

Prevalence of fear of falling among a population of older adults and its correlation with mobility, dynamic balance, risk and history of falls

Prevalência do medo de cair em uma população de idosos da comunidade e sua correlação com mobilidade, equilíbrio dinâmico, risco e histórico de quedas

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Abstract

Objectives: To investigate the prevalence of fear of falling among a population of older adults and its correlation with mobility, dynamic balance, risk and history of falls. **Methods:** This was a randomized cross-sectional study. The participants were 147 older adults between the ages of 60 and 92: 94 women (65.95%) and 53 men (36.05%). Fear of falling was assessed using FES-I-BRAZIL (FIB); mobility, using the "timed up and go" (TUG) test; risk of falls, using the "functional reach test" (FRT); and dynamic balance, using the "tandem gait test" (TGT). **Results:** One hundred and thirty-three older adults (90.48%) reported fear of falling in at least one activity and 80 older adults (54.42%) had a history of falls (HF). Pearson's correlation was statistically significant ($p < 0.001$) between fear of falling and the TGT ($r = -0.44248$), FRT ($r = -0.51562$), HF ($r = 0.54069$), TUG ($r = 0.45738$) and age ($r = 0.39772$). **Conclusions:** The present study identified high prevalence of fear of falling among older adults in the community, independent of their history of falls, and significant correlations between fear of falling and mobility, dynamic balance, risk and history of falls.

Key words: fear of falling; accidents due to falls; older adult; mobility limitation; musculoskeletal balance.

Resumo

Objetivos: Investigar a prevalência do medo de cair em uma população de idosos da comunidade e sua correlação com mobilidade, equilíbrio dinâmico, risco e histórico de quedas. **Métodos:** Estudo transversal randomizado. Participaram do estudo 147 idosos com idades entre 60 e 92 anos, sendo 94 (65,95%) mulheres e 53 (36,05%) homens. O medo de cair foi avaliado usando FES-I-BRASIL (FIB), a mobilidade foi avaliada por meio do teste "Timed Up and go" (TUG), o risco de quedas, por meio do "Functional Reach Test" (FRT) e o equilíbrio dinâmico, pelo teste da Marcha Tandem (MT). **Resultados:** Cento e trinta e três (90,48%) idosos relataram medo de cair em pelo menos uma atividade, e 80 (54,42%) dos idosos apresentaram histórico de quedas (HQ). A correlação de Pearson demonstrou resultado significativo ($p < 0,001$) do medo de cair com MT ($r = -0,44248$), FRT ($r = -0,51562$), HQ ($r = 0,54069$), TUG ($r = 0,45738$) e idade ($r = 0,39772$). **Conclusões:** O presente estudo identificou alta prevalência de medo de cair nos idosos da comunidade, independente do HQ, e correlação significativa do medo de cair com mobilidade, equilíbrio dinâmico, risco e HQ.

Palavras-chave: medo de cair; acidentes por quedas; idoso; limitação da mobilidade; equilíbrio musculoesquelético.

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Introduction

Aging is a dynamic, progressive, and physiological process accompanied by morphological and functional changes, as well as biochemical and psychological ones, that cause a reduction in the functional reserve of organs and systems¹. Population aging is a worldwide trend, and Brazil is currently ranked seventh in the world for the number of older adults; it is expected to be ranked sixth by 2025. In response to this scenario, important studies have been developed to better understand this population and to provide better quality of life, reducing the deleterious effects of aging².

Falls among older adults are recurrent and multifactorial episodes^{3,4}, therefore examining an individual at risk of falling by considering only the physical risk factors is in a sense to neglect other important aspects that cause falls, such as the fear of falling². This is usually described as a feeling of great anxiety due to the idea of a real, apparent or imaginary danger of falls⁵. Current studies define the fear of falling as low self-efficacy or low confidence to avoid falls⁶⁻⁹. Self-efficacy is understood as self-confidence. It has been noted that people with self-efficacy are normally capable of overcoming challenging situations, focusing more on the tasks than on the obstacles, thus programming strategies to allow them to overcome their limitations⁶⁻⁸. In contrast, people with low self-efficacy tend to focus much more on their limitations, emphasizing their deficiencies. It is believed that people who resist uncomfortable situations by avoiding them may not develop the abilities needed to overcome such limitations and, instead, develop fear⁷.

