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COMMUNITY-DWELLING OLDER ADULTS' ADHERENCE TO FALL PREVENTION  
RECOMMENDATIONS

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of  
Philosophy in Health Related Sciences – Gerontology at Virginia Commonwealth University.

by

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## **Dedication**

This work is dedicated to my four sons: Justin, Camden, Griffin, and Bronson Fleming. I appreciate how understanding and supportive each of you have been throughout all of these years. I know this journey had an impact on our lives, and I am proud that you view this impact as positive. You never made it a problem that I had homework to complete, books to study, and data to collect. Rather, you joined me by asking questions, talking with me about my studies, and doing your own homework alongside me. Because we traveled this journey together you've learned the value of a continued education and how this leads to the ability, and therefore the responsibility, to make a positive difference in the lives of others. Although I've said it many times before, I will say it again, here in writing for the world to see: I love each of you deeply and will always support you on the journeys you chose.....and thank you for supporting me on mine.... mom.

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## Table of Contents

<b>List of Tables .....</b>	<b>ix</b>
<b>List of Figures .....</b>	<b>x</b>
<b>Abstract .....</b>	<b>xi</b>
<b>Chapter One: Introduction .....</b>	<b>1</b>
<b>Study Background .....</b>	<b>1</b>
<b>Problem Statement .....</b>	<b>2</b>
<b>Aims .....</b>	<b>3</b>
<b>Scope of Study .....</b>	<b>4</b>
<b>Research Question and Hypotheses .....</b>	<b>5</b>
<b>Analytical Approach .....</b>	<b>7</b>
<b>Chapter Two: Literature Review .....</b>	<b>8</b>
<b>Synthesis of Previous Work .....</b>	<b>8</b>
<b>Lack of understanding. ....</b>	<b>9</b>
<b>Recent experiences with falling. ....</b>	<b>12</b>
<b>Perceived susceptibility of future falls. ....</b>	<b>13</b>
<b>Critique of Previous Work .....</b>	<b>14</b>
<b>Rationale for Formulating Analytical Framework .....</b>	<b>18</b>
<b>Significant implications of falls. ....</b>	<b>18</b>

<b>Previous research.</b> .....	19
<b>Summary and Integration of the Literature Review</b> .....	20
<b>Chapter Three: Theoretical Framework</b> .....	23
<b>Explanation of Health Belief Model</b> .....	23
<b>Presentation of Conceptual Model</b> .....	28
<b>Development of Hypotheses</b> .....	29
<b>Chapter Four: Methodology</b> .....	34
<b>Research Design</b> .....	34
<b>Data Sources</b> .....	35
<b>Home visit 1.</b> .....	36
<b>Home visit 2.</b> .....	38
<b>Home visit 3.</b> .....	39
<b>Sampling</b> .....	41
<b>Power analysis.</b> .....	42
<b>Institutional Review Board</b> .....	42
<b>Measurement of Variables</b> .....	43
<b>Independent variable: Education intervention.</b> .....	43
<b>Independent variable: Recent falls.</b> .....	44
<b>Independent variable: Perceived susceptibility (of future falls).</b> .....	47
<b>Dependent variable: Percent of adherence (with recommendations).</b> ..	47
<b>Supporting information.</b> .....	49
<b>Methods for Hypotheses Testing</b> .....	50
<b>Exploratory and Confirmatory Analytical Strategies</b> .....	52



<b>Potential Limitations and Barriers .....</b>	<b>54</b>
<b>Study Impact .....</b>	<b>56</b>
<b>Chapter Five: Results .....</b>	<b>57</b>
<b>Recruiting and Randomization .....</b>	<b>57</b>
<b>Data Collection .....</b>	<b>61</b>
<b>Exploratory Data Analysis .....</b>	<b>61</b>
<b>Demographics .....</b>	<b>65</b>
<b>Recommendations Made .....</b>	<b>68</b>
<b>Adherence .....</b>	<b>68</b>
<b>H<sub>1</sub> Education Intervention .....</b>	<b>69</b>
<b>H<sub>2</sub> Recent Falls .....</b>	<b>72</b>
<b>H<sub>3</sub> Perceived Susceptibility .....</b>	<b>74</b>
<b>Chapter Six: Discussion and Conclusion .....</b>	<b>77</b>
<b>Overview .....</b>	<b>77</b>
<b>Major Findings .....</b>	<b>78</b>
<b>Findings Related to the Literature .....</b>	<b>78</b>
<b>Education Intervention .....</b>	<b>79</b>
<b>Recent Falls .....</b>	<b>80</b>
<b>Perceived Susceptibility .....</b>	<b>81</b>
<b>Health Belief Model .....</b>	<b>82</b>
<b>Study Limitations .....</b>	<b>84</b>
<b>Sample size. ....</b>	<b>84</b>
<b>Generalization. ....</b>	<b>84</b>

Self-selection. ....	84
Self-reporting. ....	85
Perceived susceptibility. ....	85
<b>Recommendations</b> .....	86
Study design. ....	87
<i>Modification in research design.</i> .....	87
<i>Quantification of adherence.</i> .....	87
<i>Time between sessions.</i> .....	87
Recruiting. ....	88
<i>Wording.</i> .....	88
Instruments. ....	89
<i>Modification in forms.</i> .....	89
<i>Deletion of calendar.</i> .....	89
<i>Alternative to ABC Scale.</i> .....	89
<i>Add recommendation.</i> .....	91
<i>Add questions.</i> .....	92
<i>Larger study.</i> .....	92
Commentary and Closing Statement .....	92
<b>References</b> .....	94
<b>Appendix A: Activities-specific Balance Confidence Scale</b> .....	100
<b>Appendix B: Data Collection Sheet</b> .....	102
<b>Appendix C: Participant Interview Form</b> .....	104
<b>Appendix D: Home Environmental Evaluation Form</b> .....	111

<b>Appendix E: Home Environmental Evaluation Form: Recommendations .....</b>	<b>122</b>
<b>Appendix F: Environmental Fall Prevention Resources .....</b>	<b>124</b>
<b>Appendix G: 90-day Calendar Sheet .....</b>	<b>127</b>
<b>Appendix H: CDC “A Home Fall Prevention Checklist for Older Adults” ....</b>	<b>130</b>
<b>Appendix I: Personalized Education Guide .....</b>	<b>132</b>
<b>Appendix J: Example of Personalized Recommendations .....</b>	<b>135</b>
<b>Appendix K: Recruitment Flyer .....</b>	<b>137</b>
<b>Appendix L: Consent Form .....</b>	<b>139</b>
<b>Appendix M: Comparison Chart .....</b>	<b>145</b>
<b>Appendix N: Novel Situations .....</b>	<b>148</b>
<b>Vita .....</b>	<b>151</b>

## List of Tables

Table 1. <i>Health Belief Model and Hypothesis 1.</i> .....	31
Table 2. <i>Health Belief Model and Hypothesis 2.</i> .....	32
Table 3. <i>Health Belief Model and Hypothesis 3.</i> .....	33
Table 4. <i>Research Design</i> .....	34
Table 5. <i>Estimated Length of Time Per Participant, Per Visit</i> .....	40
Table 6. <i>Review of Education Intervention (IV)</i> .....	62
Table 7. <i>Review of Falls (IV)</i> .....	63
Table 8. <i>Review of Perceived Susceptibility (IV) and Percentage of Adherence (IV)</i> .....	63
Table 9. <i>Demographics: Sampled Area to Study Sample</i> .....	65
Table 10. <i>Age of Participants</i> .....	65
Table 11. <i>Percentage (N) of Male to Female Participants</i> .....	66
Table 12. <i>Percentage (N) of Ethnicity</i> .....	66
Table 13. <i>Recent Falls by Education Intervention</i> .....	67
Table 14. <i>Mean Percentage of Adherence Between Home Visits</i> .....	69
Table 15. <i>Review of <math>H_2</math> Variables</i> .....	73
Table 16. <i>Beta for <math>H_2</math> Predictor Variables</i> .....	74
Table 17. <i>Review of <math>H_3</math> Variables</i> .....	75
Table 18. <i>Beta for <math>H_3</math> Predictor Variables</i> .....	76

## List of Figures

<i>Figure 1.</i> Health Belief Model.....	24
<i>Figure 2.</i> Health Belief Model: Environmental fall prevention recommendations.....	29
<i>Figure 3.</i> Overall Recommendations.....	69
<i>Figure 4.</i> Total Percentage of Adherence .....	71

## **Abstract**

### **COMMUNITY-DWELLING OLDER ADULTS' ADHERENCE TO FALL PREVENTION RECOMMENDATIONS**

By Suzänne Fleming Taylor, Ph.D., MBA/HCM, OTR/L

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Health Related Sciences – Gerontology at Virginia Commonwealth University.

Virginia Commonwealth University, 2014

Major Director: Elizabeth Ayn Welleford, Ph.D., MSG, Chair and Associate Professor,

Department of Gerontology

Falling among older adults is a leading cause of concern due to the known impacts including physical injury, loss of independence, increased health care costs, and mortality. In efforts to decrease the numbers of falls experienced by older adults, healthcare providers assess individuals' fall risks and provide corresponding fall prevention recommendations. The effectiveness however, of these recommendations, is only as strong as the level of adherence to those recommendations; which has proven low in recent research.

Using the theoretical foundation of the Health Belief Model, this study quantified adherence to environmental fall prevention recommendations. Twenty-two community-dwelling older adults participated in this randomized control group study that took place across three home visits, scheduled approximately 30 days apart. Participants were interviewed regarding

their recent falls and perceived susceptibility to future falls; then a home evaluation was conducted. Treatment group participants were provided personalized education explaining how and why environmental fall prevention recommendations were important to decrease their risk of falls while control group participants were provided general recommendations.

A two-sample t-test for independent groups determined a statistically significant relationship: participants who received personalized education intervention were more likely to follow recommendations than those who received general education intervention. Multiple regressions were conducted to review relationships between an individual's recent falls, and their perceived susceptibility to future falls, with their extent of adherence with fall prevention recommendations. No statistically significant relationship was found. This study suggests that providing personalized education for community-dwelling older adults regarding environmental fall prevention recommendations increases their extent of adherence with such recommendations.

## **Chapter One: Introduction**

### **Study Background**

According to the National Center for Injury Prevention and Control (NCIPC), a division of the Centers for Disease Control and Prevention (CDC), one in three older adults will experience a fall this year with significant negative outcomes (NCIPC, 2011a). Post fall, individuals will face a variety of functional and emotional declines including: decreased ability to complete daily activities (ADLs), restriction of activities, depression, decreased socialization, increased institutionalization, and perhaps most importantly, an overall decreased quality of life (Boyd & Stevens, 2009; Roe et al., 2008; Shumway-Cook., 2009; Tinetti & Williams, 1998). It is estimated that 20 – 30% of falls result in a moderate to severe injury including traumatic brain injury, hip fracture, shoulder dislocation, and injury to internal organs (Tinetti & Williams, 1998; NCIPC, 2011a). In 2000 the direct medical costs to treat injurious falls reached \$19 billion. This figure is expected to reach nearly \$55 billion by 2020 (NCIPC, 2011a). Therefore, preventing falls is vital. In fact, many developed countries consider fall prevention a priority (Todd & Skelton, 2004) and the United States is no exception (NCIPC, 2011b; National Council on Aging, 2011b).

In 2005, in response to the evidence-based National Action Plan, the National Council on Aging (NCOA) developed the Falls Free<sup>®</sup> Initiative, a national network dedicated to the reduction of falls among older adults (NCOA, 2011a). Within this initiative three coalition workgroups have been developed: the Advocacy Workgroup, the Home Safety Workgroup, and



the State Coalition Workgroup. These three workgroups were charged with increasing the efficiency of fall prevention efforts as a means of decreasing the number of falls and as a result, decreasing the healthcare costs. Likewise, the NCIPC lists the reduction of falls among older adults as a priority initiative (2011b). Both of these national centers have compiled resources to train direct care providers, to support healthcare providers in implementing fall prevention programs, and to educate general consumers. The National Institute on Aging (NIA), a division of United States National Institutes of Health, provides a website designed for older adult users, encouraging engagement in preventative actions to decrease fall risks (NIH SeniorHealth, 2011). The American Association for Retired Persons (AARP) highlighted an article for the prevention of falls, encouraging readers to follow recommendations to minimize their fall risks (2011). Despite these national efforts, research has shown that regardless of the numerous tools, tests, and measures designed to identify the risk of having a fall, and various fall prevention programs and recommendations designed to decrease those risks, the majority of older adults do not follow through with fall prevention recommendations (Boyd & Stevens, 2009; Cumming, et al., 2001; Leland, Porell, & Murphy, 2011; Shumway-Cook, et al., 2009; Yardley, et al., 2006; Yardley, et al., 2008).

### **Problem Statement**

Falls are the single most costly, yet preventable, event facing older adults. With an expected health care cost of \$19 billion next year, rising to nearly \$55 billion by 2020 (NCIPC, 2011a) in the United States, the implications on our health care system are enormous; and this is merely the beginning as we experience increased longevity in our nation. Although there are numerous tools, tests, and measures designed to quantify the risk of having a fall, and various fall prevention strategies, the majority of older adults do not partake in fall prevention measures

(Boyd & Stevens, 2009; Cumming, et al., 2001; Leland, Porell, & Murphy, 2011; Shumway-Cook, et al., 2009; Yardley, et al., 2006; Yardley, et al., 2008). The problem becomes a matter of “why not?” Why would any older adults allow themselves to remain at risk of falling when the potential outcomes have been shown to be detrimental to their very well being? What factor(s) influence adherence to fall prevention recommendations? Learning the answers to this problem allows healthcare providers to structure fall prevention efforts in the most efficient manner, thereby creating a culture that lends towards increased levels of adherence.

## **Aims**

Using a client-centered, occupational therapy based approach, this study sought to quantify adherence to environmental fall prevention recommendations and clarify underlying reasons for non-adherence among community-dwelling adults aged 65 years and older.

Although substantial research has shown the effectiveness of fall prevention recommendations, several research studies have revealed community-dwelling older adults have low levels of adherence to recommendations for environmental changes (Shumway-Cook, et al., 2009; Leland, Porell, & Murphy, 2011; Cumming, et al., 2001; Yardley, et al., 2006; Roe et al., 2008). With this understanding, this study’s first aim was:

Aim 1: To compare the extent of adherence to environmental fall prevention recommendations between personalized and generalized education in community-dwelling older adults.

Previous research has considered the impact of sustaining a recent fall on the likelihood of adhering with fall prevention recommendations. While some studies have demonstrated a positive relationship (Yardley, et al., 2008; Leland, Porell, & Murphy, 2011), other research has been unable to substantiate these findings (Boyd & Stevens, 2009). According to the constructs

of the Health Belief Model, individuals who have recently fallen are more likely to take preventative actions to decrease risk(s) of future falls as *perceived susceptibility* increases *likelihood of taking action* (Rosenstock, Strecher, & Becker, 1988). This leads to the study's second aim:

Aim 2: To determine the relationship between recent falls and extent of adherence to environmental fall prevention recommendations in community-dwelling older adults.

Several research studies have demonstrated a positive relationship between perceived susceptibility of falls and actual tested abilities (Lohnes, & Earhart, 2010; Lajoie & Gallagher, 2003; Schepens, Goldberg, & Wallace, 2009). This indicates that an older adult who has a fear of falling is in fact at a greater risk of falling. The Health Belief Model proposes a positive relationship between *perceived susceptibility* of future falls and *likelihood of taking action* through adherence to environmental fall prevention recommendations. This leads to the third aim of this study:

Aim 3: To determine the relationship between perceived susceptibility to future falls and extent of adherence to environmental fall prevention recommendations in community-dwelling older adults.

### **Scope of the Study**

This study contributes to the gap between knowing how to identify and decrease fall risks, and having older adults adhere with environmental fall prevention recommendations. Following the recommendations of previous studies (Leland, Porell, & Murphy, 2011; Green, Sample, & Fruhauf, 2009; Roe, et al., 2008; Yardley, et al., 2006; Cumming, et al., 2001; Lambert, et al., 2001), this study gathered quantitative data to understand how older adults responded to fall prevention recommendations. The results of this study allow healthcare

providers to modify fall prevention programs to increase effectiveness. Specifically, this study provides recommendations on structuring models of fall prevention education in a manner shown to elicit the highest rates of adherence to recommendations.

This study is innovative in the use of treatment and control groups along multiple home visits to collect data and interview participants with open-ended questions. To date, no other published study has incorporated each of these aspects. Previous qualitative research recommends quantifying the levels of adherence to fall prevention recommendations (Yardley, et al., 2006; Roe, et al., 2008), while previous quantitative research recommends gathering a better understanding of why older adults chose to adhere to fall prevention recommendations (Leland, Porell, & Murphy, 2011; Green, Sample, & Fruhauf, 2009; Cumming, et al., 2001; Lambert, et al., 2001). Previous community-based research relied upon a single home visit and a telephone call as a follow-up to determine levels of adherence (Green, Sample, & Fruhauf, 2009). Relying upon telephone calls to determine levels of adherence tends to decrease the reliability of the gathered data due to the inherent difficulties with self-reporting (Polit & Beck, 2008). This study has increased validity through completing a total of three in-home visits to the participants' homes as a means to both gather objective data and to conduct the interviews in person.

### **Research Question and Hypotheses**

Although substantial research has shown the effectiveness of fall prevention recommendations, several research studies have revealed community-dwelling older adults have low levels of adherence to recommendations for environmental changes (Boyd & Stevens, 2009; Cumming, et al., 2001; Leland, Porell, & Murphy, 2011; Roe, et al., 2008; Shumway-Cook, et al., 2009; Yardley, et al., 2008; Yardley, et al., 2006). These studies provide presumptions as to

what factors may influence the decision to adhere to fall prevention recommendations. These presumed factors include: level of understanding how to adjust the home environment, having sustained recent falls, and perception of susceptibility of future falls. Based upon these findings and recommendations of previous research, this study asked the research question: Do these identified factors (education provided, recent falls, and perceived susceptibility to future falls) increase the likelihood that community-dwelling older adults will adhere to environmental fall prevention recommendations? The following three hypotheses were derived from this research question:

H<sub>1</sub> Community-dwelling older adults who receive personalized education regarding environmental fall hazards will be more likely than those receiving generalized education to adhere with environmental fall prevention recommendations.

H<sub>2</sub> Community-dwelling older adults who experienced one or more falls within the past 180 days are more likely to adhere with environmental fall prevention recommendations, irrespective of intervention group.

H<sub>3</sub> Community-dwelling older adults with higher perceived susceptibility of future falls are more likely to adhere with environmental fall prevention recommendations, irrespective of intervention group.

This study incorporated open-ended interviewing of the participants during each home visit as a means to compliment the quantitative hypotheses. While this information was neither coded nor analyzed, results were included in the discussion in the final chapter. During the first home visit the semi-structured interview gathered information regarding fall prevention beliefs. During the second and third home visits each participant was asked: “Why did (the participant) choose adherence / non-adherence to environmental fall prevention recommendations?”

Information was also gathered regarding any events of feeling off-balance, feeling dizzy, slips, trips, stumbles, and/or falls.

### **Analytical Approach**

Upon review of the raw data to identify and address any errors or inaccuracies, data analysis began with the utilization of t-test for independent groups. This analysis tested the first hypothesis by utilizing a two-level independent variable coded for personalized or generalized education. The dependent variable was the percentage of adherence with recommendations provided. The next two hypotheses required the use of multiple regressions. Both of these hypotheses sought to understand the relationship between two quantitative variables: the percentage of adherence with recommendations provided and: the number of falls the participant experienced in the past 180 days ( $H_2$ ); and the participant's perceived susceptibility of future fall ( $H_3$ ). Consideration was given for the potential impact of the education intervention provided and the potential impact of having sustained an injurious fall. Therefore, statistical analysis planned for control for these variables, along with any demographic variable(s) determined as non-equivalent between groups, while determining the relationship between the remaining two variables.

Information gathered from the open-ended interviewing of the participants was neither coded nor analyzed, but included in discussion in the final chapter. Information gathered is used to provide an encompassing view of how older adults respond to the Health Belief Model constructs of *cue to action* and *perceived susceptibility* in terms of likelihood of adhering to the preventative health behaviors of reducing environmental fall risks.

## **Chapter Two: Literature Review**

### **Synthesis of Previous Work**

There are numerous tools, tests, and measures designed to quantify the risk of an older adult experiencing a fall as well as interventions to decrease these risks (Tinetti, et al., 1997; Costello, E., & Edelstein, J. 2008; Feder, et al., 2000; Gibson, et al., 1987). Unfortunately, based upon recent research, the majority of community-dwelling older adults do not partake in fall prevention measures (Boyd & Stevens, 2009; Cumming, et al., 2001; Leland, Porell, & Murphy, 2011; Roe, et al., 2008; Shumway-Cook, et al., 2009; Yardley, et al., 2008; Yardley, et al., 2006).

A review of the electronic databases CINAHL, PubMed, and Medline using various combinations of the following key words within the abstract field: older adults, aged 65+, community-dwelling, falls, accidental falls, fall prevention, adherence, injuries; with limitations of English language only, revealed a theme of potential factors that may play a role in explaining older adults' adherence with fall prevention recommendations. These potential factors include:

Lack of understanding Several studies, both quantitative (Shumway-Cook, et al., 2009; Leland, Porell, & Murphy, 2011; Cumming, et al., 2001), and qualitative (Yardley, et al., 2006; Roe et al., 2008) cite the possibility that low levels of adherence with fall prevention recommendations may be corrected with improved fall prevention education. This is based on findings that indicated barriers to adherence include: a lack of understanding how to

follow the recommendations, a lack of understanding as to how the recommendations decrease the risk of falling or a disbelief in the efficacy of the recommendations.

Recent experiences with falling Previous research has not been consistent with identifying how recent experiences with falling affect levels of adherence with fall prevention recommendations. Some studies have shown that older adults with a recent fall history are more likely to adhere to recommendations (Yardley, et al., 2008; Leland, Porell, & Murphy, 2011), while other research has not been able to substantiate these findings (Boyd & Stevens, 2009).

Perceived susceptibility of future falls Previous research has considered the relationship between the perception of having a fall risk and the likelihood of adhering to recommendations but has not been able to quantify the extent of this relationship (Yardley, et al., 2006; Leland, Porell, & Murphy, 2011).

### **Lack of understanding.**

Shumway-Cook, et al., (2009) completed a secondary-data study utilizing the Medicare Current Beneficiaries Survey. Data from 12,669 respondents were analyzed with a purpose of examining the incidence of falls, associated factors, health care costs, and providers' response to reported falls. Of the respondents who reported a fall, only 48% reported speaking with a health care provider about the fall and of those, only 61% reported receiving information to reduce fall risks. The authors synthesized their findings with previous works citing both patient-centered and systems as barriers to older adults adherence to fall prevention recommendations. Their recommendations include providing fall prevention education routinely to older adults who are at risk of falls.



Leland, Porell, and Murphy (2011) utilized secondary-data obtained through the Health and Retirement Survey (HRS), a longitudinal, nationwide survey to study how older adults' fall history influences environmental changes to decrease risks of falling. By creating three observational periods of two years each, the authors analyzed data from 25,036 observations in the pooled sample. The results revealed that, of the total sample, only 34.3% (8,575) made environmental changes to decrease their risk of falling. Of the remaining respondents, 55.1% made no changes (10.6% either passed or were admitted to a nursing home). With a focus on just those respondents reporting a fall history on the HRS (in the past two years), the authors noted a trend that older adults who sustained two or more falls without an injury or an injurious fall were 44% more likely to make predicted environmental changes. Due to the use of secondary-data, they were unable to discern potential underlying reasons as to why there was not an identifiable prediction of environmental changes by the older adults who had experienced one fall or had fallen without injury. The authors hypothesize the lack of knowledge related to risks of falling and how environmental changes decrease these risks may play a role. This study's recommendations include providing older adults education regarding environmental changes as a means of optimizing fall prevention efforts.

