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Posturographic analysis of schoolteachers with different levels of habitual physical activity

Análise posturográfica em professores da rede estadual de ensino com diferentes níveis de atividade física habitual

Daiane Soares de Almeida Ciquinato[1,2,3], *Marcelo Yugi Doi*, *Arthur Eumann Mesas*[4,5], *Luciana Lozza de Moraes Marchiori*[6]

ABSTRACT

Objective: to compare parameters of postural control in teachers of state education network with different levels of habitual physical activity. **Methods:** 50 teachers (48.1 ± 9 years) participated and were evaluated on a force platform, in a bipedal position, eyes open, on surfaces rigid and unstable. The International Physical Activity Questionnaire (version abbreviated) was used to categorize the level of physical activity into low, moderate and high. The level of physical activity was also divided into groups of more active (G1) and less active (G2). The study carried out an analysis of subgroups by gender and age range and applied non-parametric statistics. **Results:** the data showed that the G2 group, the less active women and the less active individuals in the age group of 49 to 60 years presented worse results in speed in the anteroposterior direction, in the condition of unstable surface and the difference in means between the rigid surface and the unstable. **Conclusion:** the less active group, the less active teachers and less active participants in the 49-60 age group had worse results in velocity in the anteroposterior direction.

Keywords: Postural balance; Audiology; Physical activity; School teachers; Health promotion

RESUMO

Objetivo: comparar parâmetros do controle postural em professores da rede estadual de ensino com diferentes níveis de atividade física habitual. **Métodos:** participaram 50 professores (48,1±9 anos) que foram avaliados em plataforma de força, na posição bipodal, olhos abertos, em superfícies rígida e instável. O Questionário Internacional de Atividade Física (versão curta) foi utilizado para categorizar o nível de atividade física em baixo, moderado e alto. O nível de atividade física também foi dicotomizado em grupos de mais ativos (G1) e menos ativos (G2). O estudo realizou análise de subgrupos para gênero e faixa etária e aplicou a estatística não paramétrica. **Resultados:** os dados demonstraram que o grupo G2, as mulheres menos ativas e os indivíduos menos ativos na faixa etária de 49 a 60 anos apresentaram piores resultados na velocidade na direção anteroposterior, na condição de superfície instável e na diferença das médias entre a superfície rígida e a instável. **Conclusão:** o grupo menos ativo, as professoras menos ativas e os participantes menos ativos na faixa etária de 49 a 60 anos apresentaram piores resultados na velocidade na direção anteroposterior.

Palavras-chave: Equilíbrio postural; Audiologia; Atividade física; Professores escolares; Promoção da saúde

Study carried out at Universidade Pitágoras – UNOPAR – Londrina (PR), Brasil.
[1]Programa de Pós-graduação em Ciências da Reabilitação, Universidade Estadual de Londrina – UEL – Londrina (PR), Brasil.
[2]Universidade Pitágoras – UNOPAR – Londrina (PR), Brasil.
[3]Setor de Medicina do Trabalho e Saúde Ocupacional, Prefeitura Municipal de Cambé – Cambé (PR), Brasil.
[4]Programa de Pós-graduação em Saúde Coletiva, Universidade Estadual de Londrina – UEL – Londrina (PR), Brasil.
[5]Centro de Estudios Sociosanitarios, Universidad de Castilla – La Mancha (Cuenca), España.
[6]Laboratório Interdisciplinar de Intervenção em Promoção da Saúde – LIIPS, Universidade Cesumar – UNICESUMAR – Maringá (PR), Brasil.
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Corresponding author: Daiane Soares de Almeida Ciquinato. E-mail: ciquinato19@gmail.com
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INTRODUCTION

Teaching, particularly in basic education, is one of the most socially relevant professions. However, teachers' working conditions are usually challenging, with possible implications for their physical and mental health[1-3] and impacts on their professional performance[2]. Their dedication leads them to spend hours at work – even outside the workplace, planning classes and grading tests. Moreover, they work in more than one school and have exhausting workdays, which contributes to their little physical activity. Studies that have assessed teachers found a prevalence of little physical activity, ranging from 46.3% to 71.9%[4,5]. Such physical inactivity increases the risk of circulatory and metabolic diseases[6] and musculoskeletal disorders, possibly affecting postural balance[7].

