, not limited at all).

Mental Health

The respondents' mental health was measured by five questions about their mental status in the past month. These included "How much of the time have you been a very nervous person?"; "How much of the time have you felt so down in the dumps that nothing could cheer you up?"; "How much of the time have you felt calm and peaceful?" "How much of the time have you felt downhearted and blue?"; and "How much of the time have you been a happy person?" (1=all of the time to 6=none of the time).

Vitality

Four questions were used to measure respondents' vitality levels. These were "How much of the time have you felt full of pep?" "How much of the time did you have a lot of energy?" "How much of the time did you feel worn out?" and "How much of the time did you feel tired?" The questions were based on the participants' experience of the

past month and were measured by six-point Likert scales (1=all of the time to 6=none of the time).

Role Functioning

Two questions were designed to determine if respondents' role functioning was limited by their health status. These were "Does your health keep you from working at a job, doing work around the house, or going to school?" and "Have you been unable to do certain kinds or amounts of work, housework, or school work because of your health?" The measurement was a three-point Likert scale (1=yes, for more than 3 months; 2=yes, for 3 months or less; 3=no).

Perception of Pain

A single six-point scale question was used to measure the severity of pain that respondents experienced. The question was "How much bodily pain have you had in the last 4 weeks?" (1=none; 2=very mild; 3=mild; 4=moderate; 5=severe; 6=very severe).

Social Functioning

A single six-point scale question was used to measure respondents' social functioning. The question was "How much of the time has your health limited your social activities?" (0=all of the time to 5=none of the time).

I followed the procedures of scoring these seven constructs as described in the manual of MOS (Hays, Sherbourne, & Mazel, 1995). The procedures included 1) data-cleaning, 2) item recalibration and skip pattern recoding, 3) reverse scoring of items, 4) transforming item scores linearly to a common metric with a possible range of 0-100; and 5) averaging across items in the same scale (p.7). Therefore, the higher the score, the better one perceived his health to be. Reliability was conducted with Cronbach's alpha to estimate internal consistency.

The following two areas derived from the Health Status Assessment Questionnaire were used to illustrate respondents' health behaviors or status.

Number of Physician Visits Except for Routine Physical Checks

Respondents were asked to recall their number of physician visits except for vaccination or check-up in the past twelve months.

Obesity Index

Obesity is defined as an unhealthy excess of body fat. Participants' obesity level was estimated by their BMI values. Participants reported their weights and heights (in pounds and feet/inches) and these information were converted into kilograms and meters. Then, the BMI value was calculated as one's weight divided by his or her height squared (kilograms/meters^2).

The National Institutes of Health and The World Health Organization (WHO) define adults who have a BMI value between 25 kg/m^2 and 29.9 kg/m^2 as overweight and adults whose BMI value exceeds 30 kg/m^2 as obese. (CDC, n.d./2005). However, these standards may not be appropriate for older adults because of body composition changes attributed to the aging process (Heiat, Vaccarino, & Krumholz, 2001; Visvanathan & Chapman, 2005). The aging body is characterized by reduced fat free mass (primary skeletal muscle) and increased fat mass (Sardinha, & Teixeira, 2005; Villareal, Apovian, Kushner, & Klein, 2005). The age-related decline in height will also influence the BMI value independent of body fat changes. In other words, decreasing fat free mass will underestimate an older adult's BMI value, but losing height will overestimate a subject's BMI value.

Currently, there are no standard guidelines to define obese and overweight for older adults (Sardinha, & Teixeira, 2005). In addition, different studies use different standards and make inconsistent recommendations. For example, Blew et al. (2002) and Sardinha & Teixeira (2000) rejected the general BMI of 30 kg/m^2 as obese for older women because of its low sensitivity, and recommended that a BMI of 25 kg/m^2 is a better criterion to diagnose obesity for both older males and females (Sardinha & Teixeira, 2005). In contrast, Heiat et al. (2001) systematically reviewed BMI values and all-cause and coronary heart disease mortality studies concluded that the ideal weight (BMI=18.5-24.9 kg/m^2) may be overly restrictive for seniors because seniors are vulnerable to acute weight loss associated with illness and several chronic diseases.

Consequently, the present study adopted the classification from The National Institutes of Health and The World Health Organization, which define adults who have a BMI value that exceeds 30 kg/m^2 as obese. (CDC, n.d. / 2005). The reasons are this classification has been used extensively in studies related to the adverse health consequences of obesity among older adults (e.g. Brown et al., 2000). Moreover, this classification is consistent with major national health reports (e.g. Hedley, Ogden, Johnson, Carroll, Curtin, & Flegal, 2004) and policy guidelines (e.g. Healthy People 2010, 2000). Therefore, it could be used to compare with other results. For the descriptive purpose of this study, BMI was further categorized into four categories: underweight (BMI<18.5 kg/m^2), healthy weight (BMI=18.5- 24.9 kg/m^2), overweight (BMI=25.0-29.9 kg/m^2) and obese (BMI >= 30.0 kg/m^2) based on the national guideline.

Physically Active Leisure Index

Participants were asked to report up to six leisure activities in which they participated regularly. After receiving this information, each activity was assigned an intensity code based on the METs value from the compendium of physical activity (Ainsworth et al, 1993, 2000). Then, the METs value for each activity was multiplied with the frequency of the activity reported per week. A composite of the scores from all six activities was calculated to provide a quantitative index of each subjects' physically active leisure level.

Physical Activity

The Physical Activity Scale for the Elderly (PASE) (Washburn, Smith, Jette, & Janney, 1993) was originally developed to measure different forms of physical activity. It includes three forms of physical activity: leisure-time physical activity, occupational physical activity, and household physical activity.

Leisure-time Physical Activity

Participants were asked to indicate the frequency and duration of time spent participating in several leisure activities including walking outside the home; light, moderate, and strenuous sport and recreation; and muscle strengthening. The frequency was recorded as never, seldom (1–2 days/week), sometimes (3–4 days/week), and often (5–7 days/week). Duration was classified into four categories: less than one hour, between one and two hours, between two to four hours, or more than four hours. The frequency value, hours per day in the one-week reporting period, for each type of leisure activity was calculated based on the information of frequency and duration above (New England Research Institutes, 1991). Then, each type of leisure activity was multiplied with a corresponding PASE weight. Finally, a composite score was calculated from the above five different activities' products.

Occupational Physical Activity

Occupational physical activity refers to those activities that are associated with paid work. In this section, this study's questionnaire is a little bit different from the original PASE questionnaire. The original PASE's occupational physical activity contained both paid work and volunteer work. However, the researcher considered that the participants may deem their volunteer work as leisure instead of an occupation. This concept also achieved agreement with many leisure researchers (G. Godbey, personal communication, July 12, 2005). Therefore, only the hours of paid-work were examined in terms of their occupational physical activity participation. The labor levels were classified into four levels ranging from mainly sitting, such as light office work, to heavy manual labor work involving walking, such as the work of a lumberjack. The frequency value was calculated from the number of hours worked in the past week divided by seven. However, if the participants' job only involved mainly sitting with slight arm movements, the frequency value was recorded as zero (New England Research Institutes, 1991).

Household Physical Activity

Household physical activity was assessed by asking participants whether or not they did the following housework during the past week: light housework (i.e. dusting), heavy housework (i.e. vacuuming), lawn work/yard care, home repair, outdoor gardening, and caring for others. Frequency and duration of household activities were not requested. Household activity was recorded as "1" if an activity was reported and "0" if it was not (New England Research Institutes, 1991).

In order to calculate a total PASE score, the sum was taken of the average number of hours per day spent in each activity multiplied by PASE weight for that activity (Washburn, et al., 1993). The higher the PASE score, the greater the activity level for each participant. Moreover, because the purpose of the present study is to examine three different types of physical activities' contribution to health, each individual form of physical activity's score was calculated. This method appears appropriate after consulting with the original PASE questionnaire developer (R. A. Washburn, personal communication, April 25, 2005; & May 12, 2005).

Socio-demographic Variables

Age

Participants' age was measured in an open-ended format in terms of years. In order to compare among age groups, participants were further classified into four age groups: middle age (50-64 years old), young old (65-74 years old), old-old (75-84 years old), and oldest old (>85 years old) (Schaie, & Willis, 2002).

Gender

Participant's gender was coded as male or female. Then, gender was dummy coded (female=1) before being entered into the regression analysis.

Education Level

Participants were asked to provide the highest education level they have completed. The categories were as follows: grades 7-12, high school graduate, some college, technical or vocational school, associate degree, bachelor's degree, graduate degree and other. The variable was dummy coded before being entered into the regression analysis.

Ethnicity

Participants were asked the ethnic category to which they belonged. This was a closed-ended format where the responses were as follows: African American, Asian American, Native American Indian, White, Hispanic/Latino or other. The ethnicity variable was dummy coded (White=0, all others=1) before being entered into the regression analysis.

Marital Status

Four marital status choices including single, married, divorced/separated, and widow/widower were provided for participants to indicate their current marital status. The variable was dummy coded (Married=0, all others=1) before being entered into the regression analysis.

Geographic Locations

Five geographic locations were included in the present study. They are Peoria, Illinois; San Diego, California; Arlington, Virginia; Houston, Texas; and Minneapolis, Minnesota.

All the variables were summarized in Appendix B.

Data Analysis

Several statistic methods were employed to address the research questions. All statistical methods were conducted with the Statistical Package for the Social Sciences (SPSS) version 10.0. For all hypotheses in the present study, a .05 alpha p-value was used as the level of significance.

Descriptive Statistics

Basic descriptive statistics were employed to describe the participants' demographic characteristics, health status, physically active leisure index, and physical activity level (PASE score).

Content Analysis

As discussed in the previous chapter concerning the limitation of the subjectivity of self-reported physical activity, in order to convert the subject data from self-reported physical activity into a quantitative index of energy expenditure, the compendium of physical activities developed by Ainsworth et al. (Ainsworth, Haskell, Leon, et al., 1993; Ainsworth, Haskell, Whitt, et al., 2000) provides a valid and reliable estimation of the energy expenditure of physical activity (Ainsworth, et al. 2003). In addition, this compendium is also widely used by exercise scientists (Ainsworth, Richardson, Jacobs, & Leon, 1993; Kligman, Hewitt, & Crowell, 1999).

Therefore, content analysis was used to assign a physical intensity to each activity listed by participants. The METs value generated by the compendium of physical activities (Ainsworth, Haskell, Leon, et al., 1993; Ainsworth, Haskell, Whitt, et al. 2000) was used as a reference to assign the intensity level. The coding scheme is a five-digit code with the first two digits representing the major activity category and the last three digits referring to the specific description of an activity. A corresponding METs value is provided in each specific activity. For example, code 09080 belongs to the major heading category of "Miscellaneous (09)" and its detailed description of this activity as "sitting – arts and crafts, moderate effort". Therefore, a response of "make jewelry" will fall into this code and we would assign its METs value as 2.0.

Another example is if a participant gives a response as "tap dancing," I first tracked the categories best fit for this activity as "Dancing (03)." Then, I searched for the best description or classification under this major category to best represent this activity. Code 03010 "ballet or modern, twist, jazz, tap, jitterbug" meets this criteria and I could find its corresponding METs value as 4.8 provided by the compendium of physical activities. An example of selected codes, METs intensity levels, activity categories, and examples of specific activities are provided in Table **3-1.** Table **3-2** presents estimated MET levels for selected physical activities in the compendium of physical activities.

Table **3-1**
Selected Codes, MET Intensity Levels, Activity Categories, and Examples of Specific Activities

Code	**METs**	**Category**	**Activities**
01009	8.5	Bicycling	BMX, Mountain
01010	4.0	Bicycling	<10 MPH, to work or for pleasure
02010	7.0	Conditioning	Bicycling, stationary, general
02120	4.0	Conditioning	Water aerobics, water calisthenics
03017	10.0	Dancing	Aerobic, step, with 10-12 inch step
03025	4.5	Dancing	General, Greek, Middle Eastern, hula, flamenco, belly, swing

Source: "The compendium of physical activities," by B. E. Ainsworth, C. B. Corbin, & R. P. Pangrazi, 2003, June, The President's Council on Physical Fitness and Sports Research Digest, 4(2), p.2. Adapted with permission of the author.

Table **3-2**
Estimated MET Levels for Selected Physical Activities in the Compendium of Physical Activities

METs	Category	Specific activities
0.9	Inactivity	Sleeping
1.0	Inactivity	Sitting quietly and watching television
2.0	Transportation	Driving an automobile or light truck (not a semi)
3.0	Walking	Walking very slowly, strolling, household walking
4.0	Lawn and Garden	Raking the lawn, general gardening
5.0	Home Repair	Cleaning gutters, painting outside of home
6.0	Occupation	Using heavy power tools (jackhammer)
7.0	Conditioning	Stationary bicycle, ski or rowing machine
8.0	Sports	Competitive basketball game, touch football
9.0	Walking	Climbing hills with a 42 lb. backpack
10.0	Water	Freestyle lap swimming, vigorous effort
11.0	Running	Running at 9 minutes/mile
12.0	Bicycling	Road cycling 14-16 mph, fast or general racing
13.0/14.0	Running	Running at 7-7.5 minutes/mile
15.0	Winter	Competitive speed skating

Source: "The compendium of physical activities," by B. E. Ainsworth, C. B. Corbin, & R. P. Pangrazi, 2003, June, The President's Council on Physical Fitness and Sports Research Digest, 4(2), p.3. Adapted with permission of the author.

The compendium includes a wide list of different levels for a given activity. For example, for a running activity, the intensity could range from running 5 miles per hour

to 10.9 miles per hour, running in place, running on a track, or running in other situations. We could assign different METs values based on the description that best illustrates that activity. However, from our self-reported responses, most participants do not provide a specific description for their leisure activities. In this situation, we employed the recommendation from the guideline in which "Activities without a specified intensity are classified as 'general'" (p.72).

In addition, although the Compendium has 21 categories for major types of physical activity and more than 600 specific physical activities listed, it does not incorporate all the activities from participants' responses in the present study. For those activities which are not included in the list in the compendium or for those activities which don't have a corresponding "general" intensity level, three reviewers helped to judge the categories of the leisure time physical activity independently. In order to be consistent with the previous coding system from the compendium of physical activities, a copy was provided to the reviewers as a reference. However, responses such as "enjoy outdoors," "be creative," or "clear mind" were eliminated (D. Proctor, personal communication, March 18, 2004; E. Orsega-Smith, personal communication, September 1, 2004; & G. Godbey, personal communication, April 4, 2005) because the researcher may not have been able to identify their intensities. Hence, these procedures helped us generate a more objective measure of one's active leisure level.

Inferential Statistics

Reliability

Cronbach's alphas were conducted to estimate internal consistency reliability of the following health constructs: health perception, physical functioning, mental health, vitality, and role functioning.

Bivariate Correlations

First, a bivariate correlation matrix was generated to examine the relationship between several independent variables. This procedure helped to detect whether the problem of multicollinearity exists. The problem of multicollinearity occurs when two or more independent variables are highly correlated with each other in a regression model because it interferes with the explanation of each independent variable's contribution to the overall model (Munro, 2005).

The bivariate correlation was also calculated to examine the relationship between the physically active leisure index and the total PASE score including the three separated PASE scores. These include leisure-time physical activity, household physical activity, and occupational physical activity. The physically active leisure index was calculated with the aforementioned four scores separately. This procedure was undertaken in order to determine how these two measurements of the subjects' physical activity are related to one another and to assess if one can serve as a substitute for the other.

One-way ANOVA

Anova is a statistical technique to test the difference among groups (Munro, 2005). One-way ANOVA was employed to examine the difference between male/female, different age groups, subjects with different education levels, different ethnic groups, and subjects from different geographical areas in terms of subjects' physically active leisure participation.

The ratio of the variance between groups and within groups is represented as the *F* value. The degrees of freedom (*df*) for between-group variance is the number of groups minus one. With this information, we could determine that the variance between groups is significant or not by having the *F* and *df* values. When a significant *F* test is obtained, a post-hoc test is analyzed to determine where the significant different exits. There are many post-hoc techniques; the *Scheffe* test was used because "it can be used with groups of equal and unequal size" (Munro, 2005, p. 165).

Multiple Regression

Multiple regression is a statistical technique that allows us to predict values of one dependent variable based on several independent variables (Garson, n.d./2005a). In this study, a series of regression analyses were used to examine the relationship between physical activities (independent variable) and health (dependent variable) while controlling other confounding variables. More specifically, three different types of physical activity (IV) and control variables (including age, gender, education, ethnicity, and marital status) were regressed on the health variable (DV). This study was

exploratory in nature, therefore, the stepwise, backward selection method was used (Munro, 2005). This means I started with all the variables in the model (fully saturated model) and dropped the least significant variable one at a time, until only significant variables were remaining in the model (final reduced model).

A series of multiple regressions were also employed using the physically active leisure index and several demographic variables (age, gender, ethnicity, marital status, and education) as independent variables and the aforementioned nine health dimensions as dependent variables. There are two purposes for this analysis. First, to predict each health dimension from the physically active leisure index; second, to compare the strength of the relationship between using the physically active leisure index and the standardized PASE score in predicting older adults' health status.

Several assumptions were considered before conducting the multiple regression. First, the relationship between variables should be linear. Second, there should be similar variances in the dependent variable across the independent variables (homoscedasticity). Third, the dependent variable should have a normal distribution. Fourth, the error of the independent variables should also be normally distributed. In addition, the independent variables should be an interval/ratio scale. Categorical variables such as gender, ethnicity, and marital status were dummy coded before being entered into the analysis (Munro, 2005).

Several parameter estimates were reported in the result. The function and meaning of these parameters are described below:

Standardized regression coefficient (Beta) is the value being "standardized" (mean =0 and standard deviation= 1) from the unstandardized regression coefficient (b). Therefore,

independent variables with different measurement scales may be compared with each other regarding their relative importance to the independent variables in explaining the dependent variable (Hair, Black, Babin, Anderson, & Tatham, 2006). Therefore, in this study, the standardized regression coefficients (Beta) were used to assess the relative importance of three types of physical activities in the overall prediction of each health dimension.

Multiple correlation (R^2): The R^2 is used to determine the degree to which the independent variables explain the variance in the dependent variable.

F test: The F test is used to test the significance of the regression model as a whole. In the present study, I used the probability value of .05 as the indicator of significance.

In order to compare the models using the PASE scale and the physically active leisure index to determine whether they are significantly different for each dependent variable, further analyses using Hotellings t or Steiger's Z test were performed. This method is used for the following conditions in multiple regression models: first, for two collinear variables, the researcher wants to check if there is an advantage of one variable versus the other; second, the researcher wants to substitute a new variable, which might be less expensive or more available, for an old commonly used variable to predict the dependent variable. The procedures involved using the multiple R value from each regression model and the correlation between the two models to calculate the t value or z value (Garbin, n.d./2006).

Summary

This chapter provided an explanation of methodology in the present study. Because I used the secondary data analysis, the original study's purpose, instruments, and data collection were outlined. The variables and data analysis procedures were summarized, and based on these procedures conclusions were drawn about the research hypotheses.

Chapter 4

Results

The purposes of this study were as follows: a) provide a profile of older adults' self-reported leisure activities in terms of the physically active leisure index; b) compare the contributions of leisure-time physical activity with occupational and household physical activity from the Physical Activity Scale for the Elderly (PASE) and their relationship to several health dimensions among adults age fifty and older; c) compare the relative strength of relationships between the physically active leisure index using the METs value and the standardized PASE score in predicting older adults' health status.

This chapter presents first, the socio-demographic characteristics of subjects and descriptive statistics concerning all variables. Second, the content analyses of open-ended responses about subjects' leisure activities using the METs values are shown. Third, Cronbach's alpha of the MOS is used to examine the reliability of the instrument. Fourth, one-way ANOVA is used to inspect the relationship of several social demographic variables to the physically active leisure index. Fifth, multiple regressions are used to compare the contributions among leisure-time physical activity, household physical activity, and occupational physical activity to one's health. Finally, the relationship between using the physically active leisure index and the PASE score in predicting subjects' health status is presented.

Data Preparation and Missing Data

The data was collected from five different cities using two different data entry formats, a numeric scantron format and a text-based open-ended format. (See Appendix A for survey instrument). The researcher first thoroughly checked the data. Any subject missing in one or both of the formats was deleted. Then the researcher merged all the separate datasets into one dataset and checked for duplicated subjects and outliers for each variable. Duplicated subjects with the same responses were deleted and unreasonable outliers responses were treated as missing data. In addition, subjects who were less then fifty years old were removed because they did not meet the criteria of this study.

After the initial data clean up described above, the researcher then examined the item non-responses. I had three major tasks: to identify the pattern and amount of missing data, to assess why it was missing, and to determine how to deal with the missing data (Munro, 2005). The pattern of missing data could be classified into two major types: random and systematic. A random pattern refers to the missing data that is unstructured and is not associated with other variables. A systematic pattern refers to the missing values that are “methodical, nonrandom” (Munro, 2005, p. 58). To assess why data were missing, I checked the original dataset and found there were several continuous missing variables throughout the dataset for some subjects. This problem occurred because of the transformation of data from the scantron format to individual variables. I decided to delete the subjects that had more than half of the items missing in selected sections in this study because the missing data was in a systematic pattern. Other random missing values

were considered to be randomly distributed missing data. Therefore, I did not remove those subjects and I used pairwise deletion while running correlation or regression analyses because such statistical techniques are often used in these procedures (Munro, 2005).

Description of Sample

Subjects' Characteristics

After excluding the subjects with many missing values and eliminating participants below age 50 because they did not match the age criteria for this study, the sample had a total of 1611 people. The sample ranged in age from 50 to 97, with a mean age of 67.4 years. The number of female participants (63.0%) was higher than male participants (36.7%). The ethnic composition was predominantly white (88.2%), followed by African American (5%), Hispanic/Latino (3%), Asian American (1.8%), Native America Indian (0.2%) and others consisting of less than 1%. In terms of marital status, half of the subjects were currently married (51.3%), others were single (9.4%), widow or widower (15.8%), and divorced (10.2%). Subjects' educational statuses were diverse: about fifteen percent had a high school degree or less, sixteen percent had some college, three percent had tech/vocation school, five percent had associate degree, and about forty percent had bachelors' degree or above. In terms of geographical locations, about thirty-six percent of participants were from Peoria (36.3%), sixteen percent were from San Diego (15.9%), sixteen percent were from Minneapolis (15.7%), eleven percent

were from Houston (10.8%), and twenty-one percent were from Arlington (21.3%). The sample in this study was generally similar to those populations' compositions from the city population censuses (United States Census, 2003). The subjects' characteristics are presented in Table **4-1.**

Table **4-1**
Descriptions of Subjects' Characteristics

Variable	Mean	Standard Deviation	Range
Age	67.38	9.83	50-97

Variables	Categories	Number	%
Gender	Male	592	36.7
	Female	1015	63.0
	Missing	4	0.2
	Total	1611	100.0
Ethnicity	African American	81	5.0
	Asian American	29	1.8
	Native American Indian	3	.2
	White	1421	88.2
	Hispanic/ Latino	48	3.0
	Other	13	.8
	Missing	16	1.0
	Total	1611	100.0
Marital Status	Single	152	9.4
	Married	827	51.3
	Divorced	162	10.1
	Widow or Widower	254	15.8
	Missing	216	13.4
	Total	1611	100.0
Education	Grades 7-12	69	4.3
	High school graduate	207	12.8
	Some college	263	16.3
	Technical/vocational school	55	3.4
	Associates degree	73	4.5
	Bachelor's degree	328	20.4
	Graduate degree	308	19.1
	Other	24	1.5
	Missing	284	17.6
	Total	1611	100.0
Locations	San Diego	256	15.9
	Minneapolis	253	15.7
	Houston	174	10.8
	Arlington	343	21.3
	Peoria	584	36.3
	Missing	1	0.1
	Total	1611	100.0

Descriptions of Subjects' Health Status

Participants' health status was determined from seven sub-indicies in the MOS instrument, the number of doctor visits and their BMI values. All of the frequency distributions for each index are presented in Table 4-2 to Table 4-10.

