The Influence of Neighborhood Environment, Mobility Limitations, and Psychosocial Factors on Neighborhood Walking in Older Adults

by

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DEDICATION

To my family.

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TABLE OF CONTENTS

DEDICATION ii

ACKNOWLEDGEMENTS iii

LIST OF FIGURES x

LIST OF APPENDICES xi

ABSTRACT xii

CHAPTER ONE: INTRODUCTION 1

Theoretical Framework 4

Study Significance 7

Purpose 8

Specific Aims 8

Definition of Terms 9

Dependent Variable 9

Independent Variables 10

Individual Variables 10

Mobility limitations 11

Environmental Variable 12

CHAPTER TWO: BACKGROUND AND SIGNIFICANCE 13

Theoretical Model 16

Individual Variables 16

Psychosocial Factors 16

Self-Efficacy 16

Outcome Expectations 24

Demographic Characteristics 27

Mobility Limitations 28

Environment 28

Neighborhood Environment 28

Neighborhood Density 31

Neighborhood Diversity 32

Neighborhood Design 33

Neighborhood streets 33

Neighborhood sidewalks 34

Neighborhood surroundings 35

Comfort 35

Traffic safety 36

Crime safety 37

Relationships between the Study Variables 38

Environment and Mobility Limitations 38

Environment and Self-efficacy 39

Gaps in the Literature 40

CHAPTER THREE: METHODS 42

Research Design 42

Setting and Sample 42

Measures 44

Dependent Variable 44
Independent Variables: Individual 46
Psychosocial Factors 46
Self-efficacy 46
Self-efficacy for walking duration 46
Self-efficacy for PA barriers 47
Self-efficacy for neighborhood barriers 48
Self-efficacy for gait 49
Self-efficacy for balance 50
Outcome expectations 51
Mobility Limitations 53
Independent Variables: Environment 55
Neighborhood Environment 55
Density 56
Diversity 57
Design 58
Neighborhood access 59
Neighborhood streets 60
Neighborhood sidewalks 61
Neighborhood surroundings 62
Traffic safety 62
Crime safety 63
Comfort 64

Demographic Characteristics 64
Procedures 65
Protection of Human Subjects 65
Survey 65
Analysis 66
Analysis and Treatment of Missing Data 66
Evaluation of Assumptions 68
Univariate outliers 68
Linearity and homoscedasticity 69
Normality 69
Multivariate outliers 70
Multicollinearity and singularity 71
Hypothesis Testing 72
Path Analysis 72
Regression Analyses 72
CHAPTER FOUR: RESULTS 76
Sample Characteristics 76
Descriptive Analyses of Model Variables 76
Neighborhood Walking 77
Self-efficacy 77
Self-Efficacy for Walking Duration 77
Self-Efficacy for PA Barriers 78
Self-Efficacy for Neighborhood Barriers 78

Self-Efficacy for Balance 79

Self-Efficacy for Gait 79

Outcome Expectations 80

Mobility Limitations 80

Neighborhood Environment 81

Density 81

Diversity 82

Design 82

Access to services 83

Neighborhood streets 83

Neighborhood sidewalks 84

Neighborhood surroundings 84

Crime safety 84

Traffic safety 85

Comfort 85

Hypothesis Testing 85

Path Analysis 85

Bivariate Correlations 88

Regression Analyses 89

CHAPTER FIVE: DISCUSSION 97

Summary 97

Individual Variables 97

Environmental Variables 106

Demographic Characteristics 110
Study Limitations and Future Research or Directions 111
Conclusion 113
APPENDICES 115
REFERENCES 168

LIST OF FIGURES

1.1 Social Cognitive Theory 5

1.2 Theoretical model 6

3.1 Sampling configuration 43

4.1 Path analysis 87

4.2 Mediation: self efficacy , diversity and neighborhood walking 91

4.3 Mediation: self efficacy, design and neighborhood walking 92

4.4 Mediation: outcome expectations, diversity and neighborhood walking 94

4.5 Mediation: outcome expectations, design and neighborhood walking 94

LIST OF APPENDICES

A. Cover letter 115

B. Survey 117

C. Reminder postcard 146

D. Correspondence between study variables, measures, survey items 147

E. Factor analyses of scale items: Factor loading 148

F. Characteristics of study participants 152

G. Spread, mean and standard deviation of theoretical variables 154

H. Spread, mean and standard deviation for each survey item 155

I. Decomposition table for path analysis 159

J. Pearson moment correlations between theoretical variables 161

K. Pearson moment correlations between self efficacy scales 162

L. Association of neighborhood walking with theoretical variables 163

M. Mediation analyses 165

N. Relationship between self-efficacy type and neighborhood walking 166

O. Relationship between environment and neighborhood walking 167

Abstract

The Influence of Neighborhood Environment, Mobility Limitations, and Psychosocial Factors on Neighborhood Walking in Older Adults

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Regular physical activity (PA) provides health benefits for healthy aging. Walking, commonly chosen by older adults, often occurs in neighborhoods. Musculoskeletal deficits may limit older adults in negotiating their neighborhood environment. Social Cognitive Theory (SCT) has been used to study the influence of self-efficacy and outcome expectations on PA and walking in older adults. The purpose of this study was to examine the influence of self-efficacy, outcome expectations, mobility limitations and neighborhood environment on neighborhood walking in older adults living in urban settings.

A cross-sectional study was conducted using SCT as the framework. Surveys were mailed to 400 older adults with 326 participating (age 60-99 years, M =76.1, sd= 8.34). The Neighborhood PA Questionnaire, Multidimensional Outcome Expectations for Exercise Scale, Pepper Assessment Tool for

Disability, Neighborhood Environment Walkability Scale and self-efficacy scales were used to measure model variables.

Hierarchical regression indicated that demographic characteristics explained 3.8% of the variance (p = < .05) in neighborhood walking. Adding mobility limitations (R^2 = .125, p < .01), outcome expectations and total self-efficacy (R^2 = .213, p < .01), and neighborhood environment (R^2 = .273, p < .01) increased the explained variance. All of the SCT variables explained 27.3% of variance in neighborhood walking. Self-efficacy exerted the strongest influence (β = .466, p < .01) followed by number of destinations within walking distance (β = .188, p < .01), and female gender (β = .154, p < .01). In the final model, mobility limitations, outcome expectations and neighborhood density and design had no direct effect on neighborhood walking.

Further analyses revealed that self-efficacy for walking duration (β = .186, p < .05) and PA barriers (β = .308, p < .01) were associated with neighborhood walking while self-efficacy for gait, balance and neighborhood barriers were not. Of the neighborhood characteristics, only neighborhood destinations (β = .272, p < .01) were associated with neighborhood walking.

Future research should further examine the relationships between the individual variables and neighborhood walking and between mobility limitations and self-efficacy in a diverse population of older adults living in various urban settings with a wide-range of mobility limitations.

CHAPTER ONE
INTRODUCTION

The population over 65 years of age is the fastest-growing segment in the United States (U.S.) and is projected to reach 72.5 million people by 2030. Of those, approximately 33 million will be over age 75, and 10 million will be over age 85 (LeMasurier, Bauman, Corbin, Konopack, Umstattd et al, 2008; U.S. Census Bureau, 2008). As the U.S. population ages, common chronic diseases such as heart disease, diabetes and osteoarthritis will have a heightened impact on public health, and overall healthcare costs are expected to increase by 18% (Garrett & Martini, 2007). In addition, mobility difficulties increase with age (United States Department of Health and Human Services [USDHHS], 2006), impacting the ability of older adults to live independently and predicting future disability (Studenski, 2005). In 2005, over 42% of adults over age 65 reported difficulty walking ¼ mile, and 23% reported difficulty walking even a short distance without an assistive device (USDHHS, 2006).

Leisure-time physical activity (PA), including moderate PA, is inversely associated with all-cause mortality in all age groups regardless of gender (Andersen, Schnohr, Schroll & Hein, 2000) and participating in regular PA is essential to healthy aging (USDHHS, 2008). Regular PA reduces the risk of coronary heart disease, hypertension, obesity, diabetes and insulin resistance, and leads to improvements in muscle mass and bone density (Anderson et al., 2000; Bassett, Fitzhugh, Crespo, King & McLaughlin, 2002). Other benefits include the maintenance of functional ability (Nelson, Rejeski, Duncan, Judge & King; Stuck, Walthert, Nikolaus, Büla, Hohmann & Beck, 1998; Wong, Wong, Pang, Azizah & Dass, 2003), walking ability (Simonsick, Guralnik, Volpato, Balfour & Fried, 2005), and the prevention of gait and mobility-related disability (Alexander & Goldberg, 2005; LaCroix, Guralnik, Berkman, Wallace & Satterfield, 1993; Pahor, Blair, Espeland, Fielding, Gill et al., 2006). Walking is an excellent source of moderate PA for older adults (Lockett, Willis & Edwards, 2005; King, 2001) and appears to have many of the same health benefits found for PA (Knowler, Barrett-Connor & Fowler, 2002; Lee, Rexrode, Cook, Manson & Buring, 2001; Sesso, Paffenbarger & Lee, 2000).

Despite the well-recognized benefits, many older adults do not engage in regular PA, including walking, and participation decreases with age (Hughes, McDowell & Brody, 2008; Shaw & Spokane, 2008, Strath, Swartz & Cashin, 2009). The USDHHS, American College of Sports Medicine and American Heart Association recommend that older adults engage in moderate PA at least 30 minutes per day, five days a week; or in vigorous PA for 20 minutes, three days a week, in addition to strength and flexibility training (Nelson et al., 2007; USDHHS, 2008). However, only 27% of older adults achieve 150 minutes or more of leisure-time PA per week (Hughes et al., 2008) and although walking is the most common type of PA chosen by older adults, only 25% walk on a regular basis (LeMasurier et al., 2008). In addition, 52% of older adults engage in no leisure time PA at all (Hughes et al., 2008).

Walking and PA in older adults may be influenced by factors at both the individual and neighborhood or community levels (Conn, 1998; King, 1998; Sallis, Cervero, Ascher, Henderson, Kraft et al., 2006; Satariano & McAuley, 2003). Individual factors relevant to walking may include demographic characteristics, knowledge, attitudes and beliefs about walking, behavioral skills, psychosocial factors such as self-efficacy and outcome expectations, perceived barriers to walking, and health status, including mobility limitations (Conn, 1998; Resnick & Nigg, 2003; Shumway-Cook, Patla, Stewart, Ferrucci, Ciol & Guralnik, 2003).

Neighborhood environmental factors that may be particularly relevant to walking in older adults include aesthetics and neighborhood surroundings, sidewalk conditions, lighting, traffic, perception of neighborhood crime, and the presence of desired destinations within walking distance (Cunningham, Michael, Farquhar & Lapidus, 2005; Strath, Isaacs & Greenwald, 2007; Gallagher, Gretebeck, Robinson, Torres, Murphy & Martyn, 2010). In some older adults, hearing, vision or musculoskeletal deficits may limit the ability to negotiate the physical environment, heightening the influence of neighborhood environmental factors on walking in this population (Clarke, Ailshire, Bader, Morenoff & House, 2008; Frank, Engelke & Schmid, 2003; Shumway-Cook et al., 2003). Environmental factors that may be particularly pertinent for older adults with mobility limitations include lighting, crosswalk speed, presence of curbs or uneven surfaces, and other factors that may increase the risk of falls or injury

(Shumway-Cook et al., 2003). The purpose of this study was to examine the influence of both individual and environmental factors on neighborhood walking in older adults.

Theoretical Framework

Research on neighborhood environmental factors that may influence PA and walking has suffered from a lack of conceptual models with which to examine relationships and generate hypotheses (Giles-Corti, Timperio, Bull & Pikora, 2005; Wendel-Vos, Droomers, Kremers, Brug & van Lenthe, 2007). Initial models related to neighborhood environmental factors that may influence PA or walking were developed in parallel in the transportation and urban-planning, social psychology, and gerontology fields. Conceptual models developed in the urban-planning and transportation fields concentrated on examination of transportation choice, including walking for transportation. An early model, developed by Cervero and Knockelman (1996), included the "3 Ds" of the built environment: density (e.g., households per acre and floor-area ratio), diversity (e.g., land-use mix and presence of neighborhood retail), and design (e.g., street connectivity indicators, road network density, and completeness of sidewalk networks).

Early PA research in social psychology on environmental influences on PA focused on younger adults and factors that influence vigorous PA with an emphasis on access to local exercise facilities. Later research examined moderate-intensity PA and focused more attention on neighborhood environmental factors that may affect walking in older adults (Sallis et al., 2006;

Michael, Green & Farquhar, 2005). More recently, researchers from a variety of disciplines have joined together to develop more comprehensive models (Sallis et. al., 2006). In this study, Social Cognitive Theory was used with concepts incorporated from the fields of transportation, urban planning and gerontology.

In Social Cognitive Theory (Figure 1), behavior is described as dynamic and dependent on a continuing interaction among aspects of both the individual and the environment (Bandura, 1997). Individual psychosocial factors identified in Social Cognitive Theory include self-efficacy (belief in one's capability to perform a behavior), outcome expectations (belief that certain positive or negative consequences are likely to occur in response to a particular behavior), as well as demographic characteristics such as age and gender. Although Social Cognitive Theory has been widely used in studies of PA and exercise in older adults, less is known about the role of Social Cognitive Theory specific to walking behavior in older adults.

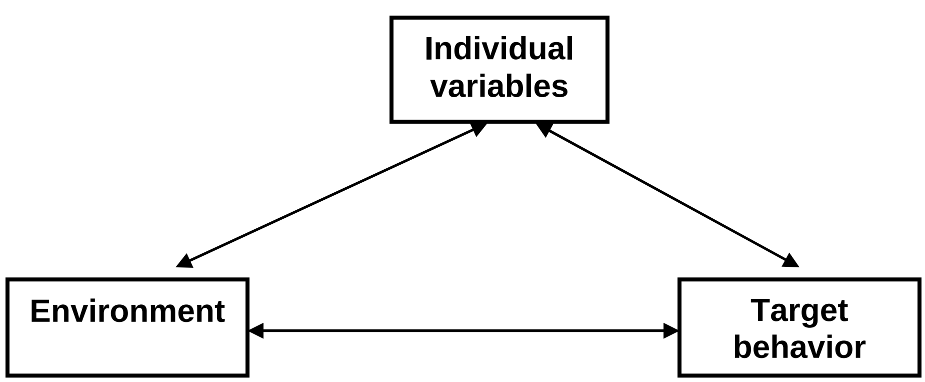

Figure 1.1. Social Cognitive Theory

This study examined the influence of each of the theoretical variables on older adult neighborhood walking in urban settings. Using the Social Cognitive Theoretical framework, the individual variables in this study included self-efficacy, outcome expectations and mobility limitations. Because 42% of older adults report difficulty walking ¼ mile (USDHHS, 2006), mobility limitations appears to be an important construct in older adults, and was included in the framework as

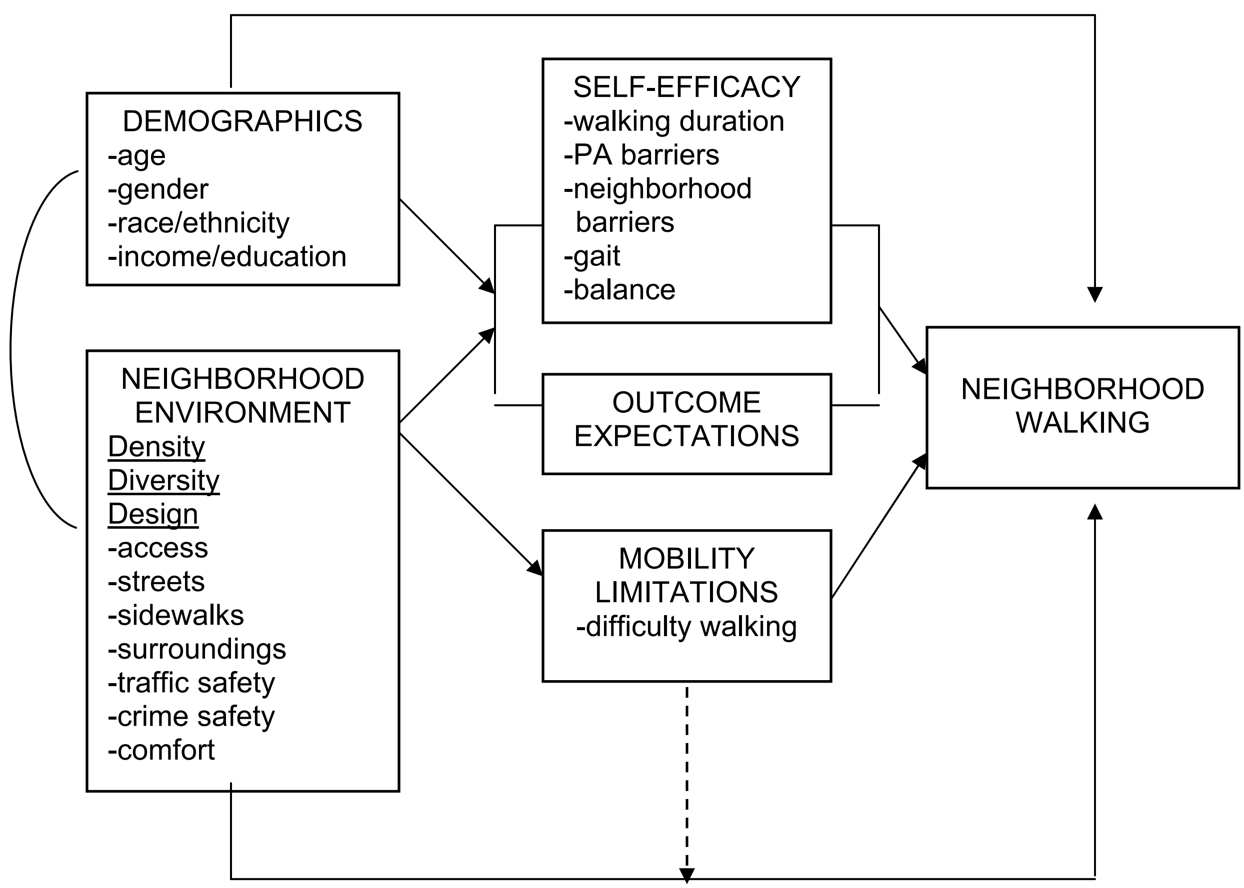

Figure 1.2. Theoretical model
Note: dotted line = moderation

an individual variable. The neighborhood environment variable was operationalized using the “3 Ds” concept developed from urban planning and transportation research (Cervero & Knockelman, 1996) which include: density, diversity, and design (Figure 2). In the 3 D model, design is comprised of six categories of neighborhood characteristics that include: neighborhood access, streets, sidewalks, surroundings, traffic, crime (Saelens, Sallis, Black & Chen, 2003). Since comfort also has been identified as salient to neighborhood walking in older adults, it was incorporated in the design construct (Gallagher et al., 2010).

Study Significance

Avoidance of walking due to environmental constraints may limit opportunities for regular PA, potentially hastening the development of chronic disease or limitations in mobility or functional ability (Balfour & Kaplan, 2002; Clarke & George, 2005). Both individual and neighborhood environmental factors may influence walking and PA in older adults. Although a number of studies have examined either individual or environmental influences on walking in older adults (Conn, 1998; King, 1998; Li, Fisher, Brownson & Bosworth, 2005; Michael, Beard, Choi, Farquhar & Carlson, 2006; Pikora, Giles-Corti, Bull, Jamrozik, & Donovan, 2003), few published studies were available that examined the relationship between neighborhood environmental factors, individual factors (psychosocial factors and mobility limitations) and walking in older adults (Nagel, Carlson, Bosworth & Michael, 2008; Michael & Carlson, 2009). To maximize the health and functioning of this growing segment of our society, it is important to identify and address the influences on walking in this population.

Purpose

The purpose of this study was to examine the influence of individual factors (self-efficacy, outcome expectations and mobility limitations) and neighborhood environment (neighborhood density, diversity and design) on neighborhood walking in older adults residing in urban settings. Since walking behavior of older adults is often influenced by age, sex, race/ethnicity, and socioeconomic position, these demographic characteristics were included in the model as covariates.

Specific Aims

Specific Aim 1: Examine the relationship between individual factors (self-efficacy, outcome expectations and mobility limitations), neighborhood environment (density, diversity and design), and neighborhood walking in older adults.

> *Hypothesis 1.1:* Self-efficacy, outcome expectations, mobility limitations and neighborhood environment will be positively associated with neighborhood walking in older adults when demographic characteristics are statistically controlled.
>
> *Hypothesis 1.2:* Mobility limitations will moderate the relationship between neighborhood environment and neighborhood walking in older adults.
>
> *Hypothesis 1.3:* Self-efficacy will mediate the relationship between neighborhood environment and neighborhood walking in older adults.

Hypothesis 1.4: Outcome expectations will mediate the relationship between neighborhood environment, and neighborhood walking in older adults.

Specific Aim 2: Examine the relationship between type of self-efficacy (self-efficacy for walking duration, self-efficacy for PA barriers, self-efficacy for neighborhood barriers, self-efficacy for gait and self-efficacy for balance) and neighborhood walking in older adults.

Hypothesis 2.1: Self-efficacy for walking duration, self-efficacy for barriers to PA, self-efficacy for neighborhood barriers, self-efficacy for gait and self-efficacy for balance will be associated with neighborhood walking in older adults.

Specific Aim 3: Examine specific neighborhood characteristics that influence neighborhood walking in older adults.

Hypothesis 3.1: Neighborhood density, diversity and characteristics of neighborhood design (neighborhood streets, neighborhood sidewalks, neighborhood surroundings, traffic safety, crime safety and comfort) will be associated with neighborhood walking in older adults.

Definition of Terms

Dependent Variable

The dependent variable in this study was neighborhood walking, defined as duration of walking (in minutes) within a half-mile of the participant's residence for transportation, leisure, or exercise. One half-mile has been described as a reasonable distance for older adults to walk for errands or leisure (Michael et al, 2006).

Independent Variables

Individual Variables

Four individual variables were examined in this study: self-efficacy, outcome expectations, mobility limitations and demographic characteristics (age, gender, race/ethnicity, marital status, and income/education).

Self-efficacy is defined as belief in the capability to perform a specific behavior (Bandura, 1997), including confidence in overcoming barriers to performance of that behavior (Baranowski, Perry & Parcel, 2002). Five types of self-efficacy were examined: self-efficacy for walking duration, self-efficacy for PA barriers, self-efficacy for neighborhood barriers, self-efficacy for gait and self-efficacy for balance. Self-efficacy for walking duration was defined as confidence in ability to walk for incremental 5 minute intervals (e.g., 5 minutes, 10 minutes, etc., up to 40 minutes) at a moderately fast pace without stopping (McAuley, Blissmer, Katula, & Duncan, 2000). Self-efficacy for PA barriers was defined as confidence in the ability to perform PA (including walking, biking or swimming) for 30 minutes five days a week for the next three months in the face of commonly identified barriers to participation (McAuley, E., 1992). Self-efficacy for neighborhood barriers was defined as the participants' confidence in the ability to walk for 10 or more minutes in their neighborhood in the face of neighborhood barriers such as crime or poorly maintained sidewalks (Gallagher et al., 2010). Self-efficacy for gait was defined as confidence in ability to negotiate stairs, path obstructions and other commonly encountered walking conditions (McAuley, Mihalko & Rosengren, 1997). Self-efficacy for balance was defined as confidence in maintaining balance while performing various activities (Myers, Fletcher, Myers & Sherk, 1998).

Outcome expectations were defined as the belief that specific positive or negative consequences are likely to occur in response to regular PA, such as improved body functioning, increase in muscle strength, etc. (Bandura, 1997, Baranowski et al., 2002; Wilcox, Bopp, Oberrecht, Kammerman & McElmurray, 2003, Wojcicki, White & McAuley, 2008).

Mobility limitations.

Mobility limitation was defined as difficulty or inability to walk a short distance with or without the use of an assistive device (Rejeski, Ip, March, Miller, Farmer et al., 2008). Mobility is the ability to move one's body through space and walking is the most common manifestation (Studenski, 2005*).* While basic mobility involves getting around inside the house or getting in or out of bed, higher-level mobility includes walking up to a half-mile and climbing stairs (Studenski, 2005). While functional limitations have been defined as difficulty in performing any of a set of physical tasks associated with the activities of daily living such as performing housework, carrying groceries, climbing stairs, and walking (Gretebeck, Black, Blue, Glideman, Huston et al., 2007), mobility limitations is considered a form of functional limitation that is specific to difficulty or inability to walk independently (Rejeski et al., 2008).

Environmental Variable

Neighborhood environment was defined as the area within 1/2 mile of the participant's home (Michael et al., 2006; Saelens et al., 2003). Neighborhood environment was described using the "3 Ds" outlined in the transportation and urban planning literature: density (housing type), diversity (presence of local destinations within walking distance), and design (neighborhood access, neighborhood streets, neighborhood sidewalks, neighborhood surroundings, comfort, traffic, and crime) (Cervero & Knockelman, 1996, Saelens, Sallis & Frank, 2003).

CHAPTER TWO
BACKGROUND AND SIGNIFICANCE

Aging is a complex process that is influenced by interacting genetic, pathophysiologic, and lifestyle variables (Mazzeo, Cavanaugh, Evans, Fiatarone & Hagberg, 1998) including PA. Physical activity is defined as any bodily movement that is produced by the contraction of skeletal muscle and substantially increases energy expenditure. Exercise, defined as planned, structured and repetitive bodily movement done to improve or maintain physical fitness, is a subclass of PA (Franklin, Whaley & Howley, 2000). Vigorous-intensity is defined as exerting more than 6 metabolic equivalents (METS) per hour. A MET is the ratio of the rate of energy used during an activity to the rate of energy used at rest (1 MET). A 6 MET activity uses six times the energy used at rest (USDHHS, 2008). Vigorous-intensity PA may include running, jumping rope or other similar activities (Jones, Ainsworth, Croft, Macera, Lloyd et al., 1998, USDHHS, 2008). Moderate-intensity PA is defined as 3 to 5.9 METS per hour (USDHHS, 2008). Moderate-intensity PA may include brisk walking, gardening, or heavy housework and can be accumulated in bouts as short as 10 minutes throughout the day (Blair & Connelly, 1996). Engaging in moderate-intensity PA assists older adults in achieving the health-related benefits associated with PA as well as meeting the PA guidelines recommended by the USDHHS, American

College of Sports Medicine and American Heart Association (Nelson et al., 2007; USDHHS, 2008).

Walking is the most common type of moderate PA chosen by adults of all ethnic backgrounds (Bassett et al., 2002; Belza, Walwick, Shiu-Thornton, Schwertz, Taylor et al., 2004; Hughes et al., 2008; King, 2001; Wong et al., 2003). Walking increases longevity and is useful in the prevention and treatment of many common chronic diseases (Singh, 2002). One study of more than 70,000 women aged 50 to 79 found that the same amount of energy expenditure, whether through vigorous PA or walking, was associated with approximately the same reduction in cardiovascular disease risk (Manson, Greenland, LaCroix, Stefanick, Mouton et al., 2002). In the Harvard Alumni Health Study, men who walked approximately three to six miles per week had a 13% lower risk of coronary heart disease (Lee et al., 2001; Sesso et al., 2000), while in the Women's Health Study, walking duration and speed were inversely related to the risk of coronary heart disease (Lee et al., 2001). In the Diabetes Prevention Project, 150 minutes of walking per week in adults with impaired glucose tolerance reduced the risk of development of diabetes by more than half (Knowler et al., 2002).

Walking does not require specific skills, clothing or equipment; can offer companionship if done with friends or family; and can easily be incorporated into daily activities by individuals with varied fitness levels (Henderson & Ainsworth, 2000; Lockett et al., 2005; Mazzeo & Tanaka, 2001; Wong et al., 2003). Walking is one of the most accessible forms of PA and can be performed by most individuals regardless of age or socioeconomic status (LeMasurier et al., 2008).Walking can be performed for recreation (exercise or leisure) or transportation, which includes walking to local destinations or public transit stops (King, Toobert, Ahn, Resnicow, Coday et al., 2006; Sallis et al., 2006). Walking can occur close to home, making it attractive to many older adults (King, 2001). Walking to local destinations may also help older adults, especially those who do not drive, to maintain their independence (Henderson & Ainsworth, 2000; Lockett et al., 2005).