A study has demonstrated that physical exercise over various weeks improves cognitive performance, including executive functions, processing speed, and memory[8]. Regardless of the aerobic or anaerobic metabolic demands, physical exercise stimulates the vestibular, neuromuscular, and proprioceptive systems. The vestibular system codes the perception of self-movement and body balance, as it detects inertial movement along with proprioceptive and visual signals[8].

Increased vestibular system stimulation during movement is believed to be an essential mediator between physical exercise and cognitive functioning[8,9]. In the case of teachers, the relationship between postural control, physical activity, and cognitive functioning is greatly important, as their work is mainly carried out through cognition and its processes, involving attention, concentration, memory, reasoning, and so forth. Hence, factors that may disturb postural control impact their professional and personal performance. However, no studies were found in the literature relating physical activity to postural control in basic education teachers. It is also important to consider the social security reforms that took place in Brazil in recent years, which tend to gradually increase the number of older people working. Therefore, this topic should be explored to promote these professionals' health and improve their quality of life.

Studies have demonstrated[10-12] that more physically active people – whether older, middle-aged, or young adults – had better results in balance parameters than less active ones. In contrast, other authors[13] assessed a sample of 75 healthy individuals but did not find the same association. Thus, this study aimed to compare postural control parameters in state public school teachers with different levels of habitual physical activity.

METHODS

This cross-sectional analytical observational study is part of a greater project named "PRO-TEACHER", conducted in partnership between the State University of Londrina (UEL) and Pitágoras Unopar University to assess and analyze the relationships between health status, lifestyle, and work in state public school teachers[14]. The assessments of this broad research project[14-16] took place in three stages – the present study belongs to the third one, conducted between September 2015 and November 2016, including the following assessments: hearing assessment, comprising medical history survey (to verify auditory and vestibular symptoms and chronic diseases) and pure-tone threshold audiometry; speech assessment, with a questionnaire; postural control assessment, with a force platform; cervical mobility assessment, with photographs, postural assessment, and a questionnaire. Lastly, a questionnaire was used to survey physical activity factors.

All participants were informed of the assessment procedures and signed an informed consent form. The procedures complied with the 1995 Declaration of Helsinki, and the study was approved by the Research Ethics Committee of the State University of Londrina, under protocol no. 33857114.4.0000.5231 and evaluation report no. 742.355.

The recruitment of participants began through a meeting with the Regional Education Department of Londrina, Brazil, in which the project's objectives and procedures were explained to the school principals. Then, teachers were contacted during visits to schools[14-16]. Those who agreed to participate in the project were invited via phone calls and e-mails to come to the Speech-Language-Hearing Clinic at the Pitágoras Unopar University, in Londrina, where the assessments in this study were conducted. The inclusion criteria were as follows: classroom teachers (i.e., responsible for at least one subject), teaching in state public middle or high schools in Londrina, who had not been on a leave of absence for 30 or more days in the previous 12 months, or reallocated to another function; of both sexes; aged 18 to 60 years; who signed the informed consent form. The exclusion criteria were as follows: having physical or sensory limitations that hindered them from taking the balance tests (e.g., inability to understand and respond to simple verbal commands and/or take the required stances); having severe or disabling hearing and/or visual impairments, preventing their activities of daily living; having orthopedical disorders that limited their movements or using lower limb prostheses; having central or peripheral vestibular disorders; having consumed alcohol 24 hours before the assessment; having taken drugs that act on the central nervous system or the vestibular system 48 hours before the assessment.

Data on physical activity was collected with the International Physical Activity Questionnaire – short version (IPAQ), validated in Brazil[17]. Participants were classified according to parameters for the Brazilian population and international guidelines[18], as the IPAQ Research Committee guidelines make it possible to use a continuous score, besides categorizing them into low (LPA), moderate (MPA), and high physical activity (HPA).

The continuous score considers the MET-minutes per week. MET stands for the metabolic equivalent task, an estimated energy expenditure during physical activity that depends on the intensity of the activity, the number of minutes performing it, and its frequency in days per week[18]. The following mean MET values were used in the instrument: 3.3 METs for walks; 4.0, for moderate activities; and 8.0, for vigorous activities. The final MET-minutes per week is expressed in the following formula: MET-minutes per week = reported physical activity MET value (walks, moderate, or vigorous) x reported minutes of physical activity x its frequency in days[18].

