

Assessment of balance and level of functional independence of elderly persons in the community



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Abstract

Objectives: To compare the balance and level of independence of elderly persons and to correlate these variables with age, cognitive status and number of medications taken. **Methods:** A total of 172 individuals, aged over 60 and without cognitive deficit were included in the study. The risk of falls was performed using the Berg Balance Scale and functional independence through the Barthel Index. Correlations were performed by Spearman's correlation index, and association was tested with the chi-square test, with $p \leq 0.05$ considered significant. **Results:** There was a moderate correlation between the risk of falls and functional independence ($r=0.38$; $p<0.0001$). There was also a statistically significant correlation between age and risk of falls ($r=-0.43$; $p<0.0001$). With regard to the association between the risk of falls and drugs, it was observed that elderly people who took three or more medications fell twice as often ($p<0.0001$). **Conclusion:** The results found a correlation between the risk of falls and functional independence, and also that older elderly persons, and those who took a greater number of medications, were more at risk of falls.

Key words: Aging; Postural Balance; Dependency; Activities of Daily Living.

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INTRODUCTION

Ageing is a normal, progressive and dynamic process that is described as a collection of morphological, physiological, biochemical and psychological changes, characterized by the progressive loss of adaptability of an individual to the environment into which he or she is inserted.^{1,2}

The changes that occur during aging, when combined with disease, use of medication and a sedentary lifestyle, can become potential factors for falls.²

According to Ribeiro et al.³ a fall is "a non-intentional event the result of which is the individual's change of position to a lower level in relation to his/her initial position, which the individual is unable to correct in a timely manner using the ground as support."

With advancing age there is a significantly increased risk of falls. In elderly persons aged 65 or older, it is estimated that the incidence of falls is between 28% and 35%, while for individuals aged over 75 this incidence, by age group, it ranges from 32% to 42%, with more than 70% of falls occurring at home and more than two thirds of those who suffer a fall falling again within six months. Moreover, there is a causal relationship between falls and 12% of all deaths among the elderly population, and falls are the sixth leading cause of death in elderly persons aged over 65.⁴⁻⁶

To satisfactorily perform activities of daily living, such as getting up from or sitting down in a chair or going for a walk, the ability of maintaining balance and postural control is essential.⁷

The level of independence of elderly persons declines with the occurrence of falls. Functional independence can be defined, according to Scattolin et al.,⁸ as the "ability to perform a task by oneself". It is linked to mobility and

functional capacity, which allow the individual to perform activities of daily living without help. In other words, independence implies possessing the satisfactory motor and cognitive conditions to perform such activities.⁹

Therefore the natural changes that occur when entering old age can lead to increased disability and changes in functions, reactions and conditions relating to the environment, rendering the individual more susceptible to falls. These in turn become important factors in the decline of the quality of life of senile elderly persons, as they reduce the degree of functionality and functional independence.¹⁰

The hypothesis of the present study, therefore, was that older elderly persons are more at risk of suffering falls and becoming more functionally dependent, as well as being susceptible to the interference of other variables such as age, cognitive status and medications on postural balance and functional dependence.

The present study aimed to compare the balance and degree of independence of elderly persons living in the community and to correlate these variables with age, cognitive status and the number of drugs used.

METHODOLOGY

A cross-sectional study of 172 non-institutionalized elderly people (117 women and 55 men) living in the city of Marília, in the state of São Paulo, was performed from November 2012 to July 2013.

Before the test was carried out a self-report questionnaire was applied to collect the personal data of all the participants (name, age, marital status, educational level, number of medications used, physical exercise).

The inclusion criteria of the study were that the individual should be: (1) aged over 60; (2) not

suffer from diseases that interfere with balance, and (3) be able to understand verbal commands. Cognitive screening was conducted using the Mini Mental State Examination (MMSE). The cut-off score was defined by educational level, with participants achieving a ≥ 18 score included in the study.¹¹

Balance was evaluated using the Berg Balance Scale (BBS), developed and validated by Berg et al.¹² This consists of 14 common tasks involving static and dynamic balance. The tasks are evaluated by observation, using an ordinal scale of five alternatives, ranging from zero (unable to perform the task) to four (performs the task independently), giving a maximum total score of 56 points. The score decreases if the task is not performed within a time limit or the individual requires supervision or external assistance to execute the task.¹³ A score of ≥ 48 was adopted to indicate an increased risk of falls.¹⁴