In the index of health perception, across all five individual items, the majority of subjects (70%) perceived their health as being higher than "good" condition (very good to excellent). Health perception, as rated by the subjects, showed a mean of 70.8 with a standard deviation (SD) of 23.4 and had scores ranging from 0 to 100 (see Table **4-2)**.

Table **4-2**
Frequency Distributions of Subjects' Health Perception Index

Health Perception	Excellent (1)	Very good (2)	Good (3)	Fair (4)	Poor (5)	Mean	Scale Mean
In general, how would you rate your health? (e1)*	267 (16.7%)	618 (38.6%)	509 (31.8%)	187 (11.7%)	18 (1.1%)	2.42	70.84
	Definitely true (1)	Mostly true (2)	Don't know (3)	Mostly false (4)	Definitely false (5)	Mean	
I am somewhat ill. (e16)	73 (4.6%)	173 (11.0%)	101 (6.4%)	432 (27.5%)	791 (50.4%)	4.1	
I am as healthy as anybody I know. (e17)*	479 (30.5%)	629 (40.1%)	204 (13.0%)	155 (9.9%)	103 (6.6)	2.2	
My health is excellent. (e18)*	347 (22.0%)	800 (50.8%)	118 (7.5%)	179 (11.4%)	131 (8.3%)	2.3	
I have been feeling bad lately. (e19)	51 (3.2%)	186 (11.8%)	49 (3.1%)	527 (33.3%)	768 (48.6%)	4.1	

In the index of physical functioning, doing vigorous activities was reported as the most limited function. Thirty-eight percent of the subjects reported that their health limited their vigorous activity. In contrast, subjects reported the least limitations for bathing or dressing. Ninety-one percent responded that they had no limit at all for their bathing or dressing. Walking one block was the second least limited function. Overall, the subjects in this study remained in good physical functioning, because more than half of the subjects reported no limits in nine of the ten physical functioning activities. These results indicated that this population could do all these tasks with little difficulty. The physical functioning index mean was 77.7 with a standard deviation of 23.1 and had scores ranging from 0 to 100 (see Table **4-3).**

Table **4-3**
Frequency Distributions of Subjects' Physical Functioning Index

Physical Functioning	Limited a lot (1)	Limited a little (2)	Not limited at all (3)	Mean	Scale Mean
Vigorous activities (e2a)	600	622	342	1.8	77.7
	(38.4%)	(39.8%)	(21.9%)		
Moderate activities (e2b)	107	452	1000	2.6	
	(6.9%)	(29.0%)	(64.1%)		
Lifting or carrying groceries (e2c)	75	361	1156	2.7	
	(4.7%)	(22.7%)	(72.6%)		
Climbing several flights of stairs (e2d)	230	516	850	2.4	
	(14.4%)	(32.3%)	(53.3%)		
Climbing one flight of stairs (e2e)	73	288	1233	2.7	
	(4.6%)	(18.1%)	(77.4%)		
Bending, lifting, stooping (e2f)	131	529	939	2.5	
	(8.2%)	(33.1%)	(58.7%)		
Walking >1 mile (e2g)	254	356	988	2.5	
	(15.9%)	(22.3%)	(61.8%)		
Walking several blocks (e2h)	152	250	1193	2.7	
	(9.5%)	(15.7%)	(74.8%)		
Walking one block (e2i)	55	153	1381	2.8	
	(3.5%)	(9.6%)	(86.9%)		
Bathing or dressing (e2j)	24	116	1459	2.9	
	(1.5%)	(7.3%)	(91.2%)		

Most subjects reported good mental health. Forty-one percent of the subjects indicated that they did not feel nervous, downhearted or blue any of the time. Sixty-eight percent of the subjects did not feel so down in the dumps that nothing could cheer them

up. Fifty-two percent of the subjects reported most of the time they felt calm and peaceful. In addition, a total of 67% of the subjects said that they were happy. The overall mental health index mean was 78.1 with a standard deviation of 15.9 and scores ranging from 8-100 (See Table **4-4)**.

Table **4-4**
Frequency Distributions of Subjects' Mental Health Index

Mental Health	None of the time (1)	A little of the time (2)	Some of the time (3)	A good bit of the time (4)	Most of the time (5)	All of the time (6)	Mean	Scale Mean
Nervous person (e8)*	683 (42.6%)	560 (35.0%)	235 (14.7%)	58 (3.6%)	53 (3.3%)	13 (.8%)	1.9	78.1
Fell so down in the dumps that nothing could cheer you up (e9)*	1103 (68.7%)	321 (20.0%)	116 (7.2%)	34 (2.1%)	22 (1.4%)	10 (.6%)	1.5	
Feel calm and peaceful (e10)	24 (1.5%)	115 (7.2%)	240 (15.0%)	390 (24.4%))	719 (44.9%)	112 (7.0%)	4.3	
Felt downhearted and blue (e12)*	657 (41.1%)	653 (40.9%)	202 (12.6%)	52 (3.3%)	23 (1.4%)	11 (.7%)	1.9	
Been a happy person (e14)	27 (1.7%)	69 (4.3%)	156 (9.7%)	283 (17.6%)	893 (55.5%)	180 (11.2%)	4.6	

Regarding the vitality index, the average subject's response fell into the middle of the six point scale. In total, over 35 % of the subjects responded that most of the time they felt full of pep and had a lot of energy. Less than 8% of the participants felt worn out or tired. The index mean was 62.1 with a standard deviation of 19.3 and had scores ranging from 0 to 100 (See Table **4-5**).

Table **4-5**
Frequency Distributions of Subjects' Vitality Index

Vitality	None of the time (1)	A little of the time (2)	Some of the time (3)	A good bit of the time (4)	Most of the time (5)	All of the time (6)	Mean	Scale Mean
Feel full of pep (e7)	75	170	381	356	552	63	3.8	62.1
	(4.7%)	(10.6%)	(23.9%)	(22.3%)	(34.6%)	(3.9%)		
Have a lot of energy (e11)	78	176	355	431	510	52	3.8	
	(4.9%)	(11.0%)	(22.2%)	(26.9%)	(31.8%)	(3.2%)		
Feel worn out (e13)*	242	713	426	136	73	15	2.5	
	(15.1%)	(44.4%)	(26.5%)	(8.5%)	(4.5%)	(.9%)		
Feel tired (e15)*	88	673	537	182	104	22	2.8	
	(5.5%)	(41.9%)	(33.4%)	(11.3%)	(6.5%)	(1.4%)		

As displayed in Table **4-6,** for the dimension of role functioning, more than 80% of the subjects indicated that their health did not interfere with their role in terms of their job, housework, or school work. The index mean was 86.2 with a standard deviation of 30.0 and a range of 0 to 100.

Table **4-6**
Frequency Distributions of Subjects' Role Functioning Index

Role Functioning	Yes, for more than 3 months (1)	Yes, for 3 months or less (2)	No (3)	Mean	Scale Mean
Does your health keep you from working at a job, doing work around the house, or going to school (e4)	144 (9.0%)	39 (2.4%)	1411 (88.5%)	2.8	86.2
Have you been unable to do certain kinds or amounts of work, housework, or school work because of your health? (e5)	235 (14.7%)	84 (5.3%)	1280 (80.1%)	2.7	

The subjects rated their bodily pain over the last four weeks choosing one of the six categories, from none to very severe. Twenty-nine percent indicated very mild bodily pain, twenty-five percent indicated mild bodily pain, twenty-one percent indicated moderate bodily pain, and a total of five percent indicated severe or very severe bodily pain in the last four weeks. When translated into a 100-point scale, this single item index had a mean of 67.3 with standard deviation of 23.7 (See Table **4-7**).

Table **4-7**
Frequency Distributions of Subjects' Perceived of Pain Severity Index

Pain	None (1)	Very mild (2)	Mild (3)	Moderate (4)	Severe (5)	Very severe (6)	Mean	Scale Mean
How much bodily pain have you had in the last 4 weeks? (e3)*	312 (19.6%)	466 (29.3%)	395 (24.8%)	338 (21.3)	65 (4.1%)	14 (0.9%)	2.6	68

The subjects also indicated they felt less limited in their social functioning when compared to other sub-health dimensions. Almost 77% of the responses showed that none of the time had their health limited their social activities. When translated into a 100-point scale, the mean score for this single item index was 91.6 with a standard deviation of 18.0 (See Table **4-8**).

Table **4-8**
Frequency Distributions of Subjects' Social Functioning Index

Social Functioning	None of the time (1)	A little of the time (2)	Some of the time (3)	A good bit of the time (4)	Most of the time (5)	All of the time (6)	Mean	Scale Mean
How much of the time has your health limited your social activities? (e6)*	1229 (76.5%)	184 (11.4%)	130 (8.1%)	34 (2.1%)	19 (1.2%)	11 (0.7%)	1.4	92

Overall, the mean scores across the seven indexes ranged from 62.2 to 91.6 on a scale between 0 and 100. Of the seven scales, respondents' scores were highest in their social functioning. In contrast, the subjects showed the lowest scores in the vitality scale.

Subjects were asked whether they visited a doctor other than check-ups in the past twelve months and the average number of visits from this sample was 2.86 (SD=3.93) with a range from zero to fifty. Sixty percent of the respondents reported that they visited the doctor less than three times during the past twelve months. The descriptive statistics are displayed in Table **4-9**.

Table **4-9**
Descriptive Statistics of Number of Doctor Visits

	N	Minimum	Maximum	Mean	SD
Times you visit a doctor for purpose other than check-up for past 12 months?	1599	0	50	2.86	3.93

The average body mass index value (BMI) from the subjects was 25.71 kg/m^2 with a standard deviation of 4.75. The minimum BMI value was 13.03 kg/m^2. The maximum BMI value was 51.73 kg/m^2. (See Table **4-10**). According to the national classification of BMI, 2.3% of the subjects were classified as underweight ($BMI<18.5kg/m^2$), 46.0% of the subjects were classified as healthy weight (BMI=18.5-24.9 kg/m^2), 36.6% were classified as overweight (BMI=25.0-29.9 kg/m^2), and 15.0% were classified as obese ($BMI>=30.0\ kg/m^2$) (Table **4-11)**.

Table**4-10**
Descriptive Statistics of Subjects' Body Mass Index

	N	Minimum	Maximum	Mean	SD
BMI	1566	13.03	51.73	25.71	4.75

Table **4-11**
Frequency Distribution of BMI Value of Subjects

Category (BMI)	Frequency	Percent
Underweight (<18.5)	36	2.2
Healthy weight (18.5-24.9)	710	44.1
Overweight (25.0-29.9)	565	35.1
Obese (>30)	232	14.4
Missing	68	4.2
Total	1611	100

Descriptions of Subjects' PASE Score

The total PASE score was calculated to indicate subjects' overall physical activity level. The mean of the total PASE score was 143.8 (SD =73.5) with scores ranging between 0 and 442 (See Table**4-12)**. This value was higher than the normative values (mean score 102.9, SD=64.1) established in a general older population reported in the PASE scoring manual (New England Research Institutes, 1991). The reason might be that the population in the current study was younger (50 years and older, mean age=67) than the study mentioned above (65 years and older, mean age=73). In addition, seasonal

variation also played a significant role in the subjects' physical activity (Matthews et al., 2001; Uitenbroek, 1993). Since the data for this investigation was collected during the summer season, increasing outdoor activities such as walking or yard work might contribute to a higher PASE score.

Table**4-12**
Descriptive Statistics of PASE Scores

	N	Minimum	Maximum	Mean	SD
PASE	1381	.00	442.43	143.81	73.48
Leisure-Time PASE	1611	.00	355.29	42.03	43.57
Household PASE	1611	.00	171.00	88.15	41.17
Occupational PASE	1381	.00	240.00	13.52	36.55

In regard to sub-categories of physical activity, the mean for leisure-time physical activity was 42 (SD =44); the mean for household physical activity was 88 (SD =41) and the mean for occupational physical activity was 13 (SD =37). To the best of the researcher's knowledge, there is no other study that has separated the total PASE score into sub-categories; therefore, no other study could be used to compare with this current data. The descriptive statistics for these three sub-categories of PASE scale have also been illustrated in Table 4-11.

Content Analysis of Physically Active Leisure Activity

All the leisure activities provided by participants in section B's open-ended responses were classified into 140 categories using content analysis as described in chapter three. As can be seen in Table **4-13**, walking was the most frequent leisure

activity reported by the participants, followed by watching television, reading, and being with family or friends. The METs value for walking is 3.5. However, the following three activities tend to be more sedentary than walking. The METs values for those activities are 1.0, 1.3 and 1.5, respectively. Using the general level of physical activity classification by Ainsworth (2003), METs value below three are classified as sedentary physical activity; METs value from 3-6 is for moderate physical activity, and METs value above 6 is for vigorous physical activity. I listed the top twenty-five activities reported by the participants from this study in Table 4-13. Sixteen of the twenty-five were sedentary activities (e.g., watching TV, reading, playing bingo), six were moderate physical activities (walking, going to the gym, gardening, golfing, swimming, dancing), three were vigorous physical activity (bicycling, jogging, and playing tennis). All 140 categories are provided in Appendix C, with detailed activity titles, METs values, and its major heading of activity, description of the activity and reference code referring to the compendium of physical activity (Ainsworth et. al. 1993, 2002).

Table **4-13**
List of Top Twenty-five Leisure Activities Reported from the Subjects

Rank	Code	Category	METs
1	2	Walking	3.5
2	3	Watching TV	1.0
3	4	Reading	1.3
4	26	Being with family/friends	1.5
5	5	Exercising/gym exercising/working out	5.5
6	6	Gardening	4.0
7	22	Playing card/bingo/crossword/puzzle/bridge	1.5
8	7	Golfing	4.5
9	11	Attending concerts	1.0
10	27	Attending classes	1.8
11	12	Bicycling	8.0
12	21	Going to museums	2.0
13	8	Swimming	6.0
14	25	Traveling/sight seeing	2.0
15	23	Using computers	1.5
16	30	Sewing (quilting/crochet/needlepoint/sew)	1.5
17	34	Eating out/drinking	1.5
18	79	Going to theaters	1.0
19	35	Watching movies	1.0
20	83	Volunteering	1.5
21	10	Jogging	7.0
22	13	Listening to music	1.0
23	33	Dancing	4.5
24	46	Baking/cooking	2.5
25	19	Playing tennis	7.0

Inferential Statistics

Reliability of MOS Indexes

Reliability was conducted with Cronbach's alpha to estimate internal consistency. The Cronbach's alphas of five of the seven health constructs were all above 0.8, which demonstrated that the instrument was a reliable measure of one's health in terms of internal consistency. The constructs of pain and social functioning were excluded because there is only one item measuring each construct (Table**4-14**).

Table **4-14**
Reliability of MOS Health Index

Index	Items	α if item deleted	Reliability (Crobach's α)
Health Perception	In general, how would you rate your health	.8652	.8858
	I am somewhat ill	.8528	
	I am as healthy as anybody I know	.8698	
	My health is excellent	.8386	
	I have been feeling bad lately.	.8766	
Physical Functioning	Vigorous activities	.9165	.9190
	Moderate activities	.8991	
	Lifting or carrying groceries	.9001	
	Climbing several flights of stairs	.8995	
	Climbing one flight of stairs	.8997	
	Bending, lifting, stooping	.9014	
	Walking>1 mile	.8994	
	Walking several blocks	.8955	
	Walking one block	.9035	
	Bathing or dressing	.9110	
Mental Health	Nervous person	.8183	.8448
	Fell so down in the dumps that nothing could cheer you up	.7970	
	Feel calm and peaceful	.8102	
	Felt downhearted and blue	.8008	
	Been a happy person	.8177	
Vitality	Feel full of pep	.8355	.8677
	Have a lot of energy	.8105	
	Feel worn out	.8352	
	Feel tired	.8275	
Role Functioning	Does your health keep you from working at a job, doing work around the house, or going to school	---	.8008
	Have you been unable to do certain kinds or amounts of work, housework, or school work because of your health	---	

Bivariate Correlations among Independent Variables

As can be seen from Table **4-15**, the bivariate correlations among all independent variables did not exceed a cutoff value of .80 (Berry & Feldman, 1991) which meant that the problem of multicollinerity could be eliminated. Pearson correlation coefficients for eight items ranged between .006 and .367. The strongest relationship (r= -.367, p<.001) was between age and occupational physical activity.

Table **4-15**
Pearson Correlation Matrix for Independent Variables

	1	2	3	4	5	6	7	8
1 Age	1.000 (1606)							
2 Gender	.032 (1603)	1.000 (1607)						
3 Ethnicity	-.006 (1592)	.026 (1592)	1.000 (1595)					
4 Marital status	.237*** (1392)	.201*** (1392)	-.056* (1380)	1.000				
5 Education	-.226*** (1323)	-.212*** (1324)	.074** (1313)	-.165*** (1316)	1.000 (1327)			
6 Leisure time PASE	-.064* (1606)	-.184*** (1607)	.024 (1595)	-.016 (1395)	.068* (1327)	1.000 (1611)		
7 Household PASE	-.173*** (1606)	-.066** (1607)	.055* (1595)	-.168*** (1395)	-.001 (1327)	.090*** (1611)	1.000 (1611)	.
8 Occupational PASE	-.367*** (1377)	-.085** (1377)	.022 (1367)	-.077** (1180)	.106*** (1118)	-.045 (1381)	.091*** (1381)	1.000 (1381)

Note.
1 *** Correlation is significant at the 0.001 level (2-tailed).
2 ** Correlation is significant at the 0.01 level (2-tailed).
3 * Correlation is significant at the 0.05 level (2-tailed).
4 (N) indicate number of subjects

One-way ANOVA Analyses of Subjects' Physically Active Leisure Participation

The physically active leisure index was calculated based on the content analysis as addressed in previous section. I multiplied the METs value for each activity with the frequency of the activity per week and summed all six activities' scores to represent a subject's physically active leisure index for a week-long period.

Several one-way ANOVAs were performed to determine if there were any significant differences in terms of subjects' physically active leisure participation (using physically active leisure index) for different demographic variables.

Using Scheffe's test, multiple pairings were used to compare the physically active leisure value between groups following a significant ANOVA result. All the results are presented in table 4-16.

Results for Hypotheses

3.15 There is no difference between males and females in terms of their physically active leisure index.

Results: The null hypothesis has been rejected. There was a significant relationship between gender and the physically active leisure index (F=43.38, p=.000). Males had significantly higher physically active leisure scores than females.

3.16 There is no difference among different age groups in terms of their physically active leisure index.

Results: There were no significant differences among the four different age groups: middle-age (50-64 years old), young-old (65-74 years old), old-old (75-84 years old),

and oldest-old (>85 years old), in terms of the physically active leisure index (F=2.04, p=.107).

3.17 There is no difference among subjects with different levels of education in terms of their physically active leisure index.

Results: There was no significant relationship between subjects' levels of education level and their physically active leisure index (F=1.65, p=.12).

3.18 There is no difference among subjects with different marital status in terms of their physically active leisure index.

Results: There were no significant differences among the four different marital status categories: single, married, divorced, and widow or widower, in terms of their physically active leisure index (F=1.29, p=.28).

3.19 There is no difference among different ethnic groups in terms of their physically active leisure index.

Results: The null hypothesis was rejected. Different ethnic backgrounds showed significant differences in the physically active leisure index (F=2.67, P=.021). Hispanic/Latino group (mean= 12.12) had the highest physically active leisure score, followed by African American (mean= 10.27), Asian American (mean= 10.01), and White (mean=9.63). However, while conducting post-hoc Scheffe test, there were no significant differences between these groups.

3.20 There is no difference among subjects from different geographical locations characterized by differences in climate and urban size in terms of their physically active leisure index.

Results: The null hypothesis was rejected. Different geographical location was a significant variable on the physically active leisure index (F=7.28, p=.000). The results showed that subjects from Arlington had the highest mean score of the physically active leisure index (mean=11.34), followed by subjects from Houston (mean=10.55), and subjects from San Diego (mean=10.16). Subjects from Minneapolis had the lowest physically active leisure index mean score (mean=8.66). The post-hoc Scheffe comparison revealed that the significant differences were among subjects from Minneapolis with Arlington and Houston, and between subjects from Houston and Peoria. Subjects from Minneapolis were less active than subjects from Arlington or Houston. Subjects from Arlington were more active than subjects from Peoria.

Table**4-16**

Mean, Standard Deviations and One-way ANOVA Results for Gender, Ethnicity, Marital status, Education, Cities by the Physically Active Leisure Index

	N	Mean	S D	F	P	Post- Hoc
Gender				43.38	.000	
Male	516	11.21	6.34			M>F
Female	854	9.00	5.49			
Age				2.04	.107	
Middle age (50-64 yrs)	597	10.14	5.64			
Young old (65-74 yrs)	454	9.66	5.66			
Old-old (75-84 yrs)	288	9.63	6.80			
Oldest old (>85 yrs)	29	7.69	5.73			
Ethnicity				2.67	.021	
African American	61	10.27	6.30			n.s.
Asian American	25	10.01	4.15			
Native American Indian	2	7.56	.80			
White	1224	9.63	5.70			
Hispanic/ Latino	35	12.12	7.35			
Other	12	13.96	12.38			
Marital Status				1.29	.28	
Single	134	10.62	6.83			
Married	729	9.76	5.48			
Divorced	133	9.99	5.10			
Widow or Widower	201	9.34	7.42			
Education				1.65	.12	
Grades 7-12	35	9.00	6.00			
High school graduate	165	9.16	5.97			
Some college	219	9.59	5.37			
Technical/vocational school	47	9.50	4.96			
Associates degree	66	8.37	3.71			
Bachelor's degree	301	10.36	6.71			
Graduate degree	292	10.22	6.08			
Other	20	10.97	6.75			
City				7.28	.000	
San Diego	213	10.16	6.54			
Minneapolis	218	8.66	4.27			M<A M<H
Arlington	156	11.34	6.85			A> P
Houston	310	10.55	6.89			
Peoria	475	9.24	5.05			

Comparison of Leisure-time Physical Activity, Household Physical Activity, and Occupational Physical Activity Using Multiple Regressions

Nine stepwise multiple regression analyses were completed to test the influence of several independent variables' impact on each health dimension. More specifically, three different types of physical activities and control variables (including age, gender, education, ethnicity, and marital status) were regressed on each health variable (DV). Ultimately, this study intended to examine the relative contribution of three different types of physical activities' influence on one's health while controlling the above-mentioned socioeconomic variables. It was hypothesized that leisure-time physical activity would contribute more than household and occupational physical activity while predicting older adults' health status. Analyses are presented in order of hypotheses.

2.1 Leisure-time physical activity contributes more than household and occupational physical activity in one's perceived health, when controlling their age, gender, ethnicity, marital status, and education level.

