Functional autonomy in elderly women who are physically active and sedentary: causal comparative study

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ABSTRACT

Introduction: Functional autonomy is considered an important marker to physical fitness, quality of life and elderly health. Objective: To compare the functional autonomy among physically active and sedentary women. **Methodology:** Causal comparative study with sample consisting of 276 volunteers: Physically Active Group (PAG, n = 201) and Sedentary Group (SG, n = 75), which respectively were subdivided in two subgroups according to age. The instrument used for functional assessment was the Senior Fitness Test. The comparison of inter-subgroups functional autonomy was performed by the U test of Mann-Whitney with significance level (p <0.05) through the program BioEstat 5.0. **Results:** Significant difference between functional autonomy of subgroups PAG about the respective SGs in all tests. **Conclusions:** The practice of regular physical activity has led physically active elderly women to have a better condition than the sedentary ones. **Keywords:** Elderly, Physical activity, sedentary lifestyle.

INTRODUCTION

Human aging, independent of chronological sections, brings a physiological decline that is influenced by genotype and phenotype factors. The latter is related to environmental determinants and lifestyle that the individual has provided in the course of his life, thus resulting in what may be regarded as the heterogeny of old age[1].

The physiological and functional decline of aging even considered normal, brings a new challenge to public health. Such challenge shall be directed to the preservation of quality of life[2], which is strongly associated with maintenance of functional autonomy and independence of elderly people, which in turn has been achieving a longer period of life[3].

Among these inexorable functional changes that will occur with longevity as the deterioration of the locomotor system, the sedentary lifestyle should be considered as a decisive aggravating factor, for among other health problems it will reduce significantly the cardio respiratory and neuromuscular functions in humans[4]. Therefore, the sedentary lifestyle also becomes a problem for global public health, and, together with other modifiable risk factors such as smoking and poor dietary habits, are the main causes of non-transmissible chronic diseases[5].

Currently there is a consensus in the scientific community about the regular practice of physical activity, this because it is seen as a very effective alternative for prevention and even as an important support in the treatment of certain diseases[6]. By targeting the benefits of such practice, specifically to the functional autonomy, it is expected that at least in its result, are maintained at recommended levels the factors that comprise the dependent variable.

Thus, this study aimed to compare the functional autonomy among physically active and sedentary elderly women.

METHODOLOGY

Type and sampling

Comparative causal study. The sample consisted of 276 elderly volunteer women, homogenized by age groups (60-64 years and 65-69 years) as recommended by the

protocol used[7]. In this sense, were divided into two groups, which were respectively subdivided into: Physically active group who were selected in public projects of physical activity for seniors in the city of Rio de Janeiro (PAG, n=201) that gave birth to the subgroups: PAG1 (n=107, aged 61.6±1.5 years) and PAG2 (n=94, aged 66.7±1.3 years), Group Sedentary selected in centers for the elderly cohabitation belonging to the Municipality of Rio de Janeiro (GS, n=75) which formed the basis for subgroups: GS1 (n=36, aged 62.9±1.2 years) and GS2 (n=39, aged 67.7±1.3 years). As an inclusion criterion of the PAG, all elderly women should have a level of participation in their physical training programs of at least three weekly sessions in a minimum period of three months and for the GS the elderly women could not have done systematized physical activity for the same period of time[8]. It was considered an exclusion criterion, any acute or chronic condition that could compromise or become an impairment or risk factor for the performance of the evaluation of functional autonomy.

This study had its research project approved by the Ethics Committee in Research involving human beings of Castelo Branco University, under protocol No. 00180/2008. The experimental procedures were performed within the ethical standards laid down in Resolution 196/96 of the National Health Council and all participants signed a consent form to the evaluation they would be subject to.

Assessment of functional autonomy

In a first contact the elderly women were informed of the objectives, procedures and risks of this assessment, after taking knowledge and declare themselves volunteers, they underwent a selection according to inclusion and exclusion criteria adopted by this study. From then they were evaluated for functional autonomy through the test of physical fitness for the elderly (Senior Fitness Test)[7], which is constituted of a battery of six tests:

Test of rising from a chair (Chair stand test), which is about standing up and sitting in a chair as many times for thirty seconds (the counting should be made from the stage of lifting). The purpose of this test is to evaluate the functional strength of the lower limbs.

Test of elbow flexion (Arm Curl test), which consists of performing pushups of the elbow as many times for thirty seconds while the evaluated person is seated in a chair and using an implement of 2.27 kg (halter) the count should be made from the concentric phase. The purpose of this test is to evaluate the functional strength of upper limbs.

