

Thesis for doctoral degree (Ph.D.)
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Falls, fear of falling, and falls self-efficacy among adults with multiple sclerosis



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**FALLS, FEAR OF FALLING, AND FALLS
SELF-EFFICACY AMONG ADULTS WITH
MULTIPLE SCLEROSIS**

Elizabeth Peterson



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*Our greatest glory is not in never falling
but in rising every time we fall.*

Confucius

ABSTRACT

Although falls are a major cause of morbidity and mortality among older adults and increasingly recognized as a threat to the wellbeing of people living with chronic neurological conditions, fall prevention research involving people with multiple sclerosis (MS) is just emerging. The overall aim of this thesis was to generate new knowledge about fear of falling (FoF), fall-related injuries, and falls self-efficacy among middle aged and older adults with MS to inform development of occupational therapy interventions. Two studies used cross-sectional data from telephone interviews with people with MS. In **Study I**, logistic regression models were used to identify factors associated with increased likelihood of reporting FoF among people with MS and factors associated with activity curtailment among the subset of individuals reporting FoF. The aim of **Study II** was to determine the prevalence of, and risk factors for, receiving medical attention for a recent injurious fall among middle-aged and older adults who have MS. **Study III** aimed to determine the outcomes of a pilot study of a falls risk management program designed specifically for people with MS and the appropriateness of several outcome tools for capturing expected changes. A pre/post intervention design was utilized and telephone interviews were used to gather baseline and post-intervention data. **Study IV** was a phenomenological study undertaken to describe the lived experience of falls self-efficacy in everyday activities among six people with MS. Data were collected via semi-structured interviews and analyzed using the empirical, phenomenological, and psychological method.

The vast majority of the people participating in Studies I-IV lived in the community. **Study I** findings indicated that 63.5% of the participants reported FoF. Increased likelihood of reporting FoF was associated with being female, experiencing greater MS symptom interference during everyday activities, history of a fall in the past 6 months, and using a walking aid. Among participants reporting FoF, 82.6% reported curtailing activity. Increased likelihood of activity curtailment among people reporting FoF was associated with using a walking aid, needing moderate or maximum assistance with instrumental activities of daily living, and having less than excellent self-reported mental health. In **Study II**, more than 50% of participants reported injurious falls; 12%, in the 6 months before the interview. Compared with participants receiving medical attention for a fall-related injury > 6 months ago or never, participants who received medical attention for a fall-related injury within the past 6 months were more likely to report FoF and osteoporosis. In **Study III**, significant improvements were observed for participants attending ≥ 5 :6 program sessions as well as participants attending ≤ 4 sessions, although some instruments, including the Falls Efficacy Scale, exhibited poor internal consistency. The Fall Prevention Strategies Survey, which was developed as part of Study III, yielded valuable information regarding adaptive changes in participants' fall risk management behaviors. In **Study IV**, one main theme (*falls self-efficacy: supporting ability to stay active and involved in life*) and six subthemes were reflected in participants' lived experiences: *understanding personal MS symptoms and fall risk; owning the changed body; focusing on what you can control; learning as you go; having heightened awareness while doing; and taking action.*

In conclusion, this thesis makes a useful contribution to clinical practice by describing the pervasive nature of FoF and fall-related injuries among people with MS and suggesting approaches to assessment and intervention that have the potential to address the specific fall prevention needs of people with MS. Findings from this thesis are relevant to occupational therapists and other professionals who seek to support people with MS in their efforts to manage fall risk and live life to its fullest.

Key words: occupational therapy, multiple sclerosis, falls, fear of falling, falls self-efficacy, injury prevention.

LIST OF PUBLICATIONS

This thesis is based on the following papers, which will be referred to in the text by their Roman numerals:

- I. Peterson, E.W., Cho, C.C. & Finlayson, M. L. (2007). Fear of falling and associated activity curtailment among middle aged and older adults with multiple sclerosis. *Multiple Sclerosis*, 13, 1168-1175.
- II. Peterson, E.W., Cho, C.C., von Koch, L. & Finlayson, M. L. (2008). Injurious falls among middle aged and older adults with multiple sclerosis. *Archives of Physical Medicine and Rehabilitation*, 89, 1031-1037.
- III. Finlayson, M., Peterson, E. & Cho, C. (in press). Findings of a pilot study exploring the potential of a fall risk management program for middle aged and older adults with multiple sclerosis. *NeuroRehabilitation*.
- IV. Peterson, E., Kielhofner, G., Tham, K. & von Koch, L. *Falls Self-Efficacy Among Adults with Multiple Sclerosis: A Phenomenological Study*. Manuscript submitted for publication.

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LIST OF ABBREVIATIONS

ADLs	activities of daily living
AIC	Akaike Information Criterion
BOMC	Blessed Short Orientation-Memory-Concentration Test
CBT	cognitive behavioral therapy
CDC	Centers for Disease Control and Prevention
CI	confidence interval
EPP	empirical, phenomenological, psychological method
FCS	Falls Control Scale
FES	Falls Efficacy Scale
FMS	Falls Management Scale
FoF	fear of falling
FPMQ	Falls Prevention & Management Questionnaire
FPSS	Falls Prevention Strategies Survey
IADLs	instrumental activities of daily living
MS	multiple sclerosis
NARCOMS	North American Research Committee on Multiple Sclerosis
OR	odds ratio
ProFaNE	Prevention of Falls Network Europe
RCT	randomized controlled trial
REM	random effects models
SAHB	<i>Safe at Home BAASE (Behaviors, Attitudes, Activities, Symptoms, Environment)</i>
SE	self-efficacy
US	United States

1 INTRODUCTION

My interest in fall prevention research began when I was a graduate student at the Boston University School of Public Health and was driven by my clinical experiences as an occupational therapist. Across medical and community-based practice settings, I worked with older adults whose lives had been disrupted by fall-related injuries. By participating in fall prevention research, I hoped to support older adults' efforts to avoid falls and engage in activities and roles that are important to them. Thus, my interest in fall prevention research has always been based upon concerns of central interest to occupational therapy. My more recent research involving people with multiple sclerosis (MS) has broadened my perspective of who is impacted by falls. I have come to appreciate that many people with MS are simultaneously managing bodily changes caused by MS and the aging process. This adds a layer of complexity to fall prevention that must be better understood.

The challenges associated with fall prevention for people with MS are substantial. Fall prevention receives little attention in clinical practice (Tinetti, Gordon, Sogolow, Lapin, & Bradley, 2006) and for people with MS, health promotion efforts are often overshadowed by a focus on the underlying medical condition (Shabas & Weinreb, 2000; Sharts-Hopko & Sullivan, 2002). Nonetheless, the studies undertaken as part of this thesis were initiated with the hope that they would raise health care providers' awareness of falls and their consequences, as well as strategies that could be used to support people with MS in their efforts to manage fall risk in day-to-day life. The initial objectives associated with this work focused on learning more about the scope of the problems of fear of falling (FoF), defined as a lasting concern about falling that leads to an individual avoiding activities that he/she remains capable of performing (Tinetti & Powell, 1993), and fall-related injuries among people with MS. Those findings were used to develop a community-based fall risk management program that was designed specifically for people living with MS. Evaluation of the potential of that intervention was an important component of this thesis. Finally, this thesis was undertaken to gain an understanding of the lived experience of falls self-efficacy, i.e., perceived self-efficacy or confidence at avoiding falls during essential, nonhazardous activities of daily living (Tinetti, Richmond, & Powell, 1990).

2 BACKGROUND

2.1 FALLS AMONG OLDER ADULTS AND INDIVIDUALS LIVING WITH CHRONIC NEUROLOGICAL CONDITIONS

A fall is an unexpected event during which the individual comes to rest on the ground, floor, or lower level (Lamb, Jørstad-Stein, Hauer, Becker, & Prevention of Falls Network Europe and Outcomes Consensus Group, 2005), typically during the performance of basic daily activities (Nachreiner, Findorff, Wyman, & McCarthy, 2007). Accumulating evidence points to the fact that for many people, falls are a substantial threat to occupational performance, which is defined as the act of doing and accomplishing a selected activity or occupation that results from the dynamic transaction among the client, the context, and the activity (Law et al., 1996).

Fall related injuries are widely recognized as a serious public health issue among people aged ≥ 65 years in developed countries (Lord, Ward, Williams, & Anstey, 1993; Kannus, et al., 1999; Scuffham, Chaplin, & Legood, 2003). In the US, falls are the leading cause of injury deaths for adults over age 65 and the most common cause of nonfatal injuries and hospital admissions for traumatic injuries (Sleet, Moffett, & Stevens, 2008). Approximately 10% of falls result in major injuries such as fractures, head injuries and soft tissue injuries (Tinetti, Speechley, & Ginter, 1988; Campbell, et al., 1990; von Heideken Wågert, Gustafson, Kallin, Jensen, Lundin-Olsson, in press.) It has been estimated that falls account for one third of the total cost of medical treatment for all injuries (Sjögren & Björnstig, 1989). Fall-related injuries are associated with declines in independence in activities of daily living (ADLS). Schiller, Kramarow, and Day (2007) found that 32% of older adults who sustained a fall-related injury required help with ADLs as a result, and among them 58.5% were expected to require help for at least six months.

Both the incidence and severity of fall-related complications increase with age, level of disability and extent of functional impairment (van Weel, Vermeulen, & van den Bosch 1995). Approximately 30% of older adults (i.e., people aged ≥ 65 years), living in the community fall each year (Tinetti et al., 1988; Hausdorff, Rios, & Edelberg, 2001). Among community-dwelling people living with neurological conditions such as MS, Parkinson's disease and stroke, the prevalence of falls is much higher (Finlayson,

Peterson, & Cho, 2006; Nilsagård, Lundholm, Denison, & Gunnarsson, 2009; Wood, Bilclough, Bowron, & Walker, 2002; Mackintosh, Goldie, & Hill, 2005). Nilsagård et al. (2009), prospectively recorded fall rates among people with MS in Sweden over a three month period and reported a prevalence rate of 63%.

2.1.1 Risk factors for falls and injurious falls

Multiple, diverse, and interacting etiologies typically contribute to falls (Chang & Ganz, 2007), with the risk of falling increasing dramatically as the number of risk factors increases (Nevitt, 1997). Fall risk factors are typically classified as intrinsic (e.g., lower extremity weakness, balance impairment) or extrinsic (e.g., polypharmacy) and environmental factors (American Geriatrics Society, British Geriatrics Society, & American Academy of Orthopaedic Surgeons Panel on Falls Prevention, 2001). These risk factors vary across medical conditions and settings (e.g., community-dwelling older adults vs. older adults from nursing care facilities and hospitals) (Rubenstein & Josephson, 2002; Koski, Luukinen, Laippala, & Kivela, 1998; Gillespie et al., 2009). Overall, balanced attention to both intrinsic and extrinsic risk factors is warranted because the interaction between an older person's physical abilities and their exposure to environmental stressors appears to influence fall risk (Lord, Menz, & Sherrington, 2006).

Among community-dwelling older adults, common intrinsic fall risk factors include higher age, previous falls, impairments in muscle strength, balance, gait, cognition, and vision; depressive symptoms; postural hypotension; and arthritis (Bergland & Wyller, 2004; Sattin, 1992; Tinetti et al., 1988; Tinetti, Doucette, Claus, & Marottoli, 1995; Campbell et al., 1990). FoF and low falls self-efficacy are also important, intrinsic fall risk factor among older adults (Friedman, Munoz, West, Rubin, & Fried, 2002; Cumming, Salkeld, Thomas, & Szonyi, 2000). With respect to extrinsic risk factors for community-dwelling older adults, polypharmacy (i.e., four or more medications) and certain classes of drugs, especially sedatives and hypnotics increase fall risk (Ray, Griffin, Schaffner, Baugh, & Melton, 1987). Home hazards contributing to fall risk among older adults have been widely studied and include obstructed walkways, unsafe stairs and steps, floor rugs without nonslip backing, slippery floors and inadequate lighting (Stevens, Holman, & Bennett, 2001; Clemson, 1997; Carter, Campbell, Sanson-Fisher, Redman, & Gillespie, 1997). Two studies have been undertaken to examine fall risk factors among community-dwelling people with MS (Finlayson et al.,

2006; Nilsagård et al., 2009). Factors associated with increased fall risk identified in the study by Finlayson et al., (2006) included being male, incontinence of bladder, FoF, problems with poor concentration or forgetfulness, deteriorating MS course in the past year, problems with balance or mobility, and periodically using a wheelchair. In their longitudinal study, Nilsagård et al. found that compared to nonfallers, fallers used walking aids, had more spasticity, greater disturbance in proprioception, and higher (poorer) ratings on the Expanded Disability Status Score.

