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ARTIGO ORIGINAL

Efeito de um treinamento de equilíbrio em um grupo de mulheres idosas da comunidade: estudo piloto de uma abordagem específica, não sistematizada e breve

The effect of balance training in a group of community-dwelling elderly women: a pilot study of a specific, non-systematic and short-term approach

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RESUMO

Objetivo: Verificar o efeito de um programa de treinamento de equilíbrio, de curto período, com exercícios específicos e sem associação de treinamentos sistematizados de força muscular, em um grupo de mulheres idosas residentes na comunidade. Métodos: Trata-se de um estudo piloto com seis mulheres que participaram de uma intervenção visando o treinamento de equilíbrio. Os testes de campo utilizados foram: "Escala de Equilíbrio Funcional de Berg – Versão Brasileira", Timed Up & Go, Chair Stand, e Marcha Tandem. Entrevistas foram realizadas sobre percepção de saúde e medo de quedas. O treinamento consistiu em atividades realizadas em grupo, com tarefas isoladas e circuitos fechados. Foi realizado duas vezes por semana, com uma hora de duração em cada dia, por um período de oito semanas. Resultados: Verificou-se que houve melhora no equilíbrio a partir da análise dos resultados obtidos. Conclusão: Um treinamento de equilíbrio específico, não sistematizado, breve e realizado em um grupo de mulheres idosas da comunidade mostrou ter um efeito na melhora das medidas de equilíbrio, porém ainda se faz necessário avaliar o impacto isolado do treino de força sistematizado sobre as medidas de equilíbrio.

PALAVRAS-CHAVE

idoso, equilíbrio musculosquelético, acidentes por quedas

ABSTRACT

Objective: verify the effect of a group program of balance training in a short period, with specific exercises and without association of systematic strength training, on a community dwelling older women. Methods: it is a pilot study with six women that participate of an intervention with balance training. Tests: BBS (Brazilian version); Timed Up & Go, Chair Stand and Tandem Gait. Interview: health perception and fear of falling. Training: Group activities with isolated exercises and closed circuits. It was done twice a week, with duration of one hour per day, for a period of eight weeks. Results: The training, without systematic strength training, improved the balance of participants. Conclusions: An specific, non-systematic, short and at group balance training of a community dwelling older women had some effects on balance measures, however, it is necessary to assessment the isolated impact of a systematic strength training on the balance measures.

KEYWORDS

aged, musculoskeletal equilibrium, accidental falls

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INTRODUCTION

Aging is a dynamic and progressive process, during which morphological and functional modifications take place, as well as biochemical and psychological ones, resulting in the decrease of the functional reserve of organs and systems[1].

The population aging process is a worldwide phenomenon, which causes changes in the age pyramid, with a narrowing of the base and widening of the top[2]. In the year 2000, the Brazilian population older than 65 years totaled 9,933,251 individuals, corresponding to 5.85% of the total population[3]. Thus, our country is the 7th in number of elderly individuals in the world and is expected to be the 6th by 2025[4]. In this context, important studies and researches have been carried out aiming at improving the quality of life in this population.

These alterations that accompany the aging process, associated to chronic diseases, use of medications and a sedentary life style, among others, are potential factors for the risk of falling, becoming a major concern regarding the elderly health. Most hip fractures are caused by falls[5,6] and even when there is no tissue injury, the psychological impact is unquestionable[7]. The injuries caused by falls, the fear of falling or the association of both impair the mobility of the elderly, and thus, their functionality in a context of daily life activities as well as their social participation[8].

Aiming at decreasing the incidence of falls in this population and concomitantly, their consequences, it is advisable and necessary to act on its determinants: the risk factors for falling.

Tinetti[10] mentions the following risk factors: use of sedatives, cognitive deficit, lower limb dysfunction, foot problems and several balance and gait abnormalities.

Regarding balance, the vestibular, visual and somatosensory systems combine to maintain the erect posture; however, the age-related deterioration affects all of them. Therefore, it is easy to understand the difficulty in performing the necessary adjustments, and consequently, the higher probability of falls[11].