Results: The zero-order correlation (between the independent variables and health perception), the initial regression model, and the final reduced model are presented in **Table4-17 .** The bivariate correlation showed significant relationships between one's health perception and their age, gender, ethnicity, education, leisure-time physical activity, household physical activity, and occupational physical activity. The final reduced model showed that gender (Beta=.063, $p<.001$), education (Beta=.178, $p<.001$), leisure-time physical activity (Beta=.211, $p<.001$), and household physical

activity (Beta=.145, p<.001) are significantly related to a positive health perception. These indicated that those subjects who are female, more educated, and more active in both leisure-time and household physical activity perceived that they had a better health status. The model had an F value of 37.01, which was significant at the p<.001 level, thus indicating a relationship between these significant independent variables and one's health perception. In fact, 10.1% of the variance in subjects' health perception was explained by the aforementioned four variables. In conclusion, in comparing the three physical activity predictors, leisure-time physical activity (Beta=.211) contributed the most to the prediction of subjects' health perception. Hypothesis 2.1 was supported by these results.

Table **4-17**
Multiple Regression of Demographic Variables and Three Types of Physical Activities on Health Perception

		Fully Saturated Model			Final Reduced Model		
	Pearson r	b	Beta	t	b	Beta	t
DV:							
Health Perception							
Constant		39.477		5.475	47.514		19.864
Age	-.086**	.022	.010	.296	---	---	---
Gender	-.023	3.175	.065*	2.164	3.065	.063*	2.324
Ethnicity	.079**	6.865	.050	1.752	---	---	---
Marital Status	-.049	-.116	-.002	-.080	---	---	---
Education	.179***	1.923	.170***	5.653	2.010	.178***	6.648
Leisure-time Physical Activity	.225***	.115	.215***	7.357	.114	.211***	7.924
Household Physical Activity	.160***	.079	.138***	4.711	.082	.145***	5.520
Occupational Physical Activity	.069**	.036	.056	1.830	---	---	---
Model Summary		N=1117			N=1323		
		R2=.106			R2= .101		
		F=16.49***			F=37.01***		

Note: * p<.05, **p<.01, ***p<.001

2.2 Leisure-time physical activity contributes more than household and occupational physical activity in one's level of physical functioning, when controlling their age, gender, ethnicity, marital status, and education level.

The zero-order correlation (between the independent variables and physical functioning), the initial regression model, and the final reduced model are presented in Table **4-18**. The bivariate correlation showed significant relationships between one's physical functioning and all independent variables. The final reduced model demonstrated that education (Beta=.207, $p<.001$), leisure-time physical activity (Beta=.184, $p<.001$), and household physical activity (Beta=.158, $p<.001$) were positively and significantly related to one's physical functioning. These indicated that for those subjects who are more educated, and more active in both leisure-time and household physical activity had fewer physical functioning limitations. Conversely, age (Beta=-.204, $p<.001$) and marital status (Beta=-.061, $p<.05$) are negatively and significantly related to one's physical functioning. These indicated that subjects who are older or not married had worse physical functioning than those who are younger or married. The model had an F value of 67.99, which was significant at the $p<.001$ level, thus indicating a relationship between these significant independent variables and one's physical functioning. In total, 20.6% of the variance in subjects' physical functioning was explained by the aforementioned five variables. When comparing the three physical activity predictors, leisure-time physical activity (Beta=.184) contributed the most to the prediction of subjects' physical functioning. Hypothesis 2.2 was supported by these results.

Table **4-18**
Multiple Regression of Demographic Variables and Three Types of Physical Activities on Physical Functioning

		Fully Saturated Model			Final Reduced Model		
	Pearson r	b	Beta	t	b	Beta	t
DV:							
Physical Functioning							
Constant		83.071		12.390	88.480		17.781
Age	-.304***	-.469	-.199***	-6.561	-.479	-.204***	-7.792
Gender	-.115***	-.477	-.010	-.350	---	---	---
Ethnicity	.073**	5.457	.040	1.497	---	---	---
Marital Status	-.173***	-2.742	-.058*	-2.046	-2.890	-.061*	-2.383
Education	.276***	2.252	.202***	7.121	2.312	.207***	8.105
Leisure-time Physical Activity	.226***	.097	.183***	6.645	.098	.184***	7.407
Household Physical Activity	.220***	.087	.155***	5.631	.089	.158***	6.250
Occupational Physical Activity	.124***	.011	.017	.585	---	---	---
Model Summary			N=1117			N=1315	
			R^2=.208			R^2= .206	
			F=36.404***			F=67.99***	

Note: * p<.05, **p<.01, ***p<.001

2.3 Leisure-time physical activity contributes more than household and occupational physical activity in one's mental health, when controlling their age, gender, ethnicity, marital status, and education level.

The zero-order correlation (between the independent variables and mental health), the initial regression model, and the final reduced model are presented in Table**4-19.** The bivariate correlation showed that age, ethnicity, education, leisure-time, household and occupational physical activity are significantly related to one's mental health. The final reduced model showed that age (Beta=.196, $p<.001$), ethnicity (Beta=.071, $p<.01$), education (Beta=.140, $p<.001$), leisure-time physical activity (Beta=.170, $p<.001$), and household physical activity (Beta=.068, $p<.05$) were significantly related to one's positive mental health. These indicated that for those subjects who are older, non-white, more educated, and more active in both leisure-time and household physical activity perceived better mental health. In contrast, marital status (Beta=-.055, $p<.05$) is negatively and significantly related to one's mental health. This indicated that subjects who are not married had worse mental health than those who are married. The model had an F value of 20.38, which was significant at the $p<.001$ level, thus indicating a relationship between the aforementioned significant independent variables and one's mental health. In total, 8.6% of the variance in subjects' mental health is explained by the aforementioned six variables. The multiple regression showed that leisure-time physical activity (Beta=.170) is the strongest predictor of the three physical activity predictors in one's mental health. Hypothesis 2.3 is supported by these results.

Table **4-19**
Multiple Regression of Demographic Variables and Three Types of Physical Activities on Mental Health

		Fully Saturated Model			Final Reduced Model		
	Pearson r	b	Beta	t	b	Beta	t
DV:							
Mental Health							
Constant		40.247		8.115	41.070		9.565
Age	.128***	.320	.197***	6.045	.317	.196***	6.959
Gender	-.045	.862	.026	.854	---	---	---
Ethnicity	.092***	6.512	.070*	2.416	6.647	.071**	2.680
Marital Status	-.050	-1.936	-.060	-1.953	-1.784	-.055*	-1.986
Education	.122***	1.114	.145***	4.762	1.076	.140***	5.083
Leisure-time Physical Activity	.176***	.064	.175***	5.921	.062	.170***	6.389
Household Physical Activity	.063*	.027	.069*	2.342	.027	.068*	2.510
Occupational Physical Activity	-.055*	-.000	.000	-.005	---	---	---
Model Summary			N=1117			N=1312	
			R^2=.086			R^2= .086	
			F=13.079***			F=20.378***	

Note: * p<.05, **p<.01, ***p<.001

2.4 Leisure-time physical activity contributes more than household and occupational physical activity in one's vitality when controlling their age, gender, ethnicity, marital status, and education level.

The zero-order correlation (between the independent variables and vitality), the initial regression model, and the final reduced model are all presented in Table **4-20.** The bivariate correlation showed that age, gender, marital status, education, leisure-time physical activity, and household physical activity are significant variables related to one's vitality level. The final reduced model showed that education (Beta=.132, $p<.001$), leisure-time physical activity (Beta=.245, $p<.001$), and household physical activity (Beta=.144, $p<.001$) are positively and significantly related to one's vitality. These indicated that for those subjects who are more educated and more active in both leisure-time and household physical activity had higher levels of vitality. The model had an F value of 53.94, which was significant at the $p<.001$ level, thus indicating a relationship between the independent variables and dependent variable. In total, 10.9% of the variance in subjects' vitality was explained by the aforementioned three variables. When comparing the three physical activity predictors, leisure-time physical activity (Beta=.245) contributed the most to the prediction of subjects' vitality level. Hypothesis 2.4 is supported by these results.

Table **4-20**
Multiple Regression of Demographic Variables and Three Types of Physical Activities on Vitality

		Fully Saturated Model			Final Reduced Model		
	Pearson r	b	Beta	t	b	Beta	t
DV:							
Vitality							
Constant		40.175		6.774	45.837		27.776
Age	-.049*	.057	.029	.905	---	---	---
Gender	-.066**	.940	.023	.779	---	---	---
Ethnicity	.037	1.248	.011	.387	---	---	---
Marital Status	-.066*	-1.004	-.026	-.847	---	---	---
Education	.148***	1.282	.138***	4.583	1.228	.132***	5.063
Leisure-time Physical Activity	.267***	.111	.250***	8.598	.109	.245***	9.387
Household Physical Activity	.166***	.068	.145***	4.963	.067	.144***	5.533
Occupational Physical Activity	.009	.002	.003	.103	---	---	---
Model Summary			N=1117			N=1326	
			R^2=.111			R^2= .109	
			F=17.224***			F=53.936***	

Note: * p<.05, **p<.01, ***p<.001

2.5 Leisure-time physical activity contributes more than household and occupational physical activity in one's role functioning, when controlling their age, gender, ethnicity, marital status, and education level.

Table **4-21** displays the zero-order correlation (between all the independent variables and role functioning), the fully saturated model, and the final reduced model. The bivariate correlation showed that all independent variables are correlated with one's role functioning significantly. The final reduced model showed that education (Beta=.109, p<.001), leisure-time physical activity (Beta=.151, p<.001), household physical activity (Beta=.171, p<.001) and occupational physical activity (Beta=.090, p<.01) are positively and significantly related to one's role functioning. These indicated that for those subjects who are more educated and more active in leisure-time, household, and occupational physical activity performed better role functioning. The model had an F value of 24.97, which was significant at the p<.001 level, thus indicating a relationship between the independent variables and subjects' role functioning. In total, 8.2% of the variance in subjects' role functioning was explained by the aforementioned four variables. In conclusion, when comparing the three physical activity predictors, household physical activity (Beta=.171) contributed the most to the prediction of subjects' role functioning, followed by leisure-time physical activity (Beta=.151) and occupational physical activity (Beta=.090). Hypothesis 2.5 is not supported by these results.

Table **4-21**
Multiple Regression of Demographic Variables and Three Types of Physical Activities on Role Functioning

		Fully Saturated Model			Final Reduced Model		
	Pearson r	b	Beta	t	b	Beta	t
DV:							
Role Functioning							
Constant		67.552		7.234	62.532		22.190
Age	-.131***	-.135	-.044	-1.355	---	---	---
Gender	-.077**	-.789	-.013	-.415	---	---	---
Ethnicity	.059*	6.627	.038	1.306	---	---	---
Marital Status	-.067*	-.08.8	-.001	-.047	---	---	---
Education	.128***	1.374	.095**	3.120	1.573	.109***	3.752
Leisure-time Physical Activity	.169***	.100	.146***	4.932	.104	.151***	5.205
Household Physical Activity	.193***	.118	.162***	5.458	.124	.171***	5.894
Occupational Physical Activity	.111***	.061	.074*	2.381	.074	.090**	3.110
Model Summary			N=1117			N=1117	
			R^2=.085			R^2= .082	
			F=12.931***			F=24.966***	

Note: * p<.05, **p<.01, ***p<.001

2.6 Leisure-time physical activity contributes more than household and occupational physical activity in reducing one's pain when controlling their age, gender, marital status, ethnicity, and education level.

Table **4-22** presents the zero-order correlation (between the independent variables and subjects' perception of pain severity), the fully saturated model, and the final reduced model. The bivariate correlation showed that one's perception of pain is significantly related to one's gender, leisure-time physical activity, household physical activity, and occupational physical activity. The final reduced model showed that education (Beta=.132, $p<.001$), leisure-time physical activity (Beta=.100, $p<.001$), and household physical activity (Beta=.074, $p<.01$) are positively and significantly related to the pain index. These indicated that for those subjects who are more educated and more active in both leisure-time and household physical activity perceived less pain. The model had an F value of 16.21, which was significant at the $p<.001$ level, thus indicating a relationship between the significant independent variables and the predicted dependent variable. Only 3.6% of the variance in subjects' perception of pain was explained by the aforementioned three variables. In conclusion, when comparing the three physical activity predictors, leisure-time physical activity (Beta=.100) contributed more to predict subjects' perception of pain than household physical activity (Beta=.074) or occupational physical activity (ns.). Hypothesis 2.6 is supported by these results.

Table **4-22**
Multiple Regression of Demographic Variables and Three Types of Physical Activities on Perception of Pain

		Fully Saturated Model			Final Reduced Model		
	Pearson r	b	Beta	t	b	Beta	t
DV:							
Pain							
Constant		51.562		6.813	54.253		25.598
Age	-.036	.040	.017	.493	---	---	---
Gender	-.057*	-.267	-.005	-.174	---	---	---
Ethnicity	.014	-.363	-.003	-.088	---	---	---
Marital Status	-.028	.339	.007	.224	---	---	---
Education	.139	1.539	.135***	4.312	1.508	.132***	4.840
Leisure-time Physical Activity	.116***	.055	.100**	3.309	.054	.100***	3.653
Household Physical Activity	.083**	.044	.077*	2.518	.042	.074**	2.704
Occupational Physical Activity	.022*	.007	.011	.348	---	---	---
Model Summary			N=1117			N=1306	
			R^2=.036			R^2= .036	
			F=5.228***			F=16.209***	

Note: * p<.05, **p<.01, ***p<.001

2.7 Leisure-time physical activity contributes more than household and occupational physical activity in one's social functioning, when controlling their age, gender, ethnicity, marital status, and education level.

Table**4-23** presents the zero-order correlation (between the independent variables and subjects' social functioning), the fully saturated model, and the final reduced model. The bivariate correlation showed that one's age, ethnicity, marital status, education, leisure-time physical activity, household physical activity, and occupational physical activity are significantly related to one's social functioning. The final reduced model showed that gender (Beta=.060, $p<.05$), ethnicity (Beta=.067, $p<.05$), education (Beta=.10, $p<.001$), leisure-time physical activity (Beta=.123, $p<.001$), and household physical activity (Beta=.111, $p<.001$) are positively and significantly related to one's social functioning. These indicated that for those subjects who are female, non-White, more educated, and more active in both leisure-time and household physical activity had better social functioning. In contrast, marital status has negative impact, which means married subjects have a higher mean score in terms of social functioning than those non-married subjects (including single, divorced, widow or widower). The model had an F value of 12.64 which was significant at the $p<.001$ level, thus indicating a relationship between the significant independent variables and the predicted dependent variable. Only 5.5% of the variance in subjects' social functioning was explained by the aforementioned significant variables. When comparing three physical activity predictors, leisure-time physical activity (Beta=.123) contributed more to predict subjects' social functioning than household physical

activity (Beta=.111) or occupational physical activity (ns.). Hypothesis 2.7 is supported by these results.

Table **4-23**
Multiple Regression of Demographic Variables and Three Types of Physical Activities on Social Functioning

		Fully Saturated Model			Final Reduced Model		
	Pearson r	b	Beta	t	b	Beta	t
DV:							
Social Functioning							
Constant		75.206		13.198	73.869		22.541
Age	-.089***	-.019	-.011	-.320	---	---	---
Gender	-.004	2.323	.062*	2.004	2.240	.060*	2.109
Ethnicity	.089***	7.018	.067*	2.266	7.037	.067*	2.465
Marital Status	-.099***	-2.421	-.066*	-2.125	-2.553	-.070*	-2.477
Education	.113***	.824	.095**	3.064	.878	.101***	3.619
Leisure-time Physical Activity	.131***	.052	.125***	4.178	.051	.123***	4.456
Household Physical Activity	.134***	.046	.106***	3.517	.049	.111***	4.052
Occupational Physical Activity	.064*	.022	.044	1.404	---	---	---
Model Summary			N=1117			N=1312	
			R^2=.057			R^2= .055	
			F=8.413***			F=12.643***	

Note: * p<.05, **p<.01, ***p<.001

2.8 Leisure-time physical activity contributes more than household and occupational physical activity in reducing the number of doctor visits except physical checks, when controlling their age, gender, ethnicity, marital status, and education level.

The zero-order correlation (between the independent variables and the number of doctor visits), the fully saturated model and final reduced model are presented in Table **4-24** . The bivariate correlation showed that age is positively and significantly related to the number of doctor visits. The final reduced model showed that leisure-time physical activity (Beta= -.067, p<.01) and household physical activity (Beth= -.141, p<.001) are negatively and significantly related to the number of doctor visits. These indicated that those subjects who are less active in leisure-time and household physical activity tend to visit the doctor more often. The model had an F value of 21.36, which was significant at the p<.001 level and 2.6% of the variance in subjects' number of doctor visits is explained by subjects' leisure-time physical activity and household physical activity. Of the three physical activity predictors, household physical activity (Beta= -.141) contributed more to predict subjects' number of doctor visits than leisure-time physical activity (Beta= -.067) or occupational physical activity (ns.). Hypothesis 2.8 is not supported by these results.

Table **4-24**
Multiple Regression of Demographic Variables and Three Types of Physical Activities on Number of Doctor Visits

		Fully Saturated Model			Final Reduced Model		
	Pearson r	b	Beta	t	b	Beta	t
DV:							
Number of Doctor Visits							
Constant		3.153		2.498	4.306		17.833
Age	.074**	.018	.045	1.336	---	---	---
Gender	.016	-.041	-.005	-.160	---	---	---
Ethnicity	-.010	-.032	-.001	-.047	---	---	---
Marital Status	.021	-.104	-.013	-.414	---	---	---
Education	-.013	.000	.000	.005	---	---	---
Leisure-time Physical Activity	-.080**	-.006	-.066*	-2.174	-.006	-.067**	-2.693
Household Physical Activity	-.147***	-.013	-.135***	-4.408	-.013	-.141***	-5.687
Occupational Physical Activity	-.036	-.001	-.012	-.369	---	---	---
Model Summary			N=1117			N=1598	
			R^2=.028			R^2= .026	
			F=4.062***			F=21.355***	

Note: * p<.05, **p<.01, ***p<.001

2.9 Leisure-time physical activity contributes more than household and occupational physical activity in decrease one's likelihood of being obese (measured by body mass index), when controlling their age, gender, ethnicity, marital status, and education level.

The zero-order correlation (between the independent variables and the body mass index), the fully saturated model, and the final reduced model are presented in Table**4-25** . The bivariate correlation showed that age, gender, leisure-time physical activity, and occupational physical activity are significantly correlated with subjects' BMI value. The final reduced model revealed that age (Beta= -.179, p<.001), gender (Beta= -.119, p<.001), education (Beta= -.103, p<.001) and leisure-time physical activity (Beta= -.139, p<.001)) are negatively and significantly related to subjects' BMI value. These indicated that for those subjects who are older, women, more educated, and more active in leisure-time physical activity had lower BMI value. The model had an F value of 19.32, which was significant at the p<.001 level. In total, 5.7% of the variance in subjects' BMI value was explained by the aforementioned four variables. Of the three physical activity predictors, only leisure-time physical activity proved to be a significant predictor of subjects' BMI value. Hypothesis 2.9 is supported by these results.

Table **4-25**
Multiple Regression of Demographic Variables and Three Types of Physical Activities on BMI value

		Fully Saturated Model			Final Reduced Model		
	Pearson r	b	Beta	t	b	Beta	t
DV:							
BMI							
Constant		35.621		23.548	34.064		31.562
Age	-.154***	-.098	-.201***	-6.078	-.087	-.179***	-6.421
Gender	-.075**	-1.286	-.129***	-4.179	-1.184	-.119***	-4.235
Ethnicity	-.034	-.453	-.016	-.551	---	---	---
Marital Status	-.002	.368	.038	1.216	---	---	---
Education	-.051	-.234	-.101**	-3.277	-.239	-.103***	-3.626
Leisure-time Physical Activity	-.115***	-.015	-.139***	-4.630	-.015	-.139***	-5.046
Household Physical Activity	-.024	-.005	-.044	-1.473	---	---	---
Occupational Physical Activity	.055*	-.002	-.018	-.579	---	---	---
Model Summary			N=1117			N=1292	
			R^2=.061			R^2= .057	
			F=8.987***			F=19.319***	

Note: * p<.05, **p<.01, ***p<.001

Overall, this study is exploratory in nature. The goal is not to have a high explanation value in predicting one's health status. Instead, this study seeks to explore the

relative influence among three different types of physical activity to one's health. Therefore, although the overall R squared values in the regression models are not high, we could still compare the relative importance among three different types of physical activity for each health dimension.

Of the nine health dimensions, leisure-time physical activity contributed more than household physical activity or occupational physical in seven (health dimensions): health perception, physical functioning, mental health, vitality, pain, social functioning, and obesity. On the other hand, household physical activity contributed more than leisure-time physical activity in two areas: dimensions of role functioning and the number of doctor visits. It is clear that leisure-time physical activity contributed more than household physical activity or occupational physical activity in predicting one's health status.

Comparison of the Physically Active Leisure Index with the PASE Scale

Bivariate correlations were used to examine the relationship between the physically active leisure index and the PASE scale and to determine the strength of using the physically active leisure in subjects' health status as opposed to the PASE scale.

Hypotheses

3.1 There is no relationship between the physically active leisure index and the PASE score.

3.2 There is no relationship between the physically active leisure index and the leisure–time PASE score.

3.3 There is no relationship between the physically active leisure index and the household PASE score.

3.4 There is no relationship between the physically active leisure index and the occupational PASE score.

Results for 3.1-3.4: Bivariate correlations between the physically active leisure index and the PASE scale were performed to compare the relationship between the two measurements. As can be seen from Table **4-26** , the physically active leisure index had significantly positive relationships with the total PASE score ($r=.157$, $p<.001$) and the leisure-time PASE score ($r=.261$, $p<.001$). However, the relationships for the physically active leisure index and the household PASE score and the occupational PASE score were negative at an insignificant level.

Table **4-26**
Bivariate Correlations between the physically active leisure index and the PASE scale

	1	2	3	4	5
1.Physical activity leisure index	1.000				
	(1397)				
2. Total PASE score	.157***	1.000			
	(1158)	(1381)			
3 Leisure-time PASE score	.261***	.631***	1.000		
	(1372)	(1381)	(1611)		
4 Household PASE score	-.015	.657***	.090***	1.000	.
	(1372)	(1381)	(1611)	(1611)	
5 Occupational PASE score	-.026	.521***	-.045	.091***	1.000
	(1158)	(1381)	(1381)	(1381)	(1381)

Note: *** Correlation is significant at the .001 level (2-tailed)
** Correlation is significant at the .01 level (2-tailed).
* Correlation is significant at the .05 level (2-tailed).

Multiple Regression Analyses for the Physically Active Leisure Index to Several Health Status Indexes

The physically active leisure index was used as the independent variable to predict older adults' health status (health perception, physical functioning, mental health, vitality, role functioning, pain, social functioning, number of physician visits, and obesity) when controlling their age, gender, ethnicity, marital status, and education level. The

purpose is to create an alternative measurement to the PASE scale in order to measure in a more quantitative way of a subject's active level.

The relationships among the socio-demographic variables and each health dimension had been discussed in detail in the previous sections. Here, I only illustrated whether the physically active leisure index could predict each health dimension significantly.

Table **4-27** displays the summarized comparisons of the regression models between the PASE scale and the physically active leisure index to each health dimension. The regression models which use the PASE scale (including the leisure-time PASE score, the household PASE score, and the occupational PASE score) are significant at the $p<.001$ level for each health dimension. However, the regression models which use the physically active leisure index are significant at the $p<.001$ level for each health dimension except for the number of doctor visits.