Some participants reported not quite a fear, but a certain "concern" about falling. Thus, some studies^{7,9} prefer to use this term to avoid the stigma associated with fear, which can be interpreted as weakness. Although the exact causes are still unclear, some authors^{7,10-13} agree on the multifactorial etiology of the fear of falling, which is strongly related to adverse factors including reduced quality of life, reduction in mobility, decline in functionality, increased frailty, depression, environmental factors, and institutionalization. Furthermore, those who have a history of falls (HF) with one or more balance abnormalities are even more likely to express fear¹¹.

The functional decline resulting from fear leads to changes in balance, postural control, depression, anxiety, and reduced social contact¹². With the identification of post-fall syndrome and the use of the term *ptophobia* (a phobic reaction when assuming the orthostatic posture), the causal factors associated with the fear of falling have been increasingly investigated. Some authors associate the fear of falling with lost confidence to maintain balance or the inability to avoid falls, classifying it as pathological when it is exaggerated or disproportionate to the stimulus and interferes with quality of life, emotional

comfort or daily performance^{5,13}. Studies involving community-dwelling older adults (76.3±6.6 years) show that approximately 20 to 60% of this population have already experienced the fear of falling, with a higher frequency in women, particularly those who have a sedentary lifestyle¹³. The literature reports that the fear of falling can occur in 12% to 65% of community-dwelling, independent older adults over 60 and with no HF. For older adults over 60 with a HF, the fear of falling ranges from 29% to 92%¹³. Therefore, the fear of falling may or may not be associated with a fall. It must be pointed out, however, that individuals who have already experienced falls are more likely to express fear.

Fletcher and Hiredes¹² showed the correlation between balance deficit/mobility and the fear of falling. Outdoor activities impose greater demands on the vestibular system and they are the first activity that older adults tend to limit after suffering a deficit in balance¹². Miyamoto et al.¹⁴ highlight postural control, stability in the voluntary movements and reactions to external disturbances as basic elements for the existence of balance¹⁴. Although maintaining postural control appears to be a simple task, it involves the integration of the sensorial, nervous, and musculoskeletal systems, so that the center of body mass stays within a support base between the limits of stability and the center of gravity moves without changes to its support base^{2,15-18}. Whitney et al.¹⁹ showed that 25% of older adults diagnosed with vestibulopathy fell when submitted to computerized dynamic posturography.

The fear of falling has negative consequences for older adults' physical and functional well-being, degree of independence, ability to perform activities of daily living (ADLs) and restriction on physical activity, which explains the high prevalence of sedentary lifestyle in this age group. A sedentary lifestyle leads to reduced mobility and balance and, consequently, higher risk of falls and heightened fear that they might occur^{10-12,20,21}. In this context, fear of falling has been compared to a vicious circle that includes the risk of falls, deficit of balance and mobility, fear and functional decline resulting in more fear²². Due to the relevance of this issue among older adults, the aim of the present study was to investigate the prevalence of fear of falling in a community-dwelling older adult population and its correlation with mobility, dynamic balance, risk, and a HF.

Methods

This was a randomized, cross-sectional study with a sample of community-dwelling older adults over 60 without distinction of sex, race or socioeconomic class. The sample was selected by draw from the six PSF-PACS (Family Health Program – Community Health Agents' Program) from the city of Diamantina,

State of Minas Gerais, Brazil. The selected PACS included 253 older adults (136 women and 117 men) with complete registration details: address, date of birth, sex and name. The examiners were divided into groups 1 and 2.

Group 1

This group was in charge of making the first contact with the participants. It consisted in a home visit to make the invitation to take part in the research. Once the invitation was accepted, two tests were applied and the HF was investigated. The first test was the Mini-Mental State Examination (MMSE)²³ to verify the presence or otherwise of cognitive changes. The absence of a cognitive deficit is determined by values greater than 13 for illiterate individuals, 18 for individuals with incomplete primary education, and 26 for those with complete primary education, according to Bertolucci et al.²³. An interview was conducted using the Falls Efficacy Scale-International-Brazil (FES-I-BRAZIL), a version adapted and validated by Camargos⁷ and based on excellent psychometric properties for the Brazilian population taken from the Falls Efficacy Scale – International (FES-I). The FES-I is a version of the FES modified by a European organization named Prevention of Falls Network Europe (PROFaNE) which has existed for two years and has 25 partners. The FES-I-BRAZIL evaluates the fear of falling in 16 different daily activities, with values ranging from 16 points for the individuals who have no concern about falling to 64 points for those who are extremely concerned⁷. Finally, a self-report of HF in the previous six months was recorded. The interviewee who reported at least one fall in the previous six months was placed in the group who had already suffered a falling episode, according to Nevitt et al.²⁴.

