PREDICTORS OF FEAR OF FALLING AND ACTIVITY AVOIDANCE IN

COMMUNITY-DWELLING OLDER ADULTS

A DISSERTATION SUBMITTED TO THE GRADUATE DIVISION OF THE
UNIVERSITY OF HAWAI'I AT MĀNOA IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR

THE DEGREE OF DOCTOR
OF PHILOSOPHY IN
NURSING

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March 2nd, 2017

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Dedication

This Dissertation is dedicated to the most important people in my life, my husband Brent and my beautiful daughters Bridgette and Adrienne. You are my greatest blessings!

~My whole world begins and ends with YOU!

Acknowledgements

I would like to express my sincerest appreciation to my academic advisor and dissertation committee chair, Dr. Maureen Shannon. Her support and guidance has been instrumental. I would also like to thank my committee members, Dr. Clementine Ceria-Ulep, Dr. Phyllis Greenberg, Dr. Allen Hanberg, Dr. Alan Titchenal, and Dr. Chen-Yen Wang for their continued support and advice throughout the development of this document.

I would also like to acknowledge the support of St. Cloud State University's Statistical Consulting and Research Center (Cat, Dustin, and Randy) for their assistance in answering my numerous questions. Additionally, I would like to express my deepest appreciation for all of my colleagues and students at St. Cloud State University, Department of Nursing Science, for all of their continued support and encouragement throughout the pursuit of my degree. In particular, I would like to thank my peers from OPN7, Dr. Marcia Scherer for her ongoing support and advice, and Kristie Koval's phone calls and friendship.

Lastly, I would like to thank my family, especially my husband and daughters. They made sure I always had an endless supply of A & W Root Beer, food on the table, kept the house clean, assisted in proofreading, and kept me smiling when I needed it the most. I am blessed beyond words! Thank you from the bottom of my heart. We did this **together.**

ABSTRACT

Falling and fear of falling are reported as becoming two of the most common and critical problems facing older adults. Healthcare costs associated with fear of falling continue to escalate. Existing research has identified factors that contribute to fear of falling and resultant activity avoidance, however, inconsistencies remain.

This study aimed to evaluate significant factors in predicting fear of falling and activity avoidance as a result of fear of falling. Determining predictors of fear of falling and activity avoidance in community-dwelling older adults was useful and will continue to guide healthcare practitioners in developing multifactorial assessments to reduce overall risk among this targeted population.

This study examined whether or not age, gender, previous fall history, and prescription medication use were significant factors in predicting a person's fear of falling and activity avoidance. In addition, examining the relative importance for each of the predictor variables was of interest.

A cross-sectional approach, using a convenience sample of community-based older adults age 65 and older was utilized. Independent variables consisted of gender, age, fall history, and prescription medication use. Dependent variables consisted of fear of falling and activity avoidance. Multiple and hierarchical regression analyses with descriptive statistics were used to analyze research results.

The results of this study found that variables gender and prescription medication use were statistically significant in predicting fear of falling. However, neither age nor fall history, were statistically significant for this dependent variable. In contrast to the results found with fear of falling, no independent variables were statistically significant in predicting activity avoidance.

Future research should continue to evaluate predictors of fear of falling and activity avoidance, specifically gender and prescription medication use. More information is needed to fully understand the role of gender and fear of falling, notably the male experience. Additionally, prescription medication use warrants further investigation. Prescription medication use would benefit from an improved operational definition to fully understand the scope of this predictor variable.

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Chapter 1. Introduction

Chapter one presents the background, statement of the problem, purpose, research questions with associated study aims, and conceptual definitions of the variables to be studied.

Background

The aging population brings unique opportunities and challenges from a healthcare perspective. Many of today's older adults wish to remain living in their own home, with an ultimate goal of delaying nursing home placement. The care needs of the older adult in the community setting may be complex, ranging from psychosocial needs, to a vast array of physical and medical needs.

Falling and fear of falling are reported as becoming two of the most common and critical problems facing older adults (Hsu et al., 2013, Li, Fisher, Harmer, McAuley, & Wilson, 2003). Fear from experiencing a fall has been rated greater than the fear of being robbed in the street or experiencing financial hardship (Brown, White, Doan, & de Bruin, 2011). Researching the effects of fear of falling within the older adult community will identify the construct in which fear of falling is experienced and associated dynamics, ultimately providing the groundwork from which further research may be based.

Fear of falling encompasses elements that are consistent with theoretical frameworks developed by Rosenstock (1974) and Bandura (1986). Inherent in these theoretical frameworks, is the need for evaluation of individual motivation and self-efficacy. Poor self-efficacy and fear-based decreased motivation have been identified as antecedents to fear of falling and purposeful avoidance of activities in community-dwelling older adults. Establishing the interrelatedness of fear of falling within the realm of existing behavioral frameworks is useful in aiding research processes.

Statement of the Problem

Fear of falling is a major healthcare concern in community-dwelling older adults. Existing research fails to fully address modifiable and non-modifiable factors that may predict fear of falling and none specifically address avoidance of activities in this context. Further investigation is suggested to determine factors that predict fear of falling and avoidance of activities in the community-dwelling older adult.

Statement of the Purpose

The purpose of this study was to determine which factors may be significant predictors of a person's fear of falling and avoidance of activity. Research questions guiding this study consist of:

1. How well does age, gender, fall history, and prescription medication use explain fear of falling?

   Specific aim 1. To determine if a particular group of independent variables: age (AGE), gender (GEN), fall history (FALL), and prescription medication use (MED) explain or predict FOF.

2. How well does age, gender, fall history, and prescription medication use explain activity avoidance?

   Specific aim 2. To determine if a particular group of independent variables (AGE, GEN, FALL, MED) explain or predict AVOID.

3. How much does age add to the prediction of fear of falling compared to gender, fall history, and prescription medication use?

   Specific aim 3. To determine how much a single, independent variable adds to the prediction of a dependent variable, over what is accomplished by other independent

variables.

4. What is the relationship between gender and fear of falling, once the relationship between

fear of falling and the other three predictors are controlled?

Specific aim 4. To determine what the relationship is between any given independent

variable and the dependent variable, once other predictors are taken into account.

5. What is the relative importance of fall history versus prescription medication use in

predicting fear of falling?

Specific aim 5. To determine the relative importance of one predictor compared to other

predictors in explaining a dependent variable.

Conceptual Definitions of the Outcome Variables

Conceptual definitions provide a review of "abstract" or "theoretical" meanings of

concepts being studied (Polit & Beck, 2004, p. 31).

Fear of falling defined. For the purpose of this study, fear of falling is conceptually

defined as "an ongoing concern about falling that ultimately leads to avoidance of the

performance of daily activities" (Tinetti & Powell, 1993, p. 36). This definition was used

throughout the research process to gain an understanding of factors that precede or contribute to

fear of falling and activity avoidance among community-dwelling older adults. The operational

definition of fear of falling is as follows: the degree to which older adults identify fear of falling

from an established measurement tool, *not at all concerned* to *very concerned.*

Avoidance of activity defined. Conceptually, avoidance of activity is defined as

restriction of activity, purposeful or unintentional, that may lead to a sequence of physical

deconditioning and weakness experienced by some older adults. Coupled with fear of falling,

the consequences of restricting physical activity may lead to deleterious effects, creating a fear-

based cycle of activity restriction, physical weakness, falling, and fear of falling. Inherent in this research study is the desire to identify factors that may predict activity avoidance among community-dwelling older adults that are experiencing fear of falling. The operational definition is as follows: the degree to which an older adult (based on fear of falling) identifies activity avoidance from an established measurement tool**,** *never* to *always***.**

Setting

This study was conducted in a senior center located in Central Minnesota. Whitney Senior Center (WSC) is a senior services organization that provides social, physical, financial, and nutritional services to adults age 55 and older in the Saint Cloud metropolitan area (www.ci.stcloud.mn.us/Whitney-Senior-Center). The senior center was established in 1977 and has seen a steady increase in the number of adults taking part in activities. Presently, approximately 500-1,000 older adults participate in formal and informal activities each day (Laura Hood, personal communication, June 15, 2016).

Sample

Participants were recruited from a heterogeneous sample of older adults that attend activities at Whitney Senior Center (WSC) located in Saint Cloud, Minnesota. A convenience sample of healthy, community-dwelling older adults, were the target population for recruitment. Many of the older adults were noted to participate in early morning coffee, humanities classes, card or board games, noon meals, exercise and fitness groups, and other formal or informal activities. Following recruitment, participants were informed about their rights to participate in the research study.

Sample characteristics. The majority of community-dwelling older adults that attend activities at WSC are female. According to the Director, approximately 60% of daily

participants are female. The age represented the most is 75-85, with a general age range of older adults age 65-85. The major ethnic group represented is Caucasian.

Sample size. A power analysis was performed to achieve a power of .80, alpha .05, and estimating a moderate effect size in order to solve for *N*. After consulting a power table, an estimated sample size of 82 is needed to detect a population of R^2 with four predictors, with a 5% chance of a Type I error and a 20% chance of a Type II error for study aims and research questions one through five (Polit, 2010).

Participant Selection

Inclusion and exclusion criteria. Older adults eligible to participate in the study must be English-speaking, reside in the community, and be age 65 or older. Subjects will be excluded from the study if they currently reside in a long-term care facility, are receiving care in an inpatient setting, are less than 65 years of age, and do not speak English.

Research Design Methods

This study involved a cross-sectional design that includes a sample of older adults (ages 65 and older) who participate in activities at WSC. Informed consent was obtained prior to beginning data collection. Subjects completed study questionnaires to obtain data about fear of falling and avoidance of activities. Analysis of the data involved a multivariate approach of multiple regression. Multiple regression assisted in predicting the dependent variables *fear of falling* (FOF) and *activity avoidance* (AVOID) by analyzing four independent variables and the strength of each respective variable: age (AGE), gender (GEN), prescription medication use (MED), and fall history (FALL) (see Appendices B and C).

Results

All assumptions for multiple regression were reviewed and it was determined that there were four cases with standardized residuals exceeding 3.0. Based on this information, these four outliers were removed from further analysis. For reporting purposes, however, each research question in this study provided an analysis and review for each situation (with and without outliers).

For research questions one through five, with outliers retained in data analysis, none of the results produced statistically significant findings. When outliers were removed from data analysis, some of the research questions were statistically significant. For example, research question one sought to determine how well independent variables age, gender, prescription medication use, and fall history explain the dependent variable fear of falling. With outliers removed, findings for research question one indicated that gender contributed the most to the prediction of fear of falling followed by prescription medication use. Neither age nor fall history were significant predictors of fear of falling. Research question four also was found to be statistically significant. Specifically, the aim of research question four analyzed whether or not gender made a significant contribution to the prediction of fear of falling once all other independent variables were controlled for. Findings for research question four indicated that gender accounted for a significant proportion of variability for fear of falling, significantly contributing to the regression equation. Lastly, the overall aim of research question five evaluated the relative importance of fall history versus prescription medication use in predicting fear of falling. Utilizing a hierarchical multiple regression approach, when fall history is entered alone, it does not account for a significant amount of variance. In step two of the multiple regression, when prescription medication use is added, this results in a

significant amount of variance in the prediction of fear of falling. Prescription medication use accounts for a significant amount of variance above and beyond fall history alone; it is more important compared to fall history for predicting fear of falling.

Discussion

The results of this study have identified gender and prescription medication use as significant predictors of fear of falling. None of the independent variables were useful in explaining and/or predicting activity avoidance. The findings from this research study are an important step to identifying and explaining fear of falling and activity avoidance that may be experienced by community-dwelling older adults. Future research should continue to focus on properly recognizing gender and prescription medication use as predictors of fear of falling and activity avoidance in this population of interest.

Chapter 2. Review of the Literature

Chapter two highlights the research development and provides details of the concept fear of falling. In addition, this chapter provides a summary of existing research with a discussion of implications for development of new knowledge relevant to nursing practice.

A literature search was performed on the topic of fear of falling. Fear of falling is prevalent in older adults and poses serious health concerns. Risk factors, consequences, and identification of fear of falling measurement tools provided the basis for this review. Additionally, theoretical application and incorporation of knowledge central to nursing is discussed.

Due to continued developments related to fear of falling research, a 15-year retrospective review was completed. From this literature search, 485 references were part of the initial review (PubMed returned 177 results, MEDLINE returned 94 results, SCOPUS returned 140 results, and CINAHL returned 74 results). Duplicate articles were identified and removed, along with articles that did not meet inclusion criteria. Inclusion criteria consisted of English-language articles focused on fear of falling and represented community-dwelling older adults age 65 or older. Journal articles and corresponding reference lists were reviewed for further relevance to the topic of interest, resulting in the final review ($N = 25$). Journals included in the review comprised a comprehensive realm of healthcare, including articles from medicine, nursing, occupational therapy, physical therapy, rehabilitation, and social work and is presented in the Literature Review Matrix (see Appendix A).

Development of Research

Fear of falling has largely been recognized in the literature as a consequence of decreasing physical activity and immobility. Past research has concentrated on examining physical effects of falling, such as fractures and soft tissue injury (Tischler & Hobson, 2005). Recently, however, the

notion has emerged that fear (as a widely subjective perception) has been under-reported and under-represented in the literature. Fear of falling is a common phenomenon that is identified in older adults, with estimates of 26%-55% of community-dwelling older adults experiencing fear of falling (Lach, 2005). The tendency to limit or avoid physical activity leads to negative self-efficacy among older adults (Dattilo et al., 2014). Self-efficacy is directly correlated with fear of falling in which self-imposed activity restriction often results in reduced strength, functional decline, decreased mobility, and loss of quality of life (Dattilo et al., 2014). Additionally, measurement tools have begun to be developed and existing tools modified that enable researchers to assess perceived fear and the extent of fear expressed by older adults (Friedman et al., 2002; Landers, Durand, Powell, Dibble, & Young, 2011). Measurement tools provide a valuable mechanism in order to adequately recognize the impact of fear of falling among older adults.

Prevalence

Falling among older adults is rapidly becoming a national healthcare concern. Falls are the leading cause of injury-related deaths in the United States (U.S.) (Costello & Edelstein, 2008) among adults 65 and older. Additionally, approximately 30% to 40% of community-dwelling older adults fall each year, nearly 3.5 million people overall (Schepens, Sen, Painter, & Murphy, 2012). The Centers for Disease Control and Prevention (CDC, 2009) estimates that one-third of adults age 65 and older and one-half of adults age 80 and older will fall every year. More concerning is research indicating 20% of older adults that experience a hip fracture (resulting from a fall) will die within one year (Costello & Edelstein, 2008; Moore & Ellis, 2008). Fear of falling results in increased healthcare costs, placing a burden on today's healthcare system (Oh-Park, Xue, Holtzer, & Verghese, 2011). Healthcare costs related to falls and fall injuries were $19.2 billion in 2000, with an estimated cost to exceed $43.8 billion by 2020 and $240 billion by 2040 (Costello &

Edelstein, 2008; Findorff, Wyman, Nyman, & Croghan, 2007; Michael et al., 2010; Moore & Ellis, 2008).

Fear of falling is a central concept gaining momentum in research literature as a major contributing factor of fall risk. It is estimated that anywhere from 21-65% of community-dwelling older adults experience fear of falling, with up to half of older adults reporting fear of falling who have never fallen (Bertera & Bertera, 2008; Dattilo, Martire, Gottschall, & Weybright, 2014; Friedman et al., 2002; Hsu, Alfermann, Lu, & Lin, 2013; Jung, 2008; Lach, 2005; Mann, Locher, Justiss, Wu, & Tomita, 2005; Painter et al., 2012; Schepens et al., 2012). It is also noted that community-dwelling older adults who expressed frequent fear of falling were twice as likely as those who did not to experience multiple falls in the subsequent year (Friedman et al., 2002). In addition, older adults who experienced a fall (upon a baseline assessment) are 5 times as likely to express fear of falling upon follow-up assessment (Friedman et al., 2002).

Defining Fear of Falling

Today's definition of fear of falling is relatively vague and describes either fear itself or fear based on performing activities required of daily living (lifting, bending, stooping, carrying, walking). While a proper definition of fear of falling is not the central aim of this research study, it warrants further investigation and clarification for future research.

Falling is defined as "unintentionally coming to rest on the ground or other level such as a chair" (Friedman, Munoz, West, Rubin, & Fried, 2002). In 1982, researchers first categorized fear of falling as "ptophobia", which is defined as "a phobic reaction to standing or walking (Bhala, O'Donnell, & Thoppil, 1982, p. 187). Initially, researchers looked to classify fear of falling as a variant of the mental health disorder, agoraphobia. Bhala et al., (1982) examined case studies of patients and determined that fear of falling was indeed, a clinical distinction notwithstanding,

agoraphobia. Recently research has broadly categorized fear of falling as "exaggerated concern of falling that leads to excess restriction of activities" and "lasting concern about falling that can lead an individual to avoid activities that he/she remains capable of performing" (Hsu, Alfermann, Lu, & Lin, 2013; Lach, 2005; Painter et al., 2012). Tinetti and Powell (1993) describe fear of falling and activity avoidance as "an ongoing concern about falling that ultimately leads to avoidance of the performance of daily activities" (p. 36), leading to a definition that is more reflective of the consequences of fear of falling and useful to clarify fear of falling in the context of this research study.

Self-Efficacy

Fear of falling has also been associated with decreased quality of life and poor self-efficacy (Hsu et al., 2013; Schepens et al., 2012). Many older adults identify concerns with quality of life that are directly linked to fear of falling. These include social isolation, anxiety, depression, and loss of confidence (Hsu et al., 2013; Moore & Ellis, 2008; Wen-Ni, Wen-Chou, & Li-Jing, 2013). If falls lead to a fear of falling and vice versa, a vicious cycle exists in which the older adult may experience functional, social, and cognitive decline. Multifactorial assessments should target understanding fear of falling, thereby reducing the likelihood of incurring a fall (Friedman et al., 2002).

Theories Guiding Fear of Falling Research

Health belief model. In 1974, Rosenstock developed the Health Belief Model (HBM). The HBM aims to identify the "perceived susceptibility and seriousness of a threat, perceived benefits of various actions to reduce a threat, and self-efficacy related to one's ability to take actions that will reduce a perceived threat" (Creasia & Friberg, 2011, p. 335). In addition, the HBM is based on the premise that: learning occurs with motivation, motivation may be internal or external, learning

occurs with improved self-efficacy, and learning occurs if relevant to learner needs (Creasia & Friberg, 2011, p. 226). Applying the HBM to fear of falling, a reasonable behavioral response of the older adult would be to intentionally restrict activities that may be perceived as increasing the risk of falling; the greater the fear response, the greater the restriction of activities, thus decreasing self-efficacy among the older adult. Interventions should be focused on adequately addressing the individual's perception of fear (degree of fear), assessing internal and external motivation, and proposing interventions aimed at enhancing greater self-efficacy in order to diminish fear thereby decreasing fall risk.

In the 1980s, Nola Pender revised the HBM, focusing on health promotion activities and behaviors. Individual characteristics, prior behavior, along with interpersonal and situational variables were enhanced with Pender's Health Promotion Model (Creasia & Friberg, 2011). These characteristics and variables affect an individual's motivation and response to self-efficacy. In relation to fear of falling, predictors of falling have been noted to include: female, fall history, co-morbidities, medication regimen, and advancing age. The addition of health promotion activities and behaviors from Pender's model, along with utilization of central concepts of the HBM are compatible with research activities focused on fear of falling and activity avoidance among community-dwelling older adults.

Bandura's self-efficacy theory (SET). Several research articles explained the importance of utilizing a theoretical framework to fully understand how self-efficacy and fear of falling are interrelated. The importance of identifying a framework stems from the inability of existing fear of falling research to fully conceptualize the concept of fear, falling, self-efficacy, and resultant consequences (Moore & Ellis, 2008; Schepens et al., 2012; Scheffer, Schuurmans, van Dijk, Hooft, & de Rooij, 2008; Stubbs, Eggermont, Patchay, & Schofield, 2014). Self-efficacy is defined as "an

individual's belief or confidence in his or her own capabilities to perform a specific activity successfully and is important for maintaining physical activity levels and preventing functional decline" (Bandura, 1986). Self-efficacy is situationally based and directly related to fear of falling in which "a person's belief in his or her ability to execute a course of action is particular to the given situation" (Schepens et al., 2012, p. 138). If an older adult modifies their level of activity due to fear associated factors, resultant decreased self-efficacy occurs in which self-imposed activity restriction results in loss of confidence and the ability to perform essential ADLs (Cheal & Clemson, 2001; Tinetti, DeLeon, Doucette, & Baker, 1994).

Avoidance of activities that an older adult deems exceeds their level of coping is an example of low self-efficacy. Assisting in the identification of the causative agent(s), which is precluding an older adult from achieving higher levels of self-efficacy, is a central aspect in targeting interventions to minimize fear of falling (Bandura, 1977). In a systematic review of 20 cross-sectional and prospective studies, it was noted that a strong positive relationship between fall-related efficacy and activity exists among community-dwelling older adults (Schepens et al., 2012). Bandura's SET provides an appropriate framework to properly assess, evaluate, and promote change in behavior for person's experiencing low self-efficacy. In addition, SET assists in properly measuring the psychological effects of fear of falling and self-efficacy, which are more ambiguous and difficult to quantify (Bandura, 1977; Moore & Ellis, 2008).

Because self-efficacy is focused on what a person *can do* versus *will do*, the construct of self-efficacy must be adequately distinguished from that of other concepts (Bandura, 2006). Self-efficacy must be viewed from an all-encompassing lens in which the degree of self-efficacy varies from person to person, "generality can vary across types of activities, the modalities in which capabilities are expressed, situational variations, and the types of individuals toward whom the

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behavior is directed" (Bandura, 2006, p. 313). Determining whether fear of falling was synonymous with low self-efficacy is an important factor worth considering for ongoing research efforts aimed at reducing fear of falling using individualized and multidimensional approaches.

