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Fear of Falling in Sensory Impaired Nursing Home Residents

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Abstract

Objectives: Fear of falling (FOF) causes excess disability in nursing home (NH) residents and is associated with vision and hearing impairment. We explored factors associated with FOF in 225 NH residents with vision, hearing or dual sensory impairment.

Methods: In this secondary analysis, we evaluated the contribution of age, gender, cognition, depression, social engagement, illness burden, falls, physical function, mobility, falls self-efficacy and outcome expectancy as predictors of FOF using univariate logistic regression modeling, followed by multivariate analysis by group (visual, hearing, dual, total sample).

Results: Fifty-one percent of residents had FOF. Residents with FOF reported better cognition, lower falls self-efficacy, and higher outcome expectancy in the total sample and in most impairment groups. Falls outcome expectancy predicted FOF in the total sample and in the visual and hearing sensory impairment groups.

Conclusion: When addressing FOF in NH residents it is important to address sensory status along with fears about falling to promote function.

Keywords

Falls; fear of falling; vision; hearing; sensory impairment; disability; nursing home

Introduction

Falls are a public health problem in the older adult population, resulting in significant human and healthcare costs. Approximately one-third of older adults living in the community fall each year (Bergen, Stevens & Burns, 2016), and the rate is much higher among NH residents (Becker & Rapp, 2010). Falls among nursing home residents occur at a rate of 1.34 –1.7 per bed (Nurmi, and Luthge, 2002; Rubenstein, 2006) and up to half fall multiple times. Physical consequences of falls are severe in this population, for example, older adults who sustain a hip fracture from a fall have poor outcomes in terms of both mortality and function (Neuman, et al., 2014). Fear of falling is a common negative psychological outcome, and

even residents who have not experienced a fall may have concerns or fear of falling that leads to reductions in physical and social activities (Lach & Parsons, 2013).

Fear of falling can cause excess disability, as older adults begin to increasingly restrict their activity, resulting in a downward spiral of functional decline, isolation, and lower quality of life (Delbaere, Crombez, Vanderstraeten et al., 2004; Denking, Lukas, Nikolaus, & Hauer, 2015; Clemson, Kendig, Mackenzie & Browning, 2015). These effects may be more pronounced in NH residents who already have a high risk of falling (Becker & Rapp, 2010). Concerns about falls consistently have a negative impact on NH residents. In a recent review, rates of fear of falling ranged from 40–70% among NH residents (Lach & Parsons, 2013), and more common with increasing age, poor health status, cognitive decline, and presence of chronic conditions (Yeung, Chow, & Wong, 2006). Difficulties with gait, balance, and mobility are also common in NH residents with fear of falling, as are psychological issues including depression and anxiety (Chou, Yeung, & Wong, 2005; Sharaf & Ibrahim, 2008).

Avoidance of self-care activities, resistance or verbalizations during transfers or mobility tasks, and reduced social activities can be red flags that a NH resident has fear of falling. Several researchers reported NH residents avoid activities to prevent falls (Chou, Yeung, & Wong, 2005; Yeung, Chow & Wong, 2006). While NH staff members are very aware of the potential for falls among the residents they care for, staff may not identify the concerns of the residents themselves regarding falls or intervene. Instead, staff may encourage residents to reduce activity to prevent falls (Fitzgerald, Hadjistravropoulos, & Macnab, 2009), and say things that increase resident fears. Given the low levels of activity for most NH residents, it is important to explore fear of falling and associated factors that may negatively impact activity and increase disability in this frail population (Sabol et al., 2011).

Sensory impairment in general older populations has been connected to falls and fear of falling and disability. In a review by White, Black, Wood & Delbaere (2015), visual field deficits in older adults and patients with glaucoma, and reduced contrast sensitivity were associated with fear of falling. Self-reported poor vision was associated with fear of falling and fall related activity restriction in other studies (Donoghue, et al., 2014; Nguyen, et al., 2015). Dual impairment (vision and hearing) has been associated with reduced social activity among European older adults (Viljanen, et al., 2014), and fear of falling (Viljanen et al., 2012). In acute care patients, vision and hearing loss was associated with fear of falling (Grue et al., 2009). Further, studies have identified accumulated sensory difficulties (vision, hearing, and balance) related to fear of falling and activity restriction (Viljanen et al., 2012) leading to disability.