Many scientific studies[5,7,12-20] mention the balance training, which is relevant for preventing falls, as the balance deficits constitute a risk factor that can be modifiable through an exercise-based intervention. However, there are many variables regarding the resources, techniques, environment context, intensity, frequency and training program.

Rydwik[21] reports on the lack of specificity between assessment and training. Of the 13 studies that evaluated balance[5,7,12-13], only two[12,15] carried out the training in a specific way without the association with other types of training.

The American Geriatrics Society, the British Geriatrics Society and the American Academy of Orthopedic Surgeons Panel on Falls Prevention[24] verified that many of the studies assessed multifactorial interventions and that the individual elements of the instituted approaches were described in an inconsistent way. Steadman[15] calls this type of approach "black box". In fact, most of the studies use associated trainings and assess their total impact on the balance tests[5,7,13,14,17,19,20,22,23,25-27] , being muscular strength training the most commonly associated intervention in 100% of the cases.

Therefore, the aim of this study is to assess the effect of a short-time balance training program with specific exercises and without the association of systematic strength training in a group of community-dwelling elderly women.

METHODS

Patients

The present study is a report of a series of cases carried out in a group of elderly women who live in the Vila Recreio district, in the city of Betim, state of Minas Gerais, Brazil. The inclusion criterion was the presence of balance deficit, as shown in the proposed tests, according to the literature. The volunteers who presented incapacitating orthopedic problems, previous neurological diseases (such as stroke), progressive neurological disease and neuropathies, neuropsychiatric diseases, unstable medical conditions, severe cognitive deficit or significant pressure lability were excluded from the study. Additionally, the participants who presented more than two (2) consecutive absences or a total of four (4) absences were excluded from the study.

This study was approved by the Ethics Committee on Research of the Pontifícia Universidade Católica de Minas Gerais - Unidade Coração Eucarístico and all the participants signed the informed consent form to undergo the proposed intervention.

Initially, the community of the Vila Recreio district in the city of Betim, state of Minas Gerais, Brazil, was invited to participate in the study. Twenty elderly women were indicated to participate by the community members. Of these, 18 were assessed, as one has traveled during the evaluation period and another was in the postoperative of a lower limb revascularization surgery. After the assessment, three women were excluded from the program, as they did not present balance deficit as demonstrated by the performed tests. Other three women were excluded for being absent from the sessions: two due to schedule incompatibility and another due to exacerbation of knee pain caused by osteoarthrosis.

During the weeks that followed the start of the training program, four elderly women quit the training - two due to adverse health conditions (assisted cardiopathy and recurrent respiratory tract infection due to immunological weakness) and two did not justify the abandonment of the program. Additionally, one participant was excluded due to absenteeism. Therefore, only seven women concluded the intervention according to the study proposal. However, one of them presented a clinical picture of labyrinthopathy during the intervention and post-intervention assessment and a consequent worsening in balance; her data were then excluded from the study.

Assessment

The interview and the tests were performed in the participant's home and were carried out by an examiner and an assistant, blinded to the intervention, immediately before and after the training. During the interview, the respective demographical data, medical history, cultural level assessment[28] and cognitive evaluation result (Mini-Mental Test)[29] were collected, as well as modified questionnaires

on health perception (SF-36)[30], fear of falling[31] and gait instability perception[31]. The field tests performed were the Berg Balance Scale (BBS) – Brazilian version[32], Timed Up & Go[33], Tandem Gait[34] and Chair Stand test[35]. Therefore, the static and dynamic balance was assessed as subjectively perceived as well as the inherent psychological factor.

