VALIDATION OF THE ENVIRONMENTAL ANALYSIS OF MOBILITY

QUESTIONNAIRE (EAMQ): COMPARISON OF COMPLEX WALKING TASKS AND THE

EAMQ AMONG COMMUNITY DWELLING OLDER ADULTS

A Thesis Submitted to the College of

Graduate Studies and Research

In Partial Fulfillment of the Requirements

For the Degree of Master of Science

In the College of Kinesiology

University of Saskatchewan

Saskatoon

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Keywords: community mobility, older adults, environment

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ACKNOWLEDGMENTS

ABSTRACT

The primary objective of the study was to address two aspects of construct validity (i.e., face and criterion validity) of the Environmental Analysis of Mobility Questionnaire (EAMQ). The EAMQ is a self-report questionnaire, which consists of items that inquire about older adults tendencies to both encounter and avoid community mobility challenges that address several dimensions of community mobility. The EAMQ was compared to selected tasks from the Walking InCHIANTI Toolkit (WIT) and with a community mobility self-efficacy questionnaire (SE). Sixty independently living, community dwelling older adults (mean ± SD; age = 74 ± 5 years) volunteered to participate. Participation included a single visit by the researcher to the home of the participant. During the visit, demographic, health information, EAMQ, SE, and the modified WIT were completed. Regarding the first hypotheses, four of the six correlations between walking speed on the modified WIT and the EAMQ-encounter score were significant (range of significant correlations was 0.169 to 0.299; $p < 0.05$). By contrast, all of the correlations between walking speed on the modified WIT and EAMQ-avoidance score were significant (range of significant correlations was -0.330 to -0.410; $p < 0.05$. Regarding the second hypotheses, a significant positive correlation was found between SE and EAMQ-encounter ($r = 0.345$; $p < 0.01$) while a significant negative correlation was found between SE and EAMQ-avoidance ($r = -0.531$; $p < 0.01$). Furthermore, SE was significantly correlated with modified WIT performances (range of significant correlations was 0.332 to 0.578; $p < 0.01$). The secondary and exploratory purpose of this validation study was to determine if the EAMQ and SE both individually and additively contributed to the prediction of CWT performances. Results indicated that the EAMQ, significantly predicted walking speed on all modified WIT tasks; however, the avoidance score was the only significant predictor in the model. When SE was added to the prediction model it became the dominant and significant predictor of walking speed on most modified WIT tasks. As

walking task complexity increased SE accounted for more of the variability in walking speed than the

EAMQ. In conclusion, the results demonstrate partial support for the validity of the EAMQ. The

EAMQ-avoidance score appears to be a valid correlate of the modified WIT and could be used as one

predictor of community mobility. Recommendations are made for improvements to the EAMQ and

for further investigation of its validity.

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LIST OF ABBREVIATIONS

ADLs = Activities of Daily Living

BMI = Body Mass Index

BWT = Basic Walking Task

CWT = Complex Walking Tasks

EAMQ = Environmental Analysis of Mobility Questionnaire

FOF = Fear of Falling

IADLs = Instrumental Activities of Daily Living

MMSE = Mini Mental State Examination

SE = Self Efficacy

QOL = Quality of Life

WIT = Walking InCHIANTI Toolkit

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CHAPTER 1
INTRODUCTION

The population in Western society is aging at an unprecedented rate. In Canada, average life expectancy is increasing (Gilbert & Belanger, 2006; Statistics Canada, 2005). In 2002, the average life expectancy at birth in Canada was 79.7 years; 77.2 years for men and 82.1 years for women (Statistics Canada, 2005: see Appendix A for a comparison of previous Canadian life expectancies). The fastest growing age group in the United States are older adults aged 85^{+} years with the population in the "oldest-old" group expecting to triple by 2030 (Ory & Cox, 1994). With this increase in longevity, maintaining good health and quality of life (QOL) of older adults are major challenges for our health care system. Older adults with chronic disease prefer to maintain a higher quality of life than to simply live longer (Rejeski & Mihalko, 2001). The goal of the majority of people is to "add life to years, not just to add more years to life" (Rejeski & Mihalko, 2001, p.23). This adage parallels a revised definition of health that is not only the absence of infirmity and disease, but rather is a state of physical, mental, and social well being (Moinpour et al., 1989; Ware, 1987, World Health Organization, 2006).

Generally, the latter years of life are marked by declines in health, reduced mobility, depression, isolation, and loneliness (Rolls & Drewnowski, 1996). As people age, they may experience a decline in function that is due to biological senescence (Arking, 1998); for instance, aging is generally associated with a decrease in muscle mass (sarcopenia) and an increase in fat mass (Evans, 1995; Westerterp & Meijer, 2001). This reduction in muscle mass is directly associated with a decrease in upper and lower body strength, aerobic capacity, and bone mineral density (Evans, 1995; Candow & Chilibeck, 2005). Not surprisingly, then, aging

is frequently associated with a decline in physical function that leads to an eventual loss of autonomy in activities of daily living (ADL: Ferrucci, et al., 2000). This decline occurs over time in older adults and can shift from a functional limitation to disability during this time, as shown in Figure 1.

It is important to recognize the difference between functional limitation and physical disability. Nagi (1976) defines functional limitations as "limitations in performance at the level of the whole organism or person" (as cited in Guralnik & Ferrucci, 2003, p. 113). By comparison, disability is defined as a "limitation in performance of socially defined roles and tasks within a sociocultural and physical environment" (as cited in Guralnik & Ferrucci, 2003, p. 113). Nagi has also theorized the pathway from disease to disability as shown in Figure 1.

Pathology   ⟶   Impairment ⟶   Functional Limitation ⟶   Disability

| Disease, injury, congenital/ developmental condition | Dysfunction and structural abnormalities in specific body systems (musculoskeletal, cardiovascular, etc) | Restrictions in basic physical and mental actions (ambulate, reach, grasp, climb stairs, speak, see standard print) | Difficulty doing activities of daily life (personal care, household management, job, hobbies) |

Figure 1. Nagi's pathway of disease to disability (as cited in Guralnik & Ferrucci, 2003, p. 113)

Although differences exist between functional limitation and disability, they can still be difficult to classify, especially the differences between an impairment and functional limitation and between a functional limitation and a disability (Guralnik & Ferrucci, 2003). The differences between functional limitation and disability become even more difficult to distinguish when mobility is considered. However, one thing that clearly makes disability distinctive is that declines in mobility impact upon the social function and roles of the individual in their daily life (e.g. personal care, household management, job, hobbies). Thus,

this impact is classified as disability and this impact on social roles is clearly different than the idea of functional limitations where the impact is on basic tasks instead of on social functions.

One of the most immediate, noticeable factors that affect the independence of older adults is the loss of community mobility. Mobility deterioration is one of the first areas in which older adults experience physical disability, and it can predict the onset of disability in tasks essential to independent daily living (Shumway-Cook et al., 2003). Currently, there is no gold standard measure that can accurately estimate community mobility. One impact of this is the inability to determine the effectiveness of a given intervention on improvements on community mobility in older adults. It is difficult to diagnose limitations in mobility before disability ensues with anything other than a complex battery of tests. Thus, there is a need for a valid and reliable measure that can estimate or predict community mobility among older adults before further disability ensues (cf Shumway-Cook et al., 2005). Recently Shumway-Cook et al have developed the Environmental Analysis of Mobility Questionnaire (EAMQ) which is an easily administered tool that offers promising clinical assessment implications. To date, only a single validation study of the EAMQ has been conducted (Shumway-Cook et al., 2005). Therefore, the purpose of this study was to examine the validity of the EAMQ. Two approaches will be taken to accomplish this purpose. The first approach to validation will be accomplished by correlating EAMQ scores with older adults' performances on selected tasks from the well-established Walking InCHIANTI toolkit (i.e., correlating older adults' behavioural perceptions of approaching or avoiding aspects of the community environment with their performances on walking tasks). The second approach to validation will be accomplished by correlating EAMQ scores with and with a measure of IADL community task self-efficacy mobility beliefs (i.e., correlating older adults' behavioural perceptions of

approaching or avoiding aspects of the community environment with beliefs about their

confidence to perform meaningful community IADLs).

Study Objectives

The primary objective of the study was to address two aspects of construct validity (i.e.,

face and criterion validity).   Specifically, scores on the EAMQ will correlated with mobility

performance tests and both the approach and avoidance scores of the EAMQ will be used to

predict walking speed on various mobility tasks (i.e., criterion-related validity). For the

purposes of this study, mobility performance was operationally defined as performance on six

walking tasks of varying complexity drawn from those comprising the Walking InCHIANTI

Toolkit (WIT), a battery of complex walking tasks for which there is a substantial older adult

performance database. Thus participants in the current study will form a comparable sample.

The secondary objective of this study was to consider whether the perception of

community mobility challenges as operationalized by the approach-avoidance situations

presented through the EAMQ will be correlated with self-efficacy beliefs about performance

on IADL's (e.g. crossing an intersection at a light) that require community mobility. These

relationships will enable interpretation of the EAMQ from a face validity perspective.

CHAPTER 2
LITERATURE REVIEW

Mobility Disability in Older Adults

As we age, mobility is often one of the first areas in which older adults experience physical disability. This mobility disability can predict the onset of disability in tasks essential to independent daily living (Shumway-Cook et al., 2003). Mobility is critical to maintain independence in instrumental activities of daily living (IADLs) and subsequently in preserving social relationships and ensuring QOL (Shumway-Cook et al., 2003). IADLs represent activities such as shopping, transportation, and housekeeping that are necessary in order for individuals to adapt to their environment and function interdependently among others within their community (Spector, Katz, Murphy, & Fulton, 1987). In contrast, ADLs represent activities that are essential to individuals living independently such as bathing, dressing and undressing, transferring from a bed to a chair and back, voluntary urine and fecal discharge, using the toilet, and being able to walk (i.e., not bed ridden: McDowell & Newell, 1996).

Mobility disability is defined by the inability of individuals to move about effectively, independently, and safely in their surrounding environment (Fried, Bandeen-Roche, Chaves, Johnson, 2000; Shumway-Cook et al., 2005**)**. Patla and Shumway-Cook (1999) have illustrated a continuum ranging from mobility to mobility disability as illustrated in Figure 2 below.

| Normal-functional Ambulator | Household Ambulator | Limited Community Ambulator | Independent Community Ambulator |
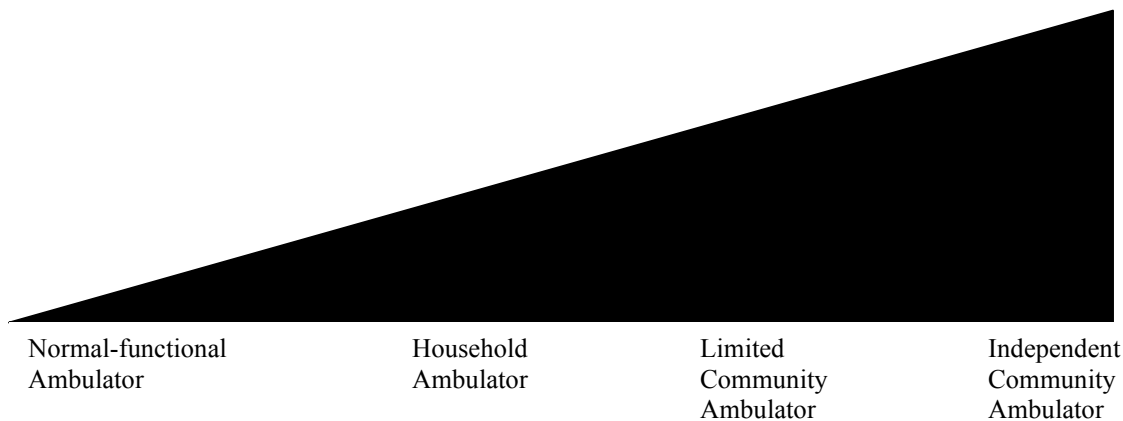
Figure 2. Graphic representation of a mobility continuum ranging from nonfunctional ambulator to independent community ambulator (Patla & Shumway-Cook, 1999)

Community mobility is a complex task learned over many years through experiences of walking in complex environments (i.e., those encountered in the range of experiences in daily life). These environments continuously challenge us to adapt our walking patterns to avoid obstacles, to change directions, carry loads, and plan a route to given destinations (Frank & Patla, 2003). A higher incidence of falls combined with lower levels of physical activity (i.e., the "practice" of walking and moving in complex environments) in the elderly is evidence that balance and mobility decline with age (Frank & Patla, 2003).

A reduction in mobility can also lead to a decrease in self-efficacy beliefs related to performance on IADLs and it has been suggested as a factor leading to falls. This is of particular concern as falling is the most common cause of injury-related death in people over the age of 75 years (Baker & Harvey, 1985). Many fallers decrease their daily activities because they fear falling again (Evitt & Quigley, 2004). While fear of falling has been studied from several perspectives, there is a close link between the confidence individuals have in their

beliefs about balance, postural control and mobility that appears to be related to performance in these domains of human functioning (Lorig et al., 1996).

The loss of confidence in individuals' ideas about their mobility may be a function of their beliefs about their inability to perform certain types of mobility tasks. Prominent experiences, such as experiencing a fall, can impact one's beliefs about their personal abilities to maintain balance. These beliefs are called self-efficacy beliefs (cf. Bandura, 1997). Self-efficacy beliefs concern individual abilities to "organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p. 3). Ashe, Eng, Miller and Soon (2007) state: "self-efficacy explores an individual's motivation to start and maintain healthy behaviors despite obvious setbacks" (Ashe, Eng, Miller, & Soon, 2007, p. 1144). In addition, information experienced vicariously through social comparison to people of similar age (cf. Bandura, 1997) is another determinant (i.e., source of information) of these beliefs. For example, older adults may socially compare themselves to others their age who have experienced a fall. If the fall had consequences such as serious injury and medical complication or poor mobility requiring a walking aid, older adults could conclude that they are also at risk and lose confidence in their ability to be mobile or avoid falling. However, reduction of mobility and corresponding loss in self-efficacy beliefs in older adults does not necessarily reflect the degradation of actual mobility performance.

Community Mobility: A Simple or Complex Task?

Most people assume that walking is a relatively simple task – we walk every day. However, a review by Frank and Patla (2003) clearly illustrates quite the opposite conclusion. They conclude that that mobility is complex and they describe walking as "a state of controlled falling in which we are always one step away from disaster" (Frank & Patla, 2003, p. 157). Consider the following quote from their review:

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"(1) when walking, two thirds of the body mass is balanced over the moving lower limbs… (2) the body's centre of mass travels outside the base of support for 80% of each stride… (3) the acceleration and braking forces of each step continually challenge trunk stability… [and] (4) the toe clears the ground by no more than 2.5 cm as the swing limb begins to move forward and drops to < 1cm during mid-swing" (Frank & Patla, 2003, p.157-158).

Thus, walking is a complex task.   When environmental challenges, such as those we constantly face in the community are added to the task its degree of complexity further increases. Walking is a central aspect of IADL's that involve community mobility such as visits to the doctor, shopping, or crossing an intersection before traffic lights change.

Measuring Mobility

The optimal exercise program for preserving community mobility and reducing falls has not yet been determined (Carter, Kannus, & Khan, 2001; Daley & Spinks, 2000; Frank & Patla, 2003). This lack of consensus may partially be due to a lack of a valid measure. Most exercise interventions have used outcome measures of standing balance and simple walking tests completed over unchallenging terrain in static environmental conditions to determine intervention effectiveness (Frank & Patla, 2003). Generally, balance tests are performed while standing in a fixed position and mobility tests are often performed over level ground in well-lit conditions (Frank & Patla, 2003). Neither of these examples reflects the challenges of mobility in more complex environments (i.e. crossing a busy street, stepping on to a curb, or shopping in a busy store). There appears to be an assumption on the part of researchers and clinicians that improvements on simple walking tests and standing balance tests will translate to improved community mobility and a reduction in falls (Frank & Patla, 2003); however, the data does not verify this assumption. For example, better standing balance performance does

not necessarily correlate with greater ability to avoid falling when tripped (Owings, Pavol, Foley, & Grabiner, 2000), and there is little information available on its relationship with community mobility (Frank & Patla 2003). "Successful mobility is dependent on (1) the skills and the abilities of the performer; (2) requirements of the task (activity); (3) challenges of the environment. Mobility disability emerges from the interaction of these three factors" (Frank & Patla, 2003, p. 158). The challenge for researchers interested in developing measures of community mobility that are valid and reliable is to move beyond the previously mentioned assumptions and utilize measures that better reflect the dimensions of community mobility. A brief review of some past research may be informative. The following research examples illustrate the investigation of (a) mobility tasks of greater complexity, and (b) clinical approaches that use the participant as an active agent in expressing the areas of difficulty they have in regard to their community mobility.

Re-thinking community mobility. Before mobility can be fully understood, it is important to consider *where mobility occurs*. It has become apparent that it is important to understand the relationship between the environment and mobility in the prevention and rehabilitation of mobility disability in older adults (Shumway-Cook et al., 2002).

Patla and Shumway-Cook (1999) developed a new conceptual framework for understanding community mobility. Their approach recognizes that community mobility involves numerous variables such as starting and stopping, changing direction and speed, walking on compliant surfaces with different geometric and physical properties, obstacle avoidance, and simultaneous execution of other tasks, such as talking, turning to look at something, or carrying an object. It is also important to consider that mobility may be carried out under different ambient conditions, adding to its level of complexity. To fully consider all

aspects of community mobility, Patla and Shumway-Cook (1999) identified eight components, or dimensions, of the physical environment that affect mobility. These dimensions are: distance, temporal factors, ambient conditions, physical load, terrain characteristics, attentional demands, postural transitions, and traffic density.

In an attempt to measure mobility under more complex "real world" conditions, Ferrucci et al (2000) developed a series of complex walking tasks (CWTs). Complex walking tasks involve adapting to changes in task and environmental demands; this requires physiological resources beyond those needed for walking under less-difficult conditions and reflects mobility that occurs in home and community environments (Frank & Patla, 2003; Patla & Shumway-Cook, 1999; Patla 2001).

There are two lines of research that are directly relevant to the present investigation. The first research focus concerns mobility tasks and the second concerns tools that allow older adults to identify where their perception of difficulty lies with respect to community mobility (approach and avoidances). Each of these lines of research will be briefly discussed in turn.