LPA was the classification of those who reported no activities or did not meet the criteria to be classified as either moderate or high. MPA was the classification of those who reported 3 or more days of vigorous activity for at least 20 minutes per day, or 5 or more days of moderate activity and/or walks for at least

30 minutes per day, or 5 or more days with any combination of moderate walks and vigorous activities that reached a minimum of 600 MET-minutes per week. HPA was the classification of those who met one out of two criteria: performing vigorous activities for at least 3 days, totaling 1,500 MET-minutes per week, or for 7 or more days with any combination of walks and moderate and vigorous activities, totaling at least 3,000 MET-minutes per week[18]. Then, participants were divided into two groups: "more active" (G1), comprising those classified as MPA and HPA with IPAQ; and "less active" (G2), comprising those classified as LPA with IPAQ. The analyses also addressed subgroups between sexes (males and females) and age groups (dividing the sample based on the median age of 48 years).

Data on postural control were collected at the Laboratory for Human Functional Assessment and Motor Performance at Pitágoras Unopar University, in a quiet, bright, and noiseless setting. The force platform (FP) used in the assessments – BIOMEC400 (EMG System do Brasil, SP) – has four rectangular load cells, measuring 500 x 500 x 100 mm and weighing 22 Kg. The system uses a 16-bit analog-digital converter and 50-Hz rejection filters. The vertical ground reaction force derives from a 100-Hz sampling. All force signals recorded with the FP are filtered with a 35-Hz low-pass filter and Butterworth filter to eliminate electrical noise[19]. Data were acquired and treated with the FP bioanalysis software.

Postural control was assessed in bipedal stance in two sensory conditions: on a rigid surface and an unstable surface (made with a square piece of foam covered with leather, measuring 50 cm long x 50 cm wide x 10 cm thick, with a density of 26). FP records were initially taken on the rigid surface and then on the unstable one. Participants stood on them upright, as motionless as possible, arms relaxed by the trunk, barefoot, parallel feet 10 cm apart one from the other, or aligned with their shoulders. The stance was tested with eyes open, fixed on a black cross measuring 14.5 cm high x 14.5 cm wide x 4 cm thick, and placed on a wall at eye level 2 m away from the participant. FP data were recorded three times for each surface, lasting 30 seconds, with 30-second rest intervals in between collections. Data analyses were based on the mean of the three measurements. To ensure the participants' safety, two evaluators stood beside them, one to the right and the other to the left of the FP, to help the participant in case of imbalance, thus avoiding any possible falls.

The difference between the means on the unstable and rigid surfaces was included in the statistical analysis. The literature describes that people generally have greater postural sway on unstable surfaces[7,20]; hence, the difference between the means could indicate that participants with less difference between the two conditions have better postural control.

The following postural control parameters were analyzed: the area of the ellipse (95%) of the center of pressure (COP) in square centimeters (A-COP in cm^2) and the mean velocity in centimeters per second (in cm/s) in both movement directions: anteroposterior (VEL-AP in cm/s) and mediolateral (VEL-ML in cm/s). Data were interpreted according to the literature, which points out that the area/surface of the ellipse (used to adjust data) quantifies 90% or 95% of the total area covered in ML and AP directions. Thus, it is considered an overall postural performance index – the smaller the surface, the better the performance. The velocity is calculated by dividing COP excursion by the test time. Both ML and AP and the resulting velocity can be considered, reflecting the effectiveness of the postural control system – the lower the velocity, the better the postural control[20].

The statistical analyses were performed in IBM SPSS, version 20 for Windows. In all analyses, the confidence interval was set at 95% and the significance level, at 5%. The Shapiro-Wilk test did not find the normality of the data; therefore, the Mann-Whitney and Kruskal-Wallis tests were applied with Dun post hoc. The effect size of the nonparametric tests was calculated. For Mann-Whitney, the following equation was used: $r = Z / \sqrt{n}$, in which "r" is the correlation coefficient, "Z" is the standardized U-value, and "n" is the number of observations[21]. For Kruskal-Wallis, the estimated epsilon square (E_r^2) was used in the following equation: $E_r^2 = H/(n^2 - 1)/(n + 1)$, in which "$E_r^2$" is the coefficient with values ranging from 0 (indicating no relationship) to 1 (indicating a perfect relationship), "H" is the value obtained with Kruskal-Wallis, and "n" is the number of observations[22]. The effect sizes followed Cohen's classification[23]. The Spearman correlation was also used, and the degree of correlation was classified according to the guidelines by Portney & Watkins[24]. The chi-square test was used to verify the association between categorical data.