Regarding the Cultural Level (CL), it was divided in seven levels: CL1= Illiterate; CL2= Can read, write and count; CL3= Finished 4 years of Elementary School (5 years of schooling including kindergarten); CL4= Finished Elementary school up to the 8th grade (9 years of schooling including kindergarten) or non-specialized technical or manual labor professions; CL5= Finished High School (12 years of schooling) or specialized technical or manual labor professions, blue collar or artisan level, with technical or managerial responsibilities; CL6= Attended College or highly qualified technical or manual labor, with long-term training; CL7= Finished College.

The Functional Berg Balance Scale has a maximum score of 56 points. Scores < 45 correspond to balance deficit[32]. At the Timed Up & Go test, scores between 20 and 29 are correlated with some level of independence and scores > 30 are correlated with dependence in many ADL and mobility.

The Chair test indicates that the maximum leg extension power is correlated with the velocity when standing up from a chair. This test was chosen as it is an indirect measurement of the muscular strength of the lower limbs. Therefore, it helps in the interpretation of the associated findings.

In addition to these tests and questionnaires, the participants were also inquired about their fear of falling in several situations. The question was – "Are you afraid of falling when…" in ten situations: Q01 = You are going to change clothes? Q02= You are getting out of bed? Q03= You have to walk alone at home? Q04= You have to get something from a high closet? Q05= You have to squat to pick up something from the floor? Q06= You have to walk alone in the street? Q07= You have to climb up or down the stairs? Q08= You have to walk in a crowded place? Q09= You have to use public transportation, such as a bus? Q10= You go out to visit friends or family members? The answers were objective, being "yes", "no" or "does not perform".

During the post-intervention assessment, questions on the perception regarding the physical and/or routine impact of the developed activities were added and testimonies were collected, in addition to the events that could impair or increment the training results.

Training Protocol

The training protocol consisted of several group activities from isolated exercised and closed circuits. Such training was carried out twice a week, one hour per day, for a period of 8 weeks, in a total of 16 sessions.

Each session was preceded by a warm-up activity, which consisted of upper and lower limb movements in sitting position and stretching of the sural triceps, quadriceps, ilipsoas, ischiotibial, and iliotibial band. The warm-up exercises were administered according to the group's disposition and without aiming at incrementing flexibility, i.e., it consisted of a single 10-second duration series. In addition to the warm-up, the intervention was followed by cooling-down exercises, through which respiratory exercises were performed in association with trunk mobility ones.

The proposed training is easy to apply, as the instruments are low-cost and can be easily manufactured: exercise mats (15 cm high, 190 cm long and 88 cm wide), batons (100 cm long), PVC tube (5 cm of diameter and 30 cm long), 75% shaded screen (to cover the mats and PVC tubes), empty plastic mineral water bottles (500 mL) for reaching out, wood beams painted in yellow (2 cm high, 100 cm long and 6 cm wide), thick rope with yellow marks (500 cm long), birdseed and sunflower seeds placed in a shoe box painted in yellow and a whistle.

The isolated exercises were as follows: sensory stimulation on the plantar surface (through the mixed birdseed and sunflower seeds, in addition to the PVC tube covered in shading screen and the mat cover); axial mobility (cervical and trunk); anti-gravitational activity and activity in a non-systematic load-free closed kinetic chain (without following a conventional pattern of maintenance and training-load progression, as the objective was narrowing the base of support, and inter- and intra-muscular coordination, and not muscular strength gain and hypertrophy) such as from sitting to standing up, body elevation through plantar flexion, hip flexion, extension and abduction, squatting, knee flexion and ankle dorsiflexion. A training of latency was also carried out through a quick response after a sound stimulus (whistle).

The closed circuits consisted of activities such as: walking on an unstable surface (mats) with unexpected disruptions (by the therapist); population condensation (large number of people within a small area limit – unstable area); sensibilized gait (heel-walking, toe-walking, inversion and eversion walking), multidirectional reach, as well as incentive for dexterity (verbal reinforcement during walking, ball games, dance movements and obstacle course) and extra attention through verbal responses to questions asked during the performance of the activities. The aforementioned activities were performed on exercise 15-cm high mats, covered with a shading screen in order to provide sensory stimulation of the plantar skin surface. Other activities included in the closed circuits were walking with narrowed bases of support and walking in a circumferential route; obstacle walking (with variable heights and widths); increase of the duration of unipodal support and of tandem gait.

