100 - ANALYSIS OF POSTURAL BALANCE WITH DUAL TASK IN HEALTHY

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INTRODUCTION

Postural control is the process by which the central nervous system (CNS), based on information coming from sensory systems of visual, vestibular and somatosensory systems, create references to develop the best strategy for maintaining balance, producing patterns of muscle activity appropriate to the relationship between the center of mass and base of support. The approach adapts to any situation due to the somatosensory, vestibular and oculomotor (GAGE, 2004; Miralles, Heras, 2005).

The increase in the percentage of elderly population in the world has changed so contun ¬ dent strategies for addressing their ¬ ences. Population aging is a fact mundial1. The elderly, today con ¬ follows easily reach the age of 80 to 90 years, however, fails to prevent the effects of natural ¬ nescência which it is assigned. The aging ¬ Ageing is that period of life that succeeds is characterized by maturity and decline of organic fun ¬ tions, and, consequently, leads to increased susceptibility to disease outbreaks (Carvalho; ALMEIDA, 2009).

In the elderly there is a reduced ability to control balance, and this results in a serious impact on their quality of life. Among the physiological changes associated with aging can include: changes in sensory systems, cognitive impairment, decreased proprioception, decreased range of motion, reduction in reaction time and muscle strength and neuromotor changes. These factors influence the functional capacity of the elderly to perform activities of daily living (Horak, 1997; Barel, 2000; Daulte et el., 2001).

In the central nervous system, there is loss in the number of neuronal cells and changes in components of brain tissue, and reduction of brain neurotransmitters, these features which negatively influence on motor function and, therefore, the balance control (AURIN et al. 1998)

Due to the often reported decrease in postural stability in older adults, it is important to understand the factors that may contribute to reduced postural stability. It is possible that the demand focused attention on the tasks performed interfere postural stability (CRODA; NASHNER, 1992).

The average speed of center of pressure is the speed of oscillation of the body achieved by the individual, both in the anterior-posterior and medial-lateral, while it remained in the posture assessment, which in this study was 60 seconds. Security area of the ellipse is 95% confidence area of oscillation of the COP, which contains 95% of their positions (Horak, 1987).

The purpose of the present study is to assess postural control in healthy elderly through stabilometry, associated with motor and cognitive dual task under conditions open and closed eyes.

METHODOLOGY

This study was classified as a clinical trial, cross-sectional quantitative and approved by the Ethics Committee in Research of the State University of West Paraná (unions) with the opinion 325/2011, case number 1207/2011.

Sample

The sample consisted of 12 volunteers, over 65 years, of both sexes, healthy, who agreed to participate and had no neurological disease, or vestibular dysfunction osteomioarticular lower limbs.

Materials

Estabilografia The data were obtained using a force platform (AMTI, model OR6-6, USA) with a sampling frequency of 200Hz. The rates of stabilometry the center of pressure were evaluated by the program MatLab: 95% of the area delimited by an ellipse points and average speed. For the motor task was used a hard plastic cup, cylindrical, 10cm high. This glass was filled with water to 0.5 cm in its full capacity.

Procedures

After evaluation of inclusion and the patient be aware of the study, signed the term of consent. He was referred to the place of examination, was oriented and familiar with the tests. During the tests an evaluator was present in the exam room to conduct the tests and provide the necessary assistance. To conduct the tests the subject was standing with arms at your sides, keeping your attention to the fixed point 1.75 m away at eye level of each individual, for 60 seconds at 2 attempts for each visual condition - eyes open and eyes closed. Were performed three tasks in the study: 1 (easy task) - subject standing, 2 (dual motor task) - subject standing, holding the full glass of water in the dominant hand with the elbow flexed at 90 degrees near the trunk; 3 (cognitive dual task) - subject standing, repeated the day of the week in reverse order until the end of the assessment aloud (HORAK; NASHNER, 1986; Horak, 1997).

Analysis of data

The results were considered normal by the Kolmogorov-Smirnov test. The ANOVA (2x3) was used considering the three tasks and two visual conditions (eyes open and closed) with a significance level of 5%.

RESULTS

Results of the areas assessed values show no differences when comparing open and closed eyes conditions ($p = 0.633$) or when comparing the dual tasks with the simple task ($p = 0.117$). Comparing the double task difference was found, and the cognitive task showed greater area of the center of pressure on both visual conditions (0.040). The values of average speed of center of pressure show no differences when comparing open and closed eyes conditions ($p = 0.997$), but the dual tasks have higher values than the simple task ($p = 0.040$). And the cognitive task has average speed exceeding the motor task (0.048) (Table 1).

