164 - CORPORAL BALANCE IN ELDERLY PEOPLE: THE RELATIONS WITH THE SIGHT

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Introduction

The rise in the life expectation requires special attention to the general well-being and to the elderly people quality of life. Today, there is a consense that the elderly present a reduction in the postural control. As the years go by the functional performance of the individuals is damaged little by little, motivated by the natural and physiological process of getting old. Among the elderly people's worries arte the possible losses originated by the process of getting old. Some serious risk factors, such as falls and loss of independence, are due to the balance[10] and gait disturbances.

In order to keep the corporal balance, the individual depends on the good conditions of three systems: proprioceptive system, vestibular system and visual system, which form the triad of the balance. The lack of some of these three pillars can cause temporary unbalance, which disappears with the compensation mechanism; if it loses two pillars, it can be permanent unbalance5. In addition to this fact, the capacity to generate force in the distal musculature of the inferior members is also important in the balance maintenance in elderly people. The plantar dorsiflexor and flexor muscles are important for the balance recuperation, as well as they are the target to get strong in exercises programs that are aimed to improve the balance and reduce the risk of falls in elderly people[21].

The maintenance of the effective working of the postural control system must exist[9] so that the elderly can keep the independence in the practice of basic motor activities and of daily life ones. Thus, the systems that constitute the triad of balance must be in good conditions of working. As people get old they become more dependent on visual information. When the erect static posture is kept, without visual information, there is a raise in the corporal oscillation8. The control of balance through the visual system has been studied[4,6,8] a lot under those perspectives. That system uses visual stimulus to provide information about the environment, the direction and the velocity of the corporal movements in relation to the environment and the body[15]. In order to better understand these facts, studies involving patients with senile cataract, after and before the treatment with surgery, were done[16]. The results show that even the low visual acuity interferes in the postural balance and that the visual recuperation leads to an improvement in the balance state and, therefore, in the patient's quality of life. However, other studies report that visual information is not fundamental for the corporal balance maintenance, once the person can be standing in balance even with the closed eyes[12,19,22]. According to this point of view and lack of a general consense among the authors regarding the theme, the present study was aimed to verify the influence of the visual system over the balance in elderly people.

Materials and Methods

Thirty-one subject of both sexes, with average age of 67,42 6,2 years old, corporal weight 694,48 119,78 N and 1,57 0,08 m of stature participate in this project. For the selection of the subjects, it was intentionally chosen that participated in regular activities offered in the Federal University of Santa Maria and that had a will to participate of the study.

For the kinetic assessment it was used an *AMTI* (*Advanced Mechanical Technology, Inc*) platform of force. In the first contact with the subjects it was explained the objective of the study, as well as the procedures for the data collection. During the whole collection, the participants were on bare foot, on bipedal support and with the arms along the body. Before the collection the stature and weight of the subjects were measured. The data were collected in the following conditions: (1) open eyes and (2) closed eyes. It was required that each participant kept the more stable erect posture as possible. In all analyzed conditions the subjects were over the platform with the feet separated one from each other in a distance equivalent to hip width. For each subject, the first position was marked in the platform so that in all attempts the subject was kept in the same position. In the open-eye condition the subjects should keep the eyes fix in the horizontal, in a point in the height of the eyes of each participant, distant 1 meter, according to the recommendations of Freitas and Duarte (2005)[11]. Six attempts of each subject were collected, three for each condition. The duration of each attempt was 30 seconds in frequency of 100Hz.

The corporal balance was analyzed through the center of force amplitude in the maximum anterior-posterior directions (COFap) and medium-lateral (COFml), center of force medium displacement in the anterior-posterior direction (DMap) and in the medium-lateral direction (DMml).

For each data analysis it was used the descriptive statistics. The data normality was verified through the *Shapiro-Wilk* test, which presented normal distribution. For the comparison among the conditions of all the variables it was applied the *t* test with level of meaning 0, 05.

Results

The results show that just the COFap presented statistically meaningful differences considering the lack of visual information. The values for COFap, COFml, DMap and DMml during both conditions are illustrated in the figures 1, 2, 3 and 4, respectively.