Determinants of Fear of Falling

Advancing age*.* Research suggests that fear of falling intensifies as an individual ages (Tischler & Hobson, 2005; Lach, 2005). Difficulties with balance, mobility, and an increased dependence for assistance with activities of daily living may compound the affects seen in the older adult population. Fear of falling is prevalent in older adults, with greater than 50% of adults age 70 and older experiencing or acknowledging fear of falling (Dattilo et al., 2014). While most researchers point to advancing age as a predictor of falling and fear of falling, there is research that speaks contrary to this. Mann et al., (2005) conducted a cross-sectional study in which 1,691 female participants were studied to determine variables that contribute to fear of falling. This study contradicts the notion that advancing age is a precursor to falling. Mann et al., (2005) also determined that other factors, such as physical, social, and psychosocial aspects are more likely attributes.

Gender.

Females. Elderly females tend to perceive fear of falling greater than males. This is postulated to due to an increased incidence of osteoporosis and general weakness of the musculoskeletal system in females (Suzuki, Ohyama, Yamada, & Kanamori, 2002). In a study of fear of falling, Suzuki et al. (2002) reported, "frail elderly females had a higher incidence of fear of falling compared with males" (p. 160). Oh-Park et al. (2011) conducted a longitudinal study of 380 participants in which fear of falling was measured at baseline and at two to three month intervals for two years. Findings from the study indicated that fear of falling is a major health

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problem, with older adults experiencing "activity restriction, decline in physical function, loss of

functional independence, admission to the nursing home, and falls" (Oh-Park et al., 2011, p. 1225).

Further, the Oh-Park et al. (2011) study determined that older adult females have a greater

tendency to experience fear of falling, deeming female gender as a "significant predictor". Boyd

and Stevens (2009) reported a similar finding in which a greater proportion of women (43.2%)

were "moderately or very afraid" of falling compared to men (26.4%) (p. 2). It is also reported that

rates of injury from falls were 40-60% greater in women compared to men (Boyd & Stevens, 2009,

p. 4). Filiatrault, Desrosiers, and Trottier (2009) conducted an exploratory study, which examined

the individual and environmental correlates of fear of falling in community-dwelling older adults.

This study found that fear of falling was present in more than one third of older adults and

significantly associated with female gender (Filiatrault et al., 2009). Bertera and Bertera (2008)

conducted a study in which fear of falling was examined in older adults. In a national sample of

adult's age 65 and older (N = 3,474), 22% of respondents report experiencing fear of falling at

least once or twice in the previous month. This study also highlighted specific characteristics of

fear of falling, specifically finding fear of falling increases with age, is more prevalent in women,

those with a lower income and education, and is experienced more frequently in those that live

alone (Bertera & Bertera, 2008). Friedman et al. (2002) completed a prospective study of 2,212

community-dwelling older adults with a focus on understanding which phenomenon comes first,

fear of falling or falling? The results of this study indicated falls and fear of falling are common in

older adults, with each being a risk factor for the other. Additionally, female gender was a

significant predictor (Friedman et al., 2002). The conclusion from the Friedman et al. (2002) study

suggested that future studies should focus on primary prevention to reduce risk factors leading to

fear of falling. Based on the review of relevant literature, it is evident that further research should

examine the differences in perception of fear of falling among women and men and understanding the specific correlates of fear of falling experienced by women.

Males. Men do experience fear of falling and suffer the negative consequences associated with fear of falling and activity restriction. In a recent study, 1,680 men were recruited to participate in a study aimed at evaluating fear of falling and physical activity (Jefferis et al., 2014). Study authors reported that 16% (n = 254/1577) of men were "very" or "somewhat" fearful of falling (Jefferis et al., 2014). Men experiencing fear of falling reportedly experienced poor self-efficacy and decreased physical activity. From the Jefferis et al. (2014) study, the importance of researching the differences in fear of falling that may be experienced based on gender is an important distinction. Consistent in this study, is the description of predictors such as prior fall history, gender, and advancing age. Inconsistent in this study, is the description of prescription medication use by community-dwelling older adults as a predictor of fear of falling. As stated by the Jefferis et al. (2014) study, men are not deemed an "at risk" population specific to fear of falling.

Polypharmacy. Older adults prescribed and taking four or more medications are at a greater risk for falling (Friedman et al., 2002). Medications classified as benzodiazepines, phenothiazine's, or antidepressants contribute to the risk of falling (Friedman et al., 2002). These medications may cause disturbances in balance, lead to weakness, cause sensory deficits, and altered cognition.

Prior fall history. Although fear of falling may be considered a normal emotional response to a fall, it continues to need thorough assessment to determine if the fear is considered inappropriate, thereby increasing dependent risk factors which may cause a fall (Delbaere, Crombez, N, Willems, & Cambier, 2006a). A previous fall history was a significant predictor of

fear of falling, as noted by (Friedman et al., 2002). Friedman, et al. (2002) notes that a previous fall history is an independent predictor for the onset of fear of falling: "Because each is a predictor of the other, an individual who develops one of these outcomes is at greater risk for developing the other. These data provide evidence of a spiraling effect of increasing falls, fear, and functional decline" (Friedman, 2002, p. 1333). Denkinger, Lukas, Nikolaus, & Hauer (2015) conducted a systematic review of factors associated with fear of falling in community-dwelling older adults. This study revealed that history of falls was associated with negative self-efficacy and fear-related activity restriction of community-dwelling older adults (Denkinger et al., 2015).

There is some dispute whether or not fall history is correlated with fear of falling. The exploratory study conducted by Filiatrault et al. (2009) found that fall history was not strongly correlated with fear of falling. It is noted that many research articles found that older adults experienced fear of falling despite never falling in the past (Denkinger et al., 2015). In other words, fear of falling existed with and without a fall history. Despite some acknowledgment from prior research studies indicating fall history is not strongly associated or correlated with fear of falling, this study will look to focus on whether or not fall history is a good predictor (or not) of fear of falling.

Functional dependence. Older adults that limit activities of daily living due to musculoskeletal weakness, sensory deficits, or perceived fear of falling are more likely to become homebound. Self-imposed activity restriction places the older adult at an increased risk from weakness due to immobility (Friedman et al., 2002; Moore & Ellis, 2008). Activity restriction can notably decrease physical function of the older adult by contributing to loss of muscle strength, flexibility, decreased overall coordination, and progressive functional physical decline (Moore & Ellis, 2008). Pain, as a subjective characteristic, is another factor specifically increasing the risk

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for falling among older adults and leading to fear of falling and overall functional dependence (Stubbs et al., 2014). Stubbs et al. (2014) has recognized the lack of research that fully addresses the complex relationship of pain resulting in overall physical decline and subsequent fear of falling with the older adult population. Stubbs et al., (2014) conducted a cross-sectional research study to evaluate the effects of pain interference and fear of falling. A total of 295 participants agreed to participate in the study (Stubbs et al., 2014). Study findings revealed that pain interference was a significant contributor to fear of falling and a strong indicator of reduced self-efficacy among older adults, thereby increasing perception of fear of falling (Stubbs et al., 2014). Functional dependence, accompanied with overall pain interference, is a primary factor leading to physical dependence of the older adult with a tendency to increase risk for future falls.

Psychological variables. Psychosocial aspects of fear of falling encompass a wide spectrum. Psychological variables include anxiety, depression, worry, and feeling tense (Painter et al., 2012). Depression has been identified as having a significant relationship with fear of falling experienced by older adults. Painter et al. (2012) report that depression is the most common mental health disorder experienced by older adults, and those that acknowledge fear of falling have the highest levels of depression, approximately 37.5% (Painter et al., 2012). Instruments used to measure fear of falling have traditionally focused on physical deficits experienced by older adults. One questionnaire used to measure the psychosocial impact of fear of falling is the Health-Related Quality of Life (HRQOL) tool (Suzuki et al., 2002). This questionnaire aims to measure basic activities of daily living (ADLs) and functional disabilities that may contribute to falling. In order to fully understand the impact of falling among community-dwelling older adults, research suggests to supplement or enhance measurement tools to encompass both the physical and psychological aspects of fear of falling (Hsu et al., 2013; Mann et al., 2005; Moore & Ellis, 2008;

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Painter et al., 2012). Psychological variables require further investigation and review in the

research literature. Moore and Ellis (2008) conducted a study, which reviewed the psychological

impact of falls and fear of falling among older adults. Specifically, Moore and Ellis (2008)

reviewed a variety of instruments used to measure the impact of fear of falling. The conclusions of

the study found that instruments used to measure fear of falling generally lack the ability to assess

the construct that is specifically being measured, along with an inability to accurately account for

the psychological impact of fear of falling (Moore & Ellis, 2008). The psychological variables

surrounding fear of falling require a comprehensive approach to fully understand this domain.

Unfortunately, existing research on fear of falling fails to fully address this phenomenon, "the

physical and socioeconomic consequences of falls are easy to identify and measure, the subsequent

psychological effects on confidence and independence are more ambiguous and harder to quantify"

(Moore & Ellis, 2008, p. 685).

     Poor general health. Chronic conditions have been cited as individual predictors of fall

risk. These include: arthritis, history of hip fracture, stroke, Parkinson's disease, and vertigo

experienced within a preceding two-year period of time (Friedman et al., 2002). Additionally,

sensory and cognitive deficits impact fear and falling by exacerbating anxiety and compounding

the effects of immobility along with decreasing activity levels (Friedman et al., 2002; Julius,

Brach, Wert, & Van Swearingen, 2012; Lach, 2005; Mann et al., 2005). In a four-year prospective

study of community-dwelling older adults, those experiencing poor general health were 1.72 times

more likely to develop fear of falling compared to those experiencing good health (Lach, 2005).

Those who had a prior fall history were four times more likely to experience fear of falling (Lach,

2005). Urinary incontinence is another factor related to poor general health that was identified

through a review of the literature. Difficulty with voiding, resulting in urinary incontinence creates

perceived decreased self-efficacy among older adults. High anxiety is a common factor in urinary incontinence. This encompasses the wide range of physical and emotional effects of incontinence (Friedman et al., 2002; Kempen et al., 2009).

Consequences

Fear of falling is related to "physical functioning, mental functioning, and vitality" (Suzuki et al., 2002). Fear of falling can limit physical and mental activity leading to negative outcomes described in this section. Additionally, fear of falling may lead to an altered self-image, decreased self-confidence, and may induce feelings of helplessness or incompetence (Hsu et al., 2013; Lach, 2005; Mann et al., 2005; Painter et al., 2012; Suzuki et al., 2002). With the perception of loss of control and a greater physical dependence, the older adult may inadvertently isolate self. This self-imposed isolation, as a result of fear of falling, may cause depression, which contributes to a cycle of fear-based immobility (Painter et al., 2012). This cycle is further described by (Mann et al., 2005) as:

> "The impact of fear often leads to avoidance of activities which in turn has been
> associated with the transition to physical frailty, resulting in a pattern of fear, falls
> and increased frailty, completing a cyclical pattern of deterioration, social isolation,
> and decreased quality of life" (p. 144).

An individual who falls subsequently develops a fear of falling (Friedman et al., 2002). Conversely, fear of falling causes falls. Results from a national sample of adults 65 years of age and older who report a fall in the past year were significantly more likely to avoid certain activities based on becoming fearful (Bertera & Bertera, 2008). These activities range from avoidance of lifting, bending, stooping, walking, using stairs, and going outside (Bertera & Bertera, 2008). This suggest a direct correlation between fear and falling, in which the older adult will purposely avoid

behaviors resulting in social isolation, increased dependence, and increased physical weakness (Bertera & Bertera, 2008; Delbaere et al., 2006; Friedman et al., 2002; Hsu et al., 2013; Mann et al., 2005; Painter et al., 2012). Resultant decreased quality of life becomes a significant factor as a result of falls and fear of falling (Greenberg, 2012; Kempen, et al., 2009; Hsu et al., 2013). In a study conducted by Hsu et al. (2013), 193 older adults from Taiwan and 182 older adults from Germany were evaluated to determine the relationship of fear of falling and quality of life. Loss of independence and loss of confidence are major consequences of fear of falling. Results of the study determined that purposeful participation in guided activities may reduce the negative outcomes associated with fear of falling and thereby enhance overall perceptions of self-efficacy and improved quality of life (Hsu et al., 2013).

Measurement Instruments

In conducting this literature review, it is noted that identifying which measurement tool to adequately measure fear of falling is needed. Several authors have noted a gap in the research literature that fully analyzes fear of falling measurement tools. Greenberg (2012) conducted an extensive review of the most frequently applied methods of measuring fear of falling in community-dwelling older adults. Greenberg's (2012) integrative review evaluated measurement tools utilized during the period from 1986 to present. In order to better understand which measurement tool is best utilized to measure fear of falling in community-dwelling older adults, a clearer understanding of existing methods must be reviewed. Kempen et al. (2008) conducted a cross-sectional study in which a convenience sampling of 193 community-dwelling older adults was evaluated to determine reliability and validity of the Falls Efficacy Scale-International (FES-I) measurement tool. This study determined the FES-I is a good measure in determining fear of falling among community-dwelling older adults (Kempen et al., 2008). The importance of

developing the most appropriate measurement tool to adequately address fear of falling is critical in order to fully understand the implications of fear of falling among older adults. It is noted that measurement tools evaluating fear of falling often excluded older adults during instrument development, were time-intensive or complicated to complete by research participants, and inadequately measured the true context in which fear of falling was to be captured (Downs, 2014; Greenberg, 2011; Greenberg, 2012; Jorstad, Becker, & Lamb, 2005; Kempen et al., 2008; Moore & Ellis, 2008; Stubbs et al., 2014).

A variety of measurement tools analyzed by Greenberg (2012) included the *Falls Efficacy Scale* (FES), *Falls Efficacy Scale-International* (FES-I), *Fear of Falling Questionnaire* (FFQ), *Activities-Specific Balance Confidence Scale* (ABC), *Modified Survey of Activities and Fear of Falling in the Elderly* (SAFFE), *University of Illinois at Chicago Fear of Falling Measure* (UIC-FFM), and the *Geriatric Fear of Falling Measurement* (GFFM) (Greenberg, 2012). Greenberg's (2012) review of existing measurement tools used to evaluate fear of falling among community-dwelling older adults concluded that the FES-I appears to be the most appropriate measurement tool. The construct of fear of falling and self-efficacy was a primary factor in reviewing measurement tools in Greenberg's (2012) integrative review. The FES-I stood out as the primary tool to most adequately measure fear of falling. The FES-I measures level of concern when carrying out "easy" and "more difficult" physical and social activities, which are commonly performed on a daily basis. The FES-I is measured on a 4-point Likert scale, ranging from 1 = no concern to 4 = very concerned (Greenberg, 2012; Yardley et al., 2005). Advantages of the FES-I include the inclusion of social activities that may be considered more challenging and which may pose or generate increased perception of fear of falling (Greenberg, 2012; Yardley et al., 2005). This yields a more accurate reflection of fear of falling among the older adult compared to the

earlier version of this measurement tool, the FES (Greenberg, 2012). In addition, another

advantage of the FES-I, compared to other measurement tools, is the ability to capture more

accurate experience of fear of falling in a proper context. In other words, the FES-I attempts to

qualify fear of falling in a context in which fear of falling encompasses "concern for falling" in

order to better discriminate among varying levels or degrees of fear of falling to include physical,

social, emotional, and cultural constructs (Greenberg, 2012; Yardley et al., 2005). Finally, the

FES-I is a short and easily administered tool, with demonstrated reliability, validity, and cross-

cultural application; fully addressing the concept of fear of falling and revealing the true context in

which fear of falling may be occurring for the community-dwelling older adult (Greenberg, 2012;

Yardley et al., 2005).

Newly developed methods of capturing fear of falling include measurement tools, which

utilize technology in the form of an iPad app. Currently, the Iconographical Falls Efficacy Scale

(IconFES) is an iPad app designed and developed in Australia, which is used to measure fear of

falling based on the FES-I. The IconFES is a 30-item measurement tool (or a 10-item short form

which is also available) with the benefit of ease of use, is well presented, reliable, available in

multiple languages, low cost, and can be completed or administered in 5 minutes (Delbaere, Smith

& Lord, 2011; Downs, 2014). Delbaere et al. (2011) conducted a study with 250 community-

dwelling older adults to determine the effectiveness of evaluating fear of falling using the IconFES

as a supplement to the FES-I in which fear of falling was contextualized using pictures to depict

activities older adults perform on a daily basis. Results of this study concluded the IconFES

proved to be an excellent, valid, and reliable measure of fear of falling in this participant group;

specifically, the IconFES was able to accurately assess fear of falling in older adults who are

deemed "high functioning" (Delbaere et al., 2011).

Strengths of This Research

There is a direct correlation between fear and falling, in which the older adult will purposely avoid behaviors resulting in social isolation, increased dependence, and increased physical weakness. Fear of falling is an independent variable, existing whether an individual experiences a fall or not. Understanding that fear of falling changes over time, this proposed research study will focus on variables and predictors of fear of falling and avoidance of activities in community-dwelling older adults.

Fear of falling has been largely underestimated and overlooked by previous research. By focusing on the lived experience of the older adult, researchers and healthcare providers may be able to more accurately measure fear of falling and implement interventions focused on physical and psychosocial support. One must challenge the notion that fear of falling (along with falls) is a *normal* part of aging (Mann et al., 2005). Mann (2005) reported that fear of falling is more of a significant problem than the fall itself. Recognizing that fear of falling can negatively influence quality of life by restriction of activities may be the key to maintaining independence in the community-based setting.

Gaps in the Literature

There are areas of limitations noted in several of the reviewed research articles. Small sample size was noted by Tischler and Hobson (2005). Their sample size of $n = 7$, may not provide an adequate representation or generalizability of the older adult population in the community researched. Additionally, most of the respondents were female, making the male perspective of fear difficult to ascertain and a very homogenous sampling (Li et al., 2003; Tischler & Hobson, 2005). Previous research has identified female gender as a significant predictor of fear of falling based on females being more likely to report or self-identify fear of falling compared to

men. Additionally, prior research has suggested that females tend to "perceive themselves to be at high risk of falls than men and that women have higher levels of sedentary behavior than men" (Jefferis et al., 2014, p. 114). The Jefferis et al. (2014) study was the only study identified in the review of literature that exclusively included men in their research. The male perspective may be under-represented and under-reported. From this literature review, along with future research studies, it will be important to identify and address the needs of *both* females and males in relation to fear of falling. There may be important factors elicited through a study equally representative of gender.

Review of the literature also identified sample mortality as a limitation. Research participants may have declined cognitively and/or physically during the research study period, resulting in withdrawal from the study. Due to this, sample sizes were affected (Lach, 2005; Michael et al., 2010).

Discrepancies within research literature, is another aspect worth noting as a limitation of existing research focusing on fear of falling. Denkinger et al. (2015) conducted a systematic literature review of fear of falling, examining studies completed between 2006 and October 2013. Conflicting results emerged after a thorough review of the literature, specifically, depression, anxiety, use of multiple drugs, and overall interpretation of the construct of fear of falling were identified as variable within existing research (Denkinger et al., 2015). Some research articles highlighted by the Denkinger et al. (2015) literature review revealed weak associations of age, co-morbidities, use of four or more medications, and self-rated perceptions of self-efficacy, whereas other research literature identified marked associations. Denkinger et al. (2015) suggested continued incorporation of physical function as an aspect of future fear of falling research, along with "disentangling" individual risk groups (anxiety, age, depression, pain, functional dependence,

gender, self-efficacy) in order to assist in designing, developing, and interpreting future research studies on fear of falling. Modifiable risk factors (incontinence and environment) must also continue be thoroughly reviewed for on-going distinction and relevance to fear of falling experienced by older adults (Denkinger et al., 2015). Environmental factors such as uneven walking surfaces, inclement weather, inadequate lighting, and limited access to healthcare resources have been described in the research literature as modifiable factors that could result in community-dwelling older adults experiencing fear of falling. These factors may lead to activity restriction of the older adult, thereby leading to the cycle of fear of falling as described throughout the review of literature. Future research should continue to clarify and quantify these modifiable, environmental risk factors.

Research that utilized cross-sectional research designs were noted to proceed cautiously in the interpretation of findings, due to the inability to infer causality (Filiatrault, Desrosiers, & Trottier, 2009; Mann et al., 2005). Participant bias was noted in several research articles, which may influence the way in which questions and responses were obtained or reported. Environmental aspects and socio-economic factors were rarely mentioned in the current literature review. These areas would warrant future review and investigation in order to determine the potential effects of an individual's environment and access to care. A final area that warrants further research is a notable gap in obtaining information about fear of falling in relation to cultural variables. Hsu et al. (2013) noted the desire to obtain information relevant to cultural considerations in their study of fear of falling and quality of life. Cultural factors must be evaluated in future research-related activities and programs (Hsu et al., 2013).

One study, which was included in this review of the literature, stood out based on the noted risk factors associated with fear of falling among community-dwelling older adults in contrast to

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all other articles included in this review. Kumar, Carpenter, Morris, Illiffe, and Kendrick (2014) conducted a cross-sectional study of 1,088 community-dwelling older adults, age 65 and older. The results of the study identified various factors associated with fear of falling among the population being studied. These factors included: lower household income, age over 80 years, being from a black/minority ethnic group, and having a higher body mass index (BMI) (Kumar et al., 2014). It is worth noting the differences among this study in comparison to other studies, as it is the only study that specifically identified a cultural factor as correlated with fear of falling. This study highlights the importance of cultural considerations in the study of fear of falling to gain a better understanding of cultural variations.