Table 1 - Values of area and velocity of the center of pressure of the subjects evaluated.

	EYES OPEN			EYES CLOSED		
Task	**Simple**	**Motor**	**Cognitive**	**Simple**	**Motor**	**Cognitive**
Área (cm^2)	1,34 ±0,93	1,69 ±0,90	2,82 ±1,67	1,77 ±1,17	1,59 ±1,08	2,26 ±2,38
Velocity (cm/s)	0,70 ±0,20	0,79 ±0,19	1,05 ±0,41	0,82 ±0,25	0,81 ±0,20	0,90 ±0,39

DISCUSSION

The results of this work show the challenges that tasks of day-to-day impose on postural control. The adaptive processes of the balance system that occur later in life can maintain the integrity of the elderly. But this work shows that these characteristics are dependent on task demands. These manifestations of imbalances in the elderly may have an impact, leading to a reduction of their social autonomy, given that they have re ¬ ducing activities of daily living, ¬ position the predisposition to falls and fractures, bringing suffering, body immobility, fear of falling, high costs of health care and this results in a serious impact on their quality of life. Inactivity can aggravate this situation, providing the largest elderly muscle fatigue and increased weakness.

In the central nervous system, there is loss in the number of neuronal cells and changes in components of brain tissue, and reduction of brain neurotransmitters, these features which negatively influence on motor function and, therefore, the balance control (LIMA, 2008). The integrations necessary for postural stability are affected by these losses. The motor and cognitive demands in different degrees challenge postural stability, as illustrated in this study.

For the human being can take to effectively infinite postures of which is capable, effective actions are required of the postural control system so that balance and body orientation in space are maintained. Within this system, there are two important parameters: the postural orientation, focused on maintaining the position of body segments in relation to the environment and own segments, posture and balance, which represents the relationships between the forces acting on the body in order to balance the same during the motor actions. The two are distinct phenomena, but with dependent relationships (WIECZOREK, 2003).

During an investigation of postural balance during visual dual tasks in young and elderly, Prado et al. (2007) found that postural balance was significantly greater in the mediolateral direction during the eyes closed condition compared with open eyes. In the anteroposterior direction, this was only observed in the elderly group, and that the amplitude of postural balance was greater for older adults than for young adults, among others. These results suggest that despite the overall increase in postural balance with aging, the integration of vision for postural control system is not affected in the course of this process.

In the elderly, the right responses to loss of balance are initiated more slowly, and the failure in the selection of responses, especially in more complex requiring speed and accuracy.

The information provided by stabilometry appear as descriptors able to identify changes in the strategic planning of the CNS to maintain postural stability (Daulte, 2001).

The rehabilitation of people with balance disorders and their consequences can be planned with greater chances of success when made accurate diagnoses and identified neuromuscular processes involved in these changes.

Are not yet fully elucidated the regulatory mechanisms of postural stability. Several theories and studies warn about the CNS role in the integration and selection of sensory information to the planning engine. New research, studies and methodologies should be developed in an attempt to identify, analyze and propose ways of therapeutic intervention to control posture.

CONCLUSION

The dual tasks provoke different adjustments of postural control in simple task, and the dual cognitive task more challenging to balance, the conditions eyes open and eyes closed.

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SUMMARY

Postural control is the process by which the central nervous system, based on information coming from sensory systems of visual, vestibular and somatosensory systems, create references to develop the best strategy for maintaining balance, producing patterns of muscle activity to the appropriate relationship between the center and the mass base of support. Objective: The objective is to evaluate since postural control in seniors through stabilometry, associated with motor and cognitive dual task under conditions open and closed eyes. Methods: The sample consisted of 12 volunteers, over 65 years, of both sexes, healthy. The subjects were evaluated on a force platform under the following conditions: simple task - remain standing stable, dual-motor task - remain stable foot holding a plastic cup almost full of water; cognitive dual task - to remain stable standing talking aloud day of the week in reverse. In the eyes open and closed conditions. We analyzed the area of the ellipse 95% of the points and the average speed of center of pressure. Results: Data showed that balance changed in the dual task condition eyes open and dual cognitive task showed higher levels of instability in the eyes closed condition. Conclusion: The increased postural demands in the double reveal a greater influence on the balance of cognition.

KEYWORDS: balance; elderly; dual-task.

