ORIGINAL ARTICLE

Effects of physical training and dual task on ptophobia and balance in the elderly

Efeitos do treinamento físico e de dupla tarefa na ptophobia e no equilíbrio de idosos

Renan Nunes Aguiar[1], Carolina Milhim Barcellos[1], Luiz Duarte de Ulhôa Rocha Júnior[2], Daniel Vicentini de Oliveira[3], Lilian Cristina Gomes do Nascimento[1]

ABSTRACT

Falls cause to the elderly several alterations in their biopsychosocial function, which may cause the appearance of ptophobia and decline in balance, thus requiring preventive programs that offer support to this population. **Objective:** This study compared the effect of the training protocols in relation to fear of falls and the balance of elderly. **Methods:** Thirty elderly people who met the inclusion and non-inclusion criteria were selected. They were randomly divided into three groups (physical training group, dual task and control group). The Falls Efficacy Scale - International (FES-I) and the Berg Balance Scale (BBS) were used as instruments for data collection. Data were analyzed by ANOVA and t-Student test. **Results:** All participants were female, with an average age of 67.4 ± 6.69. There were no significant differences between the groups analyzed in both FES-I and BBS scores. Regarding the comparison between the intervention groups and the control group, differences were found only in the FES-I scores after the interventions, with p= 0.00. In the comparison between the groups, FES-I and BBS after the interventions obtained significant scores, both having p= 0.00 and effect size of 11.54 and 4.54, respectively. **Conclusion:** In the groups that had interventions, the fear of falls decreased in relation to the group that did not receive any intervention, and the balance improved with both interventions, thus demonstrating that physical exercise associated or not with cognitive activity is beneficial to the elderly.

Keywords: Accidental Falls, Cognition, Fear, Exercise, Aged

RESUMO

As quedas ocasionam aos idosos diversas alterações na sua função biopsicossocial, podendo ocasionar o surgimento da ptophobia e declínio do equilíbrio, sendo necessários programas preventivos que ofereçam suporte para essa população. **Objetivo:** Este estudo comparou o efeito de dois protocolos de treinamentos em relação ao medo de quedas e o equilíbrio de idosos. **Métodos:** Foram selecionados 30 idosos que se enquadravam nos critérios de inclusão e não inclusão, os mesmos foram divididos aleatoriamente em três grupos (grupo de treinamento físico, dupla tarefa e controle) e tiveram como instrumento para a coleta de dados a Escala Internacional de Eficácia de Quedas (FES-I) e a Escala de Equilíbrio de Berg (EEB). Esses dados foram analisados pela ANOVA e pelo teste t-Student. **Resultados:** Todos os participantes foram do sexo feminino com média de idade de 67,4±6,69. Não se evidenciou diferenças significativas entre os grupos analisados tanto nos escores da FES-I como da EEB. Em relação a comparação entre os grupos de intervenções e grupo controle foram encontradas diferenças apenas nos escores da FES-I após às intervenções, possuindo p= 0,00. Na comparação entre os grupos, a FES-I e a EEB após as intervenções obtiveram escores significativos, ambas possuindo p= 0,00 e tamanho de efeito de 11,54 e 4,54, respectivamente. **Conclusão:** Observou-se que nos grupos que tiveram intervenções, o medo de quedas diminuiu em relação ao grupo que não recebeu nenhuma intervenção e o equilíbrio melhorou diante ambos protocolos, demonstrando que o exercício físico associado ou não à atividade cognitiva é benéfico aos idosos.

Palavras-chaves: Acidentes por Quedas, Cognição, Medo, Exercício

[1] Universidade de Franca - UNIFRAN
[2] Universidade Federal de Uberlândia – UFU
[3] UniCesumar

Corresponding
Renan Nunes Aguiar
E-mail: renannunesaguiar15@hotmail.com

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INTRODUCTION

Human aging triggers changes and declines in all body systems, hence leading to lower levels of physical activity and lower social interactions. The elderly tend to have their balance compromised, which can signal a greater fragility and/or dependence, whether from a caregiver or in the use of auxiliary walking devices.[1]

Postural balance requires integrated actions between the vestibular, somatosensory and visual systems, which capture information from the environment in which the individual is located and send it to the central nervous system for this information to be integrated.[2] For didactic purposes, the balance can be divided into semi-static and dynamic, with semi-static balance being considered when the individual maintains a steady position with the least possible oscillation, and dynamic balance is that one necessary when performing a task and remains stable, such as walking and running.[3]

