

Impact of Two Physical Exercise Social Programs on Seniors Fall Risk¹

Impacto de dos programas sociales de ejercicio físico en el riesgo de caídas de los adultos mayores

Impacto de dois programas sociais de exercício físico no risco de quedas em idosos

[Articles]

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Abstract

The aim of this study was to compare the impact of physical exercise on the risk of falls in older adults participating in two social programs. Thirty volunteers participated, divided into two groups: Con Burden (GCC), with 11 women and 4 men (75.4±9.1 years) participating in a university extension project, and Sem Carga (GSC), with 12 women and 3 men (66.9±4.2 years) who exercised at an outdoor gym in the same geographic region. GCCs and GSCs were similar in terms of female predominance, while GCCs are longer-lived ($p=0.008$). Every participant underwent physical-functional assessment with the Berg Balance Scale. The difference between groups was assessed using the Mann-Whitney test ($p \leq 0.05$). Data analysis found no significant difference between the groups regarding the results of the MSA ($p=0.2$) and both groups had a low risk of falling.

Keywords: aging, balance, fall risks, physical activity

Resumen

El objetivo de este estudio fue comparar el impacto del ejercicio físico en el riesgo de caídas en adultos mayores que participan en dos programas sociales. Participaron 30 voluntarios, divididos en dos grupos: el Grupo Con Carga (GCC), con 11 mujeres y 4 hombres (75,4±9,1 años) que participaban en un proyecto de extensión universitaria, y el Grupo Sin Carga (GSC), con 12 mujeres y 3 hombres (66,9±4,2 años) que hacían ejercicio en un gimnasio al aire libre en la misma región geográfica. Los GCC y los GSC eran similares en cuanto al predominio femenino, mientras que los GCC tenían una mayor longevidad ($p=0,008$). Todos los participantes se sometieron a una evaluación físico-funcional con la Escala de Equilibrio Berg. La diferencia entre grupos se evaluó mediante la prueba de Mann-Whitney ($p \leq 0,05$). El análisis de los datos no encontró diferencias significativas entre los grupos respecto a los resultados de la MSA ($p=0,2$) y ambos grupos presentaban un bajo riesgo de caídas.

Palabras clave: envejecimiento, equilibrio, riesgo de caídas, actividad física.

Resumo

O objetivo deste estudo foi comparar o impacto do exercício físico no risco de quedas em idosos que participam de dois programas sociais. Participaram 30 voluntários, divididos em dois grupos: o grupo com carga (GCC), com 11 mulheres e 4 homens ($75,4 \pm 9,1$ anos) participantes de um projeto de extensão universitária, e o grupo sem carga (GSG), com 12 mulheres e 3 homens ($66,9 \pm 4,2$ anos) que se exercitavam em uma academia ao ar livre na mesma região geográfica. Os GCCs e os GSGs eram semelhantes em termos de predominância feminina, enquanto os GCCs tinham maior longevidade ($p = 0,008$). Todos os participantes foram submetidos a uma avaliação físico-funcional com a Escala de Equilíbrio de Berg. A diferença entre os grupos foi avaliada pelo teste de Mann-Whitney ($p \leq 0,05$). A análise dos dados não encontrou diferenças significativas entre os grupos com relação aos escores da MSA ($p = 0,2$) e ambos os grupos apresentaram baixo risco de quedas.

Palavras-chave: envelhecimento, equilíbrio, risco de quedas, atividade física

Introduction

The population of older individuals has grown expressively throughout the last decades both in size and longevity. Various factors contribute to this growth, such as the reduction in child mortality, better sanitary and health conditions and contributions stemming from scientific research (WHO - World Health Organization, 2015).

With the increase in longevity, illnesses and occurrences that are typical with aging, such as sarcopenia, osteoporosis and falls have been occurring more frequently (Greco, Pietschmann & Migliaccio, 2019). Concerning falls in particular, this fact is worrying due to the possibility of causing physical aftereffects, contributing to disability, limitations in the practice of physical activity, reductions in mobility and loss of autonomy (Jia *et al.*, 2019). The fear of falling can also be considered an aftereffect, albeit one that is emotional in nature (Gazibara *et al.* 2017). Thus, falls are considered a public health problem, which causes increased spending for health services (Houry *et al.*, 2016).