RESULTS

Altogether, 59 teachers were assessed. However, seven of them were excluded for being above 60 years old, one was excluded for consuming alcohol within 24 hours of the assessment, and one was excluded for having a severe visual impairment (reportedly waiting for a cornea transplant). Hence, 50 teachers participated in this study, most of them women (74%), with a mean age of 48.1±9 years; 50% of the teachers reported LPA. Data on the overall characteristics of the sample are shown in Table 1.

The Kruskal-Wallis tests did not find any significant difference in the comparison between LPA, MPA, HPA, and COP variables ($p > 0.05$) (Table 2). On the other hand, in the comparison between G1 (more active) and G2 (less active) and COP measures, the Mann-Whitney test found statistical significance with a small effect size on the unstable surface regarding VEL-AP ($p = 0.047$; $r = 0.27$) and the difference in means of VEL-AP ($p = 0.044$; $r = 0.28$) – G2 had worse test results (Table 3). MET-minutes/week was not significantly correlated with COP data ($p > 0.05$), as follows: on the rigid surface: MET-minutes/week x A-COP: $r_s = -0.173$; VEL-AP: r_s: = -0.015; VEL-ML: $r_s = 0.199$; on the unstable surface: MET-minutes/week x A-COP: $r_s = 0.143$; VEL-AP: $r_s = 0.233$; VEL-ML: $r_s = 0.237$.

Since there was no statistical difference between IPAQ classification (LPA, MPA, HPA) and COP variables, considering sexes and age groups ($p > 0.05$), the analyses addressed physical activity groups (G1 and G2). There was a difference with a small effect size in the subgroup of women regarding the difference of means of VEL-AP ($p = 0.045$; $r = 0.33$) – more active women (G1) had better results. The other variables were not significant ($p > 0.05$) (Table 4). As for age groups, there was a difference in those aged 49-60 years, on the unstable surface regarding VEL-AP ($p = 0.040$; $r = 0.44$), with a small effect size. There

Table 1. Descriptive data of the sample (N = 50)

General characteristics	
Sex	
Males	n = 13 (26%)
Females	n = 37 (74%)
Age group (years)	
30-48 years	n = 28 (56%)
49-60 years	n = 22 (44%)
Mean ± standard deviation	48.1±9
weight (Kg)	73.5 [23.2][a]
Height (m)	1.63 [0.13][a]
BMI	26.5 [4.9][a]
Hearing (right ear)	
Normal hearing	n = 39 (78%)
Hearing loss	n = 11 (22%)
Tinnitus	
No	n = 39 (78%)
Yes	n = 11 (22%)
Dizziness	
No	n = 33 (66%)
Yes	n = 17 (34%)
Diabetes	
No	n = 49 (98%)
Yes	n = 1 (2%)
Hypertension	
No	n = 38 (76%)
Yes	n = 12 (24%)
Cervical pain	
No	n = 27 (54%)
Yes	n = 23 (46%)
Group (IPAQ classification)	
Low	n = 25 (50%)
Moderate	n = 17 (34%)
High	n = 8 (16%)
MET-minutes/week	1024 [1916][a]

[a]Median and interquartile range

Caption: N = Number of observations; Kg = Kilograms; m = Meters; BMI = Body mass index; IPAQ = International Physical Activity Questionnaire; MET = Metabolic equivalent task

was also a difference with a moderate effect size regarding the difference in means of VEL-AP ($p = 0.013$; $r = 0.51$) – G2 had worse test results (Table 5).

The chi-square tests did not find any associations between physical activity assessed with IPAQ (divided into two groups) and sex, age group, tinnitus, dizziness, cervical pain, or hearing loss ($p > 0.05$).

