ORIGINAL ARTICLE

The Relationship Between Falls and Psychological Well-Being in a Brazilian Community Sample

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Abstract In Brazil and in the United States, one in three older adults fall each year. Falling can lead to devastating outcomes for older adults, their families and health care systems. Research has identified many risk factors for falls, including physical and environmental hazards. However, less research has addressed the relationship between psychological well-being and falls, when the focus has usually been fear of falling and depression. Using a secondary dataset we tested the relationship between psychological well-being and falls in community dwelling older adults from the state of Rio Grande do Sul, Brazil. Analysis was conducted using logistic regression. Findings show that most of the psychological well-being variables are predictors of falls. Advanced age and not feeling calm and relaxed were the variables that showed more chances involved with falling. These research findings are important to increase the existing knowledge about falls in Brazil and provide information for professionals working in fall prevention.

Keywords Accidental falls · Psychological well-being · Aging

Introduction

In Brazil and in the United States, approximately one in three older adults fall each year and this ratio increases to one in two for older adults aged 80 years and over (Coimbra, Ricci, Coimbra, and Costallat 2010; Tinetti, Speechley, and Ginter 1988). Falls are an important cause of health problems and psychological impairment in older adults and their families because they can cause immobility, dependence (Pereira, Vogelaere, and Baptista 2008), a fear of falling, institutionalization, and increased mortality risk (Ministério da Saúde 2010; Roe et al. 2009). Apart from the negative consequences of falls for older adults and their family members, falls also affect health care systems and increase hospital and nursing home admissions (Bishop, Meuleman, Robinson, and Light 2007).

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According to Coimbra et al. (2010), among people living in the community, falls are more common for older women, especially with osteoporosis, during the post menopausal period (Ministério da Saúde 2010). Institutionalized older adults and those with diseases affecting muscle strength, balance and gait are more likely to fall (Coimbra et al. 2010).

In Brazil, according to data from 2010 Census report, the proportion of older adults increased from 5.1 % in 1991 to 5.8 % in 2000 and 7.2 % in 2010 (IBGE 2011). Approximately 15 % of the Brazilian population over 60 years old live in the state of Rio Grande do Sul. This state has the highest percentages of the elderly population in Brazil (IBGE 2009). The state is located in southern Brazil and it is estimated that the state population is around 11 million people. There are 497 cities in this state in an area of approximately 282 km^2 (IBGE 2013).

Falls have consistently been subject of academic research and much is known about this issue, risk factors, and ways to prevent them. The majority of research conducted on this subject has emphasized the physiological and environmental risk factors for falls. In addition, many studies that have focused on the effectiveness of fall prevention programs have suggested that they cannot work as well in "real life" as they do in research trials because most of the current programs do not consider the psychosocial effect of a fall, focusing only on the physiological risk factors, giving less importance to older adults mental health and social factors (Byers et al. 2008; Sjosten et al. 2008). Because of this, it is important to address other issues related to falls, like psychological well-being, in addition to physical impairment and environmental hazards, when trying to reduce the prevalence of falls. Research suggests that fallers are more depressed than non-fallers and that fear of falling can be present either in fallers and non-fallers (Downton and Andrews 1990; Whooley et al. 1999). Because of the fear, older adults tend to reduce the development of their regular activities (Leung, Chi, Lou, and Chan 2010). Depression is also associated with an increased risk of fractures, and this maybe because of the associated diseases these individuals have (Whooley et al. 1999). Another psychological factor that might impact older adults' risk of falling is subjective dizziness which was found to be associated with depression and anxiety (Downton and Andrews 1990). Leung et al. (2010) found a relationship among falling, depressive symptoms, fear of falling and decline in social activities in a Chinese sample of older adults. The present study focuses in the relationship between falls and older adult's psychological well-being, in an attempt to contribute to the knowledge related to falls in older ages.

According to the Ecological Systems Model, which is a dominant theory used to explain human behavior, elements from both micro and macro-levels systems can affect individuals' lives (Long and Holle 2007). As discussed by Long and Holle (2007), individuals affect the environment as the environment affects individuals and groups. The ecological theory can be used to explain the interaction between individuals and the environment, to explain specific facts and, therefore, have a holistic approach to the situation (Long and Holle 2007). According to Keller (2009), a holistic approach focuses on psychological, physiological, social, and environmental factors and their effects on individuals. As the relationship between psychological well-being and falls is less described in the literature, it was chosen to be explored in this article, do not underestimating the importance of the other risk factors, such as physiological, environmental and social.