Fall-induced injuries are a common source of restricted activity, disability and death (Kannus, Niemi, Palvanen, Parkkari, & Järvinen, 2005; Gill, Allore, Holford, & Guo, 2004), therefore understanding risk factors for injurious falls is important. Knowledge about the prevalence of injurious falls and their consequences largely stems from research involving older adults. Findings from Koski et al. (1998), however, suggest that rates of injurious falls may be higher for people living with disabilities. Those researchers retrospectively studied injurious falls among disabled and independent elderly over a two year period and found that two thirds of the fallers that sustained an injury were disabled. Of central importance to this thesis is that many common MS symptoms, such as balance or gait impairment, visual impairment, and cognitive impairment, are known risk factors for injurious falls among disabled and nondisabled older adults (Bergland & Wyller, 2004; Grisso et al., 1997; Tinetti et al., 1995; Nevitt, Cummings, & Hudes, 1991; Kelsey, Browner, Seeley, Nevitt, & Cummings, 1992; Koski et al.). People with MS are also at higher risk for osteoporosis than are age- and sex-matched controls (Cosman et al., 1998) and bone weakness caused by osteoporosis is recognized an important contributor to the likelihood of sustaining fall-related fractures (Cummings & Melton, 2002). Recognizing the differences in risk factors for injurious falls among different population subgroups, the United States (US) Centers for Disease Control and Prevention (CDC) has called for tailored fall prevention interventions (Sleet et al., 2008). To apply this call to action to the development of interventions for people with MS, studies of injurious risk factors among people living with MS are needed.

2.1.2 Fear of falling and falls self-efficacy

FoF is common. Although measures of FoF vary, it appears that somewhere between a third and a half of the community-dwelling elderly acknowledge FoF (Zijlstra et al., 2007; Howland et al., 1993; Arfken, Lash, Birge, & Miller, 1994; Tinetti, Mendes

deLeon, Doucette, & Baker, 1994). Information regarding FoF among people living with MS is limited, however Finlayson et al. (2006) found that that 60% of people with MS who reported a fall also reported FoF. Nilsagård et al. (2009) reported that 14/48 (29%) of people with MS who had recently fallen reported moderate or severe FoF. Among older adults, the main risk factors for developing FoF are history of at least one fall, being female, and being older (Scheffer, Schuurmans, van Dijk, van der Hooft, & de Rooij, 2008), however FoF is also common among older adults who have not fallen (Friedman et al., 2002). The literature review undertaken prior to the commencement of this thesis revealed no studies describing risk factors for FoF among people living with MS.

Understanding of FoF has grown tremendously over the past 15 years and suggests that FoF is associated with indicators of compromised occupational performance or barriers to occupational performance. Cross-sectional studies involving older adult subjects demonstrate associations between FoF and reduced quality of life (Arfken et al., 1994; Lachman, et al., 1998), depression (Arfken et al.; Gagnon, Flint, Naglie, & Devins 2005), characteristics of frailty (Arfken et al.); neuroticism (Mann, Birks, Hall, Torgerson, & Watt, 2006); anxiety disorders (Gagnon et al.) general fearfulness (Lawrence et al., 1998) and falls (Howland et al., 1993). Studies examining FoF among people with neurological conditions are just emerging but suggest FoF is an important issue impacting rehabilitation and fall risk among people living with MS and Parkinson's disease or among people who have experienced a stroke (Finlayson et al., 2006; Schmid & Rittman 2007; Watanabe, 2005; Robinson et al., 2005; Dennison et al., 2007; Adkin, Frank, & Jog ,2003). For many people, FoF leads to activity curtailment. Estimates of activity curtailment associated with FoF among community-dwelling adults range from 19% to 56% (Murphy, Williams, & Gill, 2002; Howland, et al., 1998; Fletcher & Hirdes, 2004; Zijlstra et al., 2007). Among people aged 45-65 years, 10-13% report limiting activity due to FoF (Wilson et al., 2005; Martin, Hart, Spector, Doyle, & Harari, 2005). The potential for FoF to lead to unnecessary restriction of activity is of particular concern to occupational therapists because occupational therapy is founded on an understanding that engaging in occupations (i.e., "goal-directed pursuits that typically extend over time, have meaning to the performance, and involve multiple tasks") structures everyday life and contributes to health and well-being (American Occupational Therapy Association, 2008; Christiansen, Baum, & Bass-Haugen, 2005. p. 548).

In the longitudinal study involving people with MS conducted by Nilsagård et al., (2009), FoF was not associated with fall risk. Prospective research involving community-dwelling older adults, however, suggests that people who are afraid of falling appear to enter a debilitating spiral of loss of confidence, restriction of physical activities and social participation, physical frailty, falls, and loss of independence (Friedman et al., 2002; Delbaere, Crombez, Vanderstraeten, Willems, & Cambier, 2004). Further, these studies show that people who limit activity because of FoF are at particularly high risk of becoming fallers (Friedman et al.; Delbaere et al.).

Overall, the etiology of FoF is not well understood. Three qualitative studies exploring the nature of FoF provide some insights regarding the development of the fear. Tischler & Hobson (2005) and Lee, Mackenzie, and James (2008) studied community-dwelling older adults and found that their participants expressed FoF as fear of losing independence or becoming dependent upon others. Among older adults, FoF was also experienced as fear of physical injury, fear of being unable to get up or get help after a fall, fear of being institutionalized, and fear of being confined to a wheelchair or unable to walk (Tischler & Hobson, 2005). Schmid and Rittman (2007) explored stroke survivors' recovery experiences and found that the development of FoF was closely tied to initial falls coinciding with stroke onset and perceptions of poststroke body changes.

In many circumstances (e.g., when physical abilities do not support safe involvement in a specific activity), the decision to not engage in a given activity in an effort to avoid a fall may be an appropriate (protective) response to high fall risk. On the other hand, withdrawal from valued activities may be largely driven by low falls self-efficacy. The concept of falls self-efficacy was originally defined by Tinetti, et al., (1990), who developed the Falls Efficacy Scale (FES). When introduced, the FES was intended as a measure of FoF, however evidence now suggests that falls-self-efficacy and FoF are separate constructs (McKee et al., 2002) and that falls self-efficacy may act as a mediator to reduce FoF (Li, Fisher, Harmer, & McAuley, 2005). Prospective studies have highlighted the clinical significance of falls self-efficacy by demonstrating that compared with those with a high falls self-efficacy, older adults with a low falls-self-efficacy have an increased risk of falling, and greater declines in ability to perform ADLs (Cumming et al., 2000).

Although tests of falls self-efficacy are widely used in rehabilitation research (Jørstad, Hauer, Becker, Lamb, & Prevention of Falls Network Europe [ProFaNE] Group, 2005; Yardley et al., 2005) and many evidence-based interventions are intended to improve falls self-efficacy (Zijlstra et al., 2007), qualitative studies exploring the nature of falls self-efficacy have not been published. The lack of qualitative studies exploring FoF and falls self-efficacy is surprising, as such studies have the potential to inform both assessment and intervention strategies.

2.1.3 Interventions addressing falls, fear of falling and falls self-efficacy among community-dwelling older adults

Evidence that falls can be prevented among community-dwelling older adults is strong and based on over 100 high quality randomized controlled trials (RCTs). Meta-analyses of clinical trials have concluded that interventions with multiple components and single factor interventions (e.g., exercise programs, withdrawal of some types of drugs for improving sleep, reducing anxiety and treating depression, cataract surgery, and pacemaker insertion) are effective in preventing falls among community-dwelling older adults (Gillespie et al., 2009 Chang et al., 2004). Interventions featuring multiple components typically utilize interdisciplinary health care teams and often include occupational therapists.

Approaches to the delivery of interventions with multiple components differ. In some studies (e.g., Clemson et al., 2004), one complex intervention featuring diverse components is provided to all intervention participants. In other studies, a targeted, multifactorial approach is used whereby intervention subjects receive interventions for risk factors that have been identified through the assessment process (e.g., Tinetti et al., 1994). This approach follows the logic supported by early work by Tinetti, McAvay, & Claus (1996) who found that reduction in fall risk may be associated with the number of risk factors improved or eliminated. The meta-analysis conducted by Gillespie et al. (2009) suggests that this type of intervention may be among the most effective in reducing rate (as opposed to risk) of falling. Based on their review of the literature, members of the American Geriatrics Society /British Geriatrics Society Expert Panel on Fall Prevention recommend that the following be included in multifactorial interventions, if indicated by risk factor assessment: environmental assessment conducted by a health care professional and adaptation; balance training, resistive (strengthening) exercises and gait training; reductions in psychoactive medications and

other medications; management of vision problems, and postural hypotension as well as other cardiovascular and medical problems (Tinetti, 2006).

It is important to note that in recent years, it has become common practice to measure both fall outcomes and outcomes of psychological difficulties related to falls (i.e., falls self-efficacy, FoF) in fall prevention trials involving older adults. This development may have been hastened by Friedman et al. (2002) who studied the temporal relationship between falls and FoF and found that individuals who develop one of these outcomes are at risk for developing the other, with a resulting spiraling risk of falls, FoF, and functional decline. In general, a number of randomized trials have contributed to the clinical relevance of FoF and low falls self-efficacy by demonstrating that they can be mitigated (Jung, Lee, & Lee, 2009). Limited but fairly consistent findings show that home-based exercise and fall-related multifactorial programs and community-based Tai Chi delivered in group format have been effective in reducing FoF or increasing falls self-efficacy in community-living older people (Zijlstra et al., 2007).

2.1.4 Interventions addressing falls among people with neurological conditions living in the community

Few RCTs describing evaluations of fall prevention programs for individuals with neurological conditions who live in the community have been published, and none of the RCTs examining fall prevention strategies or fall risk reduction strategies for people with chronic neurological conditions have targeted people with MS. The neurological patient populations most studied in the context of fall prevention are people who have experienced a stroke and people living with Parkinson's disease. One RCT involving people with Parkinson's disease evaluated the effect of a vitamin D analogue on bone mineral density and fracture rate and found that the number of falls was similar in the intervention and control groups (Sato, Manabe, Kuno, & Oizumi, 1999). Studies by Protas et al. (2005), Ashburn et al. (2007) and Green, Forster, Bogle and Young (2002) involved people who had experienced a stroke or people with Parkinson's disease. Each of these studies featured exercise-based approaches to fall prevention and failed to show significant intervention effects. Thus, findings from these studies suggest new approaches to reducing falls for people living with neurological conditions are warranted.

2.2 MULTIPLE SCLEROSIS

MS is a chronic, debilitating disease of the central nervous system that typically diagnosed among people between the ages of 20 and 50. MS prevalence estimates range from 20 to 200 cases per 100,000 people, depending on the population under study and the geographical region of the world (Kantarci & Wingerchuk, 2006; Aronson, Goldenberg, & Cleghorn, 1996; Weinshenker, 1996; Dean, 1994). Although conventionally included among the autoimmune diseases (Ragonese, Aridon, Salemi, D'Amelio, & Savettieri, 2008), genetic factors play a role in the pathogenesis of the disease and environmental factors also contribute to MS risk (Compston et al., 2004).

Inflammation with loss of myelin, oligodendrocytes, and axonal degeneration are the major components in determining clinical evolution of the disease (Saccardi et al., 2005). Immunosuppressive/ immunomodulating treatments are commonly used in the medical management of MS, but those therapies are only partly effective for most patients (Goodin et al., 2002). MS is a progressive disease, and the majority of people living with MS will eventually experience a worsening of symptoms and deterioration in functioning (Kantarci & Weinshenker, 2005; Wingerchuk & Weinshenker, 2000). Although MS can result in considerable disability, mortality is only slightly higher in MS when compared with that in the general population (Ragonese et al., 2008).

Because impairment depends on the area of the central nervous system that is affected by MS, people with MS can experience a range of physical, sensory, emotional, and cognitive symptoms (Brassington & Marsh, 1998). These symptoms include, but are not limited to fatigue, urinary incontinence, vision loss, impairment of coordination, spasticity, muscle weakness and cognitive impairment (Ragonese et al., 2008). At least 75% of people with MS experience walking disability (Einarsson, Gottberg, von Koch, et al., 2006), more than half have limitations in ADL (Einarsson, Gottberg, Fredriksson, von Koch, & Holmqvist, 2006), and 38-65% experience restriction of participation in social/lifestyle activities (Rodriguez et al., 1994). In general, the symptoms of MS can come and go as scars develop and heal on the central nerves. Consequently, the disease is unpredictable both day-to-day and over time (Joy & Johnston, 2001). The variable nature of MS was recently illustrated by a two-year prospective study that reported variability but no general deterioration in the functioning over the study period (Ytterberg, Johansson, Anderson, Widén Holmqvist & von Koch, 2008).