Fear of falling has long been considered a factor in the development of disability as conceptualized in the Disablement Process Model of Verbrugge and Jette (1994), the framework for this study. The model includes components laying out a directional pathway: pathology, physical impairments, and functional limitations, leading to disability. The disability path is affected by both extra-individual (i.e. medical care) and intraindividual (i.e., psychosocial and lifestyle) factors that can potentially impact this path. Age, disease, physical and cognitive functioning, fear of falling have been identified as potential factors affecting the disability paths (Braungart, Zarit, Malmberg & Johansson, 2007, Judge et al.,

1996). Understanding how these factors impact of the disability process can be helpful in developing interventions to prevent the development of disability.

Prior studies have identified a relationship between fear of falling and vision, impairment, and dual impairment in community populations. In addition, psychosocial factors of depression and cognition, physical function, and comorbidity have been identified as related to fear of falling and disability. However, none of these studies explored the relationships of these variable to fear of falling among NH residents, particularly those with sensory impairments. As a result, we explored psychosocial and physical factors associated with fear of falling and disability among participants in a NH study of residents with hearing, vision, and dual impairments.

Design and Methods

This study was a secondary analysis of baseline data from the “Nursing Interventions for Sensory Impaired Long-term Care Elders” (NINR RO1NR8777) study. This study was designed to evaluate the Individualized Sensory intervention to improve vision and hearing in NH residents (Cacchione, Willoughby, Langan & Culp, 2011). Participants were enrolled in this study if they lived in a long-term care facility, agreed to participate in the study and were found on screening to be sensory impaired in vision, hearing, or both. In addition, participants had to speak English and score less than 25 on the Short Blessed Orientation-Memory-Concentration Test (Katzman et al, 1983). Residents with delirium as identified using the NEECHAM Confusion Scale (Neelon et al., 1996) at the time of screening were excluded. They were also excluded for severe impairment if they had no light perception (both eyes), or if they could not hear tones louder than 80 decibels (dBLs) at a frequency average of 1000 hertz (Hz).

After obtaining IRB approval (SLU#14038; Penn 814779), facilities were approached to participate in the study. A random sample of residents were then screened for eligibility at each participating facility. Following informed consent from the participant and/or the responsible party with assent of participants, a complete baseline assessment was conducted. When possible, data were extracted from the residents’ medical records to reduce participant burden. Following the baseline assessment, participants were enrolled in the study and were assigned to an intervention of attention control group by NH. A total of 217 participants were enrolled from 7 homes.

Measures

Fear of falling was the primary variable of interest in the current study and measured in two ways. To determine presence of fear of falling, participants were asked if they were somewhat, very or not at all concerned about having a fall. Responses were collapsed to create a dichotomous variable of fear or no fear. Falls self-efficacy was measured using the Nursing Home Falls Self-efficacy Scale (NHFSS; Lach, Ball, & Birge, 2012). This tool includes three items designed for nursing home residents to measuring confidence in completing typical NH activities without falling, adapted from the Falls Efficacy Scale (Tinetti, Richman, & Powell, 1990): getting to the chair and back, getting to and from the bathroom, and walking down the hall and back. Higher falls self-efficacy has been

associated with lower fear of falling. In addition, 2 items measured outcome expectancy, or worry about the negative outcomes of having a fall, adapted from the Fear of Falling Questionnaire (Dayhoff, Baird, Bennett & Backer, 1994): fear of being hurt from a fall and fear of difficulty recovering from a fall injury. Higher outcome expectancy has been associated with higher fear of falling. The Likert scales were tested in NH residents and internal consistency was reported as acceptable with a Cronbach's alpha of 0.84, and 0.86 and factor analysis supported a two-factor structure (Lach, et al., 2012).

Other variables previously associated with fear of falling and disability were selected from the baseline assessment to explore their relationships with fear of falling among sensory impaired NH residents. Demographic variables included age (in years), race (white/black/other) and gender (male/female). Falls data for each resident were extracted from the most recent full Minimum Data Set (MDS) on the chart. Vision impairment was assessed using the Early Treatment of Diabetic Retinopathy Scale (ETDRS; Ferris, Kassoff, Bresnik & Bailey, 1982). A rear-illuminated ETDRS chart was used to determine distance vision acuity. Participants were considered visually impaired if they scored less than the equivalent of 20/50 visual acuity. Hearing was assessed with pure tone audiometry using the Madsen Micromate 304, using noise-reduction earphones. Hearing impairment was considered pure tone average worse than or equal to 40 dBHLs in both ears (Lichtenstein, Bess & Logan, 1988).