Mobility tasks. The InCHIANTI study launched by Ferrucci et al. (2000) was an epidemiological investigation that examined risk factors for mobility disability in old age. The purpose of the InCHIANTI study was to use complex walking tasks (CWTs) to evaluate mobility in a large sample of community-living older adults and to characterize age and sex specific performance on these tests. A large representative sample of people living in Bagno a Ripoli and Greve located in the Chianti region of Tuscany, Italy was used. Data was collected between September 1998 and March 2000 (Ferrucci et al., 2000). One thousand, two hundred twenty seven participants completed the baseline 7-m walk test. All participants were between the ages of 20 and 102 years (< 65 years, n = 227; 65 – 74 years, n = 553, 75 – 84 years, n =

295; ≥ 85 years, n = 103), with the majority of participants over the age of 65 years. Comparisons were made between age categories in order to evaluate changes in mobility with age (Shumway-Cook et al., 2007).

One of the purposes of the InCHIANTI study was to identify a finite number of impairments that are critical to walking and can be realistically measured in a geriatric setting (Ferrucci et al., 2000). The measure used to evaluate mobility in the study was the Walking InCHIANTI Toolkit (WIT). The conceptual basis for the WIT was based on person-environment interactions of mobility disability, which suggest that environmental factors mediate the relationship between functional limitations related to walking and the development of mobility disability (Shumway-Cook et al., 2007). The tasks used in the WIT were designed to measure walking performance in the face of physical challenges that can often be encountered when walking in a community environment, such as walking while performing a secondary cognitive task (such as carrying on a conversation), carrying a package, or stepping over one or more obstacles (Patla & Shumway-Cook, 1999; Shumway-Cook et al., 2007; Shumway-Cook et al., 2002; Shumway-Cook et al., 2003). The InCHIANTI toolkit also challenged walking by asking the participants to perform tasks at fast paces and over longer distances than other measures (Ferrucci et al., 2000).

The Walking InCHIANTI Toolkit tasks were designed to elicit the degree of impairment in each of the six physiological subsystems involved in mobility (central nervous system, peripheral nervous system, perceptual system, muscles, bones and joints, and energy production and delivery). For example, the walking tasks that first involved overcoming obstacles with normal illumination and second, involved the same performance in a semi-dark

environment would have a higher level of difficulty for someone with even negligible neurological impairments and visual deficits (e.g., contrast sensitivity, Ferrucci et al., 2000).

Since the inception of the InCHIANTI study and the initial assessments in 1998 and 2000, there have been several additional publications. One of the more recent by Shumway-Cook et al. (2007) addressed CWT performance by individuals in the multiple age ranges examined in the study. Fourteen walking tests were used to evaluate mobility ranging from traditional baseline walking tests (4m and 7m) to walking tests under different lighting conditions, walking while carrying a package (obstructed view of the feet), to walking with a weighted vest which increased the participants body weight by 25%. These tests were performed at either a normal speed or a fast speed. The order of task completion was done in increasing complexity/difficulty and participants were not able to proceed to the next CWT if they were unsuccessful at the previous one (adequate rest was incorporated between tasks). Results of this study showed that as individuals' age, their ability to adapt gait speed to changing environmental conditions decreases. Shumway-Cook and colleagues (2007) also recognized there is most likely overlap of the skills being tested across the tasks. Based on this observation, they recommended future research to reduce the "redundancy through evaluating the independent predictive value of each walking task to identify the minimal necessary constellation of tasks that should be incorporated into measures of mobility" (Shumway-Cook et al., 2007, p.64). One of the research limitations they identified included the inability of several participants to perform the last two tests (400m fast pace walk and 60m fast pace heavy jacket walk, respectively). Shumway-Cook et al (2007) argued that the inability of some participants to perform these tests may have been a function of fatigue rather than task difficulty.

Perceptions of mobility difficulty. The second line of research concerns older adults'

perceptions of factors related to mobility difficulty. These perceptions concern behavioural

events and beliefs in personal skills and abilities related to mobility. Preliminary research

directly relevant to the purpose of this thesis involves the observation and documentation of the

performance of IADL community mobility trips among older adults in the community. From

the initial work by Patla and colleagues (Shumway-Cook et al., 2005) who videotaped the

performances and noted the ease or difficulty of mobility for older adults, Shumway-Cook and

colleagues (2005) developed the Environmental Analysis of Mobility Questionnaire (EAMQ).

The EAMQ consists of items that inquire about older adults' tendencies to both encounter and

avoid community mobility challenges that concern the distance, temporal, terrain, posture,

physical load, and density dimensions of community mobility. This self-report questionnaire

was designed to assess older adults' environmentally-determined mobility disability. It has

been validated against direct observations in 54 older adults (>70 years of age: Shumway-

Cook, 2005). The EAMQ encounter and avoidance scores were shown to have high one-week

test-retest reliability in each of the eight dimensions, with an intraclass correlation coefficient

ranging from 0.81 (encounter in the ambient dimension) to 1.0 (encounter in the distance

dimension). Observed mobility was significantly positively correlated with the EAMQ-

encounter scores ($r = 0.66$) and significantly inversely correlated with the EAMQ-avoidance ($r = -0.58$). The EAMQ-encounter and avoidance scores were moderately correlated with

observed mobility in the distance, temporal, terrain, posture, physical load, and density

dimensions of community mobility, but not in the attention and ambient dimensions.

Shumway-Cook et al., (2005) concluded that self reported frequency of encounter and

avoidance of specific environmental features appears to be a valid method for determining

environmentally-specific mobility disability. This is the only study to validate the EAMQ, using tasks known to reflect a greater range in the complexity of community mobility. Thus, further studies are needed to address the validity of this questionnaire, specifically studies that address face and construct validity.

The second aspect of research about perceptions of behavioural outcomes related to community mobility concerns the concept of fear of falling among older adults. Fear of falling (FOF) is considered to be the most commonly reported fear among elderly adults (Howland et al., 1993). Many fallers perceive falls as being unpredictable and unpreventable (Kong, Lee, Mackenzie, & Lee, 2002). Fear of falling causes significant amounts of psychological distress among older people, especially in those who have suffered falls that resulted in serious injuries (Kong, Lee, Mackenzie, & Lee, 2002). Several studies based on community-living independent elders have estimated between 25% and 55% of this population lives with FOF (Huang, 2004). It is estimated that between 12% and 65% of community-dwelling elders experience FOF but have not in fact fallen (Legters, 2002). In the past, FOF was believed to be a consequence of having experienced a fall (Bhala, O'Donnell, & Thoppil, 1982; Kong, Lee, Mackenzie, & Lee, 2002; Lachman, Howland, Tennstedt, Jette, Assmann, & Peterson, 1998; Huang, 2004), but more recent studies have revealed that FOF also exists in those who have not yet experienced a fall (Cumming, Salkeld, Thomas, & Szonyi, 2000; Legters, 2002; Yardley, & Smith, 2002). FOF can range from a healthy concern about avoiding environmental risks to disabling anxiety that can lead to avoidance of daily activities that the individual is capable of performing (Evitt & Quigley, 2004). In fact, 13-35% of community dwelling elders who fear falling avoid activities of daily living due to a fear of falling (Evitt & Quigley, 2004). Fear of falling can result in a downward spiral of physical dysfunction

because of the avoidance of activities that keep the balance and posture system ready to respond to the adaptations required in normal community mobility. Consequently, this practice of avoiding daily activities can lead to loss of strength, isolation, depression, decrease quality of life, and increase risk of falling (Evitt & Quigley, 2004; Huang, 2004).

The third, type of perception concerns self-efficacy beliefs about skills and abilities to perform community mobility tasks. Self-efficacy beliefs may be related to approach-avoidance behavior in community mobility because individuals who either approach or avoid tasks in their environment may vary in their confidence to execute these skills. As mentioned previously, self-efficacy beliefs concern individual abilities to "organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p.3). This construct has been extensively investigated in multiple domains (i.e., hundreds of studies) including health-related research (Ashe et al., 2007; Bandura, 1997). Bandura (1997) suggests that individuals' beliefs should be related to the extent of mastery they have over their environment. For example, Ashe et al. (2007) conducted a cross-sectional study to examine the relationship between physical capacity (physiological potential) and physical activity participation (recorded engagement in physical activity using both pedometers and questionnaires). Their results showed significantly lower self-efficacy in the group of community-dwelling participants who had the capacity to engage in physical activity but did not meet the recommended activity level of 1000 kcal•wk^{-1} to be considered active (Ashe et al., 2007; Paterson, Jones, & Rice, 2007).

In the related area of posture and balance mobility, SE has been previously related to people's ability to adjust their balance in both standing and while walking (Cromwell, Meyers, Meyers & Newton, 2007). A recent study by Carpenter, Adkin, Brawley and Frank (2006)

provide an example of the relationship between self-efficacy beliefs and variables related to posture and balance. Carpenter et al. (2006) examined forceplate measures of standing balance, measures of state anxiety, blood pressure and task-specific balance and coping efficacy during quiet standing at varying heights (40, 70, 100, 130 and 160 cm) in both young (24.6 ± 2.8 years) and older (69.4 ± 7.3 years) adults. Their results showed older adults use the same stiffening strategies as younger adults when standing upon a high surface. Also, both groups reported elevated levels of anxiety and lowered confidence associated with standing on a high surface. This study provides further evidence that physiological status, state anxiety and self-efficacy are correlated with postural control changes in older adults.

Correlating mobility efficacy beliefs with individuals' perceived approach, avoidances (as determined by the EAMQ) and with performance on the CWTs may give further insight into the nature of the relationships between other related community mobility measures and the EAMQ. From a validity perspective, the following questions may be considered in relation to the EAMQ: Is the EAMQ related to performance on selected CWTs? Can the addition of SE to the EAMQ increase the prediction of performance on tasks requiring features of community mobility?

In considering the above literature review, the primary objective of the current study was to address two aspects of construct validity (face and criterion validity) of the EAMQ by determining if scores on the EAMQ are correlated with mobility performance tests. The secondary objective of the present study was to consider whether the perception of community mobility challenges, as operationalized by the approach-avoidance situations presented through the EAMQ, were correlated with self-efficacy beliefs about performance on IADL's (e.g. crossing an intersection at a light) that require community mobility. In other words, is SE

related to the frequency in which older adults approach or avoid certain situations? If the

answer to this question is yes, then a related question would be whether SE is also related to

performance on CWTs? Confidence in overcoming community mobility challenges should

also be related to the performance of tasks that reflect these challenges.

CHAPTER 3
THE CURRENT STUDY

Insomuch as there is currently no gold standard available to measure community mobility, validating a potentially useful measure of community mobility is an appropriate starting point. Validity is concerned with the appropriateness of a given test in measuring what it is designed to measure (Vincent, 2005). Cronbach and Meehl (1955) have divided validity studies into four categories: predictive validity, concurrent validity, content validity, and construct validity. The first two categories (predictive and concurrent) may be considered together as criterion-oriented validity (Cronbach & Meehl, 1955). Predictive validity is concerned with the extent to which a score and a scale or test can predict scores on some criterion measure (Cronbach & Meehl, 1955). One method of examining construct validity is through comparison of similar constructs that are measured differently (e.g. comparing a mobility questionnaire with a performance measure of mobility) and through examining different constructs that are measured similarly (e.g. comparing two questionnaires that measure distinct, but related constructs such as comparing self-efficacy belief to an individual's perceptions of their behaviour in the community environment).

There is evidence to support the interpretation of the EAMQ as a measure of an individual's approach and avoidances, but it has not yet been validated for its relationship to estimates of mobility (John & Benet-Martinez, 2000). Validity can be thought of as a process that continues over years and that is constantly evolving to form a continuously changing nomological network (Wiggins, 1973 in John & Benet-Martinez, 2000). Validation is a long

and time-consuming process that is part of a program of research in which a measure is used. No single study establishes all aspects of validity.

If relationships between performance on various CWTs, EAMQ scores and self-efficacy scores can be established, it would provide preliminary support for the validity of the EAMQ. These measures should be related, but in order to have validity and be of practical use they need to be distinct constructs that reflect the interaction of a person with their environment.

Thus, there is a need to establish the criterion-related validity of the EAMQ relative to these related but distinct measures of complex walking and self-efficacy for mobility. Criterion-related validity is the ability to demonstrate the accuracy of a measure by correlating it with another measure that has already been demonstrated to be valid (Kerlinger, 1986). It would be ideal to compare the EAMQ to the already established Walking InCHIANTI Tookit. However, taking into consideration the overlapping skills being tested on several walking tasks as well as the subject burden of time and fatigue, a modified Walking InCHIANTI Toolkit using a subset of the original 14 walking tasks was used in the present study. In this study, criterion-related validity will be investigated by examining how well each of (a) the EAMQ and (b) self-efficacy relate to prediction of walking speed for selected tasks in a modified Walking InCHIANTI Toolkit.

Other types of validity that are considered important components of construct validity and the validation process include external validity and face validity. External validity is the ability to generalize the results of a study to the population from which the samples were drawn (Vincent, 2005). Thus the sample used in the current validation study should be representative of the population the EAMQ is designed to test (i.e., older adults from a similar age range).

Face validity is concerned with theoretical considerations about the appropriateness of the EAMQ items and whether they assess behaviors that are relevant to the construct (John & Benet-Martinez, 2000). For example, are the items on the EAMQ representative of approaching or avoiding different challenges to community mobility?

As noted previously, the main focus of the current validation study will be the examination of the EAMQ's relationship to other measures. For example, positive correlations between the approach score on the EAMQ, and (a) fast performance on the CWTs, and (b) high self-efficacy might be expected in older adults who are functioning well (e.g. an older adult who has had successful experiences walking in the community will feel confident in his or her ability to walk in similar situations in the future). Conversely, it would be expected that negative correlations would occur between the avoidance scores on the EAMQ and participants' (a) faster walking speeds on the CWTs and (b) higher self-efficacy for community IADL scores.

Collectively, face and criterion validity contribute to construct validity. Construct validity is concerned with evidence that a measure is accurately assessing the construct it was designed to measure. In summary, validating a measurement tool involves interpreting several relationships between both similarly measured and differently measured constructs concerning mobility. The EAMQ is a relatively new tool for measuring perceptions of community mobility. Past research by Shumway-Cook et al. (2005) has started the journey by establishing the relationships between approach and avoidance scores within the EAMQ and direct observation of behavior (i.e., videotaped excursions of community mobility by older adults). However, there is still a need to examine the EAMQ with respect to its relationships to other mobility-related constructs in order to clarify the EAMQ's unique status as a measure.

Study Hypotheses

There were two hypotheses with sub-hypotheses for the current study:

1. It was predicted that scores obtained from the EAMQs would be correlated with performance (speed in m/sec) on various walking tasks.

Specifically,

    1a)   There would be a direct positive relationship between performance on the CWTs and the encounter score on the EAMQ.

    1b)   There would be an inverse relationship between performance on the CWTs and the avoidance score on the EAMQ.

These hypotheses were tentative because they were based on the only behavioral data obtained in conjunction with the EAMQ, specifically, past video-observational data of behavior in every day excursions of older adults in the community (Shumway-Cook et al., 2005). CWTs are more structured tasks that may be related to community mobility and thus what older adults approach and avoid.

2. It was predicted that the relationship between self-efficacy and the EAMQ would be as follows:

    2a)   Higher self-efficacy would be positively correlated with higher encounter scores on the EAMQ.

    2b)   High self-efficacy would be inversely correlated with the avoidance score on the EAMQ.

    2c)   High self-efficacy would be inversely correlated with performance on CWT's (i.e., higher efficacy scores should be correlated with faster CWT speeds [lower scores]).

Secondary Exploratory Questions

An exploratory purpose of this study was to examine (a) the ability of the two scales of the EAMQ to predict complex walking task performance and (b) to determine if self-efficacy further increased any explained variance in the prediction of complex walking task performance. Although self-efficacy and the EAMQ may seem like similar constructs, they are in fact, quite different. Self-efficacy is a belief about functional skills and abilities to complete actions (Bandura, 1997) whereas the EAMQ is a construct that measures the frequency of individual behaviours (such as approaching or avoiding a discrete community mobility task) that should be performed, in part, as a function of their beliefs in their abilities. While related, these constructs differ and it is conceivable that both variables could be used in the prediction of CWT performance. To consider these ideas, four secondary exploratory questions were examined. The first two hypotheses concerned criterion-related validity while the second two hypotheses concerned differences between walking task performances. These questions are as follows:

a) Do the EAMQ avoidance and EAMQ encounter scores predict performance on modified WIT walking tasks?

b) Does the addition of SE to the EAMQ's prediction of walking task performance increase the prediction of performance?

c) Does performance (speed in m/sec) on basic walking tasks (BWT) performed at normal speeds differ from complex walking tasks performed at normal speeds?

d) Does performance (speed in m/sec) on BWT performed at fast speeds differ from complex walking tasks performed at fast speeds?

For all walking tasks both basic (BWT) and complex (CWT), the tasks following numerical order and their description is shown in Table 1 below:

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Table 1. Walking Tasks 1-6 in the Modified WIT

Basic Walking Task #1 (BWT#1)

Basic Walking Task #2 (BWT#2)

Complex Walking Task#3 (CWT#3)

Complex Walking Task#4 (CWT#4)

Complex Walking Task#5 (CWT#5)

Complex Walking Task#6 (CWT#6)

CHAPTER 4
METHODS

Participants and Study Design

The design of the study was concurrent, observational. A total of 60 participants were recruited from older adults living independently in the municipality of Saskatoon. Recruitment was accomplished via poster solicitation (posted in the Royal University Hospital and at the University of Saskatchewan) and by word of mouth. Of the 60 participants, 23.3% (n=14) were male and 76.7% (n=46) were female. The participants' ages ranged from 64 to 86 (mean age = 74±5 years). Other demographic and biometric characteristics of the sample are reported in the results.

Inclusion and Exclusion Criteria

For the safety of the participants and the potential ability of participants to be involved in all aspects of the project, inclusion criteria were required. For inclusion in the study all participants met the following criteria:

1. Showed no clearly limiting functional or mobility problems that could compromise involvement in the balance challenging walking task. For example all participants were able to:

   a) Maintain balance with feet together for 10 seconds

   b) Transfer without help

   c) Walk without assistance for 8 meters

2. Showed no evidence of any major psychological illness.

3. We not under active treatment for any mobility and balance compromising chronic disease(s).

4. Had no vision problems that clearly limited mobility and could compromise participation.

Many seniors have comorbidities (i.e., a given individual might have cardiovascular disease, mobility-limiting arthritis, and early signs of cognitive dysfunction), thus, exclusion criteria also needed to be considered.

Exclusion criteria included:

1. Evidence of a documented cardiovascular problem that contraindicated participation.

2. Being unable to meet inclusion criteria.

3. A score on Folstein, Folstein and McHugh's (1975) mini-mental inventory of lower than 21 (22 or greater was used as a recommended score for inclusion).