Yardley, et al., (2006) completed focus groups with a total of 66 participants aged 61 to 94 years old. The sizes of the focus groups ranged from three to six participants each and were centered on understanding older adults' perceptions related to fall prevention recommendations. Using thematic analysis and constant comparison, the authors created primary and subcategories as a means of summarizing the qualitative data gathered. One of the predominate themes expressed by the participants was the insufficiency of information related to preventing falls even though participants were able to discuss examples of how they modified their lifestyles and

home environments to decrease fall risks. Conversely, participants also discussed how receiving fall prevention education might increase fears and anxieties as an older adult's awareness of potentially falling and sustaining an injury increases. Recommendations for future research include building on these qualitative findings to discover the levels of receptiveness of fall prevention education.

A qualitative study published in 2008 by Roe, et al., aimed to understand older adults' experience of falls to identify potential factors that would enhance fall prevention efforts. Using a convenience sample of 27 older adults, the authors led one-to-one, semi-structured interviews following the older adult's fall, 18 of which were able to participate in a second one-to-one, semi-structured interview three to four months later. All participants had sustained an injury and for the vast majority of the participants (81.5%) this was not their first fall. The authors found that participants often perceived falling as a natural part of aging and the need for preventative measures as a sign of aging. The authors propose that guiding older adults towards understanding why they have fallen and how preventative measures could decrease future falls may reduce fears and lead towards improved fall prevention measures.

Cumming, et al. (2001) conducted research to determine the level of adherence to recommendations for home modification as a means of reducing fall risks. An occupational therapist visited 178 homes of older adults (mean age of 76.4 years) and made recommendations in 150 of those homes. One year later, an in-home visit was completed to determine adherence to recommendations. Of the 150 homes receiving recommendations, 121 homes were revisited. The remaining 29 homes could not be assessed as the participant had moved into a structured living facility, passed away, or refused the revisit. Of the participants included in the revisit, 21% had not followed any recommendations, 21% had followed all of the recommendations, and

the remaining 58% partially followed recommendations. Although the authors were unable to identify a set of predictors of adherence, they discovered one clear difference between those participants adhering to recommendations and those who did not. Adherence to recommendations was twice as likely if the participant believed the recommendations would decrease their risk of falling. These findings are supportive of the Health Belief Model's proposition that an individual's *perceived benefit* of recommendations influences *likelihood of taking recommended action*.

### **Recent experiences with falling.**

Yardley, et al., (2008) conducted a survey with an aim of understanding how and to what extent older adults would participate with fall prevention efforts. The survey was successfully sent to 10,443 older adults (647 of the original were either returned as undeliverable or had been sent to individuals who had recently passed) and 5,440 (52.09%) were returned fully completed. The analysis revealed the factors of older age ( $\geq 75$  years old) and recent falls (two or more in the past year) as most associated with likelihood of completing environmental changes to decrease risks of falls.

Contrary to these findings, Boyd and Stevens (2009) did not find a relationship between recent falls and likelihood of making environmental changes to decrease the risk of falling. Boyd and Stevens, (2009) utilized secondary data from a cross-sectional randomized telephone survey conducted by the Centers for Disease Control and Prevention. The second Injury Control and Risk Survey, completed between 2001 and 2003, surveyed adults aged 65 years and older regarding recent falls, sustained injuries, and whether or not changes had been made to decrease future risk of falling. The purpose of Boyd and Stevens' study was to estimate the frequency of falling and prevalence of fears of falling among community-dwelling older adults. Information

gathered from 1,709 participants showed that, of those reporting a recent fall (within past 3 months), the majority (84.4%) did not make any changes to their home environment (84.4%). These are alarmingly high numbers of older adults who have experienced a recent fall, 49.6% of which were injured during that fall, and 36.2% indicated they had increased fears of future falls. The authors did not hypothesize potential reasons for the results but they indicated that a weakness to the study is the use of self-reporting without providing a definition of a fall. This may have led to inconsistency between participants in responding to the questions. From this the authors recommend future research to incorporate definitions as a means to ensuring consistency among participants when reporting falls and follow through.

In contrast, Leland, Porell, and Murphy, (2011), substantiated the findings of Yardley, et al., (2009). Their results demonstrated that older adults who experienced two or more falls without an injury were 18% more likely to make environmental changes to decrease the risk of future falls. Those sustaining an injurious fall were shown to be 26% more likely to make environmental changes. The authors hypothesize the lack of making environmental changes following a non-injurious fall may be linked to older adults' discounting the non-injurious fall. The recommendation for future research includes discovering the relationship between falling and making environmental changes. Specifically, the authors point to the value of understanding how non-fallers respond to recommendations to decrease fall risks through environmental changes.

#### **Perceived susceptibility of future falls.**

The qualitative study conducted by Roe et al., (2008) showed that *loss of confidence* and *fear of falls* appeared to increase as the severity of the injury and / or frequency of the falls increased. Those participants who reflected on their fall were more likely to address their fear of

future falls through adopting fall prevention strategies. The authors propose that assisting older adults to reflect upon the fall and achieve understanding could lead to decreased fears of future falls and, based upon their findings this would lead to greater levels of adherence with fall prevention recommendations.

Yardley, et al., (2006) discovered a common theme for study participants to agree that fall prevention recommendations were useful, but for other people who needed that information. This stemmed from participants self-description as “non-fallers” as their falls were attributable to surrounding events. Recommendations for future research includes studies using quantitative measures to determine how prevalent these views are among older adults, and the impact these views may have on adherence to fall prevention recommendations.

The study results conducted by Leland, Porell, and Murphy, (2011) demonstrated a positive relationship between recent falls and environmental modifications to reduce fall risks. However, as this study utilized secondary data, no information could be gathered related to the participants’ perceptions of future falls. The authors hypothesized that older adults’ perception of falls without injury would vary, and based on other studies, older adults may discount falls without injury. The authors recommend future research to develop an understanding of how older adults perceive their fall history as well as the level of perceived susceptibility of future falls.

### **Critique of Previous Work**

Previous research studies provided a solid backdrop from which this study has developed. Using recommendations for future research as a guide, this study also sought to address the following limitations noted with previous studies.

Cumming, et al. (2001) completed “Adherence to Occupational Therapist Recommendations for Home Modifications for Falls Prevention” in Sydney, Australia between 1995 and 1997. This study is replicable with modifications to include a theoretical foundation, include provisions for those participants whose family followed through on the recommendations, and to report the results in terms of percentages of recommendations followed to recommendations provided for ease in comparison to other studies.

In a different approach, Yardley, et al., (2006) completed a qualitative study in the form of small focus groups. The 66 participants in this study were recruited from a variety of settings including structured independent living center, church groups, senior centers, and the local community, in Australia (the authors did not narrow the geographic location used for recruitment). No operational definitions were provided to clarify what constitutes a fall and what constitutes adherence and partial adherence to recommendations. However, this study contributed a valuable basis of understanding how older adults perceive fall prevention recommendations and how those views affect adherence to recommendations.

Another qualitative study, conducted by Roe, et al. (2008), showed similar results. Using a convenience sample of 27 older people, the primary aim of this study was to explore the experiences of older adults following a fall. Participants were recruited within 10 days following a fall that resulted in seeking medical attention. The authors state that one of the study’s limitations is the recruiting method may have strengthened the likelihood of the participant remembering circumstances surrounding the fall, but may have also resulted in a heightened awareness or fear of falling.

In contrast, the study conducted by Leland, Porell, and Murphy, (2011) used a two-year reporting period as a fall history. This parameter was most likely due to the use of a secondary-

data set but nonetheless allowed for error in self-reporting events. Another limitation was the inability to control for events occurring between the two observation periods, including additional falls that may have increased the participant's fear of falling or their perceived susceptibility of future falls. However, to the authors' knowledge, this is the first published study to review the relationship between fall history and environmental adjustments to decrease the risk of future falls. The authors' recommendations for future research include exploring the impact of multiple environmental recommendations.

Shumway-Cook, et al., (2009) reviewed how falls impact the Medicare population. This study provided the first national review of falls among adults aged 65 years and older including identifying factors associated with being a recurrent faller. The authors note the major limitation of using a 12-month recall period for participants to report falls. The presumption is that this led to underreporting of falls that in turn resulted in underestimated rates and impacts. Although there are limitations with the use of secondary data sets, the information gleaned from this study emphasizes the significant need to reduce the numbers of falls with adults aged 65 years and older.

Boyd and Stevens, (2009) used secondary data from the Centers for Disease Control and Prevention second Injury Control and Risk Survey (ICARIS-2) to complete the study "Falls and fear of falling: burden, beliefs and behaviors." Participants aged 65 years and older provided self-reports of falling and injuries sustained. Of those who reported falling, two additional questions were asked related to the physical activity of the participant and if they sought a medication review. The authors compared their results to prior research that used Behavioral Risk Factor Surveillance System (BRFSS) and discovered their data showed the number of recent falls as lower but the number of injuries as similar. It is presumed this variation is related

to BRFSS providing brief operational definitions for both “fall” and “injury” whereas the ICARIS-2 does not. This becomes a limitation to the results as the data gathered relies upon the respondents’ perceptions and self-definitions of “fall” and “injury.” As this was designed as a cross-sectional study, the data analysis did not allow for examination of the relationship between falls and fears of falling. Along with limitations associated with the use of secondary data and self-reports, another limitation to this study is the low response rate of 48%, which may limit how the results generalize. Given these limitations, this study demonstrates consistent results with previous studies showing a strong relationship between recent falls and the fear of future falls.

Yardley, et al., (2008) used a survey to gather information related to adherence with fall prevention recommendations. The primary limitation with this study is the reliance upon self-reporting a written survey. The authors acknowledge that participants may have reported intentions to adhere with fall prevention recommendations but in fact may not have carried forth with these intentions. One of the strengths of this study was the inclusion of an operational definition for “fall.”

One study not included as a foundation for this study is a recent study conducted by Green, Sample, and Fruhauf, (2009). This study reviewed how community-dwelling older adults responded to recommendations to reduce their fall risks. This descriptive pilot study included identifying common fall hazards for community-dwelling seniors and determining trends of responses towards recommendations. A total of 35 participants, residing within 23 homes, participated in the study. Of these homes, 22 were contacted for follow-up interviews (one participant had passed). Although there was no information regarding the number of recommendations provided in comparison with the number of changes made, the reported data



demonstrated an adherence rate of 81% among participants. When compared to other studies, this is a significantly high rate of adherence. Of note, the authors acknowledge the efforts of over 30 students with recruitment, home evaluations, and data compilation and analyses. No information was provided to detail the recruiting and sampling method used to obtain the small (N=22) convenience sample. If the students recruited relatives, it is plausible that adherence with recommendations is related to familiar dynamics and the belief that one is assisting with a school assignment. Additionally, results showed large standard deviations and ranges that are not empirical. For example, the mean for *number of pets* is 0.48 with a standard deviation of  $\pm 0.73$  for a range of -0.25 – 1.21. The mean for *lighting mode* is 96.7 with a standard deviation of  $\pm 115.67$  for a range of -18.97 – 212.37. In another example, the mean for *lighting range* (140.6) and the standard deviation (137.3) are similar, creating a range of 3.3 foot-candles to 277.9 foot-candles. Standard deviations with these extreme ranges indicate that the histograms are flattened rather than towards a bell-shaped curve. This indicates that the samples may not be good representations of the intended population (Tabachnick & Fidell, 2007). Recognizing the limitations of the small pilot study, the authors state their desire to encourage future research related to understanding how older adults perceive and adhere to fall prevention recommendations.

Building from these previous studies, this study was based upon a theoretical foundation, provided operational definitions, gathered primary quantitative data of self-reporting and direct observations, and incorporated open-ended interview questions.

### **Rationale for Formulating Analytic Framework**

#### **Significant implications of falls.**

According to research estimates, over 8.85 million older adults will experience a fall this

year with significant negative outcomes. Post fall these individuals will face a variety of functional and emotional declines including: decreased ability to complete daily activities, restriction of activities, depression, decreased socialization, increased institutionalization, injuries, mortality, and perhaps most importantly, an overall decreased quality of life (Boyd & Stevens, 2009; Roe et al., 2008; Shumway-Cook, et al., 2009; Tinetti & Williams, 1998). This year falls resulting in injury will cost the U.S. healthcare system an estimated \$19 billion. By 2020 this number is expected to reach nearly \$55 billion (NCIPC, 2011a). As a national priority, research is needed to decrease the number of falls, and in turn, decrease the associated healthcare costs.

#### **Previous research.**

This study incorporated the recommendations of previous studies through the exploration of three hypotheses. The first hypothesis (*community-dwelling older adults who receive personalized education regarding environmental fall hazards will be more likely than those receiving generalized education to adhere with environmental fall prevention recommendations*) explored the recommendations of previous studies to provide education as a means of increasing levels of adherence with fall prevention methods. This hypothesis went a step further to explore if a personalized approach to education generated higher levels of adherence compared to generalized education.

The second hypothesis (*community-dwelling older adults who experienced one or more falls within the past 180 days are more likely to adhere with environmental fall prevention recommendations, irrespective of intervention group*) aimed to add substantiated results as to whether or not sustaining a recent fall increases the level of adherence to fall prevention

recommendations. As current studies have both supported and disclaimed this assumption, additional research is needed.

This study followed recommendations from previous studies to analyze the degree to which the perception of sustaining a future fall impacts the level of adherence with environmental fall prevention recommendations through the third hypothesis (*community-dwelling older adults with higher perceived susceptibility of future falls are more likely to adhere with environmental fall prevention recommendations, irrespective of intervention group*).

Unique to this study was the addition of open-ended questions to develop an understanding of the factors impacting adherence with environmental fall prevention recommendations. Each of the three home visits included participant interviews during which participants were encouraged to discuss their perceptions and underlying reasons for adherence or non-adherence.

### **Summary and Integration of the Literature**

Research thus far has demonstrated the significant negative impact that falls have for older adults. The ramifications include a decreased ability to complete daily activities, restriction of activities, depression, decreased socialization, increased institutionalization, and perhaps most importantly, an overall decreased quality of life. Fall prevention measures have been shown to decrease the numbers of falls experienced by older adults, provided those recommendations are followed.

Unfortunately, as research has shown, the majority of community-dwelling older adults show low levels of adherence with fall prevention measures (Boyd & Stevens, 2009; Cumming, et al., 2001; Leland, Porell, & Murphy, 2011; Roe, et al., 2008; Shumway-Cook, et al., 2009; Yardley, et al., 2008; Yardley, et al., 2006). Research has shown the underlying reasons for non-

adherence may be attributable to whether or not the older adult received education or understood the education provided, whether or not there have been recent falls, and the perceived susceptibility of future falls.

- Education received regarding risks of falling and preventative measures a: Roe et al. (2008) completed a qualitative research study to explore how older people reacted to a recent fall and to determine trends of factors that may contribute to future falls. Participants tended towards the perception that falls are an assumed consequence of aging. Another qualitative study showed that older adults perceive that fall prevention information is not readily available (Yardley, et al., 2006). Shumway-Cook et al. (2009) discovered participants cited a general disbelief in the likelihood the fall prevention recommendations decreasing their risk of falling. This research supported earlier work by Cumming et al. (2001) in which data analysis revealed the primary factor differentiating adheres and non-adheres (to fall prevention recommendations) became “a belief that home modifications prevent falls.”
- Recent experiences with falling: To date research has shown mixed results as to whether or not recent experiences with falling increase the likelihood of adherence with fall prevention recommendations (Yardley, et al., 2008; Leland, Porell, & Murphy, 2011; Boyd & Stevens, 2009). These studies recommend future research to review the impact of recent falls on following fall prevention recommendations.
- Perceived susceptibility of future falls: Yardley, et al., (2006) found a common theme for study participants to agree that fall prevention recommendations were useful, but for other people who needed that information. Additionally, participants also tended to discount their fall and attribute it to a surrounding event.

By gaining an understanding of how older adults perceive fall prevention recommendations and how factors influence adherence, health care providers will be better suited to present fall prevention programs for older adults. As older adults develop improved adherence to recommendations for reduced fall risks, it is expected that the numbers of falls experienced will decrease, thereby decreasing the financial impact on the health care system, decreasing the losses of function, and improving the overall quality of daily life for older adults.

### **Chapter Three: Theoretical Framework**

The overarching purpose of this study was to contribute to the understanding older adults' health related behaviors relative to the prevention of falls. The specific goal of this study was to quantify older adults' level of adherence with environmental fall prevention recommendations and to contribute to understanding of why an older adult would choose to, or choose not to, adhere with environmental fall prevention recommendations. The primary theoretical base is the Health Belief Model. This model provided a solid theoretical foundation to explain anticipated relationships between factors, thus gave rise to this study's hypotheses.

#### **Explanation of Health Belief Model**

The Health Belief Model (HBM) originated in the early 1950's by G. M. Hochbaum, H. Leventhal, S. S. Kegeles, and I. M. Rosenstock to provide a means for understanding the likelihood of an individual taking action to change their preventative health related behaviors including why an individual would be noncompliant with health care recommendations (Rosenstock, 1974). The inspiration for this theory developed from Kurt Lewin's social psychological theory, specifically, "goal setting in the level-of-aspiration situation" which is dependent upon two components: how the individual values the outcome and likelihood of the outcome occurring (Rosenstock, 1966). The Health Belief Model theorizes that the extent to which an individual takes action to change their behaviors is determined by the interplay of the following four key concepts: *perceived susceptibility*, *perceived severity*, *perceived benefits*, and

*perceived barriers*. In 1966 Rosenstock further developed the Health Belief Model to conceptualize three areas: *individual perceptions*, *modifying factors*, and *likelihood of action* to provide a frame exploring and incorporating *cues to action*. Figure 1 shows a common pictorial representation of the Health Belief Model.

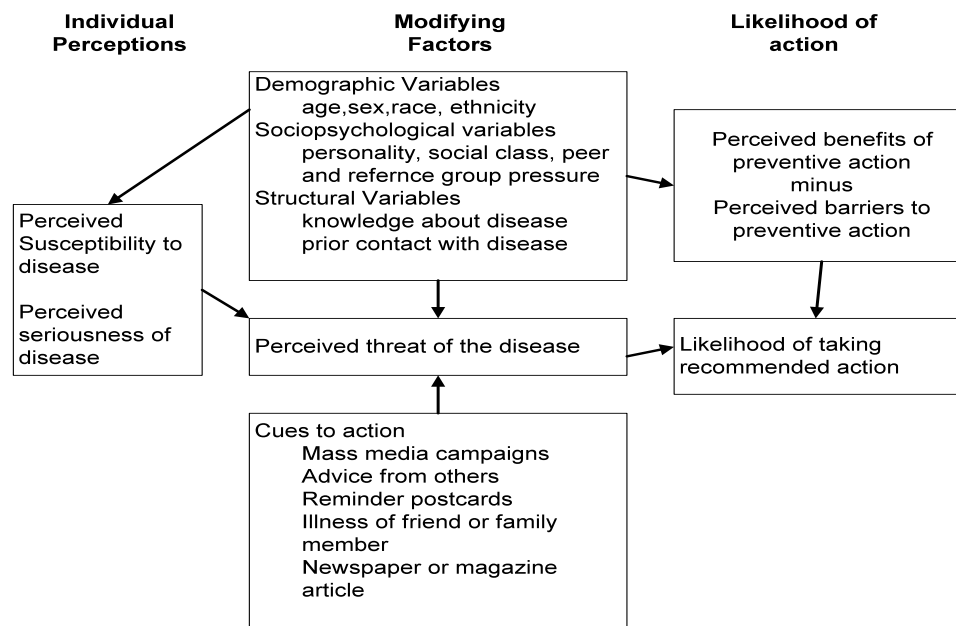


Figure 1. Health Belief Model.

- *Individual perceptions* are beliefs that an individual may have that impact their health behaviors and encompass: *perceived susceptibility* and *perceived severity*.
- *Modifying factors* include the individual's demographic variables (age, sex, race, ethnicity), socio-psychological variables (personality, social class, peer and reference group pressure) and structural variables (knowledge of and prior contact with the health topic of concern) and the constructs of *perceived threat* and the *cues to action*.
- *Likelihood of action* refers to how likely an individual is to alter their health behaviors as a result of the construct relationship: *perceived benefits* minus *perceived barriers*.

The Health Belief Model was modified in 1974 (Becker) with the addition of the *health motivation* as a factor in determining health behaviors. Health motivation is the degree to which an individual is interested in and concerned with health matters. Then in 1986, Strecher, Becker, and Rosenstock began addressing *self-efficacy*, which refers to the individual's perception that they are capable of altering health behavior.

Studies are finding that *cue to action* plays an important influence on the other factors of perceived susceptibility, perceived threat, benefits and barriers, as well as self-efficacy. Mattson (1999) proposes restructuring the Health Belief Model to place cues to action as a central component. Several other studies have also reviewed the significance of cues to action including:

- McCaul, Johnson, and Rothman, (2002) incorporated reminder letters for immunizations and the increase in the numbers of flu shots given increased.
- Werner (2003) concentrated on the relationship between cues to action and perceived barriers and demonstrated a predictive correlation in seeking cognitive examinations.
- Meillier, Lund, and Kok, (1997) reviewed how men with risk for coronary heart disease use cues to action to modify their lifestyles.
- Cho and Wister (2005) demonstrated the importance of cues to action with regards to self-care behaviors, particularly with reading about their illness, seeking guidance from health care professionals, gaining knowledge of community services, and engaging in social interactions with friends regarding their illness.

Although the Health Belief Model has been criticized for its lack of ability to predict one construct's response from another, as well as its moderate level of variance in explaining health related behaviors (as cited in Chou & Wister, 2005), the Health Belief Model has been frequently



used to research health behaviors towards preventative care (Champion, 1984). However, it is prudent to analyze the Health Belief Model as a theory prior to utilizing the constructs and relationships to study older adults and compliance with fall prevention recommendations.

As Mikhail (1981) explains, the Health Belief Model's purpose of understanding health related behaviors requires theory evaluation that focuses on empirical evidence and the contribution to understanding health behavior and overall usefulness of the theory (utility). Additionally, a sound theory has an established relationship of constructs, measured in terms of variables, within defined boundaries; and possesses the capabilities of being falsified, yet has utility (Bacharach, 1989).

The Health Belief Model has been empirically tested since 1952 (Champion, 1984) to explain health related behaviors towards prevention. Understanding how to encourage greater numbers of preventative health related behaviors is the key to managing both chronic illnesses and to developing programs to address concerns such as fall rates among older adults.

The Health Belief Model's boundaries are rooted within the paradigm that individuals desire good health and are willing to modify their behaviors to achieve good health. The basis for this paradigm is found within physiological and behavior theories. Becker, Drachman, and Kirscht, (1974) further defined the boundary of the Health Belief Model by acknowledging the individual's "health motivation," or the degree of the individual's interest in and concern of health matters, as an important construct with a leading relationship as it relates to the other constructs. This addition provided parameters for explaining why an individual would forego altering health behaviors in spite of receiving cues to action, having perceived susceptibility, and perceiving threat. When Rosenstock, Strecher, and Becker, (1988) incorporated self-efficacy into the Health Belief Model, the boundaries became more defined. Interestingly, this concept

was added as a means to understand chronic illnesses, as “the behavioral focus of the early model was on circumscribed preventive actions, such as accepting immunizations” (Rosenstock, Strecher, & Becker, 1988). Although Janz and Becker (1984) placed self-efficacy into the “barriers” component of the Health Belief Model, Rosenstock, Strecher, and Becker (1988) explained that this may be a “move in the wrong direction” as there is already a broad dimension of barriers, instead, merely recommending incorporation of self-efficacy within the Health Belief Model rather than explaining the relationship with the other constructs.