Implications for Future Research

The findings from this review of literature have identified several key aspects of fear of falling in community-dwelling older adults that are central to nursing practice. Research has identified risk factors such as age, gender, polypharmacy, fall history, and impaired physical functioning (Boyd & Stevens, 2009; Cheal & Clemson, 2001; Denkinger et al., 2015; Oh-Park et al., 2011; Patel et al., 2014; Schepens et al., 2012; Yardley & Smith, 2002). In addition to risk factors for fear of falling, several consequences have been identified. These include: self-imposed restricted physical activity, depression, anxiety, physical decline, isolation, decreased self-efficacy, reduced balance confidence, activity avoidance, decreased quality of life, early institutionalism, and increased incidence of future falling (Greenberg, 2012; Hsu, et al., 2013; Kempen, van Haastregt, McKee, Delbaere, & Zijlstra, 2009; Li et al., 2003; Moore & Ellis, 2008; Oh-Park et al., 2011; Painter, et al., 2012; Scheffer et al., 2008; Yardley & Smith, 2002; Zijlstra et al., 2007). Development of measurement tools that adequately and accurately reflect the nature of fear of falling and activity avoidance among community-dwelling older adults requires further

investigation and research development (Delbaere et al., 2011; Greenberg, 2012; Kempen et al., 2008; Moore & Ellis, 2008).

Nurses have an important role in early identification of fall risk, fear of falling, and assistance in identification of purposeful restriction of activities experienced by older adults. In addition, nurses can lessen the cumulative physical, psychosocial, and economic effects that may occur as a consequence associated with fear of falling. Utilizing multicomponent and multidimensional interventions focused on reducing fear of falling lies clearly within the domain of nursing. Working within an interdisciplinary approach will lead to comprehensive and focused interventions. Understanding that improving an older adult's perception of self-efficacy through nursing-driven interventions will be a primary factor in the development of holistic care for this population thereby reducing overall fear of falling, activity avoidance, and subsequent fall risk.

The construct of fear of falling must be appropriately identified in order to fully analyze overall effects experienced by the community dwelling older adult (Boyd & Stevens, 2009; Cheal & Clemson, 2001; Li et al., 2003; Kempen et al., 2009; Scheffer et al., 2008; Schepens, et al., 2012; Suzuki et al., 2002; Yardley & Smith, 2002). Historically, research has been conducted to identify those at high risk of falling and the development of interventions to reduce the incidence of falls. Further research should focus on the broader impact of fear of falling (self, family, community, culture, healthcare community), perceived self-efficacy, activity avoidance, and continued utilization of existing fear of falling measurement tools, in order for targeted interventions to be properly evaluated (Delbaere et al., 2011; Denkinger et al., 2015; Friedman et al., 2002). Development of comprehensive assessment tools and checklists will provide researchers and healthcare professionals (nurses, social workers, physical therapists, occupational therapists, rehabilitation experts) a more clearly defined mechanism to adequately assess fear of falling

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among the older adult population and provide interventions to facilitate a higher level of functioning or self-efficacy (Bertera & Bertera, 2008; Cheal & Clemson, 2001; Denkinger et al., 2015; Scheffer et al., 2008). As stated by Bertera and Bertera (2008), "at present, no one test alone is able to identify an individual who may be at higher risk and a candidate for an intervention program" (p. 59-60). Future research is suggested to focus on the influence of fear of falling by the fall experiences of others, fear of falling and "near misses", and the effect of unsteadiness or dizziness (Bertera & Bertera, 2008). Shifting research focus from the physical risks to psychosocial precursors may provide a glimpse into the instability of the problem. Denkinger et al. (2015) summarizes the findings of the importance of adequately studying fear of falling among older adults stating, "fear of falling has been clearly identified as one of the most important and potentially modifiable threats to autonomy in older individuals" (p. 73). This study will address how predictors of fear of falling and activity avoidance may be recognized in order to facilitate purposeful interventions aimed at reducing overall fall risk seen in community-dwelling older adults.

Chapter 3. Methodology

Chapter three will explain the purpose, research methodologies, and procedures used in this study. This chapter will also describe the sample, provide operational definitions for the independent and dependent variables, review study instruments, and discuss processes involved with protection of human subjects.

Purpose

The purpose of this study is to examine fear of falling that may be experienced by community-dwelling older adults (ages 65 and older) and provide a report of specific variables that predict fear of falling and activity avoidance. Additionally, the strength of relationship of independent variables (AGE, GEN, FALL, MED) and dependent variables (FOF, AVOID) will be examined. The aims of the study are as follows:

Aim 1. The first aim of this study was to determine if a particular group of independent variables (AGE, GEN, FALL, MED) explains or predict FOF.

Aim 2. The second aim of this study was to determine if a particular group of independent variables (AGE, GEN, FALL, MED) explains or predict AVOID.

Aim 3. The third aim of this study was to determine how much a single, independent variable adds to the prediction of a dependent variable, over what is accomplished by other independent variables.

Aim 4. The fourth aim of this study was to determine what the relationship is between any given independent variable and the dependent variable, once other predictors are taken into account.

Aim 5. The fifth aim of this study was to determine the relative importance of one predictor in explaining a dependent variable in comparison with other predictors.

Research Questions

       Research question 1. How well does age, gender, fall history, and prescription medication use explain fear of falling?

       Research question 2. How well does age, gender, fall history, and prescription medication use explain activity avoidance?

       Research question 3. How much does age add to the prediction of fear of falling, over what gender, fall history, and prescription medication use contribute?

       Research question 4. What is the relationship between gender and fear of falling, once the relationship between fear of falling and the other three predictors is controlled?

       Research question 5. What is the relative importance of fall history versus prescription medication use in predicting fear of falling?

Setting

       This study was conducted in a senior center located in Central Minnesota. Whitney Senior Center (WSC) is a senior services organization that provides social, physical, financial, and nutritional services to adults age 55 and older in the Saint Cloud metropolitan area (www.ci.stcloud.mn.us/Whitney-Senior-Center). The senior center was established in 1977 and has seen a steady increase in the number of adults taking part in activities. Presently, approximately 500-1,000 older adults participate in formal and informal activities each day (Laura Hood, personal communication, June 15, 2016).

Sample

       Subjects were recruited from a heterogeneous sample of older adults that attend activities at Whitney Senior Center (WSC) located in Saint Cloud, Minnesota. A convenience sample of healthy, community-dwelling older adults, were the target population for recruitment. Many of

the older adults were noted to participate in early morning coffee, humanities classes, card or board games, noon meals, exercise and fitness groups, and other formal or informal activities. Following recruitment, participants were informed about their rights to participate in the research study.

　　　　Sample characteristics. The majority of community-dwelling older adults that attend activities at WSC are female. According to the Director, estimates that approximately 60% of daily participants are female. The age represented the most is 75-85, with a general age range of older adults age 65-85. The major ethnic group represented is Caucasian. The Director stated that the WSC does not have firm data to support the estimates used for the demographics of participants that attend activities each day therefore, the above remarks are purely anecdotal.

　　　　Sample size. A power analysis was performed to achieve a power of .80, alpha .05, and estimating a moderate effect size in order to solve for *N*. After consulting a power table, an estimated sample size of 82 is needed to detect a population of R^2 with four predictors, with a 5% chance of a Type I error and a 20% change of a Type II error for study aims and research questions 1 through 5 (Polit, 2010).

Participant Selection

　　　　Inclusion and exclusion criteria. Older adults eligible to participate in the study must be English-speaking, reside in the community, and be age 65 or older. Subjects will be excluded from the study if they currently reside in a long-term care facility, are receiving care in an inpatient setting, are less than 65 years of age, and do not speak English.

Research Design Methods

　　　　This study involved a cross-sectional design that includes a sample of older adults (ages 65 and older) who participate in activities at WSC. Informed consent was obtained prior to

beginning data collection. Subjects completed study questionnaires to obtain data about fear of

falling and avoidance of activities. Analysis of the data involved a multivariate approach of

multiple regression. Multiple regression assisted in predicting the dependent variables *fear of*

falling (FOF) and *activity avoidance* (AVOID) by analyzing four independent variables and the

strength of each respective variable: age (AGE), gender (GEN), prescription medication use

(MED), and fall history (FALL) (see Appendices B and C). The multiple regression method

"yields an equation that provides the best prediction possible, given the correlations among all

variables in the analysis", where $Y' = a + b_1X_1 + b_2X_2 + \ldots + b_kX_k$ (Polit, 2010, p. 224). In

addition to multiple regression, multiple correlation was reported, summarizing the magnitude

of the relationship between the dependent variable and several independent variables. The

multiple correlation coefficient (***R***), when squared (***R²***), will indicate the proportion of variance

in the dependent variable that is accounted for by the predictors, thus "***R²*** provides a direct

means of evaluating the accuracy of the multiple regression equation" (Polit, 2010, p. 227).

Additionally, multiple correlation helped determine the magnitude of the relationship between

dependent variables (FOF and AVOID) and four independent variables (AGE, GEN, FALL,

MED) when entered into the regression equation using simultaneous and hierarchical regression

methods. Entering predictors into the multiple regression equation as outlined above can assist

in determining the extent of variability among correlated variables.

Operational Definitions

      Independent variables. Independent variables defined for the purpose of this study

included: age (AGE), gender (GEN), prescription medication use (MED), and fall history

(FALL).

      Age. The independent variable *age* (AGE) was gathered as a continuous variable and then

placed into categories following data collection. Categories will consist of ages: 65 to 69; 70 to 79; 80 and older.

Gender. The independent variable *gender* (GEN) is categorical with two levels: males and females.

Prescription medication use. The independent variable prescription medication use (MED) is an ordinal measurement, with participant scores calculated from the response percentage and designed to elicit the following: no prescription medication usage, one to three prescription medications, four to eight prescription medications, and more than nine prescription medications.

Fall history. The independent variable fall history (FALL) is an ordinal measurement, with participant scores calculated from the response percentage and designed to identify the following based on the survey question *Have you fallen in the last six months?* The subjects' options to respond to this question are: never, once, more than once.

Dependent variables. The dependent variables defined for the purpose of this study include: fear of falling (FOF), and avoidance of activity (AVOID).

Fear of falling. The dependent variable *fear of falling* (FOF) is a composite score from an objectively scored, validated 10-item questionnaire from the Iconographical Falls Efficacy Scale (see Appendix D) with questions focusing on measuring whether an individual would be concerned about falling if performing certain activities. Author approval has been obtained for use and modification of the Iconographical Falls Efficacy Scale for use in this research study (see Appendix E). The scores that are available for subjects to use to respond to each item range from one (not at all concerned) to four (very concerned).

Avoidance of activity. The dependent variable *avoidance of activity* (AVOID) is a

composite score from an objectively scored, validated 14-item questionnaire from the

Modified Fear of Falling Avoidance Behavior Questionnaire (mFFABQ) (see Appendix F)

with questions focusing on measuring avoidance of activities (avoidance behavior) in older

adults. Author approval has been obtained for use of the mFFABQ in this research study

(see Appendix G). Specifically, participants rate how fear of falling would affect

participation in a variety of activities, with scores ranging from *never* to *always*.

Study Instruments

The use of the Iconographical Falls Efficacy Scale (Icon-FES) was approved for use in

this study by Australian researcher and developer, Dr. Kim Delbaere (see Appendix E). The use

of the Modified Fear of Falling Avoidance Behavior Questionnaire (mFFABQ) was approved

for use in this study by Dr. Merrill Landers, PT (see Appendix G).

Demographic questionnaire. The demographic questionnaire (see Appendix H)

includes information for the participant's age, gender, living situation, education level,

ethnicity, perceived general health, attendance frequency for activities at WSC, and marital

status. Additionally, the demographic questionnaire seeks to elicit information pertaining to

prescription medication use, fall history, fear of falling, and item-response associated with a

clarifying definition for fear of falling. Data from the demographic questionnaire will be used to

provide a mechanism to analyze data that is representative of the sample population. This

socio-demographic questionnaire was developed by the researcher.

Iconographical Falls Efficacy Scale (Icon-FES). The Iconographical Falls Efficacy

Scale (Icon-FES) is a 10-item questionnaire that will be utilized to measure participant responses

regarding concern about falling when performing activities and encompasses the outcome

variable FOF. Responses range from "Not at all concerned" to "Very concerned". Verbal

phrases and associated pictures are part of the questionnaire that will assist in providing

contextual relevance to the situation when participants are answering questions about fear of

falling. The Icon-FES was adapted from the validated Falls Efficacy Scale-International (FES-

I). Internal consistency is high (Cronbach's alpha = 0.97). Construct validity is strongly

supported in relation to the validated and objectively scored FES-I ($r = .68$, $p < .001$). The Icon-

FES will be administered to participants electronically via use of an electronic device such as

the iPad or desktop computer. The Icon-FES was chosen for this research study because it is

easily administered, consists of high-contrast images, demonstrates validity and reliability, and

is an inexpensive research tool (Delbaere, Smith, & Lord, 2011).

Modified Fear of Falling Avoidance Behavior Questionnaire (mFFABQ). The

Modified Fear of Falling Avoidance Behavior Questionnaire (mFFABQ) is a Likert-style, five-

point ordinal scale ranging from zero (Never) to four (Always) and will be utilized to measure

avoidance of activity. Scores on the mFFABQ range from 0-56, with high score indicating

greater activity restriction as a result of fear of falling (Landers, Oscar, Sasaoka, & Vaughn,

2015). Currently, cut score on the mFFABQ is set at 20, with a score above 20 being

considered an "avoider" and a score below being a "non-avoider" (Landers et al., 2015). The

researchers who designed the mFFABQ established content validity using an expert panel.

Construct validity was established by comparison of the mFFABQ with other fear of falling

questionnaires such as: Falls Efficacy Scale (FES), Activities-Specific Balance Confidence

Scale (ABC), and the Berg Balance Scale (BBS) (Landers et al., 2015). Test-retest reliability

was good (.796), along with predictive validity and correlated moderately with fall history ($r =$

.380). Participant scores on the mFFABQ will comprise the outcome variable AVOID. The

mFFABQ was chosen for this study because of demonstrated reliability and validity, while

providing an objective measurement of activity avoidance.

Key elements. The key elements defined for the purpose of this study include: predictors of fear of falling, fear of falling, and purposeful avoidance of activity.

Predictors of fear of falling. Existing fear of falling research has identified predictors of fear of falling that include advancing age, female gender, taking four or more prescription medications, and prior fall history.

Fear of falling. Fear of falling in the community-dwelling older adult results from excessive concern regarding falling experienced by fallers and non-fallers alike. Fear of falling may exist before a fall occurs, thereby limiting physical activity of individuals; likewise, fear of falling may exist once a fall occurs, creating a vicious cycle of fear, deconditioning, physical limitations, leading to an enhanced risk of future falls.

Purposeful avoidance of activity. Purposeful avoidance of activity results from a desire to limit activity due to fear or anxiety. This limitation or avoidance of activity may lead to generalized weakness and deconditioning observed in community-dwelling older adults experiencing fear of falling.

Methods

Institutional Review Board approval. Approval to carry out research was obtained from the institutional review board, human studies program, at the University of Hawaiʻi at Mānoa and utilized by Whitney Senior Center (WSC) Advisory Board (Appendix I).

Prior to the start of the research, a meeting was held with WSC Director, Laura Hood and the respective Advisory Board. The intended purpose and research process was introduced and an opportunity to clarify questions was provided. A formal schedule was established, outlining specific days and times in which the research will take place.

Subject recruitment. The researcher publicly posted (throughout WSC) (see Appendix J) information pertaining to the research on fear of falling among community-dwelling older adults. A convenience sample of community-dwelling older adults was recruited for participation in this research study. Each interested individual met with the researcher in a secure and private room to obtain further information and participate in consenting procedures. Written information was reviewed and read out-loud to interested participants. Once all of the individual's questions had been answered, and s/he had agreed to participate in the study, data collection began.

Data Collection

Data collection began after the informed consent process had been completed. Data collection too place Monday through Saturday for a period of seven weeks and was completed in three to five hour increments on selected days. After consent to participate had been obtained, the following procedures took place:

- Participants were asked to complete the demographic questionnaire (see Appendix H).

- Participants were asked to answer the questions in the Iconographical Falls Efficacy Scale (see Appendix D).

- Finally, participants were asked to answer the questions in the Modified Fear of Falling Avoidance Behavior Questionnaire (see Appendix F).

- Participants were provided with a $10.00 gift card.

- Completed measurement tools have been stored in a locked filing cabinet in a secure office location that only the researcher can access. In addition, any data collected will be entered into a computer that is encrypted with a security code that only the researcher can access. The security code to access entry

into the computer will be changed every four weeks in order to maximize

subjects' confidentiality.

Statistical Analysis

In the following section, specific aims, associated research questions, and statistical

procedures to be used in the fear of falling research will be described. The two-sided test at a .05

level of significance will be used in testing the alternative hypotheses.

Specific aim 1. The first aim of this study was to determine if a particular group of

independent variables (AGE, GEN, FALL, MED) explain or predict FOF.

Research question 1. How well does age, gender, fall history, and prescription medication

use explain fear of falling?

H_0: $\beta_1 = 0$, $\beta_2 = 0$, $\beta_3 = 0$, $\beta_4 = 0$ (There is no relationship).

H_a: $\beta_1 \neq 0$, $\beta_2 \neq 0$, $\beta_3 \neq 0$, $\beta_4 \neq 0$ (At least one of the independent variables *IS* useful in

predicting FOF).

Multiple regression. Multiple regression was performed to analyze four independent

variables (AGE, GEN, FALL, MED) as a method to predict the dependent variable (FOF). The

independent variable age (AGE) is a categorical variable that will encompass the selection of an

established age range. Fall history (FALL) and prescription medication use (MED) are ordinal

measures and will consist of pre-selected classifications that assists in determining participants

"relative standing on a dimension of interest" (Polit, 2010, p. 7).

Specific aim 2. The second aim of this study was to determine if a particular group of

independent variables (AGE, GEN, FALL, MED) explain or predict AVOID.

Research question 2. How well does age, gender, fall history, and prescription medication

use explain activity avoidance?

H_0: $\beta = 0$ (There is no relationship).

H_a: $\beta \neq 0$ (At least one of the independent variables *IS* useful in predicting AVOID).

Multiple regression. Multiple regression was performed to analyze four independent variables (AGE, GEN, FALL, MED) as a method to predict the dependent variable (AVOID).

Specific aim 3. The third aim of this study was to determine how much a single, independent variable adds to the prediction of a dependent variable, over what is accomplished by other independent variables.

Research question 3. How much does age add to the prediction of fear of falling, over what gender, fall history, and prescription medication use contribute?

H_0: Age < 0 (The variable of AGE does not contribute in the regression model).

H_a: Age ≥ 0 (The variable of AGE does contribute and should remain in the regression model).

Multiple regression. Simultaneous multiple regression was used to explore the degree to which fear of falling (FOF) could be predicted on the basis of four variables (AGE, GEN, FALL, MED). Partial correlation will assist in determining the extent of correlation when AGE is added to the regression equation.

Specific aim 4. The fourth aim of this study was to determine what the relationship is between any given independent variable and the dependent variable, once other predictors are taken into account.

Research question 4. What is the relationship between gender and fear of falling, once the relationship between fear of falling and the other three predictors is controlled?

H_0: $r^2 = 0$ (There is no relationship between the DV and the IV).

H$_a$: $r^2 \neq 0$ (There is a relationship between the DV and the IV).

Multiple regression. Simultaneous and hierarchical regression were used to evaluate each predictor entered into the equation: 1) all predictors entered at the same time, 2) sequential as determined by the researcher (Polit, 2010, p. 260).

Specific aim 5. The fifth aim of this study was to determine the relative importance of one predictor in explaining a dependent variable in comparison with other predictors.

Research question 5. What is the relative importance of fall history versus prescription medication use in predicting fear of falling?

H$_0$: Adjusted $r^2 = 0$ (There is no relationship between the DV and the IV's, taking other IV's into account).

H$_a$: Adjusted $r^2 \neq 0$ (There is a relationship between the DV and the IV's, taking other IV's into account).

Multiple regression. Simultaneous and hierarchical regression were used similar to what is described in specific aim 4.

Protection of Human Subjects

Participant rights. When the study involves human participants, efforts must be made to ensure that the rights of those participants are protected. The right to self-determination affirms that study participants have a right to voluntarily participate in the research study. Additionally, study participants have the right to ask questions, clarify understanding of procedures, refuse to answer questions, or suspend participation in the study at any time (Polit & Beck, 2004). Special attention was focused on disclosing the nature of the study and highlighting the participant's rights, benefits, and risks.

All study participants will be expressly informed of their rights associated with the

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research including the right to fair treatment. Fair treatment implies that study participants will "expect fair and nondiscriminatory selection, respect for human diversity, non-prejudicial treatment of those declining to participate, and courteous treatment throughout the research encounter" (Polit & Beck, 2004, p. 149).

Lastly, study participants have the right to privacy and can expect that data will be kept confidential, along with a guarantee of anonymity. No personal identifying information will be collected, instead an individual consenting to participate in the study will be given a study identification number that will be used. The initial contact with study participants will take place within the gathering center of the senior center. Completion of the fear of falling, avoidance of activity, and demographic questionnaires will be completed in a private, adjacent room or computer lab (available at the WSC).

Possible negative consequences.

- *Physical* – minimal risk. Participants are completing questionnaires as part of the research study, which should not result in physical concerns or distress.

- *Psychological* – minimal risk for potential emotional distress. There may be feelings of sadness, fear, or anxiety as a result of completing the questionnaires.

- *Social* – minimal risk. The fear of falling research may result in self-identification of fall risk, which may in turn, result in social isolation in order to "hide" physical or psychosocial constraints that have been deemed predictors of fear of falling and avoidance of activities.

Possible positive consequences.

- Reinforcement of interventions that may assist in identifying or reducing overall fall risk.

- Identification of activities that older adults may purposely avoid leading to physical decline.

- Knowledge that they are contributing to research that is focused on promoting health initiatives and research specifically targeting older adult healthcare issues.

- Benefits of early identification of those most at risk for falling and fear of falling.