In this scenario, physical exercise has been considered an important strategy to reduce the occurrence of falls, since its effects are linked to an improvement in cardiovascular function, muscle strength, flexibility, balance and better walking performance, as well as bringing about cognitive and self-esteem improvements. All these factors provide seniors with a higher level of independence, enabling them to conduct their daily activities (Silva *et al.*, 2015). The most adequate type

of physical exercise for controlling falls has been amply studied; however, the literature suggests that including proprioceptive exercises in general exercise sessions can reinforce their beneficial effects on controlling fall risks in older adults (Sandlund *et al.*, 2017).

Despite there not being a consensus on what type of physical exercise is best suited for fall prevention, it is evident that muscle strengthening activities are of vital importance in training sessions, as they help improve postural control, which has to do with the occurrence of falls (Sadeghi *et al.*, 2021). Among the different possibilities for conducting strength training for older people, there is the training model that was developed at open-air gyms (OAG).

In Brazil, the OAGs are part of a public policy for health promotion in older individuals (Costa *et al.*, 2016) and their physical structure resembles that found in other countries, local cultural differences notwithstanding (Andrade, 2017). To Aguirres *et al.* (2018), this model of OAG aims to promote socialization, improve self-esteem and develop the functional autonomy of seniors. Cordeiro *et al.* (2018) add that it can improve the population's quality of life and reinforce the culture of healthy habits, especially among the older population groups.

At the OAGs, the physical exercise is performed with equipment that does not possess controls for gradual weight increase (Andrade, 2017; Furtado *et al.*, 2019). This brings up doubts regarding its efficacy in increasing its users' levels of muscle strength in such a way that they benefit from protection against falls, since the literature defends the need for progressive increases in weight to bring about substantial gains in muscle strength (Katch *et al.*, 2016). Thus, there is a discussion as to whether the effects caused by this equipment are comparable to those caused by training conducted on traditional machines found at physical training gyms.

The fact that the OAGs are easier to access, since they are freely offered to the general population as part of a public policy promoting health through the practice of physical exercise, makes it important for there to be studies researching the benefits of these practices on the population's health. Thus, it is important to investigate the results these initiatives can procure in order to justify their existence as part of a public policy.

Starting from the hypothesis that equipment without the possibility to gradually increase weight would show inferior results in fall prevention, this study aimed to compare the impact of a physical exercise program carried out on traditional

equipment to the impact of the program performed in the OAGs on fall risk in older adults.

Methods

The present study is classified as mostly quantitative, inferential and a cross-sectional field research (Appolinário, 2012).

Sample

The sample group included 30 individuals over 60 years of age who participated in two physical exercise programs: GCC (weights group), with 15 individuals (11 women and 4 men) (75.4 ± 9.1 years) from the Old People in Movement: Maintaining Autonomy program (IMMA/UERJ); and the GSC (non-weights group), which also included 15 individuals (12 women and 3 men) (66.9 ± 4.2 years), who participated in the OAG at UERJ. The participants were selected by convenience, as they were already part of the selected projects. The inclusion criteria for this study were: a) to have been participating in the project for at least a year; b) to be present at least three times per week; c) not having any physical disabilities or mobility issues that could hinder test execution. All participants signed the term of consent, as determined by National Health Council Resolution 466/2012 (Resolução N° 580, de 22 de Março de 2018, 2018).

Data collection instrument

All participants were subjected to a physical-functional evaluation with the Berg Balance Scale (BBS) (Berg et al., 1992), which was translated and adjusted for Brazil by Miyamoto et al (2004). The test includes 14 tasks using an evaluation scale from zero (incapable of performing task) to four points (performs task independently). The total scores vary from zero to 56 points, with the highest score corresponding to the best possible performance. According to Berg *et al.* (1992), scores under 45 predict future falls.

