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ANALYSIS OF POSTURAL STABILITY IN ACTIVE ELDERLY WOMEN

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INTRODUCTION

Postural stability is the ability to control the center of mass relative to base of support. Its control depends on the interaction between the sensory (visual, vestibular and somatosensory), central nervous and motor system. With aging the integration of this systems declines [1].

The increase in body sway is an intrinsic factor for determining the risk of falls, leading to predictions of functional dependence, reduced autonomy, isolation and depression, those consequences generate strong impact on the elderly and their social context [2].

The center of pressure (Cop) is used to measure body sway and represents the result of the actions of the systems involved in postural control. Studies show that the effectiveness of this system is directly related to the area, average velocity and displacement and total CP, stating that good control would be represented by lower values of these parameters [3,4].

There is evidence in the literature that older practitioners of regular exercise have better postural stability compared to sedentary and active older women who still also have better postural stability than sedentary ones (REF), however, remains unclear behavior of postural stability in older physically active but not practicing physical exercises compared to physically active elderly and practicing physical exercises. Thus, the present study aimed to compare the postural sway in older women active practitioners of regular exercise and not practicing and correlate the chronological age of all practitioners with the variables of Cop.

METHODS

The total sample was 21 older women who were divided into two groups: Physical Exercise Group - PEG (N=11) 67.82±5.42 years and Non Physical Exercise Group – NPEG (N=10) 63.80±4.47 years. The PEG included women who were practicing physical exercise for at least three years and the NPEG included women classified as active by IPAQ but not practitioners of systematic physical exercise. All the volunteers lived in Brasilia, were physically independent and, moreover, had no diseases that compromise the gait or balance.

The human studies ethics committee at University of Brasilia gave approval for this study, and informed consent was obtained from all subjects before their participation.

Data collection occurred at the Biomechanics Laboratory of the Faculty of Physical Education under the supervision of professionals previously trained. The participants were divided into groups of five and one group was assessed per day, totaling one week of ratings.

Body weight, height and handgrip strength were measured [5]. A health history questionnaire and the International Physical Activity Questionnaire (IPAQ) were applied.

Body sway was assessed using the Platform Balance AccuSway Plus - AMTI (Advanced Medical Technology Inc, Watertown, MA) and the Balance Clinic Software, with sampling frequency of 100 Hz and low-pass filter to 10Hz. The protocols applied were Open base eyes opened (OBEO), Open base eyes closed (OBEC), Closed base eyes opened (CBEO), Closed base eyes closed (CBEC), Tandem right (TR) and Tandem left (TL), in that order.

To correct execution of the stabilometric tests, marks were made in the platform in order to facilitate understanding of the tests. All positions should be maintained for 30 seconds. They were asked to remain motionless, his body straight, arms relaxed at your sides, breathing normally and keeping their eyes fixed on a target of 10 cm² positioned horizontally on a wall 1.5 m away. The older underwent two attempts in each protocol with 20 second intervals between them. In all the above tests was assured that the environment was lighted and quiet as possible.

Descriptive (mean ± standard deviation) statistics were used to characterize the sample data. Normality of the distributions for outcome measures was tested using the Shapiro-Wilk test and the Levene's test was used to check the assumption of homogeneity of variances. Inferential statistics (Student t test, Mann-Whitney U test and Chi-square) were were used to check for differences between the two groups in those variables. The significance was taken at 5%. The statistical package for data analysis was SPSS for Windows v.18.0.

RESULTS AND DISCUSSION

Table 1 shows the characteristics of the sample divided into PEG and NPEG in age, body mass index, grip strength and physical activity level. There were no significant differences between groups for these variables. Regarding the level of physical activity, the two groups had medians equal to 4, which correspond to the classification of active according to the IPAQ.

Table 1: Characteristics of sample (mean ± SD or median).

	PEG (N=11)	**NPEG (N=10)**	**p**
Age (years)	67.82 ± 5.42	63.80 ± 4.47	0.08
BMI (kg/m²)	25.28 ± 3.94	27.30 ± 3.67	0.27
Handgrip strength (kgf)	27.45 ± 4.50	29.14 ± 7.22	0.55
Physical activity level (IPAQ)*	4	4	0.50[b]

BMI: Body mass index, b: chi-square; *: values expressed as median, PEG: Physical Exercise Group; NPEG: Non Physical Exercise Group.