Comprehension and documentation of the informed consent. The written informed consent document was presented to prospective study participants at the time of recruitment and reviewed orally (i.e., researcher will provide an explanation about the study and individual's rights if s/he agrees to participate in the study). Simple language was utilized when explaining and communicating consent information. The informed consent was designed for an 8th grade reading level in order to accommodate reading levels of participants from a general population. Organization, font size, clear terminology, and brevity have been considered in the development of the consent form. Once an individual has agreed to participate in the study, signatures will be obtained (see Appendix K). Participants received ample time for clarification and review of questions prior to signing the consent. Each participant received a copy of the consent form and a formal copy will be kept by the researcher in a locked file. The Informed Consent Form (Appendix K) was adapted from a public template made available through the University of Hawai'i Human Studies Program. The consent form contained no personal identifying information.

Emotional or psychological harm. The proposed study requires the participant to self-evaluate fall risk and associated fear of falling (if expressly stated). In addition, the study participant answered questions pertaining to activities that the older adult may avoid due to fear of

falling. There was the potential risk of emotional discomfort in which the study questionnaires may elicit feelings of sadness or anxiety. Every effort was made to acknowledge potential emotional discomfort and minimize this risk throughout the research process.

Chapter 4. Data Analysis and Findings

In this chapter, the results of the data analysis are presented. Specifically, chapter four describes the sample characteristics with review of demographics, highlights the statistical hypothesis tests that were utilized for this research study, and provides the results of each of the five aims and associated research questions. The findings presented in this chapter demonstrate the potential for gaining a better understanding of predictors of fear of falling and activity avoidance in community-dwelling older adults.

Statistical Analysis

Statistical data analysis was completed using the Statistical Package for the Social Sciences (SPSS)® Windows Version 22. A two-sided alpha (p) of <0.05 was the criterion for statistical significance. All percentages will be rounded to the nearest whole number for reporting purposes.

Sample Characteristics

Data was collected from 102 participants (51 males; 51 females). Each of the participants was a member of and attended activities at the Whitney Senior Center, located in St. Cloud, MN. Descriptive data were obtained from the Demographic Questionnaire (Appendix H). The total number of participants ($n = 102$) met the research goal and desired statistical power. After reviewing each of the submitted surveys, it was determined that two respondents needed to be excluded from further analysis due to listing their age as less than 65. A total of 100 surveys were considered useable for this research ($n = 100$). After reviewing for all underlying multiple regression assumptions, it was determined that four outliers existed in the data set. Therefore, the final number used for all remaining analyses is $n = 96$. A discussion and justification for removal of these four survey responses is formally discussed in the Assumptions for Multiple Regression section of this chapter, specifically, the discussion on outliers. Table 4.1 provides a review of the

frequencies and sample characteristics with all outliers removed.

Table 4.1

Summary of Frequencies and Sample Characteristics (n = 96)

Variable		M (*SD*)	Frequency	Percent
Age		75 (7.64)		
	65-75		55	57.2
	76-84		27	28.4
	85-96		14	14.4
Gender:	Male		50	52.1
	Female		46	47.9
Education:	High School		31	32.3
	Vocational/Technical		8	8.3
	Some College		23	24.0
	Bachelor's degree		21	21.9
	Master's degree		8	8.3
	Doctorate		1	1.0
	Professional degree		3	3.1
	Other		1	1.0
Living Situation:	Alone		34	35.4
	With Others		62	64.6
Ethnicity:	Asian/Pacific Islander		1	1.0
	Black		0	0.0
	Caucasian/White		92	95.8
	Hispanic		0	0.0
	Indigenous or Aboriginal		1	1.0
	Latino		0	0.0
	Multiracial		0	0.0
	Would Rather Not Say		1	1.0
	Other		1	1.0
Marital Status:	Single		9	9.4
	Married		57	59.4
	Separated		1	1.0
	Divorced		11	11.5
	Widowed		18	18.7

Would Rather Not Say	0	0.0
Other	0	0.0

Age. The minimum age requirement for inclusion criteria in this study was 65. The ages of participants ranged from 65 to 96 years of age (Table 4.1). The average age of study participants was 75 years ($n = 96$, S.D. $= 7.56$). Advancing age has frequently been cited in previous research, as a predictor of fear of falling. Specifically, as age advances, fear of falling and activity avoidance increases.

Gender. An almost equal representation of males and females was obtained in this research study, with males ($n = 50$, 52%) and females ($n = 46$, 48%) being included in the analysis (Table 4.1). Female gender has consistently been reported in prior research, as being a predictor of fear of falling and activity avoidance.

Ethnicity. Caucasian/white respondents comprised the overall majority of the survey population ($n = 92$, 96%), followed by equal percentages of Asian/Pacific Islander ($n = 1$, 1%), Indigenous/Native American ($n = 1$, 1%), would rather not say ($n = 1$, 1%), and other ($n = 1$, 1%). Table 4.1 lists the number and percentages of participants categorized by ethnicity.

Living situation. The majority of participants indicated that they live with others ($n = 62$, 65%) compared to living alone ($n = 34$, 35%) (Table 4.1). Living alone has been identified as a potential factor that may contribute to fear of falling and activity avoidance. Although not a specific hypothesis for this research study, living situation warrants consideration in future research studies.

Educational level. The majority of participants have an educational level of high school or equivalent ($n = 31$, 32%), followed by some college ($n = 23$, 24%), Bachelor's degree ($n = 21$,

22%), vocational/technical college and master's degree ($n = 8$, 8%; $n = 8$, 8% respectively), and

professional degree (Ph.D., J.D., M.D.) ($n = 3$, 3%). Other categories of educational level

comprised a small percentage and included responses from the following categories: Doctorate and

Other ($n = 1$, 1%; $n = 1$, 1% respectively). Table 4.1 provides a report of educational level.

Prescription medication use. Prescription medication usage is another factor that may

contribute to fear of falling and activity avoidance. Specifically, research has noted that when an

older adult is prescribed four or more prescription medications, the risk and incidence of fear of

falling increases. Based on review of table 4.2, the majority of participants report taking one to

three medications ($n = 43$), followed by four to eight ($n = 36$), and more than eight ($n = 6$)

Table 4.2

Summary of Participants Report of the Number of Prescription Medications

None	One to Three	Four to Eight	More than Eight	*N*
11	43	36	6	96

Fall history. Fall history is an important question when addressing concerns related to fear

of falling, along with determining activities that an older adult may avoid due to fear of falling.

Prior research has established a connection among fall history and an increase in fear of falling with

resultant activity avoidance. Specifically, falls that have occurred in the most recent six-month

period of time are the most worrisome for older adults. The majority of respondents in this research

study have never experienced a fall ($n = 66$, 69%). Few participants reported having either

experienced one fall in the preceding six months ($n = 24$, 25%) or reported falling more than once ($n = 6$, 6%) (Table 4.3).

Table 4.3

Summary of Participants Report of Fall History

Never	Once	More than Once	*N*

66	24	6	96

In addition to reviewing a participant's fall history, this research study specifically asked whether or not a person is "afraid of falling". Participants answered 'yes' or 'no' to this question. Based on a review of frequencies, the majority of responses were 'no' ($n = 52$, 54%). Additionally, participants were then asked to rate the extent of fear of falling, with one being the least afraid and nine being the most afraid. The majority of responses consisted of scores reflecting a *low extent* of fear of falling (Table 4.4). For reporting purposes, extent of fear of falling was placed into categories, with extent of worry classified as one to three (low), four to six (moderate), and seven to nine (high) (Table 4.4).

Table 4.4

Summary of Participants Report of Extent of Fear of Falling

Extent of Worry	1-3	4-6	7-9	N
	70	20	6	96

This research study also sought to determine if community-dwelling older adults restrict activities due to fear of falling. Specifically, this research questionnaire invited participants to select 'yes' or 'no' when asked whether or not they avoid activities due to fear of falling. The vast majority of respondents indicated they *do not* restrict activities due to fear of falling ($n = 69$, 72%).

Perceived general health. Overall perceived general health has been a factor that has been noted in the research literature, as a component that may increase an older adult's fear of falling and activity avoidance. This question was included in the survey responses to elicit the general extent to which the older adult views his/her overall health. As reported in Table 4.5, the majority of participants reported their perceived general health to be good ($n = 56$, 58%) or excellent ($n = 20$, 21%). Few participants rated their overall perceived general health as being poor or fair.

Table 4.5

Summary of Participants Report of Overall Perceived General Health

Poor	Fair	Good	Excellent	*N*
1	19	56	20	96

Average attendance at Whitney Senior Center. The number of times an older adult

leaves their home to participate in activities at the Whitney Senior Center (WSC) was collected. As

with the question pertaining to living situation, this survey question was collected for informational

purposes only. The majority of participants report attending activities at WSC as three or more

times per week ($n = 46$, 48%), followed by once per week ($n = 27$, 28%), and two times per week

($n = 23$, 24%).

Quantitative Statistical Tests

Pearson product-moment correlation coefficient (Pearson *r*). The Pearson's *r* is an

important test statistic used to measure the magnitude and direction of a linear relationship between

two variables (Polit, 2010). Correlation coefficients range in value from -1.00 to 1.00. Negative

values are reflective of negative relationships, whereas positive values reflect positive relationships.

Effect size provides a measure or magnitude of the relationship between variables and assists in

interpreting results. For purposes of this study, effect size will be based on Cohen's (1988)

benchmark of values, consisting of: .20 = small; .50 = medium; .80 = large.

 A correlation matrix is helpful in showing relationships between variables. Table 4.6

provides the correlation matrix for four independent variables and fear of falling. This table shows

that some of the fear of falling measures were negatively correlated and some were positively

correlated. The strongest correlation among the variables is for the dependent variable fear of

falling and prescription medication use ($r = .28$, $p = < .05$), which demonstrates a positive and

small correlation. Additionally, fall history and prescription medication use demonstrate the next

strongest correlation among the variables, with a positive and small correlation ($r = .25, p = < .05$).

The weakest correlation among the variables is for gender and prescription medication use, which

demonstrates a negative and very small correlation ($r = -.05, p > .05$). In summary, among the 96

older adults in the sample, the correlation between fear of falling and prescription medication use,

along with fall history and prescription medication use were positive but small ($r = .28, p = < .05$, r

$= .25, p = < .05$, respectively). With 96 df, these two correlations were significant, $p < .05$. All

remaining measures indicate small, non-significant correlations.

Table 4.6

Summary of the Correlation Matrix for Fear of Falling (n = 96)

	AGE X_1	GEN X_2	FALL X_3	MED X_4	FOF Y
AGE X_1	1.00				
GEN X_2	-0.22*	1.00			
FALL X_3	-0.15	-0.15	1.00		
MED X_4	0.09	-0.05	0.25*	1.00	
FOF Y	0.09	0.16	0.19	0.28*	1.00

Note: Correlation coefficients marked with an asterisk were statistically significant ($p < .05$)

The table below (Table 4.7) provides the correlation matrix for four independent variables

and activity avoidance. The strongest correlation among the variables is for fall history and

prescription medication use, which demonstrates a positive and small correlation ($r = .25, p = < .05$).

Additionally, age and gender demonstrate the next strongest correlation among the variables, with a negative

and small correlation ($r = -.22, p = < .05$). The weakest correlation among the variables is for the

dependent variable activity avoidance and gender, which demonstrates a positive and small

correlation ($r = -.03, p > .05$). In summary, among the 96 older adults in the sample, the correlation

between fall history and prescription medication use was positive but small ($r = .25, p < .05$). With

96 *df*, this correlation was significant at a significance level $p < .05$. All remaining measures indicate very small, non-significant correlations.

Table 4.7

Summary of the Correlation Matrix for Activity Avoidance (n = 96)

	AGE X_1	GEN X_2	FALL X_3	MED X_4	AVOID Y
AGE X_1	1.00				
GEN X_2	-0.22*	1.00			
FALL X_3	-0.15	-0.15	1.00		
MED X_4	0.09	-0.05	0.25*	1.00	
AVOID Y	0.05	0.03	0.17	0.18	1.00

Note: Correlation coefficients marked with an asterisk were statistically significant ($p < .05$)

Multiple regression. Multiple regression is a multivariate analysis used to measure three or more variables. The benefit of multiple regression is the ability to improve predictions through the use of two or more independent variables to predict a dependent variable. This research study involved analysis of four, independent predictor variables consisting of: age (AGE), gender (GEN), prescription medication use (MED), and fall history (FALL). Dependent variables consisted of: fear of falling (FOF) and activity avoidance (AVOID).

Multiple correlation. Multiple correlation is a statistical method that determines the relative strength of predictor variables on the dependent variable. This statistical test is useful in determining the magnitude of relationship and depicted through the use of the symbol R, the multiple correlation coefficient. R cannot be a negative value and ranges in value from .00 to 1.00 (Polit, 2010). The higher the value, the stronger the relationship that exists among predictor variables and the dependent variable. In order to determine overall accuracy of the multiple regression equation, one must evaluate R^2. When R is squared (R^2), this provides the proportion of

variance of the dependent variable, which is accounted for by the predictor variables. A perfect prediction is indicated as an R^2 of 1.0, whereas an R^2 of .10 is indicative of large prediction errors (Polit, 2010).

Assumptions of Multiple Regression

Outliers. Outliers constitute extreme cases of scores with extremely small or large values. If present, outliers can have a significant effect on the mean and standard deviation of the sample population. Outliers can be detected by reviewing the frequency distribution and through an analysis of residuals for each of the variables in the multiple regression analysis. Residual values, that are "greater than 3 or less than -3, are considered multivariate outliers" (Polit, 2010, p. 247). Based on an initial review of scatterplots, there were no outliers noted in the data analysis. For predicting fear of falling, the standardized residuals ranged from -2.5 to 2.5, indicating absence of outliers. Additionally, for activity avoidance, the standardized residuals ranged from -2.0 to 3.0, also indicating the absence of outliers. There was some concern however, that some of the data points were close to or appeared to be greater than 3.0. After re-running the analyses several times, it was confirmed that there were four outlying cases, in which the data points were greater than three standard deviations from the mean (Figures 4.1 and 4.2, respectively) (Appendix L). Upon closer examination of these cases, it is noted that four participants' responses for fear of falling were higher than what was reported for all remaining participants ($M = 3.6$, 3.5, 3.3, and 3.3 respectively). These cases did not appear to have reasonably understandable and logical range of responses for the fear of falling survey. It was decided to omit these four cases for a final number of 96 for subsequent analysis ($M = 1.54$; $n = 96$). For reporting purposes, the results section will provide a narrative of tests for both situations however, with outliers included and with outliers removed, for all research questions in this research study. The rationale for this

decision is that with outliers removed, statistical significance was achieved for some analyses.

Multicollinearity. Multicollinearity is a problem in multiple regression that occurs when the independent variables are too highly correlated. Specifically, when independent variables are too closely associated, their addition to the multiple regression model provides little, additional or useful information (Polit, 2010). Another problem that exists with multicollinearity, is resultant instability of the regression model. As a result, factors described, may lead to the inability of the researcher to accurately predict or interpret results. In order to prevent multicollinearity, one should avoid predictor variables that are highly correlated. To determine if multicollinearity existed in this research study, the establishment of tolerance was computed. Tolerance is determined as 1 minus the R^2 value, with values ranging from .00 to 1.00; higher values are more desirable. Tests to see if the data met the assumption of collinearity in this research study indicated that multicollinearity was not a concern (Tolerance = .87-.92; VIF = 1.09-1.15 for fear of falling; Tolerance = .86-.95; VIF = 1.05-1.16 for activity avoidance).

Normality and linearity. The use of multiple regression is also based on the assumption of normality. Normality assumes that each variable is normally distributed, "along with all linear combinations of the variables" (Polit, 2010, p. 245). Normality also assumes linearity, specifically reflecting a straight-line relationship between variables. Normality can be assessed using a histogram of standardized residuals. The histogram of standardized residuals indicated that the data contained approximately normally distributed errors. With the aid of graphs, we can see the assumptions for normality for this multiple regression analyses have been met for fear of falling and activity avoidance. Another assessment to determine linearity is to review the P-P plot of standardized residuals. Based on a review of the P-P plot of standardized residuals, the values mostly follow a straight line for fear of falling and activity avoidance, assuming a straight-line

relationship between variables (Appendix L with outliers; Appendix M with outliers removed).

Homoscedasticity. Another aspect of normality is the assumption of homoscedasticity. Homoscedasticity assumes that "values for one variable is approximately the same for all values of another variable" (Polit, 2010, p. 246). The scatterplot of standardized residuals was examined and demonstrated that the data met the assumptions of homoscedasticity, with values evenly distributed for fear of falling and activity avoidance (Appendix L with outliers; Appendix M with outliers removed).

Non-zero variances. Non-zero variance is another assumption in multiple regression that requires examination. Values over zero are required in order for the assumption of non-zero variances to be met. After reviewing the descriptive statistics, the data met the assumption of non-zero variances (fear of falling, Variance = .39; Activity Avoidance, Variance = .30).

Results

Data was collected over a 7-week period. Recruitment flyers were available throughout the Whitney Senior Center. Research was conducted during a variety of times, including early morning, mid-day, late afternoon, and early evening.

Reliability Results of Measurement Tools for Fear of Falling and Activity Avoidance

Dependability and reliability of survey instruments is an important assessment of this research. Reliability is often assessed by calculating and evaluating Pearson's *r*. Reliability coefficients typically range from -1.00 and +1.00 (Polit, 2010). The higher the coefficient, the greater the demonstrated reliability of the measurement instrument. It is recommended that reliability coefficients be at least 0.70 or higher in order to be acceptable. After reviewing the Inter-Item Correlations for fear of falling and activity avoidance, it is determined that both measurement instruments demonstrate quality and high reliability for fear of falling and activity

avoidance (α = .82, *k* =10; α = .91, *k* = 14, respectively) (Tables 4.8 and 4.9). A discussion of

construct validity can be found in Chapter three.

Table 4.8

Summary of the Item Analysis for the Fear of Falling Measurement Instrument

Question	Item-Total Correlation*
1. Getting dressed	.593
2. Taking a bath	.597
3. Taking a shower	.484
4. Going to the shop	.444
5. Going down the stairs	.530
6. Walking around the neighborhood	.429
7. Reaching for something above your head	.746
8. Reaching for something above your head…tiptoes	.527
9. Going out to a social event	.561
10. Cleaning the gutter	.454

Note. *Cronbach's Alpha .82; *n*=10

Table 4.9

Summary of the Item Analysis for the Activity Avoidance Questionnaire

Question	Item-Total Correlation*
1. Walking	.487
2. Lifting and carrying objects	.523
3. Going up and downstairs	.398
4. Walking on different surfaces	.484
5. Walking in crowded places	.523
6. Walking in dimly lit places	.303
7. Leaving home	.443
8. Getting in and out of a chair	.423
9. Showering and bathing	.253
10. Exercise	.420
11. Preparing meals	.509

12. Doing housework	.461
13. Work and/or volunteer work	.479
14. Recreational and leisure activities	.383

Note. *Cronbach's Alpha .91; *n*=14

Research Question 1

Research question 1. How well does age, gender, fall history, and prescription medication use explain fear of falling?

Specific aim 1. The first aim of this study was to determine if a particular group of independent variables (AGE, GEN, FALL, MED) explain or predict FOF.

Research question 1 null hypothesis. $H_0: \beta_1 = 0, \beta_2 = 0, \beta_3 = 0, \beta_4 = 0$ (There is no relationship).

Research question 1 alternative hypothesis. $H_a: \beta_1 \neq 0, \beta_2 \neq 0, \beta_3 \neq 0, \beta_4 \neq 0$ (At least one of the independent variables *IS* useful in predicting FOF).

Research question 1 multiple regression. Multiple regression was conducted to analyze four independent variables (AGE, GEN, FALL, MED) as a method to predict the dependent variable (FOF).

Research question 1 results with outliers. A multiple regression was conducted to predict fear of falling based on a set of four, independent variables. The predictors included age, gender, prescription medication use, and fall history. For this research question, it is important to determine if the results are statistically significant. Based on a review of the Analysis of Variance (ANOVA) output, the significance value is greater than .05, thus the results are not statistically significant. Following this analysis, it is important to review how much of the variance in the results this analysis explains. The R^2 value indicates how much of the variance in the analysis is

explained by the predictor variables. For research question one, R^2 is .084 or 8.4%. Using the

enter method, it was found that age, gender, prescription medication use, and fall history explain

only 8.4% of the variance in fear of falling, which is not statistically significant, $F(4, 96) = 2.16$, p

$> .05$, $R^2 = .08$. The analysis of coefficients shows that the variables fall history, prescription

medication use, age, and gender did not significantly predict fear of falling ($\beta = .13$, $t(97) = 1.22$,

$p > .05$; $\beta = .14$, $t(97) = 1.33$, $p > .05$; $\beta = .13$, $t(97) = 1.21$, $p > .05$; $\beta = .23$, $t(97) = 2.22$, $p > .05$,

respectively) (Table 4.10).

In conclusion, the null hypothesis was not rejected; none of the independent variables are

useful in predicting fear of falling.

Table 4.10

Summary of Multiple Regression Results for Fear of Falling with Outliers

Variable	B	SE (B)	Beta	t	p
Gender	.12	.07	.08	1.11	.27
Med	.09	.07	.13	1.25	.22
Fall History	.11	.10	.12	1.17	.24
Age	.08	.07	.12	1.11	.27

Note. *$p < .05$ is significant; $n = 100$

Additional analysis. Additional analyses were performed that were not part of the

original proposal. Prior research has been consistent in their report of findings that female gender

has been a significant predictor of fear of falling. Based on the results of research question one,

none of the variables predicted fear of falling in this research study. It was determined that an

Independent Samples T-test may provide additional information that could be useful to evaluate if

there are differences between the population means of the independent variable gender and

dependent variable fear of falling. An Independent Samples T-test was used to examine

differences, with results shown in Table 4.11. All assumptions were met. The variance of males

(.50) was not significantly different from the variance of females (.58). The value of t is -1.86 for

both estimates, and the two-tailed significance (p) is .42. With a significance set at $p = .05$ for a

two-tailed test, this p value is not statistically significant and demonstrates a small effect size.