Group 2

After the first evaluation, group 2 was responsible for repeating the visits made by group 1, without knowledge of the previous evaluations. This group was also responsible for applying three tests: the Timed Up and Go test, the Functional Reach Test and the Tandem Gait Test. The tests are described below.

Functional mobility test – Timed Up and Go (TUG)

In this test, the patient was asked to stand up from a chair (seat height = 45cm, and arm height = 65cm), then to walk for 3m, return and sit down again while the examiner recorded the time required to execute this task. The purpose of the test is to evaluate balance while sitting, transfers from sitting to standing, stability while walking, and change in direction of travel without the aid of any compensation strategy. Independent individuals without changes in balance are able to perform this

task in 10 seconds or less; those who are independent in basic transfers spend 20 seconds or less. The individuals who spend more than 30 seconds to execute the test are dependent in many ADLs and in their mobility, therefore have an increased risk of falling¹⁸.

Functional reach test (FRT)

This test consisted in asking the participant to stand up with the right shoulder next to the wall and perform flexion of the arm at 90°, keeping the fingers and thumbs flexed; then, the length of the right upper limb was marked on the ruler. After this procedure, the participant was asked to attempt to reach an object in front of him/her without stepping forward or making use of any compensation strategy. The distance covered was measured; distances under 15cm indicate frailty and risk of falls¹⁷.

Functional test for dynamic balance – Tandem Gait Test (TGT)

The participant was told to walk in such a way that the calcaneus of the non-dominant foot was ahead of the other foot's toes. Its interpretation consisted in the number of steps taken by the participant over a straight line. Taking 10 steps on the straight line indicates a good performance and normal balance; from 7 to 9 steps, an average balance deficit; from 4 to 7 steps, a moderate deficit associated with a fear of falling and insecurity; and less than 4 steps indicates a serious balance deficit and weak performance¹⁶.

Examiners

The examiners who took part in the research were trained by means of standardized instructions for test application. They were also trained on the criteria for participant inclusion and exclusion. The examiners of each group did not have access to the test results of the other group.

Inclusion and exclusion criteria

The criterion for inclusion was being 60 years of age or older. The exclusion criteria were: cognitive deficit according to the MMSE, aphasia, visual or hearing impairment that might prevent the participant from executing the physical tests or filling in the questionnaire, absence of mobility and dependence on walking aids. Of the 253 older adults registered in the PACS, 22 were excluded from the study due to a cognitive deficit, 19 due to absence of mobility, 3 due to visual impairment (total loss of sight), 5 due to hearing disorders that made it impossible to perform the tests, 9 who refused to take part in the research, and 48 individuals who were classified as absent (deceased, moved or hospitalized). All of the older adults included in the study signed a consent form, and the research was approved by the Research Ethics Committee

of Universidade Federal dos Vales do Jequitinhonha e Mucuri, under the protocol number 027/08.

Statistical analysis

Descriptive analysis was used to present the demographic data and the scores for each variable. Pearson's linear coefficient was used to investigate whether the variables FES-I-BRAZIL, TUG, TGT, FRT, HF, and age were correlated. A level of significance of 5% ($p < 0.05$) was adopted. The software package WINKS SDA6, version 6.0.5 was used in a Windows environment.

Results

The sample consisted of 147 older adults, including 94 women (65.95%) and 53 men (36.05%). Of the 147 participants, 133 (90.48%) had a fear of falling in at least one of the 16 tasks proposed by the FES-I-BRAZIL (score = 16 points; Table 1). The tasks that created the most anxiety associated with the fear of falling, and therefore had the highest scores, were: walking on a slippery surface (eg. wet floor) (345 points); walking on an irregular surface (with stones, full of holes) (319 points), climbing and descending stairs (304 points), walking up or down a steep incline (292 points), and taking a shower (277 points).