The Health Belief Model demonstrates substantial utility in terms of theorizing health related behavior as described in previous psychological and behavior based theories. The definition of relationships between the constructs have predictive adequacy and the scope of the constructs allows for variables specific to health related behaviors.

Falsifiability is the primary weakness of the Health Belief Model. While the constructs themselves have validity, the validity of the variables is difficult to establish. The Health Belief Model proposes that health behavior is determined by the subjective view of the perceiver, rather than the objective events or environment; therefore, the variables to explain the constructs are subjective as well. The very nature of attempting to quantify subjective views, health beliefs, and subsequently health related behaviors is fraught with complications. Numerous scales have been developed as methods for quantifying perceptions; few, if any, have demonstrated strong validity. Indeed, Rosenstock identified the lack of research on cues to action nearly forty-five years ago (1966). It is for this reason, scrutiny was paramount regarding older adults *perceived susceptibility* of falling as well as the *cues to action*.

The Health Belief Model certainly provides a solid basis for exploring whether or not cues to action increase the likelihood of older adults adhering to fall prevention

recommendations. However, it would be erroneous to proceed without recognizing the importance of two constructs that are not addressed within the Health Belief Model: access to health care and older adults' social fears associated with increasingly more restrictive living arrangements such as moving into senior communities, assisted living, or nursing facilities.

### **Presentation of Conceptual Model**

Determining older adults compliance with fall prevention recommendations or taking action to decrease their risk of falls is accomplished through use of the Health Belief Model constructs:

- *Perceived susceptibility*: the perceived risk of sustaining a future fall. This variable was measured during the first home visit via the ABC scale (Appendix A) and was recorded on the Data Collection Sheet (Appendix B) as an aggregate score.
- *Cue to action*: education on fall risks and prevention recommendations. This variable was dichotomous as the control group received generalized education and the treatment group received personalized education.
- *Cue to action*: prior experience falling. This variable was self-reported during the semi-structured interview, guided by the Patient Interview Form (Appendix C). It was gathered during each home visit and was recorded on the Data Collection Sheet as the actual number of falls.
- *Likelihood of taking action*: adhering to recommendations to decrease fall risk(s). This variable was measured as a percentage, rounded to the nearest hundredth, to accommodate differences between the numbers of recommendations per participant.

Based upon the Health Belief Model, older adults who perceive susceptibility of sustaining a future fall, and / or who have sustained a recent fall, and / or who have received education regarding environmental risk factors will have an increased likelihood of adhering to

environmental fall prevention recommendations. Using the Health Belief Model as the theoretical basis, the boundary is *older adults wish to avoid falling* while the proposition is *cues to action of education and previous falls, and perceived susceptibility increase likelihood of adherence to environmental fall prevention recommendations*. Figure 2 demonstrates use of the Health Belief Model as a means to study older adults likelihood of taking action with fall prevention measures.

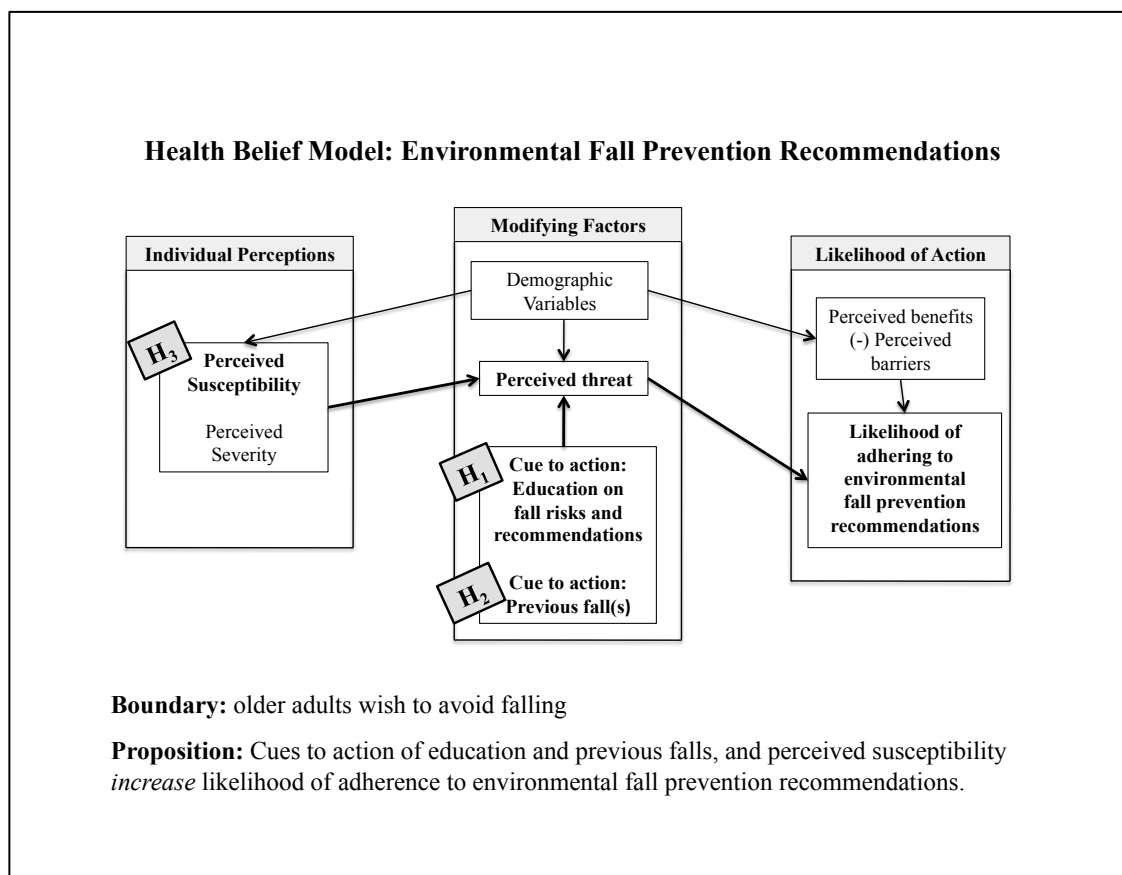


Figure 2. Health Belief Model: Environmental fall prevention recommendations

### Development of Hypotheses

Hypotheses were derived from the research question: Do the factors of education provided, recent falls, and perceived susceptibility to future falls increase the likelihood that

community-dwelling adults aged 65 years and older will adhere to environmental fall prevention recommendations? Hypotheses are supported through the Health Belief Model as follows:

H<sub>1</sub> Community-dwelling older adults who receive personalized education regarding environmental fall hazards will be more likely than those receiving general education to adhere with environmental fall prevention recommendations.

The Health Belief Model proposes that a modifying factor of *cue to action* results in an increased likelihood of an individual adhering to preventative health behaviors. With regards to fall prevention, this study hypothesized that the *cue to action* of education on environmental fall risks would increase the likelihood that participants would adhere to recommendations to reduce environmental fall hazards. Based upon recommendations from previous research, this study specifically delineated education as either personalized or standard with the overarching hypothesis remaining that education provided increases likelihood of adherence to recommendations. Table 1 provides details regarding the measurement, testing, and relationship to the constructs proposed in the Health Belief Model.

H<sub>2</sub> Community-dwelling older adults who experienced one or more falls within the past 180 days are more likely to adhere with environmental fall prevention recommendations, irrespective of intervention group.

Another modifying factor of *cue to action*, as explained by the Health Belief Model, is that of “prior contact with disease” or as in this example, previous experience(s) with falling. The second hypothesis for this study focused on this modifying factor as a cue to action. The proposition supported by the Health Belief Model is that an individual who has experienced a fall would be more likely to adhere to recommendations to reduce environmental fall risks. In considering the study participants as a whole for this hypothesis, rather than by treatment or

Table 1.

*Health Belief Model and Hypothesis 1*

	Measuring	Testing	HBM Construct	Data Support
IV: education intervention	Determined during Home Visit 1 Control group: (generalized education) Coded as "0" Treatment group: (personalized education) Coded as "1"	participants randomized	<i>cue to action: education</i>	
DV: adherence to recommendations	Determined during Home Visits 2 & 3 Coded as a percentage: number of recommendations followed divided by number of recommendations provided	direct observation of environmental areas recommended for correction	<i>likelihood of action</i>	open-ended responses during interview

control group, it was necessary to control for the variance between those participants who receive personalized education and general education. For this reason, statistical analysis for the second hypothesis controlled for the independent variable *education intervention*. Table 2 provides details regarding the measurement, testing, and relationship to the constructs proposed in the Health Belief Model.

H<sub>3</sub> Community-dwelling older adults with higher perceived susceptibility of future falls are more likely to adhere with environmental fall prevention recommendations, irrespective of intervention group.

One of the individual perceptions, as described by the Health Belief Model, is *perceived*

Table 2.

*Health Belief Model and Hypothesis 2*

	Measuring	Testing	HBM Construct	Data Support
IV: Recent falls	Coded as a whole number: number of falls in past 180 days	self-report	<i>cue to action: prior experience with falling</i>	
IV (control): Education intervention	Dichotomous coding: control group “0” or treatment group “1”	participants randomized	<i>cue to action: education</i>	
DV: adherence to recommendations	Coded as a percentage: number of recommendations followed divided by number of recommendations provided	direct observation of environmental areas recommended for correction	<i>likelihood of action</i>	open-ended responses during interview

*susceptibility*. Using the Health Belief Model as a guide, individuals who perceive susceptibility to future falls are more likely to adhere to environmental fall prevention recommendations. As with the previous hypothesis, it was necessary to control for the variance between those participants who receive personalized education and general education. Therefore, statistical analysis for the third hypothesis controlled for the independent variable *education intervention*. Table 3 provides details regarding the measurement, testing, and relationship to the constructs proposed in the Health Belief Model.

Table 3.

*Health Belief Model and Hypothesis 3*

	Measuring	Testing	HBM Construct	Data Support
IV: ABC score	Coded as a whole number: total score from ABC scale	self-report: completion of ABC Scale	<i>individual perceptions: perceived susceptibility</i>	
IV (control): Education intervention	Dichotomous coding: control group “0” or treatment group “1”	participants randomized	<i>cue to action: education</i>	
DV: adherence to recommendations	Coded as a percentage: number of recommendations followed divided by number of recommendations provided	direct observation of environmental areas recommended for correction	<i>likelihood of action</i>	open-ended responses during interview



## Chapter Four: Methodology

This study utilized a unique approach to understanding older adults' (aged 65 years and older) adherence to environmental fall prevention recommendations. Guided by the Health Belief Model, this randomized control group study sought to quantify adherence to environmental fall prevention recommendations among community-dwelling older adults. Unique to this study is the incorporation of open-ended questions to clarify underlying reasons for adherence and non-adherence with recommendations.

### Research Design

As depicted in Table 4, the research design for this study was a randomized control, pretest-multiple posttest, extended treatment design.

Table 4.

#### *Research Design*

	Home Visit 1		Home Visit 2	Home Visit 3	
	Pre-test	Treatment	Post-test	Post-test	Treatment
Treatment Group (R)	O <sub>1</sub>	X	O <sub>2</sub>	O <sub>3</sub>	-
Control Group (R)	O <sub>1</sub>	-	O <sub>2</sub>	O <sub>3</sub>	X

Due to the nature of the study, computer-generated randomization into either the control group or treatment group occurred after determining the participant met inclusion criteria and

prior to gathering baseline data. This was to accommodate feasibility of the study as the treatment of “education provided” occurred during the initial home visit. Participants were blinded to both the study design and the group to which they are randomized. Demographic variables were used to establish equivalency between the groups. Demographic variable(s) shown to be without equivalency were to be used as control variable(s).

Appropriate measures were to be taken by all occupational therapists (OT’s) to ensure the overall safety of the study participants, including notifying the appropriate person(s) of unsafe home environments. For purposes of this study, “unsafe home environments” were those environments that are generally accepted as mandated reporting situations including but not limited to: suspected abuse, suspected neglect, inadequate heating / cooling, lack of running water, lack of electricity, filth and/or squalor, or if the participant was unable to obtain food and water or was unable to contact emergency services in the event of an emergent situation. Parties to be notified included the participant’s responsible party / next of kin (as identified during the initial demographic collection), primary care physician, and Adult Protective Services if indicated. Appropriate measures were to be taken to ensure the safety of the occupational therapists entering into study participants’ homes. If at any point in time the occupational therapist felt unsafe due but not limited to: structural disarray, presence of dog(s), and / or presence of suspicious person(s), the occupational therapist was instructed to vacate the premise and inform both the study coordinator and primary investigator.

### **Data Sources**

This study relied upon primary data collection. Through a combination of self-reporting, interviewing, and objective observation, data was collected across three home visits. Home visits were conducted by an Occupational Therapist (OT), licensed to practice in the

Commonwealth of Virginia and recognized by the National Board for Certification in Occupational Therapy. All OT's associated with conducting home visits participated in training sessions prior to completing home visits to ensure understanding of the research protocol and to ensure consistency in the delivery of recommendations as well as to limit recommendations to the areas addressed within this study. Training was to be led by the study coordinator, and conducted in person with trainees. Training included the following topics: study design, conducting the semi-structured interview, completing the environmental evaluation, providing personalized education, providing generalized education, participant safety, and therapist safety. All OT's were to demonstrate competence through completing post-training testing with a minimum of 90% accuracy. Should any participant present in need of skilled therapy services (including but not limited to: outpatient, day rehab, or home health services), the OT discussed this recommendation with the participant and encourage the participant to contact their primary physician to request a referral for therapy services. Details of each home visit and data collected are as follows:

**Home visit 1.**

- For purposes of consistency participants were requested to exclude the presence of others (significant other permitted; if present this was coded on the data collection sheet). This allowed the OT to converse directly with the participant to gather data and provide education.
- Initial one-to-one, semi-structured participant interview: conducted using the Participant Interview Form, Section 1, collecting demographic data, fall history as a means to quantify the Health Belief Model construct *cue to action: previous fall*, and discuss open-ended questions related to fall prevention beliefs

- Participant completed Activities-specific Balance Confidence scale: as a means to quantify the Health Belief Model construct *perceived susceptibility* of future falls
- Occupational therapist completed the Home Environmental Evaluation Form, Section 1 (Appendix D): as a means to quantify the number of environmental fall hazards
- Provided participant with written summary of Home Environmental Evaluation (Appendix E)
- Provided participant with “Environmental Fall Prevention Resources” (Appendix F).  
This is a written list of area contractors, durable medical equipment providers, and senior care agencies to facilitate follow-through on recommendations. Costs associated with follow-through were to be the responsibility of the participant.
- Provided participant with 90-day calendar sheet (Appendix G) on which to record any events of feeling off-balance, feeling dizzy, slipping, tripping, stumbling, and/or falling.  
This study’s operational definition of a fall is included in large print on the calendar sheet and was read to the participant, clarifying as needed.
- Treatment consists of “education provided” regarding recommendations to reduce the number of environmental fall hazards. There were two levels of treatment:
  - Control Group: *standard recommendations*: participants were provided a written copy of the publication from Centers for Disease Control and Prevention: “A Home Fall Prevention Checklist for Older Adults” (Appendix H). This publication is designed to increase older adults’ awareness of methods to reduce fall risks through environmental modifications.
  - Treatment Group: as with the control group, participants were provided a written

copy of “A Home Fall Prevention Checklist for Older Adults.” In addition, the treatment group participants received *personalized education* to decrease the number of environmental fall hazards. Personalized education included verbal explanation and physical demonstration of the identified environmental fall hazard, why the environmental area was considered a fall hazard, and method(s) to correct the hazard. While interactions with participants were individualized, the information provided remained consistent as the OT followed the Personalized Education Guide (Appendix I). Participants received a written copy of the recommendations. Participants were encouraged to ask clarifying questions and additional instructions were provided as needed. Participants demonstrated their understanding of the recommendations by completing return verbalization and demonstration of the recommendation(s), using the written copy of recommendations as a guide, as needed. Participants in the treatment group were allowed as much additional time as necessary to reach an understanding of the recommendations. An example of a personalized scenario is provided in Appendix J.

## **Home visit 2.**

This visit occurred between 30 and 45 days following home visit 1.

- Home Environmental Evaluation, Section 2: determined which of the recommendation(s) from home visit 1 were followed.
- One-to-one semi-structured participant interview, guided by the Participant Interview Form, Section 2 as a means of collecting responses of why the participant chose adherence or non-adherence to recommendation(s). Quantitative information was

gathered in regards to any instances of the participant feeling off-balance, feeling dizzy, slips, trips, stumbles, and/or falls.

- Treatment levels:
  - Control group: confirmed the participant had written materials provided during home visit one, and answered any questions related to written materials and Home Environmental Evaluation results.
  - Treatment group: confirmed participant had written materials provided during home visit one, and answered any questions related to recommendations resulting from Home Environmental Evaluation. Participants were encouraged to ask clarifying questions and provided additional instruction as indicated.

### **Home visit 3.**

This visit occurred between 30 and 45 days following home visit 2.

- Home Environmental Evaluation, Section 3: determined which of the recommendation(s) from home visit 1 and/or home visit 2 were followed.
- Participant semi-structured interview, guided by the Participant Interview Form, Section 3 as a means of collecting responses of why the participant chose adherence or non-adherence to recommendations. Quantitative information was gathered in regards to any instances of the participant feeling off-balance, feeling dizzy, slips, trips, stumbles, and/or falls.
- Treatment levels:
  - Control group: confirmed participant had materials provided during home visit one. Treatment for control group: provided personalized education for participants in same manner as for treatment group during home visit one including: verbal

explanation and physical demonstration of the identified environmental fall hazard, along with method(s) to correct the hazard, and provide a written copy of recommendation(s). Participants were encouraged to ask clarifying questions and provided instruction as indicated.

- Treatment group: confirmed participant had written materials provided during home visit one, and answered any questions related to recommendations resulting from Home Environmental Evaluation. Participants were encouraged to ask clarifying questions and provided additional instruction as indicated.

As shown in Table 5, the overall anticipated length of time across all three home visits was equal between the treatment and control group participants. However, it was not possible to account for the extension in length of time due to individual preferences of participants as some participants may have had greater numbers of questions or sought further clarification of recommendations. Additionally, it was anticipated that some, if not many, participants would engage in general socialization during the sessions, thus lengthening the time per visit.

Table 5.

*Estimated Length of Time Per Participant, Per Visit*

	Treatment Group	Control Group
Home Visit 1	90 minutes	60 minutes
Home Visit 2	60 minutes	45 minutes
Home Visit 3	45 minutes	90 minutes
Total	195 minutes	195 minutes

While this study incorporated open-ended questions to clarify underlying reasons for adherence and non-adherence with recommendations, this study was not considered a mixed-methods design. As such, responses to the open-ended questions were neither coded nor analyzed but were used to clarify results and are be discussed in the final chapter.

## **Sampling**

Given the nature of this topic, non-probability sampling remained the most appropriate avenue. A convenience sample of self-selected community-dwelling adults aged 65 years and older was used. The geographic location was limited to the greater Richmond, Virginia area to allow feasibility of in-home visitation for data collection. While this limitation decreased how geographically far this study may be generalized, the structure of the study allowed for replication within other geographic locations. Recruitment was completed through flyers (Appendix K) posted in physician offices, senior centers, and local Area Agency on Aging offices. Electronic recruiting was conducted through web-postings. All participants were blinded to the both the study design and to their randomization into treatment or control group.

Interested participants were screened for the following inclusion criteria:

- Adults aged 65 years or older
- Primary residence: community-dwelling (no institutionalized living arrangement)
- Primary residence: used by the participant a minimum of 70% of the time to complete their daily routine [5 days (120 hours) of a 7 day (168 hour) period]
- Primary language: English
- Ability to engage in dressing, toileting, bathing / hygiene, and self-care transfers is independent or modified independent (may need to use adaptive equipment or durable



medical equipment to complete task); no caregivers were required for these tasks;  
based upon self-report from the interested participant

- Authority to follow through or authorize follow through with recommendations for environmental changes

Exclusion criteria includes the following:

- Currently receiving home health therapy services
- Received home health services within the past 60 calendar days
- Had a diagnosis of dementia

### **Power analysis.**

The statistical power analysis program G\*Power 3.1 was used to calculate the sample size. This study seeks a moderate effect size ( $f^2 = .15$ ) and a statistical power of .80 with .05 for the alpha level. Statistical analysis for H<sub>1</sub> was an independent sample t-test for a categorical two-level independent variable (*education intervention*) and a continuous, quantitative dependent variable (*percentage of adherence*). Statistical analysis for H<sub>2</sub> and H<sub>3</sub> was completed through multiple regressions with testing one predictor (*number of falls* and *perceived susceptibility* respectively) from a total of three predictors (*number of falls, perceived susceptibility, education intervention*). Calculations showed the required sample size to be 55, resulting in a critical F of 4.03; numerator degrees of freedom of 1; denominator degrees of freedom of 51; actual power of .8045; and a total sample size of 55. Generating a sample size of 80 participants allowed for an attrition rate of 45%.

### **Institutional Review Board**

As this social-behavioral study involved the use of human subjects, the principal investigator and study coordinator were responsible for ensuring approval from the Virginia

Commonwealth University Institutional Review Board prior to initiation of this study. All regulations were followed including obtaining signed informed consent, ensuring participants meet inclusion criteria, and establishing safety protocols. This study qualified for expedited review as no more than minimal risk was posed to participants and the research activities include surveys, interviews, and data analysis. Both the principal investigator and study coordinator have completed CITI training. All participants had the on-going right to opt-out of the study at any time with no fear of recourse. The consent form for this study may be found in Appendix L.

### **Measurement of Variables**

This study relied upon analysis of data collected for four distinct quantitative variables:

- Independent variable: Education intervention (categorical, two levels)
- Independent variable: Recent falls (categorical, four levels)
- Independent variable: Perceived susceptibility of future falls (interval)
- Dependent variable: Percentage of adherence with recommendations (ratio)

Data was collected and recorded specific to each participant, across the three home visits and was recorded on the Data Collection Sheet. Supporting information was gathered through open-ended questions during participant interviews.

#### **Independent variable: Education intervention.**

This study used a categorical, two-level independent variable for the education intervention provided. Participants randomized into the control group receive *generalized education* while participants randomized into the treatment group receive *personalized education*. Generalized education consists of receiving the CDC publication “A Home Fall Prevention Checklist for Older Adults.” Personalized education included receiving this publication as well as receiving both a verbal explanation and physical demonstration of the

identified environmental fall hazard, why the environmental area is considered a fall hazard, and method(s) to correct the hazard. It is important to note that the control group received the treatment of personalized education at the conclusion of the third home visit, thus all participants received personalized education. The categorical, independent variable is coded on the data collection form as: *personalized education* (treatment group) = 1 and *generalized education* (control group) = 2.

**Independent variable: Recent falls.**

This variable was gathered during the participant interviews that were conducted during each home visit. Participants were asked to self-report falls experienced within the past 180 days. As an inherent challenge with self-reporting, there are two challenges that were necessary to address: operationally defining a fall and encouraging accuracy in self-reporting falls.

In spite of the significant ramifications of falls and resulting injuries, there is not a universal definition of a fall. Without such a definition, the interpretation of what constitutes a fall is left to the interpretation of the study participants, those conducting research, and those utilizing results of this study. As even small differences in the definition may have significant consequences on the results of a study, it became imperative to the validity of this study to operationally define a fall. The World Health Organization's International Classification of Disease-9 (ICD-9) defines a fall as "inadvertently coming to rest on the ground, floor, or other lower level, excluding intentional change in position to rest in furniture, on the wall, or other objects" and is coded as E880 – E888 (Yoshida, 2000). It is important to note that this definition provided only a framework for defining a fall as it lacks excluding events such as overwhelming external forces that result in an older person being knocked over, or major internal disturbances that cause an older person to collapse instead of fall such as syncope, or seizure, or stroke. Both

Gibson et al. (1987) and Tinetti, et al. (1997) coined operational definitions for a fall that have been used in subsequent studies including by Feder, et al., (2000) and Findorff, et al., (2007). In efforts to capture the fundamental components, this study used a combination of the two aforementioned definitions as the operational definition of a fall:

a sudden, unintentional change in position causing an individual to land at a lower level, on an object, the floor, or the ground, *other than as a consequence of* sustaining a violent blow, loss of consciousness, sudden onset of paralysis as in stroke or an epileptic seizure or by overwhelming external force.