The approaches were based on scientific evidence that confirmed its applicability and effectiveness[11,12,15,18,36-39].

Statistical Analysis

The participants' data regarding age, associated diseases, medications being used and cultural level are presented as absolute numbers. The other results are presented as absolute numbers and the means and standard deviation (SD) were calculated. Statistical tests were not used due to the small sample size, making this an essentially descriptive study.

RESULTS

The characterization of the sample regarding age, number of associated diseases and number of currently used medications of the six participants of the study as well as cultural level and Mini-Mental test results are shown in Table 1.

Mean age was 79.17 ± 4.26 in years. Cataracts, Systemic Arterial Hypertension (SAH), Osteoarthrosis, *Diabetes Mellitus* and Osteoporosis were, in this sequence, the associated diseases with the highest prevalence. The mean result at Mini-mental Test was 22.17 ± 5.23.

It is clinically relevant to mention that, although the participants presented many associated diseases, they did not present any complications such as "orthostatic hypotension" during the evaluation and training.

Additionally, the performance at the Mini-Mental test was a representation of the cultural level and degree of schooling, and the results obtained are within the accepted parameters, without cognitive level deficits.

Table 1
Characterization of the sample regarding age, number of associated diseases and number of currently used medications; Cultural level and Mini-Mental.

Participants	Age	# of associated diseases	# of currently usedmedications	Educational level	Mini- mental test
1	85	4	5	2	24
2	83	5	1	2	14
3	78	4	4	5	26
4	78	7	6	1	18
5	78	4	7	3	28
6	73	5	5	5	23

Table 2 shows the results obtained in the pre- and post-intervention field tests, in absolute values. The results of the Berg Balance Scale are presented as scores and the Timed Up & Go test in seconds. It is observed that there was an improvement of the obtained results after the intervention.

The minimum and maximum values of the BBS before the intervention were 34 and 50; and 42 and 54 after the intervention, respectively. The minimum and maximum values of the *TIMED UP & GO* test before the intervention were 10 and 60 seconds and after the intervention, 9 and 45 seconds, respectively.

Table 3 presents the scores obtained during the Tandem Gait and Chair Stand tests.

The answers related to the questions on the "fear of falling" are shown in Figure 1 and discriminated in Table 5.

The testimonies obtained after the intervention are shown in Chart 1.

Table 2
Values obtained for the study participants in the pre- and post-intervention field tests in scores for the Berg Balance Scale test and in seconds for the Timed Up & Go test.

Participants	Field tests			
	Berg Scale		Timed Up&Go	
	Before	After	Before	After
1	34	48	21	15
2	34	42	60	45
3	47	54	18	9
4	48	51	22	14
5	45	49	14	16
6	50	51	10	14

Table 3
Values obtained at the Tandem Gait test in scores and at the Chair Stand test in seconds (with appropriate scoring according to the legend below).

Participants	Tandem gait (score)		Chair Stand [sec (score)]	
	Before	After	Before	After
1	0	1	20 (1)	15 (2)
2	0	0	38 (1)	30 (1)
3	2	2	14 (2)	10 (3)
4	2	2	19 (1)	17 (1)
5	0	1	23 (1)	20 (1)
6	0	1	26 (1)	23 (1)

1- Tandem Gait: Score: (0) Severe impairment = ambulates less than 4 steps or cannot perform without assistance; (1) Moderate impairment = ambulates 4-7 steps; (2) Mild impairment = ambulates 7-9 steps; (3) Normal = is capable of ambulating 10 heel-toe steps without staggering. 2- Chair Stand Test: The test can be scored as (0) Incapable: > 60 sec.; (1) Poor: >16 a ≤60 sec.; (2) Average: >10 a ≤ 16 sec.; (3) Very good: ≤ 10 sec.