One hundred and eleven participants (75.51%) covered a distance of less than 15cm in the FRT, thus indicating the risk of falls. In the TUG, 116 (78.91%) of the older adults performed the test in 20 seconds or less and more than 10 seconds, which reveals a partial independence for basic transfers. In the TGT, 74 (50.34%) of the participants took less than 7 steps, which characterizes the fear of falling, 46 (31.29%) took 7 to 9 steps, indicating an average balance deficit, and 27 (18.37%) were able to take 10 steps, showing a good performance and normal

balance. Of the 80 (54.42%) older adults who had a HF, 77 (96.25%) had a fear of falling, and only 3 (3.75%) did not report being afraid of falling.

Pearson's correlation showed significant results ($p < 0.001$) for all relationships. There was a positive low-to-moderate correlation between: FES-I-BRAZIL and HF ($r = 0.54069$); FES-I-BRAZIL and TUG ($r = 0.45738$); FES-I-BRAZIL and age ($r = 0.39772$); and a negative moderate correlation between the FES-I-BRAZIL and FRT ($r = -0.51562$); FES-BRAZIL and TGT ($r = -0.44248$; Table 2).

Discussion

The results obtained in the present study show that most of the participants had a fear of falling regardless of the HF. Of those who had a fear of falling (90.48%) in at least one of the tasks proposed by the FES-I-BRAZIL scale, only 54.42% reported a HF. Scheffer et al.¹⁰ stated that even older adults with no HF can have a fear of falling. Studies^{10,11,13} reveal that the prevalence of the fear of falling in the older population varies from 20% to 85%. This fear can be protective when the older adult is more careful to avoid risk, but it can also become a risk when it imposes limitations and a lack of self-confidence^{7,21}. The fear of falling has been described as independent of a past experience involving falls²⁵, and the increase in post-fall fear is more associated with the type of fall than with the fall itself. Salked et al.²⁶ explain that falls resulting in serious injury cause a significant increase in fear; in fact, the HF is considered the main risk factor for the manifestation of fear. This finding is in line with the present study because 96.25% of the individuals with a HF had a fear of falling, a greater prevalence of fear than that found in the total population (90.48%). It was also observed that there is a significant moderate correlation between the FES-I-BRAZIL scale and the variables TUG, FRT, and HF. Vellas et al.²⁷ report

Table 1. Description of the variables age, FRT, TUG, FES-I-BRAZIL, TGT and HF.

Variables	Mean (\pm SD)	Values Minimum-Maximum	Score	n (%)
Age (years)	71.38 (7.47)	60.33-92.83		
FRT (cm)	12.93 (3.41)	1.00-19.40	≥ 15 cm	36 (24.49%)
TUG (s)	17.73 (7.58)	9.81-91.15	≤ 10 seconds	4 (2.72%)
			20 e > 10 seconds	116 (78.91%)
			30 e > 20 seconds	24 (16.33%)
			> 30 seconds	2 (1.36%)
FES-I-BRAZIL	24.01 (7.60)	58-16	16 points	14 (9.52%)
			> 16 points	133 (90.48%)
TGT (number of steps)	6.06 (2.97)	0-10	< 7 steps	74 (50.34%)
			$> 7 < 9$ steps	46 (31.29%)
			10 steps	27 (18.37%)
HF				80 (54.42%)

FRT=Functional Reach Test; TUG=Timed Up and Go; FES-I-BRAZIL= Falls Efficacy Scale-International-Brasil; TGT=Tandem Gait Test; HF=History of Falls; SD=standard deviation.

that a mobility deficit caused by fear of falling indicates that this fear has been manifesting itself for a longer period of time to the point that it hampers mobility. It is also known that 15 to 20% of older adults who are afraid of falling have a mobility deficit²⁸. Clague, Petrie and Horan²⁸ point out that older adults with a fear of falling use different strategies and are more careful to maintain balance during gait which can result in a prolonged double-limb support phase and a shorter swing phase, which is a phase of greater instability and single-limb support. There is also a reduction in propulsion, knee extension, widening of the support base, decreased height and length of step and, consequently, a reduction in speed. These are all strategies to reduce the risk of falls. Restrictions to mobility will result in a loss of physical conditioning, muscle atrophy, balance deficit and dependence to execute ADLs^{21,27,29}.