It is important to note that previous studies have conclude underlying reasons for suspected under-reporting of falls as attributable to denial of falling and reluctance to inform others of recent falls for fears of negative social stigma (Yardley, et al., 2006; Leland, Porell, & Murphy, 2011). Indeed, a wellness group session held at a greater-Richmond older adult independent living center, asked community-dwelling older adults how they described a fall. In summary, the focus group agreed with one member's comment: "You can't just ask if (the participant) has fallen because chances are they'll say they haven't even if they have."

Coincidentally, one member of the focus group had a cast on her left ankle. When asked about this injury she replied "I got up to go to the bathroom at night and I stumbled into the ottoman." Pressed further by her peers, this member continued to deny falling. Denial continued even though she was willing to state that she stumbled into the ottoman and laid on the floor until the emergency medical team arrived at which time she was transported to the hospital. After further discussion, the focus group recommended the following initial questions as an alternative to "have you fallen": Do you ever feel off-balance? Do you ever feel dizzy? Do you ever stumble / slip / trip? Should the participant have an affirmative response, the recommended follow up

questions included: Did any of those times cause you to land on the floor or on the furniture? Were you injured? As this study acknowledges the inherent difficulties in achieving accuracy with self-reporting of falls, the recommended wordings from the wellness group were incorporated into the Participant Interview Form.

Studies have acknowledged the likelihood of participants under-reporting of falls, postulating the older adult may fail to remember incidents of falling (Boyd & Stevens, 2009; Yardley, 2006; Yardley 2008; Leland, Porell, & Murphy, 2011). In efforts to increase accuracy of self-reporting falls, many previous studies incorporated a daily reporting method varying from tracking falls on a calendar to mailing pre-paid post cards following a fall (studies summarized by Costello & Edelstein, 2008). Following this guidance from previous studies, during the first home visit of this study each participant was provided a 90-day calendar sheet (Appendix G) on which they were encouraged to list moments of: feeling off-balance, feeling dizzy, slipping, tripping, stumbling, and/or falling.

Reported falls were coded on the data collection sheet as a raw number for future reference, however, were coded into one of four categories for purposes of statistical analysis. As in previously published studies, it is common to code falls both by number of falls and by whether or not an injury was sustained (Leland, Porell, & Murphy, 2010). This independent variable, on an ordinal scale is coded as follows:

0 = no reported fall

1 = 1 reported fall, no injury

2 = 2 or more reported falls, no injury

3 = 1 or more reported fall with an injury

**Independent variable: Perceived susceptibility (of future falls).**

In order to gather an understanding of each participant's perceived susceptibility of future falls, participants were asked to complete the Activities-specific Balance Confidence scale (ABC scale). This is a brief self-reporting survey developed by Powell and Meyers in 1995. This scale has been used in previous studies (Meyers, et al., 1998; Lohnes, & Earhart, 2010; Lajoie & Gallagher, 2003) and has been shown to have strong test-retest reliability with  $r = .92$  (Schepens, Goldberg, & Wallace, 2009). Hatch, et al., (2003) used the ABC scale to test the relationship between balance confidence and performance on functional mobility and results showed 57% of the variance in balance confidence could be explained by balance performance, suggesting a relationship between an individual's confidence in their abilities and their tested or actual abilities. As per test coding instructions for this instrument (Powell and Myers, 1995) coding of perceived susceptibility (of future falls) were the aggregate total from the ABC scale divided by 16 (number of questions), resulting in an independent variable on an interval scale.

**Dependent variable: Percentage of adherence (with recommendations).**

Obtaining this variable required a three-step process with the first two steps occurring during the first home visit. The first step was completion of the Home Environmental Evaluation to identify fall risk hazards. The second step was to provide written recommendations to the participant based upon the results of the evaluation, thereby quantifying the number of recommendations. This number was used as the denominator to calculate the percentage of adherence with recommendations. The third step occurred during both the second and third home visits and consisted of gathering the number of recommendations followed. This number was used as the numerator to calculate the percentage of adherence with recommendations.

Measurement of this variable began with a home environmental fall risk evaluation. To date there are two home safety evaluation forms used in previous published studies: The Westmead Home Safety Assessment (WeHSA) and the Home Falls and Accidents Screening Tool (Home FAST). The WeHSA is a standardized evaluation, widely used in Australia with published data demonstrating content validity and inter-rater reliability (Clemson, 2006). One of the drawbacks to this standardized home safety evaluation is an estimated 90-minute length of time required for completion of the 72-item checklist. While the WeHSA provides a thorough review of home safety, for purposes of this study only those items related to environmental safety are applicable. Therefore, the benefit of using this standardized evaluation are minimized by the exclusion of over half of the 72-items on the checklist. Additionally, as each home visit included a semi-structured interview along with a home environmental safety evaluation, the estimated 90-minutes required for this evaluation would significantly increase the overall length of time required for each home visit. This increase in time could negatively impact the engagement of the participants during the sessions and perhaps discourage individuals during the recruiting process. In contrast, the Home FAST screening tool requires an estimated 30-minutes to complete. Research has shown fair to good inter-rater reliability for Home FAST but recommends improvement of operational definitions to increase reliability (Mackenzie, Byles, and Higginbotham, 2002). As with WeHSA, Home FAST is designed to encompass a thorough review of home safety. By excluding questions related to the physical abilities of the individual, only 10 of the 25 questions remain applicable for purposes of this study. Therefore, the Home Environmental Evaluation Form and Personalized Education Guide were created for this study to provide a basis for consistent evaluation of each participant's home, to provide operational definitions for what constitutes a hazard level, and to provide consistency with associated

recommendations. Use of these forms allowed the treatments to be individualized to the participant's daily routine and living environment while standardizing recommendations provided. The areas addressed on these forms correlates with information provided in the CDC's publication "A Home Fall Prevention Checklist for Older Adults" and incorporated five additional areas shown in previous research to pose fall risks for older adults: chair / sofa height, thresholds, bed height, presence of household pets, and presence of small children. A comparison chart between the CDC publication and the home evaluation and recommendations created for this study may be found in Appendix M.

Adherence to recommendations was measured as a percentage because it was anticipated that following the Home Environmental Evaluation, some participants would have few recommendations while others may have several recommendations. For example, following the evaluation a participant received five recommendations. During the second home visit the OT determines three of the five recommendations have been followed. In this example, "60%" (3/5) is recorded on the Data Collection Sheet. A different participant received nine recommendations and during the second home visit the OT determines three of these nine recommendations were followed. In this example, "33.33%" (3/9) is recorded on the Data Collection Sheet. In this example, each of these participants followed three recommendations. To document the raw number of "three" does not accurately portray how involved the participant was with adherence to recommendations. Converting to a percentage of recommendations followed, based upon recommendations received, allowed the data to accurately represent adherence. Therefore, coding for this variable was the total number of recommendations (obtained from the first home visit) as the denominator with the total number of recommendations followed (obtained from the



third and final home visit) as the numerator, resulting in a *total percentage of adherence*, a dependent variable on a ratio scale.

### **Supporting information.**

The Participant Interview Form, created for this study, is comprised of open-ended questions using simplified terminology. This form was designed to facilitate the gathering of information to clarify the quantitative findings. This information was not coded, nor analyzed, but was included in the discussion in the final chapter. Utilizing a semi-structured interviewing format, the OT addressed specific topics while allowing the participant the freedom to respond with as much detail as they chose. The purpose of the questioning was to gain an understanding of the level of receptiveness of older adults towards recommendations to reduce environmental fall hazards. The primary questioning was centered on why the participant chose adherence or non-adherence to environmental fall prevention recommendations. Additional open-ended questions were designed to further gain an understanding of why the participant chose adherence or non-adherence to environmental fall prevention recommendations. This form was comprised of three sections with one section completed at each of the home visits. Responses from participants were written directly on the form during the interview for future reference. The OT verbally summarized responses to the participant to ensure accuracy of documenting responses.

### **Methods for Hypotheses Testing**

Analysis of the collected data began with univariate reviews to determine accuracy of data input including searching for out-of-range values, ensuring that means and standard deviations are plausible, and reviewing univariate outliers. Missing data was reviewed to determine whether there was a pattern or if data was missing randomly. Following these steps, pairwise plots of covariables were reviewed for nonlinearity and heteroscedasticity by

determining skewness and kurtosis. Covariables included previous falls, and perceived susceptibility to future falls. If indicated, variables were transformed and the resulting transformations reviewed. Finally, a review was conducted to identify and address multivariate outliers and evaluate variables for multicollinearity and singularity. Data analysis then progressed to statistical analysis based upon hypotheses as follows:

H<sub>1</sub> Community-dwelling older adults who receive personalized education regarding environmental fall hazards would be more likely than those receiving generalized education to adhere with environmental fall prevention recommendations.

- Statistical technique: independent samples t-test. This hypothesis tested the relationship between the two-level categorical independent variable of *education intervention* and the continuous dependent variable of *percentage of adherence*.
- Alternate technique: ANCOVA was to be used dependent upon the need to control for demographic variable(s).
- H<sub>0</sub>: The difference between the mean of the treatment group of community-dwelling older adults who received personalized education and the control group of community-dwelling older adults who received generalized education is zero.

H<sub>2</sub> Community-dwelling older adults who experienced one or more falls within the past 180 days are more likely to adhere with environmental fall prevention recommendations, irrespective of intervention group, or injurious fall.

- Statistical technique: multiple regression to review the relationship between two quantitative variables: the predictor variable of *number of falls* and the response variable of *percentage of adherence*, while controlling for the variable of *education intervention*.

- H<sub>0</sub>: There is no statistically significant relationship between *number of falls* and *percentage of adherence*.

H<sub>3</sub> Community-dwelling older adults with higher perceived susceptibility of future falls are more likely to adhere with environmental fall prevention recommendations, irrespective of intervention group, or injurious fall.

- Statistical technique: multiple regression to review the relationship between two quantitative variables: the predictor variable of *perceived susceptibility* and the response variable of *percentage of adherence*, while controlling for the variable of *education intervention*.
- H<sub>0</sub>: There is no statistically significant relationship between *perceived susceptibility* and *percentage of adherence*.

### **Exploratory and Confirmatory Analytical Strategies**

The evaluation process ensured the project continued as anticipated and unforeseen difficulties were addressed in a timely manner. As the study coordinator had primary responsibility to ensure the study progressed according to the proposed plan. The principal investigator provided oversight and guidance as indicated to facilitate the study's successful completion, with success defined as follows:

- Phase 1:
  - Recruited and enrolled at least 20 participants by the end of month 2; Home Visit 1 completed within 15 calendar days of participant enrollment
- Phase 2:
  - Recruited and enrolled an additional 30 participants by the end of month 4; Home Visit 2 completed within 30-45 calendar days following Home Visit 1 for previously

enrolled participants and Home Visit 1 completed within 15 calendar days for newly enrolled participants

- Phase 3:
  - Recruited and enrolled final 30 participants by the end of month 7; Home Visits for previously enrolled participants within 30-45 calendar days (of previous Home Visit) and Home Visits 1 completed within 15 calendar days for newly enrolled participants; data entry initiated, complete entry by end of month 10 to allow data analysis to begin.

The principle investigator and study coordinator, with recommendations from the dissertation committee, developed the summative evaluation for this study. The success of the study in terms of meeting the stated aims, producing quality data and statistical analysis, and interpreting the results was summarized and reported. The strengths and weaknesses of this study in both design and implementation were considered prior to recommendations for replication.

Upon completion of this study and approval by the Dissertation Committee, the results were submitted for publication in journals, including but not limited to: American Journal Occupational Therapy, Journal of Gerontology, and Journal of Applied Gerontology. Results were also be compiled in poster format for presentation at various organizational conferences including but not limited to: Virginia Occupational Therapy Association, American Occupational Therapy Association, Southern Gerontology Society, and American Geriatrics Society. In efforts to reach a variety of potential consumers, results were also disseminated to colleagues, through presentations to senior centers, and through electronic communications.

## Potential Limitations and Barriers

The primary limitation with this study was difficulty in recruiting participants. The goal was to achieve a total of 80 participants randomized into either a treatment or control group. All efforts were made to recruit through a variety of avenues including posting flyers within senior centers and area businesses, physician offices, and healthcare centers. Recruiting also included web postings and word of mouth. To facilitate recruitment, flyers and advertisements highlighted the receipt of a free in-home environmental safety evaluation by a licensed occupational therapist.

Another limitation with this study related to the degree the results may be generalized. Given the geographic restriction required for feasibility of the study, results were limited to seniors residing within the greater Richmond, Virginia region. Recommendations regarding this limitation include replicating this study in other geographic regions and completing comparisons of results.

This study relied upon two self-reported independent variables and there are inherent limitations with self-reporting (Polit & Beck, 2008). The two variables of concern are *number of recent falls* and *perceived susceptibility of future falls*. The primary limitation of self-reporting was centered on whether the information gathered is accurate. This study created an environment to encourage participants to complete self-reporting with as much accuracy as possible. This was accomplished through the inclusion of providing the participant with a written operational definition of a fall and a 90-day calendar to record instances of feeling off-balance or dizzy, or having a slip, trip, stumble, or fall. Supporting information was gathered through open-ended questions, designed to encourage participants to reflect on their perceptions of fall prevention recommendations and instances of feeling off-balance or dizzy, or having a

slip, trip, stumble, or fall. While there was no method of ensuring accuracy, the value of self-reporting to gather data and understandings directly from the participant, outweigh the potential for inaccuracies.

This study relied upon self-selected participants; and as such includes inherent limitations (Polit & Beck, 2008). Participants who were agreeable to home visits as part of a study may have been more likely to follow recommendations compared to the general population. This is unavoidable as the participants must have been willing to allow a total of three in-home visits.

An additional limitation involved the unlikely scenario of a participant's environmental home safety evaluation resulting in zero recommendations. Should this situation occur, the participant would have received a full first home visit as described in the study and be excused from further participation with the study. Recruiting continued to achieve the desired number of participants required for statistical analysis.

A potential challenge with this study was the discovery of a participant residing in an unsafe condition. This may have included, but was not limited to, filth and squalor, inadequate heating or cooling, and / or the inability to safely care for oneself. All OT's received training prior to completing observational visits including how to identify areas of concern for unsafe living conditions. Any discovery of a participant residing in unsafe conditions would have been immediately conveyed to the principal investigator and appropriate action would have been taken. The course of action also included alerting the appropriate responsible party, including the power of attorney, next of kin, and / or the primary care physician. Concerns were to be escalated as needed. If necessary, Adult Protective Services would have been contacted for assistance. Likewise, it is important to consider the safety of the occupational therapist(s)

conducting the home visits. All occupational therapists associated with this study were instructed on vacating the premises if at any time the therapist felt their safety was at risk.

Another potential challenge was the inability to complete the follow up visit within the 30 to 45 day timeframe as outlined in the study. All efforts were made to conduct the follow up visits within the appropriate time frame. This included placing phone calls to verify visits and working with the participant to arrange visits convenient to their schedules.

### **Study Impact**

This randomized control group study was guided by the Health Belief Model and sought to quantify adherence to environmental fall prevention recommendations among community-dwelling older adults. Unique to this study was the incorporation of open-ended questions to clarify underlying reasons for adherence and non-adherence with recommendations. Results of this study provided healthcare providers guidance in developing fall prevention programs to increase adherence. As older adults develop improved adherence to recommendations with reduce fall risks, it is expected that the numbers of falls experienced would decrease, thereby decreasing the financial impact on the healthcare system, decreasing the losses of function, and improving the overall quality of daily life for older adults.

## **Chapter Five: Results**

The purpose of this randomized control group study was to quantify adherence to environmental fall prevention recommendations and clarify underlying reasons for non-adherence among community-dwelling adults aged 65 years and older. This chapter begins with an overview of recruiting, randomization of subjects, and data collection. The next section details results from exploratory data analysis. The remaining portions of this chapter include an overview of the demographics of the sample population, details of the recommendations made, and the overall mean percentage of adherence with recommendations. Finally, the remaining portion of the chapter is organized by the three hypotheses posed in Chapter 1.

### **Recruiting and Randomization**

Several methods of recruitment were used in efforts to encourage participation in this study including the following:

- posting and displaying study flyers in physician offices, waiting rooms, and in public establishments including local churches
- personal delivery of flyers (for distribution) to various healthcare providers with Virginia Commonwealth University Health System (VCUHS) including social workers, care coordinators, physicians, occupational therapists, physical therapists, and nurses
- inclusion of flyer with approximately 500 Meals on Wheels deliveries



- wellness seminars (on topics other than fall prevention) provided at greater Richmond, Virginia Area Agency on Aging (AAA) Friendship Café meetings for older adults with verbal explanation of the study and flyers provided at the end of the seminar
- wellness seminars (on topics other than fall prevention) provided at greater Richmond, Virginia independent living communities, with explanation of the study and flyers at end
- in-services to explain the study and provide flyers for distribution were provided for VCUHS House Calls treatment team and Virginia AAA managers of Friendship Cafés, both of which serve older adults at the community-level
- electronic posting of the study on the social media sites Facebook, LinkedIn, and Twitter, targeting the adult children of potential participants as well as potential participants

While data was not collected to statistically verify, it appeared that, of the various recruiting methods, the inclusion of the flyer with approximately 500 Meals on Wheels deliveries resulted in the greatest in-flux of interested parties. It also appeared that interested parties recruited via this method resulted in the greatest number of misunderstandings regarding the flyer, as explained further below.

Structured as a rolling recruitment and enrollment, individuals were randomized into either the treatment or control group. Randomization was completed through a two-step process. The first step consisted of computer-generated random numbers in sets from 1-20, then 21-40, then 41-60, finally 61-80. The second step consisted of computer-generated randomization of the treatment and control groups for each set of numbers. The purpose of dividing the randomization into sets of 20 was to provide for greater likelihood of equal numbers of

participants in each group during the recruiting process. As participants were recruited and randomized the home visits were scheduled and initiated.

A total of 37 individuals contacted the study coordinator seeking additional information regarding the study. Of these individuals, six were not recruited for the following reasons:

- Two individuals misunderstood the flyer as a means of obtaining occupational therapy services. After explaining the purpose of the study, neither individual wished to participate. One individual stated “I don’t have problems with falling” while the other individual stated “I just wanted to have someone help me [with self-care] in my home.” Both of these individuals were encouraged to speak with their primary care physician regarding occupational therapy services.
- One individual misunderstood the flyer as a means of providing construction-type services on her home: “I still need some things done since the hurricane” (which occurred in this area approximately eight years ago). After explaining the purpose of this study the individual declined participation. This individual was encouraged to speak with her husband and adult children regarding the construction-type items she wished to address.
- Two individuals were excluded from participation as the inclusion criteria of 65 years of age or older was not met. One individual was 64 years old and the other individual was 59 years old.
- One individual was excluded as per exclusion criteria. An adult child contacted the study coordinator with regards to her father who was 72 years old. She explained how the family was continuing to provide support for him to reside within his own home “but with his dementia we could certainly use any recommendations you would have.” After

the exclusion criteria for this study were explained, this individual was encouraged to speak with her father's primary care physician regarding occupational therapy services and additional in-home services for which he may qualify.

This resulted in a total of 31 individuals qualified for participation in this study meaning these individuals contacted the study coordinator for additional information, inclusion criteria were met and exclusion criteria were not violated. Of these individuals, seven opted out of the study citing the following reasons:

- Concerns about falling and/or having falls was not a problem (five individuals)
- "I won't change anything around in my home anyway" (one individual)
- "This isn't what I wanted" indicating a misunderstanding of the flyer (one individual)

Of the 31 individuals qualified for participation in this study, 24 chose to enroll in the study, of which 22 completed all three sessions, two participants did not complete the study. One completed the first visit and scheduled the second visit. As per protocol, a courtesy phone call had been placed to confirm the upcoming visit, to which the participant agreed. Upon arrival at the door for the second visit, there was no answer, nor was there an answer to a telephone call. As this individual resides in a senior apartment complex and has a son who is involved on a daily basis, the whereabouts of this individual was not considered a safety issue for purposes of this study. Subsequent phone calls remained unanswered. The other individual completed two of the three home visits with the final home visit scheduled. Prior to the third home visit the participant phoned to reschedule. Just prior to the rescheduled visit the participant phoned to cancel. Unfortunately, the participant was unable to reschedule the final visit before the end of the 30-45 day window between sessions as described in the study protocol and was therefore not able to successfully complete all sessions.

## **Data Collection**

Each home visit was conducted according to the study protocol. Consent forms were reviewed with the participant and signatures indicating willingness to participate were obtained during the first visit and prior to gathering data. All data collected was recorded on the forms as detailed in Chapter Four: Methodology.

One portion of the interview during the first visit included having participants self-score their confidence in maintaining balance during activities using the standardized Activities-specific Balance Confidence scale (ABC scale). Over half (13 of the 22) participants responded with statements such as “I don’t do that anymore” or “I wouldn’t even try” referring to one of the activities listed, rather than self-scoring the activity in terms of their ability to sustain balance during the activity. Per Powell and Myers (1995), administrators of this scale should encourage participants to “try and imagine how confident you would be if you had to do the activity.” Often participants would continue to decline rating the activity, reiterating “but I don’t do that anymore” indicating they would fall, therefore they ceased completing this activity. Therefore, the decision was made to rate such responses as “zero” indicating the participant had zero confidence in their ability to avoid falling while completing that activity.

Following the home visits, all gathered data was entered into IBM SPSS Statistics, Version 21 (SPSS) as a method to complete data analysis.

## **Exploratory Data Analysis**

Several critical steps were taken to ensure the data set was complete, correct, and reliable prior to performing any statistical analysis. To begin, the accuracy of data input was reviewed by cross-comparison between the Data Collection Sheet and the database within SPSS. A total of seven individual data entry errors were noted and corrected. The data was then reviewed for

out of range values and/or means, none of which were found. Standard deviations were plausible for all variables and no outliers were identified. There were no instances of missing data. Validity of the data was assured through ensuring accurate data that measured what it purported to measure.

There were four variables of interest associated with this study: *education intervention* (independent variable, nominal), *falls* (independent variable, ordinal), *perceived susceptibility* (independent variable, interval), and *total percent of adherence* (dependent variable, ratio). As such, additional exploratory data analysis proceeded as appropriate to the type of variable in question. As shown in Table 6, *education intervention* was reviewed for both range and frequency of values and was found to be appropriate for inclusion in data analysis.

Table 6.

*Review of Education Intervention (IV)*

	Frequency	Percent	Valid Percent	Cumulative Percent
Treatment	12	54.5	54.5	54.5
Control	10	45.5	45.5	100
Total	22	100	100	

Likewise, and as shown in Table 7, *falls* was reviewed for both range and frequency of values and was found to be appropriate for inclusion in data analysis.

The remaining two variables of interest, *perceived susceptibility* and *total percent of adherence* were reviewed for skewness and kurtosis. Table 8 provides specifics including the means, standard deviations, and standard error. Neither variable was considered greatly skewed

Table 7.

*Review of Falls (IV)*

	Frequency	Percent	Valid Percent	Cumulative Percent
no falls	9	40.9	40.9	40.9
1 fall, no injury	3	13.6	13.6	54.5
2 or more falls, no injury	2	9.1	9.1	63.6
1 or more falls with an injury	8	36.4	36.4	100
total	22	100	100	

Table 8.