3.5 There is no difference in the predictive value of the physically active leisure index compared to the PASE scale in regard to subjects' perceived health when controlling their age, gender, ethnicity, marital status, and education level.
Results: The regression model which uses the PASE scale explained 10.6% of the variance in subjects' health perception compared to 4.5% when using the physically active leisure index.

3.6 There is no difference in the predictive value of the physically active leisure index compared to the PASE scale in regard to subjects' physical functioning when controlling their age, gender, ethnicity, marital status, and education level.

Results: The regression model which uses the PASE scale explained 20.8% of the variance in subjects' physical functioning compared to 15.6% when using the physically active leisure index.

3.7 There is no difference in the predictive value of the physically active leisure index compared to the PASE scale in regard to subjects' mental health when controlling their age, gender, ethnicity, marital status, and education level.

Results: The regression model which uses the PASE scale explained 8.6% of the variance in subjects' mental health compared to 5.1% when using the physically active leisure index.

3.8 There is no difference in the predictive value of the physically active leisure index compared to the PASE scale in regard to subjects' vitality when controlling their age, gender, ethnicity, marital status, and education level.

Results: The regression model which uses the PASE scale explained 11.1% of the variance in subjects' vitality level compared to 3.1% when using the physically active leisure index.

3.9 There is no difference in the predictive value of the physically active leisure index compared to the PASE scale in regard to subjects' role functioning when controlling their age, gender, ethnicity, marital status, and education level.

Results: The regression model which uses the PASE scale explained 8.5% of the variance in subjects' role functioning compared to 4.1% when using the physically active leisure index.

3.10 There is no difference in the predictive value of the physically active leisure index compared to the PASE scale in regard to subjects' perception of reducing pain when controlling their age, gender, ethnicity, marital status, and education level.
Results: The regression model which uses the PASE scale explained 3.6% of the variance in subjects' perception of pain compared to 2.1% when using the physically active leisure index.

3.11 There is no difference in the predictive value of the physically active leisure index compared to the PASE scale in regard to subjects' social functioning when controlling their age, gender, ethnicity, marital status, and education level.
Results: The regression model which uses the PASE scale explained 5.7% of the variance in subjects' social functioning compared to 2.9% using the physically active leisure index.

3.12 There is no difference in the predictive value of the physically active leisure index compared to the PASE scale in regard to subjects' numbers of doctor visits except physical checks when controlling their age, gender, ethnicity, marital status, and education level.
Results: The regression model which uses the PASE scale explained 2.8% of the variance in subjects' number of doctor visits compared to insignificant model using the physically active leisure index.

3.13 There is no difference in the predictive value of the physically active leisure index compared to the PASE scale in regard to subjects' likelihood of being obese (measured by body mass index) when controlling their age, gender, ethnicity, marital status, and education level.

Results: The regression model which uses the PASE scale explained 6.1% of the variance in subjects' BMI value compared to 4.8% using the physically active leisure index.

3.14 There is no difference in the predictive value of the physically active leisure index compared to the PASE scale in regard to subjects overall health when controlling their age, gender, ethnicity, marital status, and education level.

Results: In addition, overall health composed from the seven sub-dimensions of the MOS scale was assessed as an dependent variable. The regression model which uses the PASE scale explained 17.6% of the variance in subjects' overall health compared to 9.5% using the physically active leisure index.

Overall, these results illustrated that while predicting each health dimension, the physically active leisure demonstrated a similar pattern with the PASE scale. However, the latter has a larger explanation rate than the former.

Table **4-27**
Model Summary of the Comparisons of the PASE Model and the Physically Active Leisure Index Model in Predicting Different Health Dimensions

Dependent Variable	PASE model[1]	Physically Active Leisure Index model[2]
Health Perception	.106***	.045***
Physical Functioning	.208***	.156***
Mental Health	.086***	.051***
Vitality	.111***	.031***
Role Functioning	.085***	.041***
Pain	.036***	.021***
Social Functioning	.057***	.029***
Doctor Visits	.028***	n.s.
Obesity	.061***	.048***
Overall Health	.176***	.095***

Note:
[1]PASE model includes the following independent variables: age, gender, ethnicity, marital status, education, leisure-time physical activity, household physical activity, & occupational physical activity.
[2]Physically Active Leisure Index model includes the following independent variables: age, gender, ethnicity, marital status, education, and the physically active leisure index
[3]Cells represent the total variance (R square) explained from the combinations of all independent variables to each Health dimension (Dependent variable).
[4]*** regression model significant at p<.001 level
[5]n.s. model not significant at p<.05 level

In order to compare the models using the PASE scale and the physically active leisure index to determine whether they are significantly different for each dependent variable, further analyses using Hotellings t and Steiger's Z test were performed. The procedures involved using the R value from each regression model and the correlation between these two models to calculate the t value or z value (Garbin, 2006). With t (927, p=.05) =1.98 and Z (.05) =1.96, the models were significantly different in the overall health and seven health dimensions including: health perception, physical functioning, mental health, vitality, role functioning, social functioning, and the number of doctor visits. In other words, the PASE model explains significantly more variance than the physically active leisure index model when predicting these seven health dimensions. However, there were no differences with predicting perception of pain or BMI values (Table **4-28**).

Table **4-28**
Summary Results of Testing of Regression Model Differences using Hotelling t and Steiger's Z

Dependent Variable	R1[1] PASE model	R2[2] Physically Active Leisure Index model	R[3]	Hotelling t[4]	Steiger's Z[5]
Health Perception	.326	.213	.543	3.81*	3.77*
Physical Functioning	.455	.395	.823	3.45*	3.43*
Mental Health	.279	.225	.786	2.62*	2.61*
Vitality	.313	.175	.461	4.26*	4.21*
Role Functioning	.304	.201	.543	3.45*	3.42*
Pain	.193	.146	.705	1.90	1.89
Social Functioning	.248	.170	.640	2.89*	2.87*
Doctor Visit	.167	.090	.407	2.18*	2.18*
BMI	.239	.224	.794	.734	.734
Overall Health	.419	.308	.664	4.55*	4.49*

Note
[1]R1: Multiple R for regression model using the PASE score and sociodemographic variables in predicting each health dimension.
[2]R2: Multiple R for regression model using the physically active leisure index and sociodemographic variables in predicting each health dimension.
[3]r: correlation between R1 and R2
[4]N=930
[5]*p<.05

Summary

The purpose of this chapter was to report research findings as conducted in this study. A variety of statistical analytic techniques were used including: first, general descriptive statistics to describe demographic characteristics of the sample and their

health status and PASE scores; second, content analysis to profile older adults' self-reported leisure activities in terms of the physically active leisure index; third, one-way ANOVA to compare the difference of demographic variables in terms of the physically active leisure index; fourth, multiple regression analyses to compare the relative contributions of three different types of physical activities on older adults' health; finally, the relationship between using the physically active leisure index compare with the PASE scale in predicting older adults' health. A brief summary of the findings is presented in the next chapter.

Chapter 5

Conclusions, Limitations and Recommendations

Introduction

The main objective of this chapter is to present an interpretation of the findings of this study. In addition, the potential usefulness of the research findings for developing effective policy making in promoting physical activities for older adults is outlined and recommendations for future physically active leisure research are suggested. Finally, the limitations of the research were stated and a concluding summary is presented.

Summary of Study Findings and Discussion

Sample Characteristics

This study utilized secondary data analysis from the study "The Relation of Local Government Recreation and Park Services to the Health of Older Adults." Data were collected from five cities: Peoria, San Diego, Arlington, Houston, and Minneapolis. The sample in the present study was predominately white and the majority of them were female with a mean age of 67. Half of them were married with a diverse education level but higher than average educational attainment for their age group (United State Census, 2003).

In regard to their health status, most of them had good health. Among the seven health dimensions of MOS measurement, they showed the highest average score on the dimension of social functioning and the lowest score on the vitality scale. The average number of doctor visits in the past twelve months was 2.86. About 15% of the subjects' BMI values were above 30 kg/m^2, which was classified as obese in the present study (CDC, n.d./2005).

In terms of their physical activity level, the mean PASE score for this sample was 143.8, which was more active than the general older population reported in the PASE scoring manual (mean=102.9, SD=64.1) (New England Research Institutes, 1991). The reason for this might be that the population in the current study was younger (50 years and older, mean age=67) than the study mentioned above (65 years and older, mean age=73). In addition, seasonal variation also played a significant role in the subjects' physical activity (Matthews et al., 2001; Uitenbroek, 1993). Because the data for this investigation were collected during the summer season, increased frequency of outdoor activities, such as walking or yard work, might contribute to the higher PASE scores (Washburn, et al., 1993).

Characterization of Older Adult's Leisure Activity in Terms of METs

Several previous studies have revealed that older adults' leisure activities are more sedentary than younger ones (Armstrong & Morgan, 1998; Horgas, et al., 1998). The results of the present study, based on the subjects' open-ended responses of their leisure activity, using METs value, reaffirm these patterns. This population revealed that

most of their leisure activities tended to be inactive. Based on the general classification of a physical activity (Ainsworth et al., 2003), sixteen of the top twenty-five activities reported by the subjects were sedentary activities (METs<3), such as watching TV, reading, or playing bingo. However, walking (METs=3.5), which is classified as moderate activity (METs value from 3 to 6) was the most popular leisure activity listed by the subjects. In fact, walking for pleasure has been shown to be a popular leisure activity for many older adults (Payne, Orsega-Smith, Roy, & Godbey, 1998, Yusuf, et al., 1996). The reason for its popularity may be due to its low cost, the ease with which it is undertaken, and the fact that it can be done individually or with others.

Relationships Between the Sociodemographic Variables and the Physically Active Leisure Index

The physically active leisure index was created to profile older adults' active leisure in terms of both frequency and physical intensity (using the METs values). The results showed that gender, ethnicity, and geographical location were significantly related to the physically active leisure index. However, age, marital status, and education were not significantly related.

Women tend to participate in physical activity less than men throughout all ages (Caspersen, et al., 2000; Lee, 2005). This study, using the physically active leisure index, did show that males were more active than females, which is consistent with several other studies (Kaplan, et al. 2001). Additionally, varied ethnic backgrounds were significantly different in regard to the physically active leisure index. The Hispanic/Latino group had the highest physically active leisure score, followed by the African American group, the

Asian American group, and the white group. However, post-hoc Scheffe tests revealed that there were no significant differences among these groups. This finding contradicts some earlier studies that whites are more active than other ethnic groups (Ahmed, et al., 2005; Fitzgerald, et al., 1994). These findings might be due to the statistical methods utilized in this study. Other studies (Allen, & Chin-Sang, 1990; Allison, & Smith, 1990; He & Baker, 2005) suggested that some ethnic differences in participation in leisure are confounded by income, education levels, and the experience of prejudice. Using one-way ANOVA may not be sufficient to rule out other confounding factors. Nevertheless, the finding of lower scores of physically active leisure index by whites is potentially quite important.

Geographic location also influences older adults' physically active leisure participation. The original research selected study-sites based on three criteria: city population size, climate and the percentage of the population that consists of ethnic/racial minorities. First, it was proposed that subjects from larger cities tend to be constrained in participating in leisure activities because of crowding, traffic congestion, and time spent waiting characteristics associated with big cities. Second, it was proposed that cold weather is more likely to restrict older adults' leisure participation. Third, the physical activity characteristics associated with differing ethnic groups, such as exercise levels, use of parks or recreation services, and the cultural expectations of women also play an important role shaping people's leisure participation (Godbey, et al., 2001). The results from the present study confirmed that subjects from larger cities with higher populations (San Diego, Peoria) had lower scores on the physically active leisure index than those from lower population cities (Arlington, Houston, Minneapolis). In addition, subjects

from the cold weather city, Minneapolis, had the lowest physically active leisure index score among the five cities. This result was parallel with the original study proposal that subjects from colder climate are less likely to be active. However, the relationship of ethnicity and older adults' physically active leisure participation did not present a clear pattern. The issue of ethnicity is complex. Several confounding factors such as socioeconomic status, social support and the duties of care-giving, etc. may influence older adults' physically active leisure participation. Future research is needed to further explain the association of physically active leisure participation and ethnicity for older adults.

The relationship between physically active leisure and climate deserves more discussion. A recent study's results in American Journal of Health Behavior (Merrill, Shields, White, Druce, 2005) showed that season and climate conditions have a significant effect on outdoor physical activity. Several winter activities, such as skiing, might not be favored by older adults. Instead, several preferable activities by older adults, such as walking or gardening, are generally enjoyed only during a warmer season. The result in the present study showed that older adults from the cold climate city showed the lowest physically active leisure participation. Uitenbroek's (1993) study revealed that levels of physical activity were lower during the cold, wet, winter months for both indoor and outdoor activities. One question for further research and policy planning in promoting physical activity may be, "do older adults from cold climates select alternative physical activities in cold weather?" or "How could leisure and recreation services serve to enhance physical activity for older adults in the colder climate?"

Surprisingly, there were no significant differences among age groups, marital status, and education levels, in terms of the physically active leisure index. In fact, some studies revealed inconsistent relationships between physically active leisure participation and sociodemographic variables. For example, Bevil, et al.'s study (1993) also demonstrated that gender, living situation, marital status, income, and race are not related to leisure activity participation. Mobily et al.'s study (1984) revealed that education, marital status did not offer sufficient predictive power with leisure repertoire for older adults.

One possible explanation of the outcome in the present study is that the participants have higher education levels than average. Generally, higher educational attainment is associated with higher leisure participation (Kelly, 1996; CDC, 2000; Strain, et al., 2002). The higher education level might interact with other socio-demographic variables in terms of physically active leisure participation; therefore, it reduced variances in this measure.

Comparison Among Three Different Types of Physical Activities

Although considerable evidence demonstrates that there is a positive relationship between physical activity and health, we do not know which form of physical activity contributes most to one's health. One of the objectives in the present study was to examine which types of physical activity – leisure-time physical activity, occupational physical activity, and household physical activity – contributes most to the older people's health.

All nine regression models were significant. The regression models accounted for the most variance (21%) in predicting limits to daily physical functioning and explained the least variance (3%) in predicting the number of doctor visits.

In comparing the three different forms of physical activities' contributions to seniors' health in different health dimensions, leisure-time physical activity was the only variable that remained as a significant predictor in each health dimension and has been shown to be the strongest predictor among three types of physical activity in seven dimensions: health perception, physical functioning, mental health, vitality, pain, social functioning, and obesity. It is clear that leisure-time physical activity contributed more than household or occupational physical activity in predicting one's health status. These findings support the literature discussed in chapter two that leisure activity, which is freely-chosen and intrinsic motivated, played an important role on older adults' health.

Henderson & Ainsworth (2002) claim that the "enjoyment" of physical activity associated with leisure plays a significant role shaping older adults' physical and mental health. In addition, the "enjoyment" factor in leisure makes it more likely for older adults to continue maintaining an active lifestyle (Wankel, 1993).

Although household or occupational physical activity may also benefit seniors' health, they do not achieve the same magnitude as leisure-time physical activity. Lawlor, et al. (2002)'s findings conclude that even though household physical activity may be sufficient for older women, these "house-proud" activities' benefit to older women's health may not achieve the same magnitude as leisure-time physical activity.

In sum, in a relatively healthy population with few physical limitations, leisure-time physical activity consists of activities that are personally meaningful and enjoyable;

therefore, the magnitude of its benefits to seniors' health are greater than household or occupational physical activity, which are part of daily obligation activities.

Contrary to this major finding, household physical activity contributed more than leisure-time physical activity in two areas: role functioning and the decrease in the number of doctor visits. Role functioning has been defined as the ability to work or do housework. It is clear that being able to do housework activity signals the ability of older adults to live independently. Being able to accomplish household activities is an especially important indicator of activities of daily living (ADLs) (Fillenbaum, 1985). Being able to accomplish household physical activities implies individuals could have greater control over their environment, and maintain an individual role functioning without assisted care.

While the reasons for the finding of the relationship between household physical activity and the number of doctor visits are not immediately obvious, they might be similar to the explanations above for role functioning. Being able to accomplish household physical activities implies that individuals have greater control of their lives. In other words, they might have better health, allowing them to perform household chores, which negatively relates to the number of doctor visits. That is, household physical activity may play a more critical role than leisure-time or occupational physical activity in everyday life. Seniors might be able to perform every kind of physical activity if they are healthy. However, if they have poor health, they might be restricted in participating in leisure-time physical activity because those activities are generally perceived as something secondary to the essential activities of daily life. However, household physical activity is critical in daily functions. This finding is consistent with Walter-Ginzburg et al.

(2001) claim that the extent of healthcare utilization might be driven primarily by health needs such as high levels of chronic disease and disability rather than the contribution from physical activity.

Comparison Between the Physically Active Leisure Index and the PASE Score

The results showed that the physically active leisure index was significantly and positively correlated with the PASE score ($r=.157$, $p<.001$) and the leisure-time PASE score ($r=.261$, $p<.001$). However, the physically active leisure index was not significantly correlated with the occupational PASE score ($r=-.015$, $p>.05$) or the household PASE score ($r=-.026$, $p>.05$).

Physical activity is a complex behavior that occurs in multiple domains of life. The PASE scale is an instrument to measure older adults' overall physical activity, which consists of three different types: leisure-time, household and occupational physical activity. However, the physically active leisure index was computed only from subjects' leisure activities. So, it is logical that the physically active leisure index was significantly and positively correlated with the total PASE score and the leisure-time PASE score. Moreover, the physically active leisure index had the highest correlation with the leisure-time PASE score.

On the other hand, He & Baker's study (2005) proposed that less leisure-time physical activity corresponds to higher occupational physical activity and vice versa. In other words, people with higher occupational physical demands are less likely to be involved in leisure physical activity because they have performed substantial physical

activities in their jobs. This could explain the reason for the negative relationship between the physically active leisure index and the occupational PASE score.

The physically active leisure index also demonstrated an inverse relationship with the household PASE score. The explanation here might be similar to those reasons for the negative correlation between the physically active leisure index and the occupational PASE score. Older adults who have performed considerable household physical activity may not have enough energy to additionally participate in more strenuous leisure activities.

The results illustrated that when predicting each health dimension, the physically active leisure index demonstrated a similar pattern with the PASE scale. However, the latter has a larger explanation rate than the former.

Further analyses using Hotellings t and Steiger's Z test were performed and revealed that the PASE model explains significantly more variance than the physically active leisure index model in predicting the following seven health dimensions: health perception, physical functioning, mental health, vitality, role functioning, social functioning, and the number of doctor visits. However, there were no differences between the two models when predicting perception of pain and BMI values.

The reason for this difference might be that the PASE scale consists of three different types of physical activity (leisure-time physical activity, household physical activity, and occupational physical activity), but the physically active leisure index only measures the leisure aspect.

Several limitations regarding the development of the physically active leisure index should be addressed. First, even though the compendium of physical activity

provides a wide variety in terms of different intensity in a given activity, some of the subjects' open-ended responses were vague. For example, running is classified by 22 categories in the compendium of METs with values ranging from 4.5 to 18.0. If a subject runs cross-country, the METs value for this activity is 9, which is a large difference from another subject who runs on a mini-trampoline (METs=4.5). However, we could not usually distinguish the difference because the subjects might only give their responses as "running" without a detailed description of the intensity. The guideline from the compendium states that if the intensity information is not available, the category of "general" can be used to classify the subjects. From the above example, these two subjects will be classified as "general" using the same METs value of 7. These problems limit variations among the subjects and lose significant intensity information of a subject' overall physical activity level.

Secondly, the physically active leisure index developed from this study attempted to incorporate more objective quantitative measures of active leisure level from both the METs value and the frequency information. However, as measured in this study, it lacks information concerning duration of participation in the activity and weight of a subject, which is needed to actually calculate energy expenditure. Energy expenditures for an activity can be most accurately calculated by multiplying the intensity level in METs value, the duration in hours or fractions of hours, and the subject's weight in kilograms (kg) (Ainsworth et al., 2003). For example, if a 60 kg individual was sitting quietly watching television (METs=1) for one hour, his or her energy expenditure for this activity is 60 kilocalories (kcal) (Energy expenditure= 1 METs* 1 hour*60 kg). There is, of course, the problem that the relationship between duration and intensity for a given

activity is unknown. For example, if an individual runs ninety minutes instead of thirty, there are no norms for determining if the longer time spent running will be done at a slower pace or lower caloric expenditure per minute.

Third, using the absolute intensity values (METs) assigned to all participants may not adequately reflect different subjects' efforts in terms of their different fitness levels, especially for older adults (Gallagher & Elia, 2005; Rikli, 2000). For instance, swimming laps (METs=7) may be a warm-up for one person but require a maximum effort by another (Howley, 2001). A standard METs value provided by the compendium may not be able to accurately differentiate the real metabolic rate for individual adults in their 50's or in their 80's because resting energy expenditure decreases as people age. In addition, as addressed as a limitation of using an absolute METs value in the updated compendium of physical activity, several characteristics associated with individual differences might alter the accuracy of true intensity level for an individual. Some examples of these characteristics are different body mass and body fat percentage, different age, cardiorespiratory fitness level, mechanical efficiency, varied geographic and environmental conditions (Ainsworth, et al. 2000).

Limitations of the Study

The Physically Active Leisure Index

As stated in the first chapter, the present study tried to address two methodological limitations from several previous leisure or recreation studies. First, this

study utilized METs values provided by the compendium of physical activities (Ainsworth et al., 1993; Ainsworth et al., 2000) to capture the energy expenditures of older adults' leisure activity. Second, this study adapted an internal vantage point from the subjects which allowed them to list the leisure activities rather than the researcher provide a list of leisure activities for subjects to identify (Mannell & Kleiber, 1997).

As discussed in the previous section, the development of the physically active leisure index is hampered in several ways in the present study. These problems include participants' vague responses when reporting intensity, lack of information of duration of a given activity, and disregard of individual variations (i.e. age, fitness levels, or geographic conditions).

Despite these limitations, the METs value developed by the compendium remains a popular and validated reference facilitating the coding of self-reported and observational physical activity research and provides a systematic coding scheme for comparison across studies.

Comparisons Between Three Different Types of Physical Activity

When comparing three different types of physical activity, measuring occupational physical activity is a limitation in this study because there are a great proportion of older adults who were not in the workforce. I had 467 subjects who did work for pay, allowing me to calculate their occupational PASE score and use the pairwise deletion method in the regression analysis. This means only those responses including working for pay and a valid zero score will be used to compare with leisure-

time physical activity and household physical activity. However, it might still represent a biased sample from the total population.

In addition, the different scoring algorithm in the PASE scale might also contribute to the problem. In the PASE questionnaire, leisure-time physical activity was calculated from the intensity, frequency, and duration. However, for household or occupational physical activity, the scores were only obtained from yes/no responses (Washburn, McAuley, Katula, Mihalko, & Boileau, 1999).

Implications for Policy

Although numerous policies and studies have been devoted to improving the health of the older population by promoting higher levels of physical activity, many seniors remain sedentary. Moreover, consistent maintenance of physical activity at the desired level is a major issue promoting a physically active lifestyle.

This study affirmed that leisure-time physical activities, those that are self-motivated and freely chosen, contribute more than other kinds of activities to personal health. Additionally, leisure-time physical activities, which are enjoyable and done from intrinsic motivation (Godbey, Caldwell, Floyd, & Payne, 2005; Henderson & Ainsworth, 2002), may also compensate for the sustainability problems of general exercise intervention programs.