Qualitative research has led to a greater understanding of the complex nature of functional decline among people with MS (Boss & Finlayson, 2006; Finlayson, 2004) and the relationship between functioning and strategies used by people with MS to manage the condition. Findings from qualitative studies suggest that when strategies are ineffective, functioning is negatively influenced, particularly with respect to mental and social health (Fong, Finlayson, & Peacock, 2006; Finlayson, VanDened, & Shevil, 2003) and community participation (Benjamin & Finlayson, 2007).

2.3 THEORETICAL CONSIDERATIONS

The theoretical foundations of this thesis are based upon two models widely used in occupational therapy practice: the Person-Environment-Occupation Model and the Model of Human Occupation. This thesis also draws upon phenomenological traditions and social learning theory, with attention to the concept of self-efficacy (SE) and use of cognitive behavioral therapy (CBT).

2.3.1 The Person-Environment-Occupation Model

The third study of this thesis involved development of an intervention which was informed by the Person-Environment-Occupation Model. The Person-Environment-Occupation Model was developed to facilitate understanding of the dynamic and complex nature of occupational performance and to serve as a framework or tool to systematically approach to the analysis of occupational performance issues (Strong et al., 1999). The Person-Environment-Occupation Model is purposefully flexible and its elements are broadly defined to allow adaptation and explanation for specific practice situations (Stewart et al., 2003). The key assumption of the model is that the person, environment, and occupation interact continuously across time and space in ways that increase or decrease their congruence: the closer the fit, the greater the overlap or occupational performance. Interventions developed through the application of the Person-Environment-Occupation framework are directed at improving the congruence of Person-Environment-Occupation transactions in an effort to enhance occupational performance.

Several features of the Person-Environment-Occupation Model are of particular importance to this thesis. First, Person-Environment-Occupation Model holds a transactive (as opposed to interactive) view of the environment and assumes interdependence of the person and the environment. Overall, the model is inclusive in

its consideration of physical, cultural institutional, and socioeconomic aspects of the environment (Law et al., 1996). Second, client-centered practice, which features a collaborative approach to determining what the client wants or needs to perform, is an over-arching value of the model (Stewart et al., 2003). Third, within the Person-Environment-Occupation Model, the person is considered a unique being of mind, body and spirit who is intrinsically motivated by the drive for occupation (Law et al., 1996). That drive leads the person to assume a variety of roles simultaneously. Those roles are dynamic, varying across time and context in their importance and duration (Law et al.). The occupational therapy evaluation process is therefore on-going and considers the client's roles, values and interests, skills, abilities, self-concept and life experiences.

2.3.2 Social learning theory and cognitive behavioral therapy

The concept of falls self-efficacy, which is used in this thesis, is derived from the concept of SE, which is of central importance to social learning theory. Leading social learning theorists include Bandura, who worked to systematize the theory (Bandura, 1977a) and Mischel, who described human beings as problem solving organisms seeking to behave in ways that maximize both rewards in the environment and internal awards in the form of self-praise (Mischel, 1977). Bandura and Mischel emphasized a view of the person as active, using symbolic (cognitive) processes to represent events and communicate with others, and capable of choice and self-regulation (Pervin, 1980).

According to social learning theory, anxiety results from perceived inefficacy in coping with potentially aversive events, rather than the threat of unconscious impulses.

Anxiety is not seen as leading to defensive (avoidance) behaviors. Rather, anxiety and defensive avoidance both are seen as resulting from negative expectations (Pervin, 1980). According to Bandura (1977a), the change process associated with reducing anxiety involves the acquisition, generalizability, and maintenance of new patterns of thought and behavior. Treatment approaches utilized in the application of social learning theory include modeling and guided participation. At the root of such procedures is a cognitive process involving improving perceived SE, i.e., the beliefs that an individual holds about his or her capacity to carry out action in a way that will influence the events that affect his or her life (Smith, Tang, & Nutbeam, 2006). SE is important because it determines how people feel, think, motivate themselves and behave. SE also influences how much effort people will expend and how long they will

persist in the face of obstacles and aversive experiences (Bandura, 1994; Bandura, 1977b).

The intervention evaluated in Study III was designed to improve falls self-efficacy among participants and procedures informed by CBT were used to support attainment of that outcome. Due to its emphasis on the relationship between cognitive processes and behavior and effectiveness in improving self-efficacy, CBT is complimentary to social learning theory. CBT is a term that describes a variety of approaches to therapy that involve cognitive mediation of behavior as a fundamental core of treatment (Taylor, 2006). CBT approaches share the assumption that cognition affects behavior, cognition can be monitored and altered, and that behavior change is mediated by cognitive change (Dobson & Dozios, 2001).

The aim of cognitive-behavioral therapy (CBT) is to identify, evaluate, and change maladaptive distorted belief systems and dysfunctional styles of information processing (Beck, 1979). Recognizing that attitudes and beliefs affect behavior, cognitive-behavioral therapists work with clients to correct habitually negative ways of thinking. According to Dobson & Dozios (2001), cognitive behavioral therapies can be grouped under three broad categories: coping skills methods, problem solving methods and cognitive restructuring methods. CBT approaches to psychotherapy have many advantages: they are structured, empowering, and time-efficient (Beck, 1995). In addition, CBT can be conducted in group settings. Group based CBT may be especially beneficial for older adults. By observing age mates, older adults can preserve or enhance a sense of self-efficacy in the face of changing abilities (Frey & Ruble, 1989).

2.3.3 Phenomenology

Exploration of the experience of falls self-efficacy was an important aspect of this thesis. The methodological approach used in that endeavor was based on phenomenological traditions (Husserl, 1925/1970; Karlsson, 1993) which seek to understand an individual's lived experience. The notion of lived experience can be traced to Husserl's concept of the *life world*. Husserl described the life-world (*Lebenswelt*) as the concrete and lived existence in the world, as it is experienced by humans (Dahlberg, Drew, & Nyström, 2001). Life-world research, which seeks to understand the meanings in everyday experiences, is challenging because in the life-world, meanings are often implicit or tacit (i.e., taken for granted). Nonetheless,

phenomenologists are committed to the effort to begin with what is given in immediate experience, to turn the essential features of what presents itself as it presents itself to consciousness, and to thereby clarify the constitutive activity of consciousness and the sense-structure of experiencing (Toombs, 1993). The task is to render explicit the taken-for-granted assumptions of everyday life and to bring to the fore one's consciousness of the world. In rendering explicit the intentional structures of consciousness, phenomenological reflection thematizes the meaning of experience (Toombs).

In addition to utilizing Husserl's concept of the life world, this thesis draws upon the work of Merleau-Ponty who extended Husserl's idea of the life-world by emphasizing the importance of the *lived world*, that is, the world we have access to through our bodies. Because the body is basic to all human experience (Kvigne, Kirkevold, & Gjengedal, 2005), all knowledge that we develop is "embodied knowing" (Dahlberg et al., 2001). The lived body is the taken-for granted place from which people exist and from which they attend and act on the world (Merleau-Ponty, 1945/2002).

2.3.4 The Model of Human Occupation

The Model of Human Occupation was used in Study IV to interpret the findings from an occupational perspective. The model conceptualizes man as an open system (i.e., an organized complex of subsystems that are in dynamic interaction) and views occupational behavior as the output of that open system (Kielhofner, 2008). The model was the first occupational therapy model to emphasize the importance of the dynamic relationship between humans and their environments. It views human occupation as arising out of a neurogenic and embodied need to act and is based on the assumption that occupation is a central aspect of the human experience (Kielhofner & Burke, 1980).

The Model of Human Occupation is ultimately concerned with the extent to which individuals can participate in life occupations and achieve a state of positive adaptation which involves constructing a positive occupational identity and achieving occupational competence over time in the context of one's environment (Kielhofner, Forsyth, Kramer, Melton & Dobson, 2009). The model presents occupational identity as a composite (subjective) sense of who one is and wishes to become as an occupational being. Occupational competence is the degree to which one is able to

sustain a pattern of occupational participation that reflects one's occupational identity. According to the model, occupational adaptation hinges on constructing identities that correspond to one's underlying capacities and environmental possibilities which can be put into effect (Kielhofner, 2008).

The model views what a client does, thinks and feels as the central mechanism for change leading to enhanced occupational adaptation. Therapeutic reasoning in the Model of Human Occupation focuses on understanding clients in terms of their a) motivation for occupation (i.e., their volition), which is made up of personal causation (one's sense of competence and effectiveness), values (what one finds important and meaningful to do) and interests (what one finds enjoyable or satisfying to do); b) roles and habits; and c) performance-related experiences within relevant environments. The model explains that volitional development and change occurs through a process that involves stages of exploration, competency and achievement.

2.4 RATIONALE FOR THIS THESIS

In summary, falls-related injuries, and FoF are widely recognized as threats to the occupational performance of older adults and increasingly understood as threats to the safety and independence of people living with neurological conditions. Despite evidence suggesting that falls and FoF may be significant problems for people with MS, little is known about the prevalence of, and risk factors associated with, fall-related injuries or FoF among people with MS. In the absence of a basic understanding of the risk factors and consequences of fall-related injuries and FoF among people with MS, it is difficult to justify attention to fall prevention or FoF and develop effective fall prevention programs for this specific population of people. Further, studies describing interventions designed specifically for people with MS to help them reduce their fall risk or prevent falls are absent from the medical literature. The progressive nature of MS and the variable nature of its symptoms place unique demands on people with MS who are attempting to remain engaged in valued occupations while avoiding falls. Current approaches to fall prevention for people with neurological conditions largely utilize exercise-based intervention strategies and do not appear to be promising. Together, this information suggests the need for comprehensive fall risk management programs designed specifically for people with MS. Finally, to date, qualitative research exploring falls self-efficacy, a concept widely used by fall researchers, has not yet been published. Such research is needed in order to understand the features of falls

self-efficacy from the perspective of individuals who consider themselves to be at risk for falls and inform efforts to measure and build falls self-efficacy. Due to the prevalence and unique challenges associated with MS, there is a pressing need to understand how falls self-efficacy is experienced by people living with MS.

3 AIMS

General aim

The overall aim of this thesis was to generate new knowledge about FoF, fall-related injuries, and falls self-efficacy among middle aged and older adults with MS in order to inform development of evidence-based occupational therapy interventions designed to help people aging with MS manage fall risk.

Specific aims

The specific aims of the thesis were to:

- I. identify factors associated with increased likelihood of reporting FoF among people with MS and factors associated with activity curtailment among the subset of individuals reporting FoF;
- II. determine the prevalence of, and risk factors for, receiving medical attention for a recent injurious fall among middle-aged and older adults who have MS;
- III. determine the outcomes of a pilot study of a falls risk management program designed for middle-aged and older adults with MS and the appropriateness of several outcomes tools for capturing expected changes;
- IV. describe the lived experience of falls self-efficacy in everyday activities among six people with living with MS.

4 METHODS

Table 1 provides an overview of the methods used in each of the four studies included in this thesis.

Table 1. Overview of the four studies.

	Study 1	Study 2	Study 3	Study 4
Design/research approach	Cross-sectional/ quantitative	Cross-sectional/ quantitative	Pre/post intervention/ quantitative	Qualitative, phenomenological
Data collection <i>(methods and assessment instruments)</i>	Interviews by telephone using a structured interview guide which included the Blessed Short Orientation- Memory- Concentration Test.	Interviews by telephone using a structured interview guide which included the Blessed Short Orientation- Memory- Concentration Test, Falls Efficacy Scale, and the Falls Control Scale.	Interviews by telephone using a structured interview guide which included the Blessed Short Orientation- Memory- Concentration Test, Falls Efficacy Scale, Falls Control Scale, Falls Management Scale, Falls Prevention & Management Questionnaire, and the Falls Prevention Strategies Survey.	In-person interviews using a semi-structured interview guide.
Data analysis	Descriptive statistics, logistic regression	Descriptive statistics, proportional odds	Descriptive statistics, paired t- test, multivariate fixed effects regression models, random effects regression models, McNemar's tests, Wilcoxon Sign- Rank tests, Chronbach's alphas	Empirical, phenomenological, psychological method

4.1 STUDY PARTICIPANTS

4.1.1 Study I

Study I participants were part of a larger study focused on identifying and describing the unmet health-related service needs of people aging with MS in the US. Five methods were used to identify and recruit potential participants: direct mailing to members of the National Multiple Sclerosis Society (NMSS), advertising through the *MS Connections* newsletters, flyers distributed by means of NMSS events, advertising in nursing homes and assisted living facilities known by NMSS chapter staff to have multiple residents with MS, and direct mailing to registrants of the North American Research Committee on Multiple Sclerosis (NARCOMS) database (Finlayson, Garcia, & Cho, 2008). People willing to be contacted for a telephone interview associated with the “unmet needs” study returned a form to the study office in a postage-paid return envelope. This form provided their contact information and the best days and times to reach them (Finlayson et al., 2006). Participation in the “unmet needs” study was open to people who a) were 45 years of age or older, b) had a self-reported diagnosis of MS, c) were willing to participate in a telephone interview. Additionally, all Study I participants answered the questions pertaining to FoF and associated activity curtailment and successfully completed the cognitive screening which included use of the Blessed Short Orientation-Memory-Concentration Test (BOMC; Katzman et al., 1983).