*Review of Perceived Susceptibility (IV) and Percentage of Adherence (DV)*

	N	Min	Max	Mean	Std. Deviation	Skewness (Std Error)	Kurtosis (Std Error)
Perceived Susceptibility	22	0.94	10.44	5.96	2.53	-0.43 (0.42)	-0.22 (0.95)
Total Percent Adherence	22	0.00	1.00	0.55	0.36	-0.45 (0.42)	-1.09 (0.95)

(-0.88 and -0.91 respectively), indicating the variables demonstrated a frequency similar to a normal distribution. With regards to kurtosis, perceived susceptibility was not greatly different from a normal distribution (-0.23), and total percent of adherence was only becoming different from a normal distribution (-1.14). Therefore, there was no need to transform these variables.

## Demographics

The population addressed in this study consists of community-dwelling adults aged 65 years or older. The sampled population focused on the geographical area of greater Richmond, Virginia. All interested individuals were screened to ensure they met the following inclusion criteria:

- Adult aged 65 years or older
- Primary residence is community-dwelling (no institutionalized living arrangement)
- Primary residence is used by the participant a minimum of 70% of the time to complete their daily routine [5 days (120 hours) of a 7 day (168 hour) period]
- Primary language is English
- Ability to engage in dressing, toileting, bathing / hygiene, and self-care transfers is independent or modified independent (may need to use adaptive equipment or durable medical equipment to complete task); no caregivers are required for these tasks; based upon self-report from the interested participant
- Authority to follow through or authorize follow through with recommendations for environmental changes

Additionally, all interested individuals were screened for following exclusion criteria:

- Currently receiving home health therapy services
- Received home health services within the past 60 calendar days
- Has a diagnosis of dementia

Of the interested individuals who met the inclusion criteria and did not violate the exclusion criteria, the total sample for this study became: 31 participants recruited, 24 participants enrolled, and 22 participants completed all three home visits.

As depicted in Table 9, the demographics for this study sample over-represent African American females compared to the demographics of the sampled area of greater Richmond, Virginia based upon census data as reported by Greater Richmond Partnership (2012).

Table 9.

*Demographics: Sampled Area to Study Sample*

	Male	Female	African American	Caucasian
Sampled area	49%	51%	30%	63%
Study sample	36.4%	63.6%	63.6%	36.4%

From the total study sample of 22 participants, 12 participants were randomized into the treatment group and 10 participants were randomized into the control group. An independent samples t-test was conducted to determine statistical equivalency of age between the treatment and control groups. Levene's test for homogeneity of variance showed  $p > .05$  (.652), indicating Levene's test was not significant and equal variance were assumed. There was no statistically significant difference between the groups,  $t(20) = .102$ ,  $p = .92$ , indicating the treatment and control groups were statistically equivalent in terms of age. Table 10 shows the age ranges and means between the treatment and control groups.

Table 10.

*Age of Participants*

	Sample N=22	Treatment N=12	Control N=10
Age range	65 - 89	66 - 89	65 - 85
Mean age	74.18	74.33	74



Table 11 shows the percentage of male to female participants. Fisher's exact testing demonstrated there is no statistically significant difference between the treatment and control groups with  $p = 1.0$ .

Table 11.

*Percentage (N) of Male to Female Participants*

	Sample N=22	Treatment N=12	Control N=10
Male	36.4% (8)	33.3% (4)	40% (4)
Female	63.6% (14)	66.7% (8)	60% (6)

*Fisher Exact  $p = 1.0$*

Table 12 shows the percentage of ethnicity. Fisher's exact testing demonstrated there is no statistically significant difference between the treatment and control groups with  $p = .69$ .

Table 12.

*Percentage (N) of Ethnicity*

	Sample N=22	Treatment N=12	Control N=10
African American	63.6% (14)	66.7% (8)	60% (6)
Caucasian	36.4% (8)	33.3% (4)	40% (4)

*Fisher Exact  $p = .69$*

Comparison of *recent falls* by *education intervention* was completed to determine if there is a need to control for the potential impact of having sustaining an injurious fall on a participant's percentage of adherence with fall prevention recommendations. As depicted in Table 13, there is a fairly equal distribution between the treatment and control groups of falls in terms of the numbers of falls.

Table 13.

*Recent Falls by Education Intervention*

		Frequency	Percent	Valid Percent	Cumulative Percent
Treatment	no falls	5	41.7	41.7	41.7
	1 fall, no injury	1	8.3	8.3	50.0
	2 or more falls, no injury	2	16.7	16.7	66.7
	1 or more falls with an injury	4	33.3	33.3	100
	total treatment group	12	100	100	
Control	no falls	4	40.0	40.0	40.0
	1 fall, no injury	2	20.0	20.0	60.0
	2 or more falls, no injury	0	0.0	0.0	60.0
	1 or more falls with an injury	4	40.0	40.0	100
	total control group	10	100	100	

To further compare participants' fall histories between the treatment and control groups, statistical analysis via chi-square was considered but not completed. This study's small sample size ( $N=22$ ) leads to violation of the requirement of chi-square that the total sample size is at least at least four or five times the number of cells in order to avoid Type I error (Stern, 2010). The current contingency table of *recent falls* (4 levels) by *education intervention* (2 levels) results in 8 cells for a minimum requirement of 32 cases. Collapsing the categories of falls into three levels (no fall, fall with no injury, fall with injury) creates a 3 x 2 contingency table, with 6 cells, requiring a minimum of 24 cases which is still greater than this study's sample size. With

an appreciation of the potential impact an injurious fall may have on a participant's percentage of adherence with fall prevention recommendations, it was important to establish equivalency between the treatment and control groups for this variable. Therefore, the decision was made to collapse the category of *recent falls* from four categories to two. The categories of: no fall, one fall no injury, and two or more falls no injury were collapsed into "no injury from a fall." The category of "one or more falls with an injury" was termed "injury from a fall." Testing via Fisher's exact test determined the groups are equivalent,  $p = 1.0$ . All further statistical testing utilizing the variable *recent falls* beyond determining equivalency between groups relied upon the original four categories as previously defined.

### **Recommendations Made**

Operational definitions including hazard levels for each of the recommendation areas are detailed in Appendix M: Comparison Chart. Figure 3 displays the number of recommendations amongst all participants as a total group along with the number of recommendations followed. As detailed, amongst the total sample (N=22), the most common recommendations made were pathways (19), rugs (18), and bed height (10). No recommendations were made for the following areas: thresholds, inside stairs, stair lighting, handrails, commode, and children. The strongest areas of adherence amongst all participants were: bedroom light (100%), nightlight (86%), kitchen tasks (67%), and pathways (63%).

### **Adherence**

Unique to this study was the inclusion of two follow-up home visits to determine adherence rather than utilizing self-reporting via telephone or survey. Table 14 details the mean percentage of adherence for the total sample between the second and third (final) visit. An increase in the mean percentage of adherence was noted during both the second and third visits.

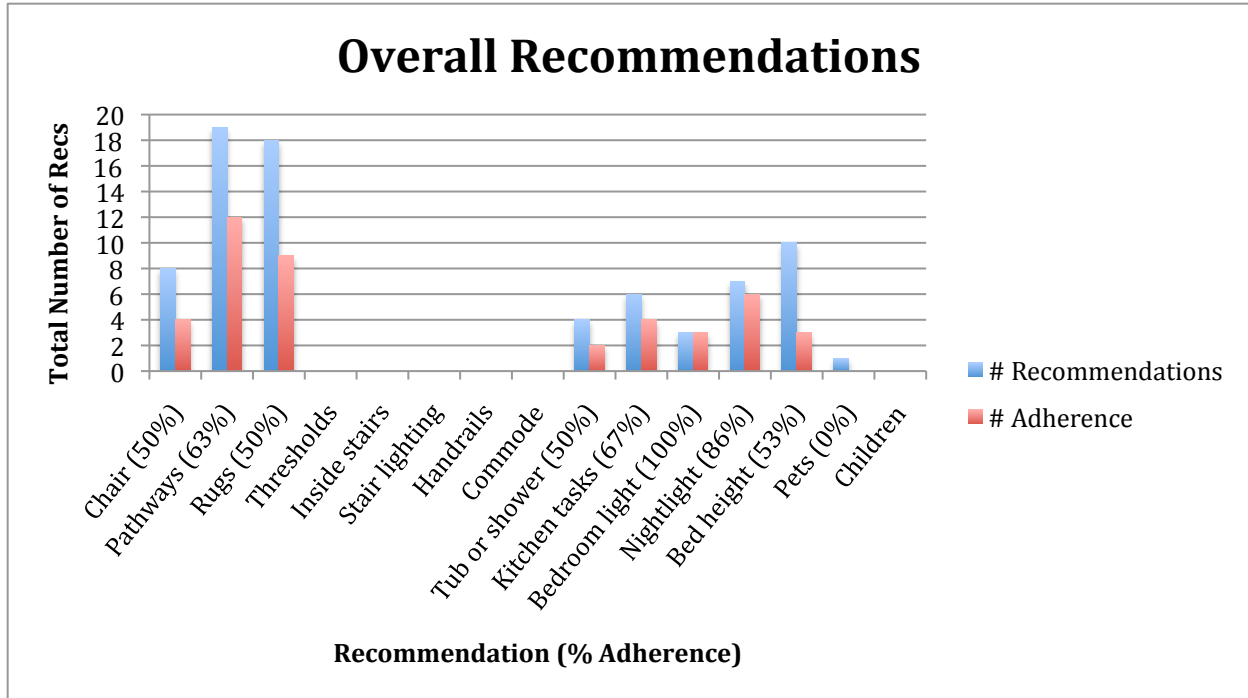


Figure 3. Overall Recommendations.

Table 14.

*Mean Percentage of Adherence Between Home Visits*

	2nd Visit Adherence	Final Visit Adherence	Between Visit Change
Total Sample	40%	55%	15%
Treatment	48%	69%	21%
Control	30%	37%	7%

## H<sub>1</sub> Education Intervention

The first hypothesis of this study was as follows:

Community-dwelling older adults who receive personalized education regarding environmental fall hazards will be more likely than those receiving generalized education

to adhere with environmental fall prevention recommendations.

This hypothesis tested the relationship between the two-level categorical independent variable of *education intervention* and the continuous dependent variable of *percentage of adherence* and was most appropriately analyzed via the statistical technique of two-sample t-test for independent groups. The following six criteria were reviewed to ensure the accuracy of the statistical procedure:

1. The dependent variable of *percentage of adherence* was measured at a ratio level.
2. The independent variable of *education intervention* consisted of two, categorical, independent groups.
3. There was independence of observations, specifically, different participants were in each group and no participant was in more than one group.
4. There were no significant outliers.
5. The dependent variable of *percentage of adherence* was normally distributed for each category of the independent variable of *education intervention*. This was determined through the use of Shapiro-Wilk test of normality, which demonstrated significance at .085 for treatment and .111 for control groups.
6. Homogeneity of variances was confirmed through the use of Levene's test which demonstrated significance at .191, greater than the necessary p-value  $> .05$ , which then rejected the null hypothesis that the variables had no homogeneity of variance.

An independent samples t-test was used to determine whether the mean for total percent of adherence with recommendations differed for participants who received *personalized education* (treatment group) compared to those who received *generalized education* (control group). The mean total *percent of adherence* for the treatment group was .69 (SD =.29) and that

for the control group was .37 (SD = .37). Analysis for each sample using a normal Q-Q plot revealed no serious threats to assumptions of normality. Levene's test for homogeneity of variance showed  $p > .05$  (.156), indicating Levene's test was not significant and equal variances were assumed. There was a statistically significant difference between the groups,  $t(20) = 2.33$ ,  $p = .03$  attributable to the independent variable of *education intervention* with a 95% confidence interval [3.40, 61.89]. The effect size  $d = .96$ ;  $r = .43$ , is approaching a moderate level. Given the small sample size (N=22), results should be viewed with caution. Figure 4 shows the distribution of percentages of adherence of the treatment and control groups. The error bars show the 95% confidence interval of the mean.

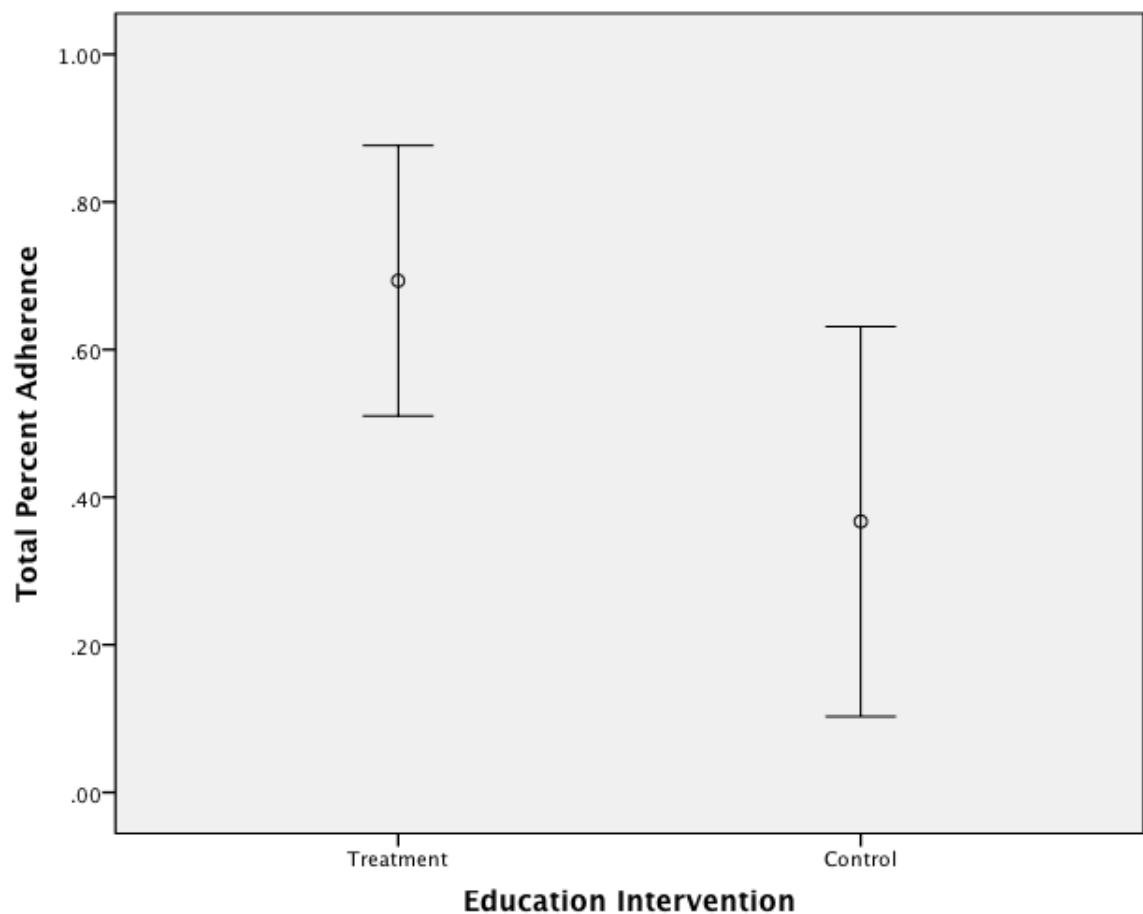


Figure 4. Total Percent of Adherence.

## H<sub>2</sub> Recent Falls

The second hypothesis was as follows:

Community-dwelling older adults who experienced one or more falls within the past 180 days are more likely to adhere with environmental fall prevention recommendations, irrespective of intervention group.

This hypothesis focused on the effect of the predictor variable of *recent falls* on the response variable of *percentage of adherence*, while controlling for the variable of *education intervention* and was most appropriately analyzed through hierarchical multiple regression. For this type of statistical analysis there was a required minimum ratio of 5:1, valid cases to the independent variable. This hypothesis utilized 2 independent variables and the study contains 22 valid cases, thereby resulting in an appropriate ratio of 11:1.

A hierarchical multiple regression analysis was conducted to explore the relationship between the predictor variables of *recent falls* and *education intervention* on the response variable of *percentage of adherence*. An informal review of the data with histograms and scatterplots revealed no serious threats to the assumptions of linearity, nor to the underlying distributional assumptions of the residuals. Table 15 shows the simple correlation values of all pairs of variables together with their significance values. The bottom panel of the table shows the mean and standard deviation of each variable.

During exploration of the belief that an older adult's percentage of adherence with fall prevention recommendations results primarily from sustaining recent falls, step 1 of a hierarchical regression predicted the *percentage of adherence* from the variable *education intervention*. For this hypothesis data analysis considers all participants as one group rather than as the treatment and control groups. Therefore, the purpose of step 1 was to control for the

Table 15.

*Review of H<sub>2</sub> Variables*

	Percentage of adherence (DV)	Education intervention	Recent falls
Education intervention	-0.46*		
Recent falls	-0.02	-0.01	
Mean	0.54	1.45	1.41
Standard deviation	0.36	0.51	1.37

\* $p < .05$ 

known variation between the treatment group and control group participants of *education intervention*. In step 2, the additional contribution of *recent falls* to predicting the *percentage of adherence* was assessed. The  $R^2$  change in step one was .21, a value that was significant,  $F(1, 20) = 5.42$ ,  $MS_{\text{residual}} = .107$ ,  $p < .05$ , indicating that the predictor variable *education intervention* explained a significant proportion of the *percentage of adherence*. The additional contribution of the variable *recent falls* did not significantly increase the proportion of the explained variance in the *percentage of adherence*,  $R^2$  change = .001,  $F(1, 19) = .02$ ,  $MS_{\text{residual}} = .113$ ,  $p = .90$ .

Table 16 shows the values of beta for predictor variables included at each step of the analysis together with significance tests. The top panel shows semipartial  $r$  values and beta values together with significance test for independent variables for step 1 of the hierarchical multiple regression analysis. The bottom panel shows these values for step 2. In step 1 the predictor variable of *education intervention* significantly improved prediction of *percentage of adherence* while the predictor variable *recent falls* did not provide a significant contribution. As previously noted, given the small sample size ( $N=22$ ), results should be viewed with caution.



Table 16.

*Beta for H<sub>2</sub> Predictor Variables*

	Semipartial <i>r</i>	beta	<i>t</i> (20)	Significance
Education intervention	-0.46	-0.46	-2.33	0.03
			<i>t</i> (19)	
Recent falls	-0.03	-0.03	-0.13	0.90
Education intervention	-0.46	-0.46	-2.271	0.04

**H<sub>3</sub> Perceived Susceptibility**

The final hypothesis in this study was as follows:

Community-dwelling older adults with higher perceived susceptibility of future falls are more likely to adhere with environmental fall prevention recommendations, irrespective of intervention group.

This hypothesis examined the effect of the predictor variable of *perceived susceptibility* of future falls on the response variable of *percentage of adherence*, while controlling for the variable of *education intervention* and is most appropriately analyzed through hierarchical multiple regression. Again, the ratio of independent variables to valid cases is 11:1, greater than the required minimum ratio of 5:1 required this type of statistical analysis. Histograms and scatterplots were informally reviewed and showed no serious threats to the assumption of linearity, nor to the underlying distributional assumptions of the residuals. Table 17 shows the simple correlation values of all pairs of variables together with their significance values. The bottom panel of the table shows the mean and standard deviation of each variable.

Table 17.

*Review of H<sub>3</sub> Variables*

	Percentage of adherence (DV)	Education intervention	Perceived susceptibility
Education intervention	-0.46		
Perceived susceptibility	0.08	-0.26	
Mean	0.54	1.45	5.96
Standard deviation	0.36	0.51	2.53

A hierarchical multiple regression analysis was conducted to explore the relationship between the predictor variables of *recent falls* and *education intervention* on the response variable of *percentage of adherence*. As with the previous hypothesis, data analysis for this hypothesis considers all participants as one group rather than as the treatment and control groups. Therefore, the purpose of step 1 was to control for the known variation between the treatment group and control group participants of *education intervention*. Step 1 of a hierarchical regression predicted the *percentage of adherence* from the variable *education intervention*. The  $R^2$  change in step 1 was .21, a value that was significant,  $F(1, 20) = 5.42$ ,  $MS_{\text{residual}} = .107$ ,  $p < .05$ , indicating that the predictor variable *education intervention* explained a significant proportion of the variance. In step 2, the additional contribution of *perceived susceptibility* to predicting the *percentage of adherence* was assessed. The additional contribution of the variable *perceived susceptibility* did not significantly increase the proportion of the explained variance in the *percentage of adherence*,  $R^2$  change = .002,  $F(1, 19) = .05$ ,  $MS_{\text{residual}} = .112$ ,  $p = .83$ .

Table 18 shows the values of beta for predictor variables included at each step of the analysis together with significance tests. As indicated in the table, in step 1 the predictor

Table 18.

*Beta for H<sub>3</sub> Predictor Variables*

	Semipartial <i>r</i>	beta	<i>t</i> (20)	Significance
Education intervention	-0.46	-0.46	-2.33	0.03
			<i>t</i> (19)	
Perceived susceptibility	-0.05	-0.05	-0.22	0.83
Education intervention	-0.46	-0.47	-2.25	0.04

variable of *education intervention* significantly improved prediction of *percentage of adherence* while the predictor variable *perceived susceptibility* did not provide a significant contribution. This suggests that an individual's *perceived susceptibility* of future falls is not a strong indicator of whether or not the individual would follow fall prevention recommendations compared to *education intervention*. As previously noted, results should be viewed with caution given the small sample size (N=22).

## **Chapter Six: Discussion and Conclusion**

The purpose of this randomized control group study was to quantify adherence to environmental fall prevention recommendations and clarify underlying reasons for non-adherence among community-dwelling adults aged 65 years and older.

### **Overview**

Falls among older adults remains a leading cause of concern due to the known impacts including physical injury, loss of independence, increased health care costs, and mortality. While healthcare providers are equipped to assess individuals' fall risks and provide corresponding, evidence-based fall prevention recommendations, recent research has shown low levels of adherence among community-dwelling older adults. Previous studies identified that potential underlying reasons for low levels of adherence may be attributable to whether or not the older adult received education or understood the education provided, whether or not there have been recent falls, and the perceived susceptibility of future falls. Using the theoretical foundation of the Health Belief Model, this randomized control group study quantified levels of adherence with environmental fall prevention recommendations and gathered supporting information from participants to help answer the research question: Do these identified factors (education provided, recent falls, and perceived susceptibility to future falls) increase the likelihood that community-dwelling older adults would adhere to environmental fall prevention recommendations?

As a randomized control, pretest-multiple posttest, extended treatment design, this study utilized a convenience sample of self-selected community-dwelling adults aged 65 years and older. The geographic location was limited to the greater Richmond, Virginia area. A total of 31 participants were recruited, of which 24 participants enrolled in this study. Of those, 22 participants completed all three home visits. Twelve participants were in the treatment group and received personalized education and ten participants were in the control group and received generalized education initially and personalized education during the final visit.

### **Major Findings**

This study suggests that overall percentages of adherence with environmental fall prevention recommendations are greater when personalized education is provided rather than general education. There were no significant findings associated with increased adherence attributable to the participant sustaining recent falls, nor were there any significant findings associated with increased adherence attributable to the participant perceiving likelihood of future falls. As noted previously, due to small sample size (N=22), results should be viewed with caution.