Test of walking in six minutes (6-Minutes Walk Test), which proposed the candidates to walk as fast as possible (without running) the longest distance in 6 minutes a course of 45.72 meters, divided into 10 segments of 4, 57 meters that were marked with cones and tape. To determine the distance traveled, a plastic card will be given to participants every time they pass by the control cone or when an assessor or assistant mark the complete circuit. If necessary, the candidates may stop and rest (in chairs available) and then keep walking. The purpose of this test is to evaluate the functional aerobic resistance.

Test for sitting and reaching (Chair sit and reach test), which aims at achieving the greatest possible bending of the trunk, while the candidate is seated in a chair with one leg bent at ninety degrees and the other extended. The candidate is supposed to drive the ipse-lateral upper limb dactylon to the lower extended hallux as much as possible. The evaluator using a 60cm ruler will measure the distance between the reference points. If they do not touch each other the value will be negative, if to touch the "Zero" will be registered and if the dactylon exceeds the hallux the amount recorded should be positive. The purpose of this test is to evaluate the functional flexibility of the lower limbs.

Test of hands behind one's back (Back scratch test) that starting from the standing position aims at achieving the largest abduction of the shoulder with an upper limb as well as an elbow flexion. The other upper limb will undergo the greatest possible shoulder adduction associated with the movement of an elbow flexion. This way the individual should bring together the dactylon of both upper limbs as much as possible in their dorsal thorax. The evaluator using a 60cm ruler will measure the distance between the reference points and if they do not touch each other the value will be negative, if they touch the "Zero" will be registered and if the dactylon exceeds the contralateral the

value should be recorded as positive. The purpose of this test is to evaluate the functional flexibility of the upper limbs.

Test of standing up and go back and forth (8-Foot Up-and-go test) in which the candidate is on the sitting position and at the signal of the evaluator, he should get up and walk toward a cone that will be at a distance of 2.44 m from the chair, spin around and return it to his original position as soon as possible. The evaluator with the aid of stopwatch will register the time that the individual takes to rise from a chair, walk the course and return to the sitting position. The purpose of this test is to evaluate the agility, dynamic balance and functional power.

Statistical treatment

Descriptive statistical techniques were used (average and standard deviation). The Kolmogorov-Smirnov test was used to verify the normality of sampling distribution and in the comparison of inter-subgroups functional autonomy we performed the U-test of Mann-Whitney, adopting as the level of significance ($p < 0.05$). To perform the statistical analysis of this study the program BioEstat 5.0 was used.

RESULTS

Tables 1 and 2 show at first the reference values for each of the tests that comprise a battery of the functional assessment Senior Fitness Test[7], and the averages and standard deviations obtained by each of the subgroups is on each of them, together with their deltas and their p-values.

Table 1: comparison of subgroups PAG1 and GS1.

Tests	Reference values	PAG 1	GS1	Δ	p-value
Chair stand	12 a 17 rep./30"	13.4±3.7	10.3±2.2↓	3.1	0.0001*
Arm curl	13 a 19 rep./30"	15.7±2.3	13.0±2.5	2.7	0.0001*
6-minutes walk	547 a 660m/6'	549.2±49.8	451.8±55.0↓	97.4	0.0001*
Chair sit-&-reach	-0.5 a +5.0 cm	-4.4±5.3↓	-5.9±4.4↓	1.5	0.0006*
Back scratch	-3.0 a +1.5 cm	-6.4±6.2↓	-8.0±5.5↓	1.6	0.0008*
8-ft up-&-go	6.0 a 4.4"	6.2±1.2↓	7.6±1.4↓	1.4	0.0001*

↓ value obtained below the reference line.
* statistically significant difference.

Table 2: comparison of subgroups PAG2 and GS2.

Tests	Reference values	PAG 2	GS2	Δ	p-value
Chair stand	11 a 16 rep./30"	12.3±2.9	9.7±1.5↓	2.6	0.0001*
Arm curl	12 a 18 rep./30"	14.3±2.4	12.5±2.4	1.8	0.0001*
6-minutes walk	500 a 635m/6'	507.0±48.7	434.4±61.7↓	72.6	0.0001*
Chair sit-&-reach	-0.5 a +4.5 cm	-4.9±4.2↓	-6.0±4.2↓	1.3	0.005*
Back scratch	-3.5 a +1.5 cm	-7.3±7.3↓	-8.8±5.5↓	1.5	0.003*
8-ft up-&-go	6.4 a 4.8"	6.9±1.2↓	8.0±1.2↓	1.1	0.0001*

↓ value obtained below the reference line.
* statistically significant difference.

In a first analysis of the tables described above, we can observe that both show that both the PAG 1 and 2 show values below the reference tests Chair sit-&-reach, back scratch and 8-ft up-&-go. As to the test Arm Curl, the respective tables express that all subgroups presented values within the reference line. Finally, according to the deltas arising from the comparison inter-subgroup, we may notice that the p-values show statistically significant differences between all subgroups studied.