4. Continuous use of an assistive mobility device (e.g., solely dependent upon wheelchair, wheeled walker).

5. Test specific criteria for excluding participants from the 400m fast walk:

    - Severe dyspnea at rest or with minimal effort

    - Recent history (<3 months) of myocardial infarction, angina

      pectoralis, heart surgery, hip or knee surgery, loss of consciousness

Any of the above listed conditions (1-5) would be contraindicated for participation in the study.

Measures

Demographics. Age, height, weight, highest level of education completed, current physical activity level (frequency), and self-rated mobility was obtained.   As well, participants were given a list of various medical conditions and asked to indicate all of the conditions that applied (e.g. diabetes, hypertension).

Physical Performance and Mobility Measures. When addressing validity of EAMQ as an indicator of community mobility contexts in which older adults will/will not engage, it is important to know whether the community mobility tasks against which the measure is being validated, are reasonable indicators of community mobility. Specifically, in order to be representative of the complexity of community mobility, mobility tasks should reflect different levels of challenge to which older adults must adapt. For the validation purposes of this study, do the walking tasks selected reflect community mobility? A total of six walking tasks were selected from the Walking InCHIANTI Toolkit (WIT). The original WIT includes 14 unique walking tasks. For the present study, the selected walking task test procedures were replicated as closely as possible so that the data would be comparable to that of the performances in the InCHIANTI study. The walking tasks were also selected in an attempt to capture as many of the eight dimensions of mobility outlined by Patla and Shumway-Cook, (1999) as possible. In addition, the EAMQ questions were reviewed for relevance to CWT selection.

In considering the number of tests from the WIT and the suggestions made by Shumway-Cook et al (2007), a conscious decision was made to modify the WIT. The following criteria were followed to achieve this purpose. To represent the complexity ranging from more basic to more complex walking performance, walking tasks were selected in an attempt to avoid redundancy (e.g. two tests measuring the same thing). In order to reduce subject burden, the amount of time to complete each task was considered. For example, if we estimate the amount of time to set-up and explain each walking task, demonstrate the task and then allow the participant to complete the task, this methodology takes approximately 3 minutes per task. If 6 walking tasks are used and rest (2 minutes is recommended between tasks) the amount of time required to complete only the walking portion of the study is

approximately 30 minutes (5 minutes per task (includes rest) x 6 tasks). Thus, participants are

committed to approximately 30 minutes of performance tests in addition to the completion of

consent, demographic information and other questionnaires that participation in the study

involves.

To illustrate the process of task selection and to represent the range in complexity

characteristics of the WIT, the eight dimensions of mobility were considered in relationship to

each of the WIT tasks. For example, the 7m usual pace walk only contains one dimension of

community mobility (i.e. distance) whereas a more complex task such as the 7m fast pace walk

over two obstacles with sunglasses evaluates several dimensions. This is illustrated in Figure 3

below.
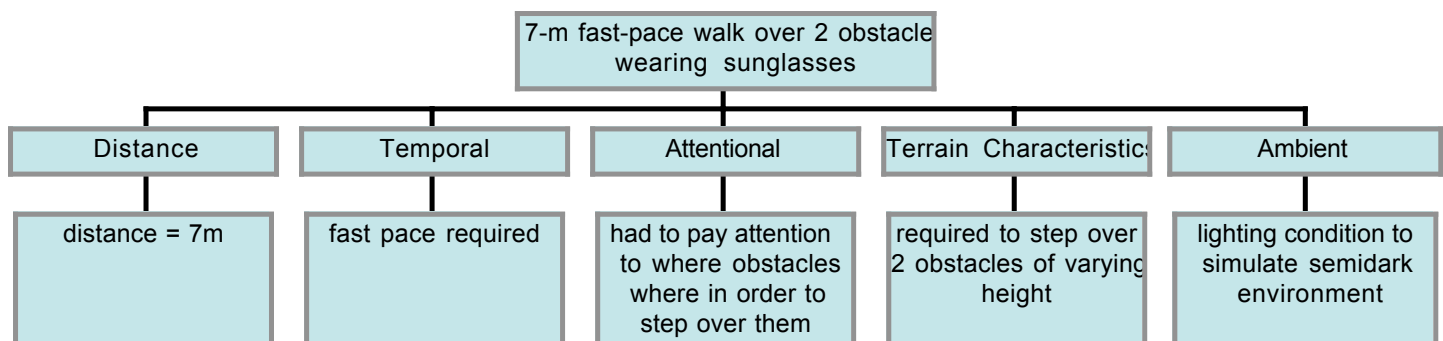
Figure 3. Dimensions of mobility represented in a complex walking task

The process of reducing the number of walking tasks led to the selection of six walking

tasks (highlighted in Figure 4) from the original WIT. This battery of tasks was called the

modified WIT.

The Walking InCHIANTI Toolkit														
	4-m usual pace walk	4-m fast pace walk	4-m fast pace walk within 25cm corridor	4-m fast pace walk within 15cm corridor	7-m usual pace walk	7-m fast pace walk	7-m usual pace walk with long steps	7-m fast walk over 2 obstacles	7-m fast walk over 2 obstacles with sunglasses	7-m usual pace walk with box carry	7-m usual pace walk and talk	7-m usual pace walk with spoon pick-up	400-m fast walk	60-m fast walk with weighted vest
Distance	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Temporal Factors		x	x	x		x		x	x				x	x
Ambient Conditions									x					
Physical Load										x				x
Terrain Characteristics			x	x				x	x					
Attentional Demands			x	x			x	x	x	x	x	x	x	
Postural Transitions							x					x		
Traffic Density														

Figure 4. Comparison between WIT and Dimension of Mobility

Although walking can be considered a complex task as discussed by Frank and Patla (2003), in this thesis walking tasks that are deemed to be less challenging (e.g. 7m usual pace walk and 7m fast pace walk) will be referred to as basic walking tasks (BWTs) and walking tasks of greater complexity (e.g. tasks involving more than 3 dimensions of mobility) will be referred to as complex walking tasks (CWTs).

As a result of the above decision-making process, the following walking tests were administered. Note that the 400m walk was always performed last as it has the highest fatigue/endurance component. The walking tasks, in order of complexity, were:

1) 7-m usual pace walk (reference task)

2) 7-m fast pace walk

3) 7-m fast-pace walk overcoming two obstacles (6 cm tall and 30 cm tall respectively)

4) 7-m fast-pace walk overcoming two obstacles (6 cm tall and 30 cm tall respectively) wearing sunglasses to mimic a semi-dark environment

5) 7-m usual-pace walk and picking-up one (a spoon) of three objects from the floor during the course

6) 400-m as fast as possible (walking 20 times around a 20-m corridor loop, with narrow turns)

Shumway-Cook et al (2007) reported gait speed was slower on all complex walking tasks than on the reference task indicating that walking speed became slower as complexity increased. Their results verify that the greater complexity of tasks reliably reflects slower walking speed in older adults. Thus, walking tasks are able to elicit a range of conditions that may estimate those challenges encountered in everyday life that require locomotor adaptation as opposed to those needed for walking under simple, low-challenge conditions.

Environmental Analysis of Mobility Questionnaire (EAMQ). The Environmental Analysis of Mobility Questionnaire provides an environmental scan of the frequency with which participants encounter specific balance and mobility challenges during routine trips into the community and the frequency with which they avoid these challenges (see Appendix B-3 for a copy of the EAMQ). The questionnaire was recently developed and validated (Shumway-Cook et al, 2005) on a study of 54 community-living older adults. Shumway-Cook et al. (2005) video-taped participants during six trips into the community that required walking (e.g.

going to the grocery store, visiting a healthcare provider or going out for social or recreational purposes). To increase the construct validity of the EAMQ, video footage was analyzed for encounter and avoidance opportunities as identified by the EAMQ. Correlations between the video footage and EAMQ encounter and avoidance scores were computed (Shumway-Cook et al. 2005). Most of the EAMQ questions are written in mirrored pairs, with one question inquiring about approaching (encounter) various mobility situations, and the other about avoiding that same mobility situation. Responses are made on a 0 (never) to 4 (always) Likert-type scale. An example of a typical mirrored pair of questions is:

> "*When you go on a trip away from home, how often do you go when it is dark?*" and
>
> "*When you go on a trip away from your home, how often do you **avoid** going when it is dark?*"

In this example, the encounter situation concerns walking outdoors with limited visibility/lighting as well as when this situation is avoided.

A total score for each of the approach and avoidance scales was used in the present study. All scales achieved an acceptable alpha level (i.e. above 0.70, Nunnally, 1978). The internal consistency analysis revealed an alpha level of 0.83 for EAMQ-encounter, 0.87 for EAMQ-avoidance.

Self-efficacy for community mobility. A self-efficacy for community mobility measure that concerned older adult's beliefs about their abilities to perform IADLs that involve mobility was used in the study to address the secondary exploratory purpose of the study (see Appendix B-3 for a copy of the SE for community mobility questionnaire). The approach to construction of items followed the recommendations of Bandura, (1997) and McAuley and Mihalko (1998) concerning the specificity of content for the construct being examined

(mobility). The scale was modified from a community mobility study by Brawley et al. 2003 (Brawley, Frank, Patla, Gardner, & Shields, 2003). An example of a question from the self-efficacy questionnaire is: *"How confident are you that you can walk across a crosswalk before the light changes*?" Respondents were asked to rate their level of confidence on an 11-point scale ranging from 0 (not at all confident) to 10 (completely confident). This self-efficacy measure had an acceptable level of internal consistency for the older adult sample involved in this study (Cronbach's alpha of 0.85; Nunnally, 1978).

Folstein Mini-Mental Examination. This brief instrument was used to screen seniors' cognitive function (Folstein, Folstein & McHugh's, 1975). Previous physical activity intervention studies with older adults suggest and approximate range of scores that allow for a level of cognitive understanding sufficient to follow study or intervention procedures. The MMSE was used previously by Ble et al. (2005) in the InCHIANTI epidemiology study. A score of ≥ 24 was used as inclusion criteria for participation in the InCHIANTI study (Coppin et al, 2006). In considering all of the participants accepted for study, subsequent analysis revealed that these participants expressed MMSE scores such that the group mean score of 25.5 ± 2.8 (Ble et al., 2005). Rejeski, Brawley, Ambrosius, Brubaker, Focht, Foy, et al. (2003) have shown that those who fall below a score of 21, may be questionable for participation in studies involving walking training. Given the MMSE range reported in various mobility studies and the cut off values for performing in physical activity, the MMSE cut off selected for this study was consistent with those selected for older adults in the previously reported literature. For the current study, the MMSE was used for exclusion criteria only and a score ≥ 22 was required for participation.

Procedure

The study was conducted at the participant's residence; involvement in the study lasted approximately one hour. Participants were provided with a written and oral review of the study, were given an opportunity to ask questions about the study, and were then given an informed consent form to read and sign (refer to Appendix B-3). It was made clear to participants that they were free to drop out from the study at any point during the study. At the beginning of each assessment, after completing informed consent, participants provided demographic information, including age, gender and highest level education completed, current activity level, self-related mobility, and current medical conditions. Next, the MMSE was administered. This test was used to assess cognitive function (Folstein, Folstein & McHugh's, 1975). If the participant scored 22 or above on the MMSE they were allowed to participate in the study. Prior to partaking in the walking task portion of the study, participants also completed the EAMQ. To be certain participants had a clear understanding of the instructions for the EAMQ, the researcher further clarified how the instrument was to be completed and answered any queries before the participant provided responses.

The modified Walking InCHIANTI Toolkit included a battery of tests that were used to evaluate walking performance under different conditions and different distances (7m and 400m). The participants were required to wear comfortable clothes and shoes and received extensive descriptions of tests, including demonstrations. No practice trial was allowed. The start line of the walking course was marked by colored tape. To help prevent the participants from slowing down in the final segment of the course, the finish line for the CWTs was unmarked (i.e. there was a pylon at both 7m and 8m on the course. The participants were instructed to walk until they reached the 8m pylon, however, their walking time ended when

they passed the 7m pylon). A stopwatch was used to record the time from the beginning to the completion of each of the walking tasks.

Prior to starting the walking portion of the study, participants were reminded that on all fast-paced walks, they were to walk as fast and as safely as possible. At the beginning of the walking tests, the participant was positioned behind the start line and started walking only after a verbal "start" cue. The different tests were completed in a random order to prevent order effects.

After the completion of the randomized walking tasks, participants completed the 400m walk. The investigator indicated that a "rest" time of 2-3 minutes was allowed between tests. However, participants could elect not to use the entire rest time. A full rest was mandatory before performing the 400m walk to avoid any biasing effects of fatigue on an older adult's performance.

In order to get an accurate estimation of current self-efficacy for community mobility (SE), the SE questionnaire was administered after the completion of the EAMQ and the walking tasks. A major review of self-efficacy and physical activity by McAuley and Mihalko (1998) noted that direct experience is the best correlate of self-efficacy. They also recommended that before administering baseline measures of self-efficacy, participants in physical activity studies should have some minimum experience with relevant tasks or situations in order for the estimate of self-efficacy to be more accurate. Consistent with this recommendation, SE was administered after the walking tasks so that participants would have recent experience of community mobility tasks as a reference for estimating their efficacy regarding community mobility IADLs. This reasoning is also consistent with Bandura's (1997) notions of the generality of efficacy beliefs to tasks of similar nature or within the same

class of tasks (i.e., community mobility tasks referred to in the efficacy statements are in the same general class of tasks as reflected in the CWTs – complex walking).

After completing the SE for community mobility questionnaire, participants were thanked for the participation in the study and any questions they had were answered.

Analytical Plan

Prior to analysis, questionnaires and walking tasks were examined using SPSS 11.0 (for Mac OS X) for accuracy of data entry, missing values, and the normality assumptions associated with the use of the parametric statistical procedures utilized. All processes are described in detail in the Analytical Plan and Data Management section of the Results. In addition, age and sex were examined to determine if there was an effect of age or sex as covariates. A multiple regression analysis was done using the EAMQ and SE to predict walking speeds on each of the six walking tests. The differences in walking speed between basic and complex walking tasks were also examined using a dependent t-test (usual pace walking tasks) and an analysis of variance (ANOVA) was used for the fast pace walking tasks.

CHAPTER 5
RESULTS

Participant Demographics and Biometrics

The participants' ages ranged from 64 to 86 (mean age = 74 ± 5 years). See Appendix C for the age distribution of older adults as well as a breakdown of other demographic information. All older adult participants were apparently healthy and community dwelling. Body mass index (BMI) was calculated using self-report height and weight. The mean BMI of the sample was 26.15 ± 4.69 kg/m^2. Of a list of eighteen comorbidities, participants reported a mean of 2.3 comorbidities (ranging from 0 to 7). The three most frequently reported co-morbidities were arthritis (n = 42; 70%), hypertension (n = 24; 40%), and cataracts (n = 17; 28.3%). The mean Mini Mental State Examination score was 28.75 ± 1.45 (range = 25 – 30) which was well above the lower limit of 22 for study inclusion. In addition, 18.3% (n = 11) of participants reported living in a senior's residence while the remainder resided in their own homes.

Compliance with the Study Protocol

All participants completed all aspects of the study protocol with the exception of one participant who was unwilling to complete the 400m fast-paced walk. Thus the analysis for CWT #6 (400 m walk) was performed with 59 participants.

Data Management

Prior to analysis, questionnaires and walking tasks were examined using SPSS 11.0 (for Mac OS X) for accuracy of data entry, missing values, and the normality assumptions

associated with the use of the parametric statistical procedures utilized. All processes are described below.

Missing data. Missing data consisted of unanswered items on the questionnaires. Only five of the 120 questionnaires (60 EAMQ + 60 SE = 120) had missing data (i.e. 4.2%). Thus, the amount of missing data was minimal. Where the missing values were for a scale item, the participant's mean for the remaining items of the scale was substituted (Tabachnik & Fidell, 2007). The advantage of using the data substitution procedure is that the power of the study is not reduced or compromised by a few missing data points (i.e., no listwise deletions will occur in the analyses after the substitutions have been made). The main disadvantage of this procedure is that the individual's variability may be reduced, thus reducing sample variability. With a large number of substitutions, analyses may be biased in a conservative direction (Tabachnik & Fidell, 2007).

Testing of assumptions. There are several assumptions and data checks for regression analysis that must be met in order to have a valid analysis. These assumptions include having an appropriate ratio of participants to independent variables, checking for outliers, as well as checking for normality and homoscedasticity of residuals, as well as multicollinearity and singularity of the variables.

The recommended ratio of participants to independent variable is no less than 5:1 (Vincent, 2005). This assumption was met as three independent variables (EAMQ-encounter, EAMQ-avoidance, and SE) were used on a sample of 60 participants to predict performance (meters/second) on various CWT's. If this assumption is not met, the equation may not be generalizable (Vincent, 2005).

Outliers were examined in the preliminary analysis as recommended by Vincent (2005). The preliminary analysis was conducted to check if outliers existed by calculating z-scores for all independent variables. Only one outlier was identified and it was transformed following the procedures outlined by Tabachnick and Fidell (2007) as explained below.

Statistical normality. Preliminary analysis was conducted to check for normality in the data. All variables were normal with the exception of EAMQ-avoidance and self-efficacy, which had slight skewness violations (2.307 and -2.382 respectively). Data is considered to be within acceptable limits of skewness if the z-values do not exceed ±2 (Vincent, 2005). However, Bohrnstedt and Carter (1971) have shown that regression analysis is robust against violations of normality. Thus, no data transformations were performed.

Outliers. Each participant's scores were screened for potential outliers for each of the following variables: walking speed (on each of the six walking tasks), EAMQ-encounter total, EAMQ-avoidance total and SE total. According to Tabachnik and Fidell (2007) outliers are primarily screened because they can (a) lead to making either a type I or type II error as it becomes difficult to determine the effect outliers may have on a given analysis and (b) lead to results that cannot be generalized.

To screen for outliers, z-scores for the walking speed (on each of the six walking tasks), EAMQ-encounter total, EAMQ-avoidance total and SE total were calculated. A z-score greater than 3.29 was considered to be an outlier (Tabachnick & Fidell, 2007; Field, 2006). In this study, only one outlier was identified.

Based on the recommendations by Tabachnik and Fidell (2007), the outlier was changed to have less of an impact on the sample (i.e. be less deviant) by transforming it to be within one standard deviation of the next highest score. The most extreme outlier occurred on

the 7m usual pace walk, speed = 1.95m/s (z-score = 3.77), the next fastest walking speed was 1.59m/s. Thus the outlier of 1.95 was changed to 1.79 (i.e., 1.59 + 0.203(SD) = 1.79). All of the analysis was performed after adjusting for the outlier.