Walking is particularly significant for the maintenance of functional ability and mobility in older adults (Shumway-Cook et al., 2003). While declines in functional ability or mobility may complicate efforts to start or maintain PA (Atchley & Scala, 1998; Lim & Taylor, 2004), successful adoption or maintenance of a PA or walking program may reduce or slow declines in functional ability (McAuley, Konopack, Motl, Morris, Hu, Doerksen et al, 2006; Messier, Loeser, Miller, Morgan, Rejeski et al., 2004; Miller, Rejeski, ReBoussin, Ten Have & Ettinger, 2000; Hardy & Gill, 2005), development of gait disorders (Alexander and Goldberg, 2005), and development of disability (Miller et al., 2000) in older adults. Walking does not have to be of long duration or distance in order to provide functional benefits: Walking as little as one mile per week has been found to reduce the risk (OR = .45, 95% CI = .35 - .58, $p < .001$) of functional limitations (Miller et al., 2000). Women with functional limitations who walked as little as eight blocks per week were more likely to maintain perceived walking ability after one year (OR=1.79, 95% CI=1.2-2.6, p=.002) than those who did not (Simonsick, Guralnik, Volpato, Balfour & Fried, 2005).

Theoretical Model

This study was guided by Social Cognitive Theory. Social Cognitive Theory variables include the target behavior, individual factors and environment (Bandura, 1997). In this study, the target behavior was neighborhood walking. Individual factors included self-efficacy, outcome expectations and mobility limitations, and environment included density, diversity and design.

Individual Variables

Psychosocial Factors

Self-efficacy and outcome expectations have been studied in relation to PA and/or walking in older adults. While self-efficacy has been widely studied, less is known about the role of outcome expectations in PA and walking in older adults.

Self-efficacy.

Self-efficacy is defined as an individual's belief in his or her capability to perform a specific behavior (Bandura, 1997; Resnick, Zimmerman, Orwig, Furstenberg & Magaziner, 2000) and includes confidence in overcoming barriers to performance of that behavior (Baranowski et al., 2002). For example, an individual may be very confident that he or she can walk or exercise when feeling well but may be less confident when experiencing pain or fatigue. Self-efficacy affects behavior, motivation, thought patterns, and emotional reactions to a situation (Resnick, Zimmerman et al., 2000). Individuals with high self-efficacy are hypothesized to approach more challenging tasks, put forth more effort, and persist longer in the face of aversive stimuli than those with lower self-efficacy (Bandura, 1988). Self-efficacy is considered the most important prerequisite for behavior change due to its effect on effort invested and level of performance achieved (Bandura, 1997; Baranowski et al., 2002).

Self-efficacy is influenced by four sources of information: performance accomplishments, including practice and prior experience; vicarious experience and observation of others (modeling); verbal persuasion; and self-evaluation of physiologic and emotional states. Of the four information sources, performance accomplishment is considered to be the strongest (Bandura, 1997; van der Bijl & Shortridge-Bagget, 2001). Other influences on self-efficacy include social support, self-assessment of adequacy of relevant skills, complexity of the task, available resources, and the physical environment, including weather and the perception of risk or danger in the environment (van der Bijl & Shortrideg-Bagget, 2001).

Although self-efficacy has been extensively studied, specific examination of its role in PA or walking in older adults is complicated by the varied types of self-efficacy and outcomes measured. Self-efficacy measures related to PA that have been studied often include self-efficacy related to exercise (barriers, duration, distance, etc.), ability to perform activities of daily living, or functional measures such as walk tests. Outcomes studied also may include not only PA and exercise measures, but functional performance and satisfaction measures. In addition, few studies have specifically examined self-efficacy for walking, particularly in older adults (McAuley et al., 2000; McAuley, Hall, Motl, White, Wojcicki, Hu et al., 2009; McAuley, Katula, Mihalko & Blissmer, 1999; Michael & Carlson, 2009). The focus of this review is specific to the influence of PA-related self-efficacy on PA or walking in older adults. Because PA-related self-efficacy has been found to be lower in older adults (Conn, 1998; McAuley, Morris, Doerksen, Motl, Hu et al., 2007; Rejeski, King, Katula, Kritchevsky, Miller et al., 2008) and in individuals with functional and mobility limitations (McAuley, Morris et al., 2007; Rejeski et al., 2008; Resnick, Palmer, Jenkins & Spellbring, 2000), the examination of the influence of PA-related self-efficacy on walking and PA is particularly important for this population.

PA-related self-efficacy has been operationalized in a number of ways, including exercise self-efficacy (confidence in ability to perform PA or exercise for a specific period of time, such as one, two or twelve weeks) and self-efficacy for PA barriers, walking duration, balance and gait. PA-related self-efficacy has been associated with PA or walking in older adults in a number of studies, both as a determinant (Conn, 1998; McAuley et al., 2006; Morris, McAuley, & Motl, 2008; Perkins, Multhaup, Perkins & Barton, 2008; Resnick, 2001; Resnick, Palmer et al., 2000) and as a consequence (Rejeski et al., 2008, McAuley, Jerome, Elavsky, Marquez & Ramsey, 2003; McAuley et al., 1999).

Many studies have reported a positive association between PA or walking and PA-related self-efficacy in cross-sectional studies or baseline measures of longitudinal studies (Brassington, Atienza, Perczek, DiLorenzo & King, 2002; Conn, 1998, Conn, Burks, Pomeroy, Ulbrich & Cochran, 2003; Conn, Burks, Pomeroy & Cochran, 2003; Perkins et al., 2003; McAuley et al., 2006; Resnick, Palmer et al., 2000) Both Conn (1998) and McAuley et al., (2006) have reported that exercise self-efficacy had a significant influence on exercise behavior in older adults ($\beta = .48$, $p < .001$ and $\beta = .70$, $p < .01$, respectively), while Perkins and colleagues (2008) found that exercise self-efficacy influenced PA in older adults in the U.S. ($\beta = .486$, $p < .05$) and Spain ($\beta = .391$, $p < .05$). Exercise self-efficacy has also been found to be associated with PA ($\beta = .45$, $p < .05$) in the three months prior to measurement of self-efficacy (Resnick, Palmer et al., 2000). Exercise self-efficacy has also been studied in relation to distinct components of exercise. Exercise self-efficacy was a significant predictor of: exercise frequency per week ($\beta = .53$, $p < .0001$), intensity ($\beta = .31$, $p < .001$) and duration of each episode ($\beta = .23$, $p = .03$), and number of months exercised ($\beta = .38$, $p < .0001$) per year (Conn, Burks, Pomeroy & Cochran, 2003).

Self-efficacy for PA barriers has also been associated with PA or exercise in middle-aged women (Wilcox, Bopp, Oberrescht, Kammerman, & McElmurray, 2003) and older women (Conn, Burks, Pomeroy & Cochran, 2003). Wilcox and colleagues (2003) found that self-efficacy for PA barriers has been found to be positively associated with PA ($r = .22$, $p < .05$), in women 50 years of age and older while Conn and colleagues (2003) found that exercise self-efficacy significantly influenced PA ($\beta = .12$, $p < .01$) in older women. In contrast, McAuley and colleagues (2009) did not find any direct association at baseline between self-efficacy for walking duration and PA in women 65 years of age and older. Self -efficacy for walking duration has also been associated with more positive and fewer negative feelings in older adults during acute bouts of PA (McAuley et al., 2000).

In addition to the role of self-efficacy for PA barriers and walking duration, balance self-efficacy has been associated with higher self-reported PA levels (McAuley et al., 2007; McAuley, Morris, Hu & White, 2008; Myers, Fletcher, Myers & Sherk, 1998) while lower balance self-efficacy has been associated with activity avoidance (r = -.92, p < .001) in older adults (Myers, Powell, Maki, Holliday, Brawley & Sherk, 1996) and slower gait speeds (Liu-Ambrose, Khan, Donaldson, Eng, Lord et al, 2006; Myers et al., 1998; Myers et al., 1996). Balance self-efficacy was associated with self-reported PA in older women (β = .19, p < .05) and in active older adults compared to older adults with restricted activity (M = 81 v. 64, t = 2.89, p < .01) in two cross-sectional studies (McAuley et al., 2007, Myers et al., 1998). McAuley and colleagues (2008) also found that more active older women (n = 294), 59 to 84 years of age, had higher self-efficacy for balance at baseline (β = .31, p < .05) of a 24-month prospective study.

Self-efficacy for balance has been associated with performance measures for both balance and gait. Self-efficacy for balance was associated with better performance on the Community Balance and Mobility Scale, a 13-item balance performance measure (β = .48, p < .05) and normal and fast-paced gait speed (β = .39, p < .05 for both gait speed measures) in women 75 years of age and older (Liu-Ambrose et al., 2006). Self-efficacy for gait was associated with performance on the Berg Balance scale (r = .47, p < .01) in older adults but was not significantly different between physically active and sedentary older adults (McAuley et al., 1997). In contrast, a mean score including both self-efficacy for gait and balance was associated with PA (β = .44, $p < .05$) and a functional performance measure (β = .21, $p < .05$) consisting of gait speed, timed up-and-go, and timed stair walk (McAuley et al. 2006).

In addition to its association with PA or walking in cross-sectional or baseline data, PA-related self-efficacy has been associated with adherence to PA and walking interventions (Brassington et al., 2002; McAuley, 1992; McAuley, 1993; McAuley, Morris, Motl, Hu, Konopack et al., 2007). However, the level of influence PA-related self-efficacy exerts may depend on whether it is examined during adoption or during later phases of PA maintenance. Self-efficacy may have more influence during adoption of new PA behavior (the initial three months of PA behavior) than during early stages of PA maintenance. In a five-month PA intervention (primarily brisk walking) with sedentary adults 45 to 64 years of age, baseline self-efficacy for PA barriers contributed to the explained variance in both PA frequency (R^2 = .21, β = .24, $p < .05$) and self-efficacy for PA barriers (R^2 = .22, β = .49, $p < .05$) at 12 weeks (McAuley, 1992). However, the only significant predictor of PA frequency at 20 weeks (the end of the intervention) was PA frequency (R^2 = .25, β = .55, $p < .05$) at 12 weeks (McAuley, 1992). The author suggested that self-efficacy for PA barriers is a significant predictor of PA in the adoption stage of PA, but as PA becomes more habitual, self-efficacy for PA barriers becomes less important (McAuley, 1992).

The influence of self-efficacy may re-emerge during the maintenance of PA. For example, in a subsequent analysis of the previously described PA/walking intervention, self-efficacy for PA barriers and exercise self-efficacy at the end of the 20 week intervention were associated with PA (r = .52, p < .05) and METS/week (r = .37, p < .01) four months later (McAuley, 1993). In addition to self-efficacy, the author also examined the influence of aerobic capacity, previous exercise experience, program attendance and effort (Borg Rated Perceived Exertion scale) on PA maintenance. Of the variables examined, only exercise efficacy at the end of the PA intervention explained a significant amount of the variance in PA (R^2 = .125, β = .42, p < .01) four months later (McAuley, 1993). Self-efficacy may be associated with longer-term maintenance of PA. In a study involving a six month PA intervention, exercise self-efficacy two years after the beginning of the intervention predicted exercise level five years after the beginning of the intervention (β = .17, p < .05) in older adults (McAuley, Morris, Motl et al., 2007).

Change in exercise self-efficacy, as well as absolute levels, have been associated with PA maintenance in older adults. In one study, amount of change in exercise self-efficacy (β = 0.28, p < 0.01) and absolute levels of exercise self-efficacy (β = 0.24, p < 0.05) after six months of a PA intervention contributed independently to participants' adherence with the intervention from 7 to 12 months (Brassington et al., 2002). In another study in middle-aged women, change in self-efficacy for PA barriers at the end of a 24 week walking intervention did not significantly predict adherence to walking 24 weeks later

(Wilbur, Vassalo, Chandler, McDevitt &Miller, 2005). However self-efficacy for PA barriers at the end of the walking intervention (β = 28, $p = .02$) as well as adherence to the intervention (β = 50, $p < .01$) did predict walking maintenance in the same study (Wilbur et al., 2005).

The influence of self-efficacy on PA adherence may also be mediated through other variables (Bandura, 1997). Although not associated with PA at baseline, self-efficacy (a mean of exercise self-efficacy and self-efficacy for walking duration) at baseline was associated with the two-year change in PA indirectly through functional limitations (β = -.21, $p < .05$) in older women (McAuley, Hall, Motl, White, Wójcicki et al., 2009). Alternatively, self-efficacy may itself serve as a mediator of adherence. In one study, exercise frequency (β = .42, $p < .05$), affect (β = .23, $p < .05$), and social support (β =.30, $p < .05$), were significantly associated with self-efficacy, while self-efficacy was significantly associated with PA at 6 and 12 months (β = .27, $p < .05$ and β = .25, $p < .05$, respectively), supporting the role of self-efficacy as a mediator between the other variables and PA (McAuley et al., 2003).

As self-efficacy has been associated with PA and walking, participation in PA and walking has been associated with increases in self-efficacy over time. Increases in PA over 24 months were associated with greater improvements in exercise self-efficacy (β=0.12, $p < .05$) while frequency of participation in a walking group (β = .64, $p < .05$) has been associated with self-efficacy for walking duration (McAuley, Morris, Doerksen et al., 2007; McAuley et al., 1999).

A number of studies have examined the influence of barriers to PA (including walking) in older adults. Health problems are among the most frequently cited barriers to PA (79% of respondents) among older white and African-American women living in rural areas (Wilcox et al, 2003) and among women over 40 from various ethnic groups (Heersch, Brown & Blanton, 2000) as well as lack of energy (Heersch et al., 2000).

In summary, PA-related self-efficacy has been associated with higher levels of PA in middle-aged and older adults. PA-related self-efficacy may be particularly important when PA is initiated and may become less influential as PA becomes more habitual. However, long-term studies of six months or more suggest that PA-related self-efficacy may mediate the relationship between PA frequency and PA at 12 and 24 months (Brassington et al., 2002; McAuley, 1993; McAuley, Morris, Motl et al., 2007). Physical activity and walking also have been associated with increases in PA-related self-efficacy, suggesting an iterative process.

Outcome expectations.

Outcome expectations are defined as the belief that specific positive or negative consequences are likely to occur in response to a particular behavior in a certain situation (Bandura, 1997; Baranowski et al., 2002; Umstaddt & Hallam, 2007). For example, individuals may believe they will feel better physically as a result of walking 30 minutes a day, five days a week.

Outcome expectations can take three major forms, all of which potentially may include positive and negative expectations associated with the behavior:

physical effects, social reactions of others, and self-evaluation (Bandura, 1997). According to Bandura (1997), when certain levels of performance of the activity determines the outcome, self-efficacy mediates the influence of outcome expectations on PA behavior, accounting for most of the variance in outcome expectations (Bandura, 1997). Self-efficacy may have less influence when expectations are not as directly controlled by performance levels. The influence of outcome expectations may be independent of self-efficacy in certain groups when no level of competence in the desired behavior can produce the desired outcomes. This may be relevant in situations where racial, age, gender or economic segregation exists (Bandura, 1997).

Outcome expectations may impact PA directly in older adults (Resnick, Palmer et al., 2000; Resnick, 2001). Resnick differentiates the influence of outcome expectations and self-efficacy by noting that individuals, while confident that they can perform an action, may choose not to do so if the outcome expectation is not considered worthwhile (Resnick, Zimmerman et al., 2000). Older adults have been found to hold lower outcome expectations than younger adults (Conn, 1998; Netz & Raviv, 2004; Resnick, Palmer et al., 2000) and their influence on walking and PA is not well understood.

Although outcome expectations are hypothesized to influence behavior primarily through self-efficacy (Bandura, 1997), the evidence in older adults is mixed. Outcome expectations have been associated with PA ($\beta = .25$, $p < .05$) at baseline of a PA intervention (McAuley, Hall et al., 2009). Outcome expectations had greater influence on PA than self-efficacy ($\beta = .30$, $p < .05$ and $\beta = .19$, $p <$

.05, respectively) in older adults living in a retirement community (Resnick, 2001). In contrast, others have found that outcome expectations had a smaller influence on PA than self-efficacy ($\beta = 17$, $p < .05$ and $\beta = .48$, $p < .001$, respectively) in older adults (Conn, 1998) or were nonsignificant as an influence on PA (Perkins et al., 2008).

The role of outcome expectations may differ depending on whether PA adoption or maintenance is examined. Although outcome expectations were not significantly associated with PA at baseline, achievement of outcome expectations were associated with exercise adherence ($r = .22$, $p < .05$) in older adults (Brassington et al. 2002) and older women ($p < .05$) at 7 and 12 months post-intervention (Wilcox, Castro & King, 2006). Outcome expectations at six months has also been associated with changes in self-efficacy ($r = .38$, $p < .05$) in older adults (Brassington et al., 2002).

Despite the proposed presence of three distinct classes of outcome expectations (physical, social, and self-evaluative), most measures combine the items or only examine outcome expectations related to physical health (Wojcicki, White, & McAuley, 2009). Health has been identified in older adults as both a motivator of PA and a reason to limit PA (Netz & Raviv, 2004) and outcomes related to health that are often cited include fitness, weight change or physical appearance, and confidence (Brassington et al., 2002; Wilcox et al., 2006). Realization of these outcome expectations at six months was associated with PA adherence from 7 to 12 months in older women (Wilcox et al., 2006). In another study achievement of fitness-related outcome expectations at six months was associated with PA adherence at six months in older adults (Brassington et al, 2002).

In summary, the role of outcome expectations in PA and walking is not clear and may depend on whether PA adoption or maintenance is examined. The influence of specific outcome expectations is important in order to identify which outcome expectations are most important in adopting or maintaining PA or walking in older adults.

Demographic Characteristics

Age and gender are found consistently to be related to PA, with lower prevalence of PA in women and adults as they age (Conn, 1998; McAuley, Morris, Doerksen et al., 2007; Shaw & Spokane, 2008; Strath et al., 2009). In one study, age had a direct significant negative influence on exercise behavior (β = -.21, $p < .001$, as well as on exercise self-efficacy (β = -.26, $p < .001$) and outcome expectations (β = -.23, $p < .001$) on older adults living independently (Conn, 1998). There is also evidence that the influence of age and gender on PA may be mediated by psychosocial variables such as self-efficacy and outcome expectations. Resnick, Palmer, and colleagues (2000) found that age and gender did not directly influence exercise levels in older adults, but did so indirectly, through self-efficacy and outcome expectations. Gender influenced exercise self-efficacy (β = -0.16, $p < 0.05$), which influenced exercise behavior (β = -.45, $p < .05$), while age influenced outcome expectations (β = -0.13, $p < 0.05$), which in turn influenced exercise behavior (β = 0.17, $p < 0.05$) in older adults living in a retirement community (Resnick, Palmer et al., 2000). Given the modifiable nature of self-efficacy and outcome expectations, it is important to understand their relationship with age and gender.

Mobility Limitations

A number of factors may complicate mobility in older adults including slowed gait, diminished or variable stride length (Alexander & Goldberg, 2005; Brach, Studenski, Perera, VanSwearingen & Newman, 2007; Lemasiuer et al., 2003), pain and stiffness, dizziness, numbness, weakness, and sensations of abnormal movement (Alexander & Goldberg, 2005). Walking is often the first activity to be limited in older adults, particularly if a fall has taken place (Bialoszewski, Slupik, Lewczuk, Gotlib, Mosiolek & Mierzwińska, 2008; Wijlhuizen, de Jon & Hopman-Rock, 2007) or if there are difficulties with strength or balance (Hill, Schwarz, Kalogeropoulos & Gibson, 1996), which may lead to further declines in mobility.

Environment

Neighborhood Environment

In Social Cognitive Theory, environment can take three different forms depending on the situation: imposed, selected or created (Bandura, 1997). Some aspects of the physical and social environment are *imposed* without control by an individual. However, the environment also has different aspects which can be rewarding or punishing, and the individual may *select* aspects that are relevant to their own needs and contexts. Finally, the *created* environment is a social system that is created to allow people to have more control over their lives (Bandura, 1997). For example, in the context of neighborhood walking, the imposed environment may include poorly maintained sidewalks in parts of the neighborhood. Rewarding aspects of the neighborhood may include social interactions with neighbors, or enjoyment of neighborhood gardens or homes. Punishing aspects may include an unsightly dumpster by a nearby school that attracts animals. The created environment may include, for example, development of a walking club that maximizes social interaction or walking maps that avoid unsightly dumpsters. The created environment also could include development of a neighborhood group to advocate for improved maintenance of sidewalks.

Although individuals may not have complete control over their environment, they have control over how they construe and react to it (Bandura, 1997). On the other hand, the characteristics of the environment that are selected depend not only on what an individual believes, but on how other people behave, and there are gradations in the amount of changeability of the environment (Bandura, 1997). For example, the physical and social characteristics of the neighborhood environment may be less amenable to rapid change than the characteristics of a home. Also, the ability to select rewarding aspects of the neighborhood environment and ignore punishing aspects may depend on physical, social and economic characteristics of the neighborhood that are not entirely under an individual's control.

Neighborhood environmental factors that may influence walking are characteristics that encourage or hamper walking or other PA that takes place outdoors. Specific neighborhood factors may have differing relevance for older adults depending on the reason (e.g., recreation, exercise, or transportation) and the location chosen for walking (e.g. mall, track or neighborhood) (King et al., 2006; Sallis et al., 2006). Some neighborhood environmental factors, such as the presence of uneven or obstructed walkways, may be particularly relevant for older adults with functional or mobility limitations (Clarke et al., 2008: Shumway-Cook et al., 2003; Strath et al., 2007).

Neighborhood characteristics relevant to walking in older adults can also be understood based on the “3 Ds” concept from urban planning. The "3 Ds" concept was developed in order to examine transportation choices within the context of the built environment and include: density (e.g., households per acre and floor-area ratio), diversity (e.g., land-use mix and presence of neighborhood retail), and design (e.g., street connectivity indicators, road network density, and completeness of sidewalk networks) (Cervero & Knockelman, 1996). Design can be expanded from its focus on streets and sidewalks to include other neighborhood characteristics found to influence walking of adults, including neighborhood access to stores and facilities, neighborhood surroundings, safety from crime and traffic, and comfort (Saelens et al., 2003; Pikora et al., 2003).

Most research that has examined the influence of the neighborhood environment on walking has focused on the general adult population but is emerging in older adults. Neighborhood environmental factors that have been identified as important to PA or walking in older adults include residential density (Shigamatsu, Sallis, Conway, Saelens, Frank et al, 2009; Surface Transportation Policy Project, 2004) diversity of local destinations (Gallagher et al., 2010;

Michael et al., 2005; Patterson & Chapman, 2003), neighborhood surroundings and aesthetics (Nagel, Carlson, Bosworth & Michael, 2008; Strath et al., 2007), pedestrian and traffic safety (Patterson & Chapman, 2003; Michael et al., 2005), presence and condition of sidewalks (Shumway-Cook et al., 2003), safety from crime and injury (Roman & Chalfin, 2008; Belza et al., 2004; Cunningham et al., 2005; Strath et al., 2007; Wilcox et al., 2003), and physical comfort, including weather and places to rest or use the bathroom (Cunningham et al., 2005; Gallagher et al., 2010; Lockett et al., 2005).

Neighborhood density.

Although neighborhood residential density has been associated with PA in the general adult population (Ewing, 2005; King et al., 2006; Saelens & Handy, 2008; Saelens, Sallis & Frank, 2003), density has not been studied as extensively in older adults, and the evidence is mixed. Shigematsu and colleagues (2009), found that neighborhood density was weakly associated only with transportation walking in older adults aged 66 to 74 years ($r = .189$, $p < .05$). Density was not associated with walking for any reason in adults over 74 years of age (Shigematsu et al., 2009). The authors suggested that the measure used may not include characteristics related to recreational walking, and recreational walking may take place in areas outside of the neighborhood, such as local parks or malls (Shigematsu et al., 2009). Older adults who walked 90 or more minutes per week for either recreation or transportation were slightly more likely to live in higher density neighborhood (OR = 1.07, CI = 0.86, 1.33) than those who did not walk at all (Rodriguez, Evenson, Diez Roux & Brines, 2009), The influence of neighborhood density may be particularly relevant for nondrivers. Among older adults who do not drive, 35% of those who live in the most densely populated neighborhoods walk on a given day, compared to 8% of those in rural or suburban areas (Surface Transportation Policy Project, 2004).

Neighborhood diversity.

Neighborhood diversity, defined as a land use mix of residential, public and commercial destinations within walking distance, has been found to be associated with general and transportation walking (Patterson & Chapman, 2003; Michael et al., 2005; Gallagher et al., 2010; King et. al, 2005; Li, Harmer, Cardinal, Bosworth, Acock et al., 2008; Lockett et al., 2005; Strath et al., 2007; King, Castro, Wilcox, Eyler, Sallis et al., 2000; Nagel et al., 2008). The influence of neighborhood may be different in walking for transport than walking for recreation. Neighborhood diversity was found to be more important for transport walking than for recreational walking in two studies of older adults (Shigematsu et al., 2009; Strath et al., 2007). Shigematsu and colleagues (2009) found that transportation walking in those 66 to 74 years old (r = .424, p < .05), and those over 74 years of age (r = .351, p < .05) was associated with land use mix diversity. Recreational walking was only associated with walking in the 66 to 74 year (r = .175, p < .05) age group (Shigematsu et al., 2009). Interestingly, the highest associations across the age groups between transportation walking and land use diversity were in older adults over 66 years old (Shigematsu et al., 2009). The authors suggest that older adults may be more sensitive to the presence of destinations within walking distance of home because they are not spending as much time at a workplace distant from their neighborhood (Shigematsu et al., 2009). In addition to walking for transport, neighborhood density has also been associated with higher levels of walking for any reason (Li, Fisher & Brownson, 2005, Michael et al., 2009, Nagel et al., 2008).

Neighborhood design.

Neighborhood streets

The results are mixed for the association between neighborhood street connectivity and four-way intersections with walking or PA in older adults (Li et al., 2005; Li, Fisher, Brownson & Bosworth, 2005; Li, Harmer, Cardinal, Bosworth, Acock et al., 2008). One study found no association between street connectivity and intersections and walking for either recreation or transportation in older adults (Shigematsu et al., 2009). In contrast, in another study adults 50 to 75 years of age living in areas with higher street connectivity were more likely to walk in their neighborhood ($\beta = .148$, $p < .05$) and to meet U.S. guidelines ($\beta = .162$, $p < .001$) for PA (Li et al., 2008). Although in the same study number of intersections was associated with neighborhood walking in older adults ($\beta = .531$, $p = .01$), an interaction was present between number of intersections and perceptions of traffic safety (Li et al., 2008). This suggests that the influence of number of intersections on neighborhood walking in older adults may depend on their perception that traffic conditions at these intersections are safe for walking (Li et al., 2008).

Neighborhood sidewalks

The presence of pedestrian infrastructure such as complete and well-maintained sidewalks promotes PA (King et al., 2000; Strath et al., 2007) and walking in older adults (Li, Fisher & Brownson, 2005; Lockett et al., 2005; Michael et al., 2005; Gallagher et al., 2010; Shigematsu et al, 2009). A weak association ($r = .155$, $p < .05$) has been found between presence and condition of neighborhood sidewalks and walking facilities and walking for transportation in older adults 66 to 75 years old (Shigematsu et al., 2009). No relationship was found between presence of sidewalk and recreational walking (Shigematsu et al., 2009). The presence of unobstructed and maintained sidewalks was related to neighborhood walking ($\beta = .148$, $p = .01$), but for either transportation or recreation (Li, Fisher & Brownson, 2005). In contrast, in older women living in rural areas the absence of sidewalks was associated with higher levels ($\beta = -0.21$, $p = .03$) of PA (Wilcox et al., 2003). These results may be limited as the sample lived in rural areas without sidewalks.