DISCUSSION

Based on the results in Tables 1 and 2 Chair standing Test, the functional strength of the lower limbs of the two sedentary subgroups were found below the reference rates[7]. Possibly this happened because physical inactivity is an important variable in the decline of force, when directing them to the functionality of the referred limbs, it seems that the sedentary lifestyle generates a more aggressive effect on females, as Capodaglio et al.[9] showed a reduction of up to 11% after 12 months of inactivity for women (n=11 and 77.2±3.4 years), a model that is not scaled to men (n=9 and 77.8±6.3 years), since they presented only 2% decrease in strength of the lower limbs for the same period of inactivity.

Still referring to the functional strength of the lower limbs such tables mention that the results presented by the two PAG subgroups are within the recommended values, but

surfacing the minimum levels of reference[7]. This vulnerability of the levels of functional strength in the lower limbs of these subgroups may have occurred by the possible absence of a specific prescription for strength training programs of physical activity where the elderly women participated, in which we should look for: volume, intensity, sequence, intervals between series and exercises chosen. If these principles are taken into account the positive effects may be relevant to the point of a sample of elderly men and women (n=20 and 76±8 years) when subjected to a physical activity program with a duration of eleven weeks, they can present an evolution of (5.7±6.9 to 12.7±6.0 reps) Chair Stand test, showing a significant gain in strength of lower limbs[10].

As to the functional strength of the upper limbs Arm curl Test the tables 1 and 2 indicate that both PAG subgroups as well as the GS, are within the reference numbers[7]. This fact, possibly occurred due to the fact that the upper limb muscles suffered less from disuse, or because the activities of daily living are able to maintain the functional strength of these members within the recommended levels for those elderly women belonging to the GS.

Still focusing on the functional strength of upper limbs, it is explicit in tables 1 and 2 that the subgroups PAG1 and 2 showed significant differences over their respective GS in the order of $p < 0.05$. This fact can be justified due to the effects programs of physical activity in which the elderly women of the PAG participated. In defense of this assumption, Yamauchi et al.[11] showed in their results a significant difference when comparing the effects of a physical activity program of twelve weeks' duration on the functional strength of upper limbs also in elderly women.

Analyzing at first the tables 1 and 2 in the 6-minutes walk test, which express that the functional aerobic resistance of all the sedentary subgroups found were below the reference rates (7). A justification for this fact would be the very sedentary condition in which these subgroups are presented, since this condition is capable of minimizing the variable in question considerably. Another aspect to be considered is the vulnerable condition that the results of the PAG subgroups presented, because, although within the reference rates[7], they are surfacing the lower recommended limit. This may have

occurred due to an underestimation in the prescription of the target zone training for those elderly women. Supporting this hypothesis, Furtado et. al.[12] obtained in their results a similarity with the present study, because in describing the profile of cardio-respiratory endurance of elderly women practitioners of physical activity, using the same assessment instrument, three of their group: G1 (n=29, aged 60-64 years and BMI=29.4±1.8), G2 (n=22, aged 65-69 years and BMI=29.0±2.1) and G3 (n=11, aged 70-74 years and BMI=29.4±1.8) also showed vulnerability to the variable in question in order of: G1=526.0±55.9 meters, G2=509±55.2m and G3=491.3±48.3 meters.

Despite presenting the results of subgroups for functional flexibility of upper and lower limbs separately, the tables 1 and 2 in the Chair sit-&-reach Test and back scratch will be analyzed simultaneously, once both show that all subgroups studied depicted no significant difference in the comparison of inter-subgroups and that all were below the predictive values in the variables involved.

Such facts may have occurred because flexibility is a component of physical fitness that is extremely affected by aging. Supporting this possibility Faria and Oliveira[13], using the same apparatus of the present study, also obtained in their pre-intervention results values below the reference ones when assessing the same variables both in the GE experimental group (n=25, aged 61.8±1.6 years) and in the control GC (n=25 aged 62.1±1.6 years) for the functional flexibility the upper and lower limbs respectively. These findings of this research gain relevance in the support of the hypothesis, because the average age of its two groups is equivalent to the subgroups PAG1 and GS1, making it acceptable that this decline is already present at younger ages and that the possible overweight intervention would not fit for this occasion, since both groups were classified as normal on the BMI analysis. An alternative that could explain the results of two physically active subgroups would be the inefficiency or even the absence of specific training for flexibility in the programs those elderly women belonged to. In support of this explanation the same authors[13], showed significant improvements in flexibility when it is trained, since they found a significant difference between pre and post Yogilates

training in their GE, placing the flexibility of upper and lower limbs of this group within the prediction values.