Table 4
Scores obtained regarding the aspects of perception/classification of the pre- and post-intervention general health status of the study participants.

Participants	Health 1		Health 2	
	Before	After	Before	After
1	3	3	2	1
2	5	2	4	1
3	1	1	4	1
4	5	3	5	2
5	4	3	4	2
6	3	3	4	1

Question on health 1- In general, how would you classify your health status? (1) excellent; (2) very good; (3) good; (4) bad; (5) very bad. Question on health 2- Compared to one year ago, how would you classify your health status now? (1) much better; (2) a little better; (3) almost the same; (4) a little worse; (5) much worse.

DISCUSSION

The data obtained from the study demonstrated a characteristic feature among elderly individuals: the "polypathology" and the "polypharmacy"[2,40]. The co-existence of multiple chronic diseases and the use of a considerable number of medications are negatively associated with the dynamic balance[16,41-43].

Another characteristic of our sample refers to the fact that the group consisted exclusively of women. This configuration can be found in many other studies[15-17,19,25,41,44] as, according to Barbosa[45], the functional limitation is more frequently observed in the female

sex, as well as the fact that women refer a higher number of chronic conditions, when compared to men[40].

Additionally, the intervention was carried out inside a community. It so happens that the setting is very variable among the studies and is limited to "domiciliary"[17,22,23,25], "collective"[19,41,44] and "institutional"[14,18]. Campbell[25] states that group activities can guarantee better program sustainability and that is the reason why such intervention was selected in our study.

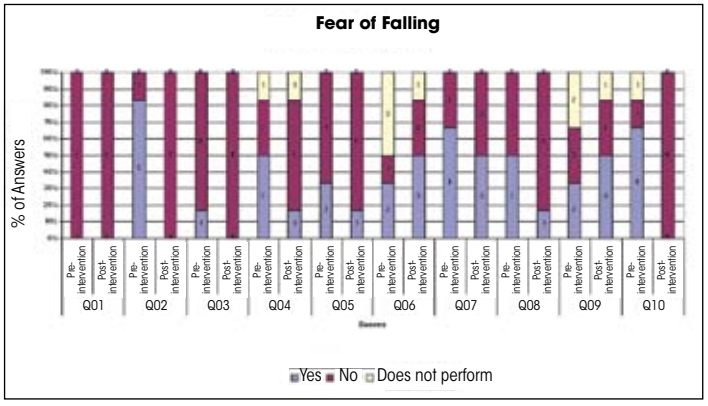
As the cognitive deficit is also characterized as a having a negative influence on balance measures[14], the records of cognitive levels presented in this study rule out such influence, which does not allow such justification as a variable to alter the balance measures presented here.

Regarding the Timed Up & Go (TUG) test, there was a decrease in the time spent to perform it; however, the changes in the differentiating levels between dependence and independence were not consistent. Nitz and Choy[12] demonstrated a decrease in the TUG test time after the training. Brouwer[7] observed that significant alterations in gait velocity did not accompany changes in balance performance. However, studies[5,7,23] that associated a systematic strength training reported improvement in gait velocity. Thus, one can justify that the decrease in time spent to perform the task was caused by the improvement in the participants' balance. Nevertheless, the participants remained stagnated at an intermediate level, possibly due to the absence of systematic muscular strengthening exercises. Additionally, one must consider that our intervention did not emphasize the flexibility aspects, as shown by Mecagni[44], who admitted the existence of positive correlations between total and bilateral ankle range of motion (ROM) and the POMA (Performance Oriented Mobility Assessment) score, a test designed by Tinetti[46] for balance and gait assessments.