Government policies should especially focus on providing recreation facilities and services to promote healthy active living for older adults (Dipietro, L. 2001; Godbey, et al., 2005; The Robert Wood Johnson Foundation, 2001). In fact, recently, the government

has acknowledged that parks, recreation facilities and programs are ideal settings for promoting sustainable active living. These facilities and services follow an environmental and structural approach (Centers for Disease Control and Prevention, 2001) which makes it more likely for subjects to continue participation as opposed to an intervention approach that targets only an individual's behavior. For instance, if there are more accessible sidewalks or scenic trails near the local parks, it might encourage seniors to continue walking for pleasure on a regular basis which they already enjoy doing more than an intervention exercise program.

This approach echoes one of the goal statements from the National Blueprint: Increasing Physical Activity Among Adults Age 50 and Older (The Robert Wood Johnson Foundation, 2001):

> Activity-friendly communities will be organized to provide age 50 and older adults with multiple opportunities for active aging. A major prerequisite for active aging is the maintenance of physical activity throughout the lifespan. In order to assist in the maintenance of physically active lifestyles, it is essential that policies and programs build on older people's preferences and interests and that a variety of physical activity options are made available (p. 19).

Recently, the National Recreation and Park Association (NRPA) and the authors of several studies have encouraged recreation services and parks to reposition themselves as health and wellness services in partnerships with other health professions and organizations promoting active living lifestyle (Henderson, et al., 2001; Orsega-Smith, Mowen, Payne, & Godbey, 2004; Payne, 2002).

For example, NRPA has recently been an active participant with the Centers for Disease Control and Prevention in promoting active living and developed several

successful programs such as Hearts ‘N Parks, a national, community-based program to reduce obesity and coronary heart disease.

Moreover, government policy should also recognize the benefits of recreation services and parks in reducing the mounting health care expenditures. It has been proposed that the health benefits associated with physically active leisure might reduce health expenditures (Payne, Orsega-Smith, Spangler, & Godbey, 1999). This is especially important due to the emerging aging population and prolonged life spans.

Recommendations for Future Study

As stated in the previous section concerning the limitations of the present study, one recommendation would be to include duration information in future research, which would allow a better calculation of the energy expenditures for an activity. One caution that needs to be addressed is that the duration might not be positively correlated with the overall active level. One study (Payne, Orsega-Smith, Roy & Godbey, 2005) shows that people who visit parks for a longer period may have less energy expenditures than those who visit parks for a shorter period of time. For example, people who stay in the parks for three hours may simply be having a picnic and would be socializing with their friends. On the other hand, people might do vigorous jogging, walking or bicycle riding in the parks for just a half hour. Therefore, combining the two limitations listed above, it would be helpful to develop a survey instrument for subjects to report more accurate intensity level and duration.

There is also the issue that length of time in a given form of physically active leisure may not be a positive indicator of energy expenditure. Those who spend less time in the activity may participate more intensively and thus expend more calories.

In response to the emerging need for more scientific and objective measurement of physical activities in the field of exercise sciences (Melanson & Freedson, 1996; Montoye, Kemper, Saris, & Washburn, 1996) and leisure studies (Bedimo-Rung, Mowen, Cohen, 2005; Godbey, et al. 2005), there needs to be more use of measuring devices such as pedometers, accelerometers, direct observations, or videotapes to complement perceived measures. These measuring devices might be a more accurate measurement than a subjective self-reported method. However, these methods are restricted because of the high cost and the interventions to the subjects (Dale, et al., 2002). Also, they are subject to the "Hawthorne Effect." That is, subjects may temporarily alter their normal behavior when they know it is being measured and reported.

Self-reported surveys are still a popular method used in large population-based studies. Therefore, the designing of a practical instrument and the accurate converting of the self-reported responses would reflect the active level, which still needs further research (Godbey, et al., 2005). One strategy to improve response accuracy in self-reported questionnaires among older adults is to administrate a follow-up interview in person or over the phone after receiving their questionnaires. Through this procedure, researchers have the opportunity to "check for completeness, to clarify information, and to check for any potential errors due to misunderstood terms" (Rikli, 2000, p.94). This

method could increase precision of a self-reported physical activity; however, it might be restricted in a smaller-scale study.

Another suggestion would be to obtain the distances and duration of a reported activity such as walking, jogging, or swimming. Therefore, the researchers could estimate the intensity of that activity more accurately.

Concurrent with what have been mentioned in the section of implications for policy, leisure and recreation research, there is a great potential in promoting active living for older adults. Future research should cooperate with other disciplines and professionals to better understand the broader ecological frameworks in advancing active lifestyle for the elderly and provide empirical evidence between leisure and health to bridge the gap between the theory and practice (Payne, 2002).

Summary

This chapter discussed findings from the various analytical procedures conducted in the present study. A presentation of the various descriptive and inferential statistics in chapter four is followed by a detailed discussion in this chapter.

Study findings highlight the greater importance of leisure-time physical activity than household or occupational physical activity in older adults' health. The content analysis from the open-ended leisure activities revealed that many older adults' leisure activities are sedentary. Gender, ethnicity, and geographical location were significantly related to the physically active leisure index. Men, non-white groups, and participants from warmer climate cities are more active than women, white group, and participants

from colder climate city. However, age, marital status, and education were not significantly related.

Although the physically active leisure index developed from this study did not explain as much variance as the PASE scale, it was a pilot method which was intended to incorporate more quantitative measures of physically active leisure in the field of leisure studies. These results should be considered in light of the study's limitations.

Our results demonstrated that the leisure-time physical activity is a better predictor than household or occupational physical activity in determining older adults' health and concludes that policy planning should provide recreation facilities and services to promote healthy active living for seniors. Moreover, future research should cooperate with other disciplines and professionals to provide more empirical evidence between leisure and health in advancing active lifestyle for the elderly.

Bibliography

Adams, B. G. (1993). Activity as structure and process: Friendships of older adults. In J. R. Kelly (ed.), *Activity and aging: Staying involved in later life* (pp. 73-85). Newbury Park, CA: Sage.

Administration on Aging (2004). *A Profile of Older Americans: 2003.* United States Department of Health and Human Services, Administration on Aging. Retrieved October 8, 2004, from http://www.aoa.gov/prof/statistics/profile/2003/2.asp

Ahmed, N.U., Smith, G. L., Flores, A. M., Pamies, R. J., Mason, H. R., Woods, K. F., et al. (2005). Racial/ethnic disparity and predictors of leisure-time physical activity among U.S. men. *Ethnicity & Disease, 15* (1), 40-52.

Ainsworth, B. E., Corbin, C. B., & Pangrazi, R. P. (2003, June). The compendium of physical activities. The President's Council on Physical Fitness and Sports Research Digest, 4(2), 2-8. United States Department of Health and Human Services. Retrieved September 9, 2004 from http://fitness.gov/Reading_Room/Digests/digests.html

Ainsworth, B. E., Haskell, W. L., Leon, A. S., Jacobs, D. R., Jr., Montoye, H. J., Sallis, J. F., et al. (1993). Compendium of physical activities: Energy costs of human movement. *Medicine and Science in Sports and Exercise, 25, 71-80.*

Ainsworth, B. E., Haskell, W. L., Whitt, M. C., Irwin, M. L., Swartz, A. M., Strath, S. J. et al. (2000). Compendium of physical activities: An update of activity codes and MET intensities. *Medicine and Science in Sports and Exercise, 32(Suppl. 9), S498-S504.*

Ainsworth, B. E., Richardson, M., Jacobs, D. R., Jr., & Leon, A. S. (1993). Gender difference in physical activity. *Women in Sport and Physical Activity Journal, 2 (1),* 1.

Ainsworth, B. E., Sternfeld, B., Slattery, M. L., Daguise, V., & Zahm, S. H. (1998). Physical activity and breast cancer: Evaluation of physical activity assessment methods. *Cancer*, 83(Suppl. 3), 611-620.

Allen, K., & Chin-Sang, V. (1990). A lifetime of work: The context and meaning of leisure for aging black women. *The Gerontologist, 30,* 734-740.

Allison, D. B., Fontaine, K. R., Manson, J. E., Stevens, J., & VanItallie, T. B. (1999). Annual deaths attributable to obesity in the United States. *The Journal of the American Medical Association, 282,* 1530-1538.

Allison, M. T., & Geiger, C. W. (1993). Nature of leisure activities among the Chinese-American elderly. *Leisure Sciences, 15,* 309-319.

Allison, M., & Smith, S. (1990). Leisure and the quality of life: Issues facing racial and ethnic minority elderly. *Therapeutic Recreation Journal, 24,* 50-63.

Andersen, R. E., Franckowiak, S., Christmas, C., & Walston, J. (2001). Obesity and reports of no leisure time activity among older Americans: Results from the third national health and nutrition examination survey. *Educational Gerontology, 27,* 297–306.

Armstrong, G. K., & Morgan, K. (1998). Stability and change in levels of habitual physical activity in later life. *Age and Ageing, 27,* 17-23.

Atchley, R. C. (1976). *The sociology of retirement.* New York, NY: Halstead Press.

Baum, A. (1991). A psychophysiological perspective, with emphasis on relationships between leisure, stress, and well-being. In B. L. Driver, P. J. Brown, & G. L. Peterson (eds.), *Benefits of leisure* (pp. 407-410). State College, PA: Venture.

Bedimo-Rung, A. L., Mowen, A. J., & Cohen, D. A. (2005). The significance of parks to physical activity and public health: A conceptual model. *American Journal of Preventive Medicine, 28(2S2),* 159-168.

Bennett, K. M. (1998). Gender and longitudinal changes in physical activities in later life. *Age and Ageing, 27,* 24-28.

Berlin, J. A., & Colditz, G. A. (1990). A meta-analysis of physical activity in the prevention of coronary heart disease. *American Journal of Epidemiology, 132,* 612-628.

Berry, W. D., & Feldman, S. (1991). *Multiple regression in practice.* Newbury Park, CA: Sage Publications.

Bevil, C. A., O'Connor, P. C., & Mattoon, P. M. (1993). Leisure activity, life satisfaction, and perceived health status in older adults. *Gerontology and Geriatrics Education, 14(2),* 3-19.

Bijnen, F. C., Feskens, E. J., Caspersen, C. J., Nagelkerke, N., Mosterd, W. L., & Kromhout, D. (1999). Baseline and previous physical activity in relation to mortality in elderly men: The Zuphen Elderly Study. *American Journal of Epidemiology, 150,* 1289-1296.

Blair, S. N., & Brodney, S. (1999). Effects of physical inactivity and obesity on morbidity and mortality: Current evidence and research issues. *Medicine and Science in Sports and Exercise,* 31(Suppl. 11), S646-S662.

Blew, R. M., Sardinha, L. B., Milliken, L. A., Teixeira, P. J., Going, S. B., Ferreira, D. L., et al. (2002). Assessing the validity of body mass index standards in early postmenopausal women. *Obesity Research, 10,* 799-808.

Bouchard, C, Shephard, R. J., & Stevens, T. (eds.) (1994). Physical activity, fitness, and health: International proceedings and consensus statement. In: Proceedings of the 1992 International Conference on Physical Activity, Fitness, and Health. Champaign, IL: Human Kinetics.

Brown, C. D., Higgins, M., Donato, K. A., Rohde, F. C., Garrison, R., Obarzanek, E., et al. (2000). Body mass index and the prevalence of hypertension and dyslipidemia. *Obesity Research, 8,* 605-619.

Buchner, D. M. (1997). Physical activity interventions in older adults. In A. S. Leon (ed.), Physical activity and cardiovascular health: A national consensus (pp. 228-235). Champaign, IL: Human Kinetics.

Caldwell, L. L., & Smith, E. A. (1994). Leisure and mental health of high risk adolescents. In D. M. Compton & S. E. Iso-Ahola (Eds.). *Leisure and mental health* (pp.330-345). Park City, UT: Family Development Resources.

Calle, E. E., Rodriguez, C., Walker-Thurmond, K., & Thun, M. J. (2003). Overweight, obesity, and mortality from cancer in a prospectively studied cohort of US adults. *The New England Journal of Medicine, 348,* 1625-1638.

Campbell, A. J., Borrie, M. J., & Spears, G. F. (1989). Risk factors for falls in a community-based prospective study of people 70 years and older. *Journal of Gerontology, 44,* M112-117.

Carpenter, G. (1994). Leisure and health during middle adulthood: A case study. In D. M. Compton & S. E. Iso-Ahola (Eds.), *Leisure & mental health (pp.98-111).* Park City, UT: Family Development Resources.

Carstensen, L. L., Isaacowitz, D. M., & Charles, S. T. (1999). Taking time seriously: A theory of socioemotional selectivity. *American Psychologist, 54*(3), 165-181.

Caspersen, C. J., Pereira, M. A., & Curran, K. M. (2000). Changes in physical activity patterns in the U.S. by cross-sectional age and sex. *Medicine and Science in Sports and Exercise, 32*(9), 1601-1609.

Caspersen, C. J., Powell, K. E., & Christenson, G. M. (1985). Physical activity, exercise, and physical fitness: Definitions and distinguish for health-related research. *Public Health Reports, 100,* 126-131.

Cauley, J. A., Petrini, A. M., LaPorte, R. E., Sandler, R. B., Bayles, C. M., Robertson, R. J., et al. (1987). The decline of grip strength in the menopause: Relationship to

physical activity, estrogen use and anthropometric factors. *Journal of Chronic Disease, 40,* 1115-1120.

Centers for Disease Control and Prevention (2000, May 19). Prevalence of leisure-time and occupational physical activity among employed adults --- United States, 1990. *Morbidity and Mortality Weekly Report, 49(19),* 420-424.

Centers for Disease Control and Prevention (2001, March 9). Physical activity trends_United States, 1990-1998. *Morbidity and Mortality Weekly Report, 50(9),* 166-169.

Centers for Disease Control and Prevention (2001, October 26). Increasing physical activity: A report on recommendation of the Task Force on community preventive services. *Morbidity and Mortality Weekly Report, 50,* 1-16.

Centers for Disease Control and Prevention (2005). *Overweight and obesity: defining overweight and obesity.* Retrieved December 22, 2005, from http://www.cdc.gov/nccdphp/dnpa/obesity/defining.htm.

Chodzko-Zajko, W. J. (1998). Physiology of aging and exercise. In R. T. Cotton, C. J. Ekeroth, H. Yancy (eds.), *Exercise for older adults: ACE's guide for fitness professionals* (pp. 1-23). San Diego, CA: American Council on Exercise.

Cohen, S., & Wills, T. (1985). Stress, social support, and the buffering hypothesis: An integrative review. *Psychological Bulletin, 98,* 310-357.

Coleman, D., & Iso-Ahola, S. E. (1993). Leisure and health: The role of social support and self-determination. *Journal of Leisure Research, 25,* 111-128.

Conway, J. M., Seale, J. L., Jacobs, D. R., Jr., Irwin, M. L., & Ainsworth, B. E. (2002). Comparison of energy expenditure estimates from doubly labeled water, a physical activity questionnaire, and physical activity records. *American Journal of Clinical Nutrition, 75,* 519-525.

Coogan, P. F., Newcomb, P. A., Claap, R. W., Trentham-Dietz, A., Baron, J. A., & Longnecker, M. P. (1997). Physical activity in usual occupation and risk of breast cancer (United States). *Cancer Causes and Control, 8,* 626-631.

Cooper-Patrick, L., Ford, D. E., Mead, L. A., Chang, P. P. & Klag, M. J. (1997). Exercise and depression in midlife: A prospective study. *American Journal of Public Health, 87,* 670-673.

Corbin, C. B., Lindsey, R., & Welk, G. J. (2001). Concepts of fitness and wellness: A comprehensive lifestyle approach (3rd ed.). St. Louis, MO: McGraw Hill Higher Education.

Crandall, R. (1979). Social interaction, affect and leisure. *Journal of Leisure Research, 11*, 165-181.

Crespo, C. J., Smit., E. Andersen, R. E., Carter-Pokras, O., & Ainsworth, B. E. (2000). Race/ethnicity, social class and their relation to physical inactivity during leisure time: Results from the Third National Health and Nutrition Examination Survey, 1988-1998. *American Journal of Preventative Medicine, 18*, 46-53.

Crystal, S., Johnson, R. W., Harman, J., Sambamoorthi, U., & Kumar, R. (2000). Out-of-pocket health care costs among older Americans. *Journals of Gerontology Series B: Psychological Sciences and Social Sciences, 55* (1), S51-S62.

Dale, D., Welk, G. J., & Matthews, C. E. (2002). Methods for assessing physical activity and challenges for research. In G. J. Welk (Ed.), *Physical activity assessments for health-related research* (pp.19-34). Champaign, IL: Human Kinetics.

Desai, M. M., Zhang, P. & Hennessy, C. H. (1999, December 17). Surveillance for morbidity and mortality among older adults -- United States, 1995-1996. *Morbidity and Mortality Weekly Report, 48*(SS08), 7-25.

Dipietro, L. (2001). Physical activity and aging: Changes in patterns and their relationship to health and function. *The Journals of Gerontology, 56*, 13-22.

DiPietro, L., Williamson, D. F., Caspersen, C. J., & Eaker, E. (1993). The descriptive epidemiology of selected physical activities and body weight among adults trying to lose weight: The Behavioral Risk Factor Surveillance System survey, 1989. *International Journal of Obesity and Related Metabolic Disorders, 17*(2), 69-76.

Dishman, R. K. (1988). Overview. In R. K. Dishman (Ed.), *Exercise adherence: Its impact on public health (pp. 1-9).* Champaign, IL: Human Kinetics.

Donald, M. N., & Havighust, R. T. (1959). The meaning of leisure. *Social Force, 37*, 355-360.

Evenson, K. R., Wilcox, S., Pettinger, M., & Brunner, R. (2002). Vigorous leisure activity through women's adults life: The women's health initiative observational cohort study. *American Journal of Epidemiology, 156*, 945-953.

Evenson, K., Rosamond, W., Cal, J., Pereira, M. A., & Ainsworth, B. (2003). Occupational physical activity in the atherosclerosis risk in communities study. *Annals of Epidemiology, 13*, 351-357.

Fillenbaum, G. G. (1985). Screening the elderly: A brief instrumental activities of daily living measure. *Journal of the American Geriatrics Society, 33*, 698-706.

Fitzgerald, J. T., Singleton, S. P., Neale, A. V., Prasad, A. S., & Hess, J. W. (1994). Activity levels, fitness status, exercise knowledge, and exercise beliefs among healthy, older African American and white women. *Journal of Aging and Health, 6*(3), 296-313.

Fogelholm, M., & Kukkonen-Harjula, K. (2000). Does physical activity prevent weight gain: A systematic review. *Obesity Reviews, 1(2),* 95-111.

Fontaine, K. R., Redden, R. T., Want, C., Westfall, A. O., & Allison, D. B. (2003). Years of life lost due to obesity. *The Journal of the American Medical Association, 289(2),* 187-193.

Fraser, G., & Pearce, N. (1993). Occupational physical activity and risk of cancer of the colon and rectum in New Zealand males. *Cancer Causes and Control, 4*(1), 45-50.

Freysinger, V. J., & Nevius, C. (1992). Activity involvement and self-confidence in later adulthood: A descriptive study. In B. A. Hawkins & R. Rothschadl (Eds.), *Proceedings of the Sandra A. Modisett Symposium on Aging and Leisure in the 1990's (pp. 41-46).* Reston, VA: AAH-PERD.

Freysinger, V. J., & Stanley, D. (1995). The impact of age, health and sex on the frequency of older adults' leisure activity participation: A longitudinal study. *Activities, Adaptation & Aging, 19,* 31-42.

Frontera, W. R., & Meredith, C. N. (1993). Exercise in the rehabilitation of the elderly. In: G. Felsenthal, S. J. Garrison, & F. U. Steinberg (Eds.), *Rehabilitation of the aging and elderly patient* (pp. 35–46). Baltimore, MD: Williams & Wilkins.

Frontera, W. R., & Meredith, C. N. (1989). Strength training in the elderly. In R. Harris & S. Harris (Eds.), Physical activity, aging and sports (pp. 319-331). Albany, NY: Centre for the Study of Aging.

Frontera, W. R., Hughes, V. A., Lutz, K. S., & Evans, W. S. (1991). A cross-sectional study of muscle mass and strength in 45–78 year-old men and women. *Journal of Applied Physiology, 71*, 644–650.

Gallagher, D., & Elia, M. (2005). Body composition, organ mass, and resting energy expenditure. In S. Heymsfield, T. Lohman, Z. Want, & S. Going (Eds.). *Human body composition* (2nd ed.) (pp. 219-240). Champaign, IL: Human Kinetics.

Garbin, C. P. (n.d.). *Research design and data analysis.* Retrieved Feb 15, 2006 from University of Nebraska, Department of Psychology web site http://www-class.unl.edu/psycrs/

Garson, G. D. (n.d.). *Quantitative research in public administration: Multiple regression.* Retrieved June 5, 2005, from North Carolina State University, College of

Humanities and Social Sciences, Department of Public Administration Web site: http://www2.chass.ncsu.edu/garson/pa765/regress.htm

Garson, G. D. (n.d.). *Quantitative research in public administration: Canonical correlation.* Retrieved May 26, 2005, from North Carolina State University, College of Humanities and Social Sciences, Department of Public Administration Web site: http://www2.chass.ncsu.edu/garson/pa765/canonic.htm

Giovannucci, H., Ascherio, A., Rimm, E. B., Colditz, G. A., Stampfer, M. J., & Willett, W. C. (1995). Physical activity, obesity, and risk for colon cancer and adenoma in men. *Annals of Internal Medicine, 122*, 327-334.

Glenny, A-M., O'meara, S., Melville, A., Sheldon, T. A., & Wilson, C. (1997). The treatment and prevention of obesity: A systematic review of the literature. *International Journal of Obesity, 21,* 715-737.

Godbey, G. (1997). *Leisure and leisure services in the 21st century.* State College, PA: Venture.

Godbey, G. (2003). Leisure in your life: An exploration (6th ed.). State College, PA: Venture.

Godbey, G. C., Caldwell, L., Floyd, M., & Payne, L. (2005). Contributions of leisure studies and recreation and park management research to the active living agenda. *American Journal of Preventive Medicine, 28 (2S2),* 150-158.

Godbey, G., Graefe, A., & James, S. (1993). Use and benefits of local recreation and park services. *Parks and Recreation, 39-43.*

Godbey, G., Payne, L., & Orsega-Smith, E. (2002). *Increasing Physical Activity Among Older Adults.* Testimony to a US Congressional Briefing sponsored by the National Coalition for the Promotion of Physical Activity, Washington, DC. October 10, 2002. Retrieved May 25, 2004 from http://www.ncppa.org/publications.asp

Godbey, G., Payne, L., & Orsega-Smith, E. (2001). *The relation of local government recreation and park services to the health of older adults.* A research proposal to the Robert Wood Johnson Foundation, Princeton, NJ.

Godbey, G., Roy, M., Payne, L., & Orsega-Smith, E. (1998). *Final research report for the health and park use study.* University Park, PA: The Pennsylvania State University.

Griffin, J., & McKenna, K. (1998). Influences on leisure and life satisfaction of elder people. *Physical and Occupational Therapy in Geriatrics, 15*(4), 1-16.

