



Original article

The influence of a protocol of aquatic exercises in postural control of obese elderly

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ABSTRACT

Objective: The objective of this study was to evaluate the effects of a protocol of aquatic exercises in postural control of elderly subjects with overweight and the influence of body mass and body mass index in variables of the center of pressure.

Method: Each participant was positioned on the force platform, without shoes, feet apart on the same alignment of the upper limbs along the body. For the collection, the subjects were instructed to stay on in bipedal support on the force platform with eyes fixed on the bright spot for 60 s.

Results: Results indicated a notable difference in the variables root mean square-mediolateral and COP area after aquatic exercise practice. However, visual condition analyzed indicates significant differences in the variables root mean square-anteroposterior and speed anteroposterior.

Conclusion: Aquatic exercise had positive effects when analyzing the sensory condition suggesting maintenance of postural control. However, when analyzed post aquatic exercise in closed eyes condition and the interaction effects of visual condition did not improve postural stability. In obese elderly, body mass index resulted in a functional adaptation in control of upright stance, suggesting that the balance was preserved in the population studied.

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Influencia de un protocolo de ejercicios acuáticos en el control postural de ancianos obesos

RESUMEN

Objetivo: El objetivo de este estudio fue evaluar los efectos de un protocolo de ejercicios acuáticos en el control postural de sujetos de edad avanzada con exceso de peso y la influencia de masa corporal y el índice de masa corporal en las variables del centro de presiones.

Método: Cada participante se posicionó en la plataforma de fuerza sin zapatos, los pies separados con la misma alineación de las extremidades superiores a lo largo del cuerpo. Para el análisis, los sujetos fueron instruidos para permanecer en apoyo bípedo sobre la plataforma de fuerza con los ojos fijos en un punto brillante durante 60 segundos.

Resultados: Los resultados indicaron una diferencia notable en las variables: Media Cuadrática-Mediolateral y el Área descrita por el desplazamiento del centro de presiones, después de la práctica de ejercicio acuático. Sin embargo, la condición visual analizada indica diferencias significativas en las variables: Media Cuadrática Anteroposterior y Velocidad Anteroposterior.

Conclusión: El ejercicio acuático tuvo efectos positivos en el análisis de la condición sensorial sugiriendo el mantenimiento del control postural. Sin embargo, cuando se analizan la condición de ojo cerrado tras

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el ejercicio acuático y los efectos de la interacción de la condición visual no mejoró la estabilidad postural. En obesos de edad avanzada, el índice de masa corporal resultó en una adaptación funcional en el control de la postura vertical, lo que sugiere que el equilibrio se conservó en la población estudiada.

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Influência de um protocolo de exercícios aquáticos no controle postural de idosos obesos

R E S U M O

Palavras-chave:

Idoso
Obeso
Postura
Controle postural
Exercícios

Objetivo: O objetivo deste estudo foi avaliar os efeitos do protocolo de exercícios aquáticos no controle postural de idosos com excesso de peso, e a influência de variáveis de massa corporal e índice de massa corporal no centro de pressão.

Método: Cada participante foi posicionado sobre a plataforma de força, sem sapatos, pés alinhados, braços ao longo do corpo. Durante a coleta, os indivíduos foram orientados a permanecer sobre a plataforma de força, com os olhos fixos no ponto brilhante durante 60 segundos.

Resultados: Os resultados indicaram uma diferença significativa nas variáveis: área do centro de pressão e média quadrática-mediolateral, após a prática de exercício aquático. No entanto, a análise da condição visual sugere diferenças significativas nas variáveis: média quadrática anteroposterior e velocidade anteroposterior.

Conclusão: Os exercícios aquáticos tiveram efeitos positivos sobre a análise sugerido pela condição da manutenção do controle postural. No entanto, quando analisados em condição de olho fechado após o exercício aquático e os efeitos da interação da condição visual, não melhoram a estabilidade postural. Em obesos idosos, o índice de massa corporal resultou numa adaptação funcional para controlar a posição vertical, o que sugere que o equilíbrio foi mantido na população estudada.

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Introduction

Aging is associated with several changes in the life style and body composition of the elderly population. Mainly, the loss of balance might reduce the independence. In addition, this condition can be intensified due obesity.^{1,2} Furthermore, changes in body composition is connected with aging, including muscle tissue reduction and increase of the fat tissue, especially in the lower limbs.^{1,3,4} The association between aging and obesity negatively influence visual acuity, muscle strength, processing and nerve conduction, tactile sensitivity causing a reduction in functional capacity, losses in balance control, and increase the risk for falls.^{1,3,4} Thus, the maintenance of body balance in standing position for the obese elderly is challenging task, which requires a complex integration of multiple systems, responsible for maintaining the projection of the center of gravity of the subject on the support base.⁵

We can say that the balance and postural control are terms used interchangeably, and can be defined as the ability to maintain the projection of the center of gravity on the support base limits for static and dynamic positions.^{6,7} The assessment of the balance can be estimated by calculating the center of pressure (COP). COP characterized by the application point of the resultant vertical forces acting on the support surface. The COP displacement is a collective result of postural control system and the force of gravity.⁸ Some of the changes that occur in postural control as part of the aging process are reflected in COP displacement.⁵

In view of some changes that occur in the elderly, physical activity can be an adjuvant therapy, improving balance control for both elderly and obese subjects. Various types of training are described in the literature and indicate positive effects in the control of these subjects.⁹⁻¹³ Aquatic exercises may be preferred for this population since they allow these to perform large movements without the risk of falling or injury and assist in maintaining an independent stance. Water has a viscosity that allows movements to be

performed slowly and so the subjects have more time to create and develop responses reaction mechanisms. Combinations of training principles lead to an increase in muscle strength, improved flexibility, balance, and consequently reduce the number of falls.¹⁰

This study hypothesized that overweight elderly subjects could improve postural control after performing a protocol of aquatic exercises, taking into account the physical properties of water in reducing the impact on the joints and in the great movements of accomplishment permission amplitude. Therefore, the aim of this study was to evaluate the effects of aquatic exercise protocol in postural control of elderly subjects with overweight and the influence of body mass and body mass index (BMI) on the COP variables.

Method

Subject

The Ethics Committee of the Federal University of Goiás (UFG) and declaration of Heisinki, under number 093, approved the study. All participants were informed about the research procedures and signed the Informed Consent. The study included ten female subjects (age = 68.90 ± 4.05 years; height = 1.43 ± 0.01 m; mass = 64.43 ± 8.32 kg) and three males (age 70.55 ± 2.40 years; height = 1.53 ± 0.03 m; mass = 67.40 ± 18.90 kg). All subjects were overweight when classified according to the BMI (LIPSCHITZ, DA, 1994). They were recruited from a Family Health Strategy Unit (ESF) in the city of Professor Jamil – Goiás and evaluated in the first half of 2011 and the first half of 2013. Inclusion criteria were having regularly attended the activities in the local from 2011; age or greater than 60; do not have musculoskeletal problems. Participants with high blood pressure and uncontrolled blood glucose, cognitive impairment losses engines (injury or broken hip, knee, ankle and/or foot in the twelve months before the trials) or device

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