Descriptive Statistics

Descriptive statistics were calculated on the sample after data cleaning. Table 2 below shows a comparison of walking speeds on each of the walking tasks by five year age increments. A further breakdown of correlations can be seen in Appendix D.

Table 2. Walking Speeds (m/s) for the Modified InCHIANTI Walking Tasks

Age	64-69yrs	70-74yrs	75-79yrs	80yrs+
	(n=11)	(n=16)	(n=21)	(n=11)
Walking Task	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
7m, usual pace	1.13 (.12)	1.22 (.23)	1.20 (.17)	1.13 (.23)
7m, fast pace	1.45 (.20)	1.52 (.35)	1.55 (.26)	1.40 (.25)
7m, fast pace, obstacles, normal light	1.07 (.17)	1.14 (.28)	1.16 (.26)	1.06 (.32)
7m, fast pace, obstacles, sunglasses	1.06 (.20)	1.11 (.26)	1.17 (.28)	1.00 (.33)
7m, usual pace, pick up object	.70 (.19)	.76 (.20)	.73 (.17)	.63 (.18)
400m, fast pace	1.14 (.13)	1.19 (.22)	1.16 (.20)	1.03 (.11)

Relationship between the EAMQ and Walking Tasks

Recall that hypothesis (1a) stated that there will be a direct relationship between performance on walking tasks and the encounter score on the EAMQ. The results of the study showed that there were significant correlations found between four of the six walking speeds and the EAMQ-encounter score (range significant of correlations = 0.169 to 0.299, $p < 0.05$). Hypothesis (1b) stated there would be an inverse relationship between performance on the walking tasks and the avoidance score on the EAMQ. This hypothesis was supported as there

were significant correlations between walking speed on all walking tasks and the EAMQ-avoidance score (range of significant correlations = -0.330 to -0.387; $p < 0.05$). Thus, faster walking times were associated with lower avoidance scores. The correlations are shown in Table 3 below.

Table 3. Correlations between EAMQ-avoidance, EAMQ-encounter, and Modified Walking InCHAINTI Toolkit

Variable	EAMQ-avoidance	EAMQ-encounter
BWT #1	-0.333**	0.131
BWT#2	-0.387**	0.271*
CWT#3	-0.410**	0.169*
CWT#4	-0.330*	0.123
CWT#5	-0.340**	0.299*
CWT#6	-0.358**	0.280*

n = 60 for CWT # 1-5

BWT#1 = 7m, usual pace;

BWT#2 = 7m, fast pace;

CWT #3 = 7m, fast pace, obstacles, normal light;

CWT #4 = 7m, fast pace, obstacles, sunglasses;

CWT #5 = 7m, usual pace, pick-up objects;

CWT#6 = 400m, fast pace (n=59)

*Correlation is significant at 0.05 level (2-tailed);

**Correlation is significant at 0.01 level (2-tailed)

Relationship between SE and EAMQ

Hypothesis (2a) stated that SE would be positively correlated with encounter scores. This hypothesis was supported as there was a significant correlation between SE_{Total} and the EAMQ-encounter ($r = 0.345$; $p < 0.01$). Thus, higher self-efficacy scores were associated with higher encounter scores. Hypothesis (2b) stated that self-efficacy would be inversely related to avoidance scores on the EAMQ. This hypothesis was also supported as there was a negative correlation between SE_{Total} and EAMQ-avoidance ($r = -0.531$; $p < 0.01$). Thus, lower self-efficacy scores are associated with higher avoidance scores.

Relationship between SE and Walking Tasks

Recall that hypothesis (2c), stated that self-efficacy, would be inversely related to performance on walking tasks. There was a significant correlation between SE_{Total} and walking speed across all walking tasks (range of correlations was 0.322 to 0.578; $p < 0.01$). Thus, higher self-efficacy and faster performance times are related.

Prediction of Walking Speed

Age was expected to be a covariate in the walking speed prediction models given that age was correlated with performance on the CWTs in the InCHIANTI studies. As well, mobility has been observed to progressively decline with age (Shumway-Cook et al., 2007). Thus, the multiple regression analyses were performed first controlling for the amount of variance in performance that was accounted for by age. Age did not significantly contribute to any of the prediction models for any walking performance. Accordingly, age was "trimmed" from the model (Tabachnik & Fidell, 2007). For the interested reader, tables of regression results including the variable of age are reported in Appendix E.

Participant sex was also examined in the initial prediction models. However, it did not significantly contribute to the prediction of walking speeds on any of the walking tasks. Thus

sex was also "trimmed" from the model. No tables are presented in the Appendices that include this variable because the sample was not selected to balance the numbers of males and females (males = 14 and females = 46). Results of regression analysis relative to this variable (not a significant contributor) may not be generalizable to other study results.

As indicated by the secondary exploratory hypothesis (a), we were interested in knowing if the addition of SE to the EAMQ's prediction of walking task performance would increase the predictability of performance. This hypothesis was evaluated using multiple regression analyses. Specifically, regressions were conducted to determine if the EAMQ scales would be significantly related to walking task performance because they were of primary interest in this validation study of the EAMQ (i.e., criterion-related validity).

Recall that self-efficacy has been correlated with other performance tasks (e.g., Bandura, 1997; McAuley & Mihalko, 1998). As a secondary interest, self-efficacy for mobility was added to the prediction model following the entry of the EAMQ scores to determine if self-efficacy beliefs about mobility IADLs contributed to the model beyond contributions made by the EAMQ scores.

Predictions for BWT#1. Recall that BWT #1 is the 7m usual pace walk. After step 2, with all three independent variables in the equation, $R^2 = 0.146$, $p < 0.05$. The adjusted R^2 value of 0.100 indicated that 10% of the variability in BWT #1 is predicted by EAMQ-avoidance, EAMQ-encounter and SE. The adjusted R^2 value of 0.080 indicated that 8% of the variance in BWT #1 is predicted by EAMQ-avoidance and EAMQ-encounter alone with avoidance being the primary contributing variable in the first model. Self-efficacy did not significantly contribute to the model for this walking task. See Table 4 below.

Table 4. Prediction of 7m Usual Pace Walk (BWT#1)

Variables in Model	$adjR^2{}_{model}$	F_{model}	β	t	p_{model}	$p_{variable}$
Model 1	.080	3.562	-	-	.035	-
EAMQ-Encounter			-.009	-.068		.946
EAMQ-Avoidance			-.337	-2.456		.017
Model 2	.100	2.299	-	-	.030	-
EAMQ-Encounter			-.043	-.314		.755
EAMQ-Avoidance			-.232	-1.524		.133
Self-Efficacy			.224	1.516		.135

Note: Model values are those with all variables included in the model

Predictions for BWT#2. Recall that BWT #2 is the 7m *fast* pace walk. After Step 1, the EAMQ-avoidance was the primary contributing variable in predicting speed. After step 2, with all three independent variables in the equation, $R^2_{model} = 0.250$, $p < 0.05$. The adjusted R^2 value of 0.209 for the model indicated that 20.9% of the variance in BWT #2 is predicted by EAMQ-avoidance, EAMQ-encounter and SE. The beta weights indicate that self-efficacy is the primary contributing variable to the overall model (*Model 2*). See Table 5.

Table 5. Prediction of 7m Fast Pace Walk (BWT#2)

Variables in Model	$adjR^2_{model}$	F_{model}	β	t	p_{model}	$p_{variable}$
Model 1	.135	5.622	-	-	.006	-
EAMQ-Encounter			-.009	1.006		.319
EAMQ-Avoidance			-.337	-2.943		.016
Model 2	.209	6.335	-	-	.001	-
EAMQ-Encounter			-.043	.630		.531
EAMQ-Avoidance			-.232	-1.179		.243
Self-Efficacy			.224	2.517		.015

Note: Model values are those with all variables included in the model

Predictions for CWT#3. Recall that CWT #3 is the 7m fast pace walk *overcoming two obstacles in normal light*. After Step 1, the EAMQ-avoidance is the primary contributing variable in predicting speed. After step 2, with all three independent variables in the equation, $R^2_{model} = 0.261$, $p < 0.05$. The adjusted R^2 value of 0.222 for the overall model indicated that 22.2% of the variance in CWT #3 is predicted by EAMQ-avoidance, EAMQ-encounter and SE. The beta weights indicate that self-efficacy is the primary contributing variable to the overall model (*Model 2*). See Table 6.

Table 6. Prediction of 7m Fast Pace Walk with Obstacles in Normal Light (CWT#3)

Variables in Model	$adjR^2_{model}$	F_{model}	β	t	p_{model}	$p_{variable}$
Model 1	.139	5.752	-	-	.005	-
EAMQ-Encounter			-.001	-.005		.996
EAMQ-Avoidance			-.410	-3.088		.003
Model 2	.222	7.081	-	-	.010	-
EAMQ-Encounter			-.056	-.437		.664
EAMQ-Avoidance			-.239	-1.685		.098
Self-Efficacy			.366	2.661		.010

Note: Model values are those with all variables included in the model

Predictions for CWT#4. Recall that CWT #4 is the 7m fast pace walk, overcoming two obstacles in *dim* light. After Step 1, the EAMQ-avoidance is the primary contributing variable in predicting speed. After step 2, with all three independent variables in the equation, $R^2_{model} = 0.277$, $p < 0.05$. The adjusted R^2 value of 0.238 for the overall model indicated that 23.8% of the variance in CWT #4 is predicted by EAMQ-avoidance, EAMQ-encounter and SE. The beta weights indicate that self-efficacy is the primary contributing variable to the overall model (*Model 2*). See Table 7.

Table 7. Prediction of 7m Fast Pace Walk with Obstacles in Dim Light (CWT#4)

Variables in Model	$adjR^2_{model}$	F_{model}	β	t	p_{model}	$p_{variable}$
Model 1	.078	3.486	-	-	.037	-
EAMQ-Encounter			-.016	-.120		.905
EAMQ-Avoidance			-.337	-2.45		.017
Model 2	.238	12.994	-	-	.001	-
EAMQ-Encounter			-.090	-.714		.478
EAMQ-Avoidance			-.107	-.763		.449
Self-Efficacy			.490	3.605		.001

Note: Model values are those with all variables included in the model

Predictions for CWT#5. Recall that CWT #5 is the 7m usual pace walk, *picking up three objects, one at a time*. After Step 1, the EAMQ-avoidance is the primary contributing variable in predicting speed. After step 2, with all three independent variables in the equation, $R^2_{model} = 0.346$, $p < 0.05$. The adjusted R^2 value of 0.311 indicated that 31.1% of the variance in the overall model for CWT #5 is predicted by EAMQ-avoidance, EAMQ-encounter and SE. The beta weights indicate that self-efficacy is the primary contributing variable to the overall model (*Model 2*). See Table 8.

Table 8. Prediction of 7m Usual Pace Walk with Obstacle Pick-Up (CWT#5)

Variables in Model	$adjR^2_{model}$	F_{model}	β	t	p_{model}	$p_{variable}$
Model 1	.116	4.872	-	-	.011	-
EAMQ-Encounter			.191	1.420		.161
EAMQ-Avoidance			-.261	-1.94		.057
Model 2	.311	17.102	-	-	.001	-
EAMQ-Encounter			.110	.916		.363
EAMQ-Avoidance			-.010	-.078		.938
Self-Efficacy			.535	4.135		.001

Note: Model values are those with all variables included in the model

Predictions for CWT#6. Recall that CWT #6 is the *400m fast pace walk*, with narrow turns. After Step 1, the EAMQ-avoidance is the primary contributing variable in predicting speed. After step 2, with all three independent variables in the equation, $R^2_{model} = 0.326$, $p < 0.05$. The adjusted R^2 value of 0.289 for the overall model indicated that 28.9% of the variance in CWT #5 is predicted by EAMQ-avoidance, EAMQ-encounter and SE. The beta weights indicate that self-efficacy is the primary contributing variable to the overall model (*Model 2*). See Table 9.

Table 9. Prediction of 400m Fast Pace Walk with Narrow Turns (CWT#6)

Variables in Model	$adjR^2_{model}$	F_{model}	β	t	p_{model}	$p_{variable}$
Model 1	.124	5.091	-	-	.009	-
EAMQ-Encounter			.172	1.301		.199
EAMQ-Avoidance			-.295	-2.227		.030
Model 2	.289	14.007	-	-	.001	-
EAMQ-Encounter			.100	.828		.411
EAMQ-Avoidance			-.087	-.660		.512
Self-Efficacy			.481	3.743		.001

Note: Model values are those with all variables included in the model

Comparison between Basic and Complex Walking Tasks

Comparisons were made between basic and complex tasks to parallel the comparisons done by Shumway-Cook et al. (2005). Recall exploratory hypothesis (c), does CWT performance (m/sec) on basic walking tasks performed at normal speed differ from complex walking tasks performed at normal speeds. To test this hypothesis, a dependent t-test was performed to compare the speeds of the different *usual pace* walking tasks. The t-test results showed a significant difference between the mean 7-m usual pace walking speed (BWT#1) and the 7-m usual pace walking speed with obstacle pick-ups (CWT#5), $t(59) = 21.638$, $p < 0.01$. See Figure 5.
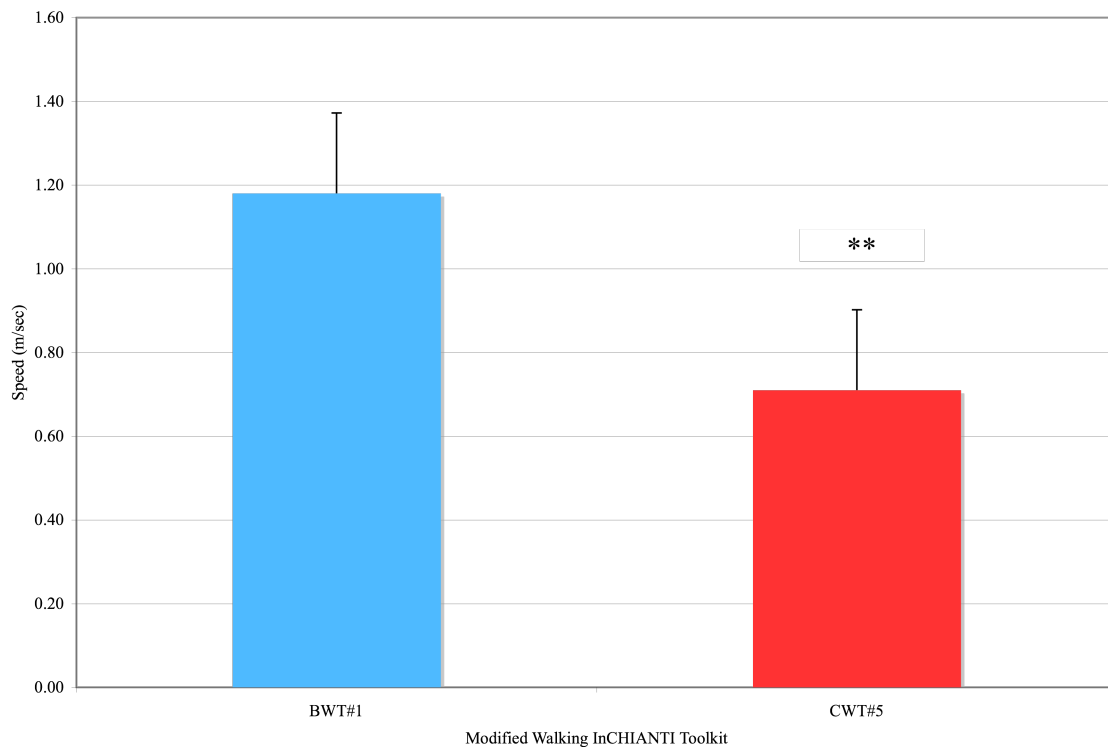
Figure 5. Comparison of Speed (m/sec) for the Usual Pace Walking Tasks

Recall exploratory hypothesis (d), does CWT performance (m/sec) on basic walking tasks performed at fast speed differ from complex walking tasks performed at fast speeds. To

test this hypothesis, a one-way repeated measures ANOVA was performed to compare the speeds of the different fast-paced walking tasks. The ANOVA revealed a significant main effect between selected walking tasks (BWT#2, CWT#3, CWT#4, and CWT#6; $F_{0.05}(3, 58) = 121.686$, $p < 0.01$), therefore a simple contrast analysis was performed to examine differences between the complex walking tasks (CWT#3,4,6) and the basic walking task (CWT #2). Results revealed a significant difference between all complex walking tasks when compared to the basic walking task (BWT#2 and CWT#3 ($F_{0.05}(1, 58) = 199.873$, $p < 0.01$; BWT#2 and CWT#4 $F_{0.05}(1, 58) = 220.286$, $p < 0.01$; and BWT#2 and CWT#6 ($F_{0.05}(1, 58) = 227.088$, $p < 0.01$). Thus, there was a significant difference between the basic fast paced walking task (7m fast pace walk) and all other fast paced complex walking tasks. No significant difference was found between the complex walking tasks performed at fast paces.
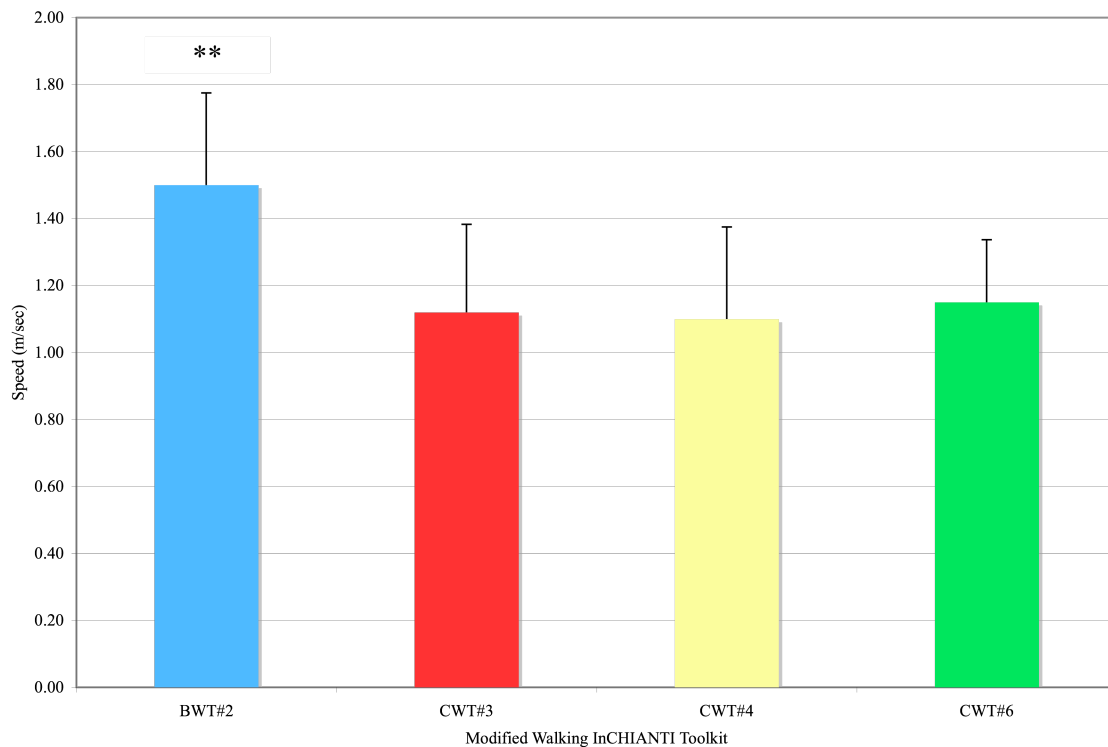
Figure 6. Comparison of Speed (m/sec) of the Fast Pace Walking Tasks

CHAPTER 6
DISCUSSION

The primary objective of the study was to address two aspects construct validity (face and criterion validity) of the EAMQ by determining if scores on the EAMQ are correlated with mobility performance tests. The indicators of community mobility that were used were six walking tasks of varying complexity selected from the Walking InCHIANTI Toolkit (Ferrucci et al., 2000, Shumway-Cook et al., 2007). The complex walking tasks were "designed to examine mobility under a broad range of challenging conditions similar to those encountered during daily life requiring locomotor adaptations beyond that needed for walking under simple, low challenge conditions" (Shumway-Cook et al., 2005, p. 64).