### **Findings Related to the Literature**

This study was unique from previous research in two important aspects: the inclusion of two home visits as a means of quantifying levels of adherence rather than relying upon self-reporting, and the randomization of participants into receiving either personalized or generalized education. An additional aspect that was unique to this study was the conversion of levels of adherence to a *percentage* of recommendations followed, based upon recommendations made rather than reporting in terms of the *number* of recommendations followed. The purpose of this was to provide a clear understanding of the degree to which the participant responded to

recommendations. For example, one participant followed three of the four recommendations made resulting in 75% adherence while another participant followed four of the six recommendations made resulting in 67% adherence. Had reporting for this study been in terms of the *number* of recommendations followed, the former participant following three recommendations would have been reported as less adherent than the latter participant following four recommendations when in fact the opposite is true.

While these differences create some difficulty in comparison to other studies, overall this study supports the findings of several previous studies.

### **Education Intervention**

As previously noted, this study suggests that providing personalized education leads to higher percentages of adherence with environmental fall prevention recommendations. The findings of this study suggesting personalized education increases the likelihood of adherence with fall prevention recommendations supports the findings of a recent study which found that older adults with a greater understanding of the benefit of the recommendation towards reducing their fall risk has a positive correlation with adherence with such recommendations (Gibson, et al., 2010).

Another finding of this study is the continued increase in percentage of adherence following additional home visits. This suggests continued learning and improved adherence with repeated visits. While the treatment group demonstrated a 21% increase in adherence between the second and final home visits, the control group demonstrated an increase as well, albeit a lower percentage of 7%. These findings suggest that repeated exposure to education, personalized or generalized, improves the likelihood of older adults adherence to fall prevention recommendations.

## Recent Falls

Research to date has shown mixed results as to whether or not recent experiences with falling increases the likelihood of adherence with fall prevention recommendations. A survey conducted by Yardley, et al. (2008) found upwards of 57.6% of respondents were willing to consider making home modifications. It is important to note this study did not review whether or not modifications were in fact made. Leland, Porell, and Murphy (2011) reviewed secondary data from Health and Retirement Study and found that following a recent fall, individuals were 17 to 26% more likely to make modifications to their home environment. Boyd and Stevens (2009) conducted interviews and found that of the majority of participants who recently fell, the majority (84.4%) *did not* make any environmental changes, implying 15.6% of the participants made some environmental change. In contrast, Cumming, et al. (2001) found 79% of participants were at least partially adherent to recommendations. As mentioned by the authors, costs and labor associated with home modifications for clients of occupational therapy are “heavily subsidized by the [Australian] government.” For example, bath rails were provided and installed by publically funded services.

This study was not able to support a relationship between recent falls and percentage of adherence with fall prevention recommendations. One potential reason for this lack of finding may center about the inherent difficulties in achieving accuracy with self-reporting of falls. As previous studies noted, underlying reasons for suspected under-reporting of falls may be attributable to denial of falling and reluctance to inform others of recent falls for fears of negative social stigma (Yardley, et al., 2006; Leland, Porell, & Murphy, 2011). Shumway-Cook, (2009) also suggested that the fall may have simply been forgotten and thus not reported.

Perhaps, in terms of understanding why an older adult would follow fall prevention recommendations, the question of whether or not an individual has recently fallen is not as important as understanding whether or not the individual had a negative experience with a recent fall due to either sustaining an injury or due to an increased fear of a future fall. It is possible that sustaining a fall without injury or a minor injury becomes disregarded, perhaps forgotten, and therefore is no longer a cue to action to follow fall prevention recommendations. In contrast, perhaps a fall resulting in a hospitalization or an impact on the individual's ability to complete their daily routine becomes a cue to action as explained by the Health Belief Model.

### **Perceived Susceptibility**

Just as with a previous study (Cumming, et al., 2001), this study found no significance with levels of adherence associated with recent falls, nor with the participants' perceived susceptibility to future falls. In agreement with Cumming, et al. 2001, these findings are at odds with the Health Belief Model. Although this study used the Activities-specific Balance Confidence scale as a means to measure perceived susceptibility of future falls, perhaps understanding an individual's perceived susceptibility is not as important as understanding whether or not the individual places value on being susceptible to a future fall. As one participant explained, he felt off balance "every time I try to turn around" and admitted to multiple previous falls. He also admitted having a high likelihood of future falls yet, "it doesn't bother me because I haven't broken anything." This demonstrates a high level of perceived susceptibility without eliciting the cue to action as proposed by the Health Belief Model. Perhaps the cue to action of perceived susceptibility follows the "law of diminishing return" in that an initial perception of sustaining a future fall elicits a fear of falling, thus serves as a cue to action. In contrast, perhaps having experience with falling no longer evokes a fear, therefore no



longer serves as a cue to action. Future studies should consider using additional measures or alternative measures to capture the individual's perceived susceptibility of injury from a future fall as well as the level of importance or value the individual places on avoidance of falling. One suggestion is to consider use of the following series of questions as a means of quantifying *perceived susceptibility*: Are you worried about falling? (or having a future fall?) Do you believe that you could be injured by a future fall? (if so, how bad?) Would it bother you if you were injured by a fall?

### **Health Belief Model**

The Health Belief Model provides the theoretical underpinning for this study. As previously explained, the interplay of the constructs *perceived susceptibility* and *cue to action* were central to this study's hypotheses. The proposed modifying factor of *cue to action* was measured in terms of the two predicting variables *recent falls* and *education intervention* while *perceived susceptibility* was the third predicting variable. The response variable was measured in terms of *percentage of adherence* with environmental fall prevention recommendations.

As per the Health Belief Model, an individual who has perceived susceptibility or has a cue to action would have an increased likelihood of adhering with prevention recommendations. This study was not able to support a relationship between perceived susceptibility, nor recent falls, on an increase in adherence with environmental recommendations. The supporting information gathered during participant interviews helped to potentially explain this disconnect. One participant appeared dismissive of recent falls; almost smiling while stating "I stopped counting since I fall so much." Another participant explained he wasn't concerned about falling: "I learned how to get off the floor." Yet another participant explained there was not a need to worry about falling because of falling every day and "I haven't gotten hurt yet." These

statements hint at the need to look deeper than merely perceived susceptibility. Perhaps the construct should address the underpinning of whether or not the individual places a value on the perceived susceptibility. Simply stated, they may indeed perceive susceptibility to a future fall but may be dismissive of a future fall, as they do not believe they would be injured by a future fall. Or perhaps they perceive susceptibility of future falls including potential injury but do not perceive a negative impact from an injury. They may have fallen so frequently that falling has become part of their expected daily routine and as such no longer warrants any change with regards to preventing future falls. A previous qualitative study indicated similar findings although the findings were not overlaid with constructs from the Health Belief Model. Roe et al. (2008) completed a qualitative research study to explore how older people reacted to a recent fall and to determine trends of factors that may contribute to future falls. Participants tended towards the perception that falls are an assumed consequence of aging. Again, this information indicates that perceived susceptibility may not be a strong construct within the Health Belief Model.

Another consideration with the Health Belief Model is how the combining effect of variables considered as a *cue to action* might impact an individual's likelihood of taking action, or as in this study, *percentage of adherence* with fall prevention recommendations. It is possible that an individual with multiple known risk factors for falling, such as having low vision, taking certain medications, and/or having certain medical conditions, may, as a combined interaction, have a greater likelihood of following fall prevention recommendations, especially once an additional *cue to action* of *education intervention* is introduced. This study did not review such variables and their potential impact. Future research should consider methodology to include potential impacts of known fall risk factors on an individual's likelihood of taking action.

## **Study Limitations**

### **Sample size.**

The primary limitation for this study was the sample size (N=22). Recruiting efforts included distributions and postings of flyers, inclusion of flyers with Meals on Wheels delivery, community wellness seminars (on topics other than fall prevention) with requests for participants following the seminar, electronic postings, and word-of-mouth. The impact of having a small sample size is realized with a large confidence interval (3.4% - 61.9%) for the statistically significant findings of personalized education increasing percentage of adherence with fall prevention recommendations. The small sample size also negatively impacted the overall power of the statistical analysis. Therefore, results should be viewed with caution.

### **Generalization.**

Another limitation with this study relates to the degree the results may be generalized. Given the geographic restriction required for feasibility of the study, results are limited to seniors residing within the greater Richmond, Virginia region. Likewise, the demographics represented in this study over-represent African American females compared to the sampled population. Recommendations regarding these limitations are to replicate this study in other geographic regions and / or increased demographic diversity and complete comparisons of results.

### **Self-selection.**

This study relies upon self-selected participants; and as such includes inherent limitations. Participants who agreed to home visits may have been more likely to follow recommendations compared to the general population. This is unavoidable however as the participants must be willing to allow a total of three in-home visits for this study protocol. Another limitation with self-selection relates to likelihood of following recommendations.

Participants that were interested in a study associated with home safety and fall prevention recommendations may have been more likely to follow recommendations compared to the general population. The limitations associated with self-selection for participation in the study are unavoidable.

### **Self-reporting.**

One hypothesis of this study relied upon self-reporting of falls. The primary limitation of self-reporting was centered on whether the information gathered was accurate. This is an inherent difficulty with self-reporting that becomes further complicated when discussing falls. Self-reporting of previous falls depends upon the participant's memory of such an event. Besides the obvious scenario that a fall was truly forgotten, it is possible the participant did not remember (or consider) a previous event as a fall but rather a "slip" or "stumble" and therefore did not report it as a fall. This study sought to create an environment in which the participants were encouraged to complete self-reporting with as much accuracy as possible by providing an operational definition of a fall and through open-ended questions including prompts to consider any times of slipping, tripping, stumbling, or feeling off-balance. It is important to note that, for purposes of this study as based on the Health Belief Model, the *perception* of the individual as to whether or not they have fallen is more important than determining the "true" number of falls. This is because the Health Belief Model proposes the cue to action as the event, *central to the individual experiencing it*, not as dictated or defined by others.

### **Perceived susceptibility.**

This study was not able to support a relationship between perceived susceptibility of future falls and percentage of adherence with recommendations. The constructs within the Health Belief Model indicate a relationship. Perhaps measuring perceived susceptibility with the

Activities-specific Confidence scale does not fully reach the underpinning construct associated with following recommendations for decreasing fall risks. As stated by one participant who reported falling “every day” including receiving injuries ranging from abrasions to lacerations requiring sutures: “I haven’t gotten hurt yet” demonstrating his indifference to the prospect of sustaining future falls as well as his seemingly dismissive attitude towards being injured. It is possible that individuals who routinely experience falls no longer perceive falling as a negative event. Likewise, individuals with perceived injuries being “not too bad,” no longer perceive falling as a negative event. This may also have been a contributing factor to the low recruiting rates for this study as older adults who do not perceive falling, and possible associated injuries, as a negative event would be less likely to participate in the study focused on home safety and decreasing fall risks.

### **Recommendations**

Given the magnitude of implications older adults are subject to as a result of falling, and the need to decrease as many risk factors as possible, future research is needed to further analyze older adults’ response to fall prevention recommendations. This study was unique in the inclusion of two home visits as follow-ups rather than relying upon self-reporting via telephone or survey. It was also unique in utilizing a randomized control group design to review the differences between personalized and generalized education. This study proved beneficial to the participants as evident by changes made to home environments to decrease fall risks as well as through supporting information. This study provided valuable insight and information related to the topic of fall prevention. It is recommended that this study be replicated, especially within different geographical locations and with larger sample sizes, with the following recommendations.

### **Study design.**

***Modification in research design.*** Given the results of improved percentage of adherence with personalized education, future research should consider a modification in the research design. By either placing the control group's treatment at the second home visit, or adding a fourth home visit, all participants would receive an observational session following their treatment visit. This would potentially allow a greater understanding of the impact of personalized education compared to generalized education. The inspiration for this recommendation stems from a control group participant who phoned requesting a fourth visit. She explained that since we talked about how the recliner causes her to be off balance when she stands up, she had her daughter help her get a new recliner: "would you please come again? I want to show you the new recliner I got. It doesn't rock and move around like the last one."

***Quantification of adherence.*** This study recommends that future research consider quantifying the recommendations as a percentage from the number of recommendations followed by the number of recommendations made. Previous studies have reported either a raw number of recommendations followed, or categorized adherence as full, partial, or non-adherence. Reporting adherence as a percentage would allow for greater ease in comparison across studies.

***Time between sessions.*** One participant was not able to complete the final visit due to the duration between the second (completed) visit and attempting to schedule the third visit. The range fell outside of study protocol (greater than 45 days between sessions). To date there have been no previous studies to suggest a time frame. It is important to note that the vast majority of participants readily scheduled visits and maintained those scheduled visits within the study protocol of 30 - 45 days between visits. This study recommends continuing with a close window

between visits in order to facilitate learning. Again, there have been no previously published studies reviewing the effectiveness or impact on length of time between sessions.

**Recruiting.** As anticipated, recruiting proved to be a limitation for this study. It is likely that a combination of factors contributed to this limitation. The following recommendations for future research are derived from continued efforts of recruiting during the data collection phase of this study.

**Wording.** Changes may be warranted for the wording advertising this study. The inclusion of “occupational therapist” was included as a means of informing potential participants that home sessions would be conducted by a licensed professional, skilled in the area of home safety and fall prevention. This however, proved to be misleading to a fair number of potential participants as their initial inquiry from the flyer included questions such as “is this the therapy I can get in my home? I need to get therapy” and “can you do OT for me?”

Another aspect of the wording in advertising that may have been misleading to some potential participants was the phrase “home safety.” This phrase was included as a means to recruit without a focus on falls but rather a focus on the environmental aspects of home safety. One potential participant stated “I really just need someone to fix my house...it’s torn up from the hurricane.” Several other individuals had similar initial comments but with further explanation were agreeable with participation.

Future studies should consider modifications in the wordings of flyers according to the intended distribution method. For example, distribution via Meals on Wheels, where potential participants receive the flyer with their meal, may require further clarification of the purpose of the study compared to distribution following a wellness seminar where the speaker is able to verbally explain the purpose of the study and answer questions from potential participants.

## **Instruments.**

***Modification in forms.*** The Participant Interview Form and the Home Environmental Evaluation Form were designed to maintain organization while gathering data across three home visits. For this study these forms were maintained separately meaning all interview data across the three visits was documented on one form while the environmental evaluation information was documented on another form. This was sufficient for purposes of the initial interview. Beyond the initial interview, having the forms separate created undue difficulty as frequently participants continued with discussion, providing valued details and comments during the home environmental evaluation. This became more cumbersome during the second and third visits. It is strongly recommended that future research create forms organized by the visit and include interview and home evaluation on the same form.

***Deletion of calendar.*** The 90-day calendar sheet was included in this study as a means to assist the participants in reporting instances of feeling off-balance or dizzy, or if they experienced any tripping, stumbling, or falling. Only 3 participants utilized the calendar, most merely kept the sheet along with their copy of the consent form and other papers associated with this study. Perhaps the inclusion of a weekly telephone call would facilitate improved use of the calendar.

***Alternative to ABC scale.*** This study utilized the Activities-specific Balance Confidence scale as a means of evaluating the participant's perceived susceptibility of future falls. As previously mentioned, this scale has been shown to have good test-retest reliability and has been used in a number of other studies. This 16-item self-reporting scale asks the participant how confident they are that they will not lose their balance while completing an activity.



One inherent difficulty, seen across the majority of participants, is related to the wording of the scale. The directions are for the participant to answer the question “how confident are you that you will NOT lose your balance or become unsteady when you...” followed by 16 activities such as walking across a parking lot or stepping onto or off of an escalator. The participant is to then rank their confidence on the scale with “0” being “no confidence” and “10” being “completely confident.” Due to the wording many participants required several repeats of the instructions and further clarification to include the explanation “zero means you are certain you will fall and ten means you will not fall.” It is unclear as to whether the validity of the scale was diminished or enhanced by the additional instructions, but for purposes of this study it was necessary to assist the participants in assessing their perceived susceptibility for future falls.

Another inherent difficulty with the use of the ABC scale became apparent with those participants who use a wheelchair or scooter as their primary mode of locomotion. They frequently refused to assign a number to the activity simply stating “I don’t do that.” Per instructions for use of the ABC scale, the participant should be encouraged to imagine whether or not they feel they would lose their balance if they did in fact engage in that activity. More often than not the participants continued to refuse to assign a number. Further clarification with the participant typically resulted in scoring of a zero for those items. Such conversations greatly increased the length of time required to complete the scale and contributed to increased time required to complete the first home visit.

Finally, all of the 16 activities listed on this scale address tasks specific to walking or reaching outside the base of support while standing, and eight of the 16 activities address walking outside of the home in public areas. There are no questions associated with completing tasks such as dressing, using the commode, showering, or any of the other activities of daily

living. Unfortunately, older adults frequently fall in their home and often times these falls occur while attempting to complete tasks within their daily routine (National Institute on Aging, 2013). It is plausible to say that an individual feels confident completing many of the 16 items on the ABC scale and rates themselves as confident; but already self-restricts showers to sponge bathing while seated sink-side due to their perceived susceptibility of falling while showering. In this example of self-restriction of activities, this individual's perceived susceptibility of falling would not be adequately represented through the use of the ABC scale.

It is for these reasons that this study recommends the use of another means of quantifying perceived susceptibility rather than through the use of the ABC scale. To date there is no known published alternative, however, perhaps perceived susceptibility should simply be quantified by asking the participant two basic questions: whether or not they believe they would fall during their daily routine and whether or not they have stopped completing an activity because of a fear of falling.

***Add recommendation.*** The recommendations for this study were based on the Centers for Disease Control and Prevention "A home fall prevention checklist for older adults" along with the addition of chair and bed heights, thresholds, and small children and cats and dogs in the home (Appendix M). Unfortunately, one recommendation was not included in this study but was observed during environmental evaluations. Three participants had poor integrity of flooring that presented an environmental fall hazard. In one case the kitchen linoleum had a tear and rolled edges approximately 5' in length. Another participant had a hole in the kitchen linoleum. In the third case the carpeting was worn and wrinkled or "bubbled" along the primary pathway. None of these three participants were able to have these hazards corrected by the third visit. Of note, these recommendations were noted on the environmental evaluation, but were not coded on

the data sheet. Future research should include the integrity of the flooring as an area for evaluation and potential recommendation to correct.

**Add questions.** As noted previously, this study found no associations between an individual's perceived susceptibility of future falls and the percentage of adherence. This appears to be in disaccord with the Health Belief Model, which proposes that perceived susceptibility of future falls leads to increased likelihood of adherence with fall prevention recommendations. It is likely that the more important aspect to understand is not whether or not the individual perceives they would fall, but whether or not the individual places value on *not* falling. One recommendation for future studies is to consider adding a series questions designed to improve quantification of perceived susceptibility: Are you worried about falling (or having a future fall)? Do you believe that you could be injured by a future fall (if so, how bad)? Would it bother you if you were injured by a fall?

**Larger study.** This study was comprised of 22 total participants and has a geographical limitation to the greater Richmond, Virginia area. Therefore, although the results demonstrated a significant increase in percentage of adherence with participants who received personalized education, the sample size is small, resulting in a large confidence interval, and the results should be viewed with caution. Additionally, results are limited to the greater Richmond, Virginia area. Future studies with a greater number of participants would increase statistical power. Expanding to other geographical locations and inclusion of participants with greater diversity would also increase generalization of the study.

### **Commentary and Closing Statement**

Although this study was limited to reviewing the participants' individual choices in adherence to recommendations and specifically did not address the physical abilities of the

participant to complete tasks, as an occupational therapist natural observation occurred during each home visit. While it is straightforward to provide environmental recommendations based on operational definitions, there were participants who were at a high risk of falls by merely standing, who followed 100% of the recommendations while others clearly violated several environmental recommendations, yet were not likely to sustain a fall during their daily routine. This demonstrates the level of complexity associated with the reduction of falls and the need for older adults, family members, and health care providers alike to avoid the erroneous belief that there is a “one-size fits all” approach to the reduction of falls. Instead, considerations must be made for not only the physical environment, but also the individual’s physical abilities to operate within that environment as well as additional factors including the side effects of medications as well as changes in their health conditions. This study acknowledged this level of complexity but sought to focus on the key element of an individual’s personal choice whether or not to follow recommendations.

Most importantly, although the sample size for this randomized control study was small (N=22), results from this study suggest that providing personalized education, i.e. individualized sessions instructing on the specifics of the recommendations, leads to greater levels of adherence with recommendations. Additionally, increased percentages of adherence across both groups were noted following the second home visit, suggesting that continued education (either personalized or generalized) is beneficial towards the reduction of environmental fall hazards. From a practical standpoint, given the magnitude of potential consequences following a fall, each and every reduction in hazard is of significant value.