In older adults, the presence and condition of sidewalks may be related to fall risk (Shumway-Cook et al., 2003) as well as pedestrian risk from traffic. Adults over age 45 (Mean age = 74 years old) who participated in more leisure-time PA were found to be at higher risk for outdoor falls than those who did not participate (OR = 2.15, 1.36 – 2.41) in PA (Li, Keegan, Sternfeld, Sidney, Quesenberry et al., 2006). Walking was the activity most commonly identified with falls (43%) and the most common locations (34%) were sidewalks, curbs and streets (Li et al., 2006). Most falls occurred outdoors and 73% were caused by neighborhood environmental factors such as uneven surfaces as well as tripping or slipping on objects (Li et al., 2006). Outdoor falls have been found to be more common in individuals with compromised health status who remained physically active (OR = 1.09, p = 0.05) while indoor falls have been associated with frailty (Bath & Morgan, 1999).

Neighborhood surroundings

Neighborhood surroundings, aesthetics, and the presence of parks and greenery have been found to influence PA (Nagel et al., 2008; Strath et al., 2007) and walking (Lockett et al., 2005; Michael et al., 2005; Gallagher et al., 2010) in older adults, although sometimes less than factors related to safety from traffic and falls (Strath et al., 2007; Lockett et al., 2005). In a study of 4317 older adults (mean age = 74.5 years old) a negative association was found between walking and neighborhood disorder (β = -2.78, p = .004), including vandalism and neighborhood maintenance (Mendes de Leon, Cagney, Bienias, Barnes, Skaupski et al., 2009). Like the influence of local destinations on walking, the importance of neighborhood surroundings may depend on the reason for walking. The presence of an attractive landscape has been found to be more important for recreational (OR = 2.15, 1.36 – 2.41) walking or bicycling (27% of responses) than for transport (13% of responses) walking or bicycling (Strath et al., 2007).

Comfort

The presence of characteristics related to comfort, such as bathrooms and places to rest, have also been identified as factors that may be important for walking in older adults (Cunningham et al., 2005; Gallagher et al., 2010; King, Satariano, Marti & Zhu, 2008; Lockett et al., 2005). In addition, inclement weather may discourage neighborhood PA and walking (Cervero & Duncan, 2003; Henderson & Ainsworth, 2000; Sumukadas, Witham, Struthers & McMurdo, 2009). In an analysis of walking trip diaries, the amount of rainfall influenced walking for transportation in the general adult population ($\beta = -0.73$, $p = .027$) (Cervero and Duncan, 2003), while amount of rain ($r = -.098$, $p = .008$), maximum daily temperature ($r = .345$, $p < .001$) and duration of sunshine ($r = .313$, $p < .001$) were significantly associated with daily PA counts by accelerometer in older adults who reported limitations in at least one activity of daily living (Sumukadas et al., 2009).

Traffic safety

Pedestrian safety and the risk of injury from motor vehicle traffic may be particularly significant for older adults. Older pedestrians suffer 23% of all pedestrian fatalities, despite representing only 13% of the total U.S. population (Federal Highway Administration, 2006). High-speed traffic, incomplete sidewalk networks, and crosswalk lights timed for younger individuals can add to the dangers older adults may face while walking outdoors (Frank et al., 2003). Older pedestrians are at the highest risk of injury during the winter months or while crossing intersections or walking behind vehicles (Federal Highway Administration, 2006). The most dangerous areas for older pedestrians are newer developments; low-density areas (fewer buildings per acre); wide, high-speed streets; and streets with few sidewalks or crosswalks (Surface

Transportation Policy Project, 2004). Streets with crosswalks are not without risk, however. In one study of more than 12,000 adults over 72 years of age, less than 1% had a walking speed sufficient to allow them to walk across the street in the time allotted by most crosswalks (Langlois, Keyl, Guralnik, Foley, Marottoli et al., 1996).

Despite this risk, research findings are mixed on the influence of motor vehicle traffic on walking in older adults. Traffic-calming measures such as speed bumps and a sense of reduced traffic safety threat have been associated with higher levels of PA or walking in many studies of older adults (Patterson & Chapman, 2003; Michael et al., 2005; King, D., 2008; Lockett et al., 2005; Strath et al., 2007). In contrast, Nagel et al. (2008) found that the presence of streets with low motor vehicle traffic volume was associated with less brisk walking time in older adults ($\beta = -0.85$, $p = .04$).

Crime safety

Older adults and women have been found to be more fearful of walking in their neighborhoods due to crime (OR = 1.02, 1.01 – 1.03; OR = 2.07, 1.48 – 4.23 respectively) than younger adults (Roman & Chalfin, 2008). A perception of potential criminal victimization has been found to negatively impact PA (Belza et al., 2004; Cunningham et al. 2005; Strath et al., 2007; Wilcox et al., 2003) and walking in older adults (Gallagher et al., 2010; King, D., 2008; Lockett et al., 2005; Michael et al., 2005). Greater perceived safety was associated with increased PA ($\beta = .20$, $p = .03$) in older white and African-American women living in rural areas (Wilcox et al., 2003). Older adults are less likely to become victims of crime (with the exception of personal larceny) than younger adults, although this may be related to avoidance of night-time activity due to fear of victimization. Older adults who are victims of a violent crime are more likely to suffer a serious injury than younger victims (U.S. Department of Justice, 2006).

Fear of injury from loose dogs may also discourage or prevent neighborhood walking and PA in older adults (Gallagher et al., 2010; King et al., 2006; Michael et al., 2006). The presence of loose dogs in the neighborhood added significantly to the explained variance in walking for transportation (additional R^2 = 7.5, p = .04) and for leisure (additional R^2 = 6.9, p = .03) at baseline in a PA intervention with middle-aged adults (King et al., 2006).

Relationships between the Study Variables

Environment and Mobility Limitations

Neighborhood environmental factors may be particularly relevant for those with mobility limitations. In a longitudinal study of lower-extremity disability rates over time, individuals reporting heavy motor vehicle traffic and neighborhood problems, such as noise and limited access to public transportation, were at higher risk of decline in lower-extremity function (OR = 2.23, 95% CI:1.08, 4.64) than those who did not report problems (Balfour & Kaplan, 2002). The authors suggest that challenges to mobility and PA encountered in a negative environment might have a rapid and strong effect on lower-body function and disability (Balfour & Kaplan, 2002). Neighborhood environmental factors may have a more pronounced effect in older adults with limitations in mobility. Some older adults may limit or avoid walking in certain environments due to a fear of falling. Compared to older adults with higher functional ability, disabled older adults have been found to avoid encounters with uneven surfaces (47% v. 0%, $p < .001$) and curbs (50% v. 0%, $p < .001$) more often (Shumway-Cook et al., 2003). While this avoidance may prevent falls, it may also diminish opportunities for PA in this population. Increased dependence in instrumental activities of daily living in older adults with diminished functional status has also been reported in those who lived in areas with fewer stores and services within walking distance. For those with functional limitations, instrumental disabilities increased by 1.13 for every standard deviation decrease in land-use diversity (Clarke & George, 2005). In another study, poor sidewalk and street conditions had no influence on mobility in adults with no mobility impairments, while those with more severe lower extremity impairment reported four times more difficulty walking two to three blocks (Clarke et al., 2008). Further research is needed to understand the relationship between mobility limitations and neighborhood environmental factors that may influence walking in older adults.

Environment and Self-efficacy

Little is known about the between neighborhood environment, self-efficacy and walking in older adults. In one cross-sectional study, Nagel and colleagues (2008) examined the influence of self-efficacy and neighborhood on walking in older adults. Although self-efficacy was strongly associated with walking ($p< .001$) no significant association was found with the neighborhood environment (traffic, crime, number of retail establishments and intersections). However, among older adults who walked, the amount of time spent walking per week was significantly associated with higher motor vehicle traffic volume (β = 1.0, $p < .05$) and number of commercial establishments in the neighborhood (β = .23, $p < .001$), accounting for 3.6% of the variance in walking duration. Similarly, Michael and Carlson (2009) examined the influence of social cohesion, self-efficacy for PA barriers and the presence of neighborhood problems on change in walking during a six month walking intervention with older adults. Only self-efficacy was found to influence the change in walking, with those with higher self-efficacy for PA barriers at six months reporting higher walking. Mean walking time in the intervention neighborhoods increased (42.9 minutes at baseline to 75.5 minutes at 6 months) while it remained unchanged in the control neighborhoods. The authors suggested that self-efficacy may have mediated the influence of the intervention on neighborhood walking. Self-efficacy also may mediate the influence of the neighborhood environment on PA. In one study changes in neighborhood satisfaction (β = .18, $p < .05$), as well as in functional limitations (β = -.15, $p < .05$) were weakly associated with changes in self-efficacy, which were associated with changes in PA at six months (β = .25, $p < .05$) in older women (Morris et al., 2008).

Gaps in the Literature

While research on the influence of the neighborhood environment on walking has increased in recent years, research on its influence in older adults is still emerging. Very few studies were identified that examined the influence of both neighborhood environmental and psychosocial factors on walking, and few studies explicitly included the potential influence of mobility limitations. Finally, no published studies were identified that examined the influence of neighborhood environmental factors, psychosocial factors, and mobility limitations in the same model on walking in older adults.

Although self-efficacy has been widely studied in relation to PA, the amount of variance explained by studies of older adults ranges from 6% (King et al., 2006; Morris et al, 2008) to 40% (McAuley et al., 1999; McAuley et al., 2003; Morris et al., 2008; Resnick, Palmer et al., 2000; Resnick, Zimmerman et al., 2000), with only one study identified that explained 60% of the variance in PA behavior (Conn, 1998). This suggests that additional variables likely influence PA in older adults. In addition, few investigators have examined the influence of self-efficacy and outcome expectations specific to walking in older adults.

Walking is an excellent form of moderate intensity PA for older adults and may help to maintain mobility and independence. Walking may be influenced by individual variables such as demographic characteristics, self-efficacy, outcome expectations, and mobility limitations. Walking may also be influenced by characteristics in the neighborhood. Characteristics of the neighborhood environment may interact with or add to the influence of individual variables (Clarke & Nieuwenhuijsen, 2009). Understanding the relationship between individual variables (demographic characteristics, self-efficacy, outcome expectations, and mobility limitations), the neighborhood environment and walking in older adults is important for planning interventions and public policy related to PA and the maintenance of mobility in older adults.

CHAPTER THREE
METHODS

Research Design

This cross-sectional study was based on Social Cognitive Theory (Bandura, 1988). The study examined the relationship between individual factors (self-efficacy, outcome expectations, and mobility limitations), environmental characteristics (neighborhood environment) and neighborhood walking in older, urban adults.

Setting and Sample

The sample was recruited from the Human Subjects and Assessment Core database maintained at the University of Michigan Claude Pepper Center. The database is comprised of individuals who have agreed to be contacted for participation in research and receive care at the University of Michigan Hospital and Clinics. Inclusion criteria for this study were: 1) residence in an urban area; 2) aged 60 years or older; 3) live independently (e.g. did not live in a skilled nursing care facility); and 4) able to walk with or without an assistive device. Only older adults living in areas defined as an urban or urbanized area by the U.S. Census Bureau (e.g. areas with a core population density of at least 1000 people per square mile and adjacent density of at least 500 people per square mile) were recruited for this study (U.S. Census Bureau, 2000).

Of the 950 older adults maintained in the Human Subjects and Assessment Core database, 559 individuals were identified as potentially eligible for the study (e.g. age 60 or older and not living in an exclusively rural zip code). The addresses in zip codes that included both rural and urban areas were searched on the U.S. Census Bureau website, and addresses in areas not identified as urban or urbanized areas were excluded (n = 55), leaving 504 potentially eligible participants. Of the 504 potential participants, 101 were excluded due to active involvement in other research studies and three were excluded because of low interest in completing mailed surveys, leaving 400 potential participants in the final mailing list for the survey.

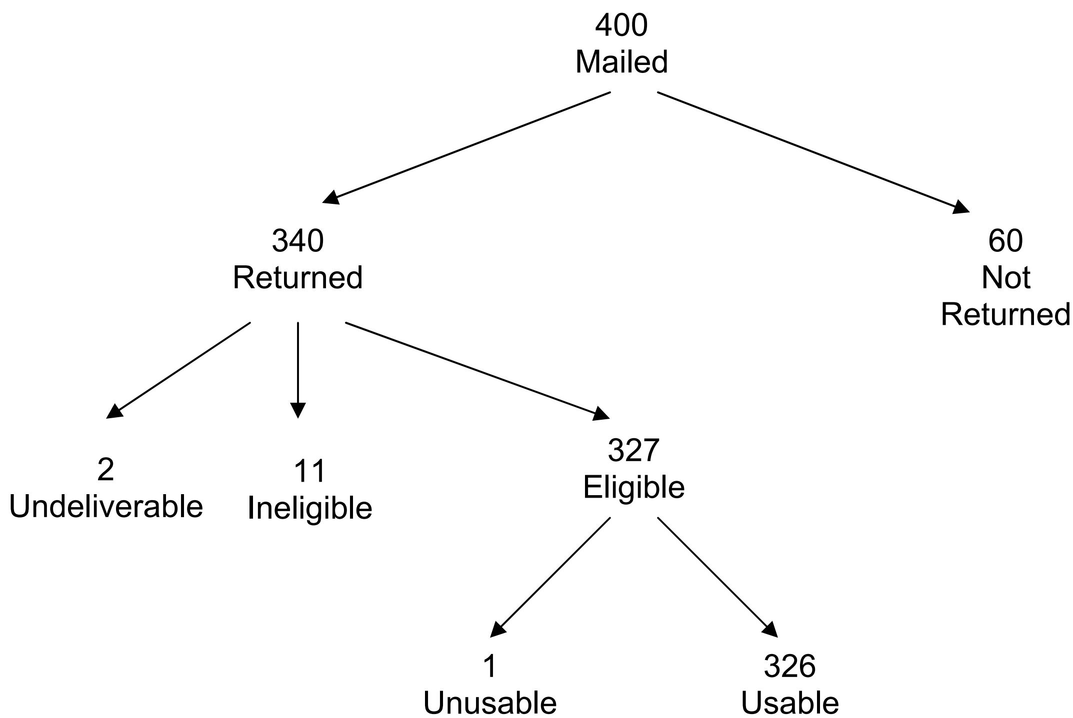

Figure 3.1. Sampling configuration

Four hundred surveys were sent to eligible individuals in the database. 327 surveys were completed and returned and 13 surveys were returned as ineligible or undeliverable, resulting in an 81.75% response rate (Figure 3.1). Reasons for ineligibility included inability to walk a short distance (n = 6), recent cancer diagnosis (n = 1) or notification of death of the potential participant (n = 4). Of the 327 eligible participants' surveys, one was not usable due to multiple inconsistent or missing responses, leaving a final sample size of 326 participants.

Measures

Measurement of the variables was guided by Social Cognitive Theory. Instruments were chosen for their ability to measure the study variables, readability, time burden, and when available, for their reliability and validity in use with older adults. Table 3.1 (Appendix D) summarizes the instruments used to measure each study variable and their placement in the survey.

Dependent Variable

Neighborhood walking (duration in minutes) was measured with the Neighborhood Physical Activity (NPAQ) Questionnaire (Giles-Corti, Timperio, Cutt, Pikora, Bull et al., 2006). The NPAQ was developed based on the International Physical Activity Questionnaire (IPAQ) short form (Craig et al., 2003) as part of a longitudinal study in Australia evaluating the impact of a new residential code designed to increase neighborhood walking (Giles-Corti et al., 2006). The 21-item questionnaire measures the frequency and duration of walking for recreation or transport in a typical week, as well as other forms of moderate and vigorous PA. For example, one question related to walking is, "In a usual week, how many times do you walk for recreation, health or fitness (including walking your dog) in or around your neighborhood?"), followed by the statement, "Please estimate the total time (in hours and minutes) you spend walking for recreation, health or fitness in or around your neighborhood or local area in a usual week" (Giles-Corti et al., 2006). The same questions are also asked regarding walking in the neighborhood for transportation. A total neighborhood walking score was calculated by summing minutes walked in the participant's neighborhood for transportation and for recreation in a usual week. Because it is a measure of walking duration for a usual week, frequency and intensity are not included in the calculation. Only the walking questions in the survey were used in the analyses.

The NPAQ has been tested in adults (N = 82, mean age = 39 years), with evidence of acceptable reliability for walking recall both in and outside of the neighborhood (k = .69 - ≥ 0.85). Reliability was excellent for recall of frequency and duration of walking for transport both in (ICC = .92-.96) and outside (ICC = .84-.87) of the neighborhood, for frequency and duration of walking for recreation inside the neighborhood (ICC = .90), and frequency of walking for recreation outside the neighborhood (ICC = .81). Reliability of recall for duration of recreational walking outside of the neighborhood (ICC = .55) was adequate (Giles-Corti et al., 2006). No studies were identified that tested the NPAQ in older adults, however, the IPAQ on which the NPAQ is based, has acceptable reliability (ICCs of .58-.94) in older adults (Jancey, Lee, Howat, Clarke, Wang, & Shilton, 2007).

Independent Variables: Individual

Psychosocial Factors

Self-efficacy.

Self-efficacy is an individual's belief in his or her capability to perform a specific behavior (Bandura, 1997). Five measures of self-efficacy were used in this study: Self-efficacy for Walking Scale, Self-efficacy for PA Barriers Scale, Self-efficacy for Neighborhood Barriers Scale, Gait Efficacy Scale, and Activities-specific Balance Confidence Scale. For each measure, participants reported their confidence on a scale comprised of 10-point increments ranging from 0% (not at all confident) to 100% (highly confident) in their ability to perform the behavior (walk or participate in PA) or maintain their balance. A mean score was calculated for each of the five scales as well as a total self efficacy score (total mean score of all five self efficacy scales). A higher score indicated more confidence in participants' ability to perform the behavior or to maintain balance under given situations. Cronbach's alpha for the total self-efficacy scale was 98.

<u>Self-efficacy for walking duration</u>

The Self-efficacy for Walking Scale (McAuley, Blissmer, Katula & Duncan, 2000) was used to measure confidence in walking at a moderately fast pace at 5 minute intervals (e.g., 5 minutes, 10 minutes, etc., up to 40 minutes). A mean score was calculated with higher scores indicating more confidence in walking for the given duration. This scale demonstrated high reliability (Cronbach's alpha > .95) when used in pre- and post-tests in an exercise intervention for older adults (McAuley et al, 2000).

An exploratory principal component factor analysis was performed (Appendix E). No rotation was necessary as only one factor was identified, accounting for 86.6% of the variance. All items loaded on a single factor with a range of .79 to .98. The standardized Cronbach's alpha for the subscale was .98.

Self-efficacy for PA barriers

The Self-efficacy for PA Barriers Scale measures confidence in engaging in exercise or PA three times a week for the next three months in the face of certain barriers, such as lack of time, poor weather, pain, etc. (McAuley, 1992). In order to be consistent with the new recommended moderate PA levels for older adults (USDHHS, 2008), participants were asked to rate their confidence in performing PA ("walking, bicycling, swimming, etc.") for 30 minutes 5 days per week. A typical question states, "How confident are you right now that you could perform PA (walking, biking, swimming, etc.) for a total of 30 minutes 5 times a week for the next 3 months if the weather was very bad?" A total mean score was calculated with a higher score indicating more confidence in engaging in PA despite barriers. The scale has been found to be reliable in older adults when the outcome is PA performed for 30 minutes 3 days per week (Cronbach's alpha = .88 to .92) (McAuley, 1992; McAuley et al., 2003).

An initial exploratory principal component factor analysis with oblique rotation revealed two factors accounting for 68.53% of the variance (Appendix E). The correlation matrix revealed that two items, if the participant was bored with the activity and if they had no PA routine, were highly correlated (.834, $p < .001$). Because the item, if bored with the activity, was more highly correlated with other items than the no routine item, bored with activity was deleted from the scale. Subsequent principal component factor analysis with oblique rotation showed all remaining items loaded on one factor. The factor loading range was .71 to .86. The standardized Cronbach's alpha for the scale was unchanged at .96 after deleting the item.

Self-efficacy for neighborhood barriers

The Self-efficacy for Neighborhood Barriers Scale was developed for this study in order to measure self-efficacy for walking for at least ten minutes at a time in the presence of neighborhood characteristics that have been identified as barriers to walking (Gallagher et al., 2010). Neighborhood walking for ten minutes or more was used in this scale in order to be consistent with the USDHHS publication, *PA Guidelines for Americans*, which notes that moderate PA, such as walking, can be accumulated in sessions of ten or more minutes at a time (USDHHS, 2008). Neighborhood was defined as the area within a 15 minute walking radius from the participant's home. Eight items identified in previous focus groups as potential neighborhood barriers to walking were included in the scale: inadequate lighting, inclement weather, lack of or poorly maintained sidewalks, nowhere to walk to, unattractive scenery, lack of safety due to loose dogs or crime, heavy traffic, and lack of places to rest or use the bathroom (Gallagher et al., 2010). A typical question is, "How confident are you right now that you could walk for at least ten minutes in your neighborhood if there was heavy traffic?" A mean score was calculated, with a higher score indicating greater confidence in the ability to walk despite neighborhood barriers.

An exploratory principal component factor analysis with oblique rotation was performed on the scale and revealed two factors accounting for 74.96% of the variance (Appendix E). However, because one item loaded equally on each factor, and the scree plot and the total variance explained suggested a third factor, the analysis was rerun forcing three factors. Pallant (2007) notes that examination of additional factors identified in exploratory factor analysis may provide interesting and novel information. Three distinct factors were identified, increasing the explained variance to 81.95%. The items in the first factor included items related to safety from falls such as adequate lighting, maintenance of sidewalks and weather. The second and third factors were related to neighborhood surroundings/comfort and safety from crime and traffic. No items were deleted from the subscale. The factor loadings ranged from .62 to .96 for the three factors. Despite the presence of three factors, this and all subsequent subscales were used in their entirety due to the exploratory nature of research on individual and environmental influences on walking in older adults, and in order to preserve adequate power to test the model. The standardized Cronbach's alpha for the total scale (including all three factors) was .91.

Self-efficacy for gait

The Gait Efficacy Scale (McAuley et al., 1997) is an 8-item scale that assesses individuals' confidence in their capability to negotiate stairs and objects in their path. For each item, participants rated their confidence to successfully navigate obstacles such as walking up or down a flight of stairs or stepping over an object in their path. The scale has excellent internal consistency with older adults with a Cronbach alpha > .90 (McAuley et al., 2006; Rosengren, McAuley, & Mihalko, 1998). One item regarding belief in the ability to navigate an uneven sidewalk was added to the scale. A mean score for the scale was calculated, with a higher score indicating increased confidence in the ability to negotiate various obstacles (McAuley et al., 1997).

An exploratory principal component factor analysis was performed (Appendix E). No rotation was necessary as only one factor was identified accounting for 73.80% of the variance. All items loaded on the single factor with a range from .77 to .91. The standardized Cronbach's alpha for the subscale was .95. Deletion of the added item did not increase the Cronbach's alpha therefore the item was retained.

<u>Self-efficacy for balance</u>

Self-efficacy for balance was measured with the Activities-specific Balance Confidence Scale (Myers et al., 1998). The Activities-specific Balance Confidence Scale is a 16-item scale developed jointly with clinicians and older adults. Participants rate their level of confidence in maintaining their balance while performing certain activities. For example, one question is, "How confident are you that you will not lose your balance or become unsteady when you sweep the floor?" Examples of activities include walking up a flight of stairs, reaching for a can on a shelf at eye level, or walking on an icy sidewalk (Powell & Myers, 1995). The scale has been found to be discriminative in identifying balance problems in higher-functioning older adults. In a study of 102 community dwelling adults 65 years of age and older, the total mean Activities-specific Balance

Confidence Scale score had an excellent 2 week test-retest reliability ($r = .92$, $p < .001$) and internal consistency with a Cronbach's alpha of .96 (Myers et al., 1998). A total mean score was calculated with a higher score indicating more confidence in not losing balance while performing these activities.

An exploratory principal component factor analysis was performed on the scale. Oblique rotation revealed two factors accounting for 80.38% of the variance (Appendix E). The first factor included confidence in maintaining balance while: reaching for a can at eye level, walking to a car, getting in and out of a car, walking up or down a ramp, walking in the house, walking across a parking lot, sweeping the floor, walking at a crowded mall, bending over, walking up and down stairs in the home, being bumped while walking, standing on one's toes, or stepping on or off an escalator while using the rail. The second factor included more difficult or potentially hazardous activities, such as walking on an icy sidewalk, stepping on or off an escalator without using the handrail, or standing on a chair and reaching for something. No items were removed. The factor loadings ranged from .66 to 1.00 for the first factor, and from .68 to .94 for the second factor. The standardized Cronbach's alpha for the scale (including both factors) was .96.

Outcome expectations

Outcome expectations are the belief that certain consequences are likely to occur in response to a particular behavior in a specific situation (Bandura, 1997). In this study, outcome expectations were measured with the Multidimensional Outcome Expectations for Exercise Scale (MOEES) (Wojcicki et al., 2009). The MOEES is a 15-item scale that includes three subscales: physical, self-evaluative and social outcome expectations of PA. Participants were asked to rate on a five- point scale (1=strongly disagree to 5 = strongly agree) how strongly they agreed that 30 minutes of PA (including walking, bicycling or swimming) 5 days per week would lead to each consequence. Although internal consistency has not been reported for the total scale, the Cronbach's alpha for each of the subscales ranged from .81 to .85 in a sample of 320 older adults (Wojcicki et al., 2009).

Consistent with the tenets of Social Cognitive Theory, potential negative outcome items were added to the scale (Bandura, 1997; Resnick et al., 2006). The additional items included: falling or injury (Clark & Norwehr, 1999; Wilcox et al., 2003; Resnick et al., 2006), pain or soreness (Gretebeck et al., 2007), worsening of an underlying condition (Resnick et al., 2006; Gretebeck et al., 2007) and heart attack, chest pain or shortness of breath (Clark & Norwehr, 1999, Wilcox et al., 2003). These items were reverse scored (1 = strongly agree and 5 = strongly disagree). A mean score was calculated that included the positive items and reverse-coded negative items. Higher scores on the total scale indicate higher expectations of positive outcomes and lower expectations of negative outcomes associated with PA.

An exploratory principal component factor analysis with oblique rotation was performed and revealed three factors accounting for 67.15% of the variance (Appendix E). The first factor contained positive mental and physical outcomes, while the second factor contained prevention of potential negative physical outcomes. The third factor was related to social outcomes. The factor loadings for the three factors ranged from .65 to .92. The standardized Cronbach's alpha for the scale (including all three factors) was .92.

Mobility Limitations

Mobility limitation was defined as difficulty or inability to walk a short distance with or without use of an assistive device (Rejeski et al., 2008). Mobility limitation was measured using the mobility subscale from the Pepper Assessment Tool for Disability (PAT-D) scale. This subscale evaluates the participant's perceived difficulty in performing specific activities related to mobility: walking one block, walking several blocks, lifting heavy objects, carrying a 10 pound bag of groceries, climbing one flight of stairs and climbing several flights of stairs (Rejeski, Ettinger, Schumaker, James, Burns et al., 1995). Activities involving both the upper body (carrying groceries) and lower body (walking or climbing stairs) were included due to the relationship between lower-extremity dysfunction and ability to lift and carry items (Rejeski et al., 1995). These items have been found to be associated with objective measures of mobility such as gait speed ($p < .001$) and to load under a single factor related to mobility in factor analysis (Rejeski et al., 2008).

A typical item asks, "How much difficulty do you have with each of these activities? Think about the past month. How hard was it to do the activity because of your health?" For each activity, participants chose from a range of responses (1 = usually did with no difficulty, 2 = usually did with a little difficulty, 3 = usually did with some difficulty, 4 = usually did with a lot of difficulty, 5 = unable to do, and 6 = usually did not do for other reason) (Rejeski et al., 1995). The Pearson correlation for test-retest reliability was > .70. Cronbach's alpha was .87 for the mobility subscale (Rejeski, 2008).

In order to evaluate the ability to walk longer distances that may be relevant to neighborhood walking, one question was added regarding the level of difficulty in walking ½ mile. In addition, an item from the instrumental activities of daily activity subscale of the PAT-D related to running errands was included. The instrumental activity of running errands may include mobility-related upper and lower body activities and therefore may have relevance to walking for transportation.

A mean score was calculated for the mobility subscale, with higher scores indicating more difficulty with the task in the last month. The response "did not do for other reason" was not included in calculation of the mean score.