There was partial support for the first hypothesis. There were no significant correlations found between the EAMQ-encounter score on participants' walking speed for BWT#1 or on CWT#4. However, there were significant correlations on the remaining four walking tasks and the EAMQ-encounter score (range of significant correlations was 0.169 to 0.299, $p < 0.05$). However, the correlations between each of the walking speeds for the CWTs and EAMQ-avoidance score were significant (range of significant correlations was -0.330 to -0.410; $p < 0.05$). Thus there was support for the second part of the first hypothesis. Faster walking times were correlated with lower avoidance scores on the EAMQ. There was a higher correlation between the EAMQ-avoidance and walking speeds as compared to the EAMQ-encounter score and walking speeds.

Criterion-related validity is supported from the perspective that the avoidance aspect of the EAMQ was related to walking speed on CWTs. Recall that CWTs are tasks that reflect

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aspects of the range of challenging conditions that require adaptive locomotion on the part of the older adult. These conditions are similar to those encountered during daily life and exceed the needs for adaptive walking under low challenge conditions.

One possible explanation for the detection of a stronger correlation between walking task performance and EAMQ-avoidance may have to do with participants' perceptions of what they feel they can either approach or avoid. For example, some situations in daily life cannot easily be avoided. Question 21 of the EAMQ-encounter scale asked, "When you go on a trip away from your home, how often do you go up and down curbs?" Every person responded that they went up and down curbs, thus overcoming curbs appears to be a situation related to community mobility that cannot easily be avoided. The distribution of responses indicated that 8.3% said that they rarely encountered curbs, 16.7% responded "sometimes", and 75% responded often or always. When asked how often they avoided curbs, 86.7% of participants said they would never or rarely avoid it, 10.0% responded that they would sometimes avoid it, 1.7% said they would often avoid curbs, and the final 1.7% responded they would always avoid going up and down curbs.

As the previous example illustrates, the questions on each of the EAMQ scales may provoke different responses about the same situation creating differential variability in response for each scale. In turn, these differential responses in "mirrored" items (i.e., encounter and avoid the same environmental challenge) may subsequently lead to a differential magnitude in correlation when the EAMQ is associated with the same walking performance task.

It may be that the responses to EAMQ questions about the same situation (e.g., confronting a curb when walking) are differentially influenced by motivational beliefs for

either engaging in or avoiding tasks. This possibility was considered by examining an individual's confidence in their IADLs for community mobility.

The Relationship between the EAMQ, Self-Efficacy and Walking Task Performance

Significant correlations were found between SE and the EAMQ-encounter scale ($r = 0.345$; $p < 0.01$). This finding supported the hypothesis that higher self-efficacy scores were associated with high encounter scores and is consistent with Bandura's postulate which states that "people readily undertake tasks they see themselves as capable of performing, and avoid tasks they see as too difficult" (Killey & Watt 2006, p. 123). The relationships between SE and EAMQ-avoidance were also examined. The correlations indicated a significant negative correlation between SE and EAMQ-avoidance ($r = -0.531$; $p < 0.01$).

A significant correlation between SE and performance on the walking tasks was also evident. Higher SE for performing community mobility actions was associated with lower avoidance scores and slower walking speeds. Self-efficacy was also related to walking speeds on each walking tasks such that the higher the efficacy the faster the speed on a given walking task. Consistent with Bandura's idea of mastery experience being one basis for efficacy beliefs, walking task performance and efficacy for performing community mobility skills were related.

In general, the correlational results for self-efficacy lend support to the hypothesis regarding the existence of a significant relationship between EAMQ and SE for community mobility ADLs. They also offer support for a relationship between SE and walking task performance.

Regarding the EAMQ and self-efficacy findings, the strong negative correlation between EAMQ-avoidance and SE may be because people may have stronger beliefs or fears about certain situations experienced vicariously through social comparison to people of similar

age or because of strong emotional responses to situations they would opt to avoid (cf.

Bandura, 1997). For example, one may avoid going out when it is dark (EAMQ question 9)

because a friend had a negative experience when he or she was out after dark. Avoidance

situations and their correspondent EAMQ measure may provoke stronger emotional responses,

which impact upon efficacy (Ashe, Eng, Miller, & Soon et al., 2007).

The secondary and exploratory purpose of the investigation was to determine if the

EAMQ and self-efficacy would either individually or additively contribute to the prediction of

walking task speeds. The form of validity being examined in this case is criterion-related

validity or how well the EAMQ and self-efficacy are related to an already established measure

(Kerlinger, 1986). As mentioned previously, the WIT was modified as recommended by

Shumway-Cook et al (2007) to include tasks with less skill overlap and fewer tasks to reduce

subject burden. Thus, comparisons were made using the EAMQ, SE and the modified WIT.

Results indicated that while the EAMQ alone predicted walking speed on the walking tasks,

when SE was added to the prediction equation, it became the dominant and significant

predictor of walking speed on all but one of the complex walking tasks (i.e., exception: usual

pace walk). As walking task complexity increased, SE accounted for more of the variability in

walking speed.

In sum, the EAMQ scales have modest criterion-related validity. However, self-

efficacy for performing community mobility IADLs was a superior predictor of walking speed,

given the results when using both predictors in the same multiple regression equation.

Whereas construct and criterion-related validity for part of the EAMQ have been

demonstrated in the present study, it is important to consider whether the results obtained were

in part due to the selection of community mobility estimates or the selection of a unique

sample. A discussion of these issues is warranted.

Comparison to InCHIANTI Study Results for Walking Tasks

   Selection of walking tasks. To consider whether the walking tasks selected were in

some way inappropriate as criterion measures to address the question of validity, the rationale

for task selection was first examined. As outlined earlier, the walking tasks were selected to

contain as many of the eight dimensions of mobility across the fewest number of tasks. This

was done to reduce skill overlap and subject burden (cf. Shumway-Cook et al, 2007). The

walking tasks were selected from the WIT and were designed to reflect a range of challenging

conditions that require adaptive locomotion on the part of the older adult. In addition, task

complexity was reflective of the multidimensional aspects of mobility as discussed by Frank

and Patla (2003) and Shumway-Cook et al (2005). The EAMQ was designed to examine

community mobility contexts reflective of greater mobility complexity and conditions that are

similar to those encountered during daily life. These conditions require adaptive walking (e.g.,

reacting and adapting to the presence of a curb or lower visibility for walking due to dim light).

Thus, it seems reasonable to conclude that the modified WIT tasks reflect task and condition

characteristics that the EAMQ attempts to assess.

   Comparison to InCHIANTI performances. Relative to the question of whether the

present results were due to unique performances by older adult sample participants,

comparisons were made to the much larger sample of the InCHIANTI study (total N = 951 for

InCHIANTI study; n for the age groups in the current sample = 60). When comparing the

walking task results from the current study to the original InCHIANTI epidemiological study

findings, the walking speed of older adults for the tasks used in the present study are relatively

similar to the InCHIANTI results despite the large difference in sample sizes. For example, the

average walking speed on the 7m fast pace walk over two obstacles in normal lighting was the same with the same standard deviation for both samples.

The range in age groups examined was similar to the InCHIANTI study with the exception of the youngest age category. The youngest age category in the current study was above the age of 65 years whereas the youngest age category in the InCHIANTI sample had a mean age of 44.0 (SD ± 12.9). However, it is interesting to note that in the current study, no effect of age as a covariate was found in the regression analyses. Although significant correlations were found between age and EAMQ-encounter, age was not a significant predictor of performance on the walking tasks. This finding differs from previous InCHIANTI research by Shumway-Cook et al (2007). However, research by Bischoff et al. (2003) found no age effect in detecting impairments in elderly persons using the Timed Up and Go Test (TUG-test), another indicator of disability (Guralnik, Simonsick, Ferrucci, et al., 1994).

The current study sample also had a higher percentage of women whereas the InCHIANTI study had more equal proportions of men and women. Previous InCHIANTI research by Shumway-Cook et al (2007) found an effect of sex on performance on the WIT (women walked slower than men). In the current study, age did not significantly contribute to the prediction of walking speeds on any of the walking tasks. A comparison between participant characteristics and walking speeds by age category can be seen in Appendix F.

The relationships detected between the EAMQ and walking task performance and between SE and walking task performance do not appear to be a function of either performance differences or selective sampling when the InCHIANTI results are considered.

Comparison of Sample to Canadian Population

Another argument could be raised about variables that would make the EAMQ relationships observed unique to this study and possibly less than a fair examination of validity.

The current sample had more comorbidities than older Canadian adults. In the current study, arthritis was the most commonly reported comorbidity with approximately 70% of the participants reporting they had some arthritis. In the year 2000, arthritis and rheumatism affected nearly 4 million Canadians aged 15 years and older (approximately 16% of this population (Public Health Agency of Canada [PHAC], 2000). The prevalence of arthritis in the Canadian population increases with age and is more common in women compared to men. Approximately 29% of men and 45% of women ages 65-69 have arthritis, this number increases to 40% and 55% of men and women respectively after the age of 85 years (PHAC, 2000). The current study sample had a higher prevalence of arthritis as compared to the Canadian population.

It could also be argued that walking task performances could be affected by excess body weight. Excess body weight is associated with functional limitations and disabilities as well as risk factors for chronic diseases such as type 2 diabetes, cardiovascular disease, hypertension, osteoarthritis, some types of cancers, as well as gallbladder disease (Canadian Institute for Health Information [CIHI], 2005). In an attempt to consider the influence of excess weight, BMI (one possible indicator of excess weight) was estimated from the participant data. BMI was calculated from self-reported height and weight of all participants. The average BMI for the current study sample was 26.15 (SD ± 4.69; range 17.28 - 45.80), which is comparable to the Canadian average for people over the age of 65 years of 25.98 (Statistics Canada, 2005). It appears that the present sample's BMI is not markedly different from the Canadian average and suggests that sample uniqueness as reflected by BMI is unlikely to be a reason for the CWT performances observed. Refer to Appendix G for a further breakdown of BMI.

Thus, the results of the study cannot be attributed to influences solely related to BMI, comorbidities, age, and unique sample performances. The sample reflects characteristics that make it reasonably generalizable to other samples of apparently healthy older adults of similar age. Validity appears to have received an unbiased test as far as these factors are concerned.

The Validation Process and Future Research

Validating a measurement tool concerned with community mobility involves interpreting several relationships between both similarly measured and differently measured constructs that represent aspects of mobility. Validation is a long and time-consuming process that requires much research. Therefore this study only represents one step in that process. The EAMQ is a relatively new tool for measuring community mobility. Shumway-Cook et al. (2005) started the validation journey by establishing the relationships between the approach and avoidance scores of the EAMQ with direct observation of behavior. The current study has established the relationship between the EAMQ, six walking tasks, and community mobility self-efficacy. Thus, the validation process has been advanced but is by no means complete.

Future validation research for the EAMQ. Even though relationships exist between the EAMQ, walking tasks of varying complexity and self-efficacy, there is still only $10 - 31\%$ of the variability accounted for across the prediction of the six walking tasks performances. Indeed, the EAMQ alone only accounted for $7.8 - 13.9\%$ of the variance observed in walking task performances. Thus, more research validating the EAMQ is required.

Of the two predictors utilized (EAMQ and SE), the EAMQ was not the strongest predictor of community mobility. There may be several reasons for this. One reason may be that the tasks from the modified WIT were not selected to match to the EAMQ conditions. They were selected to include as many of the eight dimensions of community mobility as possible. If the walking tasks were selected to match the EAMQ then perhaps it might have

been a better predictor of walking task performance. In the future, for example, the addition of a walking test up and down a flight of stairs may be useful in increasing the predictability of the EAMQ on community mobility.

A second reason may be that the EAMQ questions require some revision. In such a revision, the EAMQ might include tasks or situations (related to community mobility) that older adults absolutely would and would not avoid. Or in considering the situations reflected in the EAMQ, other situations might be added to better represent community mobility or replace the situations currently represented. For example, it is likely that most people do not frequently encounter two or more flights of stairs in their excursions into the community, but they may encounter inclines when walking. The inclusions of questions about hills or inclines may be useful in capturing aspects of community mobility that are not yet captured by the scales of the EAMQ.

A third reason may be the phrasing of some of the items of the EAMQ. An additional suggestion might be to consider the phrasing of the EAMQ items. Some of the inquiries made by participants when they were completing the EAMQ suggest that responses may have been more variable because of lack of clarity. Further revision of the wording of the EAMQ scales to provide clarity and specificity would also leave little doubt in the minds of participants about the types of situations they would encounter or avoid when walking. In considering a self-diagnostic tool such as the EAMQ, responses depend on how clearly respondents understand the approach/avoid questions. Lack of specificity and clarity may influence the amount of variability observed in EAMQ responses. An example may be instructive.

Despite the researcher clarifying how the EAMQ was items to be completed and answering questions prior to the participants beginning the questionnaire, there was still some

uncertainty on their part about how the items of the EAMQ were to be answered. For example, a pattern of participant responses that the researcher observed was that participants wanting to be good respondents would attempt to go beyond the item content in order to give a good response. For example, question 17 of the EAMQ asked, "When you go on a trip away from your home, how often do you climb two or more flights of stairs (that is about 20 steps)?" In many cases, an older adult who may not encounter two or more flights of stairs answered in terms of the possibility if they ever encountered stairs versus the actual frequency of their experience in order to be a good respondent. Participant "A" could answer quite accurately "never" as they live in a community that only has one-story buildings. Participant "B" who lives in the same one-story building community might think if I had to go up two flights of stairs I could, even though I never actually encounter that situation, it would not be something I would avoid. Thus this participant may answer "always". In measurement terms, the confound is that Participant A is interpreting the situation correctly in terms of their actual experience and Participant B is interpreting it quite differently. In the case of "B" the question has less to do with encounter or avoidance situations and more to do with "B's" self-efficacy to negotiate stairs.

Furthermore, some of the item wording creates somewhat of a communication barrier that contributes to additional measurement error. Anecdotally, it was observed that older adults struggled with the use of the word "*trip*" (i.e., a daily excursion into the community) within the EAMQ. Even though the researcher verbally defined the term "*trip*" and an introductory paragraph was provided explaining the use of the word "*trip*" referring to anytime "when you leave your home and go into the community to perform an activity, such as grocery shopping" several participants inquired about responding in relation to their most recent

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vacation. It is difficult to determine how many participants interpreted the word "*trip*" as a vacation or as its intended definition. Vagueness in some EAMQ questions may also be a factor. For example, EAMQ question 26 asks, "How often do you limit the number, or weight, of items you carry?" At some point, everyone regardless of age or physical ability has to limit the number or weight of the items that they carry. Questions such as this are vague in that they cause participants to struggle to determine what the best answer might be. This vagueness contributes to a high degree of variability in response and consequently such items may be of questionable validity.

There appears to be more formative and scaling work that is necessary to clarify the community mobility instances to which people will meaningfully respond (i.e., eliminating doubt about responses). This work would possibly include the provision of more breadth in the scaling if the desire is for the instrument to be more sensitive and to better reflect the variability in participants' responses that is not due to measurement error. This is an important consideration when developing an instrument (Eys, Carron, Bray & Brawley, 2007).

The current version of the EAMQ includes 41 items. Like any new instrument that tries to honor the construct that it was designed to test, it is lengthy in an attempt to capture as many aspects of community mobility as possible.

The foregoing suggestions have implications for validation. Changing the types of questions asked on the EAMQ may necessitate the use of other measures of performance for use in the criterion-related tests of validity in future.

Self-efficacy and community mobility. The results from the current study indicated a significant contribution of self-efficacy to the prediction of community mobility in older adults. One possible explanation for SE being a strong predictor of mobility may be related to the

scale used. The efficacy scale (0 – 10) gives older adults a greater number of alternatives to respond and may capture more of the variability that they exhibit in their complex walking tasks. Therefore the correspondence between efficacy items and CWT behaviour and the greater response scale range may have provided a greater opportunity to detect a correlation between SE and CWT.   The EAMQ scale only offers five gradations (i.e., "never" to "always") and the descriptors relative to encounter/avoidance issues of the scale *may* have less specific meaning as compared to those offered by the SE scale. For example, question 5 of the EAMQ-encounter asks, "When you go on a trip away from your home, how often do you have to cross a street at a traffic light?" In this case, the older adult must recall in the past month the frequency in which they encountered crosswalks, and then categorize the frequency of encounters into one of the five categories given. A similar item on the SE scale asks, "How confident are you that you can walk across a crosswalk before the light changes?" In the case of the SE item, the participant can answer how confident they are at the given task. This may be easier for the older adult to conceptualize than remembering frequency of a specific behaviour over the past month.