Data collection procedures

Each group's data collection took place in the morning at their project's location. The GCC space has air conditioning, while the GSC space is in the open air. The test was conducted using a chair with armrests, a chair without armrests, a 30 cm

ruler, a step platform and a stopwatch. In the GSC group, the task that required the use of a step platform had to be adapted to use a step from a set of stairs that exists at the project's location.

Intervention in the GCC Group

The IMMA project participants were undergoing individualized aerobic and strength training twice a week on traditional gym equipment, which made it possible to gradually increase the weight for training. In addition, functional gymnastics were practiced with free weights once a week. Each session was around an hour long, with an interval of 48 hours between sessions. The strength training involved two series of 8-10 submaximal repetitions with an interval of two minutes between series and exercises, alternating body segments: leg press; bench press; leg extension machine; rowing machine; leg curl machine; pull-down; foot flexion and sit-ups (the only exercise with two series of 20 repetitions). The aerobic training was held for 20 minutes at the beginning of the session on different machines, depending on the participant's ability and possibilities with an intensity of 50 – 75% of their maximum heart rate.

Intervention in the GSC Group

The exercise sessions at the OAG used a combined method in a mixed circuit. Aerobic exercises (walking and ski simulator) and muscle resistance: leg press; leg extension chair; bench press; shoulder press; leg curl chair; rowing machine; sitting and standing up from a bench; sit-ups and some exercises done without machines (such as hip abduction, hip extension, foot flexion, and stretching) were performed in an alternating pattern in two series with 15 repetitions, for 40 minutes, at least three times a week (Cordeiro et al., 2018).

Data analysis

The subject characterization data was analyzed through descriptive statistics (average, standard deviation and percentage). Data normalcy was tested with the Kolmogorov-Smirnov Test. Since the data did not present a normal distribution and there was a reduced number of subjects, the choice was made to determine the difference between the results of the Berg Balance Scale and the age of the

investigated groups with the Mann-Whitney Test. The data was analyzed with SPSS Statistics Software (Version 25, Armonk, NY, USA), with $p \leq 0.05$ being adopted for all tests.

Results and discussion

Table 1 summarizes the participants' age and sex. The groups presented a similar composition in terms of sex, with a predominance of female participants, while the GCC had a significantly higher average age than the GSC.

Table 1 – Sample characterization

GROUPS	n	SEX		AGE
		Female	Male	
GCC	15	73.3%	26.7%	75.4±9.1*
GSC	15	80%	20%	66.9±4.2

GCC = Weights Group; GSC = Non-weights Group; *Significant difference between the groups ($p = 0.008$).

Source: own elaboration.

Table 2 shows the BBS results. There was no statistically significant difference between the investigated groups, which showed results suggesting a low fall risk.

Table 2 – Berg Balance Scale Results

GROUPS	BBS	Score (Berg et al., 1992)	P
GCC	52.3±2	> 45 Low fall risk	0.2*
GSC	51.2±2.4		

GCC = Weights Group; GSC = Non-weights Group; *No difference between the groups.

Source: own elaboration

The present study aimed to compare the impact of two different physical exercise programs on the fall risk of seniors, with one group undergoing traditional strength training exercises and the other one performing exercise on machines without weight adjustment. To this end, old adults who were taking part in the investigated programs for at least a year were evaluated with the Berg Balance Scale.

The sample taken from both groups was similar regarding the number of men and women. Both groups had more women participating in them. This is in agreement with findings from other studies (Camarano, 2002; Cerri & Simões, 2007; Ribeiro et al., 2012); however, different arguments have been given to explain this phenomenon.