An exploratory principal component factor analysis was performed on the mobility subscale (Appendix E). One factor was identified, accounting for 66.96% of the variance. The single factor included level of difficulty with walking several blocks, lifting heavy objects, walking one block, lifting or carrying something weighing 10 pounds, getting in and out of a car, climbing several flights of stairs, doing errands, climbing one flight of stairs, and walking one-half mile. No items were deleted from the subscale. Factor loadings for the single factor ranged from .69 to .93. The Cronbach's alpha for the subscale in this sample was .94. Both items included in the mobility subscale loaded on the single factor at .88, and inclusion of the items did not decrease the Cronbach's alpha of the scale.

Independent Variables: Environment

Neighborhood Environment

Neighborhood environment was defined as the area within one-half mile or within a 15 minute walk from the home of the participant (Michael et al., 2006; Saelens et al., 2003). The Neighborhood Environment Walkability Scale (NEWS) (Saelens et al., 2003) was used to measure the neighborhood environment which included the "3 Ds" of the built environment outlined by Cervero and Knockelman (1996): density, diversity, and design. The NEWS was developed by Saelens, Sallis, & Frank (2003) in conjunction with urban planners, public health professionals and PA experts. Eight sub-domains associated with walking and biking were used to develop the NEWS subscales: Residential Density, Diversity, Access to Services, Street Connectivity, Walking Facilities, Neighborhood Surroundings, Traffic Safety and Crime Safety. Based on findings from a preliminary study by Gallagher et al. (2010), two items (the presence of places to rest and places to use the bathroom while walking) were used to develop a new subscale, Comfort.

The NEWS provides mean scores for each of the subscales (Saelens, Sallis, Black et al., 2003). In adults over 18 years of age, test-retest reliability correlation coefficients for the NEWS subscales ranged from .58 to .80 (Saelens et al., 2003). Brownson and colleagues (2004) reported a two-week test-retest ICC range of .41 to .93 for the subscales for adults over 18 years old (no mean age reported). No published studies were identified that reported psychometric testing of the NEWS with older adults.

Density.

Density was measured with the 6-item Residential Density subscale. Questions in this subscale ask how common types of residences (single-family homes and townhouses or apartments/ condominiums one to three stories tall, four to six stories tall, seven to twelve stories tall, and thirteen or more stories tall) are in the neighborhood. Responses include none (1), a few (2), some (3), most (4), and all (5). These items are weighted based on comparison to a single family home, with higher scores for higher density residences. For example, one-to-three story apartment buildings are considered 10 times more dense than single family homes (e.g. the score for the item related to prevalence of one-to-three story apartment buildings is multiplied by 10). Townhouses are considered 12 times more dense than single family homes (e.g. the score is multiplied by 12), etc. Scores for each item are then summed to calculate the density subscale score with possible scores ranging from 5 (all single family homes) to 566 (all apartment buildings of 13 or more stories). Test-retest reliability for this scale was 68 (Saelens, Sallis, Black et al., 2003).

Exploratory principal component factor analysis was performed on the density subscale (Appendix E). Two factors were identified, accounting for 64.03% of the variance. The first factor included single-family homes and apartments or townhouses one to three stories tall, while the second factor included apartment buildings 4 stories tall or higher. Factor loading for the first factor ranged from .77 to .87 (including one negative loading of -.83 for single-family homes). Factor loading for the second factor ranged from .69 to .82.

Cronbach's alpha was not calculated for this scale because there was no underlying latent variable leading to correlation (Klem, personal communication, 2009).

Diversity.

Diversity was measured with the 23-item *Diversity* subscale from the NEWS that measures the presence of stores and facilities (grocery stores, hardware stores, post office, library, park, etc.) within walking distance of one to thirty minutes (in five minute increments) from the participant's home. For example, a store within a five minute walk is given a score of five, while a library that is a 30 minute walk from the participant's home receives a score of one. A mean score was calculated, with higher scores indicating the presence of more stores and facilities within a shorter walking distance from the participant's home (Saelens, Sallis, Black et al., 2003).

An exploratory principal component factor analysis with oblique rotation revealed four factors accounting for 55.02% of the variance, with several items loading onto two or three factors. One item, small convenience store, had a negative loading. The items that loaded onto more than one factor were bookstores, jobs and bus stops. Due to the negative correlation of the small store item with all other items in the scale, the item was deleted. Subsequent factor analysis identified three factors. Because most items loaded onto two factors, factor analysis was conducted forcing two factors (Appendix E). The first factor included friends' houses as well neighborhood stores and services such as restaurants, grocery stores, post office, etc. The second factor included facilities that might be used by the participant that were located further away such as recreation centers, hospitals, churches and schools. The two factors explained 46.09% of the variance, and factor loadings ranged from .35 to .85. Deletion of the small stores item increased the Cronbach's alpha for the final 22-item subscale (including both factors) from .88 to .91.

Although Tabachnik and Fidell (2007) set a threshold of .32 for retaining items, they suggest that a loading of .55 is considered a "good" measure of the factor. Three items had factor loadings less than .55: hospitals and clinics (.35), recreation centers (.41), and the library (.42). Because these are potentially important destinations for older adults, the items were retained. In addition, when these items were deleted, the Cronbach's alpha for the scale decreased slightly.

Design.

In Cervero and Knockelman's "3 Ds" model (1998) the concept of design included street, intersection and sidewalk design. For this study, the concept of design was broadened to also include neighborhood surroundings (e.g. cleanliness, trees, and architecture), comfort, and characteristics related to the perception of safety from traffic and crime (e.g., crosswalks, lighting, and surveillance by neighbors). Neighborhood Design was measured with the Access to Services, Street Connectivity, Places to Walk, Neighborhood Surroundings, Traffic Safety, Crime Safety and Comfort subscales. For each of the subscales, participants chose from "1 = strongly disagree", "2 = somewhat disagree", "3 = somewhat agree" and "4 = strongly agree" that the relevant characteristic was present in their neighborhood. A summary mean of the subscales was calculated with higher scores indicating neighborhood design characteristics more conducive to walking.

Neighborhood access

Access was measured with the Access to Services subscale. The 8-item subscale measures the participant's level of agreement regarding the presence of stores, parking and public transit in the neighborhood. A typical item states "stores are within easy walking distance of my home." Test-retest reliability for this scale has been reported as .63 (Saelens, Sallis, Black et al., 2003). A mean score was calculated with higher scores indicating more stores, places to go, and public transit stops within walking distance of the participant's homes.

Exploratory principal components factor analysis followed by oblique rotation identified three factors accounting for 61.63% of the explained variance (Appendix E). One item, "there are many places to go within walking distance" loaded on two factors. The first factor contained stores within easy walking distance, can do most shopping at local stores and many places to go within walking distance. The second factor contained many places to go within walking distance, see many active people, easy walk to a transit stop, and parking is difficult. An additional factor included two items: hilly streets make walking difficult and canyons make walking difficult. Because they are not relevant to the geography in the region in which the study took place, the items related to hilly terrain and canyons were deleted from the scale. Further examination of the items: see many active people, easy walk to a transit stop, and parking is difficult revealed low squared multiple correlations (.157 or less). Factor analysis was rerun without these items and revealed one factor including all three of the remaining items: stores within easy walking distance, can do most shopping at local stores and many places to go within walking distance (Appendix E). Factor loadings ranged from .79 to .88. The Cronbach's alpha of the subscale was .76, compared to .56 for the subscale that included the deleted items.

Neighborhood streets

The Street Connectivity subscale is a 5-item scale that measures participants' level of agreement about the presence of street, sidewalk and intersection characteristics conducive to walking in their neighborhood. A typical item states, "There are many four-way intersections in my neighborhood." Test-retest reliability for this scale has been reported as .78 (Saelens, Sallis, Black et al., 2003). A mean score was calculated with higher scores indicating neighborhood streets more conducive to walking.

Exploratory principal component factor analysis with oblique rotation revealed two factors and accounted for 59.34% of the explained variance. Further examination of the two items: neighborhood street cul-de-sacs and neighborhood walkways connecting cul-de-sacs to streets, revealed squared multiple correlations of < .075, and low (<.200) or negative correlations with the other items. These items were deleted and factor analysis was performed again on the remaining items revealing one factor explaining 56.58% of the explained variance (Appendix E). Factor loadings ranged from .40 to .48. Although deletion of the items decreased the explained variance slightly, the Cronbach's alpha for the 3 item scale increased from .49 to .62.

Neighborhood sidewalks

The Places to Walk subscale is a 6-item scale that measures participants' level of agreement regarding the characteristics of sidewalks in the neighborhood. A typical item states, "The sidewalks in my neighborhood are kept clear of ice and snow." Test-retest reliability for this scale has been reported as .79 (Saelens, Sallis, Black et al., 2003). One item, "The sidewalks in my neighborhood are kept clear of overgrown bushes, fallen trees and weeds" was added to this subscale based on results from a preliminary study (Gallagher et al., 2010). A mean score was calculated with higher scores indicating sidewalks more conducive to walking.

Exploratory principal components factor analysis revealed one factor accounting for 62.69% of the variance (Appendix E). Factor loadings ranged from .85 to .91 with the exception of two items: "there are bicycle or pedestrian trails in or near my neighborhood" and "sidewalks are separated from the road by parked cars." Squared multiple correlations for these two items were .275 or less, and the trails item did not correlate with other items above .300. The correlations between the item regarding separation of sidewalks from the road and the other items on the subscale ranged from .225 to .485. Factor analysis with the two items deleted revealed one factor with loadings ranging from .85 to .92, accounting for 79.22% of the variance. Cronbach's alpha of the final 4-item subscale increased from .89 to .94. The item, sidewalks clear of overgrowth, had a factor loading of.90 and its addition did not reduce the Cronbach's alpha.

Neighborhood surroundings

The Neighborhood Surroundings subcale is a 10-item scale that measures participants' level of agreement about the presence of characteristics of neighborhood surroundings found to be conducive to walking (trees, attractive buildings, natural sights in the neighborhood, etc.). A typical item states, "There are attractive buildings/ homes in my neighborhood." Test-retest reliability for this scale has been reported at .79 (Saelens, Sallis, Black et al., 2003). A mean score was calculated with higher scores reflecting neighborhood surroundings that are more conducive to walking.

Exploratory principal component factor analysis with oblique rotation revealed two factors accounting for 60.22% of the variance. Examination of the items revealed that the squared multiple correlations were less than or close to .300 for two items, trees along the streets and trees give shade to sidewalks. Correlations between these two items and other subscale items were all < .300. Principal component factor analysis was repeated without the two items, revealing one factor accounting for 54.29% of the explained variance (Appendix E). Factor loadings ranged from .63 to .81. Following deletion of the items, the Cronbach's alpha for the 8 item subscale increased from .79 to .83.

Traffic safety

The Traffic Safety subscale is an 8-item scale that measures participants' level of agreement regarding neighborhood traffic volume and speed and the presence and safety of pedestrian crosswalks in their neighborhood. A typical item states, "There is so much traffic along nearby streets that it makes it difficult or unpleasant to walk in my neighborhood." Test-retest reliability for this scale has been reported at .77 (Saelens, Sallis, Black et al., 2003). A mean score was calculated with higher scores reflecting traffic speed or crosswalk design that is more conducive to walking.

Exploratory principal component factor analysis with oblique rotation revealed three factors accounting for 71.38% of the variance (Appendix E). The "most drivers exceed speed limit" item loaded with two other items. Further examination showed that the squared multiple correlation was .06, and that the item had no correlations above .20 with any of the other items in the subscale. Factor analysis with oblique rotation after deleting this item revealed three factors accounting for 80.13% of the variance. No items loaded on more than one factor, with a range from .82 to .92. Cronbach's alpha increased from .70 to .71 for the subscale (including all three factors) with the item deleted.

Crime safety

The Crime Safety subscale is a 6-item scale that measures participants' level of agreement about the presence of area lighting, contact with neighbors and safety from crime in their neighborhood. A typical item states, "The crime rate in my neighborhood makes it unsafe to go on walks during the day." Test-retest reliability for this scale has been reported as .80 (Saelens, Sallis, Black, & Chen, 2003). One item, "Unattended or loose dogs make it a problem to walk in my neighborhood" was added to this subscale based on responses from a focus group study (Gallagher et al., 2010). A mean score was calculated with higher scores reflecting crime safety perceptions more conducive to walking.

An exploratory principal component factor analysis with oblique rotation revealed two unique factors accounting for 57.56% of the variance (Appendix E). No items were deleted from the scale. Factor loadings ranged from .55 to .86 for the two factors. Cronbach's alpha for the subscale (including both factors) was .67. The item, presence of loose dogs, which was added to the subscale loaded at .545, and inclusion did not decrease the Cronbach's alpha.

Comfort

The Comfort subscale is a two-item scale added to the NEWS. The two items, "places to rest" and "places to use the bathroom" were identified as conducive to neighborhood walking in focus groups conducted prior to the research (Gallagher et al., 2010). A mean score was calculated from the two items, with a higher score indicating a neighborhood more conducive to walking.

Principal component factor analysis was performed on the Comfort subscale (Appendix E). Both items, "places to rest" and "places to use the bathroom" loaded on one factor, accounting for 68.16% of the explained variance. The factor loading for both items was .83. Cronbach's alpha for the 2 item subscale was .53.

Demographic Characteristics

Demographic characteristics included age, sex, race/ethnicity (Black/African-American, Asian American/Pacific Islander, White/ Caucasian, Hispanic, American Indian/Native American, or Other), education (less than high school, high school graduate, some college or trade, business or technical school, associate's degree, Bachelor's degree, graduate degree), and income.

Since 11.15% of the data was missing for the income variable, education was used to measure socioeconomic status. Additional demographic characteristics that were measured included marital status (single, married, separated/divorced, or widowed) and living arrangement (your home, apartment or condo, senior citizen apartment/condo, home of a relative/friend, or other).

Procedures

Protection of Human Subjects

Procedures in this study were approved by the Institutional Review Board at the University of Michigan. All participants were informed of the purpose of the study and its procedures. Consent was implied with the return of the completed survey. No compensation was offered for participation. Measures taken to protect confidentiality included coding surveys with an identification number and storing the list linking names and identification numbers in a locked file drawer in a locked room at the School of Nursing. Only the principal investigator and research team members had access to the files.

Survey

The survey used for this study (Appendix B) consisted of closed-ended questions formatted for easy readability by older adults (e.g. size 14 font and 1.5 line spacing). The survey was estimated to take approximately one to one and a half hours to complete. Participants were instructed that they were not required to complete the survey in one sitting but could complete it in multiple, shorter segments of time. A cover letter describing the study (Appendix A), informed consent form for the participant to keep, large self-addressed manila envelope, and the survey were mailed to each potential participant. Two weeks after the initial mailing, a reminder postcard (Appendix C) was sent to participants whose surveys had not been returned, encouraging them to complete and return the survey if they had not done so. If the survey was not received in the following two weeks, a telephone contact was made to encourage the potential participant to complete and return the survey or to determine if a replacement survey should be mailed (Dillman, 2000).

Analysis

Data were entered and statistical tests conducted using SPSS (Version 17.0, SPSS Inc., Chicago, IL). Prior to beginning analysis, the data were examined for assumptions of multiple regression, including: 1) univariate outliers, 2) missing data, 3) presence of a linear relationship between the variables, 4) heteroscedasticity, 5) normal distribution of data, 6) multivariate outliers, and 7) multicollinearity and singularity (Tabachnick & Fidell, 2007). Following cleaning of the data and evaluation of assumptions, descriptive analyses were used to describe the variables including frequency distributions, means, medians, and standard deviations.

Analysis and Treatment of Missing Data

Missing data are data that are missing from the data set for some participants due to error, subject refusal, or skip patterns (Polit, 1996) and is pervasive in research (Tabachnick & Fidell, 2007). Missing data is less problematic in a data set if the amount missing is small and occurs randomly (Tabachnick& Fidell, 2007). In this study, the amount of missing data was small, with data missing on less than 1% (.77%) of the total theoretical data points in the data set. Income had the highest proportion of missing values (11.15%). No other single item had more than 5% missing data with the exception of the Self-efficacy for PA Barriers subscale, which had data missing on 6.3% of the items. Missing data were analyzed to determine if it was missing at random (MAR). Data are considered MAR when the probability of a missing value is not dependent on the value itself, although it may depend on the values of other variables in the data set (Tabachnick & Fidell, 2007).

In order to examine whether data were MAR, Mann-Whitney U (for ordinal data) and t-tests (for interval data) were performed comparing those with and without missing income data on several theoretical variables (Polit, 1996). Those with missing income data reported that their neighborhoods were more conducive to walking than those without missing income data. Those with missing income data also reported more neighborhood diversity, higher access to neighborhood services, lower crime and fewer traffic hazards. Due to the amount and nonrandom nature of the missing data from the income variable, education was used to measure socioeconomic status rather than income (Freedman et al., 2002).

Mann-Whitney U and t-tests were also performed to compare participants with no missing values on theoretical variables with those with one or more missing values. Participants with one or more missing values on theoretical variables had less education ($p < .05$) and lower mean values for self-efficacy for walking ($p < .01$), self-efficacy for gait ($p < .01$), self-efficacy for balance ($p < .05$), total self-efficacy ($p < .05$) and neighborhood walking duration ($p < .05$) than those participants with no missing values on theoretical variables.

Missing responses for the theoretical variables were imputed using the mean of the participants' nonmissing responses for the relevant scale. In order to accommodate subscales with fewer items, responses were imputed only if 75% or more of the participant's responses for that scale or subscale were available. If greater than 25% of the responses were missing for the scale, no value was imputed for that item.

Evaluation of Assumptions

Univariate outliers.

In order to evaluate the data for univariate outliers, the minimum and maximum values in the frequency distributions for each study variable were examined for plausibility (Tabachnick & Fidell, 2007). Implausible values were checked for accuracy and corrected if coding errors were found (Fox, 1991). Univariate outliers, defined as accurate values that were three or more standard deviations above the mean (Tabachnick & Fidell, 2007), were identified in the neighborhood walking variable. A wide range of neighborhood walking duration was reported, and outliers were carefully examined. While the presence of unusual data should not be ignored, outliers may motivate model specification and should not automatically be discarded (Fox, 1991). The trimmed mean (75.92 minutes) for neighborhood walking was lower than the variable mean (89.23 minutes), indicating that outliers may be influencing the variable mean. Regression analyses with and without the outliers were then compared (Polit, 1996). Minimal differences were found in the pattern of the regression coefficients with two exceptions: The density and design subscales were found to be weakly but significantly associated with neighborhood walking ($\beta = .096$, $p = .05$ and $\beta = .116$, $p = .04$, respectively) with the outliers deleted from the analysis, but were nonsignificant when the outliers were included. Due to the exploratory nature of the influence of neighborhood environment on older adults, and because inclusion of all cases including outliers may contribute to model development, all cases were retained for analysis (Fox, 1991).

Linearity and homoscedasticity.

Linearity and homoscedasticity were evaluated by examination of bivariate scatterplots and residual plots (Tabachnick & Fidell, 2007). Bivariate scatterplots did not suggest a nonlinear relationship and rectangular patterns in the residual plots indicated homoscedasticity of the data, indicating that these assumptions were met.

Normality.

Continuous variables were screened for normal distribution through both graphical and statistical examination. Histograms and descriptive distribution statistics revealed that the dependent variable (neighborhood walking) was positively skewed. Two independent variables (neighborhood density and mobility limitations) were moderately positively skewed, and two of the self-efficacy subscales (self-efficacy for gait and balance) were moderately negatively skewed.

Transformations were performed on the skewed variables and compared with the untransformed variables. For the skewed independent variables (neighborhood density and self-efficacy for gait and balance) square root transformations were performed. For neighborhood walking, both square root and log transformations were performed (Fox, 1991; Tabachnick & Fidell, 2007). Following transformation, the skewed patterns remained for each of the variables; therefore the transformed variables were not used in the statistical analyses.

Tabachnick and Fidell (2007) suggest that while data transformations may be used as a remedy for lack of normality, linearity and homoscedasticity, they are not universally recommended. Transformed variables may be harder to interpret, particularly when using easily understood scales (such as minutes walked, used in the neighborhood walking variable) and data transformation may not resolve the skewed pattern (Fox, 1991; Tabachnick & Fidell, 2007).

Finally, residuals obtained through multiple regression were examined for normality and independence (Tabachnick & Fidell, 2007). Standardized residuals normal probability plots obtained with multiple regression analyses showed no major deviations from normality.

Multivariate outliers.

Multivariate outliers were examined using casewise plots of standardized residuals, and the Mahalanobis and Cook's distance for each case. Tabachnik and Fidell (2007) define the Mahalanobis distance as "the distance of a case from the centroid of the remaining cases where the centroid is the point created by the means of all the variables." Mahalanobis distance is used as a measure of the distance of a multivariate outlier from the other cases in the data set (Tabachnik & Fidell, 2001). Outliers were identified with Mahalanobis distances higher than the critical value at $p < .001$ (Tabchnick & Fidell, 2007). No differences were found between regression analyses performed with and without these outliers. Cook's distances (measure of influence that is the product of leverage and discrepancy scores) were also examined for each analysis and were found to be normal at less than 1. All cases therefore were retained for analysis.

Multicollinearity and singularity.

Multicollinearity is a condition in which variables are highly correlated, while singularity occurs when variables are redundant, such as when one variable is a combination of two or more other variables in the same analysis (Tabachnik & Fidell, 2007). No correlations between study variables were identified over .90, the level at which statistical problems occur with multicollinearity and singularity (Tabachnik & Fidell, 2001). Multicollinearity and singularity were further evaluated through collinearity diagnostics, including condition index, tolerance score and variance inflation factor (Polit, 1996). Multicollinearity exists when the condition index is < 30 and the variance proportions for at least two variables is > .50. No variables in this study met these criteria. Tolerance is an indication of how much the variability of one variable is not explained by another variable in the model, and should be > .10 (Pallant, 2007). No tolerance levels in this study were < .10. The variance inflation factor is the inversion of the tolerance, and should not exceed 10. All tolerance and variance inflation factor levels in this study were within the normal range. Therefore, multicollinearity and singularity do not appear to have influenced the data.

Hypothesis Testing

Path analysis.

Path analysis was conducted to examine the direct and indirect effects of 1) self-efficacy, 2) outcome expectations, 3) mobility limitations, 4) neighborhood environment (density, diversity and design), and 5) demographic characteristics on neighborhood walking. The dependent variable, neighborhood walking, was regressed on each of the independent variables: self-efficacy, outcome expectations and mobility limitations. Each independent variable was regressed on the hypothesized antecedent variables (neighborhood environment and demographic characteristics).

Regression analyses.

Hierarchical multiple regression was used to examine the influence of 1) self-efficacy, 2) outcome expectations, 3) mobility limitations, 4) neighborhood environment, 5) the interaction term between neighborhood environment and mobility limitations, and 6) demographic characteristics on neighborhood walking. Independent variables were added to the regression equations consistent with the theoretical model used in the study (Figure 1.2).

Hypothesis 1.1: Self-efficacy, outcome expectations, mobility limitations and neighborhood environment will be positively associated with neighborhood walking in older adults when demographic characteristics are statistically controlled.

Two multiple regression analyses were performed. In the first, demographic characteristics were entered first into the model, followed by the individual and environmental variables in the second step. For the second multiple regression analysis, demographic characteristics were entered first into the model, followed by mobility limitations at the second step, outcome expectations and self-efficacy at the third step, and neighborhood environment at the fourth step.

Hypothesis 1.2: Mobility limitations will moderate the relationship between neighborhood environment and neighborhood walking in older adults.

A multiple regression analysis was performed. Demographic characteristics were entered first into the model, followed by mobility limitations at the second step, outcome expectations and self-efficacy at the third step, neighborhood environment at the fourth step, and the interaction term between mobility limitations and neighborhood environment at the fifth step.

Hypothesis 1.3: Self-efficacy will mediate the relationship between neighborhood environment and neighborhood walking in older adults.

Simple linear regressions were conducted between neighborhood environment and neighborhood walking, neighborhood environment and self-efficacy, and self-efficacy and neighborhood walking. If positive relationships were found in all three analyses, additional hierarchical analysis was conducted to examine change in the influence of neighborhood environment on neighborhood walking when self-efficacy was added. For this regression neighborhood environment was added at the first step of the regression and self-efficacy was added at the second step. If the relationship between neighborhood environment and neighborhood walking was attenuated by the addition of self-efficacy to the equation, a Sobel's test of significance was conducted.

Hypothesis 1.4: Outcome expectations will mediate the relationship between neighborhood environment, and neighborhood walking in older adults.

Simple linear regressions were conducted between neighborhood environment and neighborhood walking, neighborhood environment and outcome expectation, and outcome expectations and neighborhood walking. If positive relationships were found in all three analyses, additional multiple regression analyses were conducted to examine change in the influence of neighborhood environment on neighborhood walking when outcome expectations were added. For this regression neighborhood environment was added at the first step and outcome expectations was added at the second step. If the relationship between neighborhood environment and neighborhood walking was attenuated by the addition of self-efficacy to the equation, a Sobel's test of significance was conducted.

Hypothesis 2.1: Self-efficacy for walking duration, self-efficacy for PA barriers, self-efficacy for neighborhood barriers, self-efficacy for gait and self-efficacy for balance will be associated with neighborhood walking in older adults.

Multiple linear regression was used to examine the association of each self-efficacy scale: 1) Self-efficacy for Walking scale, 2) Self-efficacy for PA Barriers scale, 3) Self-efficacy for Neighborhood Barriers scale, 4) Gait Efficacy Scale and 5) Activities-specific Balance Confidence Scale, with neighborhood walking. The mean scores for each self-efficacy scale were entered simultaneously into the regression equation and each was examined for its relative influence on neighborhood walking.

> *Hypothesis 3.1:* Neighborhood diversity and characteristics of neighborhood design, including neighborhood access, neighborhood streets, neighborhood sidewalks, neighborhood surroundings, traffic safety, crime safety and comfort, will be associated with neighborhood walking in older adults.

Multiple linear regression was used to examine the influence of neighborhood diversity and design characteristics on neighborhood walking in older adults. The mean scores for the subscales used to measure neighborhood diversity, neighborhood access, neighborhood streets, neighborhood sidewalks, neighborhood surroundings, traffic safety, crime safety and comfort were entered simultaneously in to the regression, and each was examined for its influence on neighborhood walking.

CHAPTER FOUR
RESULTS

Sample Characteristics

Sample characteristics are summarized in Table 4.1 (Appendix F). Participants ranged from 60 to 99 years of age with a mean age of 76.1 years. The majority were female (66.3%), married (58.9%), and lived in their own home or apartment (93.3%). Many were long time residents in their neighborhoods with the mean length of residence more than 27 years (range = 4 months to 61 years). Most were White (90.8%) and retired (62.6%); however, 21.2% worked full- or part-time. The sample was fairly well-educated: 65.7% had acquired a bachelor's degree or higher and all had graduated from high school. Only 27% reported a household income of less than $40,000 per year and 38.3% of the sample reported a household income of more than $60,000 per year. Fifty seven (17.5%) of the participants reported using an assistive device while walking outside of the home and 108 (33.1%) had fallen in the last year.

Descriptive Analyses of Model Variables

A summary of the descriptive analyses follows in Tables 4.2 (Appendix G) and 4.3 (Appendix H). Table 4.2 reflects a summary of each of the theoretical variables while Table 4.3 describes each of the variables in more detail.

Neighborhood Walking

Total neighborhood walking duration (sum of neighborhood transportation and recreation walking in minutes) ranged from 0 to 540 minutes per week (*M* = 89.23, *SD* = 114.74). Participants walked in their neighborhoods an average of 15.47 minutes per week for transportation (*SD* = 40, range 0 - 270) and 73.8 minutes per week (*SD* = 101, range 0 - 540) for recreation.

Among participants who reported walking in their neighborhoods (n = 195, or 59.82%), the mean for total neighborhood walking time was 145.71 minutes per week (*SD* = 114.19, range 10.20- 540). This value is higher than the findings by Nagel et al. (2008); among walkers (78%) in a sample of older adults in an urban area in the Northwest; the mean walking time was 130.98 minutes per week (*SD* = 90.96).

Self-efficacy

The mean score for total self-efficacy (total mean of five self-efficacy scales) was 65.09 (*SD* = 21.47) on a scale from 0 (no confidence) to 100 (complete confidence) (Appendix G, Table 4.2). The five self-efficacy scales had mean scores ranging from 40.89 (*SD* = 26.33) for self-efficacy for PA barriers to 84.18 (*SD* = 18.96) for self-efficacy for balance. Additional descriptive information for each of the five self-efficacy scales is described below.