DISCUSSION

This study aimed to compare postural control parameters in state public school teachers with different levels of habitual physical activity. It verified that the less active group (G2) had worse results in VEL-AP on the unstable surface and in the difference in means between the rigid and unstable surfaces, and so did the less active individuals aged 49-60 years. Moreover,

Table 2. Comparison between three levels of physical activity (defined by the International Physical Activity Questionnaire) and postural control variables

	Low (N = 25)	Moderate (N = 17)	High (N = 8)	p-value (Kruskal-Wallis)
A-COP (cm²)				
Rigid	1.39 [0.92][a]	1.42 [0.89][a]	1.54 [1.07][a]	p = 0.895 E_r^2 =0.01
Unstable	4.47 [2.65][a]	4.10 [5.04][a]	5.05 [4.28][a]	p = 0.461 E_r^2 = 0.03
Difference between means	2.62 [3.05] [a]	2.42 [4][a]	4.14 [0.24][a]	p = 0.444 E_r^2 = 0.04
VEL-AP (cm/s)				
Rigid	0.72 [0.25] [a]	0.72 [0.13][a]	0.76 [0.24][a]	p = 0.622 E_r^2 = 0.01
Unstable	1.06 [0.37][a]	1.13 [0.51][a]	1.28 [0.51][a]	p = 0.098 E_r^2 = 0.09
Difference between means	0.33 [0.26][a]	0.42 [0.49][a]	0.50 [0.31][a]	p = 0.685 E_r^2 = 0.10
VEL-ML (cm/s)				
Rigid	0.49 [0.16][a]	0.53 [0.11][a]	0.63 [0.09][a]	p = 0.105 E_r^2 = 0.09
Unstable	0.90 [0.34][a]	1.05 [0.42][a]	1.16 [0.37][a]	p = 0.150 E_r^2 = 0.07
Difference between means	0.39 [0.34][a]	0.46 [0.41][a]	0.53 [0.28][a]	p = 0.804 E_r^2 = 0.03

[a]Median and interquartile range

Caption: N = Number of observations; A-COP = Area of the center of pressure; VEL-AP = Velocity in the anteroposterior direction; VEL-ML = Velocity in the mediolateral direction; E_r^2 = Epsilon square

the less active women had worse results in VEL-AP in the difference in means between the rigid and unstable surfaces.

Some studies indicate the importance of including a challenging task (such as the balance on a foam surface) to identify differences in the assessment of healthy individuals[20,25], as demonstrated by the difference in VEL-AP on the unstable surface and in the difference between means. The foam (unstable) surface seems to be an appropriate tool to challenge postural control and cause substantial and multidirectional disturbance in balance[20]. The static stance on a foam surface changes multiple biomechanical foot variables, changing plantar pressure distribution[20].

Concerning the finding in the women subgroup, an article[26] that analyzed only women found significant velocity differences in favor of the active group, using galvanic stimulation. These authors suggest that physical activity involves repetitive stimulation of the sensory systems, which are known to increase effectiveness or at least limit the involution of different neural circuits involved in postural regulation. They also stated that physical and sports activities can improve the capacity to stand postural disturbances by using sensory information better[26].

As for the difference in the 49-to-60-year-old group, this study was similar to another one, whose authors reported findings that indicated that differences in FP-measured balance between subjects of different age groups occurred even in young and middle-aged people[27]. Thus, since strength, balance, and resistance deteriorates after 40 years old, physical activity

Table 3. Comparison between postural control variables and levels of physical activity (divided into two groups)

	G1	G2	p-value
	N = 25	N = 25	(Mann-Whitney)
A-COP (cm²)			
Rigid	1.39 [0.92][a]	1.46 [0.93][a]	p = 0.720 r = 0.05
Unstable	4.47 [2.65][a]	4.56 [4.84][a]	p = 0.712 r = 0.05
Difference between means	2.62 [3.05][a]	3.10 [4.01][a]	p = 0.455 r = 0.01
VEL-AP (cm/s)			
Rigid	0.72 [0.25][a]	0.73 [0.16][a]	p = 0.547 r= 0.08
Unstable	1.06 [0.37][a]	1.26 [0.47][a]	**p = 0.047**** **r = 0.27**
Difference between means	0.33 [0.26][a]	0.47 [0.39][a]	**p = 0.044**** **r = 0.28**
VEL-ML (cm/s)			
Rigid	0.49 [0.16][a]	0.55 [0.14][a]	p = 0.165 r = 0.19
Unstable	0.90 [0.34][a]	1.11 [0.38][a]	p = 0.077 r = 0.24
Difference between means	0.39 [0.34][a]	0.51 [0.35][a]	p = 0.286 r = 0.15