Strengths and Limitations

  Strengths. There are several strengths characteristic of the present investigation. The present study is the first, based upon the published literature, to examine the criterion and construct validity of the EAMQ. Thus, this study adds to the validation process concerning this instrument. A second strength concerns ecological validity. Whereas past community mobility and balance research has tended toward examination of participants in sterile lab environments, the current study examined participants at their residence where their performance of mobility frequently occurs. A third strength concerned the conduct of testing walking performance. In the current protocol, the order

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of the walking tasks was randomized (with the exception of the 400m walk). The purpose of randomization was to reduce order effects. A fourth and final strength of this research was the use of fewer but more discrete walking tasks as compared to the InCHIANTI study, which used 14 walking tasks. Shumway-cook et al (2007), one of the investigators publishing results of the InCHIANTI study, noted that fewer walking tasks that overlapped in similar complexity could be used in future research. This suggestion was used in the present study.

Limitations. Although this study has several strengths, there are also limitations of the research. Relative to the absence of any sex-related performance effects, the small number of male participants may have been the reason why no differences were found between men and women. A second possible limitation of the study was that there was a low representation of the more frail population in the sample. These participants are difficult to find and are often not interested in volunteering for research studies that examine their declining physical skills. From a validity stand point, another limitation of the current study may be the lack of comparison of the EAMQ to other mobility performance tasks that may relate to the EAMQ (i.e., walk up and down stairs).

CHAPTER 7
CONCLUSION

The purpose of this study was to contribute to the validation process of the Environmental Analysis of Mobility Questionnaire (EAMQ). The EAMQ was designed as a self-report tool for the purpose of identifying mobility disability in community dwelling older adults. If the EAMQ proves to be a valid measure of community mobility, a clinical use of the EAMQ would be to use this instrument as one measure (along with other forms of assessment) to identify community dwelling adults who are at risk for mobility disability. Validation of such a measure is therefore necessary. Thus, the EAMQ was examined for its relationship to older adults' performance on walking tasks that varied in complexity and were considered indicators of community mobility.

Overall, there was partial support for the validation of the EAMQ. As Table 10 below shows, four of five hypotheses were fully supported.

Table 10. Hypotheses Conclusions

Hypothesis #	Hypothesis Statement	Supported/Not Supported
1 a)	There would be a direct positive relationship between performance on the CWTs and the encounter score on the EAMQ	Partially Supported
1 b)	There would be an inverse relationship between performance on the CWTs and the avoidance score on the EAMQ	Supported
2 a)	Higher self-efficacy would be positively correlated with higher encounter scores on the EAMQ	Supported
2 b)	High self-efficacy would be inversely related to both the avoidance score on the EAMQ and performance on CWTs	Supported
2 c)	High self-efficacy would be inversely related to performance on CWTs	Supported

Based upon published literature, this is the first study to correlate the EAMQ to the performance of walking tasks from the Walking InCHIANTI Toolkit. Results indicated that the EAMQ avoidance scale is a significant predictor of speed on the walking tasks. However, when self-efficacy for performance of IADLs that require community mobility was added to the prediction of walking task speed, self-efficacy was the strongest predictor of the variability in speed for each mobility task. Thus, the EAMQ was not a significant predictor when self-efficacy was taken into account. More research examining the relationships between self-efficacy, community mobility and the EAMQ is required.

Contribution to the Field of Kinesiology

In order to be able to assess the relative success of an intervention or a community program (i.e. programs offered by the health region) we must have valid measures that assess the performance of people involved in these programs relative to community mobility. A tool that could identify a person's mobility disability relative to the community is required. More validation work such as that done in the present study is necessary for the EAMQ in the future and should be seen an ongoing process.

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APPENDICES

APPENDIX A – Life Expectancy in Canada

Figure A- 1. Life Expectancy at Birth, by Sex, in Canada (Statistics Canada, 2005)

APPENDIX B - Recruitment Poster, Ethics Approval, & Participant Package

Appendix B- 1. Recruitment Poster

Research Subjects Needed

For a study to determine community mobility among elderly residents of Saskatoon and surrounding area.

We are looking for individuals 65 to 85 years of age for a research study to determine community mobility among older adults in Saskatoon. We are interested in people who are both active and inactive.

This study is being conducted through the College of Kinesiology at the University of Saskatchewan.

The study will require a total of about 1.5 hours of your time during one visit from us to your home or residence.

For further information, please contact:
Ms. Jen Adamson-Forbes, BSc, College of Kinesiology at 966-1123 (work) or 230-2794 (cell) or by e-mail jla739@gmail.com

When Ms Adamson-Forbes cannot be reached

Dr. Larry Brawley, Professor and Canada Research Chair,
College of Kinesiology at 966-1076 or by e-mail
larry.brawley@usask.ca

"The last time I saw old Charlie, he was in his garden shed inventing some sort of mobility device."

Appendix B- 2. Certificate of Ethics Approval

UNIVERSITY OF SASKATCHEWAN

Behavioural Research Ethics Board (Beh-REB)

Certificate of Approval

PRINCIPAL INVESTIGATOR	DEPARTMENT	BEH#
Lawrence Brawley	Kinesiology	07-158

INSTITUTION(S) WHERE RESEARCH WILL BE CONDUCTED (STUDY SITE)
University of Saskatchewan
Saskatoon SK

STUDENT RESEARCHERS
Jennifer Forbes

SPONSOR
SOCIAL SCIENCES AND HUMANITIES RESEARCH COUNCIL OF CANADA (SSHRC)

TITLE
A Comparison Between Complex Walking Tasks and the Environmental Analysis of Mobility Questionnaire Among Community Dwelling Older Adults

APPROVAL DATE	EXPIRY DATE	APPROVAL OF:
14-Aug-2007	13-Aug-2008	Application
		Consent Form

CERTIFICATION
The University of Saskatchewan Behavioural Research Ethics Board has reviewed the above-named research project. The proposal was found to be acceptable on ethical grounds. The principal investigator has the responsibility for any other administrative or regulatory approvals that may pertain to this research project, and for ensuring that the authorized research is carried out according to the conditions outlined in the original protocol submitted for ethics review. This Certificate of Approval is valid for the above time period provided there is no change in experimental protocol or consent process or documents.

Any significant changes to your proposed method, or your consent and recruitment procedures should be reported to the Chair for Research Ethics Board consideration in advance of its implementation.

ONGOING REVIEW REQUIREMENTS
In order to receive annual renewal, a status report must be submitted to the REB Chair for Board consideration within one month of the current expiry date each year the study remains open, and upon study completion. Please refer to the following website for further instructions: *http://www.usask.ca/research/ethical.shtml*

John Rigby, Chair
University of Saskatchewan
Behavioural Research Ethics Board

Signature Date   16 August 2007

Please send all correspondence to:

Ethics Office
University of Saskatchewan
Room 305 Kirk Hall, 117 Science Place
Saskatoon SK S7N 5C8
Telephone: (306) 966-2084   Fax: (306) 966-2069

Appendix B- 3. Participant Package and Data Recording Sheets

Title: Validation of the Environmental Analysis of Mobility Questionnaire (EAMQ): Comparison of Complex Walking Tasks and the EAMQ among Community Dwelling Older Adults

Funding: Canada Research Chair Award (Tier 1: SSHRC) to Dr. Brawley

Names of Researchers: Principal Investigator: Larry Brawley, Ph.D., College of Kinesiology, University of Saskatchewan, phone: 966-1076. Student Researcher: Jennifer Forbes, M.Sc. candidate, College of Kinesiology, University of Saskatchewan, phone: 966-1123.

You are invited to participate in a study entitled: *A Comparison Between Complex Walking Tasks and the Environmental Analysis of Mobility Questionnaire Among Community Dwelling Older Adults.* Please read this form carefully, and feel free to ask any questions you might have.

Before you decide, it is important for you to understand what the research involves. This consent form will tell you about the study, why the research is being done, what will happen to you during the study and the possible benefits, risks and discomforts.

If you wish to participate, you will be asked to sign this form. Your participation is entirely voluntary, so it is up to you to decide whether or not to take part in this study. If you do decide to take part in this study, you are free to withdraw at any time without giving any reasons for your decision and your refusal to participate will not affect your relationship with University instructors. Please take time to read the following information carefully and to discuss it with your family, friends, and doctor before you decide.

Purpose of the study: The purpose of the proposed research is to see if the Environmental Analysis of Mobility Questionnaire (EAMQ) can be used as a means of detecting reduced function in a number of dimensions (distance, temporal factors, ambient conditions, physical load, terrain characteristics, attentional demands, postural transition, and traffic density) associated with community as examined in the EAMQ. Specifically, I wish to examine a number of the dimensions (as identified above) by using various tests from the InCHIANTI Toolkit that examine several aspects of community mobility.

Possible benefits: Your participation in the study will contribute to the scientific community.

Procedures:

If you agree to be in this study the following will happen:

- A brief medical history, current physical activity as well as some demographic information will be collected
- Folstein Mini-Mental Examination will be completed
    - This tool is used to assess cognitive function
- Environmental Analysis of Mobility Questionnaire
    - This is a 41-item questionnaire that asks questions about your walking activities within the community within the past month
- Walking InCHIANTI complex walking tasks will be performed
    - The Walking InCHIANTI Toolkit includes a battery of tests that will be used to evaluate walking performance under different conditions and different distances (7 and 400 m). You are required to wear comfortable clothes and shoes and will receive extensive descriptions of tests, including demonstrations. However, no practice trial will be allowed. The use of cane will not be allowed. One timer using stopwatches will record the time from the beginning to the completion of the test.
    - At the beginning of the tests, you will be positioned behind the start line and will start walking after a verbal "start" cue. The different tests will always be presented in the same order as reported below, and a resting time of 2-3 minutes will be allowed between tests at your request. Resting time is mandatory before performing the 400-m walk. The following 5 walking tests will be administered in a random order followed by the 400m fast walk:
        - 7-m usual pace walk
        - 7-m fast pace walk
        - 7-m fast-pace walk overcoming two obstacles (5cm tall and 30 cm tall respectively)
        - 7-m fast-pace walk overcoming two obstacles (5cm tall and 30 cm tall respectively) wearing sunglasses to mimic a semidark environment
        - 7-m usual-pace walk and picking-up one (a spoon) of three objects from the floor during the course
        - 400-m as fast as possible (walking 20 times around a 20-m corridor loop, with narrow turns)
- Self-Efficacy Questionnaire
    - This is a 8-item questionnaire that asks questions about your confidence while do different activities that are common to everyday life

Foreseeable risks, side effects or discomfort: No aspects of this study involve risk or deception to the participants. None of the required movements are unusual to those normally carried out during daily activity. The risks involved in participating in this experiment will be minimal. That is, the risks are no greater than the risks experienced in everyday life. Moreover, all the movement/tasks you will be asked to perform are intended to simulate activities of daily living and should therefore not present an appreciable threat to your welfare. Again, the risks will be minimal.

Voluntary Withdrawal: Your participation in this research is entirely voluntary. You may withdraw from this study at any time. If you decide to enter the study and to withdraw at any time in the future, there will be no penalty or loss of benefits to which you are otherwise entitled.
If you choose to enter the study and then decide to withdraw at a later time, all data collected about you during your enrolment in the study will be retained for analysis.

Confidentiality: While absolute confidentiality cannot be guaranteed, every effort will be made to ensure that the information you provide for this study is kept entirely confidential. Your name will not be attached to any information, nor mentioned in any study report, nor be made available to anyone except the research team. It is the intention of the research team to publish results of this research in scientific journals and to present the findings at related conferences and workshops, but your identity will not be revealed.

Data use: The data will be used for the completion of a masters thesis and publication purposes only, and will be retained for a minimum of five years post-publication, after which time it may be destroyed. The results may also be presented at a number of peer-review conferences relating to movement and geriatric research. Results will be submitted to peer-review journals. Study results can be provided to participants by the investigator, upon request, at the completion of the study.

Contact information of researchers:

If you have questions concerning the study you can contact Dr. Larry Brawley at 966-1076, 978-0879 (home), or 261-2042 (cell).

If you have questions about your rights as a research subject, you can contact the Office of Research Services at the University of Saskatchewan at 966-4053.

This study has been approved on ethical grounds by the University of Saskatchewan Behavioural Research Ethics Board on (August 14, 2007).

By signing below, I confirm the following:

- I have read or have had this read to me and understood the research subject information and consent form.
- I have had sufficient time to consider the information provided and to ask for advice if necessary.
- I have had the opportunity to ask questions and have had satisfactory responses to my questions.
- I understand that all of the information collected will be kept confidential and that the result will only be used for scientific objectives.
- I understand that my participation in this study is voluntary and that I am completely free to refuse to participate or to withdraw from this study at any time without changing in any way the quality of care that I receive.
- I understand that I am not waiving any of my legal rights as a result of signing this consent form.
- I understand that there is no guarantee that this study will provide any benefits to me (if applicable).
- I have read this form and I freely consent to participate in this study.
- I have been told that I will receive a dated and signed copy of this form.

Participant's Signature:_____ Date: _____

Individual conducting the consent process:_____

Date: _____

Initial Screening and Demographics

I would like to let you know that these questions are only an initial screening. Based on your answers we will be able to decide if you are eligible to participate in the study. Of course, you may wish to decline answering any of the following questions.

The first set of questions pertains to your medical history. There are 10 questions. Are you ready?

1. Have you ever had a heart attack?

   No   Yes (When: _____)
2. Do you experience angina frequently?

   No   Yes (How often: _____)

3. Do you use supplemental oxygen for any respiratory problems?

   No   Yes (How often: _____)

4. Do you have arthritis that significantly inhibits your daily mobility? It might not be severe but still might limit your mobility.

   No   Yes (Specify: _____)

5. Has a health professional (i.e. a doctor) responsible for your care told you that you have any cardiovascular problems?

   No   Yes (When: _____)

6. Do you have any health or physical symptoms that inhibit you from getting around or any other health problems not mentioned?

   No   Yes (Specify: _____)

7. Do you use a walker, or other mobility assistive device?

   No   Yes (How often: _____)

8. Do you have any vision problems that make getting around a problem?

   No   Yes (Specify: _____)

9. Have you experienced any severe hearing loss?

   No   Yes

10. Are you on any medications that make you feel ill or dizzy?

      No   Yes

The next set of questions pertains to your current activity level.

11. Do you walk on a regular basis for 10 minutes or more continuously in either the community or in your own residence?

      No   Yes (How often: _____)

12. Do you do your own shopping by going to the grocery store?

      No   Yes (If not, reason: _____)

13. On a scale of 1 to 10, can you rate your overall mobility? 1 being dependent on a wheelchair and 10 having no mobility problems whatsoever.

      1   2   3   4   5   6   7   8   9   10

14. On average, how often do you leave your home on a weekly basis?
    a. Once a week
    b. Twice a week
    c. Three or more times a week
    d. Daily

The last set of questions pertains to your demographics.

15. How old are you? _____

16. Do you live in a senior's residence or nursing home?

      No   Yes (Which: _____)

17. Do you live on your own?
    Yes ___   No ___ (with a spouse/partner ___   with a son/daughter ___
                          Other: _____)

18. a. Do you drive?   No   Yes
    b. Do you own a vehicle? No   Yes

General Information

Age: _____ years

Sex: M / F

Ethnicity: _____

Highest level of education completed: _____

Number of children: _____ sons and _____ daughters

Medical conditions (please check ALL that apply):
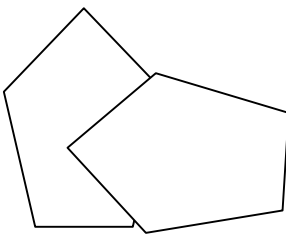
□ a. Cerebrovascular accident (stroke)
□ b. Congestive heart failure
□ c. Coronary artery disease
□ d. Hypertension
□ e. Irregularly irregular pulse
□ f. Peripheral vascular disease
□ g. Hemiplegia/hemiparesis
□ h. Multiple sclerosis
□ i. Parkinsonism
□ j. Arthritis
□ k. Hip fracture
□ l. Other fractures (e.g. wrist, vertebral)
□ m. Osteoporosis
□ n. Cataract
□ o. Glaucoma
□ p. Pneumonia
□ q. Diabetes
□ r. Emphysema/COPD/asthma
□ s. None of the above

Mini Mental State Examination
Folstein Mini-Mental Exam

Administered by: _____

Date: _____

Fill in ➔	Patient's level of education: Limitations: (i.e., sight, hearing, mood, cooperation)
Max Pt Score	
5 _____ 5 _____	Orientation: What is the year? _____ Season? _____ Month? _____ Date: _____ Day? _____ Where are we: County? _____ Province? _____ City? _____ Building? _____ Floor? _____
3 _____	Registration: Name 3 unrelated objects and have the patient repeat them. (One point for each object named correctly on the 1st repetition.) Although 1st repetition determines score, patient has up to 6 trials. Record # of trials: _____
5 _____	Attention & Calculation: Subtract 7 from 100 and keep subtracting each number (93, 86, 79, 72, 65). One point for each correct answer. (Alternative: Spell W-O-R-L-D backwards. One point for each letter in correct order.)
3 _____	Memory: What are the 3 objects you were asked to remember? (One point each.)
2 _____ 1 _____ 3 _____ 1 _____ 1 _____ 1 _____	Language and Visuo-spatial Skills: Name these objects: (point to watch, then a pencil, one point each) Repeat the following statement: "No ifs, ands or buts". (Allow only one trial.) Follow this command: Take this paper in your right hand, fold it in half and put it on the floor. (One point for each stage performed correctly.) Read and obey this: CLOSE YOUR EYES (One point if he/she closes eyes.) Write a sentence below. (Needs to contain subject and verb. Correct grammar/punctuation not necessary.) Copy this design:

Total Score: _____

Environmental Analysis of Mobility Questionnaire

Participant Name: _____ Date: _____

Name of evaluator: _____

*We are interested in learning more about your walking activities in the community **over the past month**. In this walking activities questionnaire, I will be asking you to report about trips away from your home. The word "trip" means when you leave your home and go into the community to perform an activity, such as grocery shopping. I will be asking about questions about how often you go on trips away from your home, where you go, and what time of day you tend to travel, and the kind of obstacles you encounter, such as steps. You are free not to answer any questions you do not wish to answer.*

1. When you go on a trip away from your home, how often do you go alone?
    - 0 = never
    - 1 = rarely
    - 2 = sometimes
    - 3 = often
    - 4 = always

2. When you go on a trip away from your home, how often do you **<u>avoid</u>** going out alone?
    - 0 = never
    - 1 = rarely
    - 2 = sometimes
    - 3 = often
    - 4 = always

3. When you go on a trip away from your home, what is the average number of blocks you walk?

      0 = 0 – 1 block
      1 = 2 – 4 blocks (1/4 mile)
      2 = 5 – 9 blocks (1/2 mile)
      3 = >10 blocks (1 mile)

4. When you go on a trip away from your home, how often do you purposely limit the amount you have to walk?

      0 = never
      1 = rarely
      2 = sometimes
      3 = often
      4 = always

5. When you go on a trip away from your home, how often do you have to cross a street at a traffic light?

      0 = never
      1 = rarely
      2 = sometimes
      3 = often
      4 = always

6. How often do you **avoid** a situation in which you have to cross a street at a traffic light?

      0 = never
      1 = rarely
      2 = sometimes
      3 = often
      4 = always

7. When you go on a trip away from your home, how often do you have to walk across a busy street?

      0 = never
      1 = rarely
      2 = sometimes
      3 = often
      4 = always

8. How often do you **<u>avoid</u>** a situation in which you have to walk across a busy street?

      0 = never
      1 = rarely
      2 = sometimes
      3 = often
      4 = always

9. When you go on a trip away from your home, how often do you go when it is dark?

      0 = never
      1 = rarely
      2 = sometimes
      3 = often
      4 = always

10. When you go on a trip away from your home, how often do you **<u>avoid</u>** going when it is dark?

      0 = never
      1 = rarely
      2 = sometimes
      3 = often
      4 = always

11. When you go on a trip away from your home, how often do you go when it is raining?

      0 = never
      1 = rarely
      2 = sometimes
      3 = often
      4 = always

12. When you go on a trip away from your home, how often do you **avoid** going when it is raining?

      0 = never
      1 = rarely
      2 = sometimes
      3 = often
      4 = always

13. When you go on a trip away from your home, how often do you go when it is snowing?

      0 = never
      1 = rarely
      2 = sometimes
      3 = often
      4 = always

14. When you go on a trip away from your home, how often do you **avoid** going when it is snowing?

      0 = never
      1 = rarely
      2 = sometimes
      3 = often
      4 = always

15. When you go on a trip away from your home, how often do you usually climb a single flight of stairs (that is about 10 steps)?