Cerri and Simões (2007) indicated that this phenomenon might be associated with a cultural issue, since women are quicker to admit they need to be around other people. Silva et al. (Silva et al., 2015), investigated 24 older people involved in physical therapy and found that the majority of the group (58.33%) was composed of women. However, they explained this finding from the perspective of women living longer and being less exposed to risk factors such as tobacco usage and excessive alcohol consumption, as well as their being more worried about controlling and treating diseases than men. Similarly, Camarano (2002) explained findings that were also based on the fact of men having a higher mortality rate, leading to women dominating, generally speaking, the older population groups, as their average life expectancy is seven years longer than that of men.

However, Ribeiro et al. (2012), upon finding a higher number of older women in physical activity programs offered by the Third Age Open University at Pelotas Federal University (195 women and 4 men), attributed the phenomenon to the fact that men over 60 years old may possibly have other forms of leisure activities, such as going to bars and clubs. Another possibility defended by Ribeiro et al. (2012) is the fact that some men consider this type of program inadequate, as it does not offer strenuous activities or it contains activities that would interfere, so to speak, with their masculinity. One way or another, there appears to be stronger resistance from older males towards getting involved in physical activity programs, such as the ones included in our research. This leads to the need for these programs to create strategies stimulating higher male participation and adherence to their activities.

Another relevant point regarding the characteristics of the investigated participants is the statistically significant difference between the average ages of

both groups, which may have influenced the results. The GCC participants were approximately 10 years older than those in the GSC. Thus, it would be expected that the GCC group would obtain an inferior result regarding fall risk, since this sort of risk increases with age.

Throughout the aging process, there is a reduction in muscle mass, a loss of balance, postural alterations and the sensory, vestibular, and visual systems are compromised, which together increase the fall risk for older people (Sociedade Brasileira de Geriatria e Gerontologia, 2008). The fact that the older individuals in the GCC showed similar results to the participants in the GSC may suggest that their training helped them maintain these variables, to the point of equaling their fall risk to that of the younger group.

Despite the age difference, the initial hypothesis, that equipment without the possibility of gradually increasing weight would lead to inferior fall risk reduction results, was not proven. The BBS results did not show statistically significant differences between both groups, indicating that both types of exercise programs are efficacious in reducing the fall risk for the participating senior individuals. According to these results, both the work conducted at IMMA, which is more systematic and includes the possibility of weight progression in strength training, and the work performed at the OAG, which does not permit changes in training loads, can bring benefits to their participants, at least regarding protection against falls.

These results are similar to those from studies such as the one conducted by Martins et al. (2013), which compared two groups of active older people, one group that practiced karate and another, which practiced hydro gymnastics, with a group of inactive peers in the same age group. This study included the participation of 30 older individuals between 65 and 80 years of age and, like the present study, used the Berg Balance Scale to analyze the volunteers' postural balance. Significant differences were found between the karate and hydro gymnastics participants and the inactive control group, but not between the two active groups themselves, demonstrating that, regardless of the type of physical activity, it is still better to be active than to remain sedentary.

It is important to note that, regardless of the training intensity provided by the equipment, both groups in our sample obtained results indicating a low fall risk (Berg et al., 1992). This result is in agreement with the position from the American College of Sports Medicine (Chodzko-Zajko *et al.*, 2009), which states

that even moderate physical activity is highly relevant for reducing the risk of falls.

Falls greatly impact public policy due to the high levels of morbidity and mortality they provoke, as well as the high costs these impose on health and social services, since they require a high amount of economic resources to treat their consequences (Zago, 2010). Thus, fall prevention should be one of the objectives of public health policies, which means there is the need for creating and maintaining policies and programs to prevent this major problem from affecting said part of the population. In conformity with this position, the present study showed that physical exercise programs offered in public squares can be just as good at reducing fall risk as more sophisticated programs that are harder to access for most of the older population.

Conclusion

No significant differences were found between the two types of exercise program that were studied, at least regarding a reduction in fall risk, which can indicate that both types of programs are efficacious for this purpose. This demonstrates that for this age group, the minimum level of physical activity already brings direct benefits. However, this conclusion must be carefully considered, since the present study has important limitations, such as the fact that it is *ex-post-facto*, does not possess a control group, and has a low number of subjects.

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