Self-efficacy for Walking Duration

The mean score for the Self-efficacy for Walking scale was 57.33 (*SD* = 36.85) on a scale of 0 (no confidence) to 100 (complete confidence). The 8 subscale items had mean scores between 40.60 and 80.06 (Appendix H, Table

4.3). Confidence in the ability to walk at a moderate pace without stopping decreased as the duration of walking increased. The highest level of confidence was reported for walking for five minutes without stopping (80.06) and the lowest (40.60) was for walking for 40 minutes without stopping.

Self-efficacy for PA Barriers

The mean score for the Self-efficacy for PA Barriers Scale was 40.89 (*SD* = 26.33) on a scale of 0 (no confidence) to 100 (complete confidence). The mean scores for the 15 subscale items were between 28.88 and 58.98. Most means were below 47.54, indicating low to moderate confidence in performing PA when each of the barriers were present (Appendix H, Table 4.3). Participants reported the lowest confidence in performing PA when they did not have energy (37.97), had pain or muscle soreness (37.51), did not have time (37.08), had joint or muscle problems (35.66), had to provide care for someone (33.77), had problems with balance (33.13), or were not healthy (28.88).

Self-efficacy for Neighborhood Barriers

The mean score for the Self-efficacy for Neighborhood Barriers scale was 59.35 (*SD* = 28.02) on a scale of 0 (no confidence) to 100 (complete confidence). The mean scores for the eight subscale items ranged from 37.86 to 85 (Appendix H, Table 4.3). Participants reported confidence for walking in their neighborhood even if there were no destinations to walk to (85.00), the scenery was unattractive (76.25), or there was no place to rest or use the bathroom (74.11). Participants were less confident that they would walk in their neighborhood if there were no sidewalks or they were poorly maintained (58.38), the lighting was poor (44.97), the weather was bad (43.81), or they felt unsafe due to crime or loose dogs (37.86). .

Self-efficacy for Balance

The mean score for the Activities-specific Balance Confidence Scale was 84.18 (*SD* = 18.96) with scores ranging from 1.88 to 100 on a scale of 0 (no confidence) to100 (complete confidence). The mean scores for the 16 subscale items ranged from 47.32 to 94.45, with most means above 82.5 (Appendix H, Table 4.3). Overall, participants reported confidence in their ability to maintain their balance under most circumstances. Participants reported the most confidence in their ability to maintain their balance while walking to a car in the driveway (94.45), reaching for a can on a shelf at eye level (93.47), getting in and out of a car (92.98), and sweeping the floor (92.18) and less confidence while standing on a chair to reach something (69.91), using an escalator without holding the railing (66.59) and maintaining balance while walking on icy sidewalks (47.32).

Self-efficacy for Gait

The mean score for the Gait Efficacy Scale was 83.59 (*SD* = 22.93) with scores ranging from 2.22 to 100 on a scale of 0 (no confidence) to 100 (complete confidence). The mean scores for the nine subscale items ranged from 71.38 to 94.45, indicating a high level of confidence by the participants in their ability to successfully navigate conditions commonly encountered while walking (Appendix H, Table 4.3). Participants reported the most confidence in their ability to walk down (94.45) or up (94.14) stairs while using a handrail and stepping up a curb

(88.71). Participants reported slightly less confidence in walking up (74.52) or down (71.38) stairs without using a handrail.

Outcome Expectations

The mean score for Outcome Expectations, was 3.89 (*SD* = .58) with scores ranging from 1.16 to 5 on a scale of 1 (strongly disagree) to 5 (strongly agree). Higher scores indicate stronger agreement that the outcome will occur if the participant participated in moderate PA for 30 minutes 5 days a week. Mean scores for the 19 subscale items ranged from 2.76 to 4.52 (Appendix H, Table 4.3).

Participants reported strong agreement that regular PA would improve their cardiovascular system (4.52) and body function (4.43), and increase their muscle strength (4.42). Participants also reported agreement that PA would not lead to negative outcomes such as a fall or injury (4.06), heart attack or chest pain (4.01) increased pain (3.43) or worsening of a health condition (3.97). Participants reported less agreement that regular PA would increase their acceptance by others (2.76), make them more at ease (2.87) or improve their social standing (2.89).

Mobility Limitations

The mean score for mobility limitations was 1.67 (*SD* = .86), indicating that most participants had little difficulty with tasks related to mobility. Scores ranged from 1 to 4.67 on a scale of 1 (no difficulty) to 5 (unable to do), with higher scores indicating more perceived difficulty performing the task (Appendix H, Table 4.3). Participants reported little or no difficulty with getting in and out of a car (1.33), doing errands (1.35), climbing one flight of stairs (1.36), walking one block (1.43, walking several blocks (1.75) or walking one-half mile (1.80). No participants reported inability to get in or out of a car. Participants reported somewhat more difficulty lifting heavy objects (2.39) and climbing several flights of stairs (2.05).

Neighborhood Environment

Neighborhood environment was measured with the Neighborhood Environment Walkability Scale (NEWS). The neighborhood environment variable included density, diversity and design, with individual scores for each of the constructs. The eight subscales of the Neighborhood Environment Walkability Survey were grouped into Density (Residential Density subscale), Diversity (Destinations subscale) and Design (Access to Services, Street Connectivity, Places to Walk, Neighborhood Surroundings, Pedestrian/Traffic Safety, and Crime Safety subscales). An additional subscale, Comfort, was included with the Design construct.

Density

Density was measured with the Residential Density subscale, which examines the prevalence of low versus high-density housing units. Participants rated the prevalence of housing type (e.g. single family homes, townhouses of one to three stories, apartment buildings of one to three stories, apartment buildings of four to six stories, apartment buildings of seven to twelve stories, and apartment buildings of thirteen or more stories) on a scale of 1 (none) to 5 (all). A total weighted summary score was based on the density of the housing unit. The mean total weighted score for Neighborhood Density was 205. 31 (*SD* =

44.67), with a range between 174 and 667, indicating that most participants lived in neighborhoods with lower residential density, including predominantly single family homes and one- to three- story apartments and condominiums (Appendix H, Table 4.3). The mean scores for each of the individual items related to the each type of housing ranged from 1.02 for apartment buildings from seven to twelve stories tall to 4.01 for single-family homes, also indicating that most people lived in areas with more single family homes.

Diversity

The mean for the Diversity subscale was 1.97 (.66) with a range of 1 to 4.19 on a scale of 1 (more than 30 minutes walking distance from home) to 5 (1-5 minutes walking distance from home), indicating that most destinations were not within walking distance from the participants' home. The mean scores for each of the 21 items in the Diversity subscale ranged from 1.32 to 3.47, with higher scores indicating more destinations within closer walking distance (Appendix H, Table 4.3). Participants reported that houses of friends and family (3.47) were within closer walking distance to their homes while hospitals and clinics (1.43), clothing stores (1.40) and job or volunteer sites (1.32) were furthest away.

Design

The mean score for neighborhood design was calculated from six subscales: Access to Services, Street Connectivity, Places to Walk, Neighborhood Surroundings, Traffic Safety, and Crime Safety. Items described in each subscale included characteristics that may influence neighborhood walking, with a higher score reflecting a neighborhood that is more conducive to walking. The mean scores for the subscales (Appendix H, Table 4.3) ranged from 1.65 to 3.42 on a scale of 1 (strongly disagree) to 4 (strongly agree). The total mean summary score for neighborhood design was 2.72 (*SD* = .54), indicating that participants neither agreed or disagreed that their neighborhoods had good access to local services, streets and sidewalks conducive to walking, attractive and comfortable surroundings, and low traffic volume and crime.

Access to services.

The mean score for the Access to Services subscale was 2.21 (*SD* = .95) on a scale of 1 (strongly disagree) to 4 (strongly agree), with lower scores indicating fewer stores or interesting places to go within walking distance of the participant's home. The mean scores of the individual items ranged from 2.02 to 2.33, indicating that most participants' neighborhoods contained few stores and other places to go within walking distance (Appendix H, Table 4.3).

Neighborhood streets.

The mean score of the Street Connectivity subscale was 2.62 (*SD* = .84) with a range of 1 to 4 on a scale of 1 (strongly disagree) to 4 (strongly agree). The mean scores of the three subscale items ranged from 2.41-2.76 (Appendix H, Table 4.3). Participants were neutral or reported only moderate agreement with the presence of many four-way intersections (2.41), short distances between intersections in their neighborhood (2.67), and alternate routes for getting from one place to another (2.76).

Neighborhood sidewalks.

The mean score of the Places to Walk subscale was 2.86 (*SD* = .1.06) on a scale of 1 (strongly disagree) to 4 (strongly agree) with individual item means ranging from 2.48 - 2.99 (Appendix H, Table 4.3). Participants reported agreement that sidewalks were present (2.99) and well-maintained (2.89) on most streets in their neighborhood. However, 30% of the participants reported that sidewalks were not present in their neighborhoods.

Neighborhood surroundings.

The mean score of the Neighborhood Surroundings subscale was 3.42 (*SD* = .52) with a range of 1.5 to 4 on a scale of 1 (strongly disagree) to 4 (strongly agree). The mean scores for the six subscale items ranged from 3.18 to 3.63 (Appendix H, Table 4.3). Most participants reported that their neighborhoods were free from litter (3.63), quiet and peaceful during the day (3.53) and night (3.62), and contained attractive buildings and homes (3.36), attractive natural sights (3.18) and interesting things to look at (3.18).

Crime safety.

The mean score of the Crime Safety subscale was 3.39 (*SD* = .44) with a range of 1.71 to 4 on a scale of 1 (strongly disagree) to 4 (strongly agree). The mean scores for the seven subscale items ranged from 2.69-3.87 (Appendix H, Table 4.3). Most participants agreed that crime did not make their neighborhoods unsafe during the day (3.87) or night (3.49), and that loose dogs did not make it a problem to walk (3.59). Participants also agreed that they could be seen from neighbors' homes when walking (3.16) and would see and speak to others

(3.13). Participants were more neutral regarding the adequacy of lighting in their streets at night (2.69).

Traffic safety.

The mean score of the Traffic Safety subscale was 2.88 (*SD* = .65) with a range of 1 to 4 on a scale of 1 (strongly disagree) to 4 (strongly agree). The mean scores of the seven items ranged from 2.41 to 3.39 (Appendix H, Table 4.3). Most participants reported that the volume of traffic on their street (3.39) and on nearby streets (3.26) did not make it difficult to walk in their neighborhood. Participants neither agreed nor disagreed with the statements that crosswalks and pedestrian signals were present in their neighborhoods (2.46), gave them enough time to cross the street (2.41) and helped people feel safer from traffic when crossing the street (2.48).

Comfort.

The mean score for the Comfort subscale was 1.65 (*SD* = .69) with a range of 1 to 4 on a scale of 1 (strongly disagree) to 4 (strongly agree). Participants reported that that their neighborhood did not include places to stop and rest (1.99) or places to use the bathroom (1.31) while walking (Appendix H, Table 4.3)

Hypothesis Testing

Path Analysis

Path analyses were conducted in order to examine the direct and indirect relationships between the independent variables and neighborhood walking. Exogenous variables included demographic characteristics and the neighborhood environment. Intervening endogenous variables included outcome expectations, self-efficacy and mobility limitations (see Figure 4.1). Only significant predictors are included in the figure.

Path coefficients were estimated by a series of simple linear regressions. Simple linear regressions were conducted between each of the independent variables (age, sex, race, education, neighborhood density, neighborhood diversity, neighborhood design, self-efficacy, outcome expectations and mobility limitations) and neighborhood walking. Simple linear regressions were then conducted between each of the exogenous variables (age, sex, race, education, neighborhood density, neighborhood diversity and neighborhood design) and each of the endogenous variables (self-efficacy, outcome expectations and mobility limitations). The results are summarized in Table 4.4 (Appendix I). Demographic characteristics, neighborhood diversity and design, self-efficacy, outcome expectations and mobility limitations each had significant direct effects on neighborhood walking ($p < .05$). Self-efficacy ($\beta = .432$, $p < .001$, $R^2 = .19$) had the strongest direct effect on neighborhood walking among all of the theoretical variables. Mobility limitations ($\beta = -.338$, $p < .001$) accounted for 11% of the variance in neighborhood walking. Age had the largest total effect on neighborhood walking at -.567, followed by neighborhood diversity (.465), and self-efficacy (.432). Only direct effects of self-efficacy, outcome expectations and mobility limitations were analyzed.

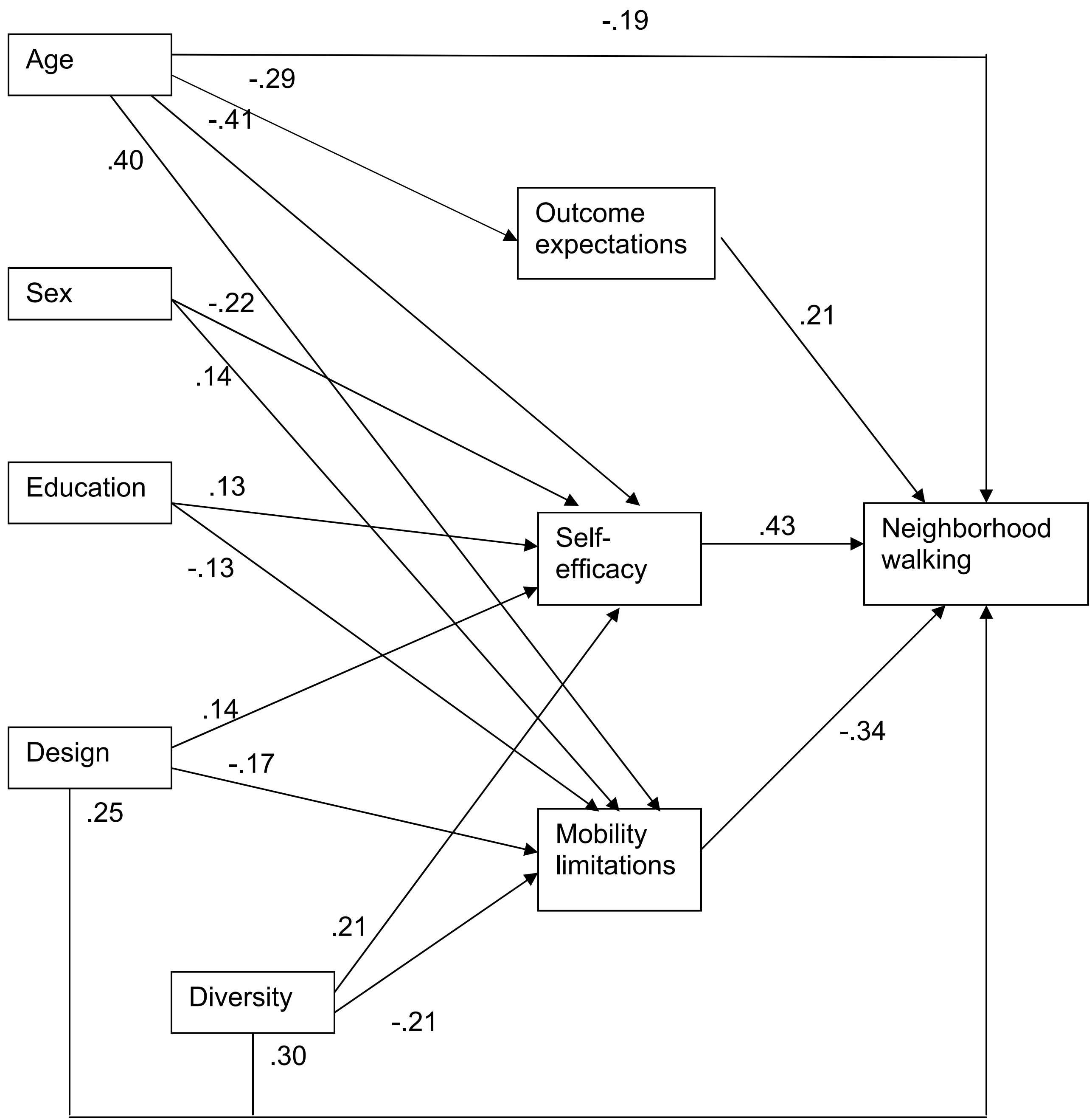

Figure 4.1. Path analysis of relationships between independent variables and neighborhood walking.
Note: only relationships significant at $p < .05$ or less are shown.

Bivariate Correlations

Correlations among all of the model variables are displayed in Table 4.5 (Appendix J). With the exception of density, all of the theoretical variables were significantly correlated with neighborhood walking (r = .213 - .432). Mobility limitations were negatively correlated with neighborhood walking (r = -.338, p < .01). Pearson Moment Correlation and simple linear regression results indicated that density was not significantly associated with neighborhood walking or any theoretical variables except design (r = .135, p < .05) therefore density was removed from further analyses.

Among the independent variables, mobility limitations were significantly negatively correlated with all of the independent variables (Appendix J, Table 4.5) indicating that fewer mobility limitations were associated with higher scores for neighborhood diversity (r = -.205, p < .01) neighborhood design (r = -.269, p < .01), total self-efficacy (r = -.780, p < .01), and outcome expectations (r = -.420, p < .01). Total self-efficacy and outcome expectations were also significantly correlated (r = .422, p < .01).

The total self-efficacy score included five self-efficacy scales. Further examination of the relationship between self-efficacy and mobility limitations revealed that three of the scales were highly negatively correlated with mobility limitations: self-efficacy for gait (r = -.781, p < .01), self-efficacy for balance (r = -.744, p < .01), and self-efficacy for walking duration (r = -.686, p < .01) indicating that individuals with less mobility impairment had higher self-efficacy for gait, balance and walking duration. These scales were also correlated with each other at .649 or higher (Appendix K, Table 4.6). Because of the high correlations, the hierarchical regression analyses were conducted with the following calculations for total self-efficacy: 1) mean of all five self-efficacy scales, 2) mean of self-efficacy for PA barriers, self-efficacy for neighborhood barriers and self-efficacy for walking duration and 3) mean of self-efficacy for PA barriers and self-efficacy for neighborhood barriers. No differences were found in the pattern of regression results. The variance inflation factors for all regression analyses were less than ten and the tolerance scores were greater than .10 indicating that multicollinearity was not a problem (Pallant, 2007). Therefore, the total mean self-efficacy score included all 5 self-efficacy subscales.

Regression Analyses

A series of simple and multiple regression analyses were conducted in order to examine the relationship between 1) individual and environmental factors and neighborhood walking, 2) type of self-efficacy and neighborhood walking, and 3) specific neighborhood characteristics and neighborhood walking.

Hypothesis Testing

Hypothesis 1.1: Self-efficacy, outcome expectations, mobility limitations and neighborhood environment (diversity and design) will be positively associated with neighborhood walking in older adults when demographic characteristics are statistically controlled.

Multiple regression results (Appendix L, Table 4.7) indicated that demographic characteristics explained approximately 4% ($F(4,315) = 3.104$, $p < .05$), of the variance in neighborhood walking (step 1). Of the demographic characteristics, only age (*β* = -.188, $p < .01$) was significantly associated with neighborhood walking. When mobility limitations was added to the model (step 2), the explained variance for neighborhood walking increased from 3.8% to 12.5% ($F(1,314) = 31.422$, $p < .001$, β = -.33. $p < .001$). The addition of self-efficacy and outcome expectations (step 3) further increased the explained variance from 12.5% to 21.3% ($F(2,312) = 17.421$, $p < .001$), however, only self-efficacy was significantly associated with neighborhood walking (β = .489, $p <$ .001),. The addition of neighborhood diversity and design (step 4) increased the explained variance by 6% (R^2=27.3, $F(2.310) = 12.710$, $p < .001$). In the final model, self-efficacy (β = .466, $p < .001$), diversity (β = .186, $p < .001$) and female sex (β = .154, $p < .01$) were significantly associated with neighborhood walking while mobility limitations, outcome expectations and design were not. Therefore, the hypothesis was partially supported.

Hypothesis 1.2: Mobility limitations will moderate the relationship between neighborhood environment and neighborhood walking in older adults.

Hierarchical regression was performed in order to examine the possible interaction between mobility limitations and the neighborhood environment. Because only neighborhood diversity was significant in the hierarchical model, moderation was examined using only neighborhood diversity.

The interaction term for neighborhood diversity and mobility limitations was added to the regression equation used for Hypothesis 1.1 (Appendix L, Table 4.7). The addition of the interaction term (step 5) was nonsignificant (β = -.080, NS) and the hypothesis was not supported.

Hypothesis 1.3: Self-efficacy will mediate the relationship between neighborhood environment and neighborhood walking in older adults.

Simple regression analyses were performed to examine the influence of self-efficacy on the relationship between: 1) neighborhood diversity and neighborhood walking; and 2) neighborhood design and neighborhood walking (Baron & Kenney, 1986). A significant association was found when self-efficacy ($\beta = .214$, $p < .01$) and neighborhood walking ($\beta = .304$, $p < .01$) were each regressed on neighborhood diversity (Figure 4.2, and Appendix M, Table 4.8). A significant relationship was also found when neighborhood walking was regressed on self-efficacy ($\beta = .432$, $p < .01$). Finally, regressions were performed examining the relationship between neighborhood diversity and

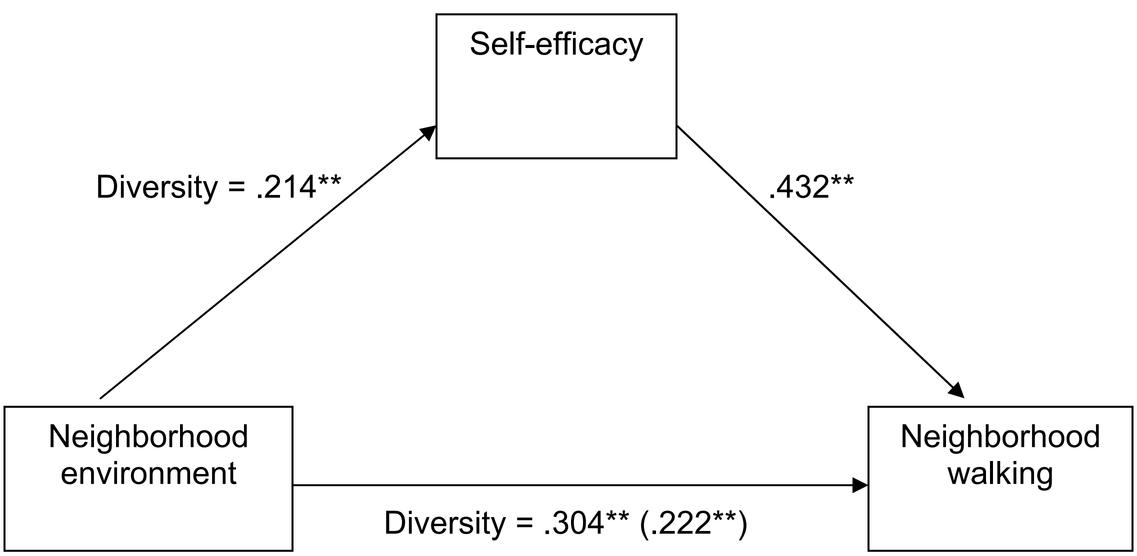

Figure 4.2. Mediation analysis of influence of self-efficacy on relationship between neighborhood diversity and neighborhood walking.
* $p < .05$, ** $p < .01$. Note: Numbers in parentheses indicate associations after self-efficacy entered into regression equation

neighborhood walking with the addition of self-efficacy to the regression equations. The addition of self-efficacy attenuated the relationship between neighborhood diversity and neighborhood walking, reducing the coefficient from .304 to .222 ($p < .01$). However, Sobel's test of significance was negative for mediation of self-efficacy on the relationship between both neighborhood diversity and neighborhood walking ($z = .12$, $p = .91$), therefore the hypothesis was not supported.

A significant association (Figure 4.3, and Appendix M, Table 4.9) was also found when self-efficacy ($\beta = .140$, $p < .05$) and neighborhood walking ($\beta = .245$, $p < .05$) were each regressed on neighborhood design. As in the earlier analysis a significant relationship was found when neighborhood walking was regressed

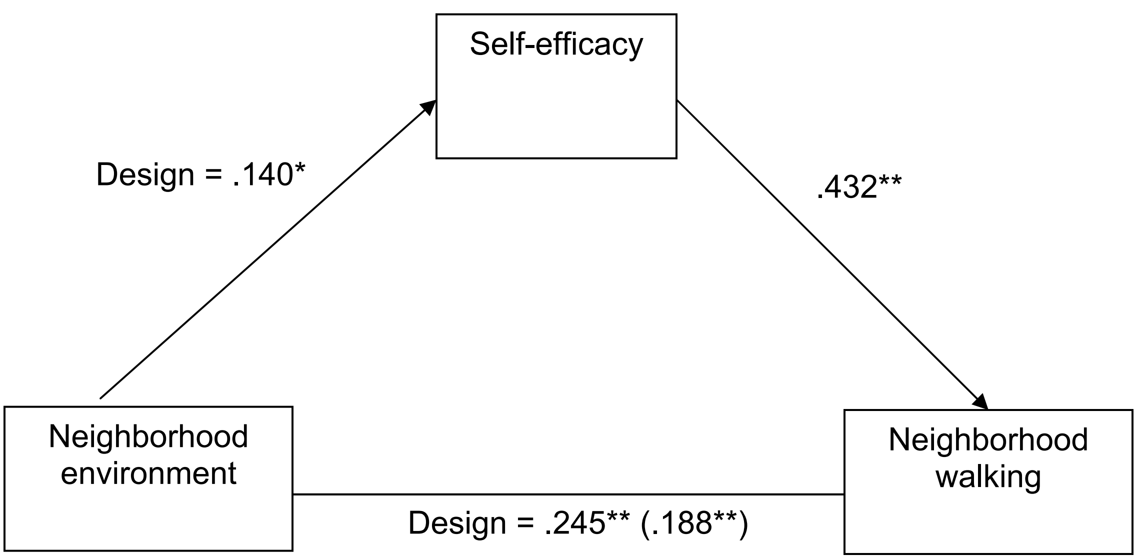

Figure 4.3. Mediation analysis of influence of self-efficacy on relationship between neighborhood design and neighborhood walking.
* $p < .05$, ** $p < .01$. Note: Numbers in parentheses indicate associations after self-efficacy entered into regression equation

on self-efficacy ($\beta = .432$, $p < .01$).

Regressions were then performed examining the relationship between neighborhood design and neighborhood walking with the addition of self-efficacy to the regression equations. The addition of self-efficacy attenuated the relationship between neighborhood design and neighborhood walking, reducing the coefficient from .245 to .188. However, Sobel's test of significance was negative for mediation of self-efficacy on the relationship between design and neighborhood walking ($z = .05$, $p = .96$), therefore the hypothesis was not supported.

Hypothesis 1.3: Outcome expectations will mediate the relationship between neighborhood environment and neighborhood walking in older adults.

Simple regression analyses (Figures 4.4 and 4.5) were performed to examine the influence of outcome expectations on the relationship between: 1) neighborhood diversity and neighborhood walking; and 2) neighborhood design and neighborhood walking (Baron & Kenney, 1986). No significant relationship was found when outcome expectations were regressed on either neighborhood diversity or neighborhood design. No further analyses were conducted and the hypothesis was not supported (Baron & Kenney, 1986).