      0 = never
      1 = rarely
      2 = sometimes
      3 = often
      4 = always

16. How often do you purposely **<u>avoid</u>** a situation where you would have to climb a single flight of stairs?
       0 = never
       1 = rarely
       2 = sometimes
       3 = often
       4 = always

17. When you go on a trip away from your home, how often do you climb two or more flights of stairs (that is about 20 steps)?
       0 = never
       1 = rarely
       2 = sometimes
       3 = often
       4 = always

18. How often do you purposely **<u>avoid</u>** a situation where you would have to climb two or more flights of stairs?
       0 = never
       1 = rarely
       2 = sometimes
       3 = often
       4 = always

19. When you go on a trip away from your home, how often do you go up or down an escalator?
       0 = never
       1 = rarely
       2 = sometimes
       3 = often
       4 = always

20. How often do you purposely **<u>avoid</u>** a situation where you would have to go up or down an escalator?
       0 = never
       1 = rarely
       2 = sometimes
       3 = often
       4 = always

21. When you go on a trip away from your home, how often do you go up and down curbs?
        0 = never
        1 = rarely
        2 = sometimes
        3 = often
        4 = always

22. How often do you purposely **avoid** a situation where you would have to go up or down a curb?
        0 = never
        1 = rarely
        2 = sometimes
        3 = often
        4 = always

23. When you go on a trip away from your home, how often do you walk on uneven surfaces?
        0 = never
        1 = rarely
        2 = sometimes
        3 = often
        4 = always

24. How often to you purposely **avoid** a situation in which you would have to walk on an uneven surface?
        0 = never
        1 = rarely
        2 = sometimes
        3 = often
        4 = always

25. During a trip away from your home, how often do you usually carry two or more items?
        0 = never
        1 = rarely
        2 = sometimes
        3 = often
        4 = always

26. How often do you limit the number, or weight, of items you carry?
 0 = never
 1 = rarely
 2 = sometimes
 3 = often
 4 = always

27. When you go on a trip away from your home, how often do you open doors that require moderate strength?
 0 = never
 1 = rarely
 2 = sometimes
 3 = often
 4 = always

28. When you go on a trip away from your home, how often do you **avoid** opening doors that require moderate strength? (e.g. use wheelchair access button)
 0 = never
 1 = rarely
 2 = sometimes
 3 = often
 4 = always

29. When you are grocery shopping, how often do you reach above shoulder height to get something?
 0 = never
 1 = rarely
 2 = sometimes
 3 = often
 4 = always

30. When you are grocery shopping, how often do you **<u>avoid</u>** reaching above shoulder height to get something?

    0 = never
    1 = rarely
    2 = sometimes
    3 = often
    4 = always

31. When you are grocery shopping, how often do you reach below your knee level?

    0 = never
    1 = rarely
    2 = sometimes
    3 = often
    4 = always

32. When you are grocery shopping, how often do you **<u>avoid</u>** reaching below your knee level?

    0 = never
    1 = rarely
    2 = sometimes
    3 = often
    4 = always

33. When you are grocery shopping, how often do you have to lean forward to reach for something?

    0 = never
    1 = rarely
    2 = sometimes
    3 = often
    4 = always

34. When you are grocery shopping, how often do you **<u>avoid</u>** leaning forward to reach for something?

    0 = never
    1 = rarely
    2 = sometimes
    3 = often
    4 = always

35. When you go on a trip away from your home, how often do you go with two or more people?
- 0 = never
- 1 = rarely
- 2 = sometimes
- 3 = often
- 4 = always

36. When you go on a trip away from your home, how often do you walk through noisy or busy places?
- 0 = never
- 1 = rarely
- 2 = sometimes
- 3 = often
- 4 = always

37. How often to you purposely **avoid** a situation in which you would have to walk through noisy or busy places?
- 0 = never
- 1 = rarely
- 2 = sometimes
- 3 = often
- 4 = always

38. When you go on a trip away from your home, how often do you go to unfamiliar places?
- 0 = never
- 1 = rarely
- 2 = sometimes
- 3 = often
- 4 = always

39. How often do you **avoid** going to places you are not familiar with?
- 0 = never
- 1 = rarely
- 2 = sometimes
- 3 = often
- 4 = always

40. How often do you go to places where there are a lot of people who might bump into you?

       0 = never
       1 = rarely
       2 = sometimes
       3 = often
       4 = always

41. How often do you purposely **avoid** a situation where there are a lot of people who might bump into you?

       0 = never
       1 = rarely
       2 = sometimes
       3 = often
       4 = always

Complex Walking Tasks

Date of Administration:_____
ID #: _____
                    Name:_____

7-m usual pace walk: _____(sec)

7-m fast pace walk: _____(sec)

7-m fast-pace walk overcoming two obstacles: _____(sec)

7-m fast-pace walk overcoming two obstacles wearing sunglasses: _____(sec)

7-m usual-pace walk with 3 object pick-up: _____(sec)

400-m as fast as possible: ____:____(min:sec)

Self-Efficacy Questionnaire

Date of Administration:_____
ID #: _____
                     Name:_____

We would like to know how confident you are for different aspects of your mobility and physical activity. For the questions below, please write a number indicating how confident you are about your current level of activity. *Use the scale below to select your confidence level.*

How confident are you that you can…	Not at all Confident					Somewhat Confident				Completely Confident	
	0	1	2	3	4	5	6	7	8	9	10
1. walk across a crosswalk before the light changes											
2. walk up stairs energetically											
3. walk down stairs without being very cautious											
4. walk over uneven ground or grass without being cautious											
5. walk in crowded malls without being concerned about your balance											
6. make daily or weekly trips into the community											
7. make daily or weekly trips into the community that require walking											

APPENDIX C - General Participant Characteristics and Comorbidities

Table C- 1. Participant Characteristics: Demographics

Age	65-69yrs (n = 11)	70-74yrs (n = 16)	75-79yrs (n = 22)	80yrs+ (n = 11)
Age, mean ±SD	66.27 ± 1.42	71.88 ± 1.59	76.91 ± 1.38	81.36 ± 3.41
Female, %	90.9	93.8	54.5	81.8
BMI, mean ±SD	30.73 ± 5.82	23.84 ± 3.83	26.02 ± 3.61	25.07 ± 3.72
Seniors Residence, %	18.2	12.5	22.7	18.2
Lives alone, %	45.5	43.8	18.2	54.5
Drives a vehicle, %	90.9	87.5	86.4	63.6
Education				
< Jr. High	0	0	4.5	0
Jr. High	9.1	12.5	4.5	9.1
High School	27.3	31.3	36.4	9.1
Trade School	27.3	43.8	31.8	54.5
Some University	18.2	0	4.5	9.1
University Degree	9.1	12.5	18.2	9.1
Graduate Degree	9.1	0	0	9.1
MMSE, mean ±SD	29.45 ± 1.21	29.19 ± 1.11	28.41 ± 1.50	28.09 ± 1.64
# of co-morbidities, mean ±SD	2.45 ± 1.37	2.31 ± 1.82	2.27 ± 1.80	2.18 ± 1.17

Table C- 2. Participant Characteristics: Age Distribution

Age Category	Frequency	Percent	Cumulative %
65-69yrs	11	18.3	18.3
70-74yrs	16	26.7	45.0
75-79yrs	22	36.7	81.7
80yrs+	11	18.3	100.0
Total	60	100.0	

Table C- 3. Participant Characteristics: Education

Education	Frequency	Percent	Cumulative %
Primary (k-6)	1	1.7	1.7
Jr. High (gr. 7-9)	5	8.3	10.0
High School (gr. 10-12)	17	28.3	38.3
Trade School	23	38.3	76.7
Some University	4	6.7	83.3
University Degree	8	13.3	96.7
Graduate Degree	2	3.3	100
Total	60	100	

Table C- 4. Participant Characteristics: Comorbidities

Comorbidities	Frequency	Percent
Stroke	5	8.3
Congestive Heart Failure	3	5
Coronary Artery Disease	1	1.7
Hypertension	24	40
Irregular Pulse	5	8.3
Peripheral Vascular Disease	0	0
Multiple Sclerosis	0	0
Parkinson's Disease	0	0
Arthritis	42	70
Hip Fracture	3	5
Other Fracture	10	16.7
Osteoporosis	10	16.7
Cataracts	17	28.3
Glaucoma	5	8.3
Pneumonia	1	1.7
Diabetes	11	18.3
Emphysema/COPD/asthma	1	1.7

Table C- 5. Participant Characteristics: BMI

	Current Study	Canadian Population*
Underweight < 18.5	3.3%	2.0%
Normal Weight 18.5-24.9	35.0%	38.9%
Overweight 25-29.9	43.3%	36.1%
Obese ≥ 30	18.3%	23.1%

* Public Health Agency of Canada, 2000

Table C- 6. Participant Characteristics: Walking Speeds (m/s)

Age	65-69yrs	70-74 yrs	75-79yrs	80+yrs
	(n = 11)	(n = 16)	(n = 21)	(n = 11)
Walking Task	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
7m, usual pace	1.13 (.12)	1.22 (.23)	1.20 (.17)	1.13 (.23)
7m, fast pace	1.45 (.20)	1.52 (.35)	1.55 (.26)	1.40 (.25)
7m, fast pace, obstacles, normal light	1.07 (.17)	1.14 (.28)	1.16 (.26)	1.06 (.32)
7m, fast pace, obstacles, sunglasses	1.06 (.20)	1.11 (.26)	1.17 (.28)	1.00 (.32)
7m, usual pace, pick up objects	0.70 (.19)	0.76 (.20)	0.73 (.17)	0.63 (.18)
400m, fast pace	1.14 (.13)	1.19 (.22)	1.16 (.20)	1.03 (.11)

Table C- 7. Participant Characteristics: Walking Speeds (m/s) by Age and Sex

	Men				Women			
	65-69 yrs	70-74 yrs	75-79 yrs	80+ yrs	65-69 yrs	70-74 yrs	75-79 yrs	80+ yrs
	(n = 1)	(n = 1)	(n = 10)	(n = 2)	(n = 10)	(n = 15)	(n = 12)	(n = 9)
Task				Mean ± Standard Deviation				
BWT#1	1.06	1.10	1.26 ± 0.18	1.30 ± 0.40	1.13 ± 0.13	1.23 ± 0.23	1.16 ± 0.16	1.09 ± 0.19
BWT#2	1.28	1.21	1.68 ± 0.23	1.44 ± 0.49	1.47 ± 0.21	1.54 ± 0.35	1.45 ± 0.24	1.39 ± 0.22
CWT#3	1.01	1.32	1.25 ± 0.26	1.10 ± 0.26	1.08 ± 0.18	1.13 ± 0.29	1.09 ± 0.26	1.05 ± 0.35
CWT#4	0.94	1.29	1.29 ± 0.25	0.90 ± 0.22	1.07 ± 0.21	1.10 ± 0.26	1.16 ± 0.27	1.02 ± 0.36
CWT#5	0.68	0.77	0.76 ± 0.18	0.44 ± 0.04	0.70 ± 0.20	0.76 ± 0.21	0.71 ± 0.16	0.67 ± 0.17
CWT#6	1.16	1.31	1.27 ± 0.21	0.91 ± 0.16	1.14 ± 0.14	1.18 ± 0.22	1.09 ± 0.17	1.07 ± 0.08

BWT#1 = 7m, usual pace; BWT#2 = 7m, fast pace; CWT #3 = 7m, fast pace, obstacles, normal light; CWT #4 = 7m, fast pace, obstacles, sunglasses; CWT #5 = 7m, usual pace, pick up object; CWT#6 = 400m, fast pace (n = 59)

*Note: the reporting format followed the report for the performance on the InCHIANTI Toolkit tests so that relevant comparisons to the present study can be made as well as areas in which the present sample was not comparable (i.e. no data available)

APPENDIX D - Correlations

Table D - 1. Correlations Between Performance Measures

Variable	BWT#2	CWT#3	CWT#4	CWT#5	CWT#6
CWT #1	0.728**	0.656**	0.669**	0.604**	0.591**
BWT#2	-	0.717**	0.725**	0.621**	0.709**
CWT#3		-	0.835**	0.734**	0.684**
CWT#4			-	0.772**	0.674**
CWT#5				-	0.740**
CWT#6					-

Note: Walking Tasks 1-5, n = 60
BWT#1 = 7m, usual pace;
BWT#2 = 7m, fast pace;
CWT #3 = 7m, fast pace, obstacles, normal light;
CWT #4 = 7m, fast pace, obstacles, sunglasses;
CWT #5 = 7m, usual pace, pick up object;
CWT#6 = 400m, fast pace (n = 59)

**Correlation is significant at 0.01 level (2-tailed)

Table D - 2. Correlations Between Psychosocial Measures

Variable	EAMQ-Encounter Total	EAMQ-Avoidance Total
SE Total	0.345**	-0.531**
EAMQ-Encounter Total	-	-0.415**
EAMQ-Avoidance Total		-

*Correlation is significant at 0.05 level (2-tailed)
**Correlation is significant at 0.01 level (2-tailed)

Table D - 3. Correlations between CWTs and SE

Variable	BWT#2	CWT#3	CWT#4	CWT#5	CWT#6	SE1	SE2	SE3	SE4	SE5	SE6	SE7
BWT#1	0.728**	0.656**	0.669**	0.604**	0.591**	0.059	0.263*	0.405**	0.316*	0.346**	0.076	0.021
BWT#2	-	0.717**	0.725**	0.621**	0.709**	0.214	0.385**	0.536**	0.414**	0.332**	0.174	0.140
CWT#3		-	0.835**	0.734**	0.684**	0.213	0.439**	0.489**	0.459**	0.314*	0.005	0.239
CWT#4			-	0.772**	0.674**	0.288*	0.458**	0.524**	0.460**	0.409**	0.026	0.212
CWT#5				-	0.740**	0.369**	0.521**	0.564**	0.556**	0.343**	0.059	0.289*
CWT#6					-	0.277*	0.578**	0.537**	0.446**	0.342**	0.100	0.381**
SE1						-	0.426**	0.431**	0.520**	0.354**	0.260*	0.438**
SE2							-	0.735**	0.706**	0.417**	0.201	0.599**
SE3								-	0.808**	0.520**	0.266*	0.407**
SE4									-	0.436**	0.302*	0.422**
SE5										-	0.303*	0.327*
SE6											-	0.375**
SE7												-

Note: Walking Tasks 1-5, n = 60
BWT#1 = 7m, usual pace; BWT#2 = 7m, fast pace; CWT #3 = 7m, fast pace, obstacles, normal light; CWT #4 = 7m, fast pace, obstacles, sunglasses; CWT #5 = 7m, usual pace, pick up object; CWT#6 = 400m, fast pace (n = 59)

*Correlation is significant at 0.05 level (2-tailed)
**Correlation is significant at 0.01 level (2-tailed)

Table D - 4. Correlations between CWTs and EAMQ-Encounter and EAMQ-Avoidance

Variable	BWT#2	CWT#3	CWT#4	CWT#5	CWT#6	EAMQ-encounter	EAMQ-avoidance
BWT#1	0.728**	0.656**	0.669**	0.604**	0.591**	0.131	-0.333**
BWT#2	-	0.717**	0.725**	0.621**	0.709**	0.271	-0.387**
CWT#3		-	0.835**	0.734**	0.684**	0.169	-0.410**
CWT#4			-	0.772**	0.674**	0.123	-0.330*
CWT#5				-	0.740**	0.299*	-0.340**
CWT#6					-	0.280*	-0.358**
EAMQ-encounter						-	-0.415**
EAMQ-avoidance							-

Note: Walking Tasks 1-5, n = 60
BWT#1 = 7m, usual pace;
BWT#2 = 7m, fast pace;
CWT #3 = 7m, fast pace, obstacles, normal light;
CWT #4 = 7m, fast pace, obstacles, sunglasses;
CWT #5 = 7m, usual pace, pick up object;
CWT#6 = 400m, fast pace (n = 59)

*Correlation is significant at 0.05 level (2-tailed)
**Correlation is significant at 0.01 level (2-tailed)

Table D - 5. Correlations between EAMQ-Avoidance, EAMQ-Encounter & SE

Variable	EAMQ-Avoidance	SE1	SE2	SE3	SE4	SE5	SE6	SE7
EAMQ-Encounter	-0.415**	0.266*	0.182	0.264*	0.305*	0.319*	0.185	0.290*
EAMQ-Avoidance	-	-0.248	-0.428**	-0.371**	-0.476**	-0.524**	-0.414**	-0.318*
SE1		-	0.426**	0.431**	0.520**	0.354**	0.260*	0.438*
SE2			-	0.735**	0.706**	0.417**	0.201	0.599**
SE3				-	0.808**	0.520**	0.266*	0.407**
SE4					-	0.436**	0.302*	0.422**
SE5						-	0.303*	0.327*
SE6							-	0.375**
SE7								-