4.1.2 Study II

Study II participants were recruited exclusively through the NARCOMS Registry. Study II participation was open to people who a) were 55 years of age or older, b) had a self-reported diagnosis of MS, and c) were willing to participate in a telephone interview. Seven hundred people with MS who were aged 55 years or older and living in the US were randomly selected and invited by mail to participate in the study. Interested people were asked to contact the study office to confirm eligibility. Individuals who agreed to be interviewed were screened for cognitive impairment using the BOMC. Individuals with BOMC scores of ≥ 9 were not included in Study II.

4.1.3 Study III

Study III participation was initially open to people who a) had a self-reported diagnosis of MS, b) were 55 years of age or older, c) experienced at least one fall to the ground in the past year, d) used a mobility device at least occasionally, e) were able to participate in a group intervention delivered in English, and f) had a score of 8 or less on the BOMC (Katzman et al., 1983). In an effort to recruit more study participants, the age restriction was eventually dropped to 40 years.

4.1.4 Study IV

A subset of the participants in Study III were recruited for Study IV. In Study IV, purposeful sampling was used to identify participants who would be able to provide rich information regarding the lived experience of falls self-efficacy. To that end, Study IV participation was limited to people who had a) actively participated in $\geq 3:6$ sessions and completed the *SAHB* program; and b) indicated willingness to participate in future studies. Attempts were made to recruit equal number of men and women, and individuals who presented with different levels of falls self-efficacy.

4.2 INTERVENTION STRATEGY

Of the four studies, one involved development, delivery and evaluation of an intervention. Specifically, the *Safe at Home BAASE (SAHB)* program was evaluated in Study III. *SAHB* is a 12-hour program delivered through six, two-hour sessions. The first five sessions are conducted over five consecutive weeks. The final “booster” session is held one month after the fifth session. Through a combination of lectures, discussion, small group activities and at-home application exercises, participants examine how behavior (*B*), attitudes (*A*), activity (*A*), symptoms (*S*) and the environment (*E*) influence falls and can be modified to reduce fall risk. The program was developed by occupational therapists with input from an international, multidisciplinary work group and intended for use in occupational therapy practice.

The *SAHB* program contains evidence-based components drawn from Study II findings as well as research involving community-based older adults (e.g., use of a multi-component intervention; inclusion of exercise and home safety content). The program’s development was also informed by the Person-Environment-Occupation Model (Law et al., 1996). In accordance with the Person-Environment-Occupation Model, the *SAHB* program considers person, environmental, and occupation-based influences on fall risk

and aims to reduce fall risk among program participants by helping them improve congruence of Person-Environment-Occupation transactions. In the *SAHB* program, attention to fall risk factors residing within the individual person with MS took many forms. Perhaps most importantly, the *SAHB* was created specifically for people with MS. The program features content on MS symptoms and fall risk, and utilizes exercise strategies that were appropriate for people with MS. In addition to attending to physical risk factors, *SAHB* utilizes techniques from CBT to build participants' falls self-efficacy. *SAHB* was developed as a group-based program in order to build participants' falls self-efficacy via peer modeling and social persuasion.

The *SAHB* program reflects the Person-Environment-Occupation Model's attention to physical, cultural institutional, and socioeconomic aspects of the environment. With respect to the physical environment, the *SAHB* program presents improving home and community safety as one component of a comprehensive fall risk management program. This perspective is consistent with evidence-based trends in fall prevention (Gillespie et al., 2009). Finally, during the *SAHB* program, participants learn skills that could be used to manage occupation or activity-related fall risks. For example, participants are taught to recognize when activity demands exceeded personal abilities. Activity analysis and modification strategies were presented in the context of fatigue management. By using occupation-based homework assignments and framing discussions of fall management strategies within the specific context of occupations as they are performed by program participants, the *SAHB* program reflects Person-Environment-Occupation Model's emphasis on the power and value of occupation.

4.3 DATA COLLECTION

Self-reported data was used in each of the four studies making up this dissertation. The instruments used to collect that data are described in the section that follows.

4.3.1 Study I

The Study I interview guide gathered information regarding sociodemographic characteristics and background. It included items pertaining to community type drawn from work by Hammel, Finlayson and Lastowski (2003) and items to assess income adequacy developed by Chipperfield, Havens, and Doig (1997). The interview guide also gathered information regarding participants' MS course, presence and extent of symptoms, limitations in ADLs and instrumental ADLs (IADLs), the use of assistive

technology, availability of social support, and the use of a wide range of health and ancillary services. Items pertaining to MS symptoms were based upon work by Finlayson and Wiebe (1998) and Kersten et al. (2000). Questions pertaining to functional status were drawn from the work of Fillenbaum (1988) and Hoenig, Hoff, McIntyre, and Branch (2001). Additionally, information was collected about falls in the past 6 months, FoF, and associated activity curtailment. The FoF variable used was drawn from the work of Yardley et al. (2005). An item developed by Howland et al. (1998) was used to collect data on activity curtailment associated with FoF.

The BOMC (Katzman et al., 1983) was included in the interview guide as part of the cognitive screening procedure used in Study I. The BOMC, also known as the Short Blessed Test, or the 6CIT (Katzman et al.), correlates well with the Mini Mental Status Exam (Goring, Baldwin, Marriot and Pratt, 2004, Brooke & Bullock 1999), outperforms the Mini Mental Status Exam milder dementia (Brooke & Bullock), and correlates highly with plaque in the temporal, parietal, and frontal cortexes (Katzman et al.). Together these findings suggest that the BOMC has good validity. It also has excellent test-retest reliability (Ball, Bisher, & Birge, 2006; Kawas, Karagiozis, Resau, Corrada, & Brookmeyer, 1995) and intra-rater reliability (Wade & Vergis, 1999).

4.3.2 Study II

The Study II interview guide gathered sociodemographic information, background about participants' MS course, presence and extent of MS symptoms, presence of activity limitations, the use of assistive technology to aid in day-to-day tasks, and availability of social support. Again, wherever possible, survey items designed to collect this information were drawn from existing studies of falls or MS. As in Study I, the BOMC (Katzman et al., 1983) was used to screen for cognitive impairment. The Study II interview guide included a number of questions designed to gather detailed data about participants' FoF, associated activity curtailment, falls self-efficacy and recent fall experiences. The variables used to assess FoF and associated activity curtailment were drawn from the work of Howland et al. (1993). The interview guide included the FES (Tinetti et al., 1990) and also the Falls Control Scale (FCS) developed by Tennstedt et al. (1998). Two open-ended questions were asked to inquire about participants' most recent fall and whether they had ever sought medical attention because of a fall-related injury.

4.3.3 Study III

In Study III, three tools were used to assess the extent to which *SAHB* led to increased knowledge of fall risk factors: the FCS (Tennstedt et al., 1998), the Falls Management Scale (FMS) (Tennstedt et al.) and the Falls Prevention & Management Questionnaire (FPMQ). The FPMQ was developed specifically for Study III and addressed 12 areas of knowledge addressed during *SAHB*. The reliability and validity of both the FCS and the FMS for community-dwelling older adults has been established (Healy et al., 2008). In addition to assessing knowledge of fall risk factors, both the FPMQ and the FMS were used to capture the extent to which *SAHB* participants increased skills to manage falls and falls risk.

To assess the extent to which *SAHB* participants modified behaviors to reduce personal fall risk, the Falls Prevention Strategies Survey (FPSS) was developed. The instrument was modeled after the Energy Conservation Strategies Survey (Mathiowetz, Finlayson, Matuska, Chen, & Luo, 2005). The instrument was designed to produce three outcome indicators: (a) number of strategies used (pre and post); (b) percent change in use for each individual strategy, and (c) the average effectiveness (self-rated) for the strategies used post-intervention.

Two additional instruments were used: the FES (Tinetti et al., 1990) and a single item indicator of FoF which was adapted from Walker and Howland (1991). The FoF indicator asked “In general, are you worried or afraid you might fall?” A four-point scale from “very worried” to “not at all worried” was used. The reliability and validity of the FES for use with community-dwelling older adults has been established (Powell & Meyers, 1995). The number of falls experienced by *SAHB* participants was tracked via use of a fall analysis form which *SAHB* participants were asked to complete each time they experienced a fall during the intervention period.

4.3.4 Study IV

During Study IV, three interviews were conducted with each of the six participants. These interviews took place approximately one, two and three months after a given participant completed participation in the *SAHB* program and were conducted by the first author of the study (E. Peterson). Five participants opted to be interviewed in their homes. One participant chose to be interviewed in first author’s private office on the university campus.

The interviews were an average of 69 minutes long and followed a semi-structured interview guide. The interview questions were open-ended and focused on generating detailed accounts of daily occupations and how participants made decisions about involvement in occupations. During the interviews, the participants were asked to talk about their perceived fall risk and how they managed those risks during day-to-day activities. All interviews were tape recorded and transcribed verbatim.

4.4 DATA ANALYSIS

4.4.1 Study I

Two separate models of logistic regression were used to determine factors associated with 1) FoF and 2) activity curtailment among individuals with MS reporting FoF. The same set of independent variables representing six categories of characteristics (demographics, fall experience, health status, functional status, potential for social support, and MS status and experiences) were used in both analyses. Those variables included: age, sex, history of a fall in the past 6 months, osteoporosis diagnosis, self-rated health, self-rated mental health, history of hospitalization in the past 6 months, use of cane or walker, use of manual or power wheelchair, amount of assistance received for IADLs, functional status change in past year, living situation (alone vs. with others), number of years since MS diagnosis, MS status within past year, MS course since diagnosis, and extent of MS symptom interference with everyday activities. Those independent variables were drawn from existing literature on FoF and activity curtailment among community-dwelling older adults. Both FoF and associated activity curtailment analyses included age and sex as covariates, otherwise model selection was performed by using the stepwise, backward and forward selection method with entry and staying criteria set at 0.05.

4.4.2 Study II

Proportional odds models were used to identify factors associated with increased odds of receiving medical attention for a fall-related injury within the past 6 months (Agestri, 2002). The following 12 independent variables were initially considered for inclusion in the model: age, sex, MS status, problems with concentration or forgetfulness, balance or mobility problems, problems with bladder control, osteoporosis diagnosis, cane or walker use, wheelchair use, report of taking three or more medications, fall frequency, and FoF. Those variables were based on knowledge about falls among

people with MS and risk factors for injurious falls among community-dwelling older adults. Model selection was performed by using the stepwise, backward and forward selection method with entry and staying criteria set at 0.05.

The data collected via open ended questions were analyzed by using content analysis techniques (Miles & Huberman, 1994) to classify injures. After independently analyzing the data, four members of the research team compared findings regarding classifications or groupings of injury types. When differences were found, discussions were held until consensus was reached. Finally, frequencies were used to summarize the nature and number of injuries that were reported in each of the classifications developed through this process.

4.4.3 Study III

The primary purpose of the data analysis associated with Study III was to determine 1) whether or not the intervention produced the desired outcomes when it was experienced by participants as intended (i.e., when at least 5 out of 6 sessions were completed) and, 2) whether or not the intervention produced the desired outcomes regardless of the number of sessions attended. Paired t-tests, multivariate fixed effects regression models, and random effects regression models (REM) were used to assess pre/post changes from the FCS, FMS, and the FPMQ because these tools exhibited approximately normal distributions (Gravetter & Wallnau, 2002; Hedeker & Gibbons, 2006). In the multivariate fixed effects regression and REM models, only time (representing the intervention effect over time) was used as the explanatory variable. The intra-class correlation (ICC) was calculated to assess the amount of total variation explained by between-subject difference. Akaike Information Criterion (AIC) was used to select between the fixed effects model and random effects model. Lower AIC statistic indicated the better model (Agresti, 2002).

Data from the FPSS were examined to determine strategies used before the program, strategies used after the program and the effectiveness of strategies used afterwards. In addition, percent change in the use of strategies after the program were examined. Reasons provided for non-use of strategies were examined descriptively.

The Wilcoxon Sign-Rank test was used to examine pre/post intervention differences in falls self-efficacy. The McNemar's test was used to examine whether FoF changed

after program participation. Because of sample size, the 4-point scale from the FoF item was dichotomized into “worried” and “not at all worried.”

The secondary goal of the Study III analysis was to evaluate the internal consistency of the FCS, FMS, FPMQ, and the FES. As a descriptive questionnaire, evaluating the internal consistency of the FPSS was not appropriate. Using data from the 35 people who provided baseline (pre-intervention) data, Cronbach’s alphas were determined for each of the above-mentioned instruments (Cronbach, 1951).