Cognition was assessed using the Mini-Mental State Examination (Folstein, et al., 1975), a widely used measure of cognition assessing attention, calculation, recall, language and construction. Scores range from 0 to 30, with a higher score indicating better cognition. The MMSE has been tested and found to have a sensitivity level of 0.87 and a specificity of 0.82 for detecting cognitive impairment (Folstein, Folstein & McHugh, 1975).

The long form (30 items) of the Geriatric Depression Scale (GDS, Yesavage & Brink, 1983) was used to measure depression. Depressive symptoms were summed for a continuous score, with a higher score indicating more depressive symptoms. The GDS has a sensitivity of 92% and specificity of 89% compared to depression diagnosis (Scheikh & Yesavage, 1986).

Participation in activity was measured using the Brief Assessment of Social Engagement (BASE, Morgan, 1998). The BASE includes a list of activities such as attending social gatherings or religious services, watching television, or contact with others, and was designed for use with NH residents. A total activity score was determined by computing the sum of all resident's current activities and a higher score indicated greater social engagement. Cronbach's alpha was reported as 0.70 (Morgan, 1998).

To measure comorbidity, the Cumulative Illness Rating Scale (CIRS, Rochon, 1996) was used. The CIRS examines the number and severity of impairments in 14 body systems. Each system is rated from 0 for no problem, to 4 indicating severe impairment, thus a higher score indicates higher illness burden. CIRS data was determined based on a review of the medical record by trained research nurses. The measure has been validated as a measure co-

morbidity in long-term care settings and was associated with disability (Parmelee et al., 1995).

The Nursing Home Physical Performance Test (NHPPT, Binder, Miller & Ball, 2001) provided a measure of function. The scale includes 6 physical performance tests for gross and fine motor movement that can identify changes in physical functioning, with test-retest for items ranging from .73-.93 (Binder, et al., 2001). The current study used the total score (NHPPT Total). In addition, two items were used to represent mobility from the gross motor subscale: the sit-to-stand and 6-meter walk or wheel test, which are relevant to falls and fear of falling. Activities in the NHPPT were measured in seconds and given a score from 0–4, with a higher score indicating higher function.

Statistical Analysis

Descriptive statistics were used to characterize this sample of sensory impaired NH residents at baseline. Distributional properties of continuous variables were examined. Since all continuous variables were normally distributed, means and standard deviations were used to describe these variables. Frequencies and percentages were used to describe dichotomous or categorical variables. Two-sample t-tests were used to examine differences in age, cognition, depression, social engagement, illness burden, physical function, mobility, falls self-efficacy and outcome expectancy for NH residents who had fear versus no fear of falling. Chi-square or Fisher's exact tests were used to compare dichotomous or categorical variables across the two groups. Univariate logistic regression models were used to assess the individual impact of each baseline characteristic on the odds of FOF. Using traditional model building methods, variables with p-values of 0.20 or greater in the univariate models were considered for inclusion in a stepwise, multivariable logistic regression model. Variables were removed one at a time based on the largest p-value until all variables remaining in the final multivariable model were significant at the 0.05 level. All analyses were conducted in the total sample as well as in each of the three sensory impairment groups (vision, hearing, dual). Statistical significance was taken at the 0.05 level. Analyses were performed using SAS Version 9.4 (SAS Institute, Inc., Cary, NC).

Results

Baseline characteristics of the sample are presented in Table 1. This sample of 225 NH residents were primarily female (74.2%) and White (92.4%), with a mean age of 86.2 years (SD=7.4). The majority of NH residents were hearing impaired (41.8%), with approximately equal numbers in the visually impaired (28.4%) and dually impaired (29.8%) groups. About half of participants had FOF (50.7%) in the total sample and each sensory impairment group. These residents participated in a number of activities (M=12.1, SD=3.1), had some degree of cognitive impairment (M=22.7, SD=4.8) and depressive symptoms (M=8.5, SD=5.7), and fair physical function (M=15.8, SD=5.7). See Table 1 for the full listing of baseline characteristics.