Note: Walking Tasks 1-5, n = 60
BWT#1 = 7m, usual pace;
BWT#2 = 7m, fast pace;
CWT #3 = 7m, fast pace, obstacles, normal light;
CWT #4 = 7m, fast pace, obstacles, sunglasses;
CWT #5 = 7m, usual pace, pick up object;
CWT#6 = 400m, fast pace (n = 59)

*Correlation is significant at 0.05 level (2-tailed)
**Correlation is significant at 0.01 level (2-tailed)

APPENDIX E - Regression Tables with Age

Table E - 1. Prediction of 7m Usual Pace Walk (BWT#1) with Age

Variables in Model	$adjR^2$	F_{model}	β	t	P_{model}	$P_{variable}$
Model 1	.089	2.317	-	-	.058	-
Age			.071	.547		.586
EAMQ-Encounter			-.027	-.190		.850
EAMQ-Avoidance			-.238	-1.546		.128
SE			.226	1.522		.134

Table E - 2. Prediction of 7m Fast Pace Walk (BWT#2) with Age

Variables in Model	$adjR^2$	F_{model}	β	t	P_{model}	$P_{variable}$
Model 1	.203	6.398	-	-	.002	-
Age			.089	.733		.467
EAMQ-Encounter			.100	.755		.454
EAMQ-Avoidance			-.176	-1.2222		.227
SE			.352	2.529		.014

Table E - 3. Prediction of 7m Fast Pace Walk Over 2 Obstacles (CWT#3) with Age

Variables in Model	$adjR^2$	F_{model}	β	t	P_{model}	$P_{variable}$
Model 1	.217	7.163	-	-	.001	.027
Age			.095	.788		.434
EAMQ-Encounter			-.036	-.274		.785
EAMQ-Avoidance			-.246	-1.730		.089
SE			.369	2.676		.010

Table E - 4. Prediction of 7m Fast Pace Walk Over 2 Obstacles, Dim Light (CWT#4) with Age

Variables in Model	$adjR^2$	F_{model}	β	t	P_{model}	$P_{variable}$
Model 1	.227	12.895	-	-	.001	-
Age			.051	.432		.668
EAMQ-Encounter			-.080	-.611		.543
EAMQ-Avoidance			-.111	-.786		.435
SE			.492	3.591		.001

Table E - 5. Prediction of 7m Usual Pace Walk, Object Pick-up (CWT#5) with Age

Variables in Model	$adjR^2$	F_{model}	β	t	P_{model}	$P_{variable}$
Model 1	.298	16.769	-	-	.001	-
Age			-.007	-.063		.950
EAMQ-Encounter			.109	.875		.385
EAMQ-Avoidance			-.010	-.073		.942
SE			.534	4.095		.001

Table E - 6. Prediction of 400m Fast Pace Walk (CWT#6) with Age

Variables in Model	$adjR^2$	F_{model}	β	t	P_{model}	$P_{variable}$
Model 1	.280	13.721	-	-	.001	
Age			-.086	-.595		.554
EAMQ-Encounter			.085	.683		.497
EAMQ-Avoidance			-.085	-.693		.526
SE			.479	3.704		.001

APPENDIX F - Comparison of Current Study to InCHIANTI Study

Table F - 1. Walking Speed (m/s) According to Age and Sex for Walking Tests in the Walking InCHIANTI Toolkit (Bandinelli et al., 2006)

	Men				Women			
	<65	65-74	75-84	≥ 85	<65	65-74	75-84	≥ 85
	(n=131)	(n=259)	(n=124)	(n=40)	(n=146)	(n=294)	(n=171)	(n=63)
Task	Mean ± Standard Deviation							
4m u.p.*	1.36 ± .19	1.21 ± .24	1.06 ± .23	.81± .29	1.30 ± .19	1.09 ± .22	.89 ± .23	.71 ± .29
BWT#2	1.51 ± .20	1.34 ± .25	1.14 ± .27	.81 ± .33	1.39 ± .19	1.17 ± .20	.95 ± .25	.74 ± .31
CWT#3	1.16 ± .28	1.14 ± .30	1.17 ± .30	.89 ± .39	1.47 ± .26	1.11 ± .25	.89 ± .28	.68 ± .31
CWT#4	1.74 ± .28	1.39 ± .25	1.17 ± .23	.96 ± .21	1.42 ± .24	1.10 ± .21	.94 ± .21	.83 ± .24
CWT#5	1.30 ± .19	1.10 ± .21	.88 ± .23	.68 ± .23	1.20 ± .18	.95 ± .19	.74 ± .21	.63 ± .24
CWT#6	1.71 ± .23	1.39 ± .20	1.16 ± .22	.98 ± .24	1.51 ± .20	1.21 ± .18	1.03 ± .21	.95 ± .20

*Note: 4m u.p. = 4m usual pace walk

BWT#1 = 7m, usual pace; BWT#2 = 7m, fast pace; CWT #3 = 7m, fast pace, obstacles, normal light; CWT #4 = 7m, fast pace, obstacles, sunglasses; CWT #5 = 7m, usual pace, pick up object; CWT#6 = 400m, fast pace

Table F - 2. Walking Speed (m/s) According to Age and Sex for Walking Tests in the Current Study

	Men				Women			
	<65	65-74	75-84	≥ 85	<65	65-74	75-84	≥ 85
	(n=0)	(n=2)	(n=12)	(n=0)	(n=1)	(n=25)	(n=18)	(n=2)
Task				Mean ± Standard Deviation				
BWT#1	-	1.08± .03	1.27 ± .20	-	1.18 ± -	1.19 ± .20	1.15 ± .15	.96 ± .43
BWT#2	-	1.25 ± .05	1.64 ± .27	-	1.38 ± -	1.52 ± .30	1.45 ± .20	1.14 ± .43
CWT#3	-	1.17 ± .22	1.23 ± .25	-	1.05 ± -	1.11 ± .25	1.10 ± .24	.78 ± .71
CWT#4	-	1.12 ± .25	1.23 ± .28	-	1.06 ± -	1.09 ± .24	1.07 ± .26	.74 ± .69
CWT#5	-	.73 ± .06	.71 ± .20	-	.86 ±	.73 ± .20	.71 ± .15	.52 ± .29
CWT#6	-	1.24 ± .11	1.21 ± .24	-	1.18 ± -	1.16 ± .19	1.08 ± .14	1.05 ± -

BWT#1 = 7m, usual pace;
BWT#2 = 7m, fast pace;
CWT #3 = 7m, fast pace, obstacles, normal light;
CWT #4 = 7m, fast pace, obstacles, sunglasses;
CWT #5 = 7m, usual pace, pick up object;
CWT#6 = 400m, fast pace (n = 59)

Table F - 3. InCHIANTI Sociodemographic and Clinical Characteristics of Study Sample According to Age Category (Ble et al., 2005)

InCHIANTI Sociodemographic and Clinical Characteristics of Study Sample According to Age Category				
	<65	65-74	75-84	≥ 85
	(n=277)	(n=553)	(n=295)	(n=103)
age, mean ± SD	44.0 ± 12.9	69.5 ± 2.8	78.6 ± 2.9	88.0 ± 2.44
female, %	52.7	53.2	58.0	61.2
years of school, mean ± SD	10.6 ± 4.4	6.1 ± 3.2	4.9 ± 3.2	3.6 ± 2.5
BMI, mean ± SD	26.2 ± 4.1	27.9 ± 4.1	27.3 ± 4.1	26.3 ± 4.0

Table F - 4. Current Study Sociodemographic and Clinical Characteristics of Study Sample According to Age Category
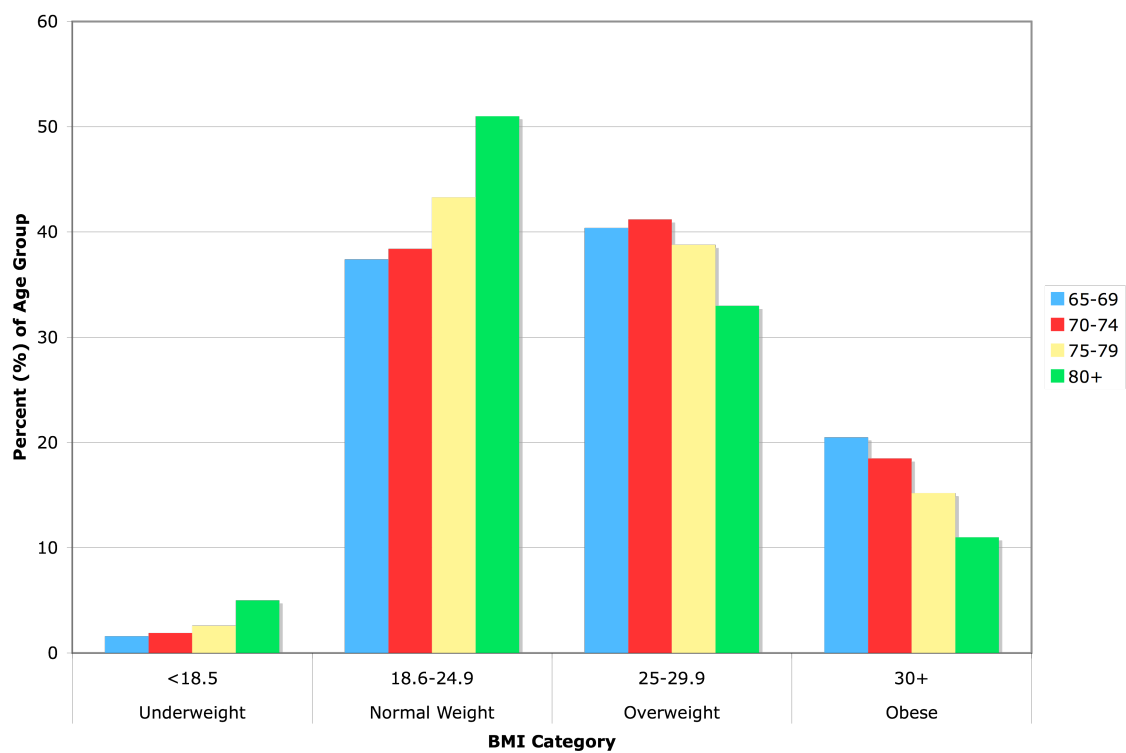
	Current Study			
	<65	65-74	75-84	≥ 85
	(n=1)	(n=27)	(n=30)	(n=2)
age, mean ± SD	64 ± -	70.1 ± 3.3	78.0 ± 2.6	85.5 ± .71
female, %	100	92.6	60.0	100
years of school, mean ± SD	13 ± -	12.5 ± 2.4	13.1 ± 2.7	12.5 ± .71
BMI, mean ± SD	28.0 ± -	26.7 ± 5.8	25.7 ± 3.7	25.2 ± 2.1

APPENDIX G – Comparison of Current Study to the Canadian Population
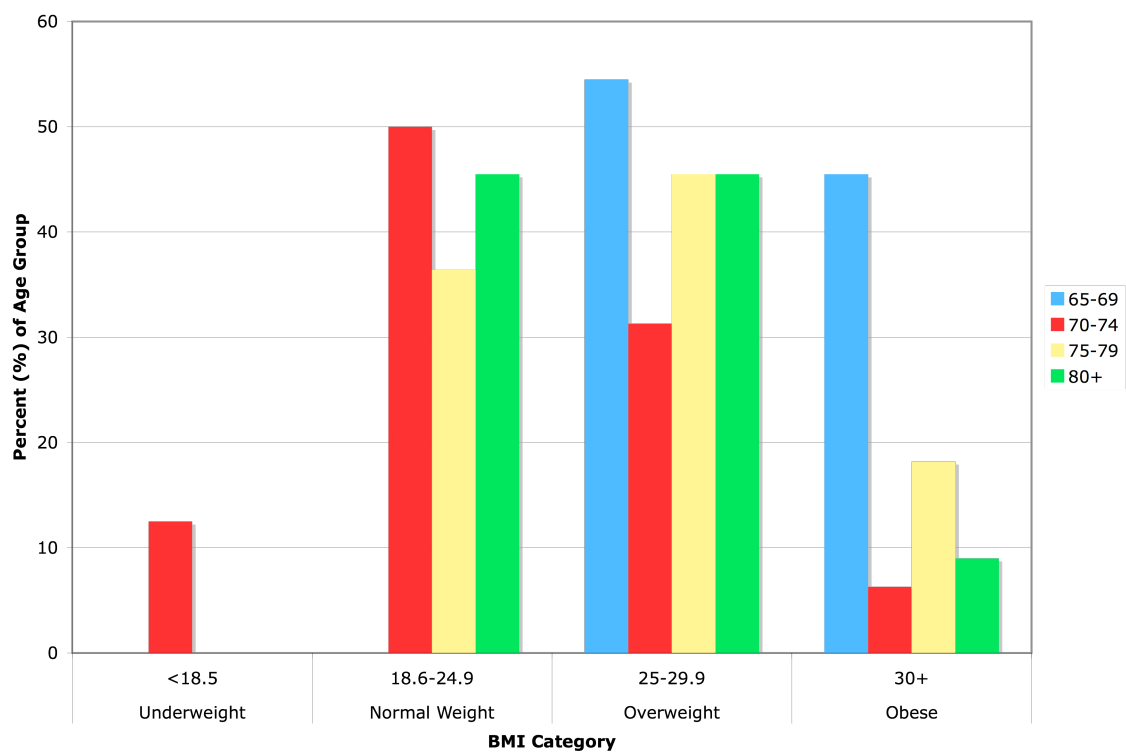
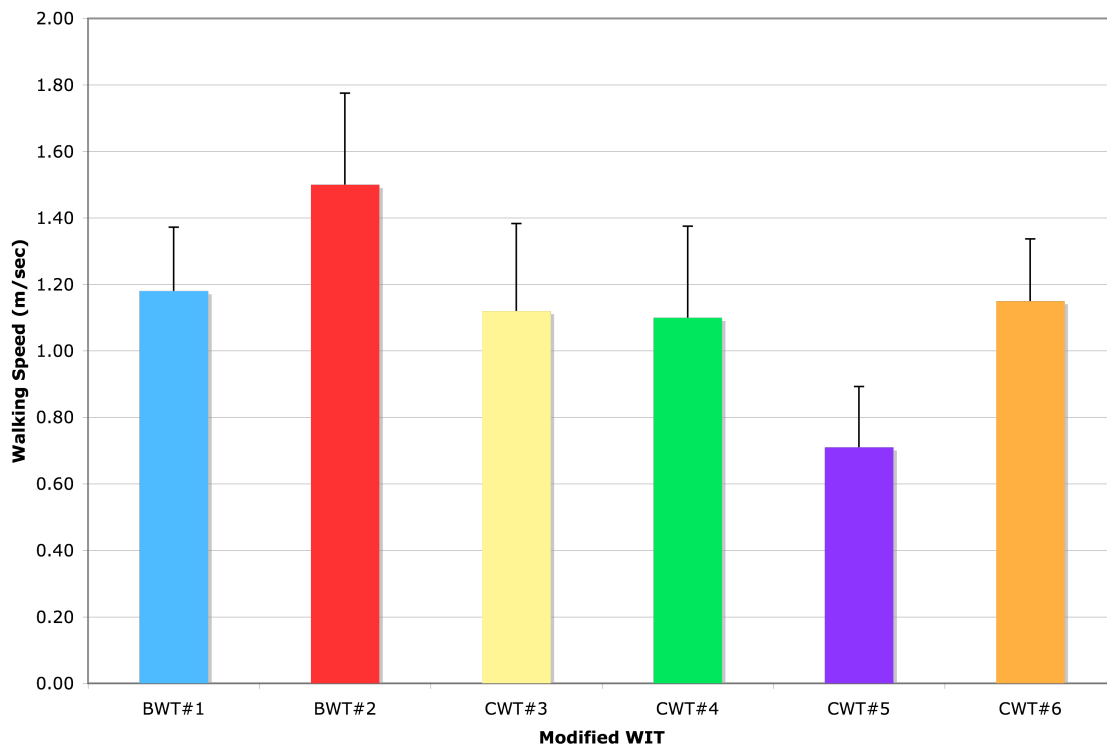**Figure G- 1.** BMI for Canadian Population by Age Group (Public Health Agency of Canada, 2000)

Figure G- 2. BMI for Current Study by Age Group

APPENDIX H - Walking Speed vs. CWT

Figure H - 1. Walking Speed (m/s) vs Walking Task

Note: walking task 1-5, n = 60
BWT#1 = 7m, usual pace;
BWT#2 = 7m, fast pace;
CWT #3 = 7m, fast pace, obstacles, normal light;
CWT #4 = 7m, fast pace, obstacles, sunglasses;
CWT #5 = 7m, usual pace, pick up object;
CWT#6 = 400m, fast pace (n = 59)

APPENDIX I - Summary Regression Tables

Table I - 1. Regression Summary

	EAMQ-a	EAMQ-e	EAMQ-a	EAMQ-e	SE
CWT#6	ns	*	ns	ns	**
CWT#5	ns	ns	ns	ns	**
CWT#4	ns	*	ns	ns	**
CWT#3	ns	**	ns	ns	**
BWT#2	ns	*	ns	ns	**
BWT#1	ns	*	ns	ns	ns
	Model #1		Model #2		

BWT#1 = 7m, usual pace;
BWT#2 = 7m, fast pace;
CWT #3 = 7m, fast pace, obstacles, normal light;
CWT #4 = 7m, fast pace, obstacles, sunglasses;
CWT #5 = 7m, usual pace, pick up object;
CWT#6 = 400m, fast pace (n = 59)

Note: *=p<0.05; **=p<0.01
Legend:
EAMQ-a = EAMQ-avoidance
EAMQ-e = EAMQ-encounter

Table I - 2. Regression Summary with Age

	Age	Age	EAMQ-a	EAMQ-e	Age	EAMQ-a	EAMQ-e	SE
CWT#6	ns	ns	*	ns	ns	ns	ns	**
CWT#5	ns	ns	ns	ns	ns	ns	ns	**
CWT#4	ns	ns	*	ns	ns	ns	ns	**
CWT#3	ns	ns	**	ns	ns	ns	ns	**
BWT#2	ns	ns	*	ns	ns	ns	ns	*
BWT#1	ns	ns	*	ns	ns	ns	ns	ns
	Model #1	Model #2			Model #3			

BWT#1 = 7m, usual pace;
BWT#2 = 7m, fast pace;
CWT #3 = 7m, fast pace, obstacles, normal light;
CWT #4 = 7m, fast pace, obstacles, sunglasses;
CWT #5 = 7m, usual pace, pick up object;
CWT#6 = 400m, fast pace (n = 59)

Note: *=p <0.05; **=p <0.01