The Barthel Index is used to evaluate activities of daily living (ADLs) and measures functional independence in personal care, mobility, locomotion and eliminations. This instrument produces a score based on the evaluation of ten self-care activities: feeding, bathing, dressing, grooming, toilet use, fecal incontinence, urinary incontinence, climbing stairs, transfers (or wheelchair use) and walking on a flat

surface. A score of 100 points (90 points for people in wheelchairs) is needed for maximum independence, which means independence in all items. A score of ≥ 60 points is classified as slight dependence; 40-55 points = moderate dependence; 20-35 points = severe dependence, and < 20 points = total dependence.¹⁵

The characteristics of the participants were presented as mean \pm standard deviation (SD). The Kolmogorov-Smirnov test was applied to assess normality of data. Correlations were made using the Spearman's rank correlation coefficient and associations were tested using the chi-square test. A value of $p \leq 0.05$ was considered significant.

The present study was approved by the Research Ethics Committee of the Faculty of Philosophy and Science of the Universidade Estadual Paulista, Marilia campus, under registration number 1.584/2009. The elderly individuals who participated in the study signed a Term of Free and Informed Consent.

RESULTS

Table 1 shows the characteristics of the elderly persons by age, drugs used, MEEM, and Berg Balance Scale and Barthel Index scores.

Table 1. Sample characteristics. Marilia, SP, 2013.

	Women	Men	<i>p</i>	Total
n	117	55		172
Age \pm sd	70.2 \pm 5.5	70.7 \pm 6.9	0.68	70.3 \pm 6.0
Medications \pm sd	2.64 \pm 1.9	2.41 \pm 2.6	0.09	2.57 \pm 2.1
MEEM \pm sd	26.4 \pm 2.4	27.0 \pm 2.4	0.05	26.6 \pm 2.4
Berg Scale \pm sd	51.5 \pm 3.7	51.5 \pm 4.1	0.76	51.5 \pm 3.8
Barthel Index \pm sd	98.4 \pm 2.9	99.7 \pm 2.0	0.01	98.8 \pm 2.7

sd= standard-deviation; MEEM= Mini Mental State Examination.

In Figure 1, BBS scores ranged between 35 and 56 points, while Barthel Index scores varied from 85 to 100 points. A moderate

correlation between the risk of falls and the level of functional independence was observed ($r= 0.38$; $p<0.0001$).

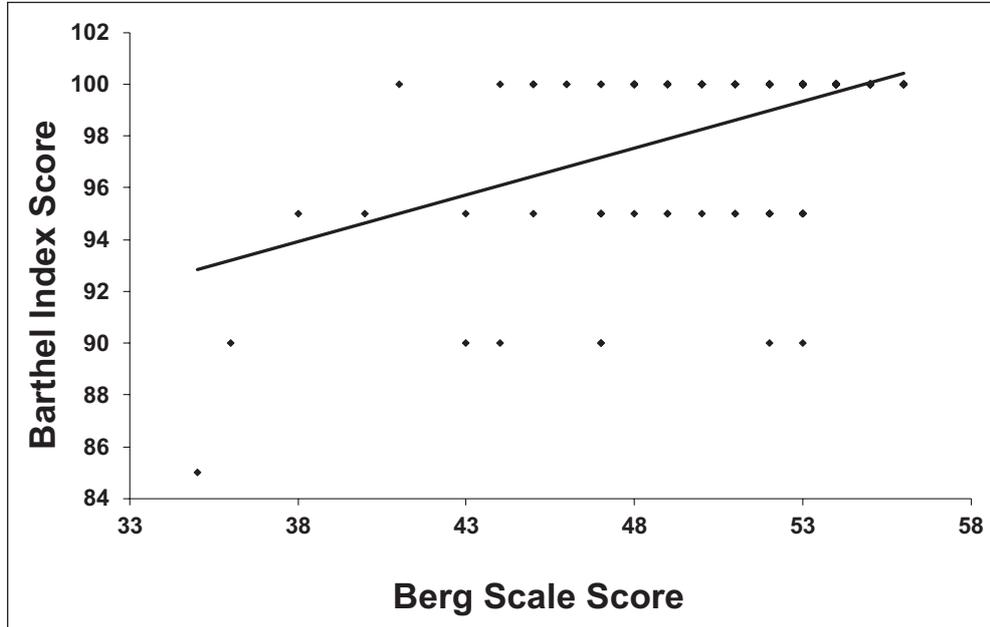


Figure 1. Correlation between Berg Scale and Barthel Index (n=172). Marilia, SP, 2013. $r=0.38$; $p<0.0001$.