Considering that falls are a serious public health issue and can compromise older adults' health and quality of life, it is extremely important to recognize all risk factors that might be involved with fall episodes and effective ways to prevent them. Research has been effective in identifying different risk factors for falling, especially the physiological and environmental ones. However, the relationship between psychological well-being and falls has not been broadly described, focusing mostly in depression and a fear of falling. The present article

focuses on the hypothesis that older adults with lower psychological well-being are more likely to have fallen in the past year than older adults with higher levels of psychological well-being.

Methods

This study focused on community dwelling older men and women, over the age of 60 years old, living in the state of Rio Grande do Sul, Brazil. We conducted secondary analysis of a dataset that was collected by a private company for the Pontifical Catholic University at Rio Grande do Sul and the Public Health School funded by a state grant. From the 497 cities in the state of Rio Grande do Sul, 39 were randomly selected to be part of the study. This was done with a multi-pronged sampling strategy that involved multi-cluster sampling, systematic sampling of households within the cluster of the neighborhood, and a random selection of an older individual within the household. In each city, census sectors were identified using the National Census information and randomly selected as well. The main project was entitled "The profile of older adults from the Rio Grande do Sul state", which methods were fully described previously elsewhere (Pereira et al. 2013).

Measures

For the purposes of this study, we focused only on questions that asked about psychological well-being. The dependent variable, falls, was identified with a question which asked if the respondent has experienced a fall. The question was worded asking if the individual fell to the ground in the last 12 months. If the answer was yes, it was asked how many times approximately.

There are a total of eight independent variables. The independent variables related to demographic information are: age (divided in age groups of 10 years old), gender, race (white, black and other), monthly household income [based on the Brazilian minimum wage, which was R$ 510 (US$296.77) in 2011]. Categories for this variable are no income, low income (0.1–2 minimum wages), medium income (2.1–4 minimum wages) and high income (more than or equal to 4.1 minimum wages). The last independent variable related to the demographic factors is educational attainment (illiterate - no education; low education - knowledge but no school to complete elementary school; medium/high education: above elementary school).

The next independent variables were used to describe older adult's psychological well-being: whether respondents reduced their usual activities due to emotional problems in the last 4 weeks (always, often, not often, didn't know), whether individuals felt relaxed and calm in the last 4 weeks (always, often, not often, didn't know), diagnosis of depression or a diagnosis of anxiety, which was self-reported. If respondents were diagnosed with these conditions they were asked if they have ever taken medication to treat depression or anxiety.

Analysis

Respondents who did not meet the criteria of cognitive ability, measured by the three- word recall test, were excluded from the analysis. The association between the dependent and independent variables was tested using complete and final logistic regression models. In the complete model all independent variables were included in the same logistic regression model. Variables that were not significant in this model were excluded sequentially, first by the least significant until all remaining variables were significant in the final model. So, the risk

associated with falls and these variables was calculated. For the analysis, the EPI INFO 3.5.3 package was used.

Results

The sample consisted of 7,184 older adults, including 3,713 women (51.7 %) and 3,471 (48.3 %) men. In order to describe the sample of the present study, demographic and fall frequencies are described in Table 1.

Approximately half of the sample is in the age group of 60–69 years old (52.6 %), more than half are white (68.8 %) and most of the respondents have low income (67.8 %) and low educational attainment (78.4 %). Just 9.8 % of the sample had a fall in the last year. Even though research suggests that 30 % of older adults fall in Brazil each year (Coimbra et al. 2010; Ministério da Saúde 2006), 9.8 % is still a considerable number.

Table 2 shows the results of the logistic regression models, verifying the association for predicting falls.

In the complete model, medication intake for anxiety and anxiety diagnosis did not have significant odds ratio for falls. In addition, neither educational attainment nor income and race had significant odds ratio in this first analysis. Excluding all no significant variables, the final

Table 1 Demographic and fall frequencies

Variables	Frequencies	Percent
Age		
60–69	3,778	52.6 %
70–79	2,485	34.6 %
80+	921	12,8 %
Gender		
Female	3,713	51.7 %
Male	3,471	48.3 %
Race		
White	4,945	68.8 %
Black	1,864	26 %
Other	375	5.2 %
Education attainment		
Illiterate	653	9.4 %
Low	5,439	78.4 %
Medium	525	7.6 %
High	323	4.6 %
Household income		
Low	4,834	67.8 %
Medium	1,111	15.5 %
High	354	4.9 %
No income	845	11.8 %
Had fallen		
No	6,480	90.2 %
Yes	704	9.8 %