In the first analysis of the 8-ft up-&-go test, tables 1 and 2 show that all subgroups PAG and GS are with their results below the reference values. This situation is possibly understood in terms of agility, balance and power for they are sharply affected by aging. Supporting this positioning, but now admitting the benefits of regular physical activity, Hallage[14], when verifying the effects of the training with aerobic dance and low impact step on the functional fitness of elderly women (n=13, aged 63,4±2.4 years) observed a significant difference regarding the evolution presented in 5.63±0.65 seconds to 4.73±0.57 after 12 weeks of intervention, but equally to the present study it also did not put them within the reference values, thus it can be assumed that even if limited, the beneficial effects of regular physical activity on subgroups PAG1 and 2 were capable of generating significant difference on their respective sedentary individuals, however, failing to guarantee their entry to normal levels.

Contradicting previous information that could lead to an acceptance of the inefficiency of physical activity to generate beneficial effects on that variable, Alves RV, et al. (15) when considering the effects of hydro gymnastics on physical fitness related to health among the elderly, found a significant difference when their experimental group in the 8-ft up-&-go test GE (n=37, aged of 78.0±3.0 years) showed a Δ=1.5 derived from the comparison of the results of the pre-intervention assessment (7.3±1.5 seconds) and after (5.8±1.0 seconds), showing that in addition to the positive effects of physical activity, it was able to ensure that they reached the prediction values.

CONCLUSION

The practice of regular physical activity has led physically active elderly women to have a better condition than sedentary ones, however, this condition is not a guarantee that physically active women will present recommended levels in all components of functional autonomy, above all, flexibility, agility, balance and power. Therefore it is necessary a more specific exercise prescription for these physical valences, for they seem to be most affected by aging.

REFERENCES

1. Fernandés MGM, Andrade NA, Nóbrega MML. Determinantes de fragilidade no idoso: uma revisão sistemática. Online Brazilian journal of nursing, v. 9, n. 1 (2010).

2. Ribeiro, RCL et al. Capacidade funcional e qualidade de vida de idosos. Estud. interdiscip. envelhec., Porto Alegre, v. 4, p. 85-96, 2002.

3. Pereira, FD et al. Comparação da força funcional de membros inferiores e superiores entre idosas fisicamente ativas e sedentárias. *Rev. Bras. Geriatr. Gerontol* 2009, vol.12, n.3.

4. Fleg JL, et al. Accelerated longitudinal decline of aerobic capacity in healthy older adults. Circulation. 2005; 112: 674-82.

5. World Health Organization – WHO. Draft global strategy on diet, physical activity and health – integrated prevention of noncommunicable diseases. Geneva. 2003; 3-18.

6. Hollmann W, Strüder HK, Tagarakis CV, King G. Physical activity and the elderly. Eur J Cardiovasc Prev Rehabil. 2007;14(6):730-9.

7. Rikli RE, Jones CJ. Fitness of older adults. The Journal Active Aging. 2002; 25-30.

8. American College Of Sports Medicine. Position stand: the recommended quantity and quality of exercise for developing and maintaining cardiorespiratory and muscular fitness, and flexibility in healthy adults. Med. Sci. Sports Exercise. 1998; 30: 975-91.

9. Capodaglio P, et al. Muscle function and functional ability improves more in community-dwelling older women with a mixed-strength training programme. Age and ageing. 2005; 34(2):141-7.

10. Chaves C, Rodrigues L, Garganta R. Effects of a Once-a-week Exercise Programme in the Elderly. 13th annual congress of the European College of Sport Science 9-12 july 2008; Estoril - Portugal. 28.

11. Yamauchi T, et al. Effect of home-based well-rounded exercise in community-dwelling older adults. Journal of Sports Science and Medicine. 2005; (4): 563-7.

12. Furtado HL, et al. Perfil de resistência cardiorrespiratória em mulheres idosas com sobrepeso do programa de atividade física no SESC de Nova Friburgo/RJ/Brasil. Revista de Desporto e Saúde da Fundação Técnica e Científica do Desporto. 2008; 4(11): 21-26.

13. Faria VAM, Oliveira AMB. Yogilates: physical conditioning, strengh and flexibility on sedentary elderly women. VI Encontro Latino Americano de Pós-Graduação – Universidade do Vale do Paraíba. 2007; 2768-72.

14. Hallage T. Efeitos de 12 semanas de treinamento com dança aeróbica e step de baixo impacto sobre a aptidão funcional de mulheres idosas. Dissertação. Mestrado em Educação Física da Universidade Federal do Paraná, 2008; p40.

15. Alves RV, et al. Aptidão física relacionada à saúde de idosos: influência da hidroginástica. Rev Bras Med Esporte 2004; 10(1): 31-7.