For all of the statistical analysis in Studies I-III, SAS® software, System 9.1 (SAS Institute Inc., Cary, North Carolina, US) was used. Across Studies I-III, a *P* value of $\leq .05$ was considered statistically significant.

4.4.4 Study IV

In Study IV, a modified form of the empirical, phenomenological, psychological method (EPP) (Karlsson, 1993) was used to analyze the data. The EPP method is a qualitative, interpretive, and descriptive analysis that aims to trace out the meaning structure of a phenomenon based on the participants’ lived experiences of the phenomenon under study. In Study IV, a focus on everyday occupations replaced the psychological perspective.

The EPP analysis was conducted in a series of five steps. The first four steps were completed separately for each participant. In the final step, data from all the participants were synthesized together. Throughout the analysis, the authors “bracketed” previous knowledge of falls self-efficacy based on medical, psychological and occupational therapy concepts. The authors also utilized *reflexivity* as a methodological strategy to improve the trustworthiness of their data. Reflexivity refers to a deliberate and systematic process of self-examination and involves both reflecting upon personal reactions to the data and considering what is being revealed in light of inner experience (Lysack, Luborsky, & Dillaway, 2006).

The first step of the EPP process involved thoroughly reading and re-reading the interview transcript in order to obtain an empathetic and holistic understanding of each interview. The second step involved identifying *meaning units*, i.e., smaller units representing shifts in meaning, in each interview. These two steps were intended to lead

to a concrete description of the phenomenon from the perspective of an individual participant. The third step involved interpreting each meaning unit in light of the whole protocol in order to trace out the underlying meaning embedded in the facts described by the participant (Karlsson, 1993). In this step of the analysis, the authors traced and interpreted the meaning of falls self-efficacy that was explicitly and implicitly expressed by participants while carefully avoiding theory-laden language.

The fourth step entailed transforming the meaning units into a situated structure (Karlsson, 1993). One synopsis that captured the meaning units from each of the three interviews was developed for each study participant. In the fifth step, the situated structure for each participant was synthesized into a general structure for all six participants. The first author took initial responsibility for identifying common features or themes. These preliminary themes were refined multiple times through numerous discussions occurring among and between the authors.

4.5 ETHICAL APPROVAL

Studies I-IV and all of their procedures were approved by the human subjects review board of the University of Illinois at Chicago.

5 RESULTS

5.1 PARTICIPANTS ACROSS STUDIES I-IV

Table 2 provides a comparative, general description of the participants in Studies I–IV.

Table 2. Characteristics of Study I-IV participants

	Study I	Study II	Study III	Study IV
Number of participants	1064	354	30 [*]	6 [^]
Age	45-90 years (mean age: 64 years)	55-94 years (mean age: 67 years)	40-68 years (mean age: 57 years)	58-67 (mean age: 61 years)
% female	74	59	83	50
Mean years since diagnosis*	20	22	15	13
% reporting deteriorating MS status in past year	34	38	23	33
% living in a nursing home or assisted living facility	3	2	0	0
Fall history	52% reported history of falls in past 6 months	64% reported ≥ 1 fall annually	100% reported ≥ 1 fall annually	100% reported ≥ 1 fall annually

* Completing baseline interview.

[^] These six individuals were a subset to the Study III participants.

5.2 STUDY I

5.2.1 Factors associated with increased likelihood of reporting fear of falling among people with multiple sclerosis

Of the Study I participants, 63.5% reported FoF. Increased likelihood of reporting FoF was associated with being female (odds ratio [OR]= 1.74, confidence interval [CI] = 1.28–2.36), history of a fall in the past 6 months (OR= 1.38, CI = 1.03–1.86), and using a walking aid (OR= 2.57, CI = 1.91–3.46). In addition, the extent of symptom interference was found to be significantly associated with FoF ($P < 0.0001$). Findings revealed that that the greater the extent of symptom interference, the greater the likelihood of reporting FoF.

5.2.2 Factors associated with activity curtailment among people with multiple sclerosis reporting fear of falling

Among participants reporting FoF, 82.6% reported curtailing activity. Increased likelihood of activity curtailment among people reporting FoF was associated with using a walking aid (OR = 1.96, CI= 1.25–3.07). Participants who reported good mental health were more likely to report activity curtailment associated with FoF compared to participants who reported excellent mental health (OR= 2.02, CI 1.23–3.31), and participants who reported poor or fair mental health were more likely to report activity curtailment than those who reported excellent mental health (OR= 1.85, CI = 1.02–3.35). The degree of IADL limitation was significantly associated with activity curtailment associated with FoF. Participants needing maximal or moderate IADL assistance were 2.43 (CI= 1.32–4.49) and 3.58 (CI = 1.86–6.91) times more likely to report activity curtailment than participants requiring very minimal assistance, respectively. In addition, participants who required moderate IADL assistance were more likely (OR= 2.09, CI = 1.12–3.91) to report activity curtailment than participants needing minimal assistance.

5.3 STUDY II

Sixty-four percent (n=225) of the study participants reported that they experienced at least 2 falls each year; 30% (n= 107) reported experiencing a fall once a month or more. More than 50% of study participants reported injurious falls; 12%, in the 6 months before the interview. Compared with study participants who reported receiving medical attention for a fall-related injury more than 6 months ago or never, participants who reported receiving medical attention for a fall-related injury within the past 6 months were more likely to report FoF (OR= 1.94; 95% CI, 1.27-2.96) and osteoporosis (OR=1.65; 95% CI, 1.03–2.62). Fractures were the most commonly reported injury. Only 24 participants (14%) reported sustaining greater than 1 injury during their most recent injurious fall.

5.4 STUDY III

5.4.1 Intervention effects

Participants' FCS, FMS, FPMQ, FoF and FES scores improved significantly at post-intervention. Findings based on the FPSS suggest that many participants had attempted to use falls prevention strategies prior to the program. FPSS findings also showed that compared to before the intervention, *SAHB* participants were engaging in more fall risk

management behaviors after the intervention. For several of the behaviors, all individuals who were not using a strategy before the program reported using it afterwards. Two main reasons for non-use of strategies were: had not had an opportunity to use the strategy yet and did not think the strategy would make a difference.

Eight of the 23 participants experienced at least one fall during the program. Three reported falling once, three participants fell twice, and two fell five times (19 falls total). None of the falls required medical attention.

5.4.2 Internal consistency of the Falls Control Scale, Falls Management Scale, Falls Prevention & Management Questionnaire, and the Falls Efficacy Scale

The Cronbach's alpha for the FCS was 0.48, and for the FMS was .73. The Cronbach's alpha for the FPMQ was 0.86. Finally, the Cronbach's alpha for FES was 0.47.

5.5 STUDY IV

The lived experience of falls self-efficacy was captured by one main theme, *falls self-efficacy: supporting ability to stay active and involved in life*, and six subthemes.

The main theme reflected participants' experience that confidence in the ability to engage a wide range of activities supported their efforts to "*stay active and involved*" in their lives. Each of the six subthemes reflect one aspect of falls self-efficacy that the participants experienced and valued for its contribution to staying active and involved in life.

Over the course of the interviews, participants talked about how they used detailed self-knowledge of their MS symptoms and abilities over and over again in the course of a day to help them decide if and how they would engage in an activity. This experience was reflected in the subtheme *understanding personal MS symptoms and fall risk*. As participants talked about their reasoning behind engaging, or not engaging in specific activities, they consistently expressed their decisions in the context of symptoms, abilities and limitations.

Over the course of the interviews, the participants expressed how they incorporated (or were in the process of incorporating) their understanding of their changed bodies into

their (reframed) images of themselves. This experience, shared by all participants, was captured in the subtheme *owning the changed body*. Basing expectations for activity levels on current abilities was highlighted by participants as being especially important because it helped them to view their efforts to stay active as successful. The participants talked about the importance of *focusing on what you can control* and how this approach to daily activities helped them feel capable of managing the fall risks that were present in activities. The participants said that their risk for falls was persistent because their MS symptoms were persistent. However, they expressed that their awareness of fall risk motivated them to recognize physical, behavioral or environmental problems that could be changed to reduce fall risk. Each participant talked about learning how to manage fall risks by *doing*, as reflected in the subtheme *learning as you go*. *Having heightened awareness while doing* was a shared experience expressed among participants. The participants expressed that this awareness helped them safely engage in activities. Finally, the participants' confidence in their ability to manage fall risk was expressed in their descriptions of how they went about *taking action* to reduce fall risk during day-to-day activities.

6 DISCUSSION

6.1 MAIN FINDINGS

The overall aim of this thesis was to generate new knowledge about FoF, fall-related injuries, and falls self-efficacy among middle aged and older adults with MS in order to inform development of occupational therapy interventions designed to help people aging with MS manage fall risk. Each of the four studies comprising this thesis addressed that aim in a unique way. Studies I and II are the first to examine FoF and fall-related injuries among people living with MS. Their findings suggest that these issues are pervasive problems for people with MS and point to opportunities for intervention. Studies describing interventions to reduce falls, fall risk or FoF among community-based people with MS are absent from the literature. The *SAHB* program, which was evaluated through Study III, addresses this gap. Study IV describes the lived experience of falls self-efficacy among six people with MS who participated in the *SAHB* program. As the first qualitative study exploring falls self-efficacy, Study IV provides an important contribution to the fall prevention literature. In general, due to their unique focus on people with MS, findings from both Studies III and IV bring to light important opportunities to assess outcomes related to managing fall risk and falls self efficacy among people with MS. Together, the four studies comprising this thesis suggest either the need for, or potential benefit of new approaches to building fall risk management skills and falls self-efficacy among people with MS. The overarching findings emanating from all four studies included in this thesis will be discussed in the following section.

6.1.1 Introducing fear of falling, associated activity curtailment, and fall-related injuries among community-based people living with multiple sclerosis as important, potentially modifiable problems

Studies I and II opened the investigation of FoF, associated activity curtailment and fall-related injuries among community-based people with MS. Findings from those studies point to the high prevalence of FoF, associated activity curtailment and injurious falls among people with MS and consequently help to justify health care providers' attention to these issues.

Study I findings suggest that prevalence of FoF for people with MS is higher than the prevalence seen among older adults residing in senior housing (Howland et al., 1998), people with rheumatoid arthritis (Fessel & Nevitt, 1997) and people with chronic dizziness (Burker et al., 1995). The Study I findings regarding the high prevalence of activity curtailment among people with MS reporting FoF may carry important implications because deconditioning in persons with MS can increase levels of fatigue which, in turn, can increase the extent of other MS symptoms (Krupp & Christodoulou, 2009). Activity (specifically impact and resistance exercises) is also needed to prevent osteoporosis (Guadalupe-Grau, Fuentes, Guerra, & Calbet, 2009). Increasing evidence suggests that osteoporosis is a serious problem for people living with MS. People with MS are at higher risk for osteoporosis (Cosman et al., 1998) and osteoporosis was one of only two factors associated with recent injurious falls in Study II.

Study II findings indicate that people with MS have substantial exposure to fall events and fall related injuries. Thirty percent of the Study II participants fell at least once a month. In comparison, about one-third of older community-dwelling adults fall once per year (Hausdorff et al., 2001). More than half of the Study II participants reported experiencing injurious falls. The high prevalence of fall-related injuries described in Study II (which enrolled participants who had an average age of 67 years) is of concern in light of gerontological research findings. Among older adults, fall-related injuries are known contributors to increased dependence (Schiller, et al., 2007; Scott, 1990). Further fractures, which were the most common type of injury reported by Study II participants, are associated with high mortality among community-dwelling older adults (Johnell et al., 2004; Vestergaard, Rejnmark, & Mosekilde, 2007; Bliuc et al., 2009).

Studies I and II hold practice implications for rehabilitation professionals by directing attention to risk factors that have the potential to be *modified* among people with MS. Two modifiable risk factors identified in Studies I and II will be highlighted in this discussion due to their potential for occupational therapy intervention: use of mobility aids and FoF.

Use of mobility aids: A modifiable risk factor associated with FoF and associated activity curtailment

Use of a walking aid was associated with both FoF and associated activity curtailment in Study I. Although the associations between walking aid use and both FoF and associated activity curtailment could be viewed as evidence that FoF or activity curtailment are appropriate responses to the fall risks associated with MS, alternative interpretations are worth consideration. It is possible that lack of training in mobility aid use may heighten concern about ambulating safely with the device, and actually increase fall risk. In their study of community-dwelling people aged 75-89 years, Löfqvist, Nygren, Brandt, Oswald, & Iwarsson (2007) showed that the pattern of mobility device use changes over a short period of time. The findings hold important implications for rehabilitation professionals who can support safe use of mobility devices. While those findings pointed to the need to recognize rapid changes in mobility device needs among very old people, the findings may also be applicable to people with MS who experience variable and typically progressive symptoms. In addition, qualitative research has shown that among people with MS, concerns about mobility loss are often linked to concerns for their future (Finlayson, 2004). Toombs (1993) describes in detail how mobility loss can contribute to concerns regarding self-image and can engender feelings of helplessness and dependency. Thus, mobility loss carries substantial meaning for many people with MS, and this may be an explanation for the association between walking aid use and FoF that was observed in Study I. Conversations held with the client during the assessment process provide an important opportunity for occupational therapists to develop an empathetic understanding of the meaning of mobility loss to an individual client. Such understanding can inform development of client-centered interventions which go beyond improving functional mobility to address what Toombs (p. 86) describes as “the disruption of body/self/world” which is often accompanied by feelings of anxiety and fear and an acute awareness of loss of control.