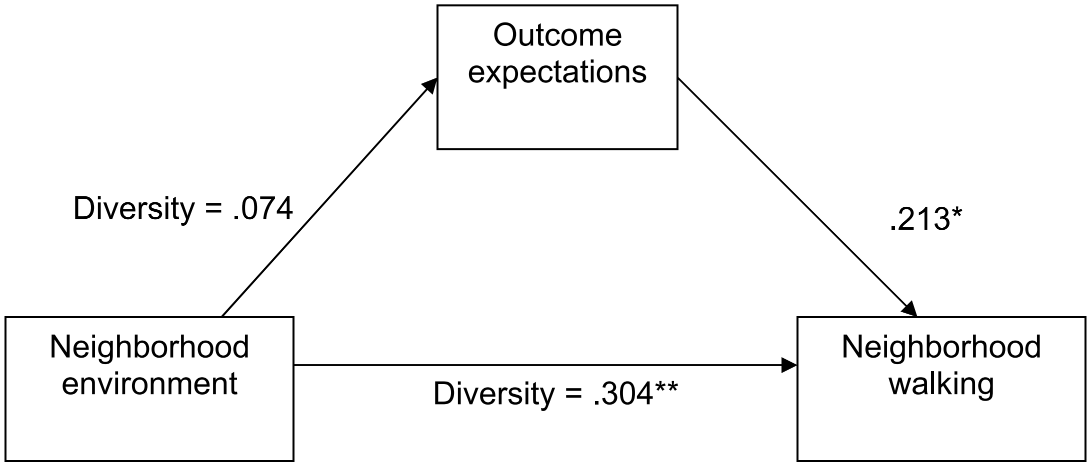

Figure 4.4 Mediation analysis of influence of outcome expectations on relationship between neighborhood diversity and neighborhood walking.
* *p* < .05, ** *p* < .01. Note: Numbers in parentheses indicate associations after outcome expectations entered into regression equation.

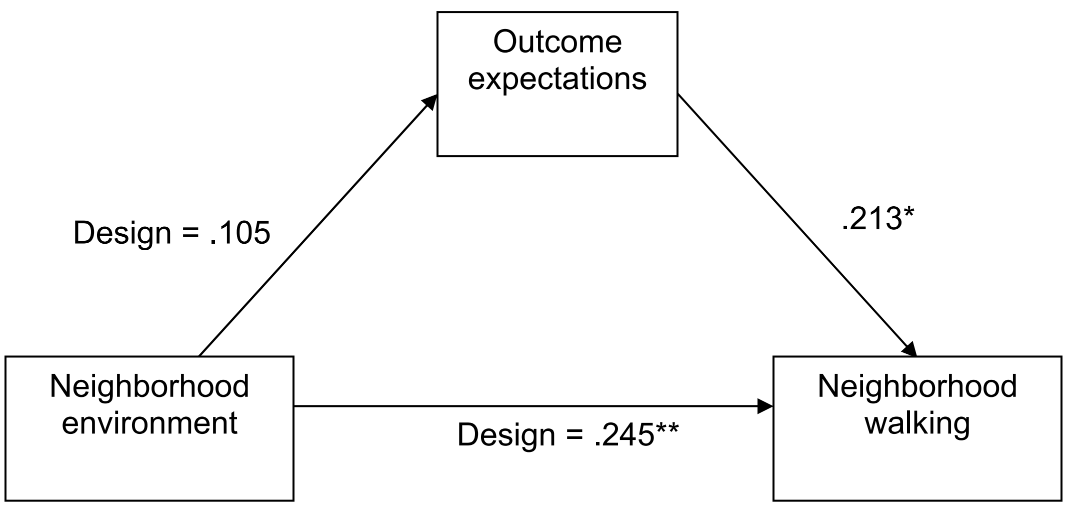

Figure 4.5. Mediation analysis of influence of outcome expectations on relationship between neighborhood design and neighborhood walking.
* *p* < .05, ** *p* < .01. Note: Numbers in parentheses indicate associations after outcome expectations entered into regression equation

Hypothesis 2.1: Self-efficacy for walking duration, self-efficacy for PA barriers, self-efficacy for neighborhood barriers, self-efficacy for balance, and self-efficacy for gait will be associated with neighborhood walking in older adults.

Multiple linear regression analyses were conducted in order to examine the relationship between neighborhood walking and type of self-efficacy (Appendix N, Table 4.10). The five self-efficacy scales were entered simultaneously into the regression equation. The five self-efficacy scales accounted for nearly 23% of the explained variance in neighborhood walking (R^2=.226,F(5, 317) = 18.526, p < .001). Only self-efficacy for PA barriers (β = .308, p < .001) and self-efficacy for walking duration (β = .186, p < .05) contributed significantly to the model, indicating that older adults with higher confidence for participating in 30 minutes of PA 5 days a week despite common barriers and walking for various durations without stopping to rest, were more likely to walk in their neighborhoods.

Hypothesis 3.1: Neighborhood diversity and characteristics of neighborhood design (neighborhood access, neighborhood streets, neighborhood sidewalks, neighborhood surroundings, traffic safety, crime safety and comfort) will be associated with neighborhood walking in older adults.

Multiple linear regression analysis was conducted to examine the influence of neighborhood diversity and design characteristics on neighborhood walking in older adults (Appendix O, Table 4.11). Neighborhood diversity and design characteristics (neighborhood access, neighborhood streets, neighborhood sidewalks, neighborhood surroundings, traffic safety, crime safety and comfort) were entered into the regression equation simultaneously and each was examined for its influence on neighborhood walking. The neighborhood diversity and design variables explained 12 % of the variance in neighborhood walking [$R^2 = .12$, $F(8, 315) = 5.297$, $p < .001$]. Neighborhood diversity was significantly related to neighborhood walking ($\beta = .272$, $p < .01$). No specific characteristics of neighborhood design were significantly associated with neighborhood walking in this sample.

CHAPTER FIVE
DISCUSSION

Summary

Many studies using Social Cognitive Theory as a theoretical framework often include the individual factors (namely self-efficacy and outcome expectations) but not the environmental factors. In this study, both were studied in order to examine the influence of both individual factors (self-efficacy and outcome expectations with the addition of mobility limitations) and neighborhood environmental factors (diversity and design) on neighborhood walking of older adults. The results of this study revealed that the individual factors were significantly associated with neighborhood walking, explaining 21.3% of the variance ($p < .001$). The addition of the neighborhood environmental factors explained an additional 6% of the variance ($p < .001$) in the model. Self-efficacy had the strongest influence on neighborhood walking followed by neighborhood diversity and sex. In the final model, mobility limitations and outcome expectations had no net direct effect on neighborhood walking in this older adult population.

Individual Variables

The influence of self-efficacy on PA and neighborhood walking in older adults is consistent with Social Cognitive Theory (Bandura, 1997) and is supported in the literature (Conn, 1998; McAuley & Motl, 2008; McAuley, Konopack et al., 2006; Nagel et al., 2008, Rejeski et al., 2008; Resnick, 2001; Resnick & Palmer, 2000). Self-efficacy has been found to have the strongest influence on PA and walking in older adults in studies examining self-efficacy and outcome expectations (Conn, 1998, Perkins et al., 2008) and self-efficacy and neighborhood environment (Michael & Carlson, 2009; Nagel et al., 2008). In this study, total self-efficacy was the only individual variable that was associated with neighborhood walking in this older adult population. In particular, self-efficacy for walking duration and self-efficacy for PA barriers were associated with neighborhood walking, while self-efficacy for neighborhood barriers, balance and gait were not.

The Self-efficacy for PA Barriers scale includes items related to confidence in performing PA under a range of circumstances, including transportation to and accessibility of recreation facilities, general health and function, motivation, weather, the presence of a PA routine or PA partner, care-giving responsibilities, and stress. Similar to the significant association of self-efficacy for PA barriers and neighborhood walking found in this study, self-efficacy for PA barriers was significantly associated with PA in cross-sectional studies of women over 50 years of age (Wilcox., 2003) and in older adults (McAuley et al., 2003). Self-efficacy for PA barriers was also significantly associated with walking adherence after walking interventions: at 24 and 52 weeks in older adults (McAuley et al., 2003) and at 48 weeks in women over 40 (Wilbur et al., 2005).

Barriers associated with health, including general health, problems with balance or joints, lack of energy and pain had the lowest means in the self-efficacy for PA barriers scale, indicating that participants had the least confidence in their ability to walk when these barriers were present. This is consistent with other authors' findings that health was a prominent barrier to PA participation in older adults (Dawson, Hillsdon, Boller & Foster, 2007), older women (Heersch et al., 2000; Wilcox et al., 2003) and in older adults with mobility limitations (Rasinaho, Hirvensalo, Leinonen, Lintunen & Rantanen, 2007). In addition, Heersch et al (2000) and King, Castro et al. (2000) found that fatigue and lack of energy were significant barriers to PA in older women. These barriers are critical to identify and address in planning PA and walking interventions for older adults, particularly for those with chronic health conditions or mobility limitations.

Self-efficacy for neighborhood barriers was not significantly associated with neighborhood walking. Although the mean score for the Self-efficacy for Neighborhood Barriers scale reflected moderately low confidence in the ability to walk in the neighborhood given certain neighborhood barriers, a low prevalence of those barriers was reported in the participants' responses on the NEWS. For example, participants reported little confidence in neighborhood walking if they felt unsafe from crime or loose dogs, but also reported that their neighborhoods were fairly free of crime and loose dogs. Even though they may not walk in the presence of crime or loose dogs, the absence of these characteristics in their neighborhoods may have limited the association with their own neighborhood walking. Further research with a larger sample from neighborhoods with more diverse neighborhood characteristics may help to clarify the relationship between self-efficacy for neighborhood barriers and neighborhood walking.

Self-efficacy for walking duration was significantly associated with neighborhood walking in this study. The Self-efficacy for Walking scale (used to measure self-efficacy for walking duration) measures confidence in ability to walk for a particular period of time. Participants indicated that their confidence in the ability to walk decreased as duration increased. In contrast, McAuley and colleagues (2009) found no direct relationship between self efficacy (a combined score of the Self-efficacy for Walking duration and the Exercise Self-efficacy scales) and PA in older women at baseline or 24 months in a prospective, observational study. An indirect relationship between self-efficacy and PA existed through lower-extremity limitations at both time points. The reason for the differing results for these two studies is unclear, but may be due to sample characteristics or setting. In the McAuley study the sample consisted of women only while this study included both men and women living in urban areas in southeast Michigan. Further examination of the associations between self-efficacy for walking duration, neighborhood walking, and lower-extremity or mobility limitations, and the potential influence of gender, is needed to better understand these relationships.

Neither self-efficacy for gait or for balance was significantly associated with neighborhood walking in this study. The literature on the influence of self-efficacy for gait on PA is mixed. McAuley, Mihalko and Rosengren (1997) found no difference in self-efficacy for gait between active and sedentary adults 52 to

85 years of age. In another study, McAuley et al (2006) reported that self-efficacy for both gait and balance was associated with PA and functional performance. The evidence for a relationship between PA and self-efficacy for balance is less equivocal. Self-efficacy for balance has been found to be associated with PA, physical function (Myers et al., 1998; McAuley et al., 2006), gait speed, and activity avoidance in older adults (Myers et al., 1996)

Despite high confidence in maintaining balance and gait under a variety of circumstances, 33.1% of the participants had experienced at least one fall within the last year, which is comparable to national rates of falls in those aged 65 and older (Hausdorff, 2001). When comparing individuals who reported a fall within the past year and those who had not, individuals who had fallen reported lower but still moderate confidence in their ability to maintain balance or successfully navigate a walkway under certain conditions (77% for both scales). Confidence in maintaining balance was moderately high in all but the riskiest conditions: standing on a chair, using an escalator without holding on to the rail and walking on an icy sidewalk. While low confidence in balance may be associated with infrequent falls due to modification of activity (Hatch, McGill & Portney, 2003; Myers et al., 1993) or reduction of PA (Wijlhuizen et al., 2006), the higher confidence associated with a history of falls in this sample is more puzzling. This apparent discrepancy may reflect high balance confidence combined with a lack of awareness of risk, the multifactorial nature of falls, or the nature of the measures used.

Bandura (1997) indicates that individuals who misjudge their abilities may put themselves at higher risk of injury by participating in activities where faulty performance may be detrimental. Older adults with high confidence in their ability to maintain balance may put themselves in high risk situations for falls by not avoiding situations that increase fall risk (e.g. walking on uneven surfaces) that individuals with lower confidence may avoid (Shumway-Cook et al., 2003).

In addition, older adults who are less fearful of falling are often more physically active than older adults who are more fearful (Wijlhuizen et al., 2006). Physically active older adults are at higher risk for outdoor falls than older adults who are not physically active (Li et al., 2006, Wijlhuizen et al., 2006). Most outdoor falls involve tripping over an object or on an uneven surface (Li et al, 2006), and older adults who fall secondary to tripping outside may not perceive the fall as related to balance and may continue to feel confident in their ability to maintain balance.

Finally, although balance deficits are associated with falls, difficulty with balance is only one of several risk factors for falls. Lower extremity weakness is the strongest risk factor for falls in older adults, and may be secondary to de-conditioning from lack of PA as well as disease (Rubenstein & Josephson, 2005). Balance efficacy scales are not designed to capture lower extremity weakness and other fall risk factors such as gait variability, vision or hearing deficits, and cognitive impairment (Hausdorff, 2001). These risk factors may affect confidence in ability to walk for longer distances and may have been captured in the Self-efficacy for Walking Duration scale.

Mobility limitations were negatively associated with neighborhood walking when entered independently into the regression equation, indicating that older adults with mobility limitations walked for a shorter duration of time in their neighborhoods. The negative influence of mobility limitations on neighborhood walking is consistent with the literature on PA and walking in older adults (Hughes et al., 2008; McAuley, Hall, Motl et al., 2009; Resnick & Spellbring, 2000; Rasinaho et al., 2006). Rasinaho and colleagues (2006) found that more than half of individuals with severe mobility limitations were minimally active compared with 11% of those with no mobility limitations. Both Hughes and colleagues (2008) and Resnick and Spellbring (2000) found that older adults with functional limitations were less active at baseline of a PA intervention than those without functional limitations. In addition, those with functional limitations were less likely to adhere to the PA interventions (Hughes et al., 2008; Resnick & Spellbring, 2000).

The association between mobility limitations and neighborhood walking became nonsignificant when self-efficacy and outcome expectations were included in the model. Among the individual factors, only self-efficacy was significantly associated with neighborhood walking. Self-efficacy may be a more important influence on neighborhood walking than mobility limitations in this population or may mediate the relationship between mobility limitations and neighborhood walking which is consistent with Social Cognitive Theory (Bandura, 1997). Although no other studies were identified that specifically examined the influence of both self-efficacy and mobility limitations on neighborhood walking, Morris, McAuley and Motl (2007) found that self-efficacy for walking duration mediated the effect of functional limitations (such as difficulty walking one mile without stopping) on PA (primarily walking) in an exercise intervention. The possible role of self-efficacy as a mediator between mobility limitations and neighborhood walking should be explored further.

The lack of a significant relationship between mobility limitations and neighborhood walking once self-efficacy was entered into the regression equation also may be related to the instrument used. The measure of mobility limitations used in this study asked participants to report limitations that were due to their health, which may have affected participants' responses. Some participants may have been in a pre-clinical stage of mobility limitations, and therefore may not have acknowledged any difficulties in mobility-related tasks. Fried, Bandeen-Roche, Chaves and Johnson (2000) hypothesize a pre-clinical phase of functional limitation in which individuals modify how or whether they perform a certain behavior prior to acknowledging difficulty with that behavior. If participants modify or reduce their walking behavior before perceiving difficulty with walking, the influence of early mobility limitations may not be captured. The self-efficacy scales may have captured this pre-clinical mobility limitation through decreased confidence in ability to perform the behavior under certain conditions or for certain durations. Future studies should include a question about modification or reduction in walking activity in the last year (Fried, 2000; Simonsick, 2008).

While mobility limitations may impact walking and PA, some older adults with mobility limitations continue to be active. In the Women's Health and Aging study, even among those with higher functional or self-care difficulties, 30% reported walking for exercise (Jerome, Glass, Mielke, Xue, Andersen et al., 2006). A better understanding of other factors that influence walking in this population and possible mediating, moderating or confounding effects between factors, will aid in development of interventions that can help older adults with mobility limitations to continue to be physically active, reducing their risk for mobility disability.

Outcome expectations were not significantly associated with neighborhood walking in this study. This finding is consistent with research reporting that outcome expectations either exert no influence on PA (Perkins et al., 2008) or exert less influence on PA than self-efficacy (Conn, 1998). In this sample, participants reported strong agreement that regular PA would have positive health benefits such as improving their muscle strength or cardiovascular systems, and would not worsen health conditions. However, the relationship between outcome expectations and neighborhood walking may be mediated through self-efficacy: even if individuals expect that a behavior such as walking or PA may lead to a certain benefit, they may not perform the behavior due to lack of self-efficacy (Bandura, 1997). In this study, while participants reported generally high expectations of positive outcomes of PA, they reported low self-efficacy for PA barriers. If participants did not have confidence in their ability to perform PA due to barriers to PA, the relationship between their expectation of positive outcomes from PA and their performance of PA may be diluted. Further research into the relationship between outcome expectations and specific types of self-efficacy will help to clarify the relative importance of each in neighborhood walking and PA.

The nonsignificance of outcome expectations may also be due to measurement. The target behavior in this study was neighborhood walking duration, while the focus of the Outcome Expectations Scale was 30 minutes of PA (including walking, biking and swimming) five days per week. Despite the inclusion of walking within the definition of PA in the survey instructions, this discrepancy may have diluted the association of outcome expectations with neighborhood walking. For example, if participants' total PA involved a combination of swimming, biking, and use of a treadmill, rather than walking in their neighborhoods, their beliefs about outcome expectations secondary to PA would not be reflected in their level of neighborhood walking.

Environmental Variables

Both neighborhood diversity (the presence of destinations such as stores, coffee shops, or libraries within walking distance) and neighborhood design were directly associated with neighborhood walking in the path analysis. In the final multiple regression model, only neighborhood diversity was associated with neighborhood walking while neighborhood design was nonsignificant (p=.075) Numerous studies have supported the influence of neighborhood diversity on total PA (Gauvin et al., 2008; Cunningham et al., 2005; Patterson & Chapman, 2003; Michael et al. 2005) and walking of older adults (Nagel et al., 2008;

Gallagher et al., 2010; Lockett et al., 2005; King, D., 2008; King, Belle, Brach, Rodriguez et al., 2009; King, Brach, Belle, Killingsworth, Fenton et al., 2003; King et al., 2000; Rodriguez et al., 2009; Shigematsu et al., 2009). King et al. (2000) found that the presence of stores within walking distance from their homes was associated with walking for errands in adults 55 years of age and older, while King, Brach et al. (2003) found that the presence of stores within walking distance was associated with higher walking levels in older women, measured by both pedometer and survey. Rodriguez et al. (2009) reported that the presence of more retail destinations in a neighborhood was associated with both transportation and recreational walking in adults 45 to 84 years old. In contrast, Strath et al. (2007) did not find the presence of nonresidential destinations to be as important an influence on walking in older adults as other characteristics such as safety and traffic, and King (2008) found that walking in older adults was associated with safety perceptions and social cohesion, but not with the presence of neighborhood retail destinations.

Both neighborhood diversity and design were indirectly associated with neighborhood walking through positive associations with self-efficacy and mobility limitations, indicating that individuals in neighborhoods conducive to walking had higher self-efficacy and fewer mobility limitations. A number of factors may contribute to these relationships.

Self-efficacy for walking may be enhanced by surroundings that are more conducive to neighborhood walking. Self-efficacy is strengthened through individual performance of the target behavior, modeling of the target behavior by others, and by self-evaluation of both emotional and physical states (Bandura, 1997; van der Bijl & Shortridge-Bagget, 2001; Resnick, 2000). Neighborhood diversity (the presence of multiple destinations within walking distance) may encourage neighborhood walking, thereby increasing self-efficacy for the behavior. Seeing other adults walking in the neighborhood may increase self-efficacy through modeling of the target behavior. Finally, design characteristics that are more pleasant and conducive to walking may enhance a person's emotional state, while more frequent opportunities for walking may improve or help to maintain their physical state, further increasing self-efficacy.

No studies were identified that specifically examined the relationship between neighborhood diversity or design and self-efficacy. However, in a study of older adults participating in a PA (mainly walking) intervention, Morris and colleagues (2008) found that increases in neighborhood satisfaction, including satisfaction with presence of local destinations within walking distance and neighborhood surroundings and safety, were associated with increased self-efficacy for PA barriers. In addition, McAuley and colleagues (2000) found that self-efficacy for walking duration was associated with more positive and less negative feelings about PA, potentially increasing willingness to participate in PA. Given the strong influence of self-efficacy on neighborhood walking, future studies should further examine the relationship between neighborhood diversity, design and self-efficacy. Examination of the relationship between specific characteristics of neighborhood design and specific types of self-efficacy may be particularly useful in planning neighborhood walking interventions for older adults.

The association between neighborhood diversity and design, mobility limitations, and neighborhood walking is of clinical importance and requires further study. Similar to the proposed relationship with self-efficacy, walking may be enhanced by diverse neighborhood characteristics and the presence of destinations within walking distance of the participant's home. These walking opportunities may in turn help to prevent or slow the progression of mobility disability (Balfour & Kaplan, 2002; Keysor, 2003).

Neighborhood characteristics related to neighborhood design may also influence opportunities for PA and walking in older adults. Balfour and Kaplan (2002) reported in a longitudinal study in Alameda County, CA, that older adults who reported heavy traffic, noise and limited access to public transportation, were at a higher risk of declines in lower-extremity function than those who did not report problems. The authors suggest that the challenges to mobility and PA encountered in a negative environment may affect lower-body function and disability (Balfour & Kaplan, 2002).

Older adults with mobility limitations may also progress more quickly to disability in the face of an environment that is not conducive to walking. Older adults with mobility limitations may avoid walking in areas where neighborhood barriers exist, leading to fewer opportunities for walking and increasing the risk of development of further mobility limitations (Shumway-Cook et al., 2003). Clarke, Ailshire et al. (2008) reported that adults with lower extremity impairment had four times the level of mobility disability (difficulty walking two or three blocks) in areas with poor street and sidewalk conditions than those without mobility impairment. Rantakokko and colleagues (2009) found a more rapid progression of walking difficulty among older adults who were fearful of moving outdoors due to poor street conditions, traffic volume and noise (Rantakokko, Manty, Iwarsson, Tormakangas, Leinonen et al., 2009). Further research on the relationship between neighborhood diversity, design and mobility limitations is needed to clarify the relationships among the variables and to identify specific neighborhood characteristics that may be associated with the progression or prevention of mobility limitations and disability.

Demographic Characteristics

In this study women were more likely to walk in their neighborhoods than men. Previous studies have reported that women engage in less PA (Brownson et al., 2005; Conn, 1998; Shaw & Spokane, 2008) and walk less (Reis, Macera, Ainsworth & Dipp, 2008) than men. However, Bryan and Katzmarzyk (2009) reported from the Canadian National Population Health Survey that women walked at least four times a week for exercise more often than men (27.1% and 25%, respectively). Women also were more likely than men to derive their total PA entirely from walking (11.9% and 8.4%, respectively).

Women are also more likely than men to develop mobility disability (Clarke, Ailshire et al., 2008) and to experience a fall (Iinattiniemi, Jokelainen & Luukinen, 2008; Tinetti et al., 1995; Stevens & Sogolow, 2005), potentially further reducing PA through activity avoidance. Consistent with the literature, women in this sample reported slightly higher mobility disability and lower self-efficacy. However, although 33.1% of the study participants had experienced a fall in the past year, t-tests revealed that there was no significant difference in falls between men and women. Further research should examine the influence of self-efficacy, mobility limitations, outcome expectations and neighborhood environment on neighborhood walking in men and women

Study Limitations and Future Research or Directions

There were some limitations to this study. The cross-sectional design used in this study does not allow determination of causality. Future studies should include experimental designs to further test the relationships between Social Cognitive Theory variables and walking in older adults.

Individual responses to the survey could have been affected by fatigue due to the length of the survey, although measures to reduce fatigue were provided. A larger, 14-point font was used as well as line spacing for the items was 1.5 to enhance reading ability and reduce fatigue. Additionally, participants were instructed that the survey did not need to be completed in one sitting. A potential limitation for all survey studies includes participants answering the survey questions in a socially desirable manner. However, the wide range of responses given to the questions about walking duration and self-efficacy for walking duration and PA barriers scale suggests that this was not the case. Generalizability of the findings from this study may be limited due to recruitment from a convenience sample of older adults living in urban settings in southeastern Michigan. The sample was predominantly white with high income and education levels, and reported living in neighborhoods with pleasant surroundings and low crime. Future studies should include participants from more diverse neighborhood environments and socioeconomic backgrounds.

Another limitation is the collection of only subjective data for neighborhood walking, mobility limitations and neighborhood environment. Future studies should include objective measures such as actigraphy, mobility performance measures and environmental measures such as census data, Geographic Information Systems or neighborhood audits. While not replacing important subjective information gained in a survey, objective data can allow comparisons between subjective and objective data and may provide additional information. For example, comparing objective measures of neighborhood characteristics (e.g. local destinations, four-way intersections, sidewalks or crime and traffic statistics) with participants' perceptions of these characteristics in their neighborhoods may allow a deeper understanding of the potential influence of neighborhood environment on walking. For this study, objective measures such as actigraphy and mobility performance measures were not feasible with the larger sample size needed to test the theoretical model.

Future research should also include wider sampling of older adults with current or pre-clinical limitations in mobility. The combined use of objective and subjective information could aid in the identification of those with both current and pre-clinical mobility limitations. Measurement of comfortable gait speed, for example, could allow identification of those with intermediate gait speeds who may be experiencing pre-clinical mobility disability that is not reflected in subjective scales related to task difficulty (Fried et al., 2000). To aid in the identification of older adults with pre-clinical mobility disability, items related to the modification, reduction or difficulty of task performance should be included in subjective measures of mobility limitations.

Finally, future studies should include longitudinal measures of the theoretical variables. Measurement over time of participants' neighborhood walking, self-efficacy and outcome expectations, mobility limitations and neighborhood environment (both objective and subjective) would allow examination of the relationships among these variables and their influence on walking and the development or progression of mobility limitations.

Conclusion

The purpose of this study was to examine the individual (self-efficacy, outcome expectations and mobility limitations) and neighborhood environmental characteristics (diversity and design) that may influence neighborhood walking in older adults. Neighborhood environment added to the explained variance in neighborhood walking above and beyond that explained by the individual variables (mobility limitations, self-efficacy and outcome expectations). The additional variance explained by neighborhood environment in this study highlights the need to examine each of the three components of Social Cognitive Theory: individual variables, the environment, and neighborhood walking. The relationships among relevant individual variables (self-efficacy, outcome expectations, and mobility limitations), neighborhood environment and neighborhood walking are novel areas of research. Analyses of potential mediation and moderation between the Social Cognitive Theory variables should be also examined. Further examination of the relationships among these variables can help guide the development of policy, clinical practice and PA and walking interventions for older adults, particularly those with or at risk for mobility limitations.

Appendix A

Cover letter

Dear Claude Pepper Human Subjects and Assessment Pool participant:

I am a nurse and a doctoral student at the University of Michigan School of Nursing. I received your name from the Human Subjects and Assessment Pool at the Claude Pepper Center at the University of Michigan, and I would like to ask for your help with an important study on the influence of neighborhoods and health beliefs on walking and physical activity in older adults.

You are eligible to participate in this study if you are 60 years of age or older, do not live in a nursing home, and are able to walk, even if it is with a walker or cane. YOU ARE ELIGIBLE TO PARTICIPATE WHETHER YOU WALK REGULARLY OR NOT. Because we are trying to learn about neighborhood walking in people over 60, however, you are not eligible to participate if you are under 60, live in a nursing home, or are unable to walk even a short distance. If you are not eligible, we would ask that you indicate that on the survey and return it in the envelope, for record keeping purposes.

As you know, physical activity, including walking, has many benefits. However, many people do not walk regularly or get enough physical activity. This study will be used to find out about the neighborhood characteristics and beliefs and opinions that relate to different amounts of physical activity and walking. The results will be used to design walking programs for older adults. The development of effective physical activity programs is important in order to keep people healthy as they grow older.

Participating in the study consists of reading the attached consent form and then completing the attached questionnaire and returning the questionnaire to me. The consent form is for your records. The questionnaire will take about 1 to 1 ½ hours to fill out. Most of the questions can be answered simply by circling the answer. You DON'T have to fill it all out at once. You can fill part of it out and then continue at a later time, if you prefer. A stamped envelope is provided for you to return the questionnaire. Your information is very important to this study. For your information to be included in the study, I will need to receive your questionnaire back by ____________ .