Due to aging, the balance patterns suffer declines, progressively decreasing the reaction strategies of episodes of falls, which often brings, among other factors, the increased risk of falls and the emergence of fear of falling, also known as ptophobia.[4] Ptophobia has an important psychological impact, as it predisposes the elderly to loss of confidence in balance, to a functional decline, reduced life quality, increased use of medications, restriction in activities of daily living and risks of new falls.[5]

Several intervention strategies should be used in order to prevent falls, including exercises that focus on improving balance. In addition to training to improve physical capacity,[6] cognitive activities to refine movements also contribute to improving balance.[7] The dual task is one of those associations that simultaneously perform a primary task with other secondary tasks. Primary tasks are generally motor, while secondary tasks can be motor, cognitive or motor-cognitive, being associated with an executive function at the cortical level.[8]

In view of the growth of the elderly population, physical therapy needs to improve its approaches to develop new specific interventions, prioritizing strategies that aim to improve the functional performance of the elderly. Although there are several established therapeutic resources, most of these are used in isolation and not compared or used concomitantly.[9]

It is recommended that physical therapy practices be supported by scientific evidence and this study contributes to the spread of theoretical and practical framework regarding issues related to physical training and dual tasks in the elderly.

No studies were found in the literature that referred to the physical training approach compared to the double task in fear of falls and balance, and the findings of the present research can be used by health professionals to provide the elderly with greater independence, gaining self-confidence and improvement in functional performance.

OBJECTIVE

The objective of this study was to compare the effect of two training protocols in relation to fear of falls and balance of the elderly.

METHODS

This is a cross-sectional study, with an experimental character and a quantitative approach.[10] The research was carried out in a Rehabilitation Center in a municipality in the state of Minas Gerais, Brazil. Firstly, 30 elderly people who showed interest in participating in the research and who met the inclusion and exclusion criteria were selected.

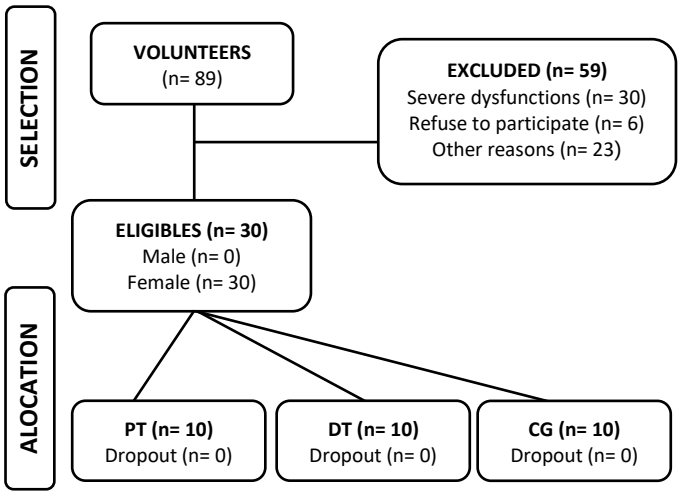
People aged 60 or over, of both sexes, with minimum scores on the Mini-Mental State Examination corresponding to a preserved/normal cognitive function (24 or more), literate, with at least elementary school education and residents of the city in question were included.

The non-inclusion criteria were elderly people with neurological diseases, severe lower limb dysfunction, individuals with uncorrected visual changes, and musculoskeletal and biomechanical disorders that would prevent the execution of the proposed protocol. Participants were recruited through invitations made in person and through dissemination on social networks and on local radio stations.

To assess the fear of falling, the Falls Efficacy Scale - International (FES-I) was used, which has 16 domains with different activities of daily life, with scores ranging from one to four. The total value of the score can vary from 16 to 64, with lower values representing lower concern about falls and higher values representing higher concern about falling.[11]

Balance assessment was performed using the Berg Balance Scale (BBS), which presents 14 tasks that simulate daily activities. Each activity has five alternative answers, ranging from zero to five, adding up to a total score of at least zero and a maximum of 56 points. The higher the score, the better the test performance.[12]

Participants were selected, evaluated and randomly divided into three groups, a group that performed physical training (PT), a group that performed exercises associated with dual tasks (DT) and a control group (CG). The study design is depicted in Figure 1.