Table 2 Complete and final logistic regression models predicting falls

Term	Odds ratio	P-value	Odds ratio	P-value
Age group (70–79/60–69)	2.1672	≤0.0001	2.2069	≤0.0001
Age group (80 anos+/60–69)	3.2467	≤0.0001	3.3255	≤0.0001
Gender (male/female)	0.7283	0.0002	0.7313	0.0002
Income (medium/low)	1.0945	0.4314		
Income (no/low)	0.9580	0.7453		
Race (other/white)	1.1211	0.5147		
Race (black/white)	0.9414	0.5323		
Educational attainment (illiterate/high)	1.4781	0.1473		
Educational attainment (low/high)	1.4311	0.1357		
Educational attainment (medium/high)	0.8959	0.7171		
Educational attainment (didn't know/high)	1.2468	0.5052		
Reduced activity (didn't know/no)	1.8887	0.0001	1.8651	0.0001
Reduced activity (yes/no)	1.8411	≤0.0001	1.8408	≤0.0001
Anxiety medication (yes/no)	1.1979	0.5834		
Anxiety diagnosis (yes/no)	1.5090	0.1394	1.6714	0.0015
Depression medication (yes/no)	0.5416	0.0402	0.5703	0.0571
Depression diagnosis (yes/no)	1.6731	0.0374	1.6376	0.0444
Feeling calm and relaxed (not often/always)	2.8850	≤0.0001	2.8983	≤0.0001
Feeling calm and relaxed (NSR/always)	1.8185	0.0288	1.7958	0.0312
Feeling calm and relaxed (often/always)	1.0401	0.7697	1.0363	0.7888

logistic regression model was achieved. All remaining variables, but gender and medication intake for depression, were positive predictors of falling. The variables that presented the highest odds ratio representing higher chances to falling are not feeling calm and relaxed (not often compared to always), age (age-groups 70–79 and 80+ compared with the 60–69 group), being women. Anxiety diagnosis seems to be a better predictor for falling than depression. Participants taking medications for depression showed protection for falling when controlling for the diagnosis of depression.

Discussion

The findings support the hypothesis that older adults with lower psychological well-being were more likely to have fallen in the past year than older adults with higher psychological well-being. According to Lindwall, et al. (2006), older adults who have changed their regular activities, becoming less active, reduce their psychological well-being, have higher levels of depression than the constantly active group of older adults. It is likely that this is a "chain-effect" in which individuals develop a fear of falling, become less active, reducing their functional and self-perceived health, increasing levels of depression and anxiety; all of these factors lead to an increased risk of falling. The order of factors causing this "chain-effect", however, cannot be inferred from these research findings due to lack of temporal data.

While medication intake is a known risk factor for falling, in this study medication for depression and anxiety was not associated with falls, in a controlled analysis. Research suggests that some medication, including antidepressants, has been associated with orthostatic

hypotension, defined as a drop of 20 mmHg or more in the systolic blood pressure between lying and standing. Orthostatic hypotension can cause dizziness, increasing the risk of falls (Rubenstein 2006). However, dizziness might be associated with psychological rather than physical symptoms. One study found that while depression and anxiety medication was associated with subjective dizziness, only sedatives showed a significant relationship with dizziness (Downton and Andrews 1990). It may suggest that symptoms related to falls depend on the type of medication used by the individual. Also, since depression and anxiety are risk factors for falling, the treatment for those symptoms seems to be protective.

The ecological systems model used as the framework for this study can help to understand the mechanisms underlying falls in older adults. The article is based on a larger study which comprised other variables, such as functional ability, multimorbidities, self-perceived environmental factors that could improve life at home, which are fundamental to describe this theory. However, in a preliminary analysis, it was found that less than 5 % of the participants responded that modifications in the environment would improve the development of activity of daily living, suggesting that those environmental factors are overlooked by the studied sample. In addition, in the same analysis functional ability and multimorbidities had a less significant relationship with falling. These findings go against many studies involving older adults, maybe because the studied population is independent community dwelling older adults, interviewed in their homes, with a mean age much younger than in other studies. It is also important to point out that older adults in Brazil are legally considered from 60 years old.

Findings from this study increase the knowledge about risk factors for falling, suggesting that psychological well-being has a relationship with falls. Therefore, it is important to look individuals as an entire unit, considering physiological, environmental, psychological and social factors, to understand falls and its consequences for the older adult population. Knowing that culture shapes the values and behavior of members of a specific place, it is especially important to look at individuals as a unit, trying to understand their behavior (Erez and Gati 2004). Rio Grande do Sul has great indicators of socioeconomic development, such as quality of life, life expectancy and low unemployment and illiteracy rates (IPEA 2012). All these facts put the population into some advantage. However, the current cohort of older adults living in the state has mostly low education, showing poor conditions in cultural, educational and social aspects in the first decades of this century, when this group was in school age (Conselho Estadual do Rio Grande do Sul 1997). In addition, when asked about their self-perceived health, the majority of older adults answer it was regular. There is a need to increase the qualification of health providers working with this age group. Also, improve the evaluation procedures, having a holistic view of the individual considering a life course perspective and increasing prevention of conditions affecting this population, including falls and chronic diseases (Conselho Estadual do Rio Grande do Sul 1997).