Your participation in this study is voluntary. You do not have to participate, but we would be very grateful if you did. There is no penalty or loss of benefits for refusing to participate in this study. All of the information you provide will be kept confidential. Your name will not be on the questionnaire. The information that you give on the questionnaire will only be identified by a number so no one will know that it is your questionnaire. The list of addresses and code numbers will be kept in a locked file cabinet separate from the questionnaires and accessible only to the investigators of the study. The information will be used for research purposes only and the results will be recorded in group form so that responses from any one person cannot be identified.

If you have any questions about this research project or how to complete the questionnaire, please contact Nancy Gallagher at (734) 649-3689 (cell) or Dr. Kimberlee Gretebeck at (734) 615-7455. If you have any questions about your rights as a research participant or a concern about a study, please contact the University of Michigan Medical School Institutional Review Board, (734) 763-4768, 517 W. William, Ann Arbor, MI 48103-4943, irbmed@umich.edu. You may also express a concern about a study by calling the University of Michigan Compliance Help Line at 1-888-296-2481.

Thank you in advance for helping me complete my doctoral dissertation and providing information that will be used to help improve the health of older adults.

Nancy Ambrose Gallagher, MS, RN
Doctoral candidate
University of Michigan
School of Nursing

Appendix B: Survey

Instructions

Thank you for participating in our study! Please remember to sign the attached consent form: we will be unable to use your questionnaire unless we also have the signed consent.

This questionnaire will take about 60-90 minutes to complete. You do not have to complete the questionnaire all at one time: you can put it down and come back to it at a later time.

In this study we are looking at walking and physical activity……The first section asks questions about walking that you do INSIDE your neighborhood, including walking for transport (such as walking to and from work, or to the store or bus stop), health, recreation or fitness. Neighborhood is defined as within a 15 minute walk or within ½ mile of your home. Examples might include walking your dog, walking specifically for exercise, or taking a walk after dinner. This section also includes specific questions about your neighborhood.

The next section asks questions about walking OUTSIDE your neighborhood for transport, health, recreation or fitness. Examples might include driving to the mall or to a public track or trail (more than ½ mile away) and walking there. The sections that follow ask questions about general physical activity, and about confidence and expectations related to walking and physical activity both INSIDE and OUTSIDE your neighborhood.

Although the questionnaire has many questions, most sections can be filled out pretty quickly. Although some of the questions may seem very similar, they ask things in different ways. Each question is important to our study. Please feel free to call or email me if you have any questions at all.

Nancy Ambrose Gallagher, RN, MS
734-649-3689
nagalla@umich.edu

We would like to know whether you walk in and outside of your neighborhood. (the area within ½ mile or a 15 minute walk from your home). We are interested in walking for any reason: transport, health, recreation or fitness. In Section A we will ask about walking IN your neighborhood, in Section B we will ask about walking OUTSIDE of your neighborhood.

SECTION A

First we are going to ask specific questions about different types of walking (for transport, recreation, etc.) IN YOUR NEIGHBORHOOD-everywhere within a ½ mile or 15 minute walk from your home.

WALKING FOR TRANSPORT IN YOUR NEIGHBORHOOD:

1. In a USUAL WEEK, how many times do you walk as a means of transport, such as going to and from work, walking to the store or the bus stop IN your neighborhood?

times: ____ □ I don't walk as a means of transport in my neighborhood

2. Please estimate the total time you spend walking as a means of transport IN your neighborhood in A USUAL WEEK.

Hours:____ Minutes: ____ □ I don't walk as a means of transport in my neighborhood

3. Check all the places where you walk to as a means of transport IN your neighborhood in a USUAL WEEK.

Places you might walk to as a means of transport IN your neighborhood in a USUAL week	Check ALL the places you walk to in a USUAL week
a. To or from work or volunteering	
b. To or from public transport (buses, trains, etc.)	
c. To or from stores	
d. To or from restaurant or coffee shop	
e. To or from a friend's house	
f. To or from church	
g. Somewhere else: Please write where:	____________________
h. I don't walk as a means of transport in my neighborhood in a usual week	□

WALKING FOR RECREATION, HEALTH OR FITNESS
IN YOUR NEIGHBORHOOD (within a ½ mile or a 15 minute walk from your home). If you included recreational walking in the previous section, don't include it here.

4. In a USUAL WEEK, how many times do you walk for recreation, health or fitness (including walking your dog) IN your neighborhood?

times: ____ □ I don't walk for recreation, health or fitness in my neighborhood

5. Please estimate the total time you spend walking for recreation, health or fitness IN your neighborhood in a USUAL WEEK. (for example, 5 times for 20 minutes = 100 minutes or 1 hour and 40 minutes)

Hours:____ Minutes: ____ □ I don't walk for recreation, health or fitness in my neighborhood

6. Check all the places where you walk for recreation, health or fitness IN your neighborhood in a USUAL WEEK.

Places you might walk to for recreation, health or fitness IN your neighborhood in a USUAL week	Check ALL the places you walk to in a USUAL week
a. To or from work or volunteering	
b. To or from public transport (buses, trains, etc.)	
c. To or from stores	
d. To or from restaurant or coffee shop	
e. To or from a friend's house	
f. To or from church	
g. Somewhere else: Please write where:	___________________________
h. I don't walk for recreation, health or fitness in my neighborhood in a usual week □	

7. What do you estimate is the total time you spend walking IN your neighborhood (for at least 10 minutes at a time) for EITHER transport, recreation, health or fitness in a USUAL WEEK? (for example, once a week for 1 hour = 1 hour, twice a week for 1 hour = 2 hours, etc.) For this question we only want to know about walking for at least 10 minutes at a time.

Hours: ______ Minutes: ________

8. The following questions are also about walking IN YOUR NEIGHBORHOOD, or within a ½ mile, or 15 minute walk, of your home.

How confident are you right now that you could walk for at least 10 minutes IN your neighborhood, if….

a. there was nowhere to walk to (ex: store, coffee shop, friend's house).

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Not at all confident Moderately Confident Highly Confident

b. the scenery was unattractive.

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Not at all confident Moderately Confident Highly Confident

c. you felt unsafe from crime or loose dogs.

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Not at all confident Moderately Confident Highly Confident

d. there was heavy traffic.

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Not at all confident Moderately Confident Highly Confident

e. there were no places to rest or use the bathroom.

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Not at all confident Moderately Confident Highly Confident

f. there were no sidewalks or the sidewalks were broken or overgrown.

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Not at all confident Moderately Confident Highly Confident

g. the weather was very bad (hot, humid, rainy, cold).

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Not at all confident Moderately Confident Highly Confident

h. the lighting was poor.

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Not at all confident Moderately Confident Highly Confident

Now think about the different places in and around your <u>neighborhood</u>-the area within about a half mile of your home, that you could walk to within about 15 minutes.

<u>9. General information about your neighborhood</u>

Among the residences in your neighborhood… (please check one answer)

a. How common are <u>detached single-family residences</u> in your neighborhood?

None	A few	Some	Most	All
☐	☐	☐	☐	☐

b. How common are <u>townhouses or row houses of 1-3 stories</u> in your neighborhood?

None	A few	Some	Most	All
☐	☐	☐	☐	☐

c. How common are <u>apartments or condos 1-3 stories</u> in your neighborhood?

None	A few	Some	Most	All
☐	☐	☐	☐	☐

d. How common are <u>apartments or condos 4-6 stories</u> in your neighborhood?

None	A few	Some	Most	All
☐	☐	☐	☐	☐

e. How common are <u>apartments or condos 7-12 stories</u> in your immediate neighborhood?

None	A few	Some	Most	All
☐	☐	☐	☐	☐

f. How common are <u>apartments or condos more than 13 stories</u> in your neighborhood?

None	A few	Some	Most	All
☐	☐	☐	☐	☐

10. Stores, facilities, and other things in your neighborhood

About how long would it take to get from your home to the nearest businesses or facilities listed below if you walked to them? Please put only one check mark (√) for each business or facility.

Business or facility	Time to walk there					
	1-5 min.	6-10 min.	11-20 min.	21-30 min.	Over 30 min.	Don't know
a. Convenience/ small grocery store						
b. Supermarket						
c. Hardware store						
d. Fruit/vegetable market						
e. Laundry/dry cleaners						
f. Clothing store						
g. Post office						
h. Library						
i. Book store						
j. Fast food restaurant						
k. Bank/credit union						
l. Restaurant						
m. Video store						
n. Pharmacy/drug store						
o. Salon/barber shop						

About how long would it take to get from your home to the nearest businesses or facilities listed below if you walked to them? Please put only one check mark (√) for each business or facility.

Business or facility	Time to walk there					
	1-5 min.	6-10 min.	11-20 min.	21-30 min.	Over 30 min.	Don't know
p. School						
q. Bus or trolley stop						
r. Recreation center, gym						
s. Job or volunteer site						
t. Friend or family's house						
u. Hospital or clinic						
v. Church						

11. How long have you lived at your current address?
_________________years

12a. Do you drive a car . . .?

□ Regularly
□ Occasionally
□ Rarely
□ I do not drive anymore

12b. Is there a vehicle in your household that you can drive, if needed?

□ Yes □ No

13. Access to services

Please check the box under the answer that best applies to you and your neighborhood. Both local and within walking distance mean within a 15 minute walk from your home.

	Strongly disagree	Somewhat disagree	Somewhat agree	Strongly agree
a. I can do most of my shopping at local stores.				
b. Stores are within easy walking distance of my home.				
c. Parking is difficult in local shopping areas.				
d. There are many places to go within easy walking distance of my home.				
e. It is easy to walk to a transit stop (bus, train) from my home.				
f. The streets in my neighborhood are hilly, making my neighborhood difficult to walk in.				
g. There are many canyons/hillsides in my neighborhood that limit the number of routes for getting from place to place.				
h. I see many people being physically active in my neighborhood doing things like walking, jogging, cycling, or playing sports and active games.				

For the following questions, please check the box under the answer that best applies to you and your neighborhood (the area within about 1/2 mile of your home, that you could walk to within in about 15 minutes.)

14. Streets In My Neighborhood

	Strongly disagree	Somewhat disagree	Somewhat agree	Strongly agree
a. The streets in my neighborhood do not have many, or any, cul-de-sacs (dead-end streets).				
b. There are walkways in my neighborhood that connect cul-de-sacs to streets, trails, or other cul-de-sacs.				
c. The distance between intersections in my neighborhood is usually short (100 yards, the length of a football field, or less).				
d. There are many four-way intersections in my neighborhood.				
e. There are many alternate, or different, routes for getting from place to place in my neighborhood. (I don't have to go the same way every time.)				

For the following questions, please check the box under the answer that best applies to you and your neighborhood (the area within about 1/2 mile of your home, that you could walk to within in about 15 minutes.)

15. Places for walking and cycling

	Strongly disagree	Somewhat disagree	Somewhat agree	Strongly agree
a. There are sidewalks on most of the streets in my neighborhood.				
b. The sidewalks in my neighborhood are well maintained (paved, even, and not a lot of cracks).				
c. The sidewalks in my neighborhood are kept clear of ice and snow.				
d. The sidewalks in my neighborhood are kept clear of overgrown bushes, fallen branches, and weeds.				
e. There are bicycle or pedestrian trails in or near my neighborhood that are easy to get to.				
f. Sidewalks are separated from the road/traffic in my neighborhood by parked cars.				
g. There is a grass/dirt strip that separates the streets from the sidewalks in my neighborhood.				

For the following questions, please check the box under the answer that best applies to you and your neighborhood (the area within about 1/2 mile of your home, that you could walk to within in about 15 minutes.)

16. Neighborhood surroundings

	Strongly disagree	Somewhat disagree	Somewhat agree	Strongly agree
a. There are trees along the streets in my neighborhood.				
b. Trees give shade for the sidewalks in my neighborhood.				
c. There are many interesting things to look at while walking in my neighborhood.				
d. My neighborhood is generally free from litter.				
e. There are many attractive natural sights in my neighborhood (such as landscaping, nice gardens and views, waterways or fountains).				
f. There are attractive buildings/homes in my neighborhood.				
g. My neighborhood is quiet and peaceful during the day.				
h. My neighborhood is quiet and peaceful during the night.				
i. There are places to stop to rest in my neighborhood.				
k. There are places to stop and use the restroom in my neighborhood.				

For the following questions, please check the box under the answer that best applies to you and your neighborhood (the area within about 1/2 mile of your home, that you could walk to within in about 15 minutes.)

17. Traffic

	Strongly disagree	Somewhat disagree	Somewhat agree	Strongly agree
a. There is so much traffic along the street that I live on that it makes is difficult or unpleasant to walk in my neighborhood.				
b. There is so much traffic along nearby streets that it makes is difficult or unpleasant to walk in my neighborhood.				
c. The speed of traffic on the street I live on is usually slow (30 mph or less.)				
d. The speed of traffic on nearby streets is usually slow (30 mph or less.)				
e. Most drivers exceed the posted speed limits while driving in my neighborhood.				
f. There are crosswalks and pedestrian signals to help walkers cross busy streets in my neighborhood.				
g. The crosswalks in my neighborhood help walkers feel safe crossing busy streets.				
h. The pedestrian signals in my neighborhood give me enough time to get safely across the street before the light changes.				

For the following questions, please check the box under the answer that best applies to you and your neighborhood (the area within about 1/2 mile of your home, that you could walk to within in about 15 minutes.)

18. Safety

	Strongly disagree	Somewhat disagree	Somewhat agree	Strongly agree
a. My neighborhood streets are well lit at night.				
b. Walkers and bikers on the streets in my neighborhood can be easily seen by people in their homes.				
c. I see and speak to other people when I am walking in my neighborhood.				
d. There is a high crime rate in my neighborhood.				
e. The crime rate in my neighborhood makes it unsafe to go on walks during the day.				
f. The crime rate in my neighborhood makes it unsafe to go on walks at night.				
g. Unattended or loose dogs make it a problem to walk in my neighborhood.				

SECTION B

This section is about walking OUTSIDE of your neighborhood-anywhere further than a ½ mile or 15 minute walk from your home. (For example, somewhere you walk to in the next neighborhood or subdivision, or somewhere you drive to in order to walk, like the mall, a gym or a walking trail.)

WALKING FOR TRANSPORT OUTSIDE OF YOUR NEIGHBORHOOD (anywhere outside of a ½ mile or a 15 minute walk from your house.)

19. In a USUAL WEEK, how many times do you walk as a means of transport, such as going to and from work, walking to the store or walking to public transport OUTSIDE of your neighborhood?

# of times: _____ □ I don't walk as a means of transport outside of my neighborhood

20. Please estimate the total time you spend walking as a means of transport OUTSIDE of your neighborhood in a usual week.

Hours: ____ Minutes: ____ □ I don't walk as a means of transport outside of my neighborhood

21. Check all the places where you walk as a means of transport OUTSIDE of your neighborhood in a USUAL WEEK.

Places you might walk to as a means of transport OUTSIDE your neighborhood in a USUAL week	Check ALL the places you walk to in a USUAL week
a. To or from work or volunteering	
b. To or from public transport (buses, trains, etc.)	
c. To or from stores	
d. To or from restaurant or coffee shop	
e. To or from a friend's house	
f. To or from church	
g. Somewhere else: Please write where:	____________________________
h. I do not walk for transport outside my neighborhood □	

WALKING FOR RECREATION, HEALTH OR FITNESS OUTSIDE YOUR NEIGHBORHOOD. If you have included recreational walking in the previous section, please do not repeat it in this section.

22. In a USUAL WEEK, how many times do you walk for recreation, health or fitness (including walking your dog) OUTSIDE your neighborhood?

Times: ____ □ I don't walk for health, recreation or fitness outside of my neighborhood

23. Please estimate the total time you spend walking for recreation, health or fitness (including walking your dog) OUTSIDE your neighborhood in a USUAL WEEK.

Hours: ____ Minutes: ____ □ I don't walk for health, recreation or fitness outside of my neighborhood

24. Check all the places where you walk for recreation, health or fitness OUTSIDE your neighborhood in a USUAL WEEK

Places you might walk for recreation, health or fitness OUTSIDE your neighborhood in a USUAL week	Check ALL the places you walk to in a USUAL week
To or from work or volunteering	
To or from public transport (buses, trains, etc.)	
To or from stores	
To or from restaurant or coffee shop	
To or from a friend's house	
To or from church	
Somewhere else (1): Please write where:	____________________
I don't walk for recreation, health or fitness outside of my neighborhood □	

25. What do you estimate is the total time you spend walking for either transportation, recreation or health OUTSIDE your neighborhood (for at least 10 minutes at a time) in a USUAL WEEK? (for example, once a week for 1 hour = 1 hour, twice a week for 1 hour = 2 hours, etc.)

Hours: ______ Minutes: ________

SECTION C.

THE REST OF THE QUESTIONS REFER TO WALKING OR PHYSICAL ACTIVITY THAT YOU PARTICIPATE IN INSIDE AND OUTSIDE OF YOUR NEIGHBORHOOD.

OTHER LEISURE TIME PHYSICAL ACTIVITIES

26. In a USUAL WEEK, do you do any other vigorous or moderate intensity leisure time physical activities? Do not include any walking.

Yes:____ No: ______

27. In a USUAL WEEK, do you do any vigorous intensity leisure time physical activities like jogging, aerobics, or competitive tennis? Do not include walking or moderate intensity physical activities. Vigorous intensity physical activities make you breathe harder or puff and pant.

Yes:____ No: ______

28. In a USUAL WEEK, how many times do you do vigorous intensity leisure time physical activities which makes you breather harder or puff and pant?

Number of times: _______

29. What do you estimate is the total time you spend doing vigorous intensity leisure time physical activities in a USUAL WEEK? (for example, 3 times for 20 minutes each time = 60 minutes)

Hours: ______ Minutes: ________

30. Apart from what you have already mentioned, in a USUAL WEEK do you do any other moderate intensity physical activities like gentle swimming or biking, social tennis, golf or heavy gardening? Moderate intensity physical activities do not make you breathe harder or puff and pant.

Yes:____ No: ______

31. In a USUAL WEEK, how many times do you do moderate intensity-physical activities which do not make you breathe harder or puff and pant?

Number of times: ________

32. What do you estimate is the total time you spend doing moderate intensity physical activities in a USUAL WEEK? (for example, 1 time for 1 hour = 1 hour)

Hours: ______ Minutes: ______

Please indicate how confident you are that you can successfully walk at a moderately fast pace without stopping. A moderately fast pace is enough to increase your heart rate and to work up a sweat. Remember to answer honestly and accurately. There is no right or wrong answer.

FOR EXAMPLE:
If you have complete confidence that you could walk for 5 minutes at a moderately fast pace without stopping, you would circle 100%. If you had no confidence that you could walk for 5 minutes at a moderately fast pace without stopping, you would circle 0%.

34. I BELIEVE THAT I CAN WALK:

a. For 5 minutes at a moderately fast pace without stopping

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Not at all confident				Moderately Confident					Highly Confident	

b. For 10 minutes at a moderately fast pace without stopping

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Not at all confident				Moderately Confident					Highly Confident	

c. For 15 minutes at a moderately fast pace without stopping

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Not at all confident				Moderately Confident					Highly Confident	

d. For 20 minutes at a moderately fast pace without stopping

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Not at all confident				Moderately Confident					Highly Confident	

e. For 25 minutes at a moderately fast pace without stopping

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Not at all confident				Moderately Confident					Highly Confident	

f. For 30 minutes at a moderately fast pace without stopping

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Not at all confident				Moderately Confident					Highly Confident	

g. For 35 minutes at a moderately fast pace without stopping

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Not at all confident				Moderately Confident					Highly Confident	

h. For 40 minutes at a moderately fast pace without stopping										
0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Not at all confident				Moderately Confident						Highly Confident

35. NOW WE ARE GOING TO ASK SOME QUESTIONS ABOUT YOUR CONFIDENCE IN DOING PHYSICAL ACTIVITY, INCLUDING WALKING, BICYCLING, SWIMMING, ETC.

Please circle the response that indicates your how confident you are that you could perform physical activity for a total of 30 minutes 5 times a week for the next 3 months if….

a. The weather was very bad (hot, humid, rainy, cold)?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Not at all confident				Moderately Confident				Highly Confident		

b. You did not have energy?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Not at all confident				Moderately Confident				Highly Confident		

c. You did not have time?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Not at all confident				Moderately Confident				Highly Confident		

d. You felt lazy or unmotivated?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Not at all confident				Moderately Confident				Highly Confident		

e. You did not have a place to perform physical activity (like a recreation center)?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Not at all confident				Moderately Confident				Highly Confident		

f. You had pain or muscle soreness?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Not at all confident				Moderately Confident				Highly Confident		

g. You were not healthy?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Not at all confident				Moderately Confident				Highly Confident		

h. You did not have someone to perform physical activity with?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Not at all confident Moderately Confident Highly Confident

i. You did not have a regular routine?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Not at all confident Moderately Confident Highly Confident

j. You were bored by the program or activity?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Not at all confident Moderately Confident Highly Confident

k. You were under personal stress?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Not at all confident Moderately Confident Highly Confident

l. It was not convenient?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Not at all confident Moderately Confident Highly Confident

m. You had joint or muscle problems?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Not at all confident Moderately Confident Highly Confident

n. You did not have transportation?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Not at all confident Moderately Confident Highly Confident

o. You had to provide care for someone (spouse, friend, family member)?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Not at all confident Moderately Confident Highly Confident

p. You had problems with your balance?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Not at all confident Moderately Confident Highly Confident

The following items are designed to determine what types of activities you can do easily, which are more difficult, and which you cannot do successfully. Please indicate your level of confidence in doing the activity in question by circling the appropriate percentage. Circle the response that most closely matches your own, remembering that there are no right or wrong answers.

FOR EXAMPLE:
In question #1 if you have complete confidence that you could "successfully walk up a flight of stairs using a handrail", you would circle 100%. If, however, you had no confidence at all that you could "successfully walk up a flight of stairs using a handrail", you would circle 0%.

36. I BELIEVE THAT I CAN SUCCESSFULLY…

a. Walk up a flight of stairs using a handrail

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Not at all confident Moderately Confident Highly Confident

b. Walk down a flight of stairs using a handrail

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Not at all confident Moderately Confident Highly Confident

c. Walk up a flight of stairs without using a handrail

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Not at all confident Moderately Confident Highly Confident

d. Walk down a flight of stairs without using a handrail

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Not at all confident Moderately Confident Highly Confident

e. Walk over obstacles in my path (obstacles that are 8 inches or less in height)

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Not at all confident Moderately Confident Highly Confident

f. Step over an obstacle in my path without tripping or falling

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Not at all confident Moderately Confident Highly Confident

g. Step up on a curb

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Not at all confident Moderately Confident Highly Confident

h. Step down from a curb

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Not at all confident Moderately Confident Highly Confident

i. Walk outside on a broken or uneven sidewalk or walking surface

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Not at all confident Moderately Confident Highly Confident

Following are statements about good or bad things that could happen if you are physically active (walking, bicycling, swimming, etc.) for 30 MINUTES, 5 DAYS PER WEEK. State the degree to which you agree or disagree that:

37. PHYSICAL ACTIVITY FOR 30 MINUTES 5 DAYS PER WEEK WILL…(√ one)

	Strongly disagree	Disagree	Neither	Agree	Strongly agree
a. Improve my ability to perform daily activities					
b. Improve my overall body functioning					
c. Strengthen my bones					
d. Increase my muscle strength					
e. Aid in weight control					
f. Improve the functioning of my cardiovascular system					
g. Improve my social standing					
h. Make me more at ease with people					
i. Provide companionship					
j. Increase my acceptance by others					
k. Help manage stress					
l. Improve my mood					
m. Improve my psychological state					
n. Increase my mental alertness					
o. Give me a sense of personal accomplishment					

p. Cause me to fall or get injured					
q. Increase pain or muscle soreness					
r. Worsen a health condition					
s. Cause chest pain, shortness of breath or a heart attack					

38. These next questions are about how confident you are about your balance under certain circumstances, How confident are you that you will not lose your balance or become unsteady when you…Please circle your answer.

a. Walk around the house?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Not at all confident Moderately Confident Highly Confident

b. Walk up and down stairs inside your home?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Not at all confident Moderately Confident Highly Confident

c. Bend over and pick up a slipper from the front of a closet floor?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Not at all confident Moderately Confident Highly Confident

d. Reach for a small can off a shelf at eye level?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Not at all confident Moderately Confident Highly Confident

e. Stand on your tip toes and reach for something above your head?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Not at all confident Moderately Confident Highly Confident

f. Stand on a chair and reach for something?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Not at all confident Moderately Confident Highly Confident

g. Sweep the floor?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Not at all confident Moderately Confident Highly Confident

h. Walk outside the house to a car parked in the driveway?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Not at all confident Moderately Confident Highly Confident

i. Get into or out of a car?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Not at all confident Moderately Confident Highly Confident

j. Walk across a parking lot to the mall or other stores?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Not at all confident Moderately Confident Highly Confident

k. Walk up or down a ramp?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Not at all confident Moderately Confident Highly Confident

l. Walk in a crowded mall or store where people rapidly walk towards you and pass you by?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Not at all confident Moderately Confident Highly Confident

m. People bump into you as you walk, because it is crowded.

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Not at all confident Moderately Confident Highly Confident

n. Step onto or off of an escalator while holding onto a railing?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Not at all confident Moderately Confident Highly Confident

o. Step onto or off an escalator while holding onto parcels such that you cannot hold onto the railing?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Not at all confident Moderately Confident Highly Confident

p. Walk outside on icy sidewalks?

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Not at all confident Moderately Confident Highly Confident

We want to know how well you can take care of yourself and do things by yourself. These questions will ask about things that most people do or have done in the past. Mark the box under the phrase that <u>best</u> tells how you were able to do the described activity in the past month.

39. How much difficulty, if any, do you have with each of these activities? Think about <u>the past month</u>. How hard was it to do the activity <u>because of your health</u>?

a. Walking several blocks?

Usually did with no Difficulty	Usually did with a little difficulty	Usually did with some difficulty	Usually did with a lot of difficulty	Unable to Do	Usually did not do for other reason
☐	☐	☐	☐	☐	☐

b. Lifting heavy objects?

Usually did with no Difficulty	Usually did with a little difficulty	Usually did with some difficulty	Usually did with a lot of difficulty	Unable to Do	Usually did not do for other reason
☐	☐	☐	☐	☐	☐

c. Walking one block?

Usually did with no Difficulty	Usually did with a little difficulty	Usually did with some difficulty	Usually did with a lot of difficulty	Unable to Do	Usually did not do for other reason
☐	☐	☐	☐	☐	☐

d. Lifting or carrying something as heavy as 10 pounds, such as a bag of groceries?

Usually did with no Difficulty	Usually did with a little difficulty	Usually did with some difficulty	Usually did with a lot of difficulty	Unable to Do	Usually did not do for other reason
☐	☐	☐	☐	☐	☐

e. Getting in and out of a car?

Usually did with no Difficulty	Usually did with a little difficulty	Usually did with some difficulty	Usually did with a lot of difficulty	Unable to Do	Usually did not do for other reason
☐	☐	☐	☐	☐	☐

f. Climbing several flights of stairs?

Usually did with no Difficulty	Usually did with a little difficulty	Usually did with some difficulty	Usually did with a lot of difficulty	Unable to Do	Usually did not do for other reason
□	□	□	□	□	□

g. Doing errands, such as grocery shopping or shopping for personal items?

Usually did with no Difficulty	Usually did with a little difficulty	Usually did with some difficulty	Usually did with a lot of difficulty	Unable to Do	Usually did not do for other reason
□	□	□	□	□	□

h. Climbing one flight of stairs?

Usually did with no Difficulty	Usually did with a little difficulty	Usually did with some difficulty	Usually did with a lot of difficulty	Unable to Do	Usually did not do for other reason
□	□	□	□	□	□

i. Walking 1/2 mile?

Usually did with no Difficulty	Usually did with a little difficulty	Usually did with some difficulty	Usually did with a lot of difficulty	Unable to Do	Usually did not do for other reason
□	□	□	□	□	□

These questions are about how you get around your community (within 10 miles, or a 20 minute drive from home): to run errands, go to the doctor, go to a place of worship, visit friends or family; etc. Please check the box beside your answer.