Figure 2 shows the correlation between age and the risk of falls among the elderly, ($r=-0.43$; $p<0.0001$).

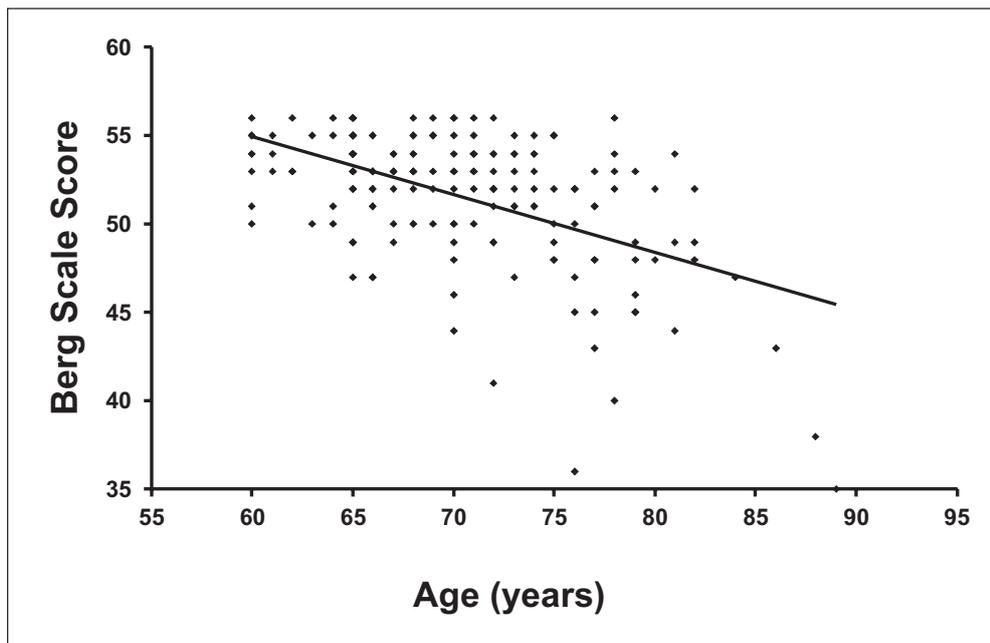


Figure 2. Correlation between age of study participants and Berg Balance Scale Score (n= 172). Marilia, SP, 2013. $r=-0.43$; $p<0.0001$.

Figure 3 shows the association between the number of drugs used by elderly persons in the community and the risk of falls. It was

observed that the risk of falls was 2.2 times greater among elderly persons taking three or more medications.

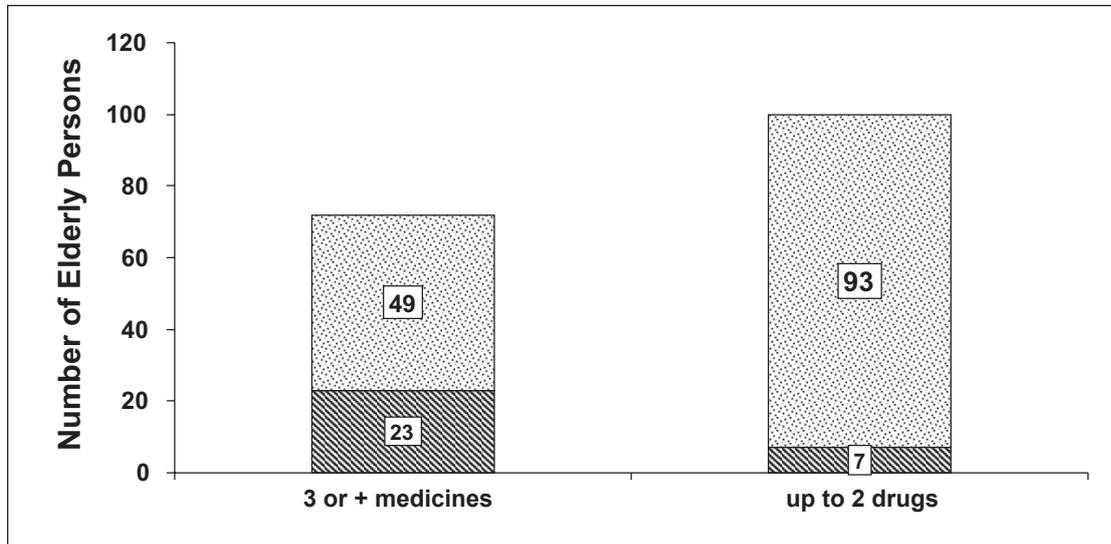


Figure 3. Association between number of medications used and risk of falling (n=172). Marilia, SP, 2013. RR = 2.22; $p < 0.0001$.  higher risk  lower risk