Abbreviations: DT= Dual Tasks; CG= Control Group; PT= Physical Training

Figure 1. Study design

The sessions were performed twice a week, each lasting 50 minutes, with a total of 10 interventions. The PT group had functional exercises, including standing on one leg support, walking on mats, walking on a line and climbing on the balance

disk. Importantly, these exercises had weekly progression with increased difficulty in performing them and in the number of repetitions.

The group that had DT as an intervention had functional exercises combined with cognitive tasks. The protocol consisted of sitting and stepping on the Swiss ball, climbing on the trampoline, passing a plastic ball between the legs and making a circuit (getting up from a chair, kicking a ball, walking on geometric shapes and throwing plastic balls on the trampoline). During the performance of these exercises, participants were involved in cognitive activities, including solving mathematical calculations, naming animals and colors.

As in the PT group protocol, in the DT group there was a weekly progression in the number of repetitions and in the difficulty of each exercise. The CG was assessed, but did not have any intervention. PT and DT groups were reevaluated at the end of the intervention period.

The instrument data were tabulated in Microsoft-Excel and their scores were used for intergroup statistical analysis in RStudio, version 3.5.3.

Firstly, the Shapiro-Wilk normality test was performed to verify the normality of the data. The data were normal, so the measure of central tendency and dispersion used were the mean and standard deviation to compose the descriptive statistics.

In the present study, the reliability of the internal consistency was used, in which the homogeneity of the items that constitute the instruments was assessed. This parameter was evaluated by the Cronbach's alpha coefficient and values between 0.70 and 0.95 are desirable.[13]

For the comparisons of the FES-I and BBS scores between the CG, PT and DT groups, both in the pre-intervention and in the post-intervention periods, analysis of variance (ANOVA) was applied. For comparisons between task modalities between the pre- and post-intervention periods, the Student's t-test for paired samples was used.

To measure the magnitude of the significant differences in the comparison between the groups, Cohen's[14] effect size was calculated. The significance level of the present study was $p < 0.05$.

The study complied and respected all the ethical principles established in the Declaration of Helsinki (2000), having its beginning after approval by the Ethics and Research Committee of the University of Franca, under number 3558405 and registration in the Brazilian Clinical Trials Registry system (ReBEC) under RBR-5wwhss.

RESULTS

Although both sexes were invited to participate in this study, there was only the participation of women, with an average age of 67.4 ± 6.69 years.

The reliability of the FES-I and BBS instruments had a Cronbach's Alpha coefficient of 0.95 for both, thus revealing that the measurements made by the instruments can be considered reliable.

In the comparison between the pre- and post-intervention period, no significant differences were found between the groups analyzed, considering FES-I and BBS scores. Regarding the comparison between the intervention groups and CG, differences were found only in the FES-I scores after the intervention period, which was significantly lower in the groups that underwent any intervention, with an effect size considered large. These findings are shown in Table 1.

Table 1. Comparison of the instruments between the interventions and the control

Test Pre-intervention	PT Average (SD)	DT Average (SD)	CG Average (SD)	p value	Effect size
FES-I	28.50 (13.10)	42.40 (8.36)	36.60 (17.03)	0.08	-
BBS	51.50 (4.19)	49.80 (2.85)	46.60 (10.37)	0.26	-
Test Post-intervention	**PT Average (SD)**	**DT Average (SD)**	**CG Average (SD)**		
FES-I	17.30 (2.31)	17.50 (1.08)	31.30 (9.33)	0.00	1.82
BBS	55.20 (1.39)	55.50 (1.26)	54.10 (2.23)	0.16	-

SD: Standard Deviation; DT: Dual Tasks; BBS: Berg Balance Scale; FES-I: Falls Efficacy Scale - International; CG: Control Group; PT: Physical Training

In the comparison between the groups of the FES-I and BBS scores after the intervention period, significant differences with large effect sizes were detected (Table 2).