RESUMEN

Control postural es el proceso por el cual el sistema nervioso central, sobre la base de información proveniente de los sistemas sensoriales de los sistemas visual, vestibular y somatosensorial, crear referencias para desarrollar la mejor estrategia para mantener el equilibrio, produciendo patrones de actividad muscular de la relación adecuada entre el centro y la masa de base de apoyo. Objetivo: El objetivo es evaluar desde el control postural en personas mayores a través estabilometría, asociada con el motor y la doble tarea cognitiva en condiciones de ojos abiertos y cerrados. Métodos: La muestra consistió en 12 voluntarios, más de 65 años, de ambos sexos, sanos. Los sujetos fueron evaluados en una plataforma de fuerza bajo las siguientes condiciones: una tarea sencilla - siguen siendo un soporte estable, de doble motor de tareas - permanecen estables pie sosteniendo un vaso de plástico casi llena de agua, doble tarea cognitiva - a permanecer de pie estable hablar en voz alta día de la semana en sentido inverso. A los ojos de las condiciones de apertura y cierre. Se analizó el área de la elipse del 95% de los puntos y la velocidad media del centro de presión. Resultados: Los datos mostraron que el equilibrio cambió en los ojos doble condición de trabajo abierta y de doble tarea cognitiva mostraron mayores niveles de inestabilidad en el estado de los ojos cerrados. Conclusión: El aumento de la demanda postural en el doble revelar una mayor influencia en el equilibrio de la cognición.

PALABRAS CLAVE: equilibrio; ancianos; tarea doble.

SOMMAIRE

Contrôle postural est le processus par lequel le système nerveux central, basé sur des informations provenant de systèmes sensoriels du système visuel, vestibulaire et somatosensoriel, créer des références pour élaborer la meilleure stratégie pour maintenir l'équilibre, la production de modèles de l'activité musculaire de la relation appropriée entre le centre et la base de masse de soutien. Objectif: L'objectif est d'évaluer, depuis le contrôle postural chez les personnes âgées grâce à la stabilométrie, associée à moteur et cognitif double tâche dans des conditions yeux ouverts et fermés. Méthodes: L'échantillon était composé de 12 bénévoles, plus de 65 ans, des deux sexes, en bonne santé. Les sujets ont été évalués sur une plateforme de force dans les conditions suivantes: une tâche simple - rester debout stable, bi-moteur tâche - restent stables à pied tenant une tasse en plastique presque pleine d'eau; cognitifs double tâche - à rester debout stables parler à haute voix jour de la semaine dans le sens inverse. Aux yeux des conditions ouvertes et fermées. Nous avons analysé le domaine de l'ellipse de 95% des points et la vitesse moyenne du centre de pression. Résultats: Les données ont montré que l'équilibre a changé dans les yeux double condition de tâche ouverte et double tâche cognitive a montré des niveaux plus élevés d'instabilité dans les yeux fermés condition. Conclusion: L'augmentation des demandes de posture dans le double révèlent une plus grande influence sur l'équilibre de la cognition.

MOTS-CLÉS: equilibre; personnes âgées; double tâche.

ANÁLISE DO EQUILÍBRIO POSTURAL ASSOCIADO A DUPLA TAREFA EM IDOSOS SAUDÁVEIS

RESUMO

O controle postural é o processo pelo qual o sistema nervoso central, baseado em informações sensoriais advindas dos sistemas visual, vestibular e somatossensorial, cria referências para elaborar a melhor estratégia de manutenção do equilíbrio, produzindo padrões de atividade muscular apropriados para a relação entre o centro de massa e a base de sustentação. Objetivo: O objetivo desde trabalho é avaliar o controle postural de idosos saudáveis, através da estabilometria, associado à dupla tarefa motora e cognitiva, nas condições olhos abertos e fechados. Métodos: A amostra foi composta por 12 voluntários, acima 65 anos, de ambos os sexos, saudáveis. Os sujeitos foram avaliados em plataforma de força nas seguintes condições: tarefa simples – permanecer em pé estável; dupla tarefa motora – permanecer em pé estável segurando 1 copo plástico quase cheio de agua; dupla tarefa cognitiva - permanecer em pé estável falando em voz alta os dias da semana de forma invertida. Nas condições olhos abertos e fechados. Foram analisadas a área da elipse de 95% dos pontos e a velocidade média do centro de pressão. Resultados: Os dados de equilíbrio se mostraram alterados nas duplas tarefas na condição olhos abertos e a dupla tarefa cognitiva mostrou maiores índices de instabilidade na condição olhos fechados. Conclusão: As demandas posturais aumentadas na dupla evidenciam maior influencia da cognição sobre o equilíbrio.

PALAVRAS-CHAVE: equilíbrio; idosos; dupla-tarefa.