In the variable COFap the values found were 1,35± 0,41 cm with the open eyes and 1,47± 0,49 cm for the closed eyes. On the other hand, for the variable COFml, it was found 1,07 ± 0,39 with the open eyes, and 0,53 with the closed eyes.

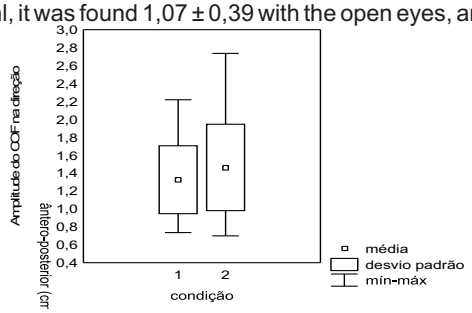

Figure 1 Center of force amplitude in the anterior-posterior direction in the open-eye and closed-eye conditions.

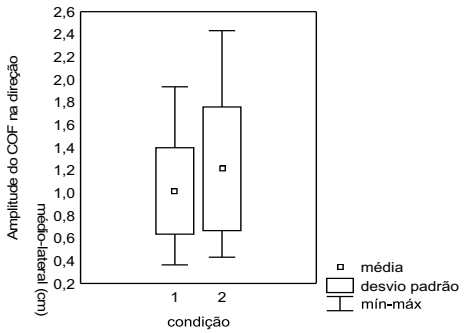

Figure 2 Center of force amplitude in the in the medium-lateral direction in the open-eye and closed-eye conditions.

By assessing the medium displacement variables, the results found for Dmap were 0,30± 0,10 cm with the open eyes and 0,31 ± 0,11 cm with the closed eyes, and for DMml the values were 0,23± 0,09 cm with open eyes and 0,27 ± 0,12 cmwith the closed eyes.

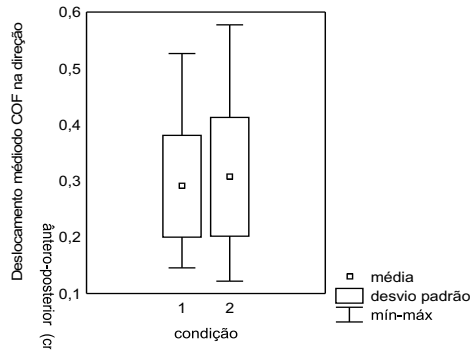

Figure 3 center od force medium displacement in the anterior-posterior direction in the open-eye and closed-eye conditions.

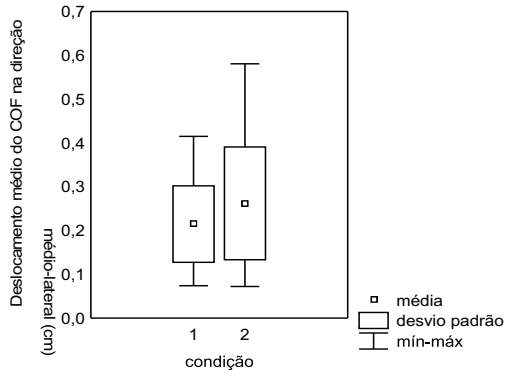

Figure 4 Center of force medium displacement in the medium-lateral direction in the open-eye and closed-eye conditions.

Discussion

The data of this study are similar to the ones found in the literature, once the researched literature points out that as people are getting old there is a reduction in the postural control when the visual information is taken out. That information is observed in the variable COFap - the most affected with the visual suppression. The process of getting old put in risk the ability of the nervous system in processing the vestibular, visual and proprioceptive signs responsible for the corporal balance maintenance, as well as, they reduce the capacity of changes in the adaptative reflexes. These processes are responsible for the vertigo and/or dizziness and unbalance in elderly people[17].

The differences in the anterior-posterior direction were also found in other studies in which the authors also consider the use of sight important for the appropriate corporal balance maintenance[8].