The correlations between the following data were analyzed: age and MEEM ($r=-0.23$; $p<0.0019$), MEEM and Berg Scale ($r=0.28$; $p<0.0001$), age and Barthel Index ($r=-0.19$; $p<0.0123$), and MEEM and Barthel Index ($r=0.18$; $p=0.016$). It was observed that elderly persons older than 79 were 0.66 times more at risk of suffering falls (RR=0.66; $p<0.0001$) than younger elderly persons.

Of the 172 elderly persons evaluated, 51 (29.6%) described having suffered one or more fall in the year prior to the study.

DISCUSSION

A significant correlation was observed between BBS scores and the level of functional independence for the performing of ADLs, a finding that was also observed in studies by Gomes et al.,¹⁶ Brito et al.¹⁷ and Nunes et al.¹⁸ A study by Celich et al.¹⁹ found that falls result in limitations to the daily lives of elderly persons,

leading to such as difficulties in performing domestic tasks, impaired walking and needing help to carry out personal hygiene. This data shows that reduced postural balance is related to greater difficulty in performing ADLs among the elderly.²⁰

According to the Brazilian Society of Geriatrics and Gerontology,⁶ individuals aged from 75 to 84 years that needed help in activities of daily living (feeding, bathing, grooming, dressing, getting out of bed, urinary and fecal incontinence) were 14 times more likely to fall than persons of the same age who were functionally independent.

Advanced age may bring decreased muscle strength and flexibility, and loss of stability and joint movement, as well as changes to the sensory, vestibular, somatosensory and nervous systems. Such changes result in the impairment of postural control mechanisms and altered posture, gait and balance.^{13,21}

The present study found that the risk of falls among elderly persons over the age of 79 years was 0.66 times higher than individuals aged 60-78 years. This correlation between age and risk of falls has also been identified in other studies. Gawryszewski²² found that there was a higher incidence of falls among older seniors, or in other words, those aged 80 or older, than among individuals aged between 60 and 79 years. Meanwhile Freitas & Scheicher²³ found that the highest incidence of falls among the elderly was among the 75-84 age group, as the activities of elderly persons aged 85 or more decreased naturally.

Some drugs can cause side effects such as dizziness and reduced reflexes, which can lead to falls and consequent fractures.²⁴ The continued use of a large number of drugs has become common among elderly persons and is an important cause of falls, with physical, psychological and social consequences, limiting the autonomy of the individual.²⁵

The present study showed that elderly persons taking three or more medications were at twice as much risk of falls than elderly persons who took up to two medications. This relationship between medication and falls was also observed in the study by Biazus et al.,²⁶ which found that elderly persons of all age groups ingested large quantities of medications, and reported having suffered falls while using the drugs.

Huang et al.²⁷ and Ray & Wolf²⁸ showed that polypharmacy (use of five or more drugs)

displayed a statistical predictive value for falls. The study by Roberts & Ciosak²⁹ showed that elderly persons who took medication over a continuous period were more likely to fall. In the present study, drugs, which have been found in some studies to be an important risk factor for falls, were not divided by class (anxiolytics, antihypertensives, diuretics). The study described only the number of drugs that are ingested by older people and their relationship to falls, which could lead to a future study that separates medications by class.

Among the limitations of the present was the difficulty of finding men who agreed to participate in the survey, meaning that it was not possible to make a comparison between men and women. It should also be noted that the sample was mainly composed of healthy elderly persons, who are generally more autonomous when it comes to performing ADLs.

CONCLUSION

The results of the present study found a correlation between the risk of falls and functional independence, indicating that the higher the risk, the greater the degree of dependence of the elderly person. It was also observed that advanced age is associated with an increased risk of falls, and that using a greater number of medications leads to a higher risk of falls, revealing the importance of carefully evaluating the medical and pharmaceutical needs of this population.

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