Scores for fear of falling were not significantly different for males ($M = 1.52$, SD $= .50$) and

females ($M = 1.72$, SD $= .58$). In summary, fear of falling is not significantly different based on

gender, t (2, 98) $= -1.87$, $p = > .05$.

Table 4.11

Summary of Independent Samples T-test for Gender Differences and Fear of Falling with Outliers

Outcome	Male Mean (SD)	Female Mean (SD)	t	df	p	d^b
Fear of Falling	1.52 (0.50)	1.72 (0.58)	-1.87	98	.42	-0.38

*Note. *$p < .05$ is significant; $n = 100$

For further analysis, a one-way Analysis of Variance (ANOVA) was performed to provide

a comparison of group means. As with gender, age has been noted to be a significant predictor of

fear of falling. Even though none of the predictor variables, which included age, were significant

in predicting fear of falling, it was useful to evaluate if responses significantly vary across age.

For purposes of this analysis, age has been placed into categories that consist of age: 60 to 69, 70

to 79, and 80 or older.

In summary, age was not significantly different for scores on fear of falling based on the

three categories of age, F (2, 98) $= .613$, $p > .05$, partial $\eta^2 = .01$ (Table 4.12). Since the results

were not statistically significant, a post hoc test was not computed. All assumptions for a one-way

ANOVA were met.

Table 4.12

Summary of One-way ANOVA for differences in Age group and Fear of Falling with Outliers

	60-69 (n=28)		70-79 (n=42)		80 or older (n=30)				
	M	SD	M	SD	M	SD	F	p	$\eta 2$

| Fear of Falling | 1.52 | .53 | 1.68 | .57 | 1.61 | .53 | .61 | .54 | .01 |

Note. $*p < 0.05$ is significant; $n = 100$

Research question 1 results with outliers removed. A multiple regression was

conducted to predict fear of falling based on a set of four, independent variables. The predictors

included age, gender, prescription medication use, and fall history. Based on a review of the

Analysis of Variance (ANOVA) output, the significance value is less than .05, thus the results are

statistically significant. Following this analysis, it is important to review how much of the

variance in the results this analysis explains. The R^2 value indicates how much of the variance in

the analysis is explained by the predictor variables. For research question one without outliers, R^2

is 0.15 or 15%. Using the enter method, it was found that age, gender, prescription medication use,

and fall history explain 15% of the variance in fear of falling, which is statistically significant, F

$(4, 91) = 4.0$, $p < .05$, $R^2 = .15$. The analysis of coefficients shows that variables gender and

prescription medication use significantly predicted fear of falling ($\beta = .232$, $t (91) = 2.30$, $p < .05$;

$\beta = .228$, $t (91) = 2.26$, $p < .05$, respectively). The analysis of coefficients shows that variables fall

history and age did not significantly predict fear of falling ($\beta = .19$, $t (91) = 1.84$, $p > .05$; $\beta = .14$, t

$(91) = 1.41$, $p > .05$; β, respectively) (Table 4.13).

In conclusion, the null hypothesis was rejected; the model was significant, with gender and

prescription medication use contributing the most to the prediction of fear of falling. Neither age

nor fall history significantly contributed to the prediction of fear of falling.

Table 4.13

Summary of Multiple Regression Results for Fear of Falling; Outliers Removed

Variable	B	SE (B)	Beta	t	p
Gender	.19	.08	.23	2.30	.02*
Med	.12	.05	.23	2.30	.03*

Fall History	.13	.07	.19	1.84	.07
Age	.08	.05	.14	1.41	.16

Note. *$p < .05$ is significant; $n = 96$

Research Question 2

    Research question 2. How well does age, gender, fall history, and prescription medication use explain activity avoidance?

    Specific aim 2. The second aim of this study was to determine if a particular group of independent variables (AGE, GEN, FALL, MED) explain or predict AVOID.

    Research question 2 null hypothesis. H0: $\beta = 0$ (There is no relationship).

    Research question 2 alternative hypothesis. Ha: $\beta \neq 0$ (At least one of the independent variables *IS* useful in predicting AVOID).

    Research question 2 multiple regression. Multiple regression was performed to analyze four independent variables (AGE, GEN, FALL, MED) as a method to predict the dependent variable (AVOID).

    Research question 2 results with outliers. A multiple regression was conducted to predict activity avoidance based on a set of four, independent variables. The predictors included age, gender, prescription medication use, and fall history. For this research question, it is important to determine if the results are statistically significant. Based on a review of the Analysis of Variance (ANOVA) output, the significance value is greater than .05, thus the results are not statistically significant. Following this analysis, it is important to review how much of the variance in the results this analysis explains. The R^2 value indicates how much of the variance in the analysis is explained by the predictor variables. For research question two, R^2 is .05 or 5%. Using the enter method, it was found that age, gender, prescription medication use, and fall history explain only 5% of the variance in activity avoidance, which is not statistically significant, $F(4, 96) = 1.28, p > .05, R^2 =$

61

.22. The analysis of Coefficients shows that fall history, prescription medication use, age, and

gender did not significantly predict activity avoidance ($\beta = .16$, t (97) = 1.54, $p > .05$; $\beta = .11$, t (97)

= 1.05, $p > .05$; $\beta = .06$, t (97) = .56, $p > .05$; $\beta = .07$, t (97) = .72, $p > .05$, respectively) (Table 4.14).

In conclusion, the null hypothesis was not rejected; none of the independent variables are

useful in predicting activity avoidance.

Table 4.14

Summary of Multiple Regression Results for Activity Avoidance with Outliers

Variable	B	SE (B)	Beta	t	p
Gender	.12	.07	.08	1.11	.27
Med	.09	.07	.13	1.25	.22
Fall History	.11	.10	.12	1.17	.24
Age	.08	.07	.12	1.11	.27

Note. *$p < .05$ is significant; $n = 100$

Additional analysis. Similar to research question one, additional analyses were performed

for research question two that were not part of the original proposal. The Independent Samples T-

test would provide additional information that could be useful to evaluate if there are differences

between the population means of the independent variable gender and dependent variable activity

avoidance. The Independent Samples T-test was used to examine differences, with results shown in

Table 4.15. All assumptions were met. The variance for males (.63) was not significantly different

from the variance for females (.62). The value of t is -.462 for both estimates, and the two-tailed

significance (p) is .67. With a significance set at $p = .05$ for a two-tailed test, this p value is not

statistically significant. Based on a review of Table 4.15, scores for activity avoidance were not

significantly different for males ($M = 1.80$, SD = .63) and females ($M = 1.86$, SD = .62). In

summary, activity avoidance is not significantly different based on gender, t (2, 98) = .56, $p > .05$.

Since the results are not statistically significant, a post hoc test was not required.

Table 4.15

Summary of Independent Samples T-test for Gender Differences and Activity Avoidance with Outliers

Outcome	Male Mean (SD)	Female Mean (SD)	t	df	p	d^b
Activity Avoidance	1.80 (0.63)	1.86 (0.62)	.56	98	.26	-0.09

Note. *$p < .05$ is significant; $n = 100$

For further analysis, a one-way Analysis of Variance (ANOVA) was performed to provide a comparison of group means. As with gender, age has been noted to be a significant predictor of activity avoidance. Even though none of the predictor variables, which included age, were significant in predicting activity avoidance, it was useful to evaluate if responses for activity avoidance significantly vary across age. For purposes of this analysis, age has been placed into categories that consist of age: 60-69, 70-79, and 80 or older. In summary, age was not significantly different for scores on activity avoidance based on the three categories of age, $F(2, 98) = .613$, $p > .05$, partial $\eta^2 = .00$ (Table 4.16). Since the results were not statistically significant, a post hoc test was not computed. All assumptions for a one-way ANOVA were met.

Table 4.16

Summary of One-way ANOVA for Differences in Age Group and Activity Avoidance with Outliers

	60-69 (n=28)		70-79 (n=42)		80 or older (n=30)				
	M	SD	M	SD	M	SD	F	p	η2
Activity Avoidance	1.83	.72	1.81	.58	1.85	.59	.04	.96	.00

Note. *$p < .05$ is significant; $n = 100$

Research question 2 results with outliers removed. A multiple regression was conducted to predict activity avoidance based on a set of four, independent variables. The predictors included age, gender, prescription medication use, and fall history. For this research question, it is important

to determine if the results are statistically significant. Based on a review of the Analysis of Variance (ANOVA) output, the significance value is greater than .05, thus the results are not statistically significant. Following this analysis, it is important to review how much of the variance in the results this analysis explains. The R^2 value indicates how much of the variance in the analysis is explained by the predictor variables. For research question two, R^2 is .06 or 6%. Using the enter method, it was found that age, gender, prescription medication use, and fall history explain only 6% of the variance in activity avoidance, which is not statistically significant, $F (4, 91) = 1.49, p > .05, R^2 = .06$. The analysis of Coefficients shows that fall history, prescription medication use, age, and gender did not significantly predict activity avoidance ($\beta = .17, t (91) = 1.55, p > .05; \beta = .13, t (91) = 1.20, p > .05; \beta = .10, t (91) = .95, p > .05; \beta = .08, t (91) = .74, p > .05$, respectively) (Table 4.17).

In conclusion, the null hypothesis was not rejected; none of the independent variables are useful in predicting activity avoidance.

Table 4.17

Summary of Multiple Regression Results for Activity Avoidance Outliers Removed

Variable	B	SE (B)	Beta	t	p
Gender	.09	.12	.08	0.74	.46
Med	.10	.08	.13	1.20	.23
Fall History	.17	.11	.17	1.55	.13
Age	.01	.01	.10	0.95	.35

Note. $*p < .05$ is significant; $n = 96$

Additional analysis. The Independent Samples T-test was used to examine differences, with results shown in Table 4.18. All assumptions were met. The variance for males (.63) was not significantly different from the variance for females (.62). The value of t is -.313 for both estimates, and the two-tailed significance (p) is .62. With a significance set at $p = .05$ for a two-tailed test, this p value is not statistically significant. Based on a review of Table 4.20, scores for activity avoidance

were not significantly different for males (*M* = 1.77, SD = .60) and females (*M* = 1.81, SD = .57). In summary, activity avoidance is not significantly different based on gender, *t* (2, 94) = .24, *p* > .05. Since the results are not statistically significant, a post hoc test was not required.

Table 4.18

Summary of Independent Samples T-test for Gender Differences and Activity Avoidance Outliers Removed

Outcome	Male Mean (SD)	Female Mean (SD)	*t*	*df*	*p*	*d*[b]
Activity Avoidance	1.77 (0.60)	1.81 (0.57)	.24	94	.62	-0.06

*Note. *p* < .05 is significant; *n* = 96

For further analysis, a one-way Analysis of Variance (ANOVA) was performed to provide a comparison of group means. In summary, age was not significantly different for scores on activity avoidance based on the three categories of age, *F* (2, 93) = .21, *p* > .05, partial η^2 = .01 (Table 4.19). Since the results were not statistically significant, a post hoc test was not computed. All assumptions for a one-way ANOVA were met.

Table 4.19

Summary of One-way ANOVA for Differences in Age Group and Activity Avoidance Outliers Removed

	60-69 (n=28)		70-79 (n=42)		80 or older (n=30)				
	M	SD	M	SD	M	SD	F	p	η2
Activity Avoidance	1.77	.65	1.76	.54	1.85	.60	.21	.81	.01

*Note. *p* < .05 is significant; *n* = 96

Research Question 3

Research question 3. How much does age add to the prediction of fear of falling, over what gender, fall history, and prescription medication use contribute?

Specific aim 3. The third aim of this study was to determine how much a single, independent variable adds to the prediction of a dependent variable, over what is accomplished by other independent variables.

Research question 3 null hypothesis. H0: Age < 0 (The variable of AGE does not contribute in the regression model).

Research question 3 alternative hypothesis. Ha: Age ≥ 0 (The variable of AGE does contribute and should remain in the regression model).

Research question 3 multiple regression. Hierarchical multiple regression was used to explore the degree to which fear of falling (FOF) could be predicted on the basis of four variables (AGE, GEN, FALL, MED). Partial correlation also assisted in determining the extent of correlation when AGE was added to the regression equation.

Research question 3 results with outliers. Predictor variables were entered simultaneously into the regression equation, and as determined by this researcher. In essence, this research question aims to test the idea that age still makes a significant unique contribution in predicting fear of falling, even after the predictor variables consisting of gender, prescription medication use, and fall history have already been entered into the equation.

The proportion of variability accounted for when the predictor variables gender, prescription medication use, and fall history are entered into the equation is $R^2 = .072$. The value for R^2 goes up to .081 when age is added to the equation. When .081 and .072 is subtracted, the result is a value of .009. This means that age accounts for an addition of less than 1% of the variability that scores for gender, prescription medication use, and fall history could not account for. For research question three, the F-ratio is .978 and its significance level is .325, indicating that age accounts for a non-significant proportion of variability for fear of falling, above and beyond

the variability accounted for by gender, prescription medication use, and fall history, $\Delta R^2 = .01$, F (4, 91) = .978, *ns* (Table 4.20).

In conclusion, the null hypothesis was not rejected; the variable age does not contribute significantly to the regression model.

Table 4.20

Summary of Hierarchical Regression Results for Research Question Three with Outliers

Variable	B	SE (B)	Beta	ΔR^2
Step 1				
Gender	.22	.11	.20	.07
Med	.10	.07	.15	
Fall History	.09	.09	.10	
Step 2				
Gender	.24	.11	.22	.01
Med	.09	.07	.13	
Fall History	.11	.10	.12	
Age	.01	.01	.10	

Note. *p < .05 is significant; *n* = 100

Research question 3 results with outliers removed. Predictor variables were entered simultaneously into the regression equation, and as determined by this researcher. In essence, this research question aims to test the idea that age still makes a significant unique contribution in predicting fear of falling, even after the predictor variables consisting of gender, prescription medication use, and fall history have already been entered into the equation.

The proportion of variability accounted for when the predictor variables gender, prescription medication use, and fall history are entered into the equation is $R^2 = .131$. The value for R^2 goes up to .155 when age is added to the equation. When .155 and .131 is subtracted, the result is a value of .024. This means that age accounts for an additional 2.4% of the variability that scores for gender, prescription medication use, and fall history could not account for. For research question three, the *F*-ratio is 2.54 and its significance level is .114, indicating that age

accounts for a non-significant proportion of variability for fear of falling, above and beyond the variability accounted for by gender, prescription medication use, and fall history, $\Delta R^2 = .024$, F (4, 91) = 2.54, *ns* (Table 4.21).

Table 4.21

Summary of Hierarchical Regression Results for Research Question Three Outliers Removed

Variable	B	SE (B)	Beta	ΔR^2
Step 1				
Gender	.16	.08	.20	.13
Med	.13	.05	.25	
Fall History	.11	.07	.16	
Step 2				
Gender	.18	.08	.22	.024
Med	.12	.05	.22	
Fall History	.13	.07	.20	
Age	.01	.01	.16	

Note. *$p < .05$ is significant; $n = 96$

In summary, we reach the same conclusion for research question three when the outliers are removed from analysis; the null hypothesis was not rejected; the variable age does not contribute significantly to the regression model.

Research Question 4

Research question 4. What is the relationship between gender and fear of falling, once the relationship between fear of falling and the other three predictors is controlled?

Specific aim 4. The fourth aim of this study was to determine what the relationship is between any given independent variable and the dependent variable, once other predictors are taken into account.

Research question 4 null hypothesis. H$_0$: $r^2 = 0$ (There is no relationship between the DV and the IV).

Research question 4 alternative hypothesis. H$_a$: $r^2 \neq 0$ (There is a relationship between

the DV and the IV).

Research question 4 multiple regression. Simultaneous and hierarchical regression was used to evaluate each predictor entered into the equation: 1) all predictors entered at the same time, 2) sequential as determined by the researcher (Polit, 2010, p. 260).

Research question 4 results with outliers. To identify the relationship of each predictor variable, a multiple regression analyses were run. To accomplish this, a hierarchical analysis was completed to determine which predictors, if any, were significant predictors of the dependent variable, fear of falling.

This research question aims to test the idea that gender still makes a significant, unique contribution in predicting fear of falling, even after the predictor variables consisting of age, prescription medication use, and fall history have already been entered into the equation.

Model three describes the proportion of variability accounted for when the predictor variables age, prescription medication use, and fall history are entered into the equation, $R^2 = .268$. In model four, the value for R^2 goes up to .285 when gender is added to the equation. When .285 and .268 is subtracted, the result is a value of .02. This means that gender accounts for an additional 2% of the variability that scores for gender, prescription medication use, and fall history could not account for. For research question four, the F-ratio is 0.98 and its significance level is .09, indicating that gender does not account for a significant proportion of variability for fear of falling, above and beyond the variability accounted for by age, prescription medication use, and fall history, $\Delta R^2 = .009$, $F(4, 91) = .98$, $p > .05$ (Table 4.22).

In conclusion, the null hypothesis was not rejected; gender does not make a significant contribution in predicting fear of falling when controlling for other independent variables.

Table 4.22

Summary of Hierarchical Regression Results for Research Question Four with Outliers

Variable	B	SE (B)	Beta	ΔR^2
Step 1				
Med	.12	.07	.17	.03
Step 2				
Med	.12	.07	.17	.03
Age	.20	.10	.19	
Step 3				
Med	.10	.07	.15	.01
Age	.22	.11	.20	
Fall	.08	.09	.09	
Step 4				
Med	.09	.07	.22	.01
Age	.23	.11	.12	
Fall	.11	.10	.10	
Gender	.01	.07	.10	

Note. $*p < .05$ is significant; $n = 100$

Research question 4 results with outliers removed. To identify the relationship of each

predictor variable, a multiple regression analyses was conducted. To accomplish this, a

hierarchical analysis was completed to test the idea that gender still makes a significant, unique

contribution in predicting fear of falling, even after the predictor variables consisting of age,

prescription medication use, and fall history have already been entered into the equation.

Model three describes the proportion of variability accounted for when the predictor

variables age, prescription medication use, and fall history are entered into the equation, $R^2 = .328$.

In model four, the value for R^2 goes up to .393 when gender is added to the equation. When .393

and .328 is subtracted, the result is a value of .065. This means that gender accounts for an

additional 6.5% of the variability that scores for gender, prescription medication use, and fall

history could not account for. For research question four, the *F*-ratio is 5.09 and its significance

level is .004, indicating that gender accounts for a significant proportion of variability for fear of

falling, above and beyond the variability accounted for by age, prescription medication use, and fall history, $\Delta R^2 = .047$, $F (4, 91) = 5.09$, $p < .05$ (Table 4.23).

In conclusion, the null hypothesis was rejected; gender significantly contributes to the prediction of fear of falling when other independent variables are controlled for.

Table 4.23

Summary of Hierarchical Regression Results for Research Question Four Outliers Removed

Variable	B	SE (B)	Beta	ΔR^2
Step 1				
Med	.15	.05*	.23*	.08*
Step 2				
Med	.14	.05*	.27*	.01*
Age	.01	.01	.09	
Step 3				
Med	.12	.05*	.23*	.02*
Age	.01	.01	.12	
Fall	.11	.07	.16	
Step 4				
Med	.12	.05*	.22*	.05*
Age	.01	.01	.16	
Fall	.13	.07	.20	
Gender	.18	.08*	.22*	

Note. *$p < .05$ is significant; $n = 96$

Research Question 5

Research question 5. What is the relative importance of fall history versus prescription medication use in predicting fear of falling?

Specific aim 5. The fifth aim of this study will be to determine the relative importance of one predictor in explaining a dependent variable in comparison with other predictors.

Research question 5 null hypothesis. H_0: Adjusted $r^2 = 0$ (There is no relationship between the DV and the IV's, taking other IV's into account).

Research question 5 alternative hypothesis. H_a: Adjusted $r^2 \neq 0$ (There is a relationship

between the DV and the IV's, taking other IV's into account).

Research question 5 multiple regression. Similar to research question four, hierarchical regression was used to evaluate each predictor entered into the equation.

Research question 5 results with outliers. Two hierarchical regressions were run. In essence, this research question aims to test the idea that fall history is more important in predicting fear of falling compared to prescription medication use.

In the first regression, with model one, the proportion of variability accounted for when the predictor variable prescription medication use is entered into the equation is $R^2 = .167$. The value for R^2 goes up to .179 when fall history is added into the equation. When .179 and .167 is subtracted, the result is a value of .012. This means that prescription medication use combined with fall history accounts for an addition of 1.2% of the variability for fear of falling. For research question five, the F-ratio is 2.82 and its significance level is .52 indicating that fall history and prescription medication use account for a non-significant proportion of variability for fear of falling in step one, $R^2 = .28$, $F (1, 98) = 2.82$, ns (Table 4.24). When prescription medication use is added in Step 2 of the equation, it does not add a significant amount of variance, $\Delta R^2 = .00$, $F (2, 97) = .42$, ns (Table 4.24). For the second hierarchical regression analysis, when fall history was added first, followed by prescription medication use, this resulted in similar, non-significant results, $R^2 = .01$, $F (1, 98) = 1.11$, ns (Step 1); $\Delta R^2 = .02$, $F (2, 97) = 2.10$, ns (Step 2) (Table 4.25).

In conclusion, the null hypothesis was not rejected for both hierarchical regression analyses. Neither fall history nor prescription medication use was significant and neither variable was more important than the other in predicting fear of falling.