40. Do you use the bus?

□ Often
□ Occasionally
□ Rarely
□ Never

41. How often do you ride as a passenger in a car?

□ Often
□ Occasionally
□ Rarely
□ Never

42. Of the transportation types listed below, which do you use? *(You may choose more than one answer)*

□ Driving your own car
□ Riding as a passenger in a car (not a taxi)
□ Retirement community transportation
□ Dial-a-ride or special senior van
□ Regular bus (with bus stops)
□ Taxi
□ Walking
□ Bicycle
□ Other (Please specify ________________________________)

43. Of the transportation types (listed below again), which do you use MOST often? *(Please choose only one answer)*

□ Driving your own car
□ Riding as a passenger in a car (not a taxi)
□ Retirement community transportation
□ Dial-a-ride or special senior van
□ Regular bus (with bus stops)
□ Taxi
□ Walking
□ Bicycle
□ Other (Please specify ________________________________)

44. How satisfied are you with your ability to get to the places you want to go in your community? Are you . . . (please circle your answer)

Very satisfied	Somewhat satisfied	Somewhat dissatisfied	Very dissatisfied

45a. Do you ever use equipment or devices such as a cane, walker or wheelchair when crossing a room?

□ YES □ NO

b. If YES, what equipment is that? (CHOOSE all that apply)

□ WALKER
□ CANE
□ WHEELCHAIR
□ OTHER (SPECIFY)________________________

46a. Do you ever use equipment or devices such as a cane, walker or wheelchair when walking outside your home?

□ YES □ NO

b. If YES, what equipment is that? (CHOOSE all that apply)

□ WALKER
□ CANE
□ WHEELCHAIR
□ OTHER (SPECIFY)_________________________

47. Have you fallen in the past 12 months? (either onto the ground or to some other level, such as a chair).

□ YES □ NO

76. What is your household income?

___ $14,999 or less per year
___ $15,000 to $39,999 per year
___ $40,000 to $59,999 per year
___ $60,000 or more per year

77. Did anyone help you fill out this questionnaire? ☐ NO ☐ YES

Thank You!

For completing our survey!

We would appreciate it if you could put it in the envelope addressed to me that was in your packet and mail it back to me. Thanks so much for participating in my dissertation study!

Appendix C

Reminder Postcard

One week ago I sent you a survey for you to complete if interested. If you have returned it, thank you! And if not, I hope you will consider helping me with the study! I do need the survey back by ________, so if you are interested and need another survey, please feel free to call or email me. Thanks again!

Nancy Gallagher (734-649-3689)nagalla@umich.edu

Appendix D

Table 3.1. Correspondence between study variables, measures, and survey items.

Study variable	Measure	Survey item number
Dependent variable		
Neighborhood walking	Neighborhood Physical Activity Questionnaire	1-7, 19-25
Independent variables		
Self-efficacy		
1)Self-efficacy for walking duration	1) Self-efficacy for Walking Scale	1) 34 (a-h)
2) Self-efficacy for PA Barriers	2) Self-efficacy for PA Barriers Scale	2) 35 (a-p)
3) Self-efficacy for neighborhood barriers	3) Self-efficacy for Neighborhood Barriers Scale	3) 8 (a-h)
4)Self-efficacy for gait	4) Gait Efficacy Scale	4) 36 (a-i)
5) Self-efficacy for balance	5) Activities-specific Balance Confidence Scale	5) 38 (a-p)
Outcome expectations	Multidimensional Outcome Expectations for Exercise Scale	37 (a-s)
Mobility limitations	Pepper Assessment Tool for Disability	39 (a-i)
Neighborhood environment	Neighborhood Environment Walkability Scale:	
	1) Density	9 (1-f)
	2) Destinations	10 (a-v)
	3) Access to Services	13 (a-h)
	4) Street Connectivity	14 (a-e)
	5) Places to Walk	15 (a-g)
	6) Neighborhood Surroundings	16 (a-i)
	7) Traffic Safety	17 (a-h)
	8) Crime Safety	18 (a-g)
	9) Comfort	16 (j-k)
Demographic characteristics (Age, sex, race and education)	Income Age, sex, race, education	76 database

Appendix E

Factor analysis of scale items: Factor loadings

Scale	Items	Factor Loadings		
		1	2	3
Self-efficacy for Walking Duration				
	Walking for 5 minutes	.79		
	Walking for 10 minutes	.90		
	Walking for 15 minutes	.96		
	Walking for 20 minutes	.97		
	Walking for 25 minutes	.98		
	Walking for 30 minutes	.97		
	Walking for 35 minutes	.95		
	Walking for 40 minutes	.92		
Self-efficacy for PA Barriers				
	Not enough energy	.86		
	Feeling lazy or unmotivated	.85		
	Inconvenient	.84		
	Under personal stress	.84		
	No routine	.81		
	Problems with joints	.81		
	Did not have time for PA	.79		
	Pain or muscle soreness	.79		
	No place to do PA	.77		
	Not healthy	.76		
	Weather was bad	.74		
	No transportation	.74		
	Have to provide care for someone	.72		
	No one to do PA with	.71		
	Problems with balance	.71		
Self-efficacy for Neighborhood Barriers				
	Inadequate lighting	.89		
	Inclement weather	.88		
	No sidewalks or poorly maintained	.72		
	Nowhere to walk		-.96	
	No attractive scenery		-.82	
	No place to rest or use bathroom		-.74	

	Unsafe from crime or loose dogs			.94
	Heavy traffic			.62
Activities-specific Balance Scale				
	Reach can at eye level	1.00		
	Walk to car in driveway	.99		
	Get into or out of car	.96		
	Walk up/down a ramp	.93		
	Walk around the house	.90		
	Walk across parking lot	.90		
	Sweep the floor	.88		
	Walk in crowded mall	.83		
	Bend over pick up slipper	.83		
	Walk up/down stairs at home	.76		
	When people bump you as walk	.71		
	Stand on toes and reach	.69		
	Use escalator holding rail	.66		
	Walk on icy sidewalk		.94	
	Use escalator without holding rail		.85	
	Stand on a chair		.68	
Gait Efficacy Scale				
	Step down from a curb	.91		
	Step up on a curb	.90		
	Walk on obstructed path	.89		
	Walk on uneven path	.89		
	Step over obstacle	.88		
	Walk up stairs without using rail	.85		
	Walk down stairs without using rail	.84		
	Walk down stairs using rail	.78		
	Walk up stairs using rail	.77		
Outcome Expectations				
	Muscle strength	.86		
	Improve daily activity	.83		
	Improve body function	.81		
	Improve cardiovascular system	.78		
	Strengthen bone	.75		
	Improve mood	.74		
	Help manage stress	.73		
	Improve psychological state	.73		
	Aid weight control	.72		
	Sense of personal accomplishment	.68		
	Increase mental alertness	.65		
	Worsen health condition[a]		.86	
	Increase pain or muscle soreness		.81	

	Cause chest pain, short breath, heart attack[a]		.79	
	Cause fall or injury[a]		.71	
	Increase acceptance			.92
	Make more at ease			.89
	Improve social standing			.83
	Provide companionship			.79
Mobility Limitations				
	Walk several blocks	.93		
	Walk ½ block	.88		
	Walk one block	.86		
	Climb one flight of stairs	.83		
	Do errands	.82		
	Lift 10 pounds	.81		
	Climb several flights of stairs	.77		
	Lift heavy load	.74		
	Get in or out of car	.69		
Neighborhood Density				
	Single family home	-.83		
	Townhouse 1-3 stories	.87		
	Apartment 1-3 stories	.77		
	Apartment 4-6 stories		.69	
	Apartment 7-12 stories		.82	
	Apartment 13 or more stories		.77	
Neighborhood Diversity				
	Fast food restaurant	.85		
	Restaurant	.85		
	Pharmacy	.83		
	Bank	.83		
	Hardware store	.72		
	Post office	.71		
	Supermarket	.71		
	Video store	.65		
	Fruit or vegetable market	.65		
	Laundromat	.65		
	Clothing store	.64		
	Barber shop or beauty salon	.61		
	Bookstore	.54		
	Library	.42		
	School		.73	
	Job		.65	
	Church		.61	
	Bus stop		.57	
	Recreation center		.41	
	Hospital or clinic		.35	
Neighborhood Design				

Access to Services				
	Stores within walking distance	.88		
	Many places within walking distance	.79		
	Can do most shopping at local stores	.79		
Neighborhood Streets				
	Distance between intersections short	.45		
	Many four-way intersections	.48		
	Many alternate walking routes	.40		
Neighborhood Sidewalks				
	Sidewalks are present	.90		
	Sidewalks are well-maintained	.92		
	Sidewalks kept clear of ice/snow	.86		
	Sidewalks kept clear of overgrowth	.92		
	Sidewalk separated from street	.85		
Neighborhood Surroundings				
	Many attractive buildings/homes	.81		
	Quiet and peaceful during day	.79		
	Many attractive natural sights	.79		
	Quiet and peaceful at night	.74		
	Many interesting things to look at	.64		
	Generally free from litter	.63		
Crime Safety				
	Unsafe to walk at night*	.86		
	High crime rate in my neighborhood*	.84		
	Unsafe to walk during day*	.79		
	Loose dogs make it a problem to walk*	.55		
	Walkers easily seen by others		.79	
	Streets are well-lit		.73	
	See and speak to others		.69	
Traffic Safety				
	Crosswalks are present	.92		
	Crosswalks help walkers feel safe	.91		
	Pedestrian signals give enough time	.88		
	Heavy traffic on my street		.92	
	Heavy traffic on nearby streets		.91	
	Traffic speed on my street			.88
	Traffic speed on nearby streets			.82
Comfort				
	Places to stop and rest	.83		
	Places to use the restroom	.83		

[a] Recode

Appendix F

Table 4.1. Characteristics of study participants (N=326)

Characteristic	*M* (*sd*) or frequency (%)
Age in years (n = 321)	76.1 (8.34)
60-69 years	79 (24.6)
70-79 years	117 (36.4)
80-89 years	111 (34.6)
90-99 years	15 (4.7)
Gender (n = 322)	
Male	106 (32.5)
Female	216 (66.3)
Marital status (n = 322)	
Single	17 (5.2)
Married	192 (58.9)
Divorced	37 (11.3)
Widowed	73 (22.4)
Separated/ Other	3 (0.9)
Ethnicity (n = 314)	
White	296 (90.8)
Black	9 (2.8)
Asian American	5 (1.5)
Other	4 (1.2)
Highest level of education achieved (n = 322)	
High school graduate	31 (9.5)
Trade/technical/business school or some college	77 (23.6)
Bachelor's degree	52 (16.0)
Some graduate work	26 (8.0)
Master's degree	92 (28.2)
PhD, MD, JD or other advanced degree	44 (13.5)
Annual household income (n = 287)	
$14,999 or less	14 (4.3)
$15,000 to $39,999	74 (22.7)
$40,000 to $59,999	74 (22.7)
$60,000 or more	125 (38.3)
Living arrangement (n = 322)	
House/apartment/condominium	304 (93.3)
Senior apartment/housing	17 (5.2)
Relative's home	1 (0.3)

Employment status (n = 322)	
Working full-time	29 (8.9)
Working part-time	40 (12.3)
Homemaker	13 (4.0)
Retired	204 (62.6)
Volunteer	35 (10.7)
Seeking employment/laid off, etc.	1 (0.3)
Use of assistive device outside the home	57 (17.5)
History of a fall within the last year	108 (33.1)
Walk in neighborhood any amount weekly	195 (59.82)

Appendix G

Table 4.2. Spread, Mean and Standard Deviation of Theoretical Variables

Variable	Range	Mean	SD
Neighborhood walking time in minutes (n = 326)	0-540	89.23	114.74
Self-efficacy total[a]	7.58-100	65.09	21.47
Self-efficacy walking duration (n=325)	0-100	57.33	36.85
Self-efficacy PA barriers (n=324)	0-100	40.89	26.33
Self-efficacy neighborhood barriers (n=322)	0-100	59.35	28.02
Self-efficacy gait (n=326)	2.22-100	83.59	22.93
Self-efficacy balance (n=326)	1.88-100	84.18	18.96
Outcome expectations (n=325)	1.16-5	3.89	.58
Mobility limitations (n=326)	1-4.67	1.67	.86
Neighborhood environment			
Density (n=326)	174-667	205.31	44.45
Diversity (n=326)	1-4.19	1.96	.64
Design (n = 325)	1-4	2,72	.54
Access to services	1-4	2.21	.95
Neighborhood Streets	1-4	2.62	.84
Neighborhood Sidewalks	1-4	2.86	1.06
Neighborhood Surroundings	1.50-4	3.42	.52
Crime Safety	1.71-4	3.39	.44
Pedestrian/Traffic Safety	1-4	2.88	.65
Comfort	1-4	1.65	.69

[a] Total Self-efficacy is the mean of all five self-efficacy scales listed.

Appendix H

Table 4.3. Spread, mean and standard deviation for each variable

Scale item (n = 326)	Range	Mean	SD
Self-efficacy for walking duration	0-100	57.33	36.85
5 minutes duration	0-100	80.06	32.59
10 minutes duration	0-100	71.91	37.09
15 minutes duration	0-100	64.54	39.62
20 minutes duration	0-100	57.49	41.46
25 minutes duration	0-100	51.61	41.56
30 minutes duration	0-100	48.54	41.64
35 minutes duration	0-100	44.07	40.85
40 minutes duration	0-100	40.60	40.76
Self-efficacy for PA barriers	0-100	40.89	26.33
Weather was bad	0-100	42.33	35.62
Not enough energy	0-100	37.97	31.23
Did not have time for PA	0-100	37.08	32.12
Feeling lazy or unmotivated	0-100	41.22	31.75
No place to do PA	0-100	46.79	37.38
Pain or muscle soreness	0-100	37.51	32.47
Not healthy	0-100	28.88	27.87
No one to do PA with	0-100	58.98	37.47
No routine	0-100	47.54	34.88
Under personal stress	0-100	47.23	34.16
Inconvenient	0-100	40.84	32.35
Problems with joints	0-100	35.66	32.13
No transportation	0-100	44.16	40.65
Have to provide care for someone	0-100	33.77	31.66
Problems with balance	0-100	33.13	32.51
Self-efficacy for neighborhood barriers	0-100	59.35	28.02
Nowhere to walk to	0-100	85.00	30.46
No attractive scenery	0-100	76.25	33.33
Unsafe from crime or loose dogs	0-100	37.86	38.82
Heavy traffic	0-100	53.63	37.48
No place to rest or use bathroom	0-100	74.11	34.77
No sidewalks or poorly maintained	0-100	58.38	37.51
Inclement weather	0-100	43.81	35.60
Inadequate lighting	0-100	44.97	37.05
Self-efficacy for balance	1.88-100	84.18	18.96
Walk around the house	0-100	91.35	18.48

Walk up/down stairs at home	0-100	87.54	22.16
Bend over and pick up a slipper	0-100	89.57	19.62
Reach can at eye level	0-100	93.47	16.81
Stand on toes and reach	0-100	85.25	24.53
Stand on a chair	0-100	69.91	33.75
Sweep the floor	0-100	92.18	18.66
Walk to car in driveway	0-100	94.45	15.69
Get in or out of car	0-100	92.98	16.09
Walk across parking lot	0-100	90.92	20.69
Walk up or down a ramp	0-100	89.75	20.19
Walk in crowded mall	0-100	87.73	23.16
When people bump you as walk	0-100	82.51	25.90
Use escalator holding rail	0-100	85.43	24.54
Use escalator without holding rail	0-100	66.59	32.44
Walk on icy sidewalks	0-100	47.32	32.89
Self-efficacy for gait	2.22-100	83.59	22.93
Walk up stairs using rail	0-100	94.14	18.29
Walk down stairs without using rail	0-100	94.45	17.46
Walk up stairs without using rail	0-100	74.52	33.59
Walk down stairs without using rail	0-100	71.38	35.37
Walk on obstructed path	0-100	80.61	26.95
Step over obstacle without tripping	0-100	79.72	30.07
Step up on curb	0-100	88.71	23.52
Step down from curb	0-100	88.21	24.68
Walk on broken/uneven sidewalk	0-100	80.52	28.65
Outcome expectations	1.16-5	3.89	.58
Improve ability to perform daily activities	1-5	4.37	.82
Improve body functioning	1-5	4.43	.78
Strengthen bones	1-5	4.34	.84
Increase muscle strength	1-5	4.42	.67
Aid weight control	1-5	4.31	.82
Improve cardiovascular system	1-5	4.52	.63
Cause fall or injury[a]	1-5	4.06	.97
Increase pain or muscle soreness[a]	1-5	3.43	1.19
Worsen health condition[a]	1-5	3.97	1.01
Cause chest pain, short breath, heart attack [a]	1-5	4.01	1.04
Improve mood	1-5	4.06	.88
Improve psychological state	1-5	4.02	.94
Increase mental alertness	1-5	4.08	.88
Sense of personal accomplishment	1-5	4.29	.82
Make more at ease	1-5	2.87	1.07
Provide companionship	1-5	3.05	1.05
Increase acceptance	1-5	2.76	1.02

Help manage stress	1-5	4.05	.95
Improve social standing	1-5	2.89	1.06
Mobility limitations	1-4.67	1.67	.86
Walk several blocks	1-5	1.75	1.29
Lift heavy load	1-5	2.39	1.28
Walk one block	1-5	1.43	.98
Lift or carry 10 pounds	1-5	1.55	1.03
Get in and out of car	1-4	1.33	.68
Climb several flights of stairs	1-5	2.05	1.23
Do errands	1-5	1.35	.79
Climb one flight of stairs	1-5	1.36	.77
Walk one-half mile	1-5	1.80	1.36
Neighborhood density (weighted score)	174-667	206.31	44.67
Single family homes	1-5	4.01	1.23
Townhouses 1-3 stories	1-5	1.71	1.04
Apartments 1-3 stories	1-5	2.16	1.23
Apartments 4-6 stories	1-5	1.16	.55
Apartments 7-12 stories	1-5	1.07	.38
Apartments 13 or more stories	1-5	1.02	.19
Neighborhood diversity	1-4.19	1.97	.66
Supermarket	1-5	1.92	1.09
Hardware store	1-5	1.63	.95
Fruit or vegetable market	1-5	1.69	1.01
Laundry or dry cleaner	1-5	1.98	1.20
Clothing store	1-5	1.40	.80
Post office	1-5	1.64	1.01
Library	1-5	1.55	.86
Book store	1-5	1.53	.92
Fast food restaurant	1-5	2.08	1.16
Bank/credit union	1-5	2.03	1.15
Restaurant	1-5	2.24	1.19
Video store	1-5	1.65	.98
Pharmacy or drug store	1-5	2.11	1.09
Barber shop or beauty salon	1-5	1.90	1.17
School	1-5	2.72	1.41
Bus stop	1-5	3.16	1.63
Recreation center or gym	1-5	1.59	1.00
Job or volunteer site	1-5	1.32	.76
Friend or family's house	1-5	3.47	1.68
Hospital or clinic	1-5	1.43	.92
Church	1-5	2.00	1.29
Neighborhood design	1-4	2,72	.54
Access to services	1-4	2.21	.95
Can do most shopping at local stores	1-4	2.28	1.23
Stores within easy walking distance	1-4	2.02	1.08

Many places to go within walking distance	1-4	2.33	1.16
Neighborhood streets	1-4	2.62	.84
Distance between intersections short	1-4	2.67	1.14
Many four-way intersections	1-4	2.41	1.11
Many alternate walking routes	1-4	2.76	1.11
Neighborhood sidewalks	1-4	2.86	1.06
Sidewalks are present	1-4	2.99	1.26
Sidewalks are well-maintained	1-4	2.89	1.21
Sidewalks kept clear of ice/snow	1-4	2.48	1.08
Sidewalks kept clear of overgrowth	1-4	2.98	1.16
Sidewalks separated from street	1-4	2.97	1.26
Neighborhood surroundings	1.5-4	3.42	.52
Many interesting things to look at	1-4	3.18	.84
Generally free from litter	1-4	3.63	.62
Many attractive natural sights	1-4	3.18	.82
Many attractive buildings/homes	1-4	3.36	.69
Quiet and peaceful during day	1-4	3.53	.69
Quiet and peaceful at night	1-4	3.62	.60
Crime safety	1.71-4	3.39	.44
Streets well lit	1-4	2.69	1.02
Walkers easily seen by others	1-4	3.16	.84
See and speak to others	1-4	3.13	.88
High crime rate in neighborhood[a]	1-4	3.79	.51
Unsafe to walk during day[a]	1-4	3.87	.46
Unsafe to walk at night [a]	1-4	3.49	.79
Loose dogs make it a problem[a]	1-4	3.59	.75
Traffic safety	1-4	2.88	.65
Heavy traffic on street[a]	1-4	3.39	.96
Heavy traffic on nearby streets[a]	1-4	3.26	.95
Traffic speed slow on my street	1-4	3.31	.97
Traffic speed slow on nearby streets	1-4	2.84	1.08
Crosswalks are present	1-4	2.46	1.21
Crosswalks help walkers feel safe	1-4	2.48	1.09
Pedestrian signals give enough time to cross street safely	1-4	2.41	1.22
Comfort	1-4	1.65	.69
Places to stop and rest	1-4	1.99	.97
Places to use restroom	1-4	1.31	.69

[a]reverse coded

Appendix I

Table 4.4. Decomposition table for path analysis

Outcome Variable	Predictor Variable	R^2	Effects		
			Direct	Indirect	Total
Neighborhood Walking	Demographics characteristics				
	Age	.04**	-.192**	-.375	-.567
	Sex	.00	.039	-.144	-.144
	Race	.00	.037	---	---
	Education	.00	-.001	.097	.097
	Self-efficacy	.19**	.432**	---	.432
	Outcome Expectations	.05**	.213**	---	.213
	Mobility Limitations	.11**	-.338**		-.338
	Neighborhood Environment				
	Density	.01	.106	---	---
	Diversity	.09**	.304**	.161	.465
	Design	.06*	.245*	.117	.362
Self-efficacy	Demographic characteristics				
	Age	.17**	-.408**	---	-.408
	Sex	.05**	-.224**	---	-.224
	Race	.00	.062	---	---
	Education	.02*	.126*	---	.126*
	Neighborhood environment				
	Density	00	-.057	---	---
	Diversity	.05**	.214**	---	.214
	Design	.02*	.140**	---	.140
Outcome expectations	Demographic characteristics				
	Age	.09**	-.298**	---	-.298
	Sex	.00	-.056	---	---
	Race	.00	-.041	---	---
	Education	.00	.058	---	---

	Neighborhood environment				
	Density	.00	.015	---	---
	Diversity	.01	.074	---	---
	Design	.01	.105	---	---
Mobility limitations	Demographic characteristics				
	Age	.16**	.402**	---	.407
	Sex	.14*	.138**	---	.141
	Race	.01	-.067	---	---
	Education	.02*	-.128	---	-.128
	Neighborhood environment				
	Density	.00	-.030	---	---
	Diversity	.04**	-.205**	---	-.205
	Design	.03**	-.169**	---	-.169

* p < .05; **p < .01
--- = not measured (indirect effects only measured for outcome variable)

Appendix J

Table 4.5. Pearson moment correlations between theoretical variables.

	Total Self-efficacy	Outcome expectations	Mobility limitations	Density	Diversity	Design	Neighborhood Walking (in minutes)
Total self-efficacy [a]	1.000	.422**	-.780**	-.057	.214**	.140*	.432**
Outcome expectations	.422**	1.000	-.420**	.015	.074	.105	.213**
Mobility limitations	-.780**	-.420**	1.000	.030	-.205**	-.269**	-.338**
Density	-.057	.015	.030	1.000	.108	.135*	.106
Diversity	.214**	.074	-.205**	.108	1.000	.507**	.304**
Design	.140*	.105	-.269**	.135*	.507**	1.000	.245**
Neighborhood walking (in minutes)	.432**	.213**	-.338**	.106	.304**	.245**	1.00

[a]Total self-efficacy is the mean of five scales: Self-efficacy for Walking, Self-efficacy for Neighborhood Barriers, Self-efficacy for PA Barriers, Gait Efficacy Scale, and Activities-specific Balance Scale.
* p <.05, ** p <.01.

Appendix K

Table 4.6. Pearson moment correlations of self-efficacy scales

	Self-efficacy Walking	Self-efficacy Neighborhood Barriers	Self-efficacy PA Barriers	Gait Efficacy	Activities-specific Balance
Self-efficacy Walking	1.000	.471**	.614**	.667**	.649**
Self-efficacy Neighborhood Barriers	.471**	1.000	.562**	.480**	.486**
Self-efficacy PA barriers	.614**	.562**	1.000	.460**	.450**
Gait Efficacy	.667**	.480**	.460**	1.000	.779**
Activities-specific Balance	.649**	.486**	.450**	.779**	1.000

* p <.05, ** p <.01
PA = physical activity

Appendix L

Table 4.7. Association of neighborhood walking with theoretical variables

Neighborhood walking	*r*	*β*	*R*	*R^2*
Step 1-				
Demographic characteristics				
Age	-.192**	-.188**		
Female gender	.039	.029		
Race	.037	.019		
Education	-.001	.001		
			.195	.038*
Step 2-				
Demographic characteristics				
Age	-.192**	-.054		
Female gender	.039	.075		
Race	.037	.019		
Education	-.001	-.029		
Mobility limitations	-.338**	-.330**		
			.354	.125**
Step 3-				
Demographic characteristics				
Age	-.192**	.021		
Female gender	.039	.139*		
Race	.037	.074		
Education	-.001-	-.035		
Mobility limitations	.338**	.030		
Outcome expectations	.213**	.038		
Self-efficacy	.432**	..489**		
			.462	.213**

Step 4-				
Demographic characteristics				
Age	-.192**	.038		
Female gender	.039	.154**		
Race	.037	.058		
Education	-.001-	-.051		
Mobility limitations	.338**	.057		
Outcome expectations	.213**	.041		
Self-efficacy	.432**	.466**		
Neighborhood environment				
Diversity	.304**	.188**		
Design	.245**	.101		
			.522	.273**
Step 5				
Demographic characteristics				
Age		.038		
Female gender		.153**		
Race		.056		
Education		-.050		
Mobility limitations		.126		
Outcome expectations		.041		
Self-efficacy		.462**		
Neighborhood environment				
Diversity		.235**		
Design		.098		
Neighborhood diversity X mobility limitations		-.081		
			.523	.274

* = *p* < .05; ** = *p* < .01

Appendix M

Table 4.8: Mediation by self-efficacy of the relationship between neighborhood diversity and neighborhood walking.

IV	DV	β	*R*	R^2
Step 1. Neighborhood environment	Neighborhood walking			
Diversity		.304**	.304	.06*
Step 2. Neighborhood environment	Self-efficacy			
Diversity		.214**	.214	.046**
Step 3. Self-efficacy	Neighborhood walking	.432**	.432	.186**
Step 4. Neighborhood environment with Self-efficacy added	Neighborhood walking			
Diversity		.222**	.484	.234**

* p = < .05, ** p = < .01

Table 4.9: Mediation by self-efficacy of the relationship between neighborhood design and neighborhood walking.

IV	DV	β	*R*	R^2
Step 1. Neighborhood environment	Neighborhood walking			
Design		.245*	.245	.092**
Step 2. Neighborhood environment	Self-efficacy			
Design		.140**	.140**	.020*
Step 3. Self-efficacy	Neighborhood walking	.432**	.432	.186**
Step 4. Neighborhood environment and Self-efficacy added	Neighborhood walking			
Design		.188**	.471	.222**

* p = < .05, ** p = < .01

Appendix N

Table 4.10. Relationship between self-efficacy type and neighborhood walking

Self-efficacy	*r*	*β*	*R*	R^2
Self-efficacy for walking duration	.390**	.186*		
Self-efficacy for PA barriers	.450**	.308**		
Self-efficacy for neighborhood barriers	.319**	.073		
Self-efficacy for gait	.272**	-.024		
Self-efficacy for balance	.270**	-.007	.476**	.226**

* = p < .05; ** = p < .01

Appendix O

Table 4.11. Relationship between neighborhood environment characteristics and neighborhood walking

	r	β	R	R^2
Neighborhood diversity	.304*	.272**		
Neighborhood design				
Access to services	.173**	-.023		
Neighborhood streets	.208**	.105		
Neighborhood sidewalks	.157**	-.041		
Neighborhood surroundings	.085	.037		
Traffic safety	.204**	.071		
Crime safety	.149**	.056		
Comfort	.064	-.021	.334	.119**

* = p < .05; ** = p < .01

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