Gutiérrez-Fisac, J. L., Guallar-Castillón, P., Díez-Gañán, L., Gopez, G. E., Banegas, J. R., & Rodríguez, A. F. (2002). Work-related physical activity is not associated with body mass index and obesity. *Obesity Research, 10,* 270-276.

Hagberg, J. M. (1987). Effect of training on the decline of VO2 Max with aging. *Federation Proceedings, 46,* 1830-1833.

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2006). *Multivariate data analysis* (6th ed.). Upper Saddle River, NJ: Pearson Prentice Hall.

Harris, R. (1977). Fitness and the aging process. In R. Harris, L. J.Frankel, & S. Harris (Eds.), *Guide to fitness after fifty* (pp. 3-11). New York: Plenum Press.

Harvell, S. (1990). Leisure participation of senior citizens before and after age 60 Abstract from: Proquest File: *Dissertation Abstracts Item: 891578.*

Hays, R. D., Sherbourne, C. D., & Mazel, R. M. (1995). *User's manual for medical outcomes study (MOS): Core measures of health-related quality of life.* Rand Corporation (MR-162-RC). Retrieved July 8, 2004, from http://www.rand.org/publications/MR/MR162/

He, X. Z., & Baker, D. W. (2005). Differences in leisure-time, household, and work-related physical activity by race, ethnicity, and education. *Journal of General Internal Medicine, 20,* 259-266.

Hedley, A. A., Ogden, C. L., Johnson, C. L., Carroll, M. D., Curtin, L. R., & Flegal, K. M. (2004). Prevalence of overweight and obesity among US children, adolescents, and adults, 1999-2002. *The Journal of the American Medical Association, 291,* 2847-2850.

Henderson, K. A., & Ainsworth, B. E. (2002). Enjoyment: A link to physical activity, leisure, and health. *Journal of Park and Recreation Administration, 20(4),* 130-146.

Henderson, K. A., Neff, L. J., Sharpe, P. A., Greaney, M. L., Royce, S. W. & Ainsworth, B. E. (2001). "It takes a village" to promote physical activity: The potential for public park and recreation department. *Journal of Park and Recreation Administration, 19(1),* 23-41.

Herzog, A. R. Ofstedal, M. B. & Wheeler, L. M. (2002). Social engagement and its relationship to health. *Clinics in Geriatric Medicine, 18(3),* 593-609.

Ho, C., Sasidharan, V., Elmendorf, W., Willits, F. K., Graefe, A., & Godbey, G. (2005). Gender and ethnic variations in urban park preferences, visitation, and perceived benefits. *Journal of Leisure Research, 37*(3), 281-306.

Hooyman, N., & Kiyak, H. (1996). *Social gerontology* (4th ed.). Boston, MA: Allyn & Bacon.

Horgas, A. L., Wilms, H., & Baltes, M. (1998). Daily life in very old age: Everyday activities as expression of successful living. *The Gerontologist, 38(*5), 556-568.

Howley, E. T. (2001). Type of activity: Resistance, aerobic and leisure versus occupational physical activity. *Medicine & Science in Sports & Exercise, 33(Suppl. 6),* S364-369.

Hughes, S. L., Seymour, R. B. Campbell, R., Pollak, N., Huber, G., & Sharma, L. (2004). Impact of the fit and strong intervention on older adults with osteoarthritis. *The Gerontologist, 44(2),* 217-228.

Iso-Ahola, S. E. (1980). *The social psychology of leisure and recreation.* Dubuque, IA: Wm. C. Brown.

Kaplan, M. S., Newsom, J. T., McFarland, B. H., & Lu, L. (2001). Demographic and psychosocial correlates of physical activity in late life. *American Journal of Preventive Medicine, 21*(4), 306-312.

Kelly, J. R., & Godbey, G. (1992). *The sociology of leisure.* State College, PA: Venture.

Kelly, J. R. (1996). *Leisure* (3rd ed.). Boston. MA: Allyn and Bacon.

Kelly, J. R., Steinkamp, M. W., Kelly, J. R. (1987). Later-life satisfaction: Does leisure contribute? *Leisure Sciences, 9,* 189-200.

Kelly, J. R., Steinkamp, S., & Kelly, J. R. (1986). Later life leisure: How they play in Peoria. *The Gerontologist, 26*(5), 531-537.

King, G. A., Fitzhugh, E. C., Bassett, D. R. Jr., McLaughlin, J. E., Strath, S. J., Swartz, A. M., et al. (2001). Relationship of leisure-time physical activity and occupational activity to the prevalence of obesity. *International Journal of Obesity and Related Metabolic Disorders, 25,* 606-612.

Kligman, E. W., Hewitt, M. J., & Crowell, D. L. (1999). Recommending exercise to health older adults: The preparticipation evaluation and exercise prescription [Electronic version]. *The Physician and Sportsmedicine, 27*(11), 42-62.

Koenig, W., Sund, M., Döring, A., & Ernst, E. (1997). Leisure-time physical activity but not work-related physical activity is associated with decreased plasma viscosity: Results from a large population sample. *Circulation, 95,* 335-341.

Larson, R., Mannell, R., & Zuzanek, J. (1986). Daily well-being of older adults with friends and family. *Journal of Psychology and Aging, 1,* 117-126.

Lawlor, D. A., Taylor, M., Bedford, C., & Ebrahim, S. (2002). Is housework good for health? Levels of physical activity and factors associated with activity in elderly women. Results from the British Women's Heart and Health Study [Electronic version]. *Journal of Epidemiology and Community Health, 56,* 473-478.

Lee, I. M., Hsieh, C. C., & Paffenbarger, R. S. Jr. (1995). Exercise intensity and longevity in men: The Harvard Alumni Health Study. *The Journal of the American Medical Association, 273,* 1179–1184.

Lee, J.-H., Scott, D., & Floyd, M. F. (2001). Structural inequalities in outdoor recreation participation: A multiple hierarchy stratification perspective. *Journal of Leisure Research, 33*(4), 427-449.

Lee, Y. S. (2005). Gender differences in physical activity and walking among older adults. *Journal of Women & Aging, 17*(1), 55-70.

Leino-Arjas, P., Solovieva, S., Riihimäki, H., Kirjonen, J., & Telama, R. (2004). Leisure time physical activity and strenuousness of work as predictors of physical functioning: a 28 year follow up of a cohort of industrial employees. *Occupational and Environmental Medicine, 61,* 1032-1038.

Lewin, C. (2005). Elementary quantitative methods. In B. Somekh & C. Lewin (Eds.), *Research methods in the social science (pp. 215-225).* Landon: Sage.

Macera, C. A., Ham, S. A., Yore, M. M., Jones, D. A., Ainsworth, B. E., Kimsey, C. D., et al. (2005). Prevalence of physical activity in the United States: Behavioral risk factor surveillance system, 2001. *Preventing Chronic Disease, 2*(2), 1-10. Retrieved June 1, 2005, from http://www.cdc.gov/pcd/issues/2005/apr/04_0114.htm.

Mannell, R. C. (1999). Older adults, leisure, and wellness. *Journal of Leisurability, 26(2),* 3-10.

Mannell, R. C., & Kleiber, D. A. (1997). *A social psychology of leisure.* State College, PA: Venture.

Manson, J. E., Willett, W. C., Stampfer, M. J., Colditz, G. A., Hunter, D. J., Hankinson, S. E., et al. (1995). Body weight and mortality among women. *The New England Journal of Medicine, 333,* 677-685.

Matthews, C. E., Freedson, P. S., Hebert, J. R., Stanek, E. J., III, Merriam, P. A., Rosal, M. C., et al. (2001). Seasonal variation in household, occupational, and leisure time physical activity: Longitudinal analyses from the seasonal variation of blood cholesterol study. *American Journal of Epidemiology, 153(2),* 172-183.

McDowell, I., & Newell, C. (1996). *Measuring health: A guide to rating scales and questionnaires* (2nd ed.). Oxford: Oxford University Press.

Melanson, E. L., & Freedson, P. S. (1996). Physical activity assessment: A review of methods. *Critical Reviews in Food Science and Nutrition, 36,* 385-396.

Merrill, R. M., Shields, E. C., White, G. L., Jr., Druce, D. (2005). Climate conditions and physical activity in the United States. *American Journal of Health Behavior, 29 (4),* 371- 381.

Michaud, D. S., Giovannucci, E., Willett, W. C., Colditz, G. A., Stampfer, M. J., & Fuchs, C. S. (2001). Physical activity, obesity, height, and the risk of pancreatic cancer. *The Journal of the American Medical Association, 286(8),* 921-929.

Mobily, K. E., Wallace, R. B., Kohout, F. J., Leslie, D. K., Lemke, J. H., & Morris, M. C. (1984). Factors associated with the aging leisure repertoire: The Iowa 65 plus rural health study. *Journal of Leisure Research, 16*(4), 338-343.

Montoye, H. J., Kemper, H. C. G., Saris, H. M. & Washburn, R. A. (1996). *Measuring physical activity and energy expenditure* (pp. 3-14). Champaign, IL: Human Kinetics.

Munro, B. H. (2005). *Statistical methods for health care research* (5th ed.). New York, NY: Lippincott Williams & Wilkins.

Neulinger, J., & Breit, M. (1971). Attitude dimensions of leisure: A replication study. *Journal of Leisure Research, 3*, 108-115.

New England Research Institutes (1991). *Physical activity scale for the elderly*. Watertown, MA: New England Research Institutes.

Older Americans 2000 (n.d.). Key indicators of well-being. Interagency Forum on Aging-Related Statistics. Retrieved October 1, 2004, from http://www.agingstats.gov/chartbook2000/frontmatter.pdf

Orsega-Smith, E., Mowen, A. J., Payne, L., & Godbey, G. (2004). The interaction of stress and park use on psycho-physiological health in older adults. *Journal of Leisure Research, 36(2),* 232-256.

Paffenbarger, R. S., Jr., Kampert, J. B., Lee, I. M., Hyde, R. T., Leung, R. W., & Wing, A. L. (1994). Changes in physical activity and other lifeway patterns influencing longevity. *Medicine and Science in Sports and Exercise, 26*(7), 857-865.

Payne, L. (2002). Progress and challenges in repositioning leisure as a core component of health. *Journal of Park and Recreation Administration, 20(4),* 1-11.

Payne, L., Orsega-Smith, E., Roy, M., & Godbey, G. (1998, November). *Influence of park use on the health of older adults.* Paper presented at annual meeting of the Gerontological Society of America, Philadelphia, PA.

Payne, L., Orsega-Smith, E., Roy, M., & Godbey, G. C. (2005). Local park use and personal health among older adults: An exploratory study. *Journal of Park and Recreation Administration, 23*(12), 1-20.

Payne, L., Orsega-Smith, E., Spangler, K. J., & Godbey, G. (1999, October). Local parks and recreation: For the health of it. *Parks & Recreation, 34,* 72-77.

Peeters, A., Barendregt, J. J., Willekens, F., Mackenbach, J. P., Mamun, A. A., & Bonneux, L. (2003). Obesity in adulthood and its consequences for life expectancy: A life table analysis. *Annals of Internal Medicine, 138*(1), 24-32.

Plotnikoff, R., Mayhew, A., Birkett, N., Loucaides, C., & Fodor, G. (2004). Age, gender, and urban-rural differences in the correlates of physical activity. *Preventive Medicine, 39*(6), 1115-1125.

Powell, K. E., Thompson, P. D., Caspersen, C. J., & Kendricks, J. S. (1987). Physical activity and the incidence of coronary heart disease. *Annual Review of Public Health, 8,* 253-287.

Ragheb, M. G. (1993). Leisure and perceived wellness: A field investigation. *Leisure Sciences, 15,* 13-24.

Rantanen, T., Era, P., & Heikkinen, E. (1997). Physical activity and the changes in maximal isometric strength in men and women from the age of 75 to 80 years. *Journal of the American Geriatrics Society, 45*(12), 1534-1535.

Reilly, J. J., Wilson, M. L., Summerbell, C. D., & Wilson, D. C. (2002). Obesity: Diagnosis, prevention, and treatment, evidence based answers to common questions. *Archives of Disease in Childhood, 86,* 392-394.

Rice, D. P. (1996). Beneficiary profile: Yesterday, today, and tomorrow. *Health Care Financing Review, 18*(2), 23-46.

Riddick, C. C., & Daniel, S. N. (1984). The relative contribution of leisure activities and other factors to the mental health of older women. *Journal of Leisure Research, 16,* 136-148.

Riddick, C. C., & Stewart, D. G. (1994). An examination of the life satisfaction and importance of leisure in the lives of older female retirees: A comparison of blacks to whites. *Journal of Leisure Research, 26(1),* 75-87.

Rikli, R. E. (2000). Reliability, validity, and methodological issues in assessing physical activity in older adults. *Research Quarterly for Exercise and Sport, 71(2),* 89-96.

Rothenbacher, D., Hoffmeister, A., Brenner, H., & Koenig, W. (2003). Physical activity, coronary heart disease, and inflammatory response. *Archives of Internal Medicine, 163,* 1200-1205.

Russienello, C. V. (1994). Recreational therapy: A medicine model. In D. M. Compton & S. E. Iso-Ahola (Eds.), *Leisure and mental health* (Vol. 1, pp. 247-259). Park City, UT: Family Development Resources.

Santiago, M. C., & Coyle, C. P. (2004). Leisure-time physical activity among women with mobility impairments: Implications for health promotion and leisure education. *Therapeutic Recreation Journal, 38(2),* 188-205.

Sardinha, L. B., & Teixeira, P. J. (2000). Obesity screening in older women with the body mass index: A receiver operating characteristic (ROC) analysis. *Science & Sports, 15,* 212–219.

Sardinha, L. B., & Teixeira, P. J. (2005). Measuring adiposity and fat distribution in relation to health. In S. B. Heymsfield, T. Lohman, Z-M, Wang, S. B. Going (Eds.), *Human body composition* (2nd ed.) (pp.177-202). Champaign, IL: Human Kinetics.

Schaie, K. W., & Willis, S. L. (2002). *Adult development and aging (5th ed.).* Upper Saddle River, NJ: Prentice Hall.

Schiller, J. S., Adams, P. F., Coriaty, N. Z. (2005). Summary health statistics for the U.S. population: National Health Interview Survey, 2003. National Center for Health Statistics. Vital Health Stat 10(224).

Schoenborn, C. A. (2004). Marital status and health: United States, 1999-2002. *Advance Data. 15*(351), 1-32.

Searle, M. S., & Iso-Ahola, S. E. (1988). Determinants of leisure behavior among retired adults. *Therapeutic Recreation Journal, 22(2),* 38-46.

Searle, M. S., Mactavish, J., & Brayley, R. E. (1993). Integrating ceasing participation with other aspects of leisure behavior: A replication and extension. *Journal of Leisure Research, 25,* 389-404.

Sharpe, P. A., Jackson, K. L., White, C., & Vaca, V. L., Hickey, T., Gu, J., et al. (1997). Effects of a one-year physical activity intervention for older adults at congregate nutrition sites. *The Gerontologist, 37(2),* 208-215.

Shary, J. M., & Iso-Ahola, S. E. (1989). Effects of a control-relevant intervention on nursing home residents' perceived competence and self-esteem. *Therapeutic Recreation Journals, 23,* 7-16.

Shephard, R. J. (2001). Absolute versus relative intensity of physical activity in a dose-response context. *Medicine and Science in Sports and Exercise, 33(*Suppl. 6*),* S400-S418.

Sobti, A., Cooper, C., Inskip, H., Searle, S., & Coggon, D. (1997). Occuptaional physical activity and long term risk of musculoskeletal symptoms: A national survey of post office pensioners. *American Journal of Industrial Medicine, 32(1),* 76-83.

Sorock, G. S., Bush, T. L., Golden, A. L., Fried, L. P., Breuer, B., & Hale, W. E. (1988). Physical activity and fracture risk in a free-living elderly cohort. *Journal of Gerontology, 43(5),* M134-139.

Stanley, D., & Freysinger, V. J. (1995). The impact of age, health, and sex on the frequency of older adults' leisure activity participation: A longitudinal study. *Activities, Adaptation & Aging, 19(3),* 31-42.

Stewart, A. L., Hays, R. D., & Ware, J. E., Jr. (1988). The MOS short-form general health survey. Reliability and validity in a patient population. *Medical Care, 26*(7), 724-735.

Strain, L. A., Grabusic, C. C., Searle, M. S., & Dunn, N. J. (2002). Continuing and ceasing leisure activities in later life: A longitudinal study. *The Gerontologist, 42(2),* 217-223.

Teague, M. L., McGhee, V. L., Rosenthal, D. M., & Kearns, D. (1997). *Health pomoting: Achieving high level wellness in the later years (3rd ed.)*. Dubuque, LA: Brown and Benchmark.

The Robert Wood Johnson Foundation (2001). *National Blueprint: Increasing physical activity among adults age 50 and older.* Princeton, NJ: The Robert Wood Johnson Foundation.

Thompson, P. D., Buchner, D., Pina, I. L., Balady, G. J., Williams, M. A., Marcus, B. H., et al. (2003). Exercise and physical activity in the prevention and treatment of atherosclerotic cardiovascular disease [Electronic version]. *Circulation, 107,* 3109-3116.

Thompson, S. & Hoekenga, S. (1998). Understanding and motivating. In R. T. Cotton, C. J. Ekeroth, & H. Yancy, (Eds.), *Exercise for older adults: ACE's guide for fitness professionals* (pp. 24-70). San Diego, CA: American Council on Exercise.

Tinsley, H. E. A., Colbs, S. L., Teaff, J. D., & Kaufman, N. (1987). The relationship of age, gender, health and economics status to the psychological benefits older persons report from participation in leisure activities. *Leisure Sciences, 9*, 53-65.

Uitenbroek, D. G. (1993). Seasonal variation in leisure time physical activity. *Medicine and Science in Sports and Exercise, 25*, 755–760.

United States Census (2003). *United States Census 2000: Educational Attainment: 2000*. Retrieved, March 08, 2006, from http://www.census.gov/prod/2003pubs/c2kbr-24.pdf.

United States Department of Health and Human Services (1996). *Physical activity and health: A report of the Surgeon General.* Atlanta: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion.

United States Department of Health and Human Services (2000, January). *Healthy People 2010.* Washington, DC: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion. Retrieved Feb 26, 2006, from www.health.gov/healthypeople/

Wagner, E. H., LaCroix, A. Z., Grothaus, L. C., & Hecht, J. A. (1993). Responsiveness of health status measures to change among older adults. *Journal of the American Geriatrics Society, 41*, 241-248.

Walter-Ginzburg, A., Chetrit, A., Medina, C., Blumstein, T., Gindin, J., & Modan, B. (2001). Physician visits, emergency room utilization, and overnight hospitalization in the old-old in Israel: The cross-sectional and longitudinal aging study (CALAS). *Journal of the American Geriatrics Society, 49*, 549-556.

Wankel, L. (1993). The importance of enjoyment to adherence and psychological benefits from physical activity. *International Journal of Sport Psychology, 24*, 151-169.

Wankel, L. M. (1987). Enhancing motivation for involvement in voluntary exercise programs. In M. L. Maehr (Ed.), *Advances in motivation and achievement: Enhancing motivation* (vol. 5). Greenwich, CT: JAI Press.

Washburn, R. A. (2000). Assessment of physical activity in older adults. *Research Quarterly for Exercise and Sport, 71*(Suppl.), 79-89.

Washburn, R. A., McAuley, E., Katula, J., Mihalko, S. L., & Boileau, R. A. (1999). The physical activity scale for the elderly (PASE): Evidence for validity. *Journal of Clinical Epidemiology, 52*(7), 643-651.

Washburn, R. A., Smith, K. W., Jette, A. M., & Janney, C. A. (1993). The Physical Activity Scale for the Elderly (PASE): Development and evaluation. *Journal of Clinical Epidemiology, 46*(2), 153-162.

Willett, W. C., Manson, J. E., Stampfer, M. J., Colditz, G. A., Rosner, B., Speizer, F. E., et al. (1995). Weight, weight change, and coronary heart disease in women: Risk within the "normal" weight range. *The Journal of the American Medical Association, 273(6*), 461-465.

Willis, J. D., & Campbell, L. F. (1992). *Exercise psychology.* Champaign, IL: Human Kinetics.

Wing, R. R. (1999). Physical activity in the treatment of the adulthood overweight and obesity: Current evidence and research issues. *Medicine and Science in Sports and Exercise, 31,* S547-S552.

Winkleby, M. A., Kraemer, H. C., Ahn, D. K., & Varady, A. N. (1998). Ethnic and socioeconomic differences in cardiovascular disease risk factors: Findings for women from the Third National Health and Nutrition Examination Survey, 1988–1994. *The Journal of the American Medical Association, 280,* 356–362.

World Health Organization (1948). WHO definition of Health. Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference, New York, 19-22 June, 1946; signed on 22 July 1946 by the representatives of 61 States (Official Records of the World Health Organization, no. 2, p. 100) and entered into force on 7 April 1948. Retrieved October 10, 2004, from http://www.who.int/about/definition/en/

World Health Organization (1997). *The Heidelberg guidelines for promoting physical activity among older persons.* Geneva: World Health Organization.

Yusuf, H. R., Croft, J. B., Giles, W. H., Anda, R. F., Casper, M. L., Caspersen, C. J., & Jones, D. A. (1996, June 24). Leisure-time physical activity among older adults-United States, 1990. *Archives of Internal Medicine, 156 (12).*

Zheng, W., Shu, X. O., Mclaughlin, J. K., Chow, W. H., Gao, Y. T., & Blot, W. J. (1993). Occupational physical activity and the incidence of cancer of the breast, corpus uteri, and ovary in Shanghai. *Cancer, 71*(11), 3620-3624.

Appendix A

Survey Instrument

Park/Recreation Use and Personal Health Study In

Conducted by

University of Illinois
The Pennsylvania State University
University of Delaware

Sponsored by

The Robert Wood Johnson Foundation

Thank you for participating in this study! All of your answers are important. Please be assured that all of the information you give is completely confidential. Your name does not appear anywhere on the questionnaire.

Please use the enclosed #2 pencil to fill in the circles next to the answer categories that best reflect your opinions and behaviors.

After completing the survey, mail back the packet as soon as possible.
Include the following:

1. The completed survey.
2. The signed consent form. (You may keep the extra copy.)
3. The focus group interest form.

PLEASE DO NOT WRITE IN THIS AREA

SERIAL

Section A: Use of Recreation and Park Services

Instructions: Please answer the following questions about your park activities.

1. Is there a local park within walking distance of your home?
- ○ Yes
- ○ No

2. How often do you use your local park areas or playgrounds during the summer months, June through September?
- ○ Never (Skip to Q. 8)
- ○ Less than 1 time per month
- ○ 1-3 times per month
- ○ 1 time per week
- ○ 2-3 times per week
- ○ 4 or more times per week

3. During your most recent local park visit, how did you travel to the park? ***Choose the one primary method.***
- ○ By car
- ○ Walked
- ○ Bicycled
- ○ By bus
- ○ Other (*specify below)*

_____

4. Who was with you during your most recent visit?
Mark all that apply.
- ○ No one, I was alone.
- ○ Friends
- ○ Family
- ○ Other (*specify below)*

_____

5. Who suggested visiting the park?
Mark the one best answer.
- ○ Self
- ○ Spouse / Significant other
- ○ Friend
- ○ Children
- ○ Parent
- ○ Grandchild
- ○ Co-worker
- ○ Other *(specify below)*

_____

6. How long did you stay during your most recent visit to the park?
- ○ Less than 15 minutes
- ○ 15 - 29 minutes
- ○ 30 - 44 minutes
- ○ 45 - 59 minutes
- ○ 1 hour to 1 hour & 29 mins
- ○ 1 hour & 30 mins to 2 hours
- ○ More than 2 hours

7. How often have you participated in organized activities/programs at this city's park & recreation department?

- ○ Never
- ○ Less than 1 time per month
- ○ 1-3 times per month
- ○ 1 time per week
- ○ 2-3 times per week
- ○ 4 or more times per week

8. In which of the following local park & recreation district programs have you participated in the past 12 months?
Mark all that apply.