Table 2 provides descriptive statistics by FOF in the total sample and in each of the three sensory impairment groups. In the total sample of NH residents, those with FOF reported

significantly better cognition ($M=23.44$ vs. $M=22.00$, $p=0.0237$), more depressive symptoms ($M=9.73$ vs. $M=7.32$, $p<0.0015$), lower physical function related to mobility (sit-to-stand $M=1.81$ vs. $M=2.52$, $p=0.0010$; 6-meter walk or wheel $M=2.29$ vs. $M=2.85$, $p=0.0017$), lower falls self-efficacy ($M=3.67$ vs. $M=4.41$, $p<0.0001$), and higher outcome expectancy ($M=3.92$ vs. $M=3.19$, $p<0.0001$). Among NH residents with vision impairment, those with FOF reported statistically significantly lower falls self-efficacy ($M=3.35$ vs. $M=4.33$, $p=0.0015$), and higher outcome expectancy ($M=3.93$ vs. $M=3.11$, $p=0.0004$). NH residents with hearing impairment who had FOF reported significantly better cognition ($M=24.53$ vs. $M=22.07$, $p=0.0147$), more depressive symptoms ($M=9.02$ vs. $M=6.91$, $p=0.0375$), and higher outcome expectancy ($M=3.85$ vs. $M=3.22$, $p=0.0023$). Similarly, among residents with dual impairment who reported FOF had more depressive symptoms ($M=10.87$ vs. $M=7.00$, $p=0.0076$), lower self-efficacy ($M=3.30$ vs. $M=4.59$, $p=0.0006$), and higher outcome expectancy ($M=4.00$ vs. $M=3.26$, $p<0.0016$) (Table 2).

Univariate logistic regression model results for the total sample and for each of the three sensory impairment groups are summarized in Table 3; final multivariable model results are provided in Table 4. In the total sample, cognition ($p=0.0251$), gender ($p=0.0251$), depression ($p=0.0020$), mobility ($p=0.0003$), self-efficacy ($p<0.0001$), and outcome expectancy ($p<0.0001$) were statistically significant at the 0.20 level and were included in a full multivariable logistic regression model (Table 3). After backwards elimination, variables in the final multivariable model for the total sample included self-efficacy ($p=0.0011$), and outcome expectancy ($p<0.0001$) (Table 4). The odds of FOF decreases by 39% for each one-unit increase in falls self-efficacy ($OR=0.613$, 95% $CI=0.457-0.823$). Lastly, for every one-unit increase in the falls outcome expectancy, there is a two-fold increased odds of FOF ($OR=2.091$, 95% $CI=1.467-2.946$) (Table 4).

Among NH residents with visual impairment, backwards selection multivariable logistic regression modeling results demonstrated that falls self-efficacy ($p=0.0328$) and outcome expectancy ($p=0.0095$) emerged as significant predictors of FOF (Table 4). Specifically, for each unit increase in self-efficacy, the odds of FOF decreases by 43% among visually impaired residents ($OR=0.570$, 95% $CI=0.340-0.955$). There is a nearly three-fold increased odds of FOF for every one-unit increase in falls outcome expectancy among visually impaired NH residents ($OR=2.807$, 95% $CI=1.287-6.122$). Among those with hearing impairment, variables in the final model included: cognition ($p=0.0401$) and outcome expectancy ($p=0.00771$). Among hearing impaired NH residents, there is a 10% increased odds of FOF for each unit increase in cognition ($OR=1.104$, 95% $CI=1.004-1.14$). For those with hearing impairment, for every one-unit increase in cognition (MMSE), the odds of FOF increases by 10% ($OR=1.104$, 95% $CI=1.004-1.214$). Additionally, the odds of FOF nearly doubled for outcome expectancy ($OR=1.876$, 95% $CI=1.181-2.981$). Among residents who were dually impaired, self-efficacy emerged as the only significant predictor of FOF in the final multivariable model for this group ($OR=2.71$, 95% $CI=0.134-0.551$, $p=0.0003$) (Table 4).