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## **Appendix A**

### **Activities-specific Balance Confidence scale**

Name \_\_\_\_\_

**For each of the following activities, please indicate your level of self-confidence by choosing a corresponding number from the following rating scale:**

0	1	2	3	4	5	6	7	8	9	10
no confidence			somewhat confident					completely		
confident										

**How confident are you that you will NOT lose your balance or become unsteady when you...**

1. ...walk around the house? \_\_\_\_
2. ...walk up or down stairs? \_\_\_\_
3. ...bend over and pick up a slipper from the front of a closet floor? \_\_\_\_
4. ...reach for a small can off a shelf at eye level? \_\_\_\_
5. ...stand on your tip toes and reach for something above your head? \_\_\_\_
6. ...stand on a chair and reach for something? \_\_\_\_
7. ...sweep the floor? \_\_\_\_
8. ...walk outside the house to a car parked in the driveway? \_\_\_\_
9. ...get into or out of a car? \_\_\_\_
10. ...walk across a parking lot to the mall? \_\_\_\_
11. ...walk up or down a ramp? \_\_\_\_
12. ...walk in a crowded mall where people rapidly walk past you? \_\_\_\_
13. ...are bumped into by people as you walk through the mall? \_\_\_\_
14. ...step onto or off of an escalator while you are holding onto a railing? \_\_\_\_
15. ...step onto or off an escalator while holding onto parcels such that you cannot hold onto the railing? \_\_\_\_
16. ...walk outside on icy sidewalks? \_\_\_\_

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**Appendix B**  
**Data Collection Sheet**

ID		Demographics												Areas Recommended to decrease hazards																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
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**Appendix C**  
**Participant Interview Form**

**SECTION 1**  
**Demographic Data**

Participant ID: \_\_\_\_\_ Session Dates: #1 \_\_\_\_\_ #2 \_\_\_\_\_ #3 \_\_\_\_\_

Age: \_\_\_\_\_ Sex: M F Race: C AA H O #Days Between \_\_\_\_\_

Residents: ☐ Spouse / sig. other ☐ Child(ren) ☐ Other \_\_\_\_\_

Type of home: ☐ Free-standing ☐ Duplex ☐ Apartment ☐ Trailer ☐ Other \_\_\_\_\_

Stairs: ☐ Inside: # \_\_\_\_\_ rails R / L ☐ Outside: # \_\_\_\_\_ rails R / L

Time residing in home: ☐ < 12 months ☐ 12 – 36 months ☐ 36 - 60 months ☐ > 60 months

Primary mode of locomotion: \_\_\_\_\_ Adaptive device: \_\_\_\_\_

Vision: ☐ WFL ☐ impaired \_\_\_\_\_ ☐ eye glasses [☐ reading only]  
☐ glaucoma ☐ macular degeneration ☐ comments \_\_\_\_\_

Hearing: ☐ WFL ☐ impaired \_\_\_\_\_ ☐ Hearing aid R / L  
☐ tinnitus ☐ comments \_\_\_\_\_

Medical conditions: ☐ Pain: \_\_\_\_\_

☐ Arthritis: \_\_\_\_\_ ☐ h/o CVA: \_\_\_\_\_

☐ Parkinson's ☐ Diabetes Mellitus ☐ Peripheral Neuropathy ☐ Home O<sub>2</sub>

☐ Other: \_\_\_\_\_

Daily medications: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Fall History**

Tell me about any times when you've felt:

- off balance \_\_\_\_\_  
\_\_\_\_\_
- dizzy \_\_\_\_\_  
\_\_\_\_\_



---

Tell me about any times when you've:

- slipped \_\_\_\_\_
- tripped \_\_\_\_\_
- stumbled \_\_\_\_\_

Tell me about any times when you've lost your balance: \_\_\_\_\_

Have any of these times caused you to land on the floor or onto furniture? \_\_\_\_\_

How many falls have you had since \_\_\_\_\_ [180 days prior to session]? \_\_\_\_\_

\*\*If yes: Were you injured? ☐ No ☐ Yes: \_\_\_\_\_

What were you doing when this happened? \_\_\_\_\_

Who did you tell about this? \_\_\_\_\_

Adjusted number of falls / comments: \_\_\_\_\_

### **Perceptions related to fall prevention**

What ways do you know to lower your risk of falling? \_\_\_\_\_

How do you believe this information could help you? \_\_\_\_\_

What, if any, changes have you made in and around your home to lower your risk of falling? \_\_\_\_\_

What questions or concerns do you have? \_\_\_\_\_

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## SECTION 2 -----

What information do you remember from our last session? \_\_\_\_\_

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### Fall History Since Previous Session

Since our last session, tell me about any times you've felt off balance or dizzy: \_\_\_\_\_

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Since our last session, tell me about any times of slipping, tripping, or stumbling: \_\_\_\_\_

---

Since our last session, tell me about any times you've lost your balance: \_\_\_\_\_

---

Have any of these times caused you to land on the floor or onto furniture? \_\_\_\_\_

---

\*\*If yes: Were you injured? ☐ No ☐ Yes: \_\_\_\_\_

What were you doing when this happened? \_\_\_\_\_

Who did you tell about this? \_\_\_\_\_

### Qualitative Questioning

Why did / didn't you follow [insert 1<sup>st</sup> recommendation]? \_\_\_\_\_

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Why did / didn't you follow [insert 2<sup>nd</sup> recommendation]? \_\_\_\_\_

---

---

Why did / didn't you follow [insert 3<sup>rd</sup> recommendation]? \_\_\_\_\_

---

---

Why did / didn't you follow [insert 4<sup>th</sup> recommendation]? \_\_\_\_\_

---

---

Why did / didn't you follow [insert 5<sup>th</sup> recommendation]? \_\_\_\_\_

---

---

*[use back of form for additional recommendations]*

Are there other recommendations you plan on following? \_\_\_\_\_

---

---

What questions or concerns do you have? \_\_\_\_\_

---

### **SECTION 3** -----

What information do you remember from our last session? \_\_\_\_\_

---

### **Fall History Since Previous Session**

Since our last session, tell me about any times you've felt off balance or dizzy: \_\_\_\_\_

Since our last session, tell me about any times of slipping, tripping, or stumbling: \_\_\_\_\_  
\_\_\_\_\_

Since our last session, tell me about any times you've lost your balance: \_\_\_\_\_  
\_\_\_\_\_

Have any of these times caused you to land on the floor or onto furniture? \_\_\_\_\_  
\_\_\_\_\_

\*\*If yes: Were you injured? ☐ No ☐ Yes: \_\_\_\_\_

What were you doing when this happened? \_\_\_\_\_

Who did you tell about this? \_\_\_\_\_

### **Qualitative Questioning**

Why did / didn't you follow [# of recommendation remaining after second session]? \_\_\_\_\_  
\_\_\_\_\_

Why did / didn't you follow [# of recommendation remaining after second session]? \_\_\_\_\_  
\_\_\_\_\_

Why did / didn't you follow [# of recommendation remaining after second session]? \_\_\_\_\_  
\_\_\_\_\_

Why did / didn't you follow [# of recommendation remaining after second session]? \_\_\_\_\_  
\_\_\_\_\_

Why did / didn't you follow [# of recommendation remaining after second session]? \_\_\_\_\_  
\_\_\_\_\_

*[use back of form for additional recommendations]*

What questions or concerns do you have? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## **Appendix D**

### **Home Environmental Evaluation Form**

Participant ID: \_\_\_\_\_ Session Dates: #1 \_\_\_\_\_ #2 \_\_\_\_\_ #3 \_\_\_\_\_

-----**Session 1**-----

**Chair or sofa:** *participant's preferred seating surface*

Location: \_\_\_\_\_ Type of seating surface: \_\_\_\_\_

☐ Participant is able to rise on first trial from seated position

**\*\***☐ Participant is NOT able to rise on first trial from seated position:

**\*\***☐ Multiple trials required

**\*\***☐ Unstable sitting surface (rocking / soft cushions)

**\*\***☐ Unsupportive / too soft of sitting surface

**\*\***☐ No armrests

Comments: \_\_\_\_\_

**Pathways:** *primary pathway for participant to travel between:*

- sleeping area and bathroom
  - ☐ free of clutter / open pathway
  - \*\***☐ clutter along pathway
  - \*\***☐ furniture or items placed in pathway
- bathroom and living area
  - ☐ free of clutter / open pathway
  - \*\***☐ clutter along pathway
  - \*\***☐ furniture or items placed in pathway
- living area and sleeping area
  - ☐ free of clutter / open pathway
  - \*\***☐ clutter along pathway
  - \*\***☐ furniture or items placed in pathway

Comments: \_\_\_\_\_

**Throw rugs:** *rugs that are removable, edges are not fastened to the floor*

☐ Not applicable: participant has no throw rugs

☐ Participant has throw rugs fastened securely to the floor

☐ Participant has throw rugs:

**\*\***☐ not fastened securely to the floor

**\*\***☐ with edges rolling

Comments: \_\_\_\_\_

---

**Thresholds:** *change in flooring surface from one area to another or within a doorway*

- ☐ Not applicable: continuous flooring surface throughout home
- ☐ Changes in flooring surfaces, however, thresholds are <2 cm difference between surfaces
- \*\***☐ Changes in flooring surfaces with thresholds >2 cm difference between surfaces

Comments: \_\_\_\_\_

---

**Inside stairs:** *stairs used to navigate from one level to another level within the home*

- ☐ Not applicable: single-level living
- ☐ Rise between steps are equal & depth of steps is  $\geq 20$  cm
- \*\***☐ Rise between steps are unequal
- \*\***☐ Depth of steps is  $\geq 20$  cm

Comments: \_\_\_\_\_

---

**Stair lighting:** *lighting for the stairway*

- ☐ Not applicable: single-level living
- ☐ Lighting available for stairway
- ☐ Light switch located at top and bottom of stairway
- \*\***☐ No lighting available for stairway
- \*\***☐ Light switch available at only top / bottom of stairway

Comments: \_\_\_\_\_

---

**Handrails:** *supportive rails along on or both sides of the stairs*

- ☐ Not applicable: single-level living
- ☐ Supportive handrails available on both sides of stairs
- \*\***☐ Supportive handrail available on only R / L side (when going upstairs)
- \*\***☐ Handrails broken / loose
- \*\***☐ No handrails available

Comments: \_\_\_\_\_

---



---

**Commode:** *primary commode used by participant*

☐ Participant is able to rise on first trial

**\*\***☐ Participant is NOT able to rise on first trial:

**\*\***☐ Multiple trials required

**\*\***☐ Unstable surface (loose commode seat)

**\*\***☐ No safety bars available

Comments: \_\_\_\_\_

---

**Bathtub / shower:** *participant's primary method of completing hygiene:*

☐ shower

☐ standing surface has non-skid surface or mat

☐ safety bars securely fastened

**\*\***☐ standing surface is slippery

**\*\***☐ safety bars are loose / broken

**\*\***☐ no safety bars are available

☐ tub bath

☐ standing surface has non-skid surface or mat

☐ safety bars securely fastened

☐ by demonstration: participant is able to step over tub, sit in tub, and rise

**\*\***☐ standing surface is slippery

**\*\***☐ safety bars are loose / broken

**\*\***☐ no safety bars are available

**\*\***☐ by demonstration: participant is NOT able to step over tub, sit in tub, and rise

☐ sponge bathe

☐ participant is seated sink-side

☐ participant stands sink-side

☐ area located within arm's reach to place toiletries and clothing

**\*\***☐ by self-report: participant is unable to complete typical hygiene in current arrangement

Comments: \_\_\_\_\_

---

**Kitchen tasks:** *cabinets and surface areas used for meal preparation*

☐ Commonly used items are stored at heights between shoulders and knees

**\*\***☐ Commonly used items are stored above shoulder height

**\*\***☐ Commonly used items are stored below knee height

**\*\*☐** Participant uses stepstool to reach into cabinets

Comments: \_\_\_\_\_

---

**Bedroom lighting:** *primary sleeping area for the participant*

☐ Lighting is available within arm's reach while participant is in resting position

**\*\*☐** Lighting is available, however, NOT within arm's reach while in resting position

**\*\*☐** No lighting is available in the primary sleeping area

Comments: \_\_\_\_\_

---

**Nightlight:** *lighting available for the participant's pathway between sleeping area and commode*

☐ Nightlight is available and in use to light pathway

**\*\*☐** Nightlight is available, however, is NOT in use to light pathway

**\*\*☐** No nightlight is available

Comments: \_\_\_\_\_

---

**Bed height:** *primary sleeping surface for the participant*

☐ Participant is able to place feet on the floor while seated on the edge of the bed

**\*\*☐** Participant is NOT able to place feet on the floor while seated on the edge of the bed

☐ Participant uses a raised surface to enter / exit the bed

☐ Raised surface is permanent and stable

**\*\*☐** Raised surface is a stepstool or unstable

Comments: \_\_\_\_\_

---

**Household pets:** *dog(s) or cat(s) allowed inside the participant's home*

☐ Not applicable: no inside dog(s) or cat(s)

☐ Participant has dog(s): \_\_\_\_\_

☐ Participant has cat(s): \_\_\_\_\_

☐ Food and water dishes are:

☐ In a separate area from pathway

**\*\*☐** Near / in pathway

☐ Pet does not play with toys or toys are contained within a designated area

- \*\*☐ Pet places toys within pathway(s)
- \*\*☐ Pet alters the environment by moving items

Comments: \_\_\_\_\_

**Small children:** *child(ren) under the age of 5 years within the participant's home*

- ☐ Not applicable: no child(ren) under age of 5 years
- ☐ Child(ren) toys are contained within a designated area
- \*\*☐ Child(ren) places toys within pathway(s)
- \*\*☐ Child(ren) alters the environment by moving items

Comments: \_\_\_\_\_

-----**Recommendations made to participant**-----

\_\_\_\_\_ **Chair or sofa (max 4)**

- |   |                                  |
|---|----------------------------------|
| _____ raise / lower the chair (knees at 90 degrees) | _____ prevent the rocking motion |
| _____ have armrests / add grab bar                  | _____ strengthen seating surface |

\_\_\_\_\_ **Pathways (max 2)**

- |                                   |                                    |
|-----------------------------------|------------------------------------|
| _____ clear clutter from pathways | _____ move furniture from pathways |
|-----------------------------------|------------------------------------|

\_\_\_\_\_ **Throw rugs (max 1)**

- |                             |                             |
|-----------------------------|-----------------------------|
| _____ remove throw rugs, or | _____ securely fasten edges |
|-----------------------------|-----------------------------|

\_\_\_\_\_ **Thresholds (max 1)**

- |  |
|--|
| _____ switch to low-profile thresholds |
|--|

\_\_\_\_\_ **Inside Stairs (max 1)**

- |                            |  |
|----------------------------|--|
| _____ have steps fixed, or | _____ alter living space to avoid stairs |
|----------------------------|--|

\_\_\_\_\_ **Stair lighting (max 2)**

- |                    |                                     |
|--------------------|-------------------------------------|
| _____ add lighting | _____ add light switch top / bottom |
|--------------------|-------------------------------------|

\_\_\_\_\_ **Handrails (max 2)**

- |                           |                          |
|---------------------------|--------------------------|
| _____ add handrail(s) R/L | _____ fix broken rail(s) |
|---------------------------|--------------------------|

\_\_\_\_\_ **Commode (max 2)**

- |                              |                              |
|------------------------------|------------------------------|
| _____ add raised toilet seat | _____ add safety grab bar(s) |
|------------------------------|------------------------------|

\_\_\_\_\_ **Bathtub / shower (max 3)**

- \_\_\_\_\_ add non-skid mat      \_\_\_\_\_ add safety grab bar(s)      \_\_\_\_\_ add bath bench
- \_\_\_\_\_ **Kitchen (max 2)**
- \_\_\_\_\_ put items below shoulders      \_\_\_\_\_ put items above knees
- \_\_\_\_\_ **Bedroom lighting (max 1)**
- \_\_\_\_\_ place lamp within reach while laying in bed
- \_\_\_\_\_ **Nightlight (max 2)**
- \_\_\_\_\_ add nightlight(s) for pathway      \_\_\_\_\_ add nightlight within bathroom
- \_\_\_\_\_ **Bed height (max 1)**
- \_\_\_\_\_ raise / lower bed so feet touch when seated edge of bed (knees at 90 degrees)
- \_\_\_\_\_ **Household pets (max 2)**
- \_\_\_\_\_ place dishes away from pathways      \_\_\_\_\_ keep pathways free from toys
- \_\_\_\_\_ **Small children (max 2)**
- \_\_\_\_\_ create space for child(ren) to play with toys      \_\_\_\_\_ keep pathways free from toys

---

**General Home Safety**

---

- ☐ Adequate heat / cooling
- ☐ Running water
- ☐ Electricity
- ☐ Generally clean
- ☐ Participant able to contact EMS

**Areas of concern** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\*\*General home safety concerns must be brought to the immediate attention of Ms. Fleming (804) 501-8757 and Dr. Welleford (804) 828-1565

**Checklist:**

- \_\_\_\_\_ Provide the participant a written copy of the recommended environmental changes
- \_\_\_\_\_ Provide the participant a copy of “A Home Fall Prevention Checklist for Older Adults”
- \_\_\_\_\_ Provide the participant a copy of “Environmental Fall Prevention Resources”

Control Group:

- Return to the area in which the Participant Interview was completed

- Read through the handouts with the participant and review the recommendations
- Ask the participant if s/he has any questions / concerns regarding the recommendations
- AVOID physically demonstrating recommendations

Treatment Group:

- Return to each area in the home identified as an area of environmental risk (\*\*)
- Physically demonstrate each of the recommended environmental changes
- Ask the participant if s/he has any questions / concerns regarding the recommendations

-----Section 2-----

**Mark the items on which recommendations were followed, total on line next to category.**

\_\_\_\_\_ **Chair or sofa (max 4)**

\_\_\_\_\_ raise / lower the chair (knees at 90 degrees) \_\_\_\_\_ prevent the rocking motion

\_\_\_\_\_ have armrests / add grab bar \_\_\_\_\_ strengthen seating surface

Comments: \_\_\_\_\_

\_\_\_\_\_ **Pathways (max 2)**

\_\_\_\_\_ clear clutter from pathways \_\_\_\_\_ move furniture from pathways

Comments: \_\_\_\_\_

\_\_\_\_\_ **Throw rugs (max 1)**

\_\_\_\_\_ remove throw rugs, or \_\_\_\_\_ securely fasten edges

Comments: \_\_\_\_\_

\_\_\_\_\_ **Thresholds (max 1)**

\_\_\_\_\_ switch to low-profile thresholds

Comments: \_\_\_\_\_

\_\_\_\_\_ **Inside Stairs (max 1)**

\_\_\_\_\_ have steps fixed, or \_\_\_\_\_ alter living space to avoid stairs

Comments: \_\_\_\_\_

\_\_\_\_\_ **Stair lighting (max 2)**

\_\_\_\_\_ add lighting \_\_\_\_\_ add light switch top / bottom

Comments: \_\_\_\_\_

\_\_\_\_\_ **Handrails (max 2)**

\_\_\_\_\_ add handrail(s) R/L \_\_\_\_\_ fix broken rail(s)

Comments: \_\_\_\_\_

\_\_\_\_\_ **Commode (max 2)**

\_\_\_\_\_ add raised toilet seat                      \_\_\_\_\_ add safety grab bar(s)

Comments: \_\_\_\_\_

\_\_\_\_\_ **Bathtub / shower (max 3)**

\_\_\_\_\_ add non-skid mat                      \_\_\_\_\_ add safety grab bar(s)                      \_\_\_\_\_ add bath bench

Comments: \_\_\_\_\_

\_\_\_\_\_ **Kitchen (max 2)**

\_\_\_\_\_ put items below shoulders                      \_\_\_\_\_ put items above knees

Comments: \_\_\_\_\_

\_\_\_\_\_ **Bedroom lighting (max 1)**

\_\_\_\_\_ place lamp within reach while laying in bed

Comments: \_\_\_\_\_

\_\_\_\_\_ **Nightlight (max 2)**

\_\_\_\_\_ add nightlight(s) for pathway                      \_\_\_\_\_ add nightlight within bathroom

Comments: \_\_\_\_\_

\_\_\_\_\_ **Bed height (max 1)**

\_\_\_\_\_ raise / lower bed so feet touch when seated edge of bed (knees at 90 degrees)

Comments: \_\_\_\_\_

\_\_\_\_\_ **Household pets (max 2)**

\_\_\_\_\_ place dishes away from pathways                      \_\_\_\_\_ keep pathways free from toys

Comments: \_\_\_\_\_

\_\_\_\_\_ **Small children (max 2)**

\_\_\_\_\_ create space for child(ren) to play with toys                      \_\_\_\_\_ keep pathways free from toys

Comments: \_\_\_\_\_

-----Section 3-----

\_\_\_\_\_ **Chair or sofa (max 4)**

\_\_\_\_\_ raise / lower the chair (knees at 90 degrees)                      \_\_\_\_\_ prevent the rocking motion

\_\_\_\_\_ have armrests / add grab bar                      \_\_\_\_\_ strengthen seating surface

Comments: \_\_\_\_\_

\_\_\_\_\_ **Pathways (max 2)**

\_\_\_\_\_ clear clutter from pathways \_\_\_\_\_ move furniture from pathways

Comments: \_\_\_\_\_

\_\_\_\_\_ **Throw rugs (max 1)**

\_\_\_\_\_ remove throw rugs, or \_\_\_\_\_ securely fasten edges

Comments: \_\_\_\_\_

\_\_\_\_\_ **Thresholds (max 1)**

\_\_\_\_\_ switch to low-profile thresholds

Comments: \_\_\_\_\_

\_\_\_\_\_ **Inside Stairs (max 1)**

\_\_\_\_\_ have steps fixed, or \_\_\_\_\_ alter living space to avoid stairs

Comments: \_\_\_\_\_

\_\_\_\_\_ **Stair lighting (max 2)**

\_\_\_\_\_ add lighting \_\_\_\_\_ add light switch top / bottom

Comments: \_\_\_\_\_

\_\_\_\_\_ **Handrails (max 2)**

\_\_\_\_\_ add handrail(s) R/L \_\_\_\_\_ fix broken rail(s)

Comments: \_\_\_\_\_

\_\_\_\_\_ **Commode (max 2)**

\_\_\_\_\_ add raised toilet seat \_\_\_\_\_ add safety grab bar(s)

Comments: \_\_\_\_\_

\_\_\_\_\_ **Bathtub / shower (max 3)**

\_\_\_\_\_ add non-skid mat \_\_\_\_\_ add safety grab bar(s) \_\_\_\_\_ add bath bench

Comments: \_\_\_\_\_

\_\_\_\_\_ **Kitchen (max 2)**

\_\_\_\_\_ put items below shoulders \_\_\_\_\_ put items above knees

Comments: \_\_\_\_\_

\_\_\_\_\_ **Bedroom lighting (max 1)**

\_\_\_\_\_ place lamp within reach while laying in bed

Comments: \_\_\_\_\_

\_\_\_\_\_ **Nightlight (max 2)**

\_\_\_\_\_ add nightlight(s) for pathway \_\_\_\_\_ add nightlight within bathroom

Comments: \_\_\_\_\_

\_\_\_\_\_ **Bed height (max 1)**

\_\_\_\_\_ raise / lower bed so feet touch when seated edge of bed (knees at 90 degrees)

Comments: \_\_\_\_\_

\_\_\_\_\_ **Household pets (max 2)**

\_\_\_\_\_ place dishes away from pathways      \_\_\_\_\_ keep pathways free from toys

Comments: \_\_\_\_\_

\_\_\_\_\_ **Small children (max 2)**

\_\_\_\_\_ create space for child(ren) to play with toys      \_\_\_\_\_ keep pathways free from toys

Comments: \_\_\_\_\_



## **Appendix E**

### **Home Environmental Evaluation Form: Recommendations**

Session date: \_\_\_\_\_ Occupational therapist: \_\_\_\_\_

\_\_\_\_\_ **Chair or sofa**

- \_\_\_\_\_ raise / lower the chair (knees at 90 degrees)      \_\_\_\_\_ prevent the rocking motion  
\_\_\_\_\_ have armrests / add grab bar      \_\_\_\_\_ strengthen seating surface

\_\_\_\_\_ **Pathways**

- \_\_\_\_\_ clear clutter from pathways      \_\_\_\_\_ move furniture from pathways

\_\_\_\_\_ **Throw rugs**

- \_\_\_\_\_ remove throw rugs

\_\_\_\_\_ **Thresholds**

- \_\_\_\_\_ switch to low-profile thresholds

\_\_\_\_\_ **Inside Stairs**

- \_\_\_\_\_ have steps fixed, or      \_\_\_\_\_ alter living space to avoid stairs

\_\_\_\_\_ **Stair lighting**

- \_\_\_\_\_ add lighting      \_\_\_\_\_ add light switch top / bottom

\_\_\_\_\_ **Handrails**

- \_\_\_\_\_ add handrail(s) R/L      \_\_\_\_\_ fix broken rail(s)

\_\_\_\_\_ **Commode**

- \_\_\_\_\_ add raised toilet seat      \_\_\_\_\_ add safety grab bar(s)

\_\_\_\_\_ **Bathtub / shower**

- \_\_\_\_\_ add non-skid mat      \_\_\_\_\_ add safety grab bar(s)      \_\_\_\_\_ add bath bench

\_\_\_\_\_ **Kitchen**

- \_\_\_\_\_ put items below shoulders      \_\_\_\_\_ put items above knees

\_\_\_\_\_ **Bedroom lighting**

- \_\_\_\_\_ place lamp within reach while laying in bed

\_\_\_\_\_ **Nightlight**

- \_\_\_\_\_ add nightlight(s) for pathway      \_\_\_\_\_ add nightlight within bathroom

\_\_\_\_\_ **Bed**

- \_\_\_\_\_ raise / lower bed so feet touch when seated edge of bed (knees at 90 degrees)

\_\_\_\_\_ **Household pets**

- \_\_\_\_\_ place dishes away from pathways      \_\_\_\_\_ keep pathways free from toys

\_\_\_\_\_ **Small children**

- \_\_\_\_\_ create space for child(ren) to play with toys      \_\_\_\_\_ keep pathways free from toys

## **Appendix F**

### **Environmental Fall Prevention Resources**

## **Contractors**

**(safety grab bars / stairs / handrails / lighting)**

### **A-Z Handyman Services, LLC**

- Member of the Better Business Bureau with “A” rating
- Offers senior discounts

2570 Barnesway Lane, Richmond

804-337-8029

[www.azHandymanServices.com](http://www.azHandymanServices.com)

### **Regal Home Improvement Co.**

- Member of the Better Business Bureau with “A+” rating
- Offers senior discounts

4002 Hermitage Road, Richmond

804-767-6859

[www.RegalHomeImprovement.com](http://www.RegalHomeImprovement.com)

### **B.K. Martin, Incorporated**

- Member of the Better Business Bureau with “A+” rating

PO Box 14589, Richmond, VA 23221

804-477-8417

[www.bkmartin.com](http://www.bkmartin.com)

## **Medical Equipment**

**(furniture risers / non-skid bath mats / nightlights)**

### **Bed Bath & Beyond**

10050 West Broad Street, Glen Allen

804-935-0600

[www.BedBathAndBeyond.com](http://www.BedBathAndBeyond.com)

### **Wal-Mart / Target**

## **Durable Medical Equipment**

**(bath bench / raised toilet seat / bedside commode / bedrails)**

### **West Home Health Care, Inc**

- Member of the Better Business Bureau with “A+” rating
- 2277 Dabney Road #1, Richmond  
804-353-7703

### **Capital Medical Supply**

2233 Tomlynn Street, Richmond  
804-353-0707

[www.CapitalMedicalSupply.com](http://www.CapitalMedicalSupply.com)

### **MaxiAids**

800-522-6294

[www.MaxiAids.com](http://www.MaxiAids.com)

**Walgreens / RiteAid / Wal-Mart / local pharmacy**

## **Appendix G**

### **90-day Calendar Sheet**

Please use this form to chart any times:  
that you felt OFF-BALANCE or DIZZY  
also chart any SLIPS, TRIPS, STUMBLES, or  
FALLS that you had

A FALL is: a sudden, unintentional change in position causing an individual to land at a lower level, on an object, the floor, or the ground, *other than as a consequence of* sustaining a violent blow, loss of consciousness, sudden onset of paralysis as in stroke or an epileptic seizure or by overwhelming external force

*Month* \_\_\_\_\_

Sun	Mon	Tues	Wed	Thur	Fri	Sat

*Month* \_\_\_\_\_

Sun	Mon	Tues	Wed	Thur	Fri	Sat

*Month* \_\_\_\_\_

Sun	Mon	Tues	Wed	Thur	Fri	Sat

[www.FreePrintable.net](http://www.FreePrintable.net)



## **Appendix H**

**“A Home Fall Prevention Checklist for Older Adults (Page 1 of 8 shown)”**

This checklist is based on the original version printed by the Centers for Disease Control and Prevention. Support for this version was provided by MetLife Foundation.