Fear of falling: A modifiable risk factor associated with fall-related injuries

In Study II, FoF was one of two variables associated with increased odds of receiving medical attention for a fall-related injury within the past 6 months. FoF has not been identified as a risk factor for injurious falls in previous studies involving disabled or nondisabled community-dwelling older adults. Fortunately, findings from Study III suggest that it is possible for people with MS to reduce FoF. Those findings are

consistent with RCTs involving community-dwelling older adults that have demonstrated that FoF can be mitigated (Wolf et al., 1996; Li, Harmer, et al., 2005).

The influence of FoF on the occupational performance of people with MS warrants special consideration. The potential for FoF to be protective (i.e., leading an individual to avoid a feared activity) is recognized. Individuals who express FoF may be making a rational assessment of their personal risk of sustaining injurious falls and the associated consequences (Vellas, Wayne, Romero, Baumgartner, & Garry, 1997). For people with MS, who often live with many fall risk factors, the potential for appropriate activity restriction due to FoF cannot be over-emphasized. Nonetheless, findings from Study I revealed that 1) a large subset of individuals with MS reporting FoF are curtailing activities due to the fear, and 2) not all predictors of activity curtailment were markers of increased vulnerability to falls. Although Study II procedures did not allow for discrimination between FoF and activity restriction associated with FoF, findings from Study I raise the possibility that for some people with MS, activity curtailment associated with FoF may be not driven by actual risk for falls. Specifically, in Study I, recent experience of a fall did *not* increase the likelihood of activity curtailment despite FoF. Having a fall history is a known fall risk factor among older adults (American Geriatrics Society et al., 2001) and could be viewed as a proxy for fall risk. In addition, lower self-rated mental health was independently associated with activity curtailment associated with FoF and 68% of the individuals who reported never needing assistance for IADLs also reported activity curtailment associated with FoF.

6.1.2 Informing assessment of fall risk management and falls self-efficacy among people with multiple sclerosis

The content that follows highlights two assessment implications stemming from this thesis that are of particular interest in light of current assessment practice.

Fall prevention behaviors: Why are they important? How can they be measured?

Although fall prevention interventions are diverse in nature and range from increasing vitamin D intake (Bischoff-Ferrari, et al., 2004) to engaging in exercise programs (Wolf et al., 1996) and improving home safety (Cumming et al., 1999), many share a common assumption that individual-level behavioral change is critically important to fall prevention. Despite this emphasis on behavior change, assessment tools that can be

used to measure behavior changes associated with fall risk reduction efforts have only recently appeared (Clemson, Bundy, Cumming, Kay, & Lockett, 2008; Clemson, Cumming, & Heard, 2003). The FPSS was developed to address this gap for people with MS. Because of its behavioral focus, the FPSS may have utility in comprehensive MS clinics or outpatient rehabilitation settings, independent of the *SAHB* program. In addition to describing changes in fall prevention strategy use and perceived effectiveness of fall prevention strategies, the FPSS was designed to identify fall prevention strategies that are used (or not used) by people with MS. This information could be used to inform treatment planning for people with MS.

It is interesting to note that asking health care providers about ways to reduce fall risk was one of the *least* common strategies used by Study III participants prior to the program. This finding, combined with Study II findings that highlight the high frequency of falls among people with MS, raises the possibility that sometimes a person with MS may not view a fall as a critical event necessitating action. The finding also highlights the need to educate health care providers about the importance initiating conversations about fall prevention and management for people with MS. Health care providers who wait for clients with MS to raise the topic of fall prevention may miss opportunities assess risk and intervene accordingly.

In summary, measuring behavioral changes associated with fall risk reduction was an important component of Study III. Findings from Study III suggest that the FPSS has the potential to yield clinically relevant data. Thus, further development of the assessment tool is warranted.

Falls self-efficacy among people with MS: Potential assessment implications based on an understanding of the lived experience of the phenomenon

In Study III, both the FCS and the FES exhibited poor internal consistency despite the fact that they performed well as outcome measures for the *Matter of Balance* program which targeted community-dwelling older adults (Healy et al., 2008; Tennstedt et al., 1998). These findings suggest that these tools may not be appropriate for use with people with MS, and the need to better understand how both “falls control” and falls self-efficacy are experienced by people with MS. Findings regarding the FES carry substantial implications for fall prevention research and practice because the FES is used widely. In the content that follows, Study IV findings relevant to the use of the

FES, in particular, and the concept of falls self-efficacy in general will be explored in greater detail.

Fall prevention researchers often look for improvements in falls self-efficacy as evidence of a successful intervention, i.e., higher falls self-efficacy is desirable and associated with reduced fall risk (e.g., Tinetti et al., 1994; Clemson et al., 2004; Voukelatos, Cumming, Lord, & Rissel, 2007). This may be the case for well older adults living in the community with few fall risk factors. Study IV findings suggest however, that for some people with MS (who have symptoms that place them at persistent risk for falls), lower falls self-efficacy pertaining to specific activities might be desirable because it may reflect an accurate appraisal of fall risk. Study IV findings raise the possibility that findings from the FES might best be utilized as a starting point for discussions between the person with MS and the rehabilitation professional. Drawing from FES findings, rehabilitation professionals can engage the person with MS in a collaborative discussion to explore the fit between level of confidence and actual risk.

The FES is a 10-item instrument that assesses confidence in the ability to carry out specific ADLs or IADLs. Individuals completing the FES rate their level of confidence when carrying out each of the 10 activities without falling. The items included in the original FES reflect the perspectives of the ten rehabilitation professionals who were asked to name the ten most important activities essential to independent living. The main theme emerging from Study IV (*falls self-efficacy: supporting ability to stay active and involved in life*) highlights the relevance of assessing falls self-efficacy in the context of daily activities. However, Study IV findings also suggest that the activities included as part of the FES may not be the activities that are most important to people with MS. Overall, Study IV participants discussed involvement in a wide range of diverse occupations. These activities were a reflection of each participant's unique values and interests. Thus, Study IV findings suggest that there may be great value in providing people with MS with more opportunities to discuss their level of confidence in their ability to avoid falls in the context of activities that are important to them. Understanding relationship between valued activities and levels of falls self-efficacy would support a client-centered approach to assessment of falls self-efficacy. In addition, taking time during the assessment process to gain an appreciation of occupations of central importance to the client with MS would increase the likelihood

that intervention would yield benefits associated with occupation-based intervention. Those benefits range from the creation and maintenance of personal identity (Christiansen, 1999), to the development of competence (Clark et al., 1991; Yerxa et al., 1989) and the enactment of personal stories (Clark, 1993).

Study IV provides an important opportunity to understand how people with MS experience confidence in their ability to manage fall risk day-to-day to stay active and involved in life. However, Study IV findings are a first step in the process of understanding the meaning of falls self-efficacy for people with MS. More research is needed to understand consistent features of falls self-efficacy for people with MS. Nonetheless, the findings resonated with the conceptualization of factors influencing participation offered in the Model of Human Occupation (Kielhofner, 2008), and invite the possibility of a new approach to assessing falls self-efficacy that is based upon an appreciation of falls self-efficacy as multifaceted phenomenon that influences occupational involvement.

Study IV findings underscore that far from being an isolated trait, falls self-efficacy was experienced by the study participants as one part of a larger process. This process involved habits, strategies and skills used to reduce falls risk while participating in life occupations as well as feelings and thoughts that influenced the participants' activity-related decisions. Similarly, the Model of Human Occupation emphasizes several influences on a person's engagement in life occupations, including volition (i.e., motivation for occupation), habituation, and performance capacity (i.e., ability to do things provided by underlying objective abilities and subjective experiences). Many of the feelings and thoughts expressed by the Study IV participants pertained to personal causation (i.e., sense of competence and effectiveness). According to the Model of Human Occupation, personal causation is an important aspect of volition. Thus, Study IV findings suggest that falls self-efficacy has very strong volitional features. The close relationship between falls self-efficacy and volition has previously been suggested by Peterson et al. (1999).

Considered in light of the Model of Human Occupation, Study IV findings suggest several new assessment priorities related to falls self-efficacy. These priorities include understanding the client's 1) motivation for occupation, 2) understanding of personal MS symptoms and their impact on performance, 3) experience of, and feelings toward

the changed body, 4) perceived ability to control fall risk in order to operationalize values and interests and fulfill role expectations, and 5) ability to engage in adaptive habits and use effective strategies to “take action” to reduce fall risk. Overall, this approach to the assessment of falls self-efficacy differs from current practice. To date, the falls self-efficacy literature has largely focused on using falls self-efficacy as a quantitative measure of FoF and categorizing its presence on a continuum from “high” to “low”. This emphasis on measurement is understandable as the concept of falls self-efficacy was introduced by Tinetti et al. (1990) in the form of the FES, which was originally intended as a tool to measure FoF. Shifting attention to the *meaning* of falls self-efficacy for people with MS, however, creates new assessment opportunities based on an understanding of falls self-efficacy *as lived*.

6.1.3 Informing the use of occupation-based strategies to build fall risk management skills and falls self-efficacy among people with multiple sclerosis

The intervention implications stemming from Studies III and IV are innovative in that they are based upon occupationally-focused theoretical ideas. Occupational perspectives are rarely discussed in the context of published interventions designed to reduce falls, fall risk or FoF. This section of the thesis will draw from Study III and IV findings to discuss how occupational perspectives have the potential to inform new approaches to building fall risk management skills and falls self-efficacy.

Suggesting the potential benefit of an approach to building fall risk management skills informed by the Person-Environment-Occupation Model

The *SAHB* program utilized a comprehensive approach to fall risk management that contrasts with interventions designed to reduce fall risk among people with chronic neurological diseases currently described in the literature. Those interventions focus on mitigation of physical risk factors and often utilize exercise as a strategy to reduce fall risk (Sato et al., 1990; Protas et al., 2005; Ashburn et al., 2007; Green et al., 2002).

The *SAHB* program reflected the Person-Environment-Occupation Model’s view that each person’s needs, interests, and abilities will change over time. This view is consistent with contemporary disability frameworks that recognize that disablement is a dynamic process that can fluctuate in breadth and severity across the life course (Jette, 2006). To prepare participants for future fall prevention needs, the *SAHB* program

sought to build participants' problem solving skills through the use of action plans and fall analysis forms. Through the fall analysis forms, participants used the "BAASE" concept (which was informed by the Person-Environment-Occupation model) to consider and manage behaviors, attitudes, activities, symptoms and environmental factors influencing fall risk. The emphasis the *SAHB* program placed on problem solving skills consistent with current approaches to chronic disease self-management (Lorig & Holman, 2003). Both the *Matter of Balance* (Tennstedt et al., 1998) program and the *Stepping On* program (Clemson et al., 2004) which aim to increase falls self-efficacy and prevent falls, respectively, aim to develop problem solving skills among program participants in an effort to support long-term fall risk reduction.

This *SAHB* program is unique its attention to MS-relevant issues pertaining to fall risk management, and also in the way those MS-specific issues are woven through the program. The program's attention to risk factors for injurious falls specific to people with MS (drawn from Study II) and emphasis on the relationship between MS symptoms and fall risk was intended to support the participants' ability to consider environmental or occupation-based fall risk factors in the context of their "person" factors. This attention to person-environment-occupation interaction is an important feature of the Person-Environment-Occupation Model. *SAHB* is also gave equal attention to the influence of physical and psychosocial "person" factors on fall risk. The intervention's CBT content, in particular, was a central part of the program. Consistent with CBT traditions, the *SAHB* program promoted restructuring of maladaptive attributions by encouraging participants' involvement in "personal experiments" in the form of homework exercises. These personal experiments, which often occurred in the context of valued activities, enabled participants to experience positive situations that resulted in outcomes contrary to their expectations or beliefs. Strategies to enhance SE are not limited to CBT techniques. Lorig and Holman (2003) have identified several "ingredients" of efficacy enhancement including performance mastery, modeling and social persuasion. Each of these efficacy enhancement mechanisms is present in the *SAHB* program.