Regarding the scores obtained at the BBS test, it was observed that 50% of the participants were already above the cutoff before the intervention. Two participants were below cutoff and one was at the cutoff. Even though they did not go beyond the cutoff in the post-intervention assessment (which happened in only case) all of them improved their scores, going further beyond the low scores that are correlated with dependence in ADL. Such result is in accordance with those by Wolf[14], who reported an improvement in BBS scores in 60% of the test group participants (*vs*. 7.5% of the control group). Additionally, of the 6 volunteers, 4 improved 4 points or more, which, according to Wolf[14], is clinically relevant. The others, who did not increase their scores by 4 points or more, had already presented higher pre-intervention scores. One can also imply that one item of the BBS test might have contributed to limit the increment of their global pre- and post-intervention scores. The item that assesses time during unipodal support did not show such an improvement that could considerably increase the total BBS

Chart 1
The testimonies obtained after the intervention.

"Nowadays I have more courage to do things, I feel more like going out. I improved in everything, because I was a immobile and thought I was worthless. I improved, as I could not do what I can do today." (APS)
"I feel happier today. I do not stay unhappy…in bed. I used to lie down a lot. Now, I do my activities inside the house much more easily, I feel more secure." (MF)
"It has been really a blessing, because Mother has improved a lot, she is happier, she does not stand still anymore." (Filha de MF)
"My neck, leg and back pain improved. I improved my walking; now, I feel more secure." (RPAC)
"I improved my balance and my pains. The relationship with the group was good for me. Now I feel more secure. I think the group improved and became more optimistic and happier." (CHI)
"It is now much better, for walking and doing the exercises. I improved quite a lot." (STS)
"I became more solid, upright and elegant after the exercises. I noticed that I can do my activities with more security and that my balance has improved. My husband and my son have noticed that I walk now with better balance." (NCO)
"She stopped falling and she does not think about buying a cane anymore." (Esposo de NCO)



The question (Q) was: "Are you afraid of falling when…", in the following situations: Q01 = You are going to change clothes? Q02= You are getting out of bed? Q03= You have to walk alone at home? Q04= You have to get something from a high closet? Q05= You have to squat to pick up something from the floor? Q06= You have to walk alone in the street? Q07= You have to climb up or down the stairs? Q08= You have to walk in a crowded place? Q09= You have to use public transportation, such as a bus? Q10= You go out to visit friends or family members? The answers were objective: 0- Does not perform; 1- No; 2- Yes.

Figure 1
Study participants' answers regarding the fear of falling in different situations.

Table 5
Study participants' answers regarding the fear of falling in different situations.

	PARTICIPANTS											
	1		2		3		4		5		6	
QUESTION	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Q01	1	1	1	1	1	1	1	1	1	1	1	1
Q02	2	1	2	1	1	1	2	1	2	1	2	1
Q03	1	1	2	1	1	1	1	1	1	1	1	1
Q04	2	1	0	0	1	1	2	1	2	2	1	1
Q05	1	1	1	1	1	1	2	1	1	1	2	2
Q06	0	2	0	0	1	1	0	2	2	1	2	2
Q07	2	2	2	2	2	1	2	2	1	1	1	1
Q08	2	1	2	2	1	1	2	1	1	1	1	1
Q09	0	0	2	2	1	1	0	2	1	1	2	2
Q10	2	1	0	1	1	1	2	1	2	1	2	1

The meaning of Q01 to Q10 is described in the legend of Figure 1.

score, although it showed a trend to improvement. This increment might have been more significant if there had been an association with muscular strength training. Keeping in line with this, Judge[20] showed an improvement of 18% in the unipodal support measures in the group that performed a vigorous lower limb strengthening program associated with postural control exercises. The same author also compared his results with those obtained exclusively with a postural control program (performed once a week), which did not reach a statistically significant change in his results.

All of the elderly women who participated in the study decreased the time spent during the performance of the Chair Stand test and only two of them increased their scores by one point. Hauer[5], through an intervention based on a balance training program associated with high-intensity progressive strength training and Campbell[17] with a balance training program associated with moderate strength training, observed an improvement of motor performance in this test, regarding the time spent for performing the test. Perhaps, if the intervention had been associated to a high-intensity systematic strength training program, the results would have been compatible with a considerable change in scores.