Discussion

This study provides new evidence about the impact that fear of falling may have on frail NH residents with sensory impairments, and adds to our knowledge about the mechanisms that impact disability. Fear of falling was common among these sensory impaired NH residents and half of these NH residents had fear of falling. This level is slightly lower than the approximately 60% rates found with other studies in this setting (Lach & Parsons, 2013). We did not see significant differences in prevalence of fear of falling based on the type of sensory impairment, but vision had been associated with fear of falling in some studies (Sharaf & Ibrahim, 2008; Yeung, Chou & Wong, 2006). Based on our findings, residents with hearing impairment and dual impairment also may have fear of falling. Staff should assess sensory impairment and resident fears and implement interventions to reduce disability and prevent activity restriction in this population.

In addition to fear of falling, we examined falls efficacy, a related construct to fear of falling, which has been frequently examined in community-dwelling older adults (Denkinger, Lucas, Nikolaus & Hauer, 2015). As originally conceptualized by Tinetti, Richman & Powell (1990), older adults develop fear of falling and begin to limit their activities when are concerned they may fall while performing daily activities. Indeed, in our sample, residents in nearly every impairment group who had higher confidence that they would not fall during daily activities were less likely to have fear of falling. Other nursing home studies have used the original Tinetti falls efficacy measure (Kato, 2008; Kocic, 2016; Guzman, et al., 2013) as the only measure of fear of falling. As some items on the original tool may not be relevant to the daily lives of nursing home residents, such as preparing meals or cleaning house, we used the nursing home version to measure falls efficacy (Lach, Ball, & Birge), which has also been used successfully in a German nursing home study (Konner et al., 2016).

Beyond falls self-efficacy, we used a subscale of the NHFSS assessing outcome expectancy, as measured by participant ratings of their fears about being hurt or difficulty recovering from a fall injury. Outcome expectancy was independently predictive of fear of falling in the total sample and those with visual and hearing impairment groups in our study, and self-efficacy was predictive of fear of falling in those with visual and dual impairment. As a result, both of these related constructs may be important for understanding fear of falling in nursing home residents. Konner (2016) did not use this subscale in the German study because during translation their sample had difficulty answering these questions. In the current study, the participants were able to answer the question with a range of responses. Further research is needed to evaluate the relationships between fear of falling, falls self-efficacy, outcome expectancy, restriction of activity, and disability in this population, as well as the best way to measure these constructs.

Fear of falling was associated with negative outcomes including depression in the current study as well as prior studies (Lach & Parsons, 2013). Residents had significant depressive symptoms with an overall mean of eight positive symptoms, out of 30 on the measurement tool. Although we could not determine whether fear impacted depression or depression impacted fear of falling, these two factors continue to be associated. Mental health issues are

a critical issue in NH residents and need assessment and intervention, and further research is critical on their relationships with fear of falling.

Falls were not associated with fear of falling in any of the sensory impairment groups or the total sample as seen in previous nursing home studies (Lach & Parsons, 2013). The history of falls was based on the most recent MDS in the resident's medical record. Because the MDS is completed quarterly, falls may not have been recent, and falls may not have been captured in the MDS report. Hill Westmoreland and Gruber-Baldini (2005) found only fair agreement between falls documented on the MDS and those on the medical records of NH residents and under-reporting of falls in NHs common. As a result, we may not have captured all residents with falls. In contrast with our study, Guzman et al. (2013) found fear of falling associated with lower fall rates. Further exploration of the relationship of falls with fear of falling **and activity restriction** is needed in this setting.

In this study, higher cognition was associated with fear of falling. This effect was most prominent in the residents with hearing impairment. The mean score for this sample indicated many residents had some degree of cognitive impairment, although most were mild. This was expected as older adults with severe impairment were excluded from this study. Prior researchers identified moderate to high levels of fear of falling in older adults with mild cognitive impairment (Borges, Radanovi, & Forlenza, Uemura et al., 2012, Uemura et al., 2015). Others have suggested that with significant impairment, the ability to judge risk may decrease, thus reducing concerns about falling. Further studies are needed to explore changes in fear over time with changes in cognition.

Fear of falling was also associated with disability and lower mobility function as measured by two performance tests from the NHPPT. This finding is consistent with other studies of NH residents (Lach and Parsons, 2013) and community-dwelling older adults (Denkinger, Lukas, Nikolaus, & Hauer, 2015). The relationship between function and fear of falling is not clear. Difficulty with mobility may cause fear, and fear may result in poor performance on tests of physical function. Assessment of mobility along with fear of falling is important to improve physical function in NH residents and reduce disability.