Overall, evidence supports the emphasis that the *SAHB* program placed on building falls self-efficacy. According to Jerant, Moore, Lorig and Franks (2008), SE enhancement mediates improvements in health behaviors. Numerous researchers investigating interventions designed to help people self-manage chronic diseases,

including MS, have found that people who believe in their capability to organize and execute the courses of action required to produce a desired outcome are more likely to experience improvements in health and/or healthful behaviors (e.g., Lorig et al., 2001; Barnason, Zimmerman, Schmaderer, Carranza, & Reilly, 2003; Dallow & Anderson, 2003; Stuifbergen, Becker, Rogers, Timmerman, & Kullberg, 1999; Wassem & Dudley, 2003). In the area of fall prevention for older adults, the *Stepping On* program (Clemson et al., 2004), the *Matter of Balance* program (Tennstedt et al., 1998) and the *Advancing Better Living for Elders* program (Gitlin, Hauck, Winter, Dennis, & Schultz, 2006) share a strong emphasis on building participants' falls self-efficacy.

In its use of the fall analysis forms and emphasis on the relationship between MS symptoms environmental or occupation-based fall risk factors, the *SAHB* program reflected the Person-Environment-Occupation Model's attention to the transactive nature of the environment, and (accordingly) recognition of the interdependence of person and environment. The *SAHB* program also reflected the Person-Environment-Occupation Model's comprehensive view of the environment by educating participants about environmental hazards in the home, emphasizing the relationship between the *social* environment and fall risk management, and helping participants recognize opportunities to utilize personal or community-based resources. The program also helped participants develop behaviors intended to support their ability to manage environmental fall hazards that were relevant to them in the long term. It is interesting to note that Dickie, Cutchin, & Humphrey (2006) argue that the Person-Environment-Occupation Model does not go far enough to truly be transactive, because the model separates the "person" and "environment" components. However, the model contributed to the development of the *SAHB* program by highlighting the importance of the environment in managing fall risk, defining the environment broadly, and emphasizing that the environment needs to be considered from the unique perspective of the individual, household, neighborhood or community. The model's inclusive consideration of the physical, cultural, institutional, and socioeconomic environment is also consistent with the World Health Organization (2001) International Classification of Functioning and reflects the growing understanding that disability is not an inherent attribute of individuals but rather a reflection of the interactions between individuals and their physical and social environments.

Introducing the potential value of interventions that frame the experience of low falls self-efficacy as a volitional challenge

Falls self-efficacy has been identified as an important outcome of fall injury prevention trials (Lamb et al., 2005). The question facing rehabilitation professionals and researchers is not *if* falls self-efficacy should be addressed in fall injury prevention trials but *how* this can be done. Study IV findings offer some insights into this question that may apply to people with MS. For example, in Study IV, *learning as you go* emerged as a subtheme. This subtheme reflected the study participants' experience of learning of manage falls over time during the course of day-to-day life and highlights the need for fall risk management programs for people with MS (such as *SAHB*) that support development of skills needed to manage fall risk over the long term.

Considered in light of the Model of Human Occupation, Study IV findings offer additional insights into intervention strategies that can be used to build falls self-efficacy among people with MS. The Model of Human Occupation emphasizes that sense of capacity and effectiveness (personal causation) is an important influence on motivation to participate in life occupations (volition) and heavily influenced by occupational engagement. The importance of sense of capacity and engaging in occupations to building confidence in the ability to manage fall risk was clearly expressed by Study IV participants. Specifically, engaging in valued activities without falling helped them feel confident in their ability to prevent falls. This finding highlights the importance of occupation to developing an understanding of functional capacity and is consistent with previous research (Tham, Borell, & Gustavsson, 2000; Erikson, Karlsson, Söderström, & Tham, 2004).

Study IV findings lend support to key Model of Human Occupation concepts pertaining to intervention in two principal ways. First, the findings support the emphasis the Model of Human Occupation places on the need to understand a client's subjective experiences because those subjective experiences strongly influence performance. In relating their confidence in their ability to control their fall risk and prevent falls in most situations, the participants emphasized the importance of their sense of personal capacity which allowed them to know what they could and could not control and where to focus their energies in reducing fall risk. The participants' emphasis on "accepting" their bodies with MS underscored the extent to which personal causation involves feelings about one's abilities and limitations. Second, the findings supported the Model

of Human Occupation's premise that volitional thoughts and feelings occur within a cycle of anticipation (noticing and reacting to the potentials or expectations for action), choice (short term activity choices as well as long term occupational choices), experience while doing (immediate thoughts and feelings) and interpretation (how people make sense of what they have done) (Kielhofner, 2008). Overall, the dynamics of this volitional cycle were highlighted by the Study IV findings. The participants' high level of falls self-efficacy was reflected in their expectation (anticipation) they would be acceptably effective in controlling fall risk. Most often this positive expectation was voiced in the participants' short term plans, but each described long term plans (and associated fall prevention strategies) as well. The participants' high level of falls self-efficacy was also seen in their tendency to interpret events and experiences in a positive light.

Study IV findings suggest that how people with MS interpret *the experience of bodily awareness* and *fall events* are particularly important to their confidence in their ability to control fall risk. Both can be explored during the course of occupational therapy intervention. With respect to the former, in Study IV, *having a heightened awareness while doing* emerged as an important feature of the experience of falls self-efficacy. Study IV participants talked about bodily awareness in a positive light and discussed how being aware of their bodies led them to take steps to reduce their fall risk. This positive experience of bodily awareness contrasts with other descriptions of bodily awareness (provided in the context of phenomenological research) involving people with physical disabilities. In several studies, the separation between body and self is experienced by people with physical disabilities as an unwanted experience (Tham et al., 2000; Guidetti, Asaba, & Tham, 2007). Study IV findings, however, suggest that it is possible for people with MS to appreciate and use this bodily awareness to reduce fall risk. With respect to understanding the subjective experiences of falls, Study IV findings were surprising in that falls were viewed by Study IV participants as part of the process associated with learning how to manage fall risk. The Study IV participants typically relayed stories about falls in a matter-of-fact style, which emphasis on what caused the fall and how future falls in similar situations could be prevented or managed. In other words, the Study IV participants did not interpret falls as failures. These accounts contrast dramatically with descriptions of FoF provided by stroke survivors involved in a qualitative study undertaken to explore the perceived consequences of poststroke falls (Schmid & Rittman, 2009). Findings from Study IV

suggest that it is possible for people with MS to be “vigilant” in managing fall risk while still “accepting” that falls will occur from time to time due to the inherent nature of MS. Intervention approaches complimentary to, but different from, those based on the Model of Human Occupation may be appropriate for people with MS whose negative beliefs or self-defeating attitudes interfere with efforts to reduce fall risk. Specifically, cognitive restructuring, an intervention strategy often used as part of CBT, may be appropriate to teach people with MS ways to reframe maladaptive self-conceptions related to awareness of the body or fall experiences. The *Matter of Balance* program used cognitive restructuring strategies extensively (Peterson, 2003), thus there is precedent for using such strategies interventions designed to build falls self-efficacy.

6.2 METHODOLOGICAL CONSIDERATIONS

6.2.1 Sample-related considerations

As described in Section 4.1.1, Study I participants were part of a larger study (the “unmet needs study”) involving people aged 45 years or older. Recruitment procedures associated with the “unmet needs” study were developed to involve a large number of participants aged 65+ and were successful in that regard, as the mean age of the Study I sample was 64 years. A comparison of the Study I sample to previously described samples of older adults with MS (Klewer, Pohlau, Nippert, Haas, & Kugler, 2001; Finlayson, 2002; Minden & Marder, 1993) suggests general consistencies with respect to average age, gender distribution, most common symptoms experienced, duration of MS, and living arrangements. However, it is possible that the people volunteering for Study I could be more or less likely to fall than the general MS older adult population. Also, participation in Study I was limited to people who had cognitive skills sufficient to successfully engage in a lengthy telephone interview.

Study II involved people with MS, age 55 years or older. The Study II sample is comparable to other samples of people aged 65+ with MS with respect to average age, sex distribution, most common symptoms experienced, duration of MS, and living arrangements, however concerns about the extent to which the Study II sample is representative of people with MS aged ≥ 55 years exist. These concerns stem primarily from the fact that Study II participation was limited to people who scored ≥ 9 on the BOMC and that sample selection was drawn from the voluntary NARCOMS registry. It is possible that people who respond to recruitment efforts associated with

the NARCOMS registry may be different than those who do not. Therefore, the true representativeness of the sample is unknown despite demographic similarities between NARCOMS registrants and the participants of the Sonya Slifka Longitudinal Multiple Sclerosis Study (Minden et al., 2006) and the New York State MS Registry data (Jacobs et al., 1999).

Study III sample was very small and Study III participation was limited to people with MS age ≥ 40 years who had BOMC scores of 8 or less. Therefore, the Study III sample is not representative of the larger MS population. In addition, the 23 Study III participants who attended five or more sessions did so despite significant challenges: 14:23 used a cane sometimes or always; 13:23 used a walker sometimes or always, 9:23 reported visual problems; 12:23 were “somewhat or very” afraid of falling, and 7:23 reported that they were “a little” afraid that they would fall. The commitment to involvement in the *SAHB* program shown by these individuals, therefore, was substantial and may reflect a desire and readiness to manage fall risk that is rare among people with MS.

The Study IV participants were unique in their prior participation in the *SAHB* program. While the benefit of conducting qualitative studies *prior* to the development of interventions is recognized, the intent to interview individuals who had insights into the experience of falls self-efficacy combined with logistical concerns drove the decision to conduct the qualitative study after Study III. The researchers’ experiences prior to the commencement of Studies III and IV suggested that recruitment of community-based people with MS to research projects occurring in the Chicago area would be challenging. Steps needed to be taken to avoid compromising the size of the pool from which Study III applicants could be drawn. Participating in a series of three interviews undertaken specifically for the purpose of exploring the lived experience of falls self-efficacy certainly could influence participants’ falls self-efficacy, which was an outcome measured in Study III. Therefore, it would not have been appropriate to include qualitative study participants in the *SAHB* pilot study. By recruiting a subset of Study III participants into Study IV, the size of the pool of potential Study III subjects was not compromised. Recruiting a subset of Study III participants into the Study IV did have benefits. Prior knowledge of potential Study IV participants (gained through their involvement in Study III) supported the purposeful sampling used in Study IV to

identify participants who would be able to provide rich information regarding the lived experience of falls self-efficacy.

6.2.2 Design and Procedures

Design and procedural considerations relevant to all four studies

Across each of the four studies, data was gathered by trained interviewers. Manuals and/or protocols outlining study procedures were developed and the extent to which procedures were followed was carefully monitored by senior members of the research teams. With exception of one interviewer who was a statistician engaging in doctoral studies, the interviewers were occupational therapists or occupational therapy students. This is important to consider because involving research team members with occupational therapy backgrounds may have influenced the nature of the data collected. For example, when participants in Study II responded to the open-ended question regarding recent fall experience, the interviewers may have probed more to obtain details about activity-related risk factors.

Design and procedural considerations specific to Studies I and II

The cross-sectional methods used in Studies I and II allowed for an examination of associations between independent and dependant variables, but does not allow for causal interpretation. This is a major limitation shared by both studies. However, several strategies were used to conduct high quality cross-sectional studies. For example, independent variables in Studies I and II were carefully selected and the sample sizes supported inclusion of a number of independent variables (Tabachnick & Fidell, 1989). The analyses conducted were also appropriate given the nature the data used (i.e., logistic regression for binary data, proportional odds modeling for ordinal data; Agresti, 2002).

With respect to the selection of independent variables, in Study I, those variables captured information regarding participants' MS status and experiences and drew from existing literature of FoF and activity curtailment, which was based on research involving older adults. In Study II independent variables were informed by the two published studies describing fall risk factors among people with MS (Cattaneo et al., 2002; Finlayson et al., 2006) and knowledge about falls risk factors among people with MS and injurious falls among community-dwelling older adults. Nonetheless, an assessment of the independent variables reveals a bias toward inclusion of client

factors, i.e., specific characteristics or beliefs that reside within a client (American Occupational Therapy Association, 2008). Those independent variables do not reflect the many influences on occupational performance that are addressed by occupational therapists. Among people with MS, both fatigue and signs of depression are associated with perceived physical and psychological impact and thus warrant consideration as potential risk factors for FoF or fall-related injuries. Because fatigue and depression were not associated with fall risk in either the Cattaneo et al. study or the Finlayson et al. study, they were not included as independent variables in the Study II models. Study I did include extent of MS symptom interference and self-rated mental health as independent variables, but such variables cannot substitute for measures of depression and fatigue, especially if such measures are performance-based. Together, this information suggests that Studies I and II should be considered a starting point for understanding risk factors associated with FoF, associated activity curtailment and fall-related injuries among people with MS.