[a]Median and interquartile range; **Statistically significant

Caption: N = Number of observations; G1 = More active (comprising the moderate and high levels of physical activity); G2 = Less active (comprising those with a low level of physical activity); A-COP = Area of the center of pressure; VEL-AP = Velocity in the anteroposterior direction; VEL-ML = Velocity in the mediolateral direction; r = Correlation coefficient

in middle-aged individuals may prevent fall in later years, improving their performance in risk factors, such as muscle strength, balance, and resistance[28]. These authors suggest that postural balance can be improved in people 40-65 years old and future falls may be avoided by starting and maintaining physical activity programs[28].

A finding that called the attention was that data differed only regarding VEL-AP – which is probably related to the strategy of using the ankle to maintain standing postural control. Using the ankle is one of the strategies described in the literature to maintain postural stability in the anteroposterior direction by activating the muscles of this joint, especially when the person is submitted to small postural control disturbances[7], such as standing. Moreover, changing plantar pressure distribution on the unstable surface[20] can increase the recruitment of muscles in the region.

This study found no association or difference between categorical variables (tinnitus, hearing loss, dizziness, cervical pain, hypertension, and diabetes) and physical activity or postural control. Nevertheless, these variables impact the teachers' health. Tinnitus and hearing loss are known to significantly affect teachers[29]. Dizziness is also a recurrent complaint and may be related to poor sleep quality[30], while cervical pain is one of the most reported symptoms in teachers[31,32]. On the other hand, being physically active can be a protective factor against such types of pain (physical activity protective factor)[31,32]. Circulatory and metabolic diseases, such as hypertension and diabetes[6], are among the most common chronic diseases

Table 4. Comparison between postural control variables, sexes, and levels of physical activity (divided into two groups)

	Males			Females		
	G1	G2	Exact p-value	G1	G2	Exact p-value
	(n = 8)	(n = 5)	(Mann-Whitney)	(n = 17)	(n = 20)	(Mann-Whitney)
A-COP (cm²)						
Rigid	1.41 [0.86][a]	1.46 [0.67][a]	p = 0.833 r = 0.08	1.36 [1.37][a]	1.55 [1.11][a]	p = 0.684 r = 0.07
Unstable	5.04 [2.92][a]	4.56 [5.94][a]	p = 0.833 r = 0.07	4.31 [2.38][a]	4.53 [4.72][a]	p = 0.460 r = 0.12
Difference between means	3.11 [3.36][a]	3.10 [5.27][a]	p = 0.943 r = 0.04	2.40 [2.79][a]	3.23 [3.96][a]	p = 0.270 r = 0.18
VEL-AP (cm/s)						
Rigid	0.68 [0.13][a]	0.73 [0.33][a]	p = 0.284 r = 0.30	0.80 [0.27][a]	0.72 [0.14][a]	p = 0.916 r = 0.01
Unstable	1.07 [0.38][a]	1.29 [0.90][a]	p = 0.435 r = 0.24	0.99 [0.38][a]	1.20 [0.37][a]	p = 0.080 r = 0.29
Difference between means	0.35 [0.34][a]	0.47 [0.62][a]	p = 0.524 r = 0.20	0.32 [0.22][a]	0.47 [0.37][a]	**p = 0.045**** **r = 0.33**
VEL-ML (cm/s)						
Rigid	0.46 [0.08][a]	0.49 [0.16][a]	p = 0.622 r = 0.16	0.51 [0.22][a]	0.57 [0.14][a]	p = 0.497 r = 0.11
Unstable	0.91 [0.35][a]	1.11 [0.56][a]	p = 0.943 r = 0.02	0.90 [0.34][a]	1.10 [0.37][a]	p = 0.056 r = 0.31
Difference between means	0.51 [0.36][a]	0.52 [0.45][a]	p = 0.943 r = 0.01	0.35 [0.35][a]	0.48 [0.35][a]	p = 0.167 r = 0.23