Nursing home residents tend to develop increasing disability over time for many reasons. Fear of falling is associated with activity restriction in community populations (Denkinger, Lukas, Nikolaus & Hauer, 2015), and in the current study, most residents with fear of falling had lower, although non-significant activity levels than those without fear. Initiatives to help nursing home residents maintain appropriate concerns about falling, and maintain function are needed. Nursing home staff also have concern about falls, and may encourage restriction of activity (Fitzgerald, Hadjistravropoulos, & McNabb, 2009). The role of NH staff in encouraging activity and not reinforcing overly fearful worries needs to be explored. While we want NH residents to be appropriately cautious, we also want them to maintain appropriate activities to maintain strength and engage with others in meaningful activity.

There are a few potential limitations of this study. The findings may be limited by the sample size. When broken down by type of sensory impairment and presence of fear of falling, the groups were relatively small. Fear of falling was not a primary outcome of the

study, so limited detail was collected. Some variables may not have been collected that have been associated with fear of falling, such as balance (Lach & Parsons, 2013). This was a secondary analysis of the study baseline data, so it is not clear if fear of falling changed over time after interventions for sensory impairment were implemented. Despite these limitations, the sample was larger than most NH studies that included fear of falling, included measurement of several related constructs, and explored important groups of older adults with sensory impairment.

The findings have implications for practice. Fear of falling should be part of assessment of function and fall risk for NH residents. Asking if older adults are worried about falling is considered one of the three important fall risk screening questions for older adults by the Centers for Disease Control and Prevention (2017), along with history of falls and feeling unsteady. Interventions are especially indicated for residents who are sensory impaired, avoid social events, physical activity, and self-care, as they are high risk for debilitation. Promoting exercise and physical activity appropriate to each resident, and providing individualized therapy as needed improves fear of falling in community populations (Kumar et al., 2016). Providing adaptive equipment for residents who are sensory impaired as well as checking the function and cleanliness of NH residents' hearing aids and glasses must also be implemented in practice. Few interventions in the NH population have been developed or tested to address FOF in this population (Lach & Parsons, 2013). Quality studies are needed to design and test interventions.

Conclusion

Fear of falling as well as self-efficacy and outcome expectancy continue to be common and associated with negative outcomes in nursing home residents. When addressing FOF in NH residents it is important to address sensory status along with fear of falling to promote function. Sensory impairments are common, and often under diagnosed and untreated. While we identified several factors related to fear of falling in this population, further research is needed to determine the best approaches to improve function in NH residents, and address sensory impairment, fear of falling, depression, and mobility to reduce disability.

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Table 1.

Baseline Characteristics of ISEE Participants (N = 225)

Characteristic	n (%) or <i>M (SD)</i>
Age in years, <i>M (SD)</i>	86.24 (7.41)
Gender, n (%)	
Female	167 (74.2%)
Male	58 (25.8%)
Race, n (%)	
White	208 (92.4%)
Black	16 (7.1%)
Other	1 (0.5%)
Sensory Impairment, n (%)	
Vision	64 (28.4%)
Hearing	94 (41.8%)
Dual	67 (29.8%)
Comorbidity – CIRS, <i>M (SD)</i>	28.58 (3.97)
Cognition – MMSE, <i>M (SD)</i>	22.72 (4.81)
Depression – GDS, <i>M (SD)</i>	8.54 (5.72)
Function – NHPPT Total, <i>M (SD)</i>	15.87 (5.73)
Activity – BASE, <i>M (SD)</i>	12.09 (3.07)
MDS falls in last 30 days, n (%)	44 (19.6%)
Self-Efficacy subscale, <i>M (SD)</i>	4.04 (1.13)
Outcome expectancy subscale, <i>M (SD)</i>	3.56 (0.97)
Fear of Falling, n (%)	114 (50.7%)

Note. *M* = mean. *SD* = standard deviation. ISEE = Individualizes Sensory Enhancement for the Elderly study; CIRS = Cumulative Illness Rating Scale, MMSE = Mini-Mental State Examination, GDS = Geriatric Depression Scale, NHPPT = Nursing Home Physical Performance Test, BASE = Brief Assessment of Social Activity.