In Rio Grande do Sul, while the percentage of the older adult population is the highest in Brazil, older adults' mortality rate is in the 9th lowest place at the same time that children mortality rate is the 2nd lowest place. This comparison was made among the 26 states and the Federal District from the country (IBGE 2009). Additionally, the dependency rate for older adults is higher in Rio Grande do Sul when compared to the other Brazilian states. This is because there is a reduction in the fecundity rate and an increase in the mobility of young adults to other states (IPEA 2012). These facts suggest that there is a need to increase public policies for older adults, and improve healthy behaviors in this age group, especially in this state.

Apart from the relevant findings it is very important to point out the low number of older adults who reported falling in this study. As previously stated, 30 % of older adults fall each year, and just 9.8 % of the current sample reported falling. Perhaps the lack of agreement on

the best definition of a fall may have played a role in the way older adults interpreted and answered the question. In addition, the way the question was worded, asking if the individual "fell to the ground" may have caused different interpretations as well. Also, the majority of respondents in this sample were in the young-old group (60 through 69 years old). According to our findings, age is a predictor for falls especially in the age groups after 70 years old, increasing the risk steadily. Talbot, et al. (2005) found that 21 % of older adults from 46 to 65 years old fell in the 2 years of their study. As suggested by these authors and these study findings, the likelihood of falling increases with age. In addition, Ruthig, et al. (2007) suggest that younger older adults might experience less serious falls or recover more rapidly from their effects when compared to the oldest old group. Therefore, younger older adults may be at risk of under-reporting falls.

Another suggestion for the lower frequency of falls in this population is that falling is usually a very sensitive topic for older adults to talk about and they might deny having experienced a fall. Research has found that in older ages, falls can represent loss of control of their own body and many older adults relate falling to a loss of dignity (Mahler and Sarvimaki 2010). In their qualitative study regarding falling and its meaning for older men and women, Mahler and Sarvimaki (2010) found that participants avoided talking about falls and one participant, at the beginning of the interview, totally denied having experienced a fall, even though participants were selected from fall-registration sheets and from a course in fall prevention.

There are several limitations in this study. The use of secondary data limits the analysis of other important factors related to older adult's well-being that would be interesting to investigate, such as perceived social support and the presence of a fear of falling. In addition, although the interviews were conducted by trained interviewers, subjectivity is inherent to human beings and it could have interfered with some of the responses. For example, some questions may have been interpreted in different ways by different people, due to lack of specific definitions, such as the definition of falling. Also, some of the independent variables are self-reported measures, which can be a potential limitation for the study.

Another limitation of the study is that we cannot infer a causal relationship between psychological well-being and falls because of lack of temporal data. In this case, for example, having experienced a fall might have led to the development a fear of falling, depression or anxiety. At the same time, these conditions could have led older adults to reduce their activities, reduce functional health, deconditioning and ultimately to fall.

Further research should be developed to verify a causal relationship between falls and psychological well-being. Conducting longitudinal studies where it is possible to untangle the order of occurrence of events would be very important, so that it is possible to discriminate cause and effect and target them specifically in fall prevention programs. Also, it would be interesting to analyze the relationship between these variables in different groups, living in different areas of Brazil or different countries. We also suggest conducting qualitative research with in-depth interviews in order to understand the meaning of falling for older adults, especially considering how these psychological factors interact with physical factors to contribute to the risk of falling.

The results of this study add to the knowledge about falls, and can be used to help improve fall prevention programs. Previous research has been focused primarily on the physical and environmental factors related to falls. This study will help to broaden the focus when we think about falling and its risk factors. In addition, the use of a multistage random sample of more than 7,000 individuals makes the results significant for the older adult population.

Implications for Practice

To summarize, falls are an important problem among the older adult population and fall prevention programs are crucial to reduce the burden a fall can cause for older individuals, their families, and the public system. Identifying factors that are associated with falling can improve the efficiency of fall prevention programs. It is already known that environmental and physical factors can lead individuals to fall.

From the results of this study, most of the psychological well-being variables have been shown to predict falls, independent of other factors. Older adults who reported having low psychological well-being were more likely to have fallen in the last year than older adults with high psychological well-being. Therefore, these factors should be considered in fall prevention programs and medical consultation to prevent older adults from falling.

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