[a]Median and interquartile range; **Statistically significant

Caption: n = Number of observations; G1 = More active (comprising the moderate and high levels of physical activity); G2 = Less active (comprising those with a low level of physical activity); A-COP = Area of the center of pressure; VEL-AP = Velocity in the anteroposterior direction; VEL-ML = Velocity in the mediolateral direction; Difference between means = Difference in means between the unstable and rigid surfaces; r = Correlation coefficient

Table 5. Comparison between postural control variables, age groups, and levels of physical activity (divided into two groups)

	18-48 years			49-60 years		
	G1 (n = 14)	G2 (n = 14)	Exact p-value (Mann-Whitney)	G1 (n = 11)	G2 (n = 11)	Exact p-value (Mann-Whitney)
A-COP (cm^2)						
Rigid	1.59 [1.73][a]	1.36 [0.79][a]	p = 0.482 r = 0.13	1.37 [0.74][a]	1.77 [1.16][a]	p = 0.699 r = 0.09
Unstable	4.06 [2.18][a]	3.98 [4.47][a]	p = 0.734 r = 0.06	5.21 [2.89][a]	5.54 [5.38][a]	p = 0.365 r = 0.20
Difference between means	2.29 [1.81][a]	2.33 [3.03][a]	p = 0.839 r = 0.04	3.33 [2.76][a]	4.78 [3.91][a]	p = 0.332 r = 0.21
VEL-AP (cm/s)						
Rigid	0.64 [0.21][a]	0.70 [0.24][a]	p = 0.285 r = 0.20	0.74 [0.21][a]	0.74 [0.09][a]	p = 0.898 r = 0.02
Unstable	0.93 [0.34][a]	1.00 [0.49][a]	p = 0.265 r = 0.21	1.10 [0.36][a]	1.35 [0.43][a]	**p = 0.040**** **r = 0.44**
Difference between means	0.27 [0.15][a]	0.32 [0.36][a]	p = 0.541 r = 0.11	0.38 [0.26][a]	0.62 [0.29][a]	**p = 0.013**** **r = 0.51**
VEL-ML (cm/s)						
Rigid	0.48 [0.27][a]	0.55 [0.17][a]	p = 0.839 r = 0.20	0.51 [0.15][a]	0.56 [0.12][a]	p = 0.076 r = 0.38
Unstable	0.86 [0.32][a]	1.03 [0.42][a]	p = 0.306 r = 0.19	0.92 [0.34][a]	1.16 [0.29][a]	p = 0.133 r = 0.32
Difference between means	0.37 [0.30][a]	0.38 [0.35][a]	p = 0.769 r = 0.04	0.50 [0.37][a]	0.51 [0.31][a]	p = 0.270 r = 0.24

[a]Median and interquartile range; **Statistically significant

Caption: n = Number of observations; G1 = More active (comprising the moderate and high levels of physical activity); G2 = Less active (comprising those with a low level of physical activity); A-COP = Area of the center of pressure; VEL-AP = Velocity in the anteroposterior direction; VEL-ML = Velocity in the mediolateral direction; r = Correlation coefficient

in the general population, which could be likewise controlled with physical activities.

All these factors affected the health and personal and professional quality of life of the teachers in this study sample. The increased work demands[33] and working hours (both in and out of school[34], interfering with their leisure time) cause them to have little physical activity[5]. However, being physically active proves to be important to minimize or prevent aggravations to the teacher's health and improve their postural control by activating the somatosensory system, especially when other sensory systems are disturbed. Therefore, it is greatly important to encourage physical activities and stimulate teachers to engage in them to improve their health and quality of life.

Some limitations of the study must be addressed. The assessments were conducted with eyes open in a bipedal stance, whereas in other sensory conditions, the findings might have been different – although this is the teachers' everyday position. Another limitation was the protocol variability in the literature to assess postural control in healthy adults and the scarcity of studies on teachers' postural control, which made it difficult to compare findings.

CONCLUSION

Considering the anteroposterior sway velocity, teachers that were more active and older teachers that were more active had better postural control on the unstable surface. Also, more active women and older more active teachers had less variation in body sway velocity between the rigid and unstable surfaces.

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