- ○ Sport programs (golf, tennis, ...)
- ○ Group exercise (yoga/tai chi, aerobics, ...)
- ○ Dance classes (line, ballroom, ...)
- ○ Arts & crafts (knit, floral arrangement, ...)
- ○ Outdoor (gardening, nature education, ...)
- ○ Clubs (books, walking, cards, tours, ...)
- ○ Self-directed exercise (lap swim, weights, treadmill, bicycle, ...)

Section B: Your Leisure Activities

1. List **up to 6** recreation and leisure activities which you enjoy doing regularly. These may include anything from watching TV, playing sports, walking in a park, visiting friends, pursuing hobbies, visiting nightclubs, to attending concerts or museums, or taking classes.
For each activity, select benefit codes 1-21, below, to indicate up to 3 benefits you received from that activity. A benefit is anything good that happens to you as a result of doing the activity.

Benefit codes:

1 Accomplishment	**8** Reflection	**15** Increase energy
2 To be with friends	**9** Make friends	**16.** Refresh / clear mind
3 Competition	**10.** Self-expression	**17.** Improve mental health
4 Make something useful	**11** Relieve stress	**18** A change from routine
5 Learn	**12** Improve strength	**19** Improve physical health
6 Exercise	**13** To be with family	**20** Entertainment
7 Enjoyment	**14** Challenge	**21.** Other (*specify*:_____

Activity	**# days/week you participate**	**most important benefit**	**2*nd* most important**	**3*rd* most important**
Example: surfing	*7*	*12*	*11*	*15*
a) _____	____	____	____	____
b) _____	____	____	____	____
c) _____	____	____	____	____
d) _____	____	____	____	____
e) _____	____	____	____	____
f) _____	____	____	____	____

2. If you walk as a leisure-time activity, where do you typically walk?
Mark the one most likely place.

- ○ Neighborhood
- ○ Local park
- ○ Mall
- ○ Outdoor track
- ○ Indoor track
- ○ Other, specify: _____

3. Describe the people with whom you actually participate in **physically active recreation.** ***Physically active recreation is any activity that involves bodily movement (e.g., walking, gardening, exercise, sightseeing)***.

	How often does the person participate with you?				
	Most of the time	Some of the time	A little of the time	None of the time	N/A
Spouse / Significant Other	○	○	○	○	○
Friend / Co-worker	○	○	○	○	○
Child	○	○	○	○	○
Health Professional	○	○	○	○	○
Parent	○	○	○	○	○
Other *(specify:* _____	○	○	○	○	○

4. Describe how each person below encourages you to participate in **physically active recreation**:

	How often does the person encourage you?					*How much does the person encourage you?*			
	Most of the time	Some of the time	A little of the time	None of the time	N/A	Strongly	Moderately	Slightly	Not at all
Spouse / Significant Other	○	○	○	○	○	○	○	○	○
Friend / Co-worker	○	○	○	○	○	○	○	○	○
Child	○	○	○	○	○	○	○	○	○
Health Professional	○	○	○	○	○	○	○	○	○
Parent	○	○	○	○	○	○	○	○	○
Other *(specify:* _____	○	○	○	○	○	○	○	○	○

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Section C: Environmental Effects on Exercise

1. How much does your participation in physically active recreation decline during winter or periods of cold weather?	Does Not Apply	Not at All	Declines A Little	Declines Somewhat	Declines Quite a Bit	Completely Declines
a. Walking outside	○	○	○	○	○	○
b. Light sport/recreation activities (e.g., fishing, bowling, golfing with a cart)	○	○	○	○	○	○
c. Moderate sport/recreation activities (e.g., hunting, tennis, golf without a cart, dancing)	○	○	○	○	○	○
d. Strenuous sport/recreational activities (e.g., jogging, swimming)	○	○	○	○	○	○

2. How much does your participation in physically active recreation decline during summer or periods of hot weather?	Does Not Apply	Not at All	Declines A Little	Declines Somewhat	Declines Quite a Bit	Completely Declines
a. Walking outside	○	○	○	○	○	○
b. Light sport/recreation activities (e.g., fishing, bowling, golfing with a cart)	○	○	○	○	○	○
c. Moderate sport/recreation activities (e.g., hunting, tennis, golf without a cart, dancing)	○	○	○	○	○	○
d. Strenuous sport/recreational activities (e.g., jogging, swimming)	○	○	○	○	○	○

3/8" SPINE PERF

3. How much does your participation in physically active recreation decline during periods of bad air pollution?	Does Not Apply	Not at All	Declines A Little	Declines Somewhat	Declines Quite a Bit	Completely Declines
a. Walking outside	○	○	○	○	○	○
b. Light sport/recreation activities (e.g., fishing, bowling, golfing with a cart)	○	○	○	○	○	○
c. Moderate sport/recreation activities (e.g., hunting, tennis, golf without a cart, dancing)	○	○	○	○	○	○
d. Strenuous sport/recreational activities (e.g., jogging, swimming)	○	○	○	○	○	○

Section D: Stress Questions

Use the 10-point scale below to indicate your assessment of stress levels.
There are no correct answers. Just give your best opinion for each of the questions.

	LEAST Stressed Life									MOST Stressed Life
1. Right now, where would you say you are on this scale?	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
2. Where do you think most people your age are on this scale?	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨
3. In 5 years, where do you think you will be on this scale?	⓪	①	②	③	④	⑤	⑥	⑦	⑧	⑨

Section E: Questions About Your Health

If you are unsure about how to answer a question, please give the best answer that you can.

1. In general, how would you rate your health?

○ Excellent ○ Very good ○ Good ○ Fair ○ Poor

2. For how long (if at all) has your health limited you in each of the following activities? ***Mark one rating for each activity.***

	Yes Limited a lot	Yes Limited a little	No Not limited at all
a) The kinds or amounts of vigorous activities you can do, like lifting heavy objects, running, or participating in strenuous sports.	○	○	○
b) The kinds or amounts of moderate activities you can do, like moving a table, pushing a vacuum cleaner, playing golf or bowling	○	○	○
c) Lifting or carrying groceries	○	○	○
d) Climbing several flights of stairs	○	○	○
e) Climbing one flight of stairs	○	○	○
f) Bending, lifting, or stooping	○	○	○
g) Walking more than a mile	○	○	○
h) Walking several blocks	○	○	○
i) Walking one block	○	○	○
j) Bathing or dressing	○	○	○

3. How much bodily pain have you had in the last 4 weeks?

○ None ○ Very mild ○ Mild ○ Moderate ○ Severe ○ Very severe

4. Does your health keep you from working at a job, doing work around the house, or going to school?

○ Yes, for more than 3 months
○ Yes, for 3 months or less
○ No

5. Have you been unable to do certain kinds or amounts of work, housework, or school work because of your health?

○ Yes, for more than 3 months
○ Yes, for 3 months or less
○ No

For each of the following questions, mark the one answer that comes closest to the way you have been feeling DURING THE PAST MONTH.	All of the time	Most of the time	Good bit of the time	Some of the time	A little of the time	None of the time
6. How much of the time has your health limited your social activities (like visiting with friends or relatives)?	○	○	○	○	○	○
7. How much of the time have you felt full of pep?	○	○	○	○	○	○
8. How much of the time have you been a very nervous person?	○	○	○	○	○	○
9. How much of the time have you felt so down in the dumps that nothing could cheer you up?	○	○	○	○	○	○
10. How much of the time have you felt calm and peaceful?	○	○	○	○	○	○
11. How much of the time did you have a lot of energy?	○	○	○	○	○	○
12. How much of the time have you felt downhearted and blue?	○	○	○	○	○	○
13. How much of the time did you feel worn out?	○	○	○	○	○	○
14. How much of the time have you been a happy person?	○	○	○	○	○	○
15. How much of the time did you feel tired?	○	○	○	○	○	○

For each of the following questions, mark the degree to which the statement is true or false for you.	Definitely True	Mostly True	Don't Know	Mostly False	Definitely False
16. I am somewhat ill.	○	○	○	○	○
17. I am as healthy as anybody I know.	○	○	○	○	○
18. My health is excellent.	○	○	○	○	○
19. I have been feeling bad lately.	○	○	○	○	○

You're doing great. Your input is valuable. Thanks!

Section F: Health Status Questions

This section asks about your health. Please answer as best as you can.

1. What is your age? ____ (years)

2. What is your gender? ○ Male ○ Female

3. How tall are you without shoes? ____ (feet) ____ (inches)

4. What is your present weight without clothes on? _____ (lbs.)

5. Which single race group best describes you?
   - ○ African American
   - ○ Asian American
   - ○ Native American Indian
   - ○ White
   - ○ Hispanic/Latino
   - ○ Other, (specify:_____)

6. Do you currently smoke? ○ Yes ○ No

7. How often do you drink alcohol?
   - ○ Never
   - ○ Infrequently (less than 1 day per week)
   - ○ 1 or 2 days per week
   - ○ 3 or 4 days per week
   - ○ 5 or 6 days per week
   - ○ Daily

8. In the past 12 months, how many times have you visited a physician for anything other than a vaccination or check-up?

   Number of visits: _____

9. In the past 12 months, how many nights have you spent in a hospital? _____

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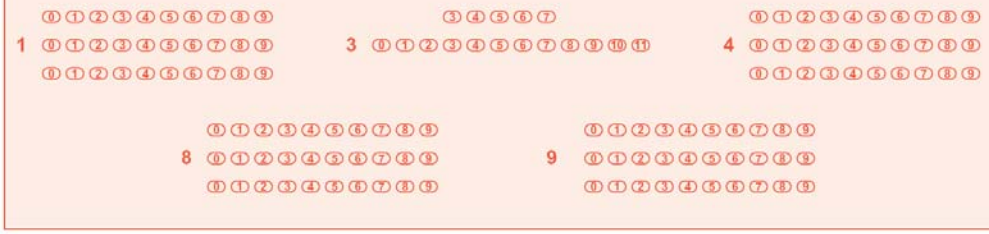

Section G: Exercise Perception

Instructions: Please indicate the degree to which you agree with each of these statements.

	Strongly Disagree	Moderately Disagree	Disagree	Agree	Moderately Agree	Strongly Agree
1. I have excellent reflexes.	○	○	○	○	○	○
2. I am agile and graceful.	○	○	○	○	○	○
3. I am embarrassed by my voice.	○	○	○	○	○	○
4. My physique is rather strong.	○	○	○	○	○	○
5. I sometimes hold up well under stress.	○	○	○	○	○	○
6. I can run fast.	○	○	○	○	○	○
7. I have physical defects that sometimes bother me.	○	○	○	○	○	○
8. I feel in control when I take tests involving physical motor skills.	○	○	○	○	○	○
9. People think negative things about me because of my posture.	○	○	○	○	○	○
10. I am hesitant about disagreeing with people bigger than me.	○	○	○	○	○	○
11. I have poor muscle tone.	○	○	○	○	○	○
12. I take little pride in my ability in sports.	○	○	○	○	○	○
13. Athletic people usually receive more attention than me.	○	○	○	○	○	○
14. I am sometimes envious of those better looking than myself.	○	○	○	○	○	○
15. Sometimes my laugh embarrasses me.	○	○	○	○	○	○
16. I am concerned with the impression my physique makes on others.	○	○	○	○	○	○

	Strongly Disagree	Moderately Disagree	Disagree	Agree	Moderately Agree	Strongly Agree
17. Sometimes I feel uncomfortable shaking hands because my hands are clammy.	○	○	○	○	○	○
18. My speed has helped me out of some tight spots.	○	○	○	○	○	○
19. I find that I am accident prone.	○	○	○	○	○	○
20. I have a strong grip.	○	○	○	○	○	○
21. Due to my agility, I have been able to do things which many others could not do.	○	○	○	○	○	○

Section H: Leisure Constraints

Please indicate the degree to which you agree with each of these statements.

	Strongly Disagree	Moderately Disagree	Disagree	Agree	Moderately Agree	Strongly Agree
1. People like me do participate in physically active recreation.	○	○	○	○	○	○
2. I am too old for most forms of physically active recreation.	○	○	○	○	○	○
3. I would succeed in recreation activities more physically challenging than the ones I currently do.	○	○	○	○	○	○
4. Money is not a limitation in my participation in recreation activites.	○	○	○	○	○	○
5. I don't know anyone who would participate with me in physically active recreation.	○	○	○	○	○	○
6. I don't have enough time to participate in physically active recreation.	○	○	○	○	○	○
7. There are recreation facilities close to my home that I could use for physically active recreation.	○	○	○	○	○	○
8. I am concerned about my safety in the recreation areas.	○	○	○	○	○	○
9. I am unable to participate because of a lack of transportation.	○	○	○	○	○	○

Section I: Support and Exercise Questions

A list of things people might do or say to someone who is trying to exercise regularly appears below. If you are not trying to exercise, then some of the questions may not apply to you, **but please read and give an answer to every question.**

In the following questions, **family** means anyone living in your household.

During the past month, how often has your family (or members of your household) said or done what is described below?	None	Rarely	A Few Times	Often	Very Often	Does Not Apply
1. Exercised with me.	○	○	○	○	○	○
2. Gave me encouragement to stick with my exercise program.	○	○	○	○	○	○
3. Changed their schedule so we could exercise together.	○	○	○	○	○	○
4. Offered to exercise with me.	○	○	○	○	○	○
5. Gave me helpful reminders to exercise (*"Are you going to exercise tonight?"*)	○	○	○	○	○	○
6. Planned for exercise on a recreational basis.	○	○	○	○	○	○
7. Discussed exercise with me.	○	○	○	○	○	○
8. Talked about how much they liked to exercise.	○	○	○	○	○	○
9. Helped plan activities around my exercise.	○	○	○	○	○	○
10. Asked me for ideas on how they can get more exercise.	○	○	○	○	○	○
11. Took over chores so I had more time to exercise.	○	○	○	○	○	○
12. Made positive comments about my physical appearance.	○	○	○	○	○	○

Hang in there, you are almost finished.

During the past month, how often have your friends, acquaintances, or co-workers said or done what is described below?	None	Rarely	A Few Times	Often	Very Often	Does Not Apply
13. Exercised with me.	○	○	○	○	○	○
14. Gave me encouragement to stick with my exercise program.	○	○	○	○	○	○
15. Changed their schedule so we could exercise together.	○	○	○	○	○	○
16. Offered to exercise with me.	○	○	○	○	○	○
17. Gave me helpful reminders to exercise (*"Are you going to exercise tonight?"*)	○	○	○	○	○	○
18. Planned for exercise on a recreational basis.	○	○	○	○	○	○
19. Discussed exercise with me.	○	○	○	○	○	○
20. Talked about how much they liked to exercise.	○	○	○	○	○	○
21. Helped plan activities around my exercise.	○	○	○	○	○	○
22. Asked me for ideas on how they can get more exercise.	○	○	○	○	○	○
23. Took over chores so I had more time to exercise.	○	○	○	○	○	○
24. Made positive comments about my physical appearance.	○	○	○	○	○	○

Section J: Satisfaction with Life

Please indicate the degree to which you agree with each of these statements.	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree Nor Disagree	Moderately Agree	Agree	Strongly Agree
1. In most ways, my life is close to my ideal.	○	○	○	○	○	○	○
2. The conditions of my life are excellent.	○	○	○	○	○	○	○
3. I am satisfied with my life.	○	○	○	○	○	○	○
4. So far, I have gotten the most important things I want in life.	○	○	○	○	○	○	○
5. If I could live my life over, I would change almost nothing.	○	○	○	○	○	○	○

Section K: Physical Activity Questions

Instructions: This next set of questions are about your current level of physical activity and exercise. There are no right or wrong answers. We simply need to assess your current levels.

Leisure Time Activity:

1. ***Over the past 7 days:***
   (a) How often did you participate in **sitting activities** such as reading, watching TV, or doing handicrafts?
   - ○ 0 days ***(skip to question 2)***
   - ○ 1-2 days
   - ○ 3-4 days
   - ○ 5-7 days

   (b) On average, how many hours per day did you engage in these **sitting activities?**
   - ○ Less than one hour
   - ○ 1 but less than 2 hours
   - ○ 2-4 hours
   - ○ More than 4 hours

   (c) What were these activities?

   _____

2. ***Over the past 7 days:***
   (a) How often did you take a **walk** outside your home or yard for any reason (e.g., for fun or exercise, walking to work, walking the dog)?
   - ○ 0 days ***(skip to question 3)***
   - ○ 1-2 days
   - ○ 3-4 days
   - ○ 5-7 days

   (b) On average, how many hours per day did you spend **walking?**
   - ○ Less than one hour
   - ○ 1 but less than 2 hours
   - ○ 2-4 hours
   - ○ More than 4 hours

3. ***Over the past 7 days:***
   (a) How often did you engage in **light sport or recreational activities** such as bowling, golf with a cart, shuffleboard, fishing from a boat or pier, or other similar activities?
   - ○ 0 days ***(skip to question 4)***
   - ○ 1-2 days
   - ○ 3-4 days
   - ○ 5-7 days

   (b) On average, how many hours per day did you engage in these **light sport or recreational activities?**
   - ○ Less than one hour
   - ○ 1 but less than 2 hours
   - ○ 2-4 hours
   - ○ More than 4 hours

   (c) What were these activities?

   _____

4. ***Over the past 7 days:***
   (a) How often did you engage in **moderate sport or recreational activities** such as doubles tennis, ballroom dancing, hunting, ice skating, golf without a cart, softball, or other similar activities?
   - ○ 0 days ***(skip to question 5)***
   - ○ 1-2 days
   - ○ 3-4 days
   - ○ 5-7 days

   (b) On average, how many hours per day did you engage in these **moderate sport or recreational activities?**
   - ○ Less than one hour
   - ○ 1 but less than 2 hours
   - ○ 2-4 hours
   - ○ More than 4 hours

   (c) What were these activities?

   _____

5. ***Over the past 7 days:***
(a) How often did you participate in **strenuous sport or recreational activities** such as jogging, swimming, aerobic dance, singles tennis, or other similar activities?
- ○ 0 days ***(skip to question 6)***
- ○ 1-2 days
- ○ 3-4 days
- ○ 5-7 days

(b) On average, how many hours per day did you engage in these **strenuous sport or recreational activities?**
- ○ Less than one hour
- ○ 1 but less than 2 hours
- ○ 2-4 hours
- ○ More than 4 hours

(c) What were these activities?

_____

6. ***Over the past 7 days:***
(a) How often did you engage in **exercises specifically to increase muscle strength and endurance** such as weights, push-ups, etc.?
- ○ 0 days
- ○ 1-2 days
- ○ 3-4 days
- ○ 5-7 days

(b) On average, how many hours per day did you engage in these **strength and endurance exercises?**
- ○ Less than one hour
- ○ 1 but less than 2 hours
- ○ 2-4 hours
- ○ More than 4 hours

(c) What were these activities?

_____

Household Activity:

7. **During the past 7 days, have you done any...**	No	Yes
a) light housework, such as dusting or washing dishes?	○	○
b) heavy housework or chores, such as vacuuming, scrubbing floors, washing windows, or carrying wood?	○	○
c) home repairs, like painting, wallpapering, electrical work, etc.?	○	○
d) lawn work or lawn care, including snow or leaf removal, wood chopping, etc.?	○	○
e) outdoor gardening?	○	○
f) caring for another person, such as a child, dependent spouse, or another adult?	○	○

Work-Related Activity:

8. During the past 7 days, did you work ***for pay***?

- ○ No
- ○ Yes

If **yes**, how many hours did you work ***for pay*** in the past 7 days?

HOURS

0	0	0
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9

9. During the past 7 days, did you work ***as a volunteer?***

- ○ No
- ○ Yes

If **yes**, how many hours did you work **as a volunteer** in the past 7 days?

HOURS

0	0	0
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9

10. Which category below **best** describes the highest level of physical labor required...
on your job? .....***and*** .....***as a volunteer?***

○	Mainly sitting with slight arm movements (e.g., office worker, seated assembly line worker, bus driver).
○	Sitting or standing with some walking (e.g., cashier, general office worker, light tool or machinery worker).
○	Walking,with some handling of materials generally weighting less than 50 lbs. (e.g., mail carrier, waiter/waitress, construction worker, heavy tool or machinery worker).
○	Walking and heavy manual labor often requiring handling of materials weighing over 50 lbs. (e.g., lumberjack, stone mason, farm or general laborer).