Table 4.24

Summary of 1ˢᵗ Hierarchical Regression Results for Research Question Five with Outliers; Prescription Medication Use Entered first, followed by Fall History

Variable	B	SE (B)	Beta	ΔR^2
Step 1				
Med	.15	.05	.28	.08
Step 2				
Med	.13	.05	.25	.02
Fall History	.11	.10	.12	

Note. $*p < .05$ is significant; $n = 100$

Table 4.25

Summary of 2ⁿᵈ Hierarchical Regression Results for Research Question Five with Outliers; Fall History entered first, followed by Prescription Medication Use

Variable	B	SE (B)	Beta	ΔR^2
Step 1				
Fall History	.13	.07	.19	.04
Step 2				
Fall History	.09	.07	.13	.06
Med	.13	.05	.25	

Note. $*p < .05$ is significant; $n = 100$

Research question 5 results with outliers removed. Two hierarchical regressions were run. In essence, this research question aims to test the idea that fall history is more important in predicting fear of falling compared to prescription medication use.

The proportion of variability accounted for when the predictor variable prescription medication use is entered into the equation is $R^2 = .08$. The value for R^2 goes up to .09 when fall history is added into the equation. When .08 and .09 is subtracted, the result is a value of .016. This means that prescription medication use combined with fall history accounts for an addition of 1.6% of the variability for fear of falling. For research question five, the F-ratio is 7.90 and its significance level is .01, for prescription medication use (when entered first), indicating prescription medication use accounts for a significant proportion of variability for fear of falling,

above and beyond the variability accounted for when fall history is added to the equation, $R^2 =$ .08, F (1, 94) = 7.90, $p = < .05$ (Step 1) (Table 4.26). When fall history is added in Step 2 of the equation, it adds a non-significant amount of variance, $\Delta R^2 = .02$, F (2, 93) = 1.60, $p = ns$ (Table 4.26). For the second hierarchical analysis, when fall history was added first, this resulted in a non-significant amount of variance, $R^2 = .04$, F (1, 94) = 3.56, $p = ns$ (Table 4.27). When prescription medication use is added in Step 2 of the equation, it adds a significant amount of variance above and beyond what fall history accounts for on its own, $\Delta R^2 = .06$, F (2, 93) = 5.81, $p = < .05$ (Table 4.27).

In conclusion, the null hypothesis was not rejected for the first hierarchical regression analyses. In the first regression, prescription medication use, when entered first, is significant. However, when fall history is added (Step 2), it does not add a significant amount of variance above and beyond what prescription medication use adds on its own. In the second hierarchical regression, when fall history is entered in the first step, it did not account for a significant amount of variance in fear of falling. When prescription medication use is added in Step 2, it accounts for a significant amount of variance in fear of falling, above and beyond fall history alone.

In summary, prescription medication use is more important to the prediction of fear of falling compared to fall history.

Table 4.26

Summary of 1ˢᵗ Hierarchical Regression Results for Research Question Five with Outliers Removed; Prescription Medication Use entered first, followed by Fall History

Variable	B	SE (B)	Beta	ΔR^2
Step 1				
Med	.15	.05	.28	.08*
Step 2				
Med	.13	.05	.25	.02
Fall History	.11	.10	.12	

Note. *$p < .05$ is significant; $n = 96$

Table 4.27

Summary of 2nd Hierarchical Regression Results for Research Question Five with Outliers Removed; Fall History entered first, followed by Prescription Medication Use

Variable	B	SE (B)	Beta	ΔR^2
Step 1				
Fall History	.13	.07	.19	.04
Step 2				
Fall History	.09	.07	.13	.06*
Med	.13	.05	.25	

Note. *$p < .05$ is significant; $n = 96$

Chapter 5. Discussion

The purpose of this research study was to determine if predictor variables (age, gender, prescription medication use, fall history) explain and/or predict fear of falling and activity avoidance in community-dwelling older adults (65 year of age and older). Relationships and correlations of the predictor variables and dependent variables were analyzed. Identification of factors that may contribute to fear of falling and activity avoidance may facilitate healthcare providers' ability to better understand the effects of these situations experienced by community-dwelling older adults.

This chapter provides an analysis and discussion of the research findings. In addition, an in-depth analysis of the predictor variables and their association with the respective dependent variables will be reviewed. Chapter five will also discuss study strengths, weaknesses, and implications for future practice.

Discussion of Results and Findings

Fear of falling and activity avoidance are serious concerns experienced by older adults. Previous research has identified common predictors of fear of falling and subsequent activity avoidance. Results of prior research indicates that participants' age, gender, prescription medication use, and fall history have been found to predict fear of falling and activity avoidance (Bertera & Betera, 2008; Boyd & Stevens, 2009; Filiatrault et al., 2009; Jefferis et al., 2014; Oh-Park et al., 2011; Suzuki et al., 2002). Fear of falling often leads to purposeful restriction of physical activities, leading to decreased self-efficacy and resultant decline in overall health (Suzuki et al., 2002). Effects of fear of falling lead to a myriad of physical, social, and psychosocial consequences that may be experienced by older adults (Hsu et al., 2013; Lach, 2005; Mann et al., 2005; Painter et al., 2012; Suzuki et al., 2002).

In previous studies, reporting of fear of falling and activity avoidance have most commonly been researched as separate situations (Hsu et al., 2013; Lach, 2005; Mann et al., 2005; Painter et al., 2012; Suzuki et al., 2002). Frequently, prior research has focused exclusively on predictors of fear of falling, without assessing if these factors also predict activity avoidance in the same sample population. In addition, there has been inconsistency in the reporting of significant predictors of fear of falling and activity avoidance, wherein existing research fails to reach a consistent consensus on specific predictors for each outcome variable (Mann et al., 2005). It seems logical to focus on understanding whether previously cited predictors of fear of falling and activity avoidance are consistent. Likewise, it is important to understand the extent to which each predictor in this research study contributes to the outcome of the respective dependent variable.

In this current study, four factors were used as predictors of fear of falling and activity avoidance. Each factor was hypothesized to be a useful predictor of fear of falling and activity avoidance experienced by community-dwelling older adults. Specifically, age, gender, prescription medication usage, and fall history were hypothesized to be associated with fear of falling and activity avoidance. The current study investigated the extent to which participants experienced fear of falling and/or activity avoidance and whether age, gender, prescription medication usage, and fall history could help explain these outcome variables.

Research question 1. Research question one was focused on the analysis of four, independent variables predicting and/or explaining the dependent variable fear of falling. The multiple regression was not statistically significant ($p > .05$) when outliers were kept in the analysis; age, gender, prescription medication use, and fall history do not predict fear of falling. However, once it was identified that the data set contained four outliers, the data were analyzed with these cases removed. Subsequently, the multiple regression was statistically significant ($p <$

.05). Specifically, gender and prescription medication use significantly predicted fear of falling. Gender was the single best predictor followed by prescription medication use. While gender has been frequently identified as a significant predictor, prescription medication use has often been the least identified predictor noted in prior research. This is an interesting finding in this current research study. It is reported that when a community-dwelling older adult takes four or more prescription medications, the incidence of fear of falling increases (Friedman et al., 2002). The majority of participants reported taking one to three medications ($n = 43$), followed by four to eight ($n = 36$), and eight or more ($n = 6$). This finding is of interest, as prescription medication use warrants further examination to determine whether it is the number of medications a person takes or the specific classification of prescription medication that result in increased fear of falling. Future studies in this realm would elicit additional information.

      Research question 2. Research question two was focused on the analysis of four, independent variables predicting and/or explaining the dependent variable activity avoidance. The multiple regression was not statistically significant ($p = > .05$). Once outliers were deleted from subsequent analysis, the data met the assumptions for multiple regression. Age, gender, prescription medication use, and fall history do not predict activity avoidance. Few studies have evaluated specific predictors for activity avoidance. Mainly, these studies have focused on specific activities of daily living (ADLs) that a community-dwelling older adult may avoid due to being fearful of falling. While none of the predictor variables were significant in predicting activity avoidance, this information is useful for future research focused on this outcome variable. By thoroughly identifying predictor variables, overall risk may be reduced. Providing additional insight and value to researching activity avoidance in community-dwelling older adults will inherently lead to health promotion initiatives and strategies that will aid these individuals.

Research question 3. Research question three sought to determine if the dependent variable 'age' adds to the prediction model for fear of falling. This question was based on *a priori* hypothesis. When age is added to the regression model, there is a less than 3% increase in the overall contribution to the prediction of the outcome variable fear of falling. Age is not significant in predicting fear of falling. This is contrary to existing research. Existing research has consistently reported age as a significant predictor of fear of falling. Advancing age is of particular concern (Tischler & Hobson, 2005; Lach, 2005). Dattilo et al. (2014) reported that over 50% of older adults age 70 and older experience or acknowledge fear of falling. This study failed to identify age as a predictor of fear of falling in the sample population. The mean age of study participants was 75 and the majority of participants (54%) answered 'no' when asked if they are afraid of falling. In addition, the vast majority of participants (72%) indicated they do not restrict activities due to fear of falling. It is equally important to note that the majority of participants rate their overall perceived general health as good (58%) or excellent (21%). These findings reflect a sample population that is active and generally views their health as satisfactory. It can be postulated that this sample population may have been more physically active and healthier versus other community-dwelling older adults that do not participate in activities outside their home.

Advancing age warrants further investigation and clarification. Mann et al., (2005) conducted a study that found that age is not predictive of fear of falling, noting that other factors must be evaluated first, namely physical, social, and psychosocial attributes.

While it was expected, that age would predict fear of falling in this study, it should be reconsidered in future studies based on the need for clarification and relevance.

Research question 4. Research question four analyzed whether or not there was a relationship with the independent variable 'gender' and the dependent variable fear of falling,

while controlling for the other three predictor variables.

As outlined previously, gender has been recognized as a significant predictor of fear of falling (Bertera & Betera, 2008; Boyd & Stevens, 2009; Filiatrault et al., 2009; Jefferis et al., 2014; Oh-Park et al., 2011; Suzuki et al., 2002). In particular, female gender has been singled out as a predictor of fear of falling with large percentages of females reporting fear of falling compared to males (Filiatrault et al., 2009). Rates of injury are also significantly higher for females (Boyd & Stevens, 2009).

The results of research question four reveal that gender is not a significant predictor of fear of falling when outliers were retained in the model. Once outliers were removed however, gender became a significant predictor of fear of falling. This study corroborates much of what has been historically reported in existing research literature. It is unknown if female reporting of fear of falling is "greater" compared to males. To support a claim that females report fear of falling more than men, it was decided to run a one-way ANOVA to evaluate mean differences in the sample population. The results indicate there are no mean differences noted between women's and men's scores for fear of falling in this sample population.

More research needs to be done to adequately identify the role of gender and fear of falling. Is the male experience under-reported or misunderstood? Jefferis et al. (2014) confirm that males do experience fear of falling. The male experience may be related to poor self-efficacy and inability to adequately quantify findings. Future research would benefit from a qualitative approach to identify gender perceptions of fear of falling and activity avoidance in order to provide more perspective on the phenomenon of interest.

Research question 5. Research question five examined the relative importance of fall history versus prescription medication use in predicting fear of falling. Fall history and

prescription medication use have been established by prior research as significant predictors of fear of falling, but typically, to a lesser degree compared to other predictors such as age and gender (Denkinger et al., 2015; Friedman et al., 2002). The goal of research question five was to determine if fall history is a better predictor of fear of falling compared to prescription medication use.

Experiencing a fall often results in physical or psychological injury. An older adult who experiences a fall may consequently limit or restrict physical activity which, in turn, may lead to physical and/or emotional decline. This creates a negative cycle in which an older adult may purposely limit physical activity due to a previous fall history (Friedman et al., 2002). In addition, an older adult who experiences a traumatic fall will often report a higher incidence of fear of falling compared to non-fallers.

Prescription medication use is another factor highlighted in the research literature. Namely, older adults who take four or more prescription medications each day have a higher incidence of fear of falling and resultant activity avoidance. An older adult who takes more than four prescription medications may experience medication side effects or adverse effects due to the number of medications and complexity of their overall medication regimen. Multiple, prescription medications may result in sensory deficits, delayed neurological function, and other adverse effects that may increase fall risk and subsequent fear of falling (Friedman et al., 2002).

The majority of participants in this study report having never fallen (69%) or having fallen only once in the preceding six months (25%). Similarly, the majority of participants report taking one to three prescription medications (44%) and no prescription medications (12%). In this research study, neither fall history nor prescription medication use were significant predictors of fear of falling while retaining outliers in the multiple regression. However, once outliers were

deleted from the analysis, significance was achieved. Specifically, after running a hierarchical regression it is noted after analyzing model two, it was determined that prescription medication use contributes significantly to the variability of fear of falling above and beyond what is provided when prescription medication use and fall history are combined. This is an interesting finding. With *a priori* hypotheses, prescription medication use was the predictor variable that was hypothesized to contribute the *least* out of all predictor variables in this research study. Prescription medication use may have been under-defined in the current study. Thus, it is suggested that the operational definition of prescription medication use be reconsidered for future studies. In addition, a thorough evaluation of self-efficacy may be advantageous. The theoretical framework for this study had its underpinnings centered upon Bandura's Self-Efficacy Theory (SET) as well as Rosenstock's Health Belief Model (HBM). Perceptions of self-efficacy was not an aim of this research study; however, it warrants further investigation into the effects of fall history and prescription medication use in relation to fear of falling.

Strengths of this Research

There are few studies evaluating predictors of fear of falling, and none specifically addressing activity avoidance in the same sample population. In this study, predictors of fear of falling and activity avoidance were analyzed. This study assists in gaining an understanding of situations and activities that may lead to fear of falling and activity avoidance in the community-dwelling older adult. Based on the results of this study, gender and prescription medication use significantly predict fear of falling. Additionally, this study is the first to utilize specific measurement instruments, in conjunction, to measure fear of falling and activity avoidance in the sample population. Each instrument demonstrated high reliability, demonstrating the effective use of these measurement instruments in this research study. Lastly, increasing awareness of the

effects of falling and fear of falling, coupled with activity avoidance, is essential to the development of multifactorial healthcare interventions aimed at reducing overall risk in the targeted population.

Limitations

Homogenous sample population. The sample population demonstrated limited ethnic variability in the sample population. The majority (96%) of respondents listed their ethnicity as "white/Caucasian". In addition, the study focused on "healthy" community-dwelling older adults who were able to attend activities at the WSC. Therefore, this sample population may not be representative of the larger, older adult population, thereby limiting generalizability of this research study.

Sample size. Another potential limitation of this study was the small sample size. A larger sample size could be obtained if data were collected for a longer period of time (for example, 12 months or greater).

Study design. The study design was a convenience sample of community-dwelling older adults who attend activities at WSC. The survey was completed through use of technology via an iPad. Many of the older adults required assistance with navigation of the survey using the iPad. As such, some of the participant surveys were completed with active assistance from the researcher. This could raise a concern over researcher bias, as the intent of the proposal was to have the study participants complete the survey without assistance from the researcher.

Another limitation with the current study design is that the perception of self-efficacy was not an original aim of this research study. Perception of self-efficacy and its association with fear of falling and activity avoidance in community-dwelling older adults is being considered for a future study. Additionally, this study design, which consisted of a convenience sampling, involves

the process of participant recruitment via a voluntary mechanism from individuals who are conveniently available to participate in the study. This process may result in inability to generalize research findings and possibly results in selection bias beyond the control of the researcher. For example, self-referral of older adults by their 'friends' who were simultaneously attending activities at WSC may have contributed to potential bias of responses.

Lastly, this study offered a $10 gift card for participation in the research study. It could be asserted that participants were unduly attracted to participate in the research study on the basis of the financial incentive.

Implications for Nursing Practice

The results of this study assist in the identification of predictors of fear of falling and activity avoidance in community-dwelling older adults. With information obtained from this research study, healthcare interventions can be initiated to support older adults who remain living in the community setting. In addition, providing an avenue for open dialog among older adults and their healthcare providers is an important result. Many of the participants in this research study requested more information (i.e. pamphlets, further discussion, and outreach) from the researcher regarding falls and activities that are commonly associated with activity avoidance that increases the risk of falling. The benefit to this type of discussion is awareness, education, and overall health promotion among these individuals.

Directions for Future Research

Based on the findings of this study, the following recommendations for future research are suggested:

1. Replicate the study using a larger sample, from multiple geographic regions.

2. Conduct a qualitative study to explore and examine the perceptions of fear of falling

and activity avoidance among community-dwelling older adults.

3. Determine the impact of significant health issues on fear of falling, specifically focused on community-dwelling older adults receiving assistance with one or more activities of daily living.

4. Further examine the effects of gender and prescription medication use.

5. Determine methods to increase a heterogeneous sample population.

6. Conduct an experimental, longitudinal study to determine long-term effects of fear of falling and activity avoidance.

7. Evaluate the factor of self-efficacy in relation to fear of falling and activity avoidance

8. Evaluate a research design that most effectively accounts for "active" community-dwelling older adults that will better ascertain the extent to which these individuals report fear of falling and activity avoidance.

9. Determine the appropriateness for an ethnographic research study, to evaluate the cultural understanding and meaning associated with fear of falling and activity avoidance.

Conclusion

This study showed that gender and prescription medication use were significant predictors of fear of falling. Information and analysis from this study were of interest. Specifically, certain predictors were more strongly associated with fear of falling and activity avoidance compared to others. More importantly, this study has begun to identify predictors of fear of falling and activity avoidance in community-dwelling older adults at an early stage. Information from this study will assist in the identification of interventions and insights that will assist community-dwelling older adults in reducing fear of falling and activity avoidance. These interventions will optimistically,

improve overall quality of life and lead to health promotion initiatives for these individuals.

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Appendix A

Table 1. Review of the Literature on Fear of Falling Among Community-Dwelling Older Adults

Author(s), Title, Journal	Year	Purpose of Study	Type of Study/Study Design, *N,* and Theoretical Framework	Key Words	Major Concepts	Funding Sources
1. Bertera, E. & Bertera R.; Fear of falling and activity avoidance in a national sample of older adults in the United States.; Health and Social Work, Vol. 33, No 1.	2008	To explore the relationship between fear of falling and avoidance of nine everyday activities critical to maintaining independence among sample of community-dwelling older adults.	• Quantitative, Descriptive Analysis • $N = 3,474$ • Theoretical Framework: Health Belief Model	• Activity avoidance • Falls history • Fear of falling • Independence • Older Adults	1. In adults age 65>, fear of falling at least once or twice in the previous month was reported by 22% of respondents. 2. Fear of falling increased with: age, was higher for women, those with lower income and education, and those who lived alone.	Erickson Foundation, MD
2. Boyd & Stevens; Falls and fear of falling: Burden, beliefs, and behaviours; Age and Ageing, p. 1-6.	2009	To estimate the frequency of falls and prevalence of fear of falling among adults age 65 and older.	• Quantitative, Cross-sectional study • $N = 1,709$ • No theoretical framework identified	• Falls • Fear of falling • Injury • Elderly	1. High prevalence of falls and fear of falling among US older adults is of concern. 2. Fear of falling can result in decreased quality of life, functional limitations,	None

					restricted activity, and depression.	
3. Dattilo, et al., A pilot study of an intervention designed to promote walking, balance, and self-efficacy in older adults with fear of falling. Educational Gerontology, Vol. 40, p. 26-39.	2014	To evaluate the effects of individualized interventions on older adults who had a fear of falling and were not engaged in a high level of physical activity.	• Quantitative, Exploratory study • N = 6 • No theoretical framework discussed.	• Falls • Fear of falling • Older Adults • Exercise program	1. Focused interventions improved participants walking and led to reduction in overall fear of falling. 2. Improved self-efficacy.	
4. Delbaere et al., Development and Initial Validation of the Iconographical Falls Efficacy Scale	2011	To develop a fear of falling questionnaire using pictures and investigate the psychometric properties of the resulting IconFES as a measurement tool.	• Quantitative, Cross-sectional Study • N = 250 • No theoretical framework discussed	• Accidental falls • Fear of falling • Aging • Sensitivity to change • Rasch analysis	1. The IconFES is an innovative way of assessing fear of falling using pictures to describe a range of activities and situations. 2. The IconFES has the ability to assess fear of falling in high functioning older adults.	None
5. Denkinger, M.; Factors associated with fear of falling and associated activity restriction in community-dwelling older adults: A systematic review. American Journal of Geriatric Psychiatry, Vol.	2015	To review interventional programs in older adults in order to gain an understanding of existing research of factors leading to fear of falling and associated	• Systematic Review • N = 20 • No theoretical framework provided	• Fear of falling • Fall-related self-efficacy • Balance confidence	1. The construct of fear of falling must be further defined and/or refined. 2. Modifiable risk factors were discussed. 3. Fall history and poor self-rated	None