The current study showed, by means of the TUG score, that 116 (78.91%) of the older adults were partially independent in transfer activities and that the average time taken to perform the test was 17.73 (± 7.78) seconds. Dekbaerem et al.²⁰ reported that the fear of falling can result in simultaneous recruitment of the agonist and antagonist muscles which lead to a certain postural rigidity, abnormal gait, inadequate postural strategies, insecurity, dependence on devices to guarantee stability (such as orthoses), and an increased risk of falls. The studied population had a mean value of 12.93cm (± 3.41) in the FRT, and 111 (75.51%) of the participants covered less than 15cm, which indicates a risk of falls for this group. The FRT is a test that requires a change in the postural configuration, which promotes instability due to a forward projection of the body, simulating a reaching activity. The inability to execute it suggests the presence of a balance deficit, thus compromising the stability, which indicates a greater proneness to fall².

The significant correlation between the FES-I-BRAZIL scale and the TGT must be highlighted because the interpretation of the test reveals that a number of steps less than 7 indicates a fear of falling¹⁶; therefore the findings of the present study corroborate this fact as 68 (91.89%) of the 74 participants with a number of steps less than 7 reported

being afraid of falling and the average number of steps in the general population was 6.06 (± 2.97).

The highest scoring activities of the FES-I-BRAZIL scale can simulate a situation outside the home, drawing attention to the risk of social exclusion and restriction of activities, a recurrent fact among older adults who manifest the fear of falling. When older adults avoid challenging situations outside the home, they restrict themselves to the household environment. Camargos⁷ reported that outdoor and social activities are considered the most difficult by older adults and are the first to be given up when there is some balance deficit. Martin et al.²¹ reported that the risk of future falls among older adults who have a fear of falling is increased when they restrict their activities. The authors found an association between deficits in lower-limb strength with restrictions to physical activity. Furthermore, these restrictions were correlated with low physical performance and a reduction in maximal muscle strength. As a hypothesis, the authors suggested that such an event occurs due to lack of use, consequently resulting in more falls and strength deficit.

Given that the manifestation of the fear of falling has been pointed out primarily as a consequence of mobility and balance deficit and not of psychological effects²¹ and that the greatest risk factor for fear of falling is the occurrence of one or more falls¹⁰, the present study identified a significant moderate correlation between fear of falling (FES-I-BRAZIL) and mobility (TUG), dynamic balance (TGT), risk of falls (FRT) and HF. The study also showed a significant moderate correlation between TUG, FRT and TGT. Dite and Temple³⁰, in a clinical test to identify multiple falls, highlighted the correlation between TUG and FRT as an indicator of multiple falls. The authors commented that, when preserved, balance and mobility are important resources to ensure the stability needed to maintain a standing position, thus generating a feeling of self-confidence. Also, the study developed by Oscan et al.³¹ showed that longer TUG performance was associated with shorter distances in FRT. They also showed that older adults with greater physical deterioration had compromised balance and gait, as well as a high risk of falling³¹.

The low correlation between the FES-I-BRAZIL and age was significant. Most studies highlight aging as one of the risk factors for the fear of falling on the grounds that advanced age is indicative of a decline in functional reserve and that the perception of these losses can generate a feeling of low self-efficacy and fear of falling^{7,9-13,20-22,25,27,29}. Andresen et al.⁶ did not detect any statistical correlation between aging and HF; they attributed their result to the fact that the population of their cohort study was younger (age 49-65). Although advanced age is indicative of a decline in functional reserve, it does not determine the individual's physical condition^{2,32}. Some studies^{2,7,11-13,32} also reveal that the multifactorial etiology of the fear of falling

Table 2. Correlation between variables FES-I-BRAZIL, age, TUG, MT and FRT.

Variables	FES-I-BRAZIL	Age	TUG	MT	FRT
		Pearson's Linear Coefficient			
HF	0.59069*	0.39550*	0.27026*	0.38677*	-0.41189*
FRT	-0.51562*	-0.42178*	-0.59007*	0.74722*	
MT	-0.44248*	-0.44444*	-0.48885*		
TUG	0.45738*	0.31943*			
Age	0.39772*				

*All of the correlated variables had a significance level of $p < 0,001$; FES-I-BRAZIL= Falls Efficacy Scale-International-Brazil; HF=History of Falls; FRT=Functional Reach Test; TGT=Tandem Gait Test; TUG=Timed Up and Go.

and of falls require careful analysis that takes into account possible causal factors and the relationship between them, since these factors are rarely found in isolation. The present study stands out for its reproducibility and low cost, although limited to the population with preserved mobility and independence from walking aids.

Conclusion ::::

This research identified a high prevalence of fear of falling among community-dwelling older adults and a significant correlation between the fear of falling and the mobility, dynamic balance, age, risk, and HF of these individuals.

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