



7<sup>th</sup> EFSMA - European Sports Medicine Congress

3<sup>rd</sup> Central European Congress of Physical Medicine and Rehabilitation  
Annual Assembly of the German and the Austrian Society of Physical Medicine and Rehabilitation

Salzburg, 26th - 29th October 2011



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## Postural balance in elderly evaluated in a force platform: the vestibular system and its importance in the aging process

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**Objective:** Balance dysfunction remains a significant factor for disability in the elderly [1]. Several mechanisms have been proposed to explain the changes in balance during aging. Balance disorders represent a growing public health problem due to the association with falls and fall related injuries [2]. The complexity of the balance system, however, often requires a thorough, multidisciplinary approach to the evaluation and successful treatment of balance impairment [3]. The vestibular system detects head movement in space and in turn generates reflexes that are crucial for daily activities, such as stabilizing the visual axis and maintaining head and body posture [4]. To measure postural balance an accurate and reliable instrument is needed that can numerically reflect the importance of the different variables involved in human balance [5]. With this study it's our aim to directly determine the balance of older people and to establish the importance of the vestibular system in aging.

**Material/Methods:** The data of postural balance in three test conditions was collated with a Metitur® force platform (normal standing with eyes open, normal standing with eyes closed, foam standing with eyes open and foam standing with eyes closed, with 30 seconds duration each). Height was measured with a Seca® stadiometer: subjects were asked to stand with back, buttocks and heels against the stadiometer. Subject's feet were together and flat on the floor and their heads in the Frankfort plane.

**Results:** We evaluated 49 elderly (42 woman and 7 men) with a mean age of 68,73±9,39 years and with a BMI of 28,63±4,77. The postural balance data obtained was:

Mean x-axis speed in normal standing with eyes open – 3,56±1,39 mm/s

Mean y-axis speed in normal standing with eyes open – 6,82±2,5 mm/s

Mean x-axis speed in normal standing with eyes closed – 4,51±2,35 mm/s

Mean y-axis speed in normal standing with eyes closed – 10,96±4,75 mm/s

Mean x-axis speed in foam standing with eyes open – 4,37±1,67 mm/s

Mean y-axis speed in foam standing with eyes open – 9,29±2,86

Mean x-axis speed in foam standing with eyes closed – 5,59±2,62

Mean y speed in foam standing with eyes closed – 15,01±4,29

Establishing correlations, we observed that the age is positively correlated to different types of evaluations in foam: mean x-axis speed in foam standing with eyes open (0,358\*, p=0,011), mean y-axis speed in foam standing with eyes open (0,419\*\*, p=0,002), mean x-axis speed in foam standing with eyes closed (0,331\*, p=0,02) and mean y-axis speed in foam standing with eyes closed. Comparing the subjects studied with reference values of same age and sex [5], we can observe that our subjects achieve better results (less velocity) in both "x" and "y" axis (subjects versus references values):

Mean x-axis speed in normal standing with eyes open – 3,56±1,39 mm/s vs. 4,18±0,81 mm/s

Mean y-axis speed in normal standing with eyes open – 6,82±2,5 mm/s vs. 7,27±1,84 mm/s

Mean x-axis speed in normal standing with eyes closed – 4,51±2,35 mm/s vs. 5,68±1,44 mm/s

Mean y-axis speed in normal standing with eyes closed – 10,96±4,75 mm/s vs. 12,20±3,01 mm/s

Taking into account the results in the different tests, the platform software assigns a classification to the importance of the different systems involved in balance. The vestibular system is itself responsible for 55,19% of the total balance of the studied subjects.

**Conclusion:** The subjects of our sample had better results when compared with reference values of same age and sex. They also tended to have more pronounced sway with age in foam standing with eyes open and in foam standing with eyes closed, in both "x" and "y" axis, which means that the vestibular system has a very important role in the balance of the elderly subjects we have studied.

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