A study of Silva et al (2002)[20] compared the postural control between adult and elderly individuals, and noticed that the youngsters presented postural stability higher than the elderly, in relation to the anterior-posterior amplitude and the speed of COF displacement. Regarding the influence of visual information, it was not observed a rise in the postural activity instability in the closed-eye condition. For the elderly, specifically, the analysis of the COF oscillation amplitude showed an opposite tendency, that is, when the visual information was taken out, the elderly presented a light reduction of the oscillation amplitude in the anterior-posterior direction.

A study that compared the corporal oscillation in three different ages (youngsters, adults and elderly) did not verified differences among the groups. However, it was found statistically meaningful differences in the COF displacement area in the activity with closed eyes, also implying that the suppression of visual information negatively interferes in the postural balance[7]. Another balance study related to a public of young adults, statistically meaningful differences for the variables COFap and DMap, when the open-eye and closed-eye conditions were compared. The values found in that study for the former condition were 0,83 ± 0,16 cm and 1,14 ± 0,21 cm for the latter in the variable COFap, and 0,16 ± 0,05 cm for the open-eye condition and 0,21 ± 0,04 cm for the closed-eye condition in the variable DMap. Although the differences had been found only in one of the analysed variables, they are very relevant because the (Incidência) of falls in elederly people can be related to dhe visual difficulty making this relation a factor of risk[1,2,14].

Studies about children were found in the literature, and they also present disagreement in relation to the function of

sight for the balance. According to some authors [18,23], around seven years old only, there is a transition period, in which the postural control system is not dependent on the sight anymore and starts to be part of the information from the other sensorial systems, assuming an strategy similar to the one verified in the working of the postural control system in adults. Other authors[13], on the other hand, suggest that the sight does not contribute significantly for the postural stability in children, while for the adults it represents 50% of the postural stability. A study of Barela, Polastri and Godoi[3], which analyzed the corporal oscillation and the corporal oscillation frequency in children of different ages, did not verified statistically meaningful differences in the corporal balance with the open and closed eyes. Despite the results had been from an average age lower than the one studied in the present study, it was clarified that for that age the visual information seems not to influence in the balance.

According to the data found in the literature, the variable COFap seems to be the one that is the most influenced by the visual suppression, once in most of the studies, it was the variable most related to the differences of COF oscillations. Regarding the other variables, they seem not to be influenced by the suppression of visual information.

Conclusion

As already proved in previous studies, with the process of getting old, the visual information becomes important for the postural control. In fact, it was possible to prove this affirmation through the values found for the variable center of force amplitude in the anterior-posterior direction in this study factor that can make the balance a difficult task. When there is the suppression of visual information, the other systems act as a way of compensation in order to keep the balance. Nevertheless, because of the results found in this study and despite the existence of that compensation, there was a meaningful variation in one of the fundamental variables for the balance, implying then, that the visual information is an important allied in the corporal balance maintenance.

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CORPORAL BALANCE IN ELDERLY PEOPLE: THE RELATIONS WITH THE SIGHT

Abstract

The present study was aimed to verify the static balance in elderly people, as well as the influence of sight in this task. Thirty-one subject of both sexes, with average age of 67,42 6,2 years old, corporal weight 694,48 119,78 N and 1,57 0,08 m of stature participate in the study. For the kinetic assessment it was used an *AMTI*(*Advanced Mechanical Technology, Inc*) platform of force. The data were collected in the open and closed eye conditions, with the feet positioned in the width of the hip. It was collected six attempts of 30 second three for each position in a frequency of 100Hz. The corporal balance was analyzed through the amplitude and the center of force displacement in the anterior-posterior and medium-lateral directions. For the data analysis it was used descriptive statistics and *t* test for comparison. According to the results found, the conclusion is that the values were different only in the variable center of force amplitude in the anterior-posterior direction when the visual information was manipulated. For the other variables it was not found statistically meaningful differences. Thus, the final conclusion is that the visual information is important for the balance of elderly people.

Keywords: static balance, elderly people.