Design and procedural considerations specific to Study III

Study III was undertaken as a pilot study, with the goal of obtaining data needed to support a proposal for a larger randomized trial. The primary purpose of Study III was to explore the potential of the *SAHB* program. Several strategies, listed below, were used to meet this goal and enhanced the scientific integrity of the work.

- 1) Diverse recruitment strategies were used and results of those efforts were carefully documented.
- 2) In order to test the intervention as opposed to the skill of a particular interventionist, four different occupational therapists delivered six cycles of the program.
- 3) Subject recruitment and attrition were carefully monitored as important markers of program feasibility. Reasons for non-participation (among individuals who voiced interest and met the inclusion criteria) and participants' attendance to *SAHB* sessions were tracked.
- 4) To reduce the potential of biased responses, the post-intervention *SAHB* data was collected by a member of the research team who was not an interventionist.
- 5) Pre/post intervention changes in several desired outcomes were evaluated statistically.
- 6) The appropriateness of the outcome tools for capturing expected changes were also assessed. This was important because existing measures had not been

previously used in studies involving people with MS, and two new measures intended for people with MS were developed as part of Study III.

Overall, the selection of statistical techniques to evaluate pre/post intervention changes in Study III participants and the appropriateness of the instruments was driven by the type of data (e.g., interval, nominal) distribution of the data, characteristics of the data (i.e., parametric statistics for ratio data, and nonparametric statistics for ordinal data) and the purpose of the statistical test (e.g., paired t-test to examine pre/post intervention changes, Cronbach's alpha to assess internal consistency of instrument items).

The methods used to establish the potential of the *SAHB* program were also informed by Lichstein, Riedel, and Grieve (1993) who identified threats to treatment fidelity and strategies to enhance treatment fidelity that focus on facilitating and monitoring adequate levels of delivery, receipt, and enactment. Following this logic, as part of Study III, a facilitators' manual was developed to support consistent delivery of the *SAHB* program. Separate fidelity checks on each *SAHB* session were also completed by both the occupational therapist delivering the session and an outside observer who was a member of the research team to assess the extent to which each session was delivered as intended. Treatment receipt is heavily influenced by interventionists' abilities. Therefore, the therapists involved in delivering the program were carefully selected. Each of the four therapists had experience managing groups of older adults, experience working with people who have MS, and a clear interest in MS and fall prevention. In addition, two of the occupational therapists involved in delivering the program contributed to the development of the *SAHB* program and had extensive knowledge of the content and processes of the intervention. The other two occupational therapists were trained as interventionists before delivering the program. Training covered content and logistics of the program, MS symptoms influencing fall risk, and group management strategies. The occupational therapists were also trained to draw on participants' existing experiences and to promote peer interaction, group problem solving and mutual support for behavioral change. The fidelity checks were used to monitor the extent to which the therapists encouraged participant involvement and discussion during the *SAHB* sessions.

Several of the measures utilized in Study III (e.g., FES, FoF item, FPMQ) would be categorized by Lichstein et al (1993) as indirect measures of treatment receipt. To

assess treatment enactment, several strategies were used. For example, homework was assigned and reviewed, and fall analyses (which required participants to apply knowledge regarding types of fall risk factors) were used. The FPSS also reflected treatment enactment.

As described in Section 4.2, *SAHB* is a group-based program and the group process was intended to be an important feature of the program. The recruitment challenges experienced prior to the delivery of the *SAHB* program, however, led to groups sizes that were smaller than intended. In addition, the group sizes ranged from two to seven people. This variation in group size led to different group experiences for participants and should be considered a limitation associated with Study III.

Design and procedural considerations specific to Study IV

In Study IV, a phenomenological approach was used to explore the lived experience of falls self-efficacy among six people with MS and the EPP method was used to analyze the data. A particular strength of the EPP method is its emphasis on systematic neutrality. EPP procedures support the researcher's endeavor to set aside theoretical commitments in order to describe the participants' first hand experience of the phenomenon being studied. The Study IV analysis was led by one person (E. Peterson) but involved three other researchers (Tham, von Koch and Kielhofner). Together, the Study IV investigators supported each other in the endeavor to set theoretical or clinical insights aside during the analysis process. Study IV did allow for the exploration of falls self-efficacy over a three-month period. However, if the study had been conducted over a longer study period, a better understanding of the relative stability of falls self-efficacy could have gained. It is important to note that none of the Study IV participants experienced an injurious fall or an exacerbation of their MS during the 3-months in which Study IV took place. Exploring falls self-efficacy in light of these types of experiences could lead to further insights regarding the challenges of maintaining falls self-efficacy for people living with MS. One strength of Study IV is that all interviews were conducted in person, by the same individual (E. Peterson). The rapport established between the researcher and the participants may have facilitated the participants' willingness to provide detailed accounts of their personal experiences pertaining to falls self-efficacy.

6.2.3 Measures/Instrumentation

Across Studies I-IV, a differentiation has been made between FoF and falls self-efficacy. This differentiation is seen in the instruments used and can be considered a strength of the dissertation. The decision to measure FoF in Study I (instead of falls self-efficacy) was based, in part, on the need to establish prevalence of FoF in the samples of people with MS. Compared to measures of falls self-efficacy, the FoF measures used serve the function of establishing prevalence easily. The instruments used to measure FoF in this thesis varied. While difference in FoF measurement strategies used in this thesis reflects the diversity seen in FoF measures (Jørstad et al., 2005), the need to develop a standard for FoF measurement is recognized.

Only one performance-based measure was used in this dissertation: the BOMC. In Studies I, II and III, the BOMC was used to screen for cognitive impairment as part of the screening undertaken to determine eligibility for participation. Using self-report measures in Studies I-III provided advantages in that they were brief and easy to administer, relatively low in cost, and presented no risk of physical injury to study participants. However, use of self-report measures can be seen as a limitation because self-report measures appear to be less sensitive to functional changes over time (Kempen et al., 1996; Cress et al., 1995; Reuben, Valle, Hays, & Siu, 1995) and are easily biased by cognitive impairment (Sager et al., 1992; Edwards, 1990). The lack of performance-based measures used in Study I raised a unique limitation in that without such measures, it was not possible to determine (from a clinical perspective) whether or not reported activity restriction associated with FoF was warranted. In Study II, using self-reported information about the receipt of medical care for a fall-related injury may have influenced the study's results, either through under- or over-reporting or through inaccurate descriptions of the sustained injuries. Across all of the studies, data regarding the occurrence of falls was gathered via self-report. Although common, this strategy to document the occurrence of falls is problematic. Some older adults may view a fall as a marker for impending dependency and a critical event leading to institutionalization, and thus may be reluctant to disclose fall experiences (Peterson, 2001). Others may deny fall experiences altogether. This possibility has been substantiated by recent research that demonstrated underreporting of falls in geriatric patients with repressive coping (Hauer et al., 2009). To address the problem of fall under-reporting, Lamb et al. (2005), representing the consensus of the ProFaNE, recommend that falls should be recorded using prospective daily recording and a

notification system with a minimum of monthly reporting. Additionally, telephone or face-to-face interview should be used to rectify missing data and to ascertain further details of falls and injuries. In light of the ProFaNE recommendations, the use of self-reported data on fall experiences is an important limitation associated with Studies I-III.

Determining the appropriateness of the tools used to evaluate the *SAHB* program was an important goal associated with Study III. The analysis revealed that two of the outcome tools (the FCS and the FES) exhibited poor Cronbach's alphas in the study sample. Study III results associated with the FCS and the FES must be viewed with caution given the poor performance of those tools.

6.2.4 Ethical Considerations

Studies I-IV posed minimal risk to the study participants, however, there was some burden associated with participation. Each study required participants to reflect on their fall risk and the impact of MS on their lives. In Studies II, III and IV, participants discussed recent fall experiences at some length, which could have led them to feeling sad or uncomfortable. Participating in an interview (associated with Study I, II or IV) or a *SAHB* session (Study III) could have been tiring for the participants. Further, the time commitment associated with Studies III and IV was substantial. To address those increased risks, several steps were taken. The consent process associated with each study emphasized that participation was voluntary. Participants were told that they could withdraw at any time without consequences of any kind and that they could refuse to answer any questions and still remain in the study. The consent process was repeated with each Study IV participant prior to the beginning of each interview. In addition, all interviews were conducted at a time that was convenient and preferred by the participant involved.

6.3 CONCLUSIONS

The findings of this thesis have important clinical implications for occupational therapists and other health care providers working with people with MS. Studies I and II indicate that FoF, associated activity curtailment and fall-related injuries warrant the attention of health care providers due to their high prevalence among community-based people living with MS. Those studies also suggest numerous opportunities for intervention by identifying modifiable risk factors. Findings from this thesis serve to inform the assessment of fall risk management skills and falls self-efficacy among

people with MS. They also suggest that approaches to building fall risk management skills and falls self-efficacy that are based upon occupationally-grounded theoretical principles may meet the unique needs of people with MS. Specifically, Study III findings suggest that the *SAHB* intervention appears to have potential to foster changes in knowledge, skills and behavior associated with reduced personal fall risk. Study IV findings highlight the importance of embedding fall prevention efforts for people with MS within the context of their quest to stay active and involved in life. Those findings also point to the possibility of a close relationship between volitional attributes and confidence in the ability to avoid falls during day-to-day activities. In doing so, Study IV findings raise the possibility that helping people with MS to integrate their awareness of fall risk and use of fall risk management strategies into their thoughts, feelings and actions may support their efforts to create successful occupational lives.

6.4 FUTURE STUDIES

Findings from this thesis suggest four priorities for future research.

Psychometric work- Psychometric work is needed to examine the appropriateness of using existing instruments designed to assess falls self-efficacy with people with MS. This work should not be limited to the FES as the Falls Efficacy Scale-International (Yardley et al., 2005) has recently emerged as an important tool to measure falls self-efficacy. The FPSS, developed for Study III, is unique in that it is a self-report instrument addressing protective behaviors related to fall risk among adults with MS. Thus, further psychometric work to develop the FPSS is warranted.

Longitudinal studies- Longitudinal cohort studies involving people with MS aged 18 and over are needed to describe the relationship between FoF and functioning over time among people with MS. Such work should measure a variety of variables that reflect diverse influences on occupational performance. In addition, longitudinal studies should gather information regarding recurrent falls, injurious falls (validated against medical records or coding via established measures of severity) and participation. This prospective work can be enhanced by use of self-report/subjective and performance-based/objective measures, use of accelerometers which provide information on the amount, frequency, and duration of physical activity (Murphy, 2009; Plasqui & Westerterp, 2007), and use of strategies to assess cost-effectiveness

and use qualitative methodologies. A qualitative dimension is needed to understand the relationship between falls and behaviors/activities and to better understand the context in which falls are occurring.

Qualitative studies exploring falls self-efficacy- Qualitative work is needed to understand how falls self-efficacy is experienced by diverse groups of people with MS (e.g., people who have not been involved in fall prevention or fall risk management programs, people who are recently diagnosed, people transitioning to new living situations). In addition, qualitative exploration of how falls self-efficacy is developed over time and experienced by people living with other chronic (e.g., diabetes, cancer, stroke) and acute (e.g., hip fracture, head injury) medical conditions is warranted. Such work may reveal consistent features of falls self-efficacy or it may highlight features of falls self-efficacy that are unique to specific patient groups. In either case, future qualitative work has the potential to inform the development of new approaches to fall prevention.

Qualitative and quantitative studies to evaluate the efficacy and effectiveness of the SAHB program- Further pilot work on the *SAHB* program is needed to explore the potential of the *SAHB* program for use with people with MS aged 18 or over and to determine if the recruitment process is made easier when the age-related inclusion criteria is lowered. Following the successful completion further pilot work, initiating a RCT to evaluate the *SAHB* program may be appropriate. Based upon the recommendations provided by Gates, Fisher, Cooke, Carter, and Lamb (2008), such a trial should be powered to detect cost effectiveness as well as clinically important effects on the number of fall related injuries, number of people sustaining falls, rates of falls, and quality of life. Participation-focused outcomes would also be meaningful. With respect to fall-related injuries, it would be important to include minor (e.g., nonhip, nonvertebral) fractures. Although often overlooked in studies of fall-related injuries, these types of fractures are associated with premature mortality among community-dwelling older adults (Bliuc et al., 2009). Finally, any RCT undertaken to evaluate *SAHB* should examine any long term (>1 year) program benefits.

Drawing upon findings from *SAHB* research involving people with MS, it may be possible to develop complimentary fall risk management interventions for people living with other types of medical conditions that place them at high risk for falls. Such

research would address the recognized need for tailored interventions designed to reduce fall risk among people living with specific medical conditions, such as stroke (Sleet et al., 2008; Schmid & Rittman, 2009). Efforts to modify *SAHB* for use with other patient populations would be enhanced by applying findings from qualitative and quantitative studies in order to understand and address specific nature of fall risk for people living with a specific medical condition.

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