23, p. 72-86.		consequences.		• Communit y-dwelling older adult • Systemati c review	health are contributors to fear of falling. Female gender and physical function are significant factors related to fear of falling.	
6. Filiatrault, J., et al.; An exploratory study of individual and environmental correlates of fear of falling among community-dwelling older adults, Journal of Aging and Health, Vol. 21, 881-894.	2009	To identify individual and environmental correlates of fear of falling among community-dwelling seniors	• Multivariate logistic regression; cross-sectional; Quantitative • $N = 288$ • No theoretical framework provided	• Fear of falling • Accidental falls • Accident prevention • Communit y-dwelling seniors	1. Strongest correlates of fear of falling are gender, support from spouse/partner, and residential area 2. Risk factors include: female, living in a smaller city/rural area Protective factor: support from a spouse/partner	Canadian Institutes of Health Research
7. Friedman, et al.; Falls and fear of falling: Which comes first? Journal of American Geriatric Society, Vol. 50, 1329-1335	2002	To determine the temporal relationship between falls and fear of falling, and to see whether these two outcomes share predictors	• Quantitative, Prospective, observationa l • $N = 2,212$ • No theoretical framework provided	• Falls • Fear of Falling • Older Adults • Predictors • Prevention	1. Experiencing a fall at baseline assessment was a predictor of developing fear of falling 2. Falls and fear of falling are a vicious cycle 3. Predictors of fear of falling include:	National Institute on Aging Grant

					a. Age (especially >80) b. Female c. > 4 or more medications (specifically sedatives, benzodiazepines) d. Falls at baseline e. Co-morbidities 4. Falls and fear of falling are common experiences; potentially preventable	
8. Greenberg, Analysis of measurement tools of fear of falling for high-risk, community-dwelling older adults. Clinical Nursing Research, Vol. 21, p. 113-130.	2012	To review the literature in relation to conceptualizing measurement tools for fear of falling among community-dwelling older adults.	• Systematic Review • *N* = 15 • No theoretical framework discussed	• Fear of falling • Falling • Older Adults	1. The Falls Efficacy Scale-International (FES-I) is the most appropriate measurement tool to best assess fear of falling in community-dwelling older adults.	Ruth Kirschstein National Research Service Award
9. Hsu, et al., Pathways from fear of falling to quality of life: The	2013	To examine how Fear of falling leads to many adverse	• Quantitative, Cross-sectional	• Cross-cultural compariso	1. Cultural factors should be accounted for	None

mediating effect of the self-concept of health and physical independence, Aging and Mental Health, Vol. 17, p. 816-822.		consequences and may compromise the quality of life of older adults.	study • $N = 375$ • No theoretical framework discussed.	ns • Falls Efficacy • Loss of independence • Physical self-concept	when conducting research and programs related to fear of falling. A large proportion of older adults are apprehensive about falling and fear of falling may compromise quality of life.	
10. Kempen et al.; Socio-demographic, health-related and psychosocial correlates of fear of falling and avoidance of activity in community-living older persons who avoid activity due to fear of falling; Bio-Med Central Public Health, Vol. 9, p. 1-7.	2009	To examine the relationship between severe levels of fear of falling and avoidance of activity.	• Quantitative, Cross-sectional study • $N = 540$ • No theoretical framework discussed	• Fear of falling • Activity avoidance • Elderly • Community-dwelling	1. Female sex, limitations in activity of daily living, and one or more falls in the previous six months correlate independently with severe fear of falling.	ZonMw—The Netherlands Organization for Health Research and Development
11. Kempen et al.; The short FES-I: a shortened version of the falls efficacy scale-international to assess fear of falling; Age and Ageing, Vol. 37, p. 45-50.	2008	To compare the effectiveness of the Short FES-I measurement tool in the evaluation of fear of falling.	• Quantitative, Cross-sectional study • $N = 193$ • No theoretical framework discussed	• Fear • Older adults • Accidental falls • Quality of life • Elderly • Questionnaire	1. The Short FES-I is a good and reliable measure of fear of falling.	European Committee Grant

12. Kumar, et al., Which factors are associated with fear of falling in community-dwelling older adults; Age and Ageing, Vol. 43, p. 76-84.	2014	To identify factors associated with fear of falling.	• Quantitative, Cross-sectional study • $N = 1,088$ • No theoretical framework discussed	• Fear of falling • Falling • Older persons • Elderly • Risk Factors • Older People	1. Several factors are associated with fear of falling. These include: self-perceived physical health, problems with balance and lower income level. 2. Fear of falling is disabling and increases the risk of falls.	National Institute for Health Research Technology Assessment
13. Lach; Incidence and risk factors for developing fear of falling in older adults. Public Health Nursing, Vol. 22, No 1, 45-52	2005	To explore the incidence and risk factors for developing fear of falling among older adults	• Quantitative, prospective, longitudinal • $N = 890$ • No theoretical framework provided	• Elderly • Falls • Fear of Falling	1. Fear of falling has been shown to increase with age and be more prevalent among women than men. 2. Having two or more falls, feeling unsteady, and reporting fair or poor health status were independent risk factors for developing fear of falling. 3. The incidence and prevalence of fear and falling is significant among community-dwelling older adults with an impact on quality of life.	National Institute of Nursing Research

14. Li, et al.; Fear of falling in elderly persons: Association with falls, functional ability, and quality of life; Journal of Gerontology, Vol. 58B, p. 283-290.	2003	To examine the relationship of fear of falling using the Survey of Activities and Fear of Falling in the Elderly (SAFFE) scale.	• Quantitative, Cross-sectional study • $N = 256$ • No theoretical framework provided	• Falls • Fear of Falling • Elderly • Measurement tools	1. High-fear individuals are significantly more likely to experience or report falls. 2. Fear of falling measured on the SAFFE are linked to a range of adverse health consequence.	National Institute on Aging, Grant AG18394
15. Moore & Ellis; Measurement of fall-related psychological constructs among independent-living older adults: A review of the literature; Aging and Mental Health, Vol. 12, p. 684-699.	2008	To review the published research literature on the measurement of fall-related psychological constructs among independent-living older adults.	• Systematic Review • N = 19 • No theoretical framework discussed.	• Falls • Self-efficacy • Balance Confidence • Older Adults • Psychometric • Fear of falling	1. Inconsistencies among fear of falling measurement tools are noted across various research studies. 2. Focused fall and fear of falling interventions should be tailored to meet the physical and psychosocial needs of the older adult.	None
16. Oh-Park, M, et al; Transient versus persistent fear of falling in community-dwelling older adults: Incidence and risk factors; The Journal of American Geriatrics Society, Vol. 59, No 7, 1225-1231	2011	To investigate the fear of falling (FOF) and the risk factors associated with transient versus persistent (FOF) in community-dwelling older adults.	• Quantitative, Prospective, Cohort Study • $N = 380$ • No theoretical framework identified	• Fear of falling • Risk Factors • Older Adults	1. Fear of Falling (FOF) has a reported prevalence ranging from 20% to 83% in community-dwelling older adults. 2. Fear of Falling (FOF) status in older adults may	National Institutes of Health (NIH) Clinical and Translational Science Award Grant

					change over time, with shared and distinct risk factors for persistent and transient FOF.	
17. Patel, et al., High Prevalence of falls, fear of falling, and impaired balance in older adults with pain in the United States: Findings from the 2011 National Health and Aging Trends Study. The American Geriatrics Society/JAGS, Vol. 62, p. 1844-1852.	2014	To determine the prevalence of clinically-relevant falls-related outcomes according to pain status in older adults.	• Quantitative, Cross-sectional study • $N = 7,601$ • No theoretical framework identified	• Pain • Aging • Falls • Fear of falling • Balance • Epidemiology	1. Falls-related outcomes were more substantially more common in older adults with pain. 2. Few studies have investigated the association with fear of falling and pain, a well-established risk factor for falls and activity avoidance.	None
18. Tischler, L & Hobson, S.; Fear of falling: A qualitative study among community-dwelling older adults, Physical and Occupational Therapy in Geriatrics, Vol. 23, 37-53	2005	To uncover why older adults experience the fear of falling and discover the perceived consequences older adults fear	• Qualitative, exploratory study • $N = 7$ • No theoretical framework discussed.	• Fear of falling • Falls • Perceived consequence • Older Adults • Life satisfaction • Quality of life	1. Participants developed fear of falling after experiencing a fall 2. Aging was a predictor in onset of fear of falling 3. Older adults fear consequences of falling and becoming dependent on others	None
19. Scheffer, et al., Fear	2008	To examine the	• Systematic	• Fear of	1. Reported variation	None

of falling: measurement strategy, prevalence, risk factors, and consequences among older persons. Age and Ageing, Vol. 37, 19-24.		current literature, specifically reviewing fear of falling prevalence, risk factors, consequences, and various measurement tools.	Review • *N* = 28 • Utilized Bandura's SET as discussion.	falling • Prevalence • Risk Factors • Older Persons • Elderly • Systematic Review	among reported prevalence of fear of falling. 2. Uniform measurement strategy to address fear of falling is important.	
20. Schepens, et al., Relationship between fall-related efficacy and activity engagement in community-dwelling older adults: A meta-analytic review. American Journal of Occupational Therapy, Vol. 66(2), p. 137-148.	2012	To examine the relationship between falling-related efficacy and activity and participation in relation to fear of falling.	• Systematic Review • *N* = 20 • Discussed Bandura's SET as a construct for fear of falling	• Accidental falls • Activities of daily living • Fear • Self-efficacy	1. Falls in older adults is a major concern. 2. Focused interventions should focus on fall-related efficacy to reduce fear of falling.	Eunice Kennedy Shriver National Institute of Child Health and Human Development
21. Stubbs, et al., Pain interference is associated with psychological concerns related to falls in community-dwelling older adults: Multisite observational study. Physical Therapy, Vol. 94, p. 1410-1420.	2014	To examine the relationship of fear of falling and avoidance activities, falls efficacy, balance confidence, and consequences of falling with pain as interference.	• Quantitative, Cross-sectional Study • *N* = 295 • No Theoretical Framework discussed	• Fear of falling • Pain Interference • Community-Dwelling Older adults	1. Pain interference is an important contributing factor related to falls. 2. Pain has a strong impact on reducing falls efficacy and increasing older adults' concerns about consequences of falling.	None
22. Suzuki, M., et al., The relationship between	2002	To examine the relationship between	• Correlational study,	• Activities of daily	1. Walking and bathing had a	Grant-in-Aid for

				living	significant correlation with fear of falling among females 2. Fear of falling contributed to psychological conditions such as depression 3. Females were more likely to express fear compared to males 4. Individuals expressing fear were associated with decreased mobility and activity, along with repeated falling 5. Authors recommend older adults utilize assistive devices to assist with mobility, and modify their home environment for safety	Scientific Research
fear of falling, activities of daily living, and quality of life among elderly individuals. Nursing and Health Sciences, Vol. 4, 155-161		functional disability and fear of falling during daily activities; in addition, the relationship between fear of falling and health-related Quality of Life (QOL) was examined	Quantitative • $N = 135$ • No theoretical framework discussed.	• Elderly • Fear of falling • Functional disability • Health-related Quality of Life (HRQL)		
23. Wen-Ni, et al.; Associations between fear of falling and functional balance in older adults. International Journal of Therapy and Rehabilitation, Vol. 20, p. 101-107.	2013	To evaluate the association between fear of falling and the performance of common functional balance tasks in older adults.	• Quantitative, Cross-sectional • $N = 43$ • No theoretical framework discussed	• Fear of falling • Elderly • Balance • Functional Tasks	1. Poorer performance in daily tasks was associated with fear of falling. 2. Older adults with fear of falling may avoid or restrict daily activities.	I-Shou University
24. Yardley & Smith; A	2002	To identify the most	• Quantitative,	• Falls	1. Commonly feared	None

prospective study of the relationship between feared consequences of falling and avoidance of activity in community-living older people. The Gerontologist, Vol. 42, p. 17-23.		common beliefs concerning the negative consequences of falling and determine whether these motivate avoidance activity.	Cross-sectional study. • *N* = 224 • No theoretical framework discussed.	• Disability • Elderly • ADL • Anxiety	consequences of falling were loss of functional independence and damage to identity. 2. Fear of falling was noted to be greater among women than men.	
25. Zijlstra, et al.; Prevalence and correlates of fear of falling, and associated avoidance of activity in the general population of community-living older people. Age and Ageing, Vol. 36, p. 304-309.	2007	To assess prevalence rates and study correlates of fear of falling and avoidance of activity due to fear of falling in this population.	• Quantitative, Cross-sectional study. • *N* = 4,031 • No theoretical framework discussed.	• Aged • Correlates • Fear of falling • Daily activity • Cross-sectional • Elderly	1. Fear of falling and avoidance of activities due to fear of falling, were highly prevalent in community-dwelling older adults. 2. Poor perceived general health showed a strong, independent association with fear of falling.	Zon-Mw— The Netherlands Organization for health Research and Development

Appendix B

Table 3.1 *Illustration of a Correlation Matrix for Multiple Regression and Fear of Falling*

	AGE X_1	GEN X_2	FALL X_3	MED X_4	FOF Y
AGE X_1	0.00	0.00	0.00	0.00	0.00
GEN X_2	0.00	0.00	0.00	0.00	0.00
FALL X_3	0.00	0.00	0.00	0.00	0.00
MED X_4	0.00	0.00	0.00	0.00	0.00
FOF Y	0.00	0.00	0.00	0.00	0.00

Note: Correlation coefficients marked with an asterisk were statistically significant ($p < .05$)

Table 3.2 *Illustration of a Correlation Matrix for Multiple Regression and Activity Avoidance*

	AGE X_1	GEN X_2	FALL X_3	MED X_4	AVOID Y
AGE X_1	0.00	0.00	0.00	0.00	0.00
GEN X_2	0.00	0.00	0.00	0.00	0.00
FALL X_3	0.00	0.00	0.00	0.00	0.00
MED X_4	0.00	0.00	0.00	0.00	0.00
AVOID Y	0.00	0.00	0.00	0.00	0.00

Note: Correlation coefficients marked with an asterisk were statistically significant ($p < .05$)

Iconographical Falls Efficacy Scale

Icon-FES

10-item version
for older people living in a house

developed by

Kim   Delbaere
Stuart   T   Smith
Stephen R Lord

Neuroscience Research Australia
Discover. Conquer. Cure.

Delbaere K, Smith S, Lord S. Development and Initial Validation of the Iconographical Falls Efficacy Scale. J Gerontol A Biol Sci Med Sci 2011;2011; 66A:674-680.

"Please look at each picture carefully, and try to imagine yourself performing the activity."

If you currently don't do the activity (e.g. if someone does your shopping for you), please answer to indicate whether you think you would be concerned about falling IF you did the activity.

Imagine that you are using your normal walking aid.

"We would like to know how concerned you are about the possibility of falling while doing any of the following activities, as pictured on the drawings. For each of the following activities, please show the level of concern which is closest to your own opinion to show how concerned you are that you might fall if you did this activity."

"According to the following SCALE (show scale): not at all concerned, somewhat concerned, fairly concerned, very concerned."

"Please look at each picture carefully, and try to imagine yourself performing the activity."

If you currently don't do the activity (e.g. if someone does your shopping for you), please answer to indicate whether you think you would be concerned about falling IF you did the activity.

Imagine that you are using your normal walking aid.

"We would like to know how concerned you are about the possibility of falling while doing any of the following activities, as pictured on the drawings. For each of the following activities, please show the level of concern which is closest to your own opinion to show how concerned you are that you might fall if you did this activity."

"According to the following SCALE (show scale): not at all concerned, somewhat concerned, fairly concerned, very concerned."

2

Getting dressed

Taking a bath

Taking a shower

Going to the shop

Going down the stairs

Walking around in the neighbourhood
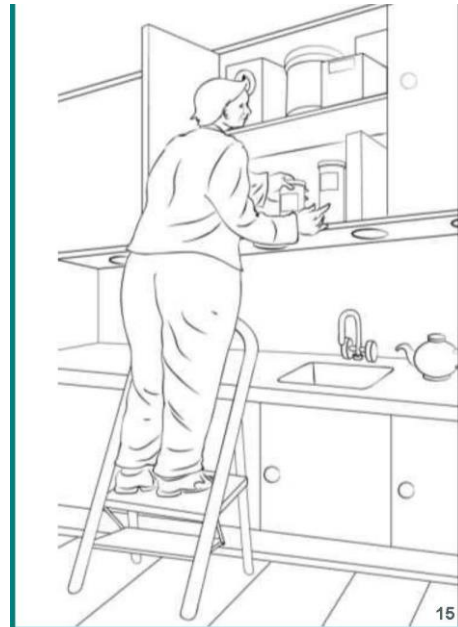
Reaching for something above your head

Reaching for something above your head

Going out to a social event

Cleaning the gutter

1	2	3	4
Not at all concerned	Somewhat concerned	Fairly concerned	Very concerned

From: Kim Delbaere [k.delbaere@neura.edu.au]
Sent: Sunday, January 03, 2016 5:28 PM
To: Bagley, Jane S.
Subject: RE: Research
Hi Jane,

Thank you for your interest in our work. The scale is available here:
http://www.neura.edu.au/research/facilities/falls-and-balance-research-group/resources#questionnaires.   The scale is free to use.

We now also have the scale available as an iPad app if that would be useful to you:
http://neura.edu.au/apps/iconfes.

Very happy to discuss a potential research partnership.

Best of luck with your project,
Kim

Kim Delbaere
Senior Research Scientist, NeuRA
Career Development Fellow, NHMRC
Conjoint Senior Lecturer, UNSW

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Margarete Ainsworth Building
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www.neura.edu.au/research/themes/delbaere-group

-----Original Message-----
From: Bagley, Jane S. [mailto:jsbagley@stcloudstate.edu]
Sent: Monday, 4 January 2016 5:48 AM
To: k.delbaere@neura.edu.au
Subject: Research

Hello Dr. Delbaere. My name is Jane Bagley. I am a Nursing Professor at St. Cloud State University located in St. Cloud, Minnesota USA. I am preparing to complete my Dissertation on Fear of Falling in Community-Dwelling Older Adults. My studies are through the University of Hawaii. In my Review of the Literature, I have come across your extensive work and research on Fear of Falling. As I prepare for my Preliminary Defense, and look toward my research study, I have become very interested in your development of the iPad app: iconFES. I am inquiring if you require permission to use the iconFES program and if there is a potential for any research partnerships between myself and you/your organization. I am a Registered Nurse with extensive background and passion in care of the Older Adult. I became interested in learning more about falls and subsequently fear of falling

following course work taken through the University of Hawaii and learning that my home state of Minnesota ranks 3rd in the United States for fall-related mortality. I look forward to hearing from you and discussing potential next steps.

Kindly and with warm regards,

Jane Bagley
Assistant Professor of Nursing
St. Cloud State University
jsbagley@stcloudstate.edu
320-761-1418 (cell)

Sent from my iPad

Modified Fear of Falling Avoidance-Behavior Questionnaire (mFFABQ)

NAME:

DATE:

Please answer the following questions that are related to your balance. For each statement, please check one box to say how the **fear of falling** has or has not affected you. If you do not currently do the activities in question, try and imagine how your **fear of falling** would affect your participation in these activities. If you normally use a walking aid to do these activities or hold onto someone, rate how your **fear of falling** would affect you as if you were not using these supports. If you have questions about answering any of these statements, please ask the questionnaire administrator.

Due to my fear of falling, I avoid...	*Never* (0% of the time)	*Rarely* (25% of the time)	*Sometimes* (50% of the time)	*Often* (75% of the time)	*Always* (100% of the time)
1. *Walking*	☐	☐	☐	☐	☐
2. *Lifting and carrying objects (e.g., cup, child)*	☐	☐	☐	☐	☐
3. *Going up and downstairs*	☐	☐	☐	☐	☐
4. *Walking on different surfaces (e.g., grass, uneven ground)*	☐	☐	☐	☐	☐
5. *Walking in crowded places*	☐	☐	☐	☐	☐
6. *Walking in dimly lit, unfamiliar places*	☐	☐	☐	☐	☐
7. *Leaving home*	☐	☐	☐	☐	☐
8. *Getting in and out of a chair*	☐	☐	☐	☐	☐
9. *Showering and/or bathing*	☐	☐	☐	☐	☐
10. *Exercise*	☐	☐	☐	☐	☐
11. *Preparing meals (e.g., planning, cooking, serving)*	☐	☐	☐	☐	☐
12. *Doing housework (e.g., cleaning, washing clothes)*	☐	☐	☐	☐	☐
13. *Work and/or volunteer work*	☐	☐	☐	☐	☐
14. *Recreational and leisure activities (e.g., play, sports, arts and culture, crafts, hobbies, socializing, travelling)*	☐	☐	☐	☐	☐

Please make sure you have checked one box for each question. Thank you!

Appendix G

From: Merrill Landers <<u>merrill.landers@unlv.edu</u>>
Sent: Wednesday, June 29, 2016 12:49 PM
To: Bagley, Jane S.
Subject: Re: FFABQ Questionnaire and Requesting Permission for Use in PhD studies
 Hi Jane,
I grant you permission to use the FFABQ and the modified FFABQ. You are welcome to use either. Most of the testing has been done using the former. The only difference is in the Likert anchors. In regards to your question about altering the questionnaire, I would discourage that since that would invalidate the psychometrics of the questionnaire. I am attaching both questionnaires along with a few reference articles which you may use. Best of luck to you in your research. Your dissertation sounds very interesting and I look forward to seeing the results.

Sincerely,
Merrill

For the modified version if you use it, here is the information for citing its properties:
Landers MR, Lopker M, Newman M. Reliability and validity of the modified fear of falling avoidance behavior questionnaire in Parkinson's disease. *Movement Disorders*. 2014;29 Suppl 1:478.

Objective:

The purpose of this study was to examine the test-retest reliability and construct validity of the modified Fear of Falling Avoidance Behavior Questionnaire (mFFABQ) in those with Parkinson's disease (PD).

Background:

A recently developed questionnaire to measure fear of falling avoidance behavior, the Fear of Falling Avoidance Behavior Questionnaire (FFABQ), has good evidence for its reliability and validity. However, a recently modified version of it (mFFABQ) is theorized to be easier to understand for those completing the questionnaire because the Likert responses are more consistent with the item stem.

Methods:

Thirty-four subjects (age 72.3 ± 9.9; 25 men, 9 women) diagnosed with PD (diagnosis year median=2006; Hoehn and Yahr median and mode=3.0) who were cognitively screened with the Mini-Mental State Exam participated in the study. For test-retest reliability, the mFFABQ was administered twice, separated by one week. Evidence for construct validity was evaluated by comparison of the mFFABQ to the following: self-perceived balance questionnaires (Falls Efficacy Scale (FES), Activities-Specific Balance Confidence Scale (ABC)); balance-performance using the Berg Balance Scale (BBS); and, average daily activity levels using an activity monitor for one week (i.e., time sitting/lying, time standing, time stepping, number of steps).