Table 2.
Descriptive Statistics by Fear of Falling in Total Sample and in each Sensory Impairment Group

Variable	Total Sample (N=225)			Visual Impairment (N=64)			Hearing Impairment (N=94)			Dual Impairment (N=67)		
	Fear (N = 114)	No Fear (N = 111)	p	Fear (n = 27)	No Fear (n = 37)	p	Fear (n = 49)	No Fear (n = 45)	p	Fear (n = 38)	No Fear (n = 29)	p
Fear of Falling												
Age, <i>M (SD)</i>	86.20 (7.78)	86.29 (7.05)	0.9305	85.63 (8.12)	82.76 (7.27)	0.1423	86.02 (7.59)	87.22 (6.55)	0.4150	86.84 (7.95)	89.34 (5.70)	0.1557
Gender, n (%)			0.0515			0.0948			0.6297			0.2393
Female	91 (79.8%)	76 (68.5%)		22 (81.5%)	23 (62.2%)		37 (75.5%)	32 (71.1%)		32 (84.2%)	21 (72.4%)	
Male	23 (20.2%)	35 (31.5%)		5 (18.5%)	14 (37.8%)		12 (24.5%)	13 (28.9%)		6 (15.8%)	8 (27.6%)	
Cognition – MMSE, <i>M (SD)</i>	23.44 (4.64)	22.00 (4.89)	0.0237	23.89 (5.12)	23.54 (4.25)	0.7675	24.53 (4.18)	22.07 (5.39)	0.0147	21.71 (4.45)	19.90 (4.18)	0.0943
Depression – GDS, <i>M (SD)</i>	9.73 (5.52)	7.32 (5.69)	0.0015	9.41 (6.81)	8.08 (6.31)	0.4251	9.02 (4.58)	6.91 (5.11)	0.0375	10.87 (5.60)	7.00 (5.81)	0.0076
Activity – BASE, <i>M (SD)</i>	12.04 (3.28)	12.14 (2.85)	0.8243	11.81 (3.65)	12.22 (2.67)	0.6127	12.90 (2.31)	12.09 (2.79)	0.1284	11.11 (3.84)	12.10 (3.24)	0.2643
Comorbidity-CIRS, <i>M (SD)</i>	28.66 (3.99)	28.50 (3.96)	0.7727	29.56 (3.61)	28.89 (4.05)	0.5005	29.20 (3.45)	28.22 (4.11)	0.2111	27.32 (4.61)	28.45 (3.72)	0.2837
Sit-Stand – NHPPT, <i>M (SD)</i>	1.81 (1.57)	2.52 (1.57)	0.0010	1.73 (1.54)	2.14 (1.72)	0.3411	2.16 (1.57)	2.69 (1.52)	0.1034	1.41 (1.54)	2.75 (1.40)	0.0006
6m Walk/Roll – NHPPT, <i>M (SD)</i>	2.29 (1.37)	2.85 (1.26)	0.0017	2.08 (1.32)	2.76 (1.40)	0.0573	2.57 (1.31)	3.07 (1.23)	0.0624	2.08 (1.44)	2.64 (1.10)	0.0904
Combined Mobility Items – NHPPT, <i>M (SD)</i>	4.11 (2.51)	5.37 (2.42)	0.0002	3.81 (2.55)	4.89 (2.66)	0.1106	4.73 (2.37)	5.76 (2.39)	0.0403	3.49 (2.55)	5.39 (2.08)	0.0020
Overall Function – NHPPT Total, <i>M (SD)</i>	14.80 (5.90)	16.95 (5.37)	0.0048	14.38 (6.34)	16.49 (5.84)	0.1795	16.61 (5.66)	18.13 (5.39)	0.1863	12.70 (5.25)	15.72 (4.45)	0.0158
MDS falls in last 30 days, n (%)	20 (18.7%)	24 (23.8%)	0.3708	4 (17.4%)	7 (21.2%)	0.7233	9 (19.2%)	13 (31.7%)	0.1747	7 (18.9%)	4 (14.8%)	0.7476
Self-Efficacy subscale, <i>M (SD)</i>	3.67 (1.16)	4.41 (0.96)	<0.0001	3.35 (1.33)	4.33 (1.02)	0.0015	4.10 (0.89)	4.35 (0.99)	0.2004	3.30 (1.19)	4.59 (0.84)	<.0001
Outcome expectancy subscale, <i>M (SD)</i>	3.92 (0.83)	3.19 (0.97)	<0.0001	3.93 (0.72)	3.11 (0.94)	0.0004	3.85 (0.96)	3.22 (0.97)	0.0023	4.00 (0.71)	3.26 (1.02)	0.0016