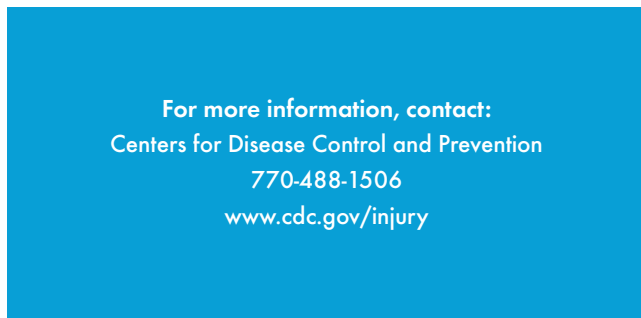
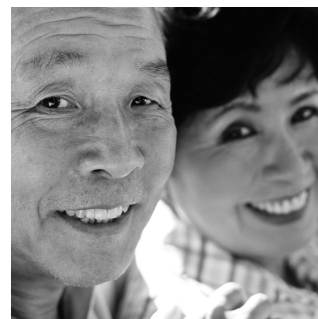
2005



**MetLife Foundation**



Department of Health and Human Services  
Centers for Disease Control and Prevention



**Appendix I**  
**Personalized Education Guide**

**Chair or sofa:** demonstrate how seating height too low / high causes increased physical effort to rise; assess if participant braces leg(s) against seat to reach standing position; demonstrate how these actions alter standing balance, in particular during transitional movements; educate on recommendations to raise / lower the level of seating to allow appropriate placement of feet and knees at an approximately 90 degrees of flexion; if participant has a chair that rocks or swivels, demonstrate how the movement of the chair tends to shift balance during transitional movements; educate on recommendation that rocking mechanisms should be locked; additional recommendations include: soft or sling seats should be braced to provide support; armrests provide support during transitional movements

**Pathways:** demonstrate how narrowed pathways alter base of support when ambulating pathways, thus shifting balance; educate on recommendations to clear pathways between living area and bedroom and bathroom with path wide enough to allow participant to maneuver (including with adaptive equipment if used) and no less than 30"; include education regarding arrangement of furniture to allow direct paths for ambulation

**Throw rugs:** demonstrate how throw rugs catch front of shoes / feet / walker / canes, leading to tripping and stumbling; educate on preferred recommendations to remove all throw rugs; dependent upon participant's responses, offer alternative recommendation of securely fastening edges such as with contractor grade double-sided tape

**Thresholds:** demonstrate how thresholds catch front of shoes / feet / walker / canes, leading to tripping and stumbling; educate on replacing thresholds with low-profile to decrease changes between flooring surfaces

**Inside stairs:** demonstrate how uneven steps and/or steps with narrow-depth create unsafe transitions when ascending / descending, increasing the risk of missteps; educate on recommendations to fix steps or consider altering living space to remain on main level

**Stair lighting:** demonstrate how changes in lighting from dark areas to lit areas impacts vision and increases the risk of missing the first / last steps; educate on recommendation to have the ability to turn on / off lights from both bottom and top of stairs;

**Handrails:** demonstrate difference in safety between use of handrail and (participant's current technique); demonstrate how holding supportive and securely fastened handrail helps to catch one's balance should a misstep occur; educate on recommendations to have securely fastened handrails available on both sides of steps

**Commode:** demonstrate how low commode and/or unstable surface create difficulty in rising; demonstrate how safety bars, placed in the appropriate location, provide a secure option to safely rise; educate on recommendations to add safety bar(s) and / or raised toilet seat to increase safety

**Bathtub / shower:** following the participant's preferred routine to maintain hygiene (shower, tub bathing, sink-side sponge bathing); demonstrate how non-skid surfaces decrease likelihood of slipping, in particular at end of hygiene routine when surfaces are wet; demonstrate how completing the task at a seated level decreases risk of losing balance due to fatigue or bending /

reaching for items; educate on recommendations including safety bar(s) in proper location(s), bath bench, non-skid mat;

**Kitchen tasks:** demonstrate how reaching above shoulders or below knees to retrieve items changes the center of balance, placing the participant at an increased risk of losing balance; educate on recommendations to place commonly used items in new locations either on low shelves in upper cabinets, directly on the counter tops, or in the upper drawers of the lower cabinets

**Bedroom lighting:** demonstrate how leaving the sleeping area to turn on lights places the participant at risk for stumbling during those transitions; educate on recommendations to place lamp near bed to allow turning light on from resting position

**Nightlight:** demonstrate how changes in lighting from dark areas to lit areas impacts vision and increases the risk of stumbling, tripping; educate on recommendation to use nightlight between bed and bathroom, including pathway

**Bed:** demonstrate how bed height too low / high causes increased physical effort to get in / out of bed, placing participant at risk of losing balance during transitional movement; educate on recommendations to raise / lower bed so feet touch when seated at the edge of the bed and knees are at approximately 90 degrees flexion

**Household pets:** demonstrate how food and water dishes placed within pathways increases the need of the participant to step over / around, thus shifting balance and placing the participant at risk for losing balance; demonstrate how toys left within the pathways can be visually missed, causing the participant to misstep, stumble, and/or lose balance; educate on recommendations to place food and water dishes away from pathway; educate on recommendations to keep pathway free of toys

**Small children:** demonstrate how toys left within the pathways can be visually missed, causing the participant to misstep, stumble, and/or lose balance; educate on recommendations to create a space for child(ren) to play with toys; educate on recommendations to keep pathway free of toys

## **Appendix J**

### **Example of Personalized Recommendations**

Following the home environmental evaluation:

Control group receives:

- Written summary of Home Environmental Evaluation
- Handout: Environmental Fall Prevention Resources
- 90-day calendar sheet
- CDC publication: “A Home Fall Prevention Checklist for Older Adults”
- OT to the control group participant: *“The Home Environmental Evaluation shows that you have a cluttered pathway. This is considered a fall hazard and the recommendation is to have your pathways free from clutter.”*

Treatment group:

- Written summary of Home Environmental Evaluation
- Handout: Environmental Fall Prevention Resources
- 90-day calendar sheet
- CDC publication: “A Home Fall Prevention Checklist for Older Adults”
- Personalized education of recommendations from Home Environmental Evaluation
- OT to the treatment group participant: *“The Home Environmental Evaluation shows that you have a cluttered pathway. Please come with me so I can show you. (OT and participant go to the cluttered pathway.) Let me show you how this bit of clutter here could cause you to fall. (OT demonstrates why the cluttered pathway is a fall hazard.) The recommendation is to have this clutter cleared so that you have a wide enough pathway and are less likely to catch your foot on something, causing you to lose your balance and fall. Does this make sense? Do you want me to show you again? Do you have any questions about keeping your pathways free from clutter?”*

**Appendix K**  
**Recruitment Flyer**



***Would you, or someone you know,  
be interested in a  
FREE in-home safety evaluation  
by a licensed Occupational Therapist?***

**Participants are now being accepted to take part in a research study conducted in the greater Richmond area.**

**Adults aged 65 years and older are encouraged to take advantage of this opportunity to receive 3 FREE in-home sessions from a licensed occupational therapist.**

Study participants receive:

- FREE in-home safety evaluation by a licensed Occupational Therapist
- FREE recommendations on ways to decrease the risk of falling
- Two follow-up home visits
- Written materials to help make your home environment safer

To learn more about this exciting opportunity, please contact:

Suzanne F Taylor, Occupational Therapist, MBA, Ph.D.(c)

Virginia Commonwealth University

[phone number]

[phone number]

[email]

This study is being conducted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, Health Related Sciences at Virginia Commonwealth University, through the Department of Gerontology and in conjunction with the Department of Occupational Therapy.

**VCU IRB#: HM13996**

**Appendix L**  
**Consent Form**

## **RESEARCH SUBJECT INFORMATION AND CONSENT FORM**

**TITLE: Older Adults' Adherence to Fall Prevention Recommendations**

**VCU IRB NO.:** HM13996

This consent form may contain words that you do not understand. Please ask the study staff to explain any words that you do not clearly understand. You may keep to read an unsigned copy of this consent form to think about or discuss with family or friends before making your decision.

### **PURPOSE OF THE STUDY**

The purpose of this research study is to find out about how older adults respond to fall prevention recommendations.

If you decide to be in this research study, you will be asked to sign this consent form after you have had all your questions answered and understand what will happen to you.

In this study you will be asked to allow a study researcher to conduct a total of three in-home visits, each lasting about one hour. During the first visit you will be asked to complete a short survey to describe your confidence in not falling. The study researcher will complete an environmental home safety evaluation and provide you a written copy of the results. You will also receive written recommendations to make your home safer so you are less likely to fall. During the second and third in-home visits the study researcher will review the home safety evaluation areas from the first home visit. During each in-home visit the study researcher will ask you questions about falling. The responses will be written to make sure they are understood as you intended.

You are being asked to participate in this study because you are an adult aged 65 years or older, residing in the greater Richmond, Virginia area. Approximately 80 subjects will participate in this study. There are certain requirements you must meet in order to participate in this study:

- You are 65 years or older
- You don't live in an assisted living, nursing facility, or a group home
- You speak English as your primary language
- You can get dressed, use the toilet, and bathe by yourself
- You can authorize changes to your home (such as moving furniture or adding grab bars or fixing steps)

You would not be able to participate in this study if:

- You are receiving home health therapy services
- You have received home health therapy services in the past 60 calendar days
- You have a diagnosis of dementia

The screening process to participate in this study is completed through a telephone call. During this screening process you will be asked to participate with a brief cognitive screening.

Significant new findings developed during the course of the research, which may relate to your willingness to continue participation, will be provided to you.

## **RISKS AND DISCOMFORTS**

Sometimes talking about falling causes people to become upset or to become afraid of falling. The researcher will ask you several questions about whether or not you have fallen and what happened during the fall. You do not have to talk about any times when you have fallen. You do not have to talk about any subjects that make you upset. If you become upset or afraid of falling the study staff will assist you in contacting your physician to receive appropriate medical services. You may choose to stop talking about falling at anytime.

## **BENEFITS TO YOU AND OTHERS**

You may receive the benefit of learning how to make your home environment safer and decrease your risk of falling. The information we learn from people in this study may help us design better programs to decrease the risk of falling for older adults.

## **COSTS**

There are no costs for participating in this study other than the time you will spend with the researcher during the home visits and filling out questionnaires.

Any costs associated with following the recommendations to improve your home safety will be your responsibility. You are not, however, required to implement any of the recommendations as a condition of your continued participation in this study.

## **ALTERNATIVES**

Participation in this study provides you education on improving your home safety.

There are other ways you can learn about improving your home safety, including:

- asking your physician for occupational therapy services

- contacting the Centers for Disease Control and Prevention: Injury Prevention & Control: Falls – Older Adults through the World Wide Web at:  
<http://www.cdc.gov/HomeandRecreationalSafety/Falls/index.html>

Or telephone at:

(800) 232-4636

TTY (888) 232-6348

Monday through Friday, 8a – 8p Eastern Time (closed holidays)

Another alternative to participation with this study is to decline participation.

## **CONFIDENTIALITY**

Potentially identifiable information about you will consist of your name, your address, surveys, and interview notes. Data is being collected only for research purposes. Your data will be identified by an ID number, not by your name or address. Your name and address will be stored separately from data collection in a locked research area. All personal identifying information (your name and address) will be kept in password-protected files and these files will be deleted upon completion of the study. Other records consisting of surveys and interview notes will be kept in a locked file cabinet indefinitely. Access to all data will be limited to study personnel.

We will not tell anyone the answers you give us; however, information from the study and the consent form signed by you may be looked at or copied for research or legal purposes by Virginia Commonwealth University. Personal information about you might be shared with or copied by authorized officials of the Department of Health and Human Services (if applicable).

What we find from this study may be presented at meetings or published in papers, but your name will not ever be used in these presentations or papers.

Study staff are required by law to report any suspected situations of abuse or neglect. Unsafe home environments will also be reported. For purposes of this study, “unsafe home environments” are those environments that are generally accepted as mandated reporting situations including but not limited to: suspected abuse, suspected neglect, inadequate heating / cooling, lack of running water, lack of electricity, filth and/or squalor, or if the participant is unable to obtain food and water or is unable to contact emergency services in the event of an emergent situation. Parties to be notified may include your responsible party or next of kin, your primary care physician, and Adult Protective Services if indicated.

## **VOLUNTARY PARTICIPATION AND WITHDRAWAL**

You do not have to participate in this study. If you choose to participate, you may stop at any time without any penalty. You may also choose not to answer particular questions that are asked in the study.

Your participation in this study may be stopped at any time by the study staff without your consent. The reasons might include:

- the study staff thinks it necessary for your health or safety;
- you have not followed study instructions;
- administrative reasons require your withdrawal.

If you leave the study before the final regularly scheduled visit you may not receive all of the opportunities to learn how to make your home environment safer to decrease your risk of falling.

## QUESTIONS

In the future, you may have questions about your participation in this study. If you have any questions, complaints, or concerns about the research, contact:

Suzanne F Taylor, Study Coordinator  
[Address]  
[City, State, Zip]  
[Phone]

If you have any questions about your rights as a participant in this study, you may contact:

Office for Research  
Virginia Commonwealth University  
[Address]  
[City, State, Zip]  
[Phone]

You may also contact this number for general questions, concerns or complaints about the research. Please call this number if you cannot reach the research team or wish to talk to someone else. Additional information about participation in research studies can be found at <http://www.research.vcu.edu/irb/volunteers.htm>.

## CONSENT

*I have been given the chance to read this consent form. I understand the information about this study. Questions that I wanted to ask about the study have been answered. My signature says that I am willing to participate in this study. I will receive a copy of the consent form once I have agreed to participate.*

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Participant name printed

Participant signature

Date

---

Printed Name of Person Conducting Informed Consent Discussion / Witness

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Signature of Person Conducting Informed Consent Discussion / Witness

---

Date

---

Principal Investigator Signature (if different from above)

---

Date

**Appendix M**  
**Comparison Chart**



<b>Reference</b>	<b>Area</b>	<b>Operational Definition</b>	<b>Hazard Level</b>	<b>Recommendation(s)</b>
<b>Hopkins &amp; Smith (1993) Chp 8 (pg 225)</b>	<b>Chair or sofa height</b>	Participant's preferred seating surface	Participant is unable to rise on first trial from preferred chair or sofa	Raise seating surface; if rocking motion - stabilize; provide grab bar(s) nearby
<b>CDC Checklist: Floors (pg 3)</b>	<b>Pathways</b>	Primary pathways for participant to travel between sleeping, living, and bathroom areas	Furniture or items placed in pathway; clutter on floors	Clear pathways; move furniture from pathways
<b>CDC Checklist: Floors (pg 3)</b>	<b>Throw rugs</b>	Rugs that are removable, edges are not fastened to the floor	Throw rugs within bathroom, near bed, in hallway, at doors	Remove throw rugs
<b>Hopkins &amp; Smith (1993) Chp 9 (pg 324)</b>	<b>Thresholds</b>	Change in flooring surface from one area to another or within a doorway	Thresholds with change in floor level > ½ inch	Change thresholds to low profile
<b>CDC Checklist: Stairs and Steps (pg 4)</b>	<b>Inside stairs</b>	Stairs used to navigate from one level to another level within the home	Rise between steps is unequal; depth of steps is < 20 cm	Alter living space to avoid stairs (primary living on first level)
<b>CDC Checklist: Stairs and Steps (pg 4)</b>	<b>Stair lighting</b>	Lighting for the stairway	Absent lighting; light switch at only the top or bottom of the stairway	Review other lighting options nearby stairway; self-adhesive touch lights
<b>CDC Checklist: Stairs and Steps (pg 4)</b>	<b>Handrails</b>	Supportive rails along one or both sides of the stairs	Absent rails; broken or loose rails;	Add handrails if missing; fix broken rails
<b>CDC Checklist: Bathroom (pg 5)</b>	<b>Commode</b>	Primary commode used by participant	Participant is unable to rise on first trial (safety bars or raised toilet seat as needed)	Add raised toilet seat and / or safety grab bars

<b>CDC Checklist: Bathroom (pg 5)</b>	<b>Bathtub / shower</b>	Participant's primary method of completing hygiene (shower, tub bath, sponge bathing)	Standing surface is missing non-skid mat or has slippery surface; Participant is unable to complete typical hygiene routine in current arrangement (may use safety bars or tub bench)	Add non-skid mat for standing surface; Recommend adaptive or durable medical equipment as indicated including safety grab bars
<b>CDC Checklist: Kitchen (pg 5)</b>	<b>Kitchen tasks</b>	Cabinets and surface areas used for meal preparation	Common items are at heights above shoulders or below knees	Place commonly used items at heights between shoulders and knees
<b>CDC Checklist: Bedroom (pg 6)</b>	<b>Bedroom lighting</b>	The primary sleeping area for the participant	Lighting is beyond reach while participant is in resting position	Place lamp / light switch within reach while in the resting position
<b>CDC Checklist: Bedroom (pg 6)</b>	<b>Nightlight</b>	Lighting available for the participant for pathway between sleeping area and commode	No lighting or minimal lighting available to illuminate pathway between sleeping area and commode	Add nightlight(s) to provide illumination from primary sleeping area to commode
<b>Hopkins &amp; Smith (1993) Chp 8 (pg 225)</b>	<b>Bed height</b>	The primary sleeping surface for the participant	Participant is unable to touch the floor with feet while seated on the edge of the bed	Raise (furniture risers) or lower (remove mattress / lower frame) the bed to allow participant to rest feet on floor while seated edge of the bed
<b>CDC Checklist: Floors (pg 3)</b>	<b>Household pets</b>	Pets allowed inside the home: dog(s) / cat(s) or similar pet able to roam freely in the home	Toys and/or food water dishes in pathways; pet alters environment by moving items or leaving toys in the pathways	Place food and water dishes in separate area from pathways; use reacher to keep pathways free from clutter
<b>CDC Checklist: Floors (pg 3)</b>	<b>Small children</b>	Child(ren) under the age of 5 years within the participant's home	Child(ren) alters the environment by moving items leaving toys within the pathways	Create designated space in home for child(ren) to play with toys; have assist with keeping pathways free from clutter

**Appendix N**  
**Novel Situations**

Despite efforts to anticipate a variety of situations, novel situations were encountered during home visits and are important to include in discussion for both full understanding of this study as well as for consideration in future studies.

**Additional recommendation.** There were three situations of a needed recommendation that had not been included in this study, all of which related to flooring. While these recommendations were not included in totals for data analysis, the recommendations were discussed with the participants and hand-written on their Recommendations Handout. One participant had a strip of torn linoleum in her kitchen, running the full length of the kitchen. While she was aware of this, she stated she did not have funds to replace her flooring. A second participant had a hole torn in his kitchen linoleum. As he resides in an apartment complex, a request was submitted to management. The flooring was not corrected by the third home visit. The third participant had wrinkled and buckled carpeting in his living area. Again, residing in an apartment complex, a request was submitted to management but was not corrected by the third visit.

**Additional visit.** One control group participant made contact with the study coordinator after the third home visit to request a fourth visit. “I want to show you the new recliner because it is higher and doesn’t rock like the last one.” Per request of this participant, a fourth visit was made during which the participant stated: “It’s easier to get up now!”

**Hoarding.** It was discovered after the initial environmental evaluation was completed that one participant had a section of her free-standing home (an addition) that she only entered to obtain laundry detergent and bird seed. As this was not located within the primary residing area of her home, it was not noticed earlier in the visit. The addition by all accounts, was that of hoarding. “My husband’s been filling this area with his stuff for over 30 years and I can’t get rid

of any of it.” Pathways were approximately 12” wide with stacks of random items reaching the ceiling. Complicating matters was the impaired structural integrity of the addition. The participant noted “see back there....the floor’s falling in....so I don’t go back there anymore.” During this session the participant was assisted to relocate the laundry detergent and birdseed to just inside the entrance, allowing her the ability to reach these items without entering the area. Further discussion with the participant led to the understanding that she has a long-standing case manager and was agreeable for contact to be made with the case manager regarding this situation. The case manager stated she was indeed aware of the participant’s situation and was working with the participant.

**Sexual advance.** A sexual advance was made from a male participant towards the home evaluator during the final home visit. Upon asking the participant if he had fallen recently, the response was “only for you” while walking closer, leaning in, and placing his hand on the evaluator’s shoulder. The participant continued to stand within close proximity while the evaluator made efforts to redirect and move to an open area. The decision was made to continue with the session and gather the final information, while taking care to monitor the presence of the participant. The session ceased within the next 10 minutes with no further instances.

## **Vita**

Suzänne Fleming Taylor earned a Bachelor of Science degree in Occupational Therapy from Saint Louis University in 1996. As an NBCOT certified and state licensed occupational therapist, she began her practice in rural areas of southern Missouri. With a focus on working with older adults, she provided services in a variety of settings including independent and assisted living, long-term care, home health, and mental health. In 1999, while working full-time as an occupational therapist, Suzänne founded The Dance Company to provide dance instruction for children ages 3 years through 18 years old in the southern Missouri and Illinois areas. In 2004 she earned a Master of Business Administration with a concentration in Health Care Management through University of Phoenix. This educational advancement led to an opportunity to serve as a Regional Director of Therapy Operations for a nationwide senior housing company, and required relocation for Suzänne and her family to Richmond, Virginia. Suzänne now provides occupational therapy services within the Virginia Commonwealth University Medical Center as a clinician with the Cancer Rehabilitation team at Massey Cancer Center. She also serves as an Adjunct Instructor in the Department of Occupational Therapy and is a member of the clinical instruction team providing supervision for occupational therapy students. Suzänne is married to Patrick Taylor and has four sons: Justin, Camden, Griffin, and Bronson Fleming; four step-children: Elizabeth, Tyler, Jonathan, and Rebekah Taylor; and an adopted member of the blended family, Darrion Sistrunk. Post-doctoral, Suzänne intends to continue harvesting her high energy level and her passion for research and practice to facilitate preventative health care for older adults.