Regarding the Tandem Gait test, it was observed that of four elderly women, who in the pre-intervention period were classified as being "severely impaired", three improved their scores, having been re-classified as "moderately impaired". The others remained classified as being "slightly impaired. Steadman[15], did not use this test in his study as an assessment parameter and Campbell[17] included this test in his assessment protocol and performed balance training associated with muscular strength training, ROM and mobility. Both authors demonstrated positive results regarding balance. This fact shows that the balance-specific training seems to be important regarding the improvement observed in the participants who presented a more severe impairment at the aforementioned test prior to the intervention. Additionally, those who presented a less severe impairment might have presented more benefits with the associated training.

A study carried out by Salked[47] showed that approximately 50% of the participants reported that their health status was worse when compared to that observed 12 months immediately before the assessment. This evidence supported our findings and we also added a change in this perception of health status after the balance training program. This trend of improving their health status perception presented by the study individuals was also observed by Brouwer[7]. Another observation from our study was that most of the elderly women classified their health status as being bad. According to Ramos[40] in his follow-up study of elderly individuals in the Brazilian population, the number of individuals who perceived their health status as "bad" or "very bad" corresponded to the prevalence of a high degree of dependence at the ADL, to a probable psychiatric disorder or cognitive alteration. It is worth mentioning that the last two causes were excluded due to our sample's characteristics. Our study showed that the self-perceived health status deterioration can present a positive alteration, caused by the impact of the proposed intervention.

The evidence observed by Hauer[5] on the "fear of falling" was a significant decrease in this negative feeling after the intervention, which comprised a progressive functional balance training associated to high muscular endurance strength training. Brouwer[7] emphasized that the main finding of his study was that the fear of falling can be significantly reduced by participating in activity and education programs, but that the effects that accompany the improvement in balance confidence was program-specific (negative correlation with an intervention that was purely educational). Campbell[25] showed how influent the presence of this fear is in the adherence of an elderly population to an exercise program, as he observed that the ones who quit the program during the first year of its implementation were those who presented the highest levels of fear of falling. Additionally, Maki[48] added that the fear of falling has been associated with a poor performance in balance tests, including the increase in postural oscillation and decrease of unipodal support time. Wolf[14] adversely observed in his results that a 4-6 week intervention (consisting of general exercises within a context of activities of daily living - ADL) can be very short to have an effect on the record of the fear of falling in ADL. Our intervention, however, albeit short (8 weeks), decreased this feeling in the studied group. It can be observed, from the analysis of the results shown on the subject, that when there was an increase in the number of positive answers (regarding the fear of falling in questions Q06 and Q09), there was a decrease in the number of "Does not perform" answers, as shown in details in Table 5. This fact means that there was a trend to increase the mobility perceived at the performance (even in the presence of fear) of activities that were not performed prior to the intervention.

CONCLUSION

A specific short-term, non-systematic, easily applicable and low-cost balance training program, which was carried out in a group of community-dwelling elderly women showed to have an effect on the improvement of balance measures.

A preventive practice can be associated to the increment of the BBS values, as it averted its lower limit from the level corresponding to dependence in the ADL. The gait velocity can have the higher benefit with the association of a muscular strength training and flexibility and the tasks proposed in this study. The relevance of a specific balance training program, regarding lower limb muscular strength, can be evident in the presence of the combination of systematic muscular strength training, and even more so, with a higher evidence for high-intensity training.

Lastly, but not less important, the present study showed that the proposed intervention had a considerable impact on the improvement of the health status perception of the participants, as well as reduced the negative assessment of the perception of gait instability and attenuated the fear of falling.

One of the limitations of the present study was the lack of advice regarding the performance or not of the exercises at home. Therefore, it was not possible to evaluate the effects of the intervention on the frequency of training.

Unfortunately, one cannot make completely affirmative remarks on the correlations between variables, as the small sample size did not allow the use of a significant statistical analysis. Hence, further studies with a higher number of participants are necessary to confirm the findings of the present study.

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