Note. MMSE= Mini-mental State Examination; GDS = Geriatric Depression Scale; BASE = Brief Assessment of Social Engagement; CIRS = Cumulative Illness Rating Scale; NHPPT = Nursing Home Physical Performance Test; NHESS = Nursing Home Falls Self-Efficacy Scale. *M* = Mean, *SD* = Standard Deviation.

Table 3. Univariate logistic regression model results for FOF in total sample and each of the sensory impairment groups

Variable	Total Sample			Visual Impairment			Hearing Impairment			Dual Impairment		
	OR	95% CI	p	OR	95% CI	p	OR	95% CI	p	OR	95% CI	p
Age, years	0.998	0.964-1.034	0.9301	1.052	0.983-1.127	0.1439	0.976	0.921-1.034	0.4114	0.948	0.881-1.021	0.1587
Gender			0.0531			0.1008			0.6298			0.2442
Female	1.822	0.992-3.346		2.678	0.826-8.686		1.253	0.501-3.132		2.032	0.616-6.699	
Male	REF	REF		REF	REF		REF	REF		REF	REF	
Cognition – MMSE	1.066	1.008-1.128	0.0251	1.017	0.912-1.135	0.7632	1.115	1.018-1.220	0.0186	1.103	0.983-1.238	0.0967
Depression – GDS	1.080	1.029-1.135	0.0020	1.032	0.956-1.115	0.4197	1.097	1.004-1.198	0.0413	1.132	1.029-1.245	0.0112
Activity – BASE	0.990	0.909-1.079	0.8234	0.958	0.815-1.127	0.6066	1.134	0.964-1.335	0.1294	0.923	0.802-1.062	0.2619
Comorbidity – CIRS	1.010	0.945-1.079	0.7715	1.047	0.918-1.193	0.4939	1.073	0.961-1.197	0.2106	0.937	0.833-1.054	0.2803
Mobility – Combined NHPPT Items	0.813	0.728-0.909	0.0003	0.853	0.701-1.038	0.1119	0.832	0.695-0.995	0.0438	0.702	0.549-0.896	0.0045
MDS falls in last 30 days			0.3723			0.7237			0.1783			0.6680
Yes	0.734	0.378-1.439		0.782	0.200-3.057		0.510	0.191-1.359		1.342	0.350-5.140	
No	REF	REF		REF	REF		REF	REF		REF	REF	
Falls Self-Efficacy subscale	0.515	0.387-0.684	<.0001	0.498	0.310-0.800	0.0040	0.745	0.474-1.171	0.2014	0.271	0.134-0.551	0.0003
Falls Outcome expectancy subscale	2.440	1.750-3.402	<.0001	3.385	1.584-7.235	0.0017	1.949	1.240-3.062	0.0038	2.752	1.412-5.364	0.0029

Note. Event = 'Fear of Falling', REF = Reference Category, OR = Odds Ratio, CI = Confidence Interval

Multivariable logistic regression model results for FOF in total sample and each of the sensory impairment groups

Table 4.

Variable	Total Sample			Visual Impairment			Hearing Impairment			Dual Impairment		
	OR	95% CI	P-value	OR	95% CI	P-value	OR	95% CI	P-value	OR	95% CI	P-value
Cognition – MMSE							1.104	1.004-1.214	0.0401			
Falls Self-Efficacy subscale	0.613	0.457-0.823	0.0011	0.570	0.340-0.955	0.0328				0.271	0.134-0.551	0.0003
Falls Outcome expectancy subscale	2.079	1.467-2.946	<.0001	2.807	1.287-6.122	0.0095	1.876	1.181-2.981	0.0077			

Note. Event = 'Fear of Falling', REF = Reference Category, OR = Odds Ratio, CI = Confidence Interval