L'ÉQUILIBRE CORPOREL DE PERSONNES ÂGÉES : LEURS RELATIONS AVEC LA VISION

Résumé

La présente étude a cherché vérifier l'équilibre statique de personnes âgées, ainsi que, l'influence de la vision dans cette tâche. Ont participé de cette étude 31 sujets des tous les deux sexes avec moyenne d'âges de 67,42 ± 6,2 ans, poids corporel 694,48 ± 119,78 N et stature 1,57 ± 0,08 m. Pour l'évaluation cinétique a été utilisée une plateforme de potence *AMTI (Advanced Mechanical Tecnologies, Inc*). Les données ont été cueillis dans les conditions des yeux ouverts et des yeux fermés avec les pieds placés dans la largeur de la hanche. Ont été cueillis six tentatives de trente secondes, étant trois pour chaque condition à une fréquence de 100Hz. L'équilibre corporel a été analysé à travers de l'amplitude et du déplacement du centre de force dans les directions antéro-postérieur et moyen-latéral**.** Pour analyse des données a éte utilisé la statistique descriptive et test t pour comparaison. D'accord avec les résultats trouvés se conclut que les valeurs se montrent différents seulement dans la variable amplitude du centre de force dans la direction antéro-postérieur quand l'information visuelle a été manipulée. Pour les autres variables n'ont pas été trouvées des différences statistiquement significatives. De cette façon, se conclut que l'information visuelle est importante pour l'équilibre de personnes âgées.

Mots clé : équilibre statique, âgés.

EQUILIBRIO CORPORAL DE ANCIANOS: SUS RELACIONES CON LA VISIÓN

Resumen:

Este estudio buscó verificar el equilibrio estático de ancianos, y también la influencia de la visión en este proceso. Participaron del estudio 31 personas de los dos sexos con edad media de 67,42 ± 6,2 años, peso corporal de 694,48 ± 119,78 N y estatura 1,51 ± 0,08 m. En la evaluación cinética se utilizó una plataforma de fuerza *AMTI (Advanced Mechanical Tecnologies, Inc*.). Los datos fueron recogidos en las condiciones ojos abiertos y ojos cerrados con los pies en la posición de la amplitud de las caderas. Fueron recogidas seis tentativas de treinta segundos, siendo tres para cada condición a una frecuencia de 100Hz. El equilibrio corporal fue analisado por medio de la amplitud y del desplazamiento del centro de fuerza en las direcciones anteroposterior y mediolateral. En el análisis de los datos se usó la estadística descriptiva y el test *t* para comparación. De acuerdo con los resultados obtenidos se concluye que los valores se presentan distintos solamente para la variable amplitud del centro de fuerza en la dirección anteroposterior cuando la información visual fue manipulada. En las otras variables no fueron encontradas diferencias relevantes. De esta manera, se concluye que la información visual es importante para el equilibrio de los ancianos.

Palabras-clave: equilibrio estático, ancianos.

EQUILÍBRIO CORPORAL DE IDOSOS: SUAS RELAÇÕES COM A VISÃO

Resumo

O presente estudo buscou verificar o equilíbrio estático de idosos, assim como, a influência da visão nesta tarefa. Participaram deste estudo 31 sujeitos de ambos os sexos com média de idades de 67,42 ± 6,2 anos, peso corporal 694,48 ± 119,78 N e estatura 1,57 ± 0,08 m. Para a avaliação cinética foi utilizada uma plataforma de força *AMTI (Advanced Mechanical Tecnologies, Inc*.). Os dados foram coletados nas condições olhos abertos e olhos fechados com os pés posicionados na largura do quadril. Foram coletadas seis tentativas de trinta segundos, sendo três para cada condição a uma freqüência de 100Hz. O equilíbrio corporal foi analisado através da amplitude e do deslocamento do centro de força nas direções ântero-posterior e médio-lateral. Para análise dos dados utilizou-se a estatística descritiva e teste t para comparação. De acordo com os resultados encontrados conclui-se que os valores mostram-se diferentes apenas na variável amplitude do centro de força na direção ântero-posterior quando a informação visual foi manipulada. Para as demais variáveis não foram encontradas diferenças estatisticamente significativas. Desta forma, conclui-se que a informação visual é importante para o equilíbrio de idosos.

Palavras chave: equilíbrio estático, idosos.