Table 2. Comparison of instruments before and after the intervention

PT	Average (SD) Pre-intervention	Average (SD) Post-intervention	p value	Effect size
FES-I	28.50 (13.10)	17.30 (2.31)	0.00	1.91
BBS	51.50 (4.19)	55.20 1.39	0.01	1.18
DT	**Average (SD) Pre-intervention**	**Average (SD) Post-intervention**		
FES-I	42.40 (8.36)	17.50 (1.08)	0.00	11.54
BBS	49.80 (2.85)	55.50 (1.26)	0.00	4.54

SD: Standard Deviation; DT: Dual Tasks, BBS: Berg Balance Scale; FES-I: Falls Efficacy Scale - International; PT: Physical Training

DISCUSSION

The results of this study indicate that, regardless of isolated exercises or with the combination of the dual task, both are effective in decreasing ptophobia and maintaining balance.

Activities carried out with an increasing degree of difficulties, with surface modifications and destabilizations cause the appearance and increase of neuronal connections, thereby improving the functional performance. These modifications corroborate with the reduction of the risk of falls, which is indeed associated with an improvement in independence and in the performance of daily activities.[15]

Regarding the fear of falls assessed by FES-I, the findings revealed that the participants in the PT groups and in the DT group had significant improvements after the interventions. These results suggest that the elderly women acquired self-confidence, as it was evidenced that the interventions were

efficient to reduce ptophobia. Additionally, the exercises performed alone or in combination with the double task exhibited satisfactory results. Interventions with physical exercises associated with dual tasks are becoming increasingly popular, being an effective approach in reducing falls and ptophobia, thus exploring the restoration and maintenance of muscle strength and balance.[16]

The participants in the groups that had interventions revealed significant results in relation to the CG, hence demonstrating the importance of performing physical exercises aimed at the prophylaxis of falls. Previous study estimated that 50% of falls related to the elderly can be avoided with continuous interventions by qualified multidisciplinary teams and specialized in this theme and in this audience.[17]

The simple fact that a person is elderly is already an inherent risk to fall events. These falls trigger restrictions, which may compromise daily activities and even activities that were once pleasurable, transmitting feelings of frustration and insecurity to the elderly. Besides causing ptophobia, the occurrence of falls in elderly people is a constant concern among health professionals, owing to the increased morbidity and mortality.[18]

The main cause of falls is the reduction in postural balance, which in most cases can be mitigated with regular physical exercise. Remarkably, the participants in both groups (PT and DT) demonstrated similar results in comparison with the CG, showing no significant differences in BBS. Furthermore, the balance was improved after the interventions, thus, these findings indicate that both interventions had effects on balance. Maintaining balance in the elderly is beneficial, as it favors the gain of postural stability, preventing falls and possible complications, such as fractures and dependence.[19]

Regarding the significant improvement in balance assessed by BBS, the authors Silva et al.[15] conducted a research focused on the analysis of a proprioceptive reeducation in the balance of 11 elderly women aged 74.1 ± 8.3 years. After applying the test, the authors reported an increase in the final score in relation to the initial score. The data proved that the practice of physical exercises improved the quality of daily activities and the balance, as well as helped in preventing falls.

In this study, the effects of physical training and dual tasks were similar in relation to the effective contribution to reducing ptophobia and to maintaining the balance of the participants. The combination of the dual task of exercise affords the elderly alternatives to perform more pleasurable activities, that is, the activities can be composed of innovative approaches. Moreover, it is possible to train cognitive, coordination and motricity activities, serving as incentives for the emergence of new neural connections.[20]

The present research is essential to provide scientific evidence regarding the use of physical activities, especially when this activity is combined with some cognitive stimulation. The study was developed and well-articulated with all the participants, with their active dedication.

The sample size can be considered as a limitation of this article, which, due to a small number of participants, may not have concrete data or an inadequate distribution when compared to a sample size with a higher number of participants.[21] Furthermore the presente study has convenience sampling as a limiting factor. However, the authors consider this limitation and recognize it as a favorable condition to foster the realization of new approaches on the theme fear of falls and quality of life in the elderly population, suggesting new studies that focus on this topic so that more data can be obtained.

CONCLUSION

It was possible to observe in this study that the participants of the groups that had some type of interventions (PT or DT), demonstrated a decrease in the fear of falls scores and an improvement in the balance scores in relation to the participants in the control group, who did not receive any of the interventions. Interventions, demonstrated that physical exercise is associated or not with cognitive activity provides benefits to the elderly, improving balance and ptophobia.

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