Table 2 shows the comparisons between variables Area95 (95^{th} area of the ellipse), PathLengthCop (Total length oscillation of Cop) and AvgVel (Average velocity of Cop) in all evaluated protocols. There were no significant differences between groups in protocols and variables. Significant correlations were found between the age of participants and AvgVel (r=0.507; p=.006) and PathLengthCop (r=0.650; p<.01).

Table 2. Results of PEG and NPEG in all protocols (Mean and 95% confidence interval).

Protocol	**Area95 (cm²)**			**PathLengthCop (cm)**			**AvgVel (cm/s)**		
	PEG	**NPEG**	*p*	**PEG**	**NPEG**	*p*	**PEG**	**NPEG**	*p*
OBEO	0.50 (0.40-0.74)	0.75 (0.50-1.26)	0.08[a]	27.42 (24.29-30.54)	23.62 (19.56-26.67)	0.10	0.90 (0.78-1.02)	0.79 (0.65-0.92)	0.17
OBEC	0.59 (0.40-0.77)	0.60 (0.35-1.28)	0.44[a]	32.62 (26.02-39.22)	27.02 (22.29-32.56)	0.16	1.10 (0.87-1.32)	0.90 (0.74-1.06)	0.13
CBEO	1.64 (1.13-2.14)	2.49 (1.22-3.76)	0.24	32.96 (28.63-37.28)	27.66 (23.00-32.32)	0.08	1.07 (0.92-1.22)	0.92 (0.77-1.08)	0.13
CBEC	4.11 (2.64-5.68)	3.68 (2.12-5.23)	0.66	44.98 (35.59-54.28)	54.84 (33.93-75.73)	0.31	1.56 (1.24-1.87)	1.83 (1.13-2.52)	0.41
TR	5.48 (3.49-7.47)	4.83 (3.03-6.62)	0.99	91.65 (74.90-111.75)	91.94 (63.00-120.88)	0.98	3.05 (2.38-3.73)	3.06 (2.10-4.03)	0.98
TL	5.04 (3.31-8.59)	4.84 (3.14-7.30)	0.40[a]	87.49 (67.63-113.29)	89.13 (64.96-115.20)	0.94[a]	2.88 (2.57-3.19)	3.00 (2.16-3.84)	0.74

OBEO: Open base eyes opened; OBEC: Open base eyes closed; CBEO: Closed base eyes opened; CBEC: Closed base eyes closed; TR: Tandem Right; TL: Tandem Left.

This study helped to demonstrate some aspects related to postural stability in older active evaluated in different situations of sensory requirements. Overall, the main findings of this study showed no significant difference between the variables of displacement in Cop protocols evaluated between these two groups of elderly women.

The effects of regular exercise have been previously reported as being beneficial for the balance of elderly evaluated by postural sway. Some authors observed in a cross-sectional study that elderly practitioners of exercise had postural oscillations smaller than inactive elderly. In the present study, the level of physical activity was assessed by the IPAQ, a validated assessment tool used internationally, as in the previous study the classification of inactive was performed only from the adoption of a systematic exercise and lack of standardization of analyzes related physical activity limits possible comparisons [6].

Some aspects must be considered: although no significant difference, the PEG has characterization values, such as age, higher than the NPEG and significant correlation was observed between age and two variables of Cop, also found in other studies [7].

This fact also seems to happen with older males, as suggested by [8], who observed no differences between body sway tests in elderly men classified as sedentary, exercise practitioners and athletes. Additionally, sociocultural factors may also influence such parameters, in this study the subjects resided in the Federal District, a city renowned for its high human development index, which may favor the maintenance of active aging. Despite the above findings, there is still little observation studies assessing postural sway in the elderly population that remains active even with low adherence to systematic physical exercises or even the absence, as the participants of this study.

It is important to report some limitations to the methodology of this study as the average age of the groups and lack of control of physical exercises practiced by PEG.

CONCLUSIONS

The results suggest that a sustained level of physical activity, with a minimum of 150 minutes per week, performed regularly, can ensure values of body sway comparable to older active practitioners of physical exercise and the practice of regular physical activity also contributes for the maintenance of postural control in elderly women.

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