Results:

The mFFABQ had good overall test-retest reliability (ICC(3,1)= 0.796, 95% confidence interval: 0.625-0.895) with a 90% minimal detectable change of 15.8 scale points. In addition, the mFFABQ correlated with fall history (r=.380) and exhibited moderate correlations with the ABC (-.633), FES (r=.497), and BBS (r=-.435). It also correlated with time sitting/lying (r=.399), time standing (r=-.365), time stepping (r=-.554), and number of steps (r=-.587).

Conclusions:

Results from this study offer evidence of the reliability and validity of the mFFABQ in PD. The reliability and construct validity of the mFFABQ are consistent with the original questionnaire and suggest that it may be useful as an outcome tool in patients with fear avoidance behavior. The mFFABQ offers the clinician a way to confidently assess the patient with PD whose fear of falling has triggered a reduction in the daily activity and participation.

Merrill R. Landers, PT, DPT, PhD, OCS
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Cyrus Chung Ying Tang Foundation Research Professor
Fellow of the APTA Education Leadership Institute
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UNLV | PHYSICAL THERAPY

On Tue, Jun 28, 2016 at 4:09 PM, Bagley, Jane S. <jsbagley@stcloudstate.edu> wrote:

Hello Dr. Landers. I received your email address via Dr. Cortney (Durand) Parriott. My name is Jane Bagley. I am an Assistant Professor of Nursing at St. Cloud State University, located in St. Cloud, Minnesota and I am preparing for my Preliminary Defense as a PhD in Nursing student through the University of Hawaii. My research study is: Predictors of Fear of Falling and Activity Avoidance in Community-Dwelling Older Adults. While conducting my Literature Review, I came across Dr. Parriott's Dissertation Defense entitled: "Development of a scale to assess avoidance behavior due to fear of falling: the fear of falling avoidance behavior questionnaire (FFABQ)". The reason for my email is to inquire about permission from you for use of the FFABQ questionnaire in my Dissertation Research (Proposal and Final Defense). I am scheduled to complete my Proposal in August. I am conducting a multiple regression with the following research questions and aims:

In the following section, specific aims, associated research questions, and statistical procedures to be used in the fear of falling research will be described. The two-sided test for level of significance will be used in testing the alternative hypotheses.

Specific aim 1. The first aim of this study will be to determine if a particular group of independent variables (AGE, GEN, FALL, MED) explain or predict FOF.

Research question 1. How well do age, gender, fall history, and prescription medication use explain fear of falling?
H0: $\beta1 = 0$, $\beta2 = 0$, $\beta3 = 0$, $\beta4 = 0$ (There is no relationship).
Ha: $\beta1 \neq 0$, $\beta2 \neq 0$, $\beta3 \neq 0$, $\beta4 \neq 0$ (At least one of the independent variables IS useful in predicting FOF).

Multiple regression. Multiple regression will be performed to analyze four independent variables (AGE, GEN, FALL, MED) as a method to predict the dependent variable (FOF). The independent variable age (AGE) is a categorical variable that will encompass the selection of an established age range. The independent variable gender (GEN) is a dichotomous variable, which will require dummy coding with the two values consisting of male (0) or female (1). Fall history (FALL) and prescription medication use (MED) are ordinal measures and will consist of pre-selected classifications that assists in determining a participants "relative standing on a dimension of interest" (Polit, 2010, p. 7).

Specific aim 2. The second aim of this study will be to determine if a particular group of independent variables (AGE, GEN, FALL, MED) explain or predict AVOID.

Research question 2. How well do age, gender, fall history, and prescription medication use explain activity avoidance?
H0: $\beta = 0$ (There is no relationship)
Ha: $\beta \neq 0$ (At least one of the independent variables IS useful in predicting AVOID.

Multiple regression. Multiple regression will be performed to analyze four independent variables (AGE, GEN, FALL, MED) as a method to predict the dependent variable (AVOID). As with specific aim 1, dummy coding of independent variables and selection of participant classification in each category will be required in order to perform statistical analysis.

Specific aim 3. The third aim of this study will be to determine how much a single, independent variable adds to the prediction of a dependent variable, over what is accomplished by other independent variables.

Research question 3. How much does age add to the prediction of fear of falling, over what gender, fall history, and prescription medication use contribute?
H0: Age < 0 (The variable of AGE does not contribute in the regression model).
Ha: Age ≥ 0 (The variable of AGE does contribute and should remain in the regression model).

Multiple regression. Simultaneous multiple regression will be used to explore the degree to which fear of falling (FOF) could be predicted on the basis of four variables (AGE, GEN, FALL, MED). Partial correlation will assist in determining the extent of correlation when AGE is added to the regression equation.

Specific aim 4. The fourth aim of this study will be to determine what the relationship is between any given independent variable and the dependent variable, once other predictors are taken into account.

Research question 4. What is the relationship between gender and fear of falling, once the relationship between fear of falling and the other three predictors is controlled?
H0: $r2 = 0$ (There is no relationship between the DV and the IV)
Ha: $r2 \neq 0$ (There is a relationship between the DV and the IV)

Multiple regression. Simultaneous, hierarchical, and stepwise regression will be used to evaluate each predictor entered into the equation: 1) all predictors entered at the same time, 2) sequential as determined by the researcher, and 3) entered in the order that contributes most to the increment of R2 (Polit, 2010, p. 260).

Specific aim 5. The fifth aim of this study will be to determine the relative importance of one predictor in explaining a dependent variable in comparison with other predictors.

Research question 5. What is the relative importance of fall history versus prescription medication use in predicting fear of falling?
H0: Adjusted $r2 = 0$ (There is no relationship between the DV and the IV's, taking other IV's into account)
Ha: Adjusted $r2 \neq 0$ (There is a relationship between the DV and the IV's, taking other IV's into account
Multiple regression. Simultaneous, hierarchical, and stepwise regression will be used similar to what is described in specific aim 4.
If you are agreeable to allowing use of the FFABQ, I would need email correspondence from you granting permission. Also, if you are willing to allow use of the FFABQ in my research study, can the FFABQ be modified in any way or must it remain in its entirety?

If you could please reply to my email, I would greatly appreciate it. Thank you in advance for any and all consideration. I truly appreciate you taking time to review my email and associated request.

Have a wonderful day!
Kindly,
Jane Bagley

Demographic Questionnaire

Fear of Falling Survey

* 12. What is your age? (Numeric values only)

* 13. What is your gender?

○ Male ○ Female

* 14. What is your current living situation?

○ Alone ○ With Others

* 15. What is your education level?

○ High school or Equivalent ○ Master's degree

○ Vocational/Technical College (2 Year) ○ Doctorate

○ Some college ○ Professional Degree (MD, JD, etc.)

○ Bachelor's degree

○ Other (please specify)

1

Fear of Falling Survey

* 16. How would you classify yourself?

○ Asian/Pacific Islander   ○ Hispanic   ○ Multiracial

○ Black   ○ Indigenous or Aboriginal   ○ Would Rather Not Say

○ Caucasian/White   ○ Latino

○ Other (please specify)

[ ]

* 17. How would you rate your overall perceived general health?

○ Poor ○ Fair ○ Good ○ Excellent

* 18. How many times per week do you attend activities at the Whitney Senior Center?

○ One time per week

○ 2 times per week

○ 3 or more times per week

* 19. What is your Martial Status?

○ Single   ○ Separated   ○ Widowed

○ Married   ○ Divorced   ○ Would Rather Not Say

○ Other (please specify)

[ ]

2

Fear of Falling Survey

* 20. Are you afraid of falling?

  ◯ Yes　　　　　　　◯ No

* 21. Please rate the extent to which you are afraid of falling (1 being least afraid and 9 being most afraid).

1	2	3	4	5	6	7	8	9
◯	◯	◯	◯	◯	◯	◯	◯	◯

* 22. Do you restrict or limit activities due to fear of falling?

  ◯ Yes　　　　　　　◯ No

* 23. Have you fallen in the past six months?

  ◯ Never　　　　◯ Once　　　　◯ More than Once

3

Receipt of Informed Consent

DATE: October 05, 2016

TO:

FROM: PROTOCOL TITLE: FUNDING SOURCE: PROTOCOL NUMBER:

Shannon, Maureen, PhD, CNM, FNP, University of Hawaii at Manoa, Nursing Bagley, Jane, University of Hawaii at Manoa, Nursing Lin-deshetler, Denise, Dir, Hum Stds Prog, Social & Behavioral Fear of Falling and Avoidance of Activity in Community-Dwelling Older Adults NONE

2016-30415

NOTICE OF APPROVAL FOR HUMAN RESEARCH

This letter is your record of the Human Studies Program approval of this study as exempt.

On October 05, 2016, the University of Hawai'i (UH) Human Studies Program approved this study as exempt from federal regulations pertaining to the protection of human research participants. The authority for the exemption applicable to your study is documented in the Code of Federal Regulations at 45 CFR 46.101(b) 2.

Exempt studies are subject to the ethical principles articulated in The Belmont Report, found at the OHRP Website www.hhs.gov/ohrp/humansubjects/guidance/belmont.html.

Exempt studies do not require regular continuing review by the Human Studies Program. However, if you propose to modify your study, you must receive approval from the Human Studies Program prior to implementing any changes. You can submit your proposed changes via email at uhirb@hawaii.edu. (The subject line should read: Exempt Study Modification.) The Human Studies Program may review the exempt status at that time and request an application for approval as non-exempt research.

In order to protect the confidentiality of research participants, we encourage you to destroy private information which can be linked to the identities of individuals as soon as it is reasonable to do so. Signed consent forms, as applicable to your study, should be maintained for at least the duration of your project.

This approval does not expire. However, please notify the Human Studies Program when your study is complete. Upon notification, we will close our files pertaining to your study.

If you have any questions relating to the protection of human research participants, please contact the Human Studies Program by phone at 956-5007 or email uhirb@hawaii.edu. We wish you success in carrying out your research project.

VOLUNTEERS NEEDED FOR RESEARCH STUDY!
Predictors of Fear of Falling and Activity
Avoidance in Older Adults

People **Age 65 and Older** are Needed

I am conducting research to determine specific predictors of fear of falling and activity avoidance.

- **Eligibility Criteria:**
    - Age 65 and Older
    - English-Speaking
- **Procedures**
    - All surveys and/or questionnaires will be completed on a computer or IPad located at the Whitney Senior Center
    - Complete a 5-question demographic questionnaire
    - Complete a 10-question Fear of Falling survey
    - Complete a 14-question Activity Avoidance survey
    - Research will be conducted beginning in September, 2016, with specific dates and times to be posted.
    - **No** personal identifying information will be collected.

- **Time Commitment**
    - It should take approximately 25-30 minutes to complete all questions required for the Research Study.
- **Risks**
    - There are no risks associated with this study.
- **Benefits**
    - Benefits of this study will assist researchers in identifying predictors of fear of falling and activity avoidance. As such, proper identification of these predictors will assist healthcare personnel in providing resources that will focus on reducing fear of falling and falling among older adults living in the community setting.
- Participants will receive a $10.00 Visa Gift card

Name and contact information of Researcher: Jane Bagley, RN, Assistant Professor of Nursing at St. Cloud State University and a PhD in Nursing Student through the University of Hawai'i. Email: jbagley@hawaii.edu. Phone Number: 320-761-1418

This study has been reviewed and approved by the
University of Hawai'i Human Studies Program, as an Exempt Study.

Predictors of Fear of Falling and Activity Avoidance Research Study

<u>Informed Consent Form</u>

University of Hawaiʻi at Mānoa, Honolulu, Hawaii

You are being asked to take part in a research study of how fear of falling and avoidance of activities may affect older adults. This study is being done as part of my doctoral program and I will be the primary researcher for the study. Dr. Maureen Shannon, my University of Hawaiʻi at Mānoa faculty advisor, will oversee the study.

I am asking you to take part in this study because it may have future potential benefits, such as assisting researchers in determining factors that may lead to a person developing fear of falling and purposefully avoid some   activities. Knowledge of factors that may lead to fear of falling will assist healthcare providers in identifying interventions focused on reducing fear of falling and activity avoidance that may be experienced by older adults. Please read this form carefully and ask any questions you may have before agreeing to take part in the study.

What the study is about: The purpose of this study is to learn how fear of falling and avoidance of activity may impact daily life of older adults.

What we will ask you to do: If you agree to be in this study, you will be asked to complete a questionnaire about some of your characteristics (for example, your age, ethnicity/race, etc.), a questionnaire asking about activities you perform on a daily basis, and a questionnaire about whether or not you are fearful of falling. These last two questionnaires include questions with pictures regarding your daily activities, activities that you may need help with, and if you become fearful of falling while thinking about or while performing any of the activities. The questionnaire about some of your characteristics has 6 questions and the Fear of Falling and Activity questionnaires have 10 and 14 questions respectively. It may take about 30 minutes to complete all three of the questionnaires. Your responses will be completed on a computer or electronic device such as an Apple IPad. Your name will not be used to identify any of your answers to the questionnaires; instead your will be identified using a study identification number. This is to protect your privacy.

Risks and benefits:
There is the risk that you may find some of the questions regarding daily activities and potential fear of falling to be sensitive and lead to sadness or anxiety. I do not anticipate any other risks to you participating in this study other than those encountered in day-to-day life.

There are no benefits specifically to you. However, learning more about the impact of fear

of falling may assist the healthcare profession in developing interventions that will assist in reducing overall fear of falling that may be experienced by some older adults.

Compensation: You will receive a $10.00 Visa Gift Card for your participation in this study.

Your answers will be confidential. The records of this study will be kept private. In any sort of report we make public, we will not include any information that will make it possible to identify you. The research records will be kept in a locked file that only I as the researcher will be able to access. In addition, your name will not be used on your responses to the questionnaires; a study identification number will be assigned to you instead. .

Taking part is voluntary: Taking part in this study is completely voluntary. You may skip any question that you do not want to answer. If you decide to take part, you are free to withdraw at any time.

If you have questions: The researcher conducting this study is Jane Bagley, an Assistant Professor of Nursing at St. Cloud State University and a PhD in Nursing student at the University of Hawai'i at Mānoa. My doctoral advisor at the University of Hawai'i at Mānoa is Dr. Maureen Shannon (maureens@hawaii.edu). Please ask any questions you have now.

If you have questions later, you may contact me (Jane Bagley) at jbagley@hawaii.edu or at 1-320-308-5780. If you have any questions or concerns regarding your rights as a research participant in this study, you may contact the University of Hawai'i Human Studies Program by phone at 808-956-5007 or by email at uhirb@hawaii.edu.

You will be given a copy of this form to keep for your records.

Statement of Consent: I have read the above information, and have received answers to any questions I asked. I consent to take part in the study.

Your Signature _____ Date: _____

Your Name (printed) _____

Signature of person obtaining consent
_____ Date: _____

Printed name of person obtaining consent _____

This consent form and research records will be kept in a locked file in the researcher's office for the duration of the study. All personal information will be destroyed upon completion of the research project.

Appendix L

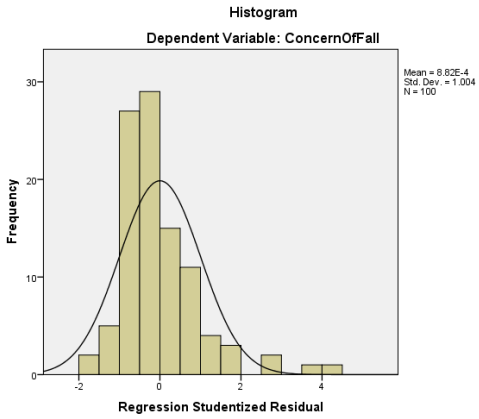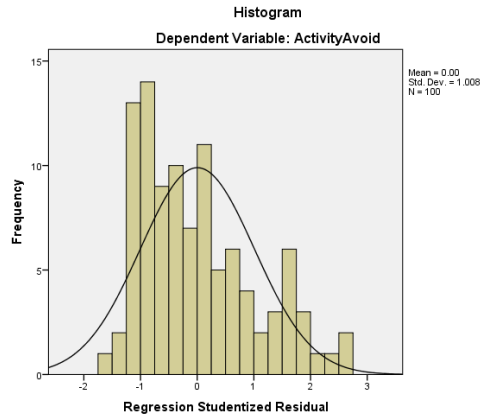Assumptions of Multiple Regression with Outliers Retained
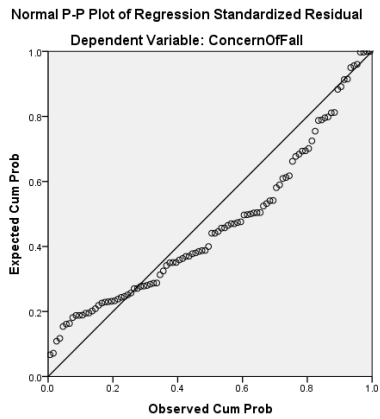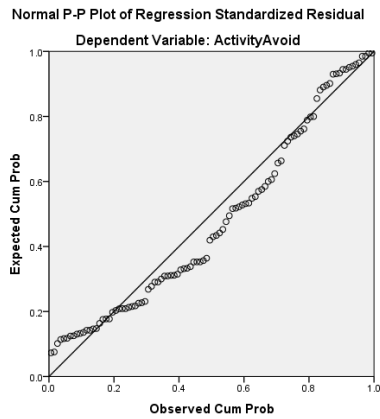
Figure L1

Figure L2

Figure L3

Figure L4

Figure L5
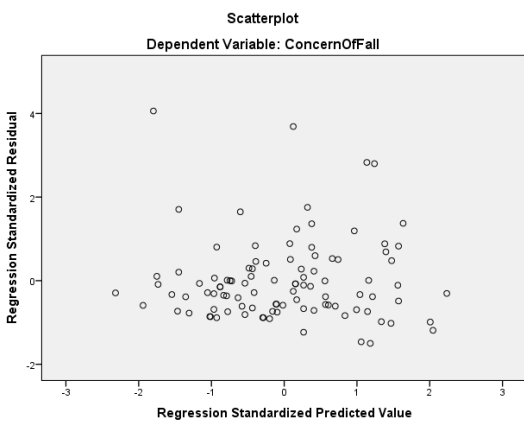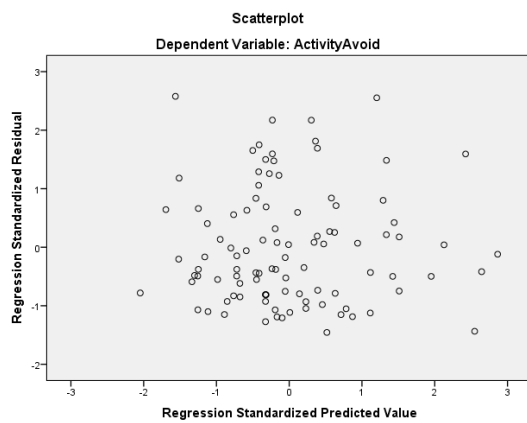

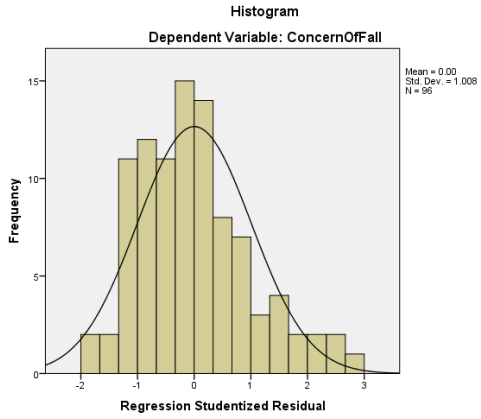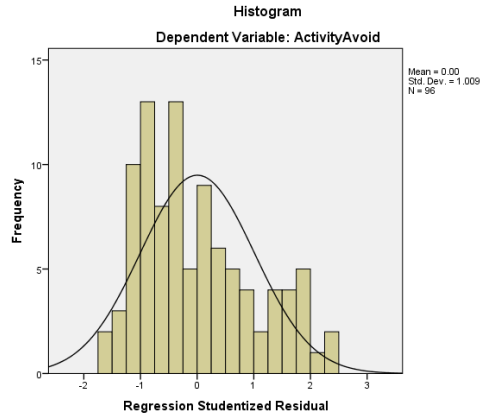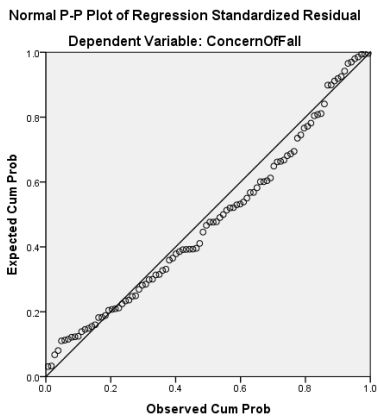Figure L6

Assumptions of Multiple Regression with Outliers Removed
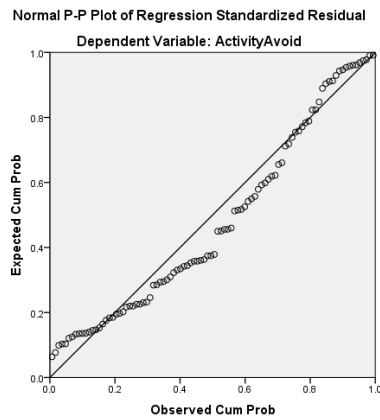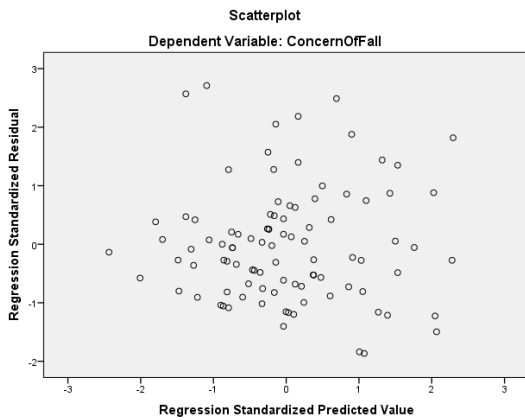
Figure M1

Figure M2

Figure M3

Figure M4

Figure M5

Figure M6