Section L: Additional Questions

1. What is your current marital status?

- ○ single
- ○ married
- ○ divorced/separated
- ○ widow or widower

2. What is the highest level of formal education you have completed?

- ○ grades 7 - 12
- ○ high school graduate
- ○ some college
- ○ technical or vocational school
- ○ associate degree
- ○ bachelor's degree
- ○ graduate degree
- ○ Other (please specify): _____

3. Do you have a disability or handicap?

- ○ Yes
- ○ No

If yes, please describe: _____

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SERIAL

Appendix B

Operationalization of Variables

Variable	Scale	Question	Operationalization	Recodes
Demographic Age (f1)	Interval	What is your age?	Open-ended response format	Middle age (50-64 yrs) Young old (65-74 yrs) Old-old (75-84 yrs) Oldest old (>85 yrs)
Gender (f2)	Nominal	Are you Male Female	Closed –ended response format	Recoded into dummy variable Male=0 Female=1
Ethnicity (f5)	Nominal	Which ethnic group best describes you?	Closed-ended response format 1=African American 2=Asian American 3=Native American India 4=White 5=Hispanic/Latino American 6=Other	Dummy coded 0=White 1=Non-white
Marital status (l1)	Nominal	What is your current marital status?	Closed-dnded response format 1=Single 2=Married 3=Divorced/separated	Dummy coded 0=Married 1=Not-married

Variable	Scale	Question	Operationalization	Recodes
			4=Widow or widower	
Education (l2)	Ordinal	What is the highest level of formal education you have completed?	Closed-ended response format 1=Grades 7-12 2=High school graduate 3=Some college 4=Technical or vocational school 5=Associate degree 6=Bachelor's degree 7=Graduate degree 8=other	
Health				
Health perception (5 items)	Interval	In general, how would you rate your health? (e1)* I am somewhat ill. (e16). I am as healthy as anybody I know (e17)* My health is excellent (e18)* I have been feeling bad lately. (e19)	Measure on a 5–point scale 5=poor 4=fair 3=good 2=very good 1=excellent 1=definitely true 2=mostly true 3=don't know 4=mostly false 5=definitely false	Transform scores linearly to a common metric with a possible range of 0-100 1=0 2=25 3=50 4=75 5=100 Calculate the mean score. Higher score indicate better health * Reverse coded
Physical functioning (10 items)	Interval	Vigorous activities (e2a) Moderate activities (e2b) Lifting or carrying groceries (e2c)	Measure on a 3–point scale 1=limited a lot 2=limited a little	Transform scores linearly to a common metric with a possible range of 0-100 1=0

Variable	Scale	Question	Operationalization	Recodes
		Climbing several stairs (e2d) Climbing one stairs (e2e) Bending, lifting, stooping (e2f) Walking >1 mile (e2g) Walking several blocks (e2h) Walking one block (e2i) Bathing or dressing (e2j)	3=no limited at all	2=50 3=100 Calculate the mean score. Higher score indicate better health * Reverse coded
Mental health (5-items)	Interval	Nervous person (e8)* Fell so down in the dumps that nothing could cheer you up (e9)* Feel calm and peaceful (e10) Felt downhearted and blue (e12)* Been a happy person (e14)	Measure on a 6-point scale 6=all of the time 5=most of the time 4=a good bit of the time 3=some of the time 2=a little of the time 1=none of the time	Transform scores linearly to a common metric with a possible range of 0-100 1=0 2=20 3=40 4=60 5=80 6=100 Calculate the mean score. Higher score indicate better health * Reverse coded
Vitality (4 items)	Interval	Feel full of pep (e7) Have a lot of energy (e11) Feel worn out (e13)* Feel tired (e15)*	Same as above6 point scale	
Role functioning (2 items)	Interval	Does your health keep you from working at a job, doing work around the house, or going to school? (e4) Have you been unable to do certain kinds or amounts of work, housework, or school work because of your health? (e5)	Measure on a 3-point scale 1=yes, for more than 3 months 2=yes, for 3 months or less 3=no	Transform scores linearly to a common metric with a possible range of 0-100 1=0 2=50 3=100 Calculate the mean score. Higher score indicate better health

Variable	Scale	Question	Operationalization	Recodes
				* Reverse coded
Pain (1 item)	Interval	How much bodily pain have you had in the last 4 weeks? (e3)*	1=none 2=very mild 3=mild 4=moderate 5=severe 6=very severe	Transform scores linearly to a common metric with a possible range of 0-100 1=0 2=20 3=40 4=60 5=80 6=100 Calculate the mean score. Higher score indicate better health * Reverse coded
Social functioning	Interval	How much of the time has your health limited your social activities? (e6)*	6=all of the time 5=most of the time 4=a good bit of the time 3=some of the time 2=a little of the time 1=none of the time	Transform scores linearly to a common metric with a possible range of 0-100 1=0 2=20 3=40 4=60 5=80 6=100 Calculate the mean score. Higher score indicate better health * Reverse coded
Health status Weight (f4)	Interval	What is your present weight without	Open-ended response format	Recorded into metric system

Variable	Scale	Question	Operationalization	Recodes
		clothes on?	(lbs)	Recorded into metric system
Height (f3)	Interval	How tall are you without shoes?	Open-ended response format (feet/inches)	Create BMI variable=weight/height^2
Hospital visitation (f8)	Interval	In the post 12 months, how many times have you visited a physician for anything other than a vaccination or check-up?	Open-ended response format	
Physically activity				
Physically active leisure index (b1a-b1f)		List six activities you enjoy doing regularly	Open-ended response format	1. Assign METs value based on each activity's intensity 2. Multiply the METs value for each activity with the frequency / per week 3. Sum all six activities' score
Leisure time physical activity (k2a-k6a)	Interval	Over the past 7 days How often did you take a walk outside your home or yard for any reason? (k2a) How often did you engage in light sport or recreational activities? (k3a) How often did you engage in moderate sport or recreational activities? (k4a) How often did you participate in strenuous sport or recreational	1=0 days 2=1-2 days 3=3-4 days 4=5-7 days	Convert the scores into frequency value (hours per day in the one-week period) 1.1 For k2a-k6a, convert 1=0 2=1.5 3=3.5 4=6 1.2 For k2b-k6b, convert 1=0.5

Variable	Scale	Question	Operationalization	Recodes
		activities? (k5a) How often did you engage in exercises specially to increase muscle strength and endurance? (k6a) On average, how many hours per day did you spend/ engage in in these activities? (k2b, k3b, k4b, k5b, k6b)	1=Less than one hour 2=1 but less than 2 hours 3=2-4 hours 4=More than 4 hours	2=2.5 3=3 4=5 1.3 Multiply the frequency by duration k2a*k2b/7=K2 k3a*k3b/7=K3 k4a*k4b/7=K4 k5a*k5b/7=K5 Multiply the activity weight by the activity frequency for each item K2*20 K3*21 K4*23 K5*23 Sum the above 4 products
Occupational physical activity		During the past 7 days, did you work for pay? (k8b) If yes, how many hours did you work for pay in the past 7 days? Which category best describes the highest level of physical labor required on your job? (k10b)	Open-ended response format 4=Mainly sitting with slight arm movements 3=sitting or standing with some walking	For those k10b=4, occupational physical activity =0 For k10b=1, 2, or 3 occupational physical activity =k8b/7*21

Variable	Scale	Question	Operationalization	Recodes
			2=Walking, with some handling or materials generally weighting less than 50 lbs 1=Walking and heavy manual labor often requiring handling of materials weighing	
Household physical activity	Nominal	During the past 7 days, have you done any Light housework (k7a) Heavy housework (k7b) Home repairs (k7c) Lawn work or lawn care (k7d) Outdoor gardening (k7e) Caring for another person (k7f)	Closed-ended response format 1=No 2=Yes	Record 1=0 2=1 Multiply the activity weight by the activity frequency K7a*25 K7b*25 K7c*30 K7d*36 K7e*20 K7f*35 Sum the above 6 products

Appendix C

Content Analysis of Physically Active Leisure

Rank	Frequency	Code	Activity	METs	Compcode	Heading	Description
1	688	2	Walking	3.5	17160	walking	walking for pleasure (Taylor Code 010)
2	581	3	Watching TV	1	07010	inactivity quiet	lying quietly, watching television
3	520	4	Reading/cryptoquote	1.3	09030	miscellaneous	sitting - reading, book, newspaper, etc.
4	414	26	With family/friends	1.5	09100	miscellaneous	retreat/family reunion activities involving sitting, relaxing, talking, eating
5	329	5	Exercising/gym workout	5.5	02060	Conditioning Exercises	health club exercise, general (Taylor Code 160
6	236	6	Gardening	4	08245	Lawn and Garden	gardening, general
7	230	22	Playing Card/bingo/crossword	1.5	09010	Miscellaneous	sitting - card playing, playing board games
8	220	7	Golfing	4.5	15255	Sports	golf, general
9	195	11	Attending concerts	1	07021	Inactivity	sitting quietly, sitting smoking, listening to music (not talking or reading), watching a movie in a theate
10	135	27	Attending classes	1.8	09065	Miscellaneous	sitting - in class, general, including note-taking or class discussion
11	129	12	Bicycling	8	01015	Bicycling	bicycling, general
12	111	21	Going to museum	2	09105	Miscellaneous	touring/traveling/vacation involving walking and riding
13	106	8	Swimming	6	18310	water activities	swimming, leisurely, not lap swimming, general
14	101	25	Traveling/sightseeing	2	09105	Miscellaneous	touring/traveling/vacation involving walking and riding
15	97	23	Using computer	1.5	20100	Religious Activities	typing, electric, manual, or computer
16	96	30	Sewing	1.5	05080	Home Activities	sitting - knitting, sewing, lt. wrapping (presents)

Rank	Frequency	Code	Activity	METs	Compcode	Heading	Description
17	96	34	Eating out/drinking	1.5	13030	self care	eating (sitting)
18	90	79	Going to theater	1	07021	Inactivity	sitting quietly, sitting smoking, listening to music (not talking or reading), watching a movie in a theater
19	86	35	Watching movies	1	07021	Inactivity	sitting quietly, sitting smoking, listening to music (not talking or reading), watching a movie in a theater
20	71	83	Volunteering	1.5	21000	volunteer activities	sitting - meeting, general, and/or with talking involved
21	65	10	Jogging	7	12020	running	jogging, general
22	65	13	Listening to music	1	07021	Inactivity	sitting quietly, sitting smoking, listening to music (not talking or reading), watching a movie in a theater
23	65	33	Dancing	4.5	03025	Dancing	general, Greek, Middle Eastern, hula, flamenco, belly, and swing dancing
24	62	46	Baking/cooking	2.5	05052	Home Activities	cooking or food preparation - walking
25	60	19	Playing tennis	7	15675	sports	tennis, general
26	60	24	Art and craft	2	09080	miscellaneous	sitting - arts and crafts, moderate effort
27	60	37	Church/spiritual duties	1.5	20005	religious activities	sitting in church, talking or singing, attending a ceremony, sitting, active participation
28	59	1	Aerobic Dancing	6.5	03015	dancing	aerobic, general
29	57	48	Shopping	2.3	05065	Home Activities	non-food shopping, standing or walking
30	57	95	Weight lifting	6	02050	Conditioning Exercises	weight lifting (free weight, nautilus or universal-type), power lifting or body building, vigorous effort (Taylor Code 210
31	55	15	Yoga	2	02100	Conditioning Exercises	stretching, hatha yoga
32	49	44	Ballroom/line/square dancing	4.5	03031	Dancing	ballroom, fast (disco, folk, square), line dancing, Irish step dancing, polka, contra, country
33	46	78	Water aerobics	4	18355	water activities	water aerobics, water calisthenics
34	45	9	Running	10	12050	Running	running, 6 mph (10 min/mile)
35	40	31	Fishing	3	04001	fishing and hunting	fishing, general
36	32	71	Walking dog	3	17165	Walking	walking the dog

Rank	Frequency	Code	Activity	METs	Compcode	Heading	Description
37	24	60	Bowling	3	15090	Sports	bowling (Taylor Code 390)
38	23	29	Writing	1.8	09040	Miscellaneous	sitting - writing, desk work, typing
39	22	38	Singing/chorale	2	20020	Religious Activities	standing, singing in church, attending a ceremony, standing, active participation
40	22	49	Visiting parks/zoo	2	09105	Miscellaneous	touring/traveling/vacation involving walking and riding
41	20	50	Camping	2.5	09110	Miscellaneous	camping involving standing, walking, sitting, light-to-moderate effort
42	20	51	Watching sports/auction	1.5	09115	miscellaneous	sitting at a sporting event, spectator
43	19	54	Meeting	1.5	21000	volunteer activities	meeting, general, and/or with talking involved
44	19	106	Hiking	6	17080	Walking	hiking, cross country (Taylor Code 040)
45	18	90	Library	1.3	09030	Miscellaneous	sitting - reading, book, newspaper, etc.
46	17	100	Parties/pub	2	13035	Self Care	talking and eating or eating only (standing)
47	17	105	Playing with kid	4	05175	Home Activities	walk/run - playing with child(ren) – moderate, only active periods
48	15	52	Playing piano/organ	2.5	10070	music playing	piano or organ
49	15	96	Wood work	6	08020	lawn and garden	chopping wood, splitting logs
50	15	103	Attending events	2.3	05065	Home Activities	non-food shopping, standing or walking
51	14	14	Bird watching	2.5	17085	Walking	bird watching
52	14	28	Talking on the phone	1.5	09055	miscellaneous	sitting - talking or talking on the phone
53	14	55	Photography	4	11800	occupation	walking, 3.0 mph, moderately and carrying light objects less than 25 lbs
54	14	72	Canoeing/rowing/boating	3.5	18070	Water activities	canoeing, rowing, for pleasure, general (Taylor Code 250
55	14	77	Oil painting	2	09080	Miscellaneous	sitting - arts and crafts, moderate effort
56	14	102	Entertainment	1	07021	Inactivity	sitting quietly, sitting smoking, listening to music (not talking or reading), watching a movie in a theater
57	13	91	Book club	1.5	21000	volunteer activities	meeting, general, and/or with talking involved

Rank	Frequency	Code	Activity	METs	Compcode	Heading	Description
						sitting -	
58	12	67	Playing softball	5	15620	Sports	softball or baseball, fast or slow pitch, general (Taylor Code 440)
59	11	18	Tai chi	4	15670	Sports	tai chi
60	11	36	Cleaning house	3	05030	Home Activities	cleaning, house or cabin, genera
61	11	73	Sailing	3	18120	Water activities	sailing, boat and board sailing, windsurfing, ice sailing, general (Taylor Code 235)
62	11	76	Mowing grass/lawn	5.5	08095	Lawn and Garden	mowing lawn, general
63	11	80	Babysitting	2.5	05185	home activities	child care: sitting/kneeling - dressing, bathing, grooming, feeding, occasional lifting of child-light effort, genera
64	11	97	Treadmill	9	02065	Conditioning Exercises	stair-treadmill ergometer, general
65	11	109	Motorcycle/jet ski	2.5	16030	transportation	motor scooter, motorcycle
66	11	119	Interior changes/remodeling	3	06160	home repair	painting, papering, plastering, scraping, inside house, hanging sheet rock, remodeling
67	10	41	floor exercise /rehab exercise	3.5	02030	Conditioning Exercises	calisthenics, home exercise, light or moderate effort, general (example: back exercises), going up & down from floor (Taylor Code 150
68	10	143	Pickleball /shuffleboard game	7	15675	sports	tennis, general
69	9	99	Casino	2.3	09020	Miscellaneous	standing - drawing (writing), casino gambling, duplicating machine
70	9	136	Entertain family/clowning	4	05175	home activities	walk/run - playing with child(ren) – moderate, only active periods
71	8	59	Playing basketball	6	15050	sports	basketball, non-game, general (Taylor Code 480)
72	8	107	visiting nurse homes	3	21070	Volunteer Activities	walk/stand combination, for volunteer purposes
73	7	17	Table tennis, ping pong	4	15660	sports	table tennis, ping pong (Taylor Code 410)
74	7	47	Pet care	2.5	05053	home activities	feeding animals

Rank	Frequency	Code	Activity	METs	Compcode	Heading	Description
75	7	57	Picnics	2	13035	Self Care	talking and eating or eating only (standing)
76	7	63	Playing baseball	2.5	15235	Sports	football or baseball, playing catch
77	7	64	Horseback riding	4	15370	Sports	horseback riding, general
78	7	108	Attend community/civic activity	1.5	21000	volunteer activities	meeting, general, and/or with talking involved
79	7	135	Flower arranging	1.5	05080	sitting - Home Activities	sitting - knitting, sewing, lt. wrapping (presents)
80	6	42	Tap dancing/ballet	4.8	03010	Dancing	ballet or modern, twist, jazz, tap, jitterbug
81	6	104	Playing with cats/dogs	2.8	05192	Home Activities	walk/run, playing with animals, light, only active periods
82	6	117	Playing music/play clarinet	4	10130	music playing	marching band, playing an instrument, baton twirling (walking)
83	5	32	Hunting	5	04100	Fishing and Hunting	hunting, general
84	5	43	Arthritis aerobics	5	03020	Dancing	aerobic, low impact
85	5	65	Playing racquetball	7	15530	sports	racquetball, casual, general (Taylor Code 470)
86	5	89	Driving	2	16010	transportation	automobile or light truck (not a semi) driving
87	5	93	Kayak	5	18100	water activities	kayaking
88	5	101	Meditation	1	07021	inactivity quiet	sitting quietly, sitting smoking, listening to music (not talking or reading), watching a movie in a theater
89	5	114	Teaching class	2.3	11600	Occupation	standing; light (bartending, store clerk, assembling, filing, duplicating, putting up a Christmas tree), standing and talking at work, changing clothes when teaching physical education
90	5	116	Bathe/spa/jacuzzi	1.5	13010	self care	bathing (sitting)
91	5	131	Care for mother /help homebond	4	05187	home activities	elder care, disabled adult, only active periods
92	4	61	Coaching sports	4	15140	sports	coaching: football, soccer, basketball, baseball, swimming, etc.
93	4	82	Pray	1	20025	Religious Activities	kneeling in church/at home (praying)

Rank	Frequency	Code	Activity	METs	Compcode	Heading	Description
94	4	118	Clog dancing	4.5	03031	dancing	ballroom, fast (disco, folk, square), line dancing, Irish step dancing, polka, contra, country
95	4	129	Nordic skiing/xc ski	9	19100	winter activities	skiing, cross country, 5.0-7.9 mph, brisk speed, vigorous effort
96	4	132	Restore airplanes/work on car	3	06010	home repair	airplane repair
97	4	142	Thinking	1	07021	Inactivity	sitting quietly, sitting smoking, listening to music (not talking or reading), watching a movie in a theater
98	3	16	Coin/ doll /rock collection	1.5	09010	Miscellaneous	sitting - card playing, playing board games
99	3	56	Acting in plays/ theater	3	11870	Occupation	working in scene shop, theater actor, backstage employee
100	3	75	Having Sex	1.3	14020	sexual activity	general, moderate effort
101	3	87	Skiing	7	19075	winter activities	skiing, general
102	3	123	In-line skating	12	15591	sports	roller blading (in-line skating)
103	3	124	Watch scenery/watch tree	1	07021	inactivity quiet	sitting quietly, sitting smoking, listening to music (not talking or reading), watching a movie in a theater
104	3	127	Read to blind/kid/study	1.8	09060	miscellaneous	sitting - studying, general, including reading and/or writing
105	2	20	Volleyball	4	15710	sports	volleyball (Taylor Code 400)
106	2	45	Helping/serving dining	2.5	05051	home activities	serving food, setting table - implied walking or standing
107	2	66	Soccer	7	15610	sports	soccer, casual, general (Taylor Code 540)
108	2	81	Bible study	1.3	20010	Religious Activities	sitting, reading religious materials at home
109	2	86	Swim laps	7	18240	water activities	swimming laps, freestyle, slow, moderate or light effort
110	2	88	Worship	2	20020	Religious Activities	standing, singing in church, attending a ceremony, standing, active participation
111	2	111	Football	2.5	15235	Sports	football or baseball, playing catch
112	2	112	Judo	10	15430	sports	judo, jujitsu, karate, kick boxing, tae kwan do
113	2	115	Surfing	3	18220	water activities	surfing, body or board

Rank	Frequency	Code	Activity	METs	Compcode	Heading	Description
114	2	122	Farming/work with horses	3.5	11150	occupation	farming, chasing cattle, non-strenuous (walking), moderate effort
115	2	125	Beach	6	18300	water activities	swimming, lake, ocean, river (Taylor Codes 280, 295)
116	2	126	Referee	4	11875	occupation	teach physical education, exercise, sports classes (non-sport play
117	2	138	Fixing condo	4.5	06060	home repair	carpentry, finishing or refinishing cabinets or furniture
118	2	144	Pool/pocket billiard	2.5	15080	sports	billiards
119	1	39	Mountain biking	10	01040	bicycling	bicycling, 14-15.9 mph, racing or leisure, fast, vigorous efforr
120	1	53	Playing guitar	2	10120	music playing	guitar, classical, folk (sitti
121	1	62	Fencing	6	15200	Sports	fencing
122	1	74	Diving	7	18200	water activities	skindiving, scuba diving, general (Taylor Code 310)
123	1	94	Fly airplane	2	16020	transportation	flying airplane
124	1	98	Jazzercise	6	02090	Conditioning Exercises	slimnastics, jazzercise
125	1	110	Windsurf	3	18120	water activities	sailing, boat and board sailing, windsurfing, ice sailing, general (Taylor Code 235)
126	1	113	Squash	12	15650	sports	squash
127	1	128	Snowshoeing	8	19190	winter activities	snow shoeing
128	1	130	Landscaping	6	06050	home repair	carpentry, outside house, installing rain gutters, building a fence, (Taylor Code 640)
129	1	133	Massage	1	07011	inactivity quiet	lying quietly, doing nothing, lying in bed awake, listening to music (not talking or reading
130	1	137	Working on photo	2.3	11600	occupation	standing; light (bartending, store clerk, assembling, filing, duplicating, putting up a Christmas tree), standing and talking at work, changing clothes when teaching physical education
131	1	139	Farmers market	2.3	05060	home activities	food shopping with or without a grocery cart, standing or walking
132	1	141	Bookkeeping	1.5	11580	occupation	sitting - light office work, general (chemistry lab work, light use of hand tools, watch repair or micro-assembly, light assembly/repair), sitting, reading, driving at work
133	1	145	Orchid	4.5	08150	lawn and garden	planting trees
134	1	147	Arber climbing	8	17120	walking	rock or mountain climbing (Taylor Code 060)

Rank	Frequency	Code	Activity	METs	Compcode	Heading	Description
135	1	149	Race walking	6.5	17110	Walking	race walking
136	1	150	Playing drums	4	10040	music playing	drums
137	1	151	Kite flying	5	17260	walking	walking, grass track
138	1	152	Horse racing	6.5	11400	Occupation	horse racing, trotting
139	1	153	Sleeping	0.9	07030	inactivity quiet	sleeping
140	1	154	Rowing machine	7	02070	conditioning exercise	exercise rowing, stationary ergometer, genera

VITA

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EDUCATION

◆ Ph.D.	The Pennsylvania State University (PSU)		2002- 2006
	Leisure Studies	Minor: Gerontology	
◆ Master of Education	National Taiwan Normal University (NTNU)		2000- 2002
	Sport and Leisure Management		
◆ Bachelor of Education	National Taiwan Normal University		1994- 1998
	Home Economics Education	Minor: Health Education	

PUBLICATIONS

- Godbey, G., Burnett-Wolle, S. & **Chow, H.-W.** (Accepted). New understandings about getting middle age and older adults moving. Submitted to *The Journal of Physical Education, Recreation & Dance.*
- Yarnal, C., Hutchinson, S., & **Chow, H.-W.** (2006) "I could probably run a marathon right now": Embodiment, space, and young women's leisure experience. *Leisure Sciences, 28* (2), 133-161.

PROFESSIONAL EXPERIENCES

• Co-instructor	RPTM 120 "Leisure and Human Behavior"	PSU	2005-2006
• Research Assistant	Journal article review	PSU	2005
• Research Assistant	Trinity-Shasta Lake Boater Survey	PSU	2005
• Research Assistant		PSU	2004
◆ Dr. Geoffrey Godbey speeches			
◆ Central Pennsylvania Convention and Visitors Bureau visitor survey			
• Teaching Assistant		PSU	2004
◆ RPM 120 "Leisure and Human Behavior"			
• Research Assistant		PSU	2003-2004
◆ "Camp Blaze" study			
◆ "Park/Recreation Use and Personal Health"			
• Research Assistant	Creative thinking teaching project	NTNU	2000-2001

SELECTED PROFESSIONAL CONFERENCE PRESENTATIONS

- **Chow, H.-W.** (2006, October). *Measuring physically active leisure using METs value and its comparison with the Physical Activity Scale for the Elderly (PASE).* Paper presented in The Cooper Institute Conference Series, Dallas, TX.
- Yarnal, C., Hutchinson, S., & **Chow, H.-W.** (2005, May). *Now I feel I could do anything: Embodiment, space and young women's leisure.* Paper presented at the Canadian Congress on Leisure Research, Nanaimo BC, Canada.
- **Chow, H.-W.**, Orsega-Smith, E., Payne, L., Graefe, A., & Godbey, G. (2005, April). *Examining the relationship between physically active leisure and health for older adults above 50.* Paper presented at The 17th Northeastern Recreation Research Symposium, Bolton Landing, NY.
- **Chow, H.-W.**, Orsega-Smith, E., Payne, L. & Godbey, G. (2004, November). *The relationship between physically active leisure activities and health for older adults.* Paper presented at the 57th Annual Scientific Meeting of the Gerontological Society of America, Washington D. C.
- C. M. Yarnal, **H.-W. Chow** (2004, March). *Camp blaze: Fire camp for young women.* Centennial meeting of the Association of American Geographers, Philadelphia, PA.