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RELATION BETWEEN PRESSURE SENSITIVITY AND PLANTAR IN DIFFERENT REGIONS OF FOOT IN YOUNG AND ELDERLY

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SUMMARY

Here the relation between foot sensitivity and plantar pressure was analyzed for different regions of the foot in the young and elderly. Plantar pressure was measured during quiet standing. Foot sensitivity was evaluated using monofilaments. Our findings suggest that elderly present different patterns of plantar pressure during standing compared to young, which may rely on the lower foot sensitivity at midfoot. This result may influence regulation of postural control during standing in the elderly.

INTRODUCTION

In the next ten years, the number of people over 60 years living in the planet will increase in almost 200 million and by 2050, elderly will be almost 2 billion people, or 20% of the world population [1]. The increase in senior population will impact significantly the health care costs. To understand the degenerative processes associated to the aging process in order to improve prevention and rehabilitation, several researches is being developed on aged gait and posture. The loss of foot sensitivity and deficits in postural control are topic of many studies, as with the aging the damages to the peripheral nervous system lead to losses in the sensory nerves [2]. The peripheral nerves adaptation in the elderly may contribute to different foot sensitivity in the different foot region and therefore would affect postural control. However, there are few researches addressing the relationship between foot sensitivity and plantar pressure considering different foot regions.

OBJECTIVES

Our study aimed at evaluates the differences in foot sensitivity and plantar pressure during quiet standing for elderly and young subjects without any gait limitations.

METHODS

This study included 38 subjects aged between 18 and 90 years, divided into two groups according to their ages (19 young, mean height of 1.67 m and body mass 69.5 kg, 19 elderly, mean height of 1.55 m and body mass 68.8 kg). The inclusion criteria were the ability to fully support the upright standing independently without use of orthoses or prostheses, and negative historic of lower limbs injuries in the last 3 months. Exclusion criteria involved vestibular and cerebellar disorders and lesions on the feet. For data collection, subjects were first evaluated concerning the foot sensitivity. The foot sensitivity was evaluated for ten different regions of the plantar region for both the foot by using nylon monofilaments with different diameters (SORRI Bauru Semmes-Weistein Monofilaments). Sensitivity was quantified according to the different colors of the monofilaments. Afterwards, they were requested to stand barefoot while plantar pressure under each foot of the subjects was

monitored (Fscan, Tekscan Inc., USA). Plantar pressure was monitored during 30 s of quiet standing with eyes open and closed. Two repetitions were completed for each condition. The sensitivity and plantar pressure were averaged for forefoot (FF), midfoot (MF) and rearfoot (RF). Data normality was verified using the Shapiro-Wilk test. Data were compared between legs, visual condition and foot region using analysis of variance in a model 2x2x3 with Bonferroni corrections for multiple comparisons. When a leg or visual condition effect was observed data were compared by t test. For a foot region effect an analysis of variance one-way was applied with post-hoc Bonferroni. Statistical significant was set at 0.05.

RESULTS AND DISCUSSION

Fig. 1 summarizes the plantar pressure results. There was no effect of visual condition on plantar pressure. It is consistent with a higher participation of visual information for dynamic stability rather than static postural control [3]. For all foot regions, sensitivity was higher in young compared to the elderly ($P<0.05$). Any asymmetry in foot sensitivity was observed for both the groups. Regarding the comparison between foot regions, young showed similar sensitivity for FF, MF and RF. However, elderly had MF less sensitive than FF and RF. For plantar pressure, young presented differences between all the foot regions. FF pressure was higher than MF ($P<0.05$), and lower than RF ($P<0.05$). In the elderly plantar pressure was similar for FF and MF ($P<0.05$), but RF had higher pressure than MF ($P<0.05$) FF ($P<0.05$). Plantar pressure was similar between young and elderly for FF and RF, but elderly had higher pressure in the MF ($P<0.05$).

CONCLUSIONS

Our findings suggest that elderly present different patterns of plantar pressure during standing compared to young, which may rely on the lower foot sensitivity at midfoot. This result may influence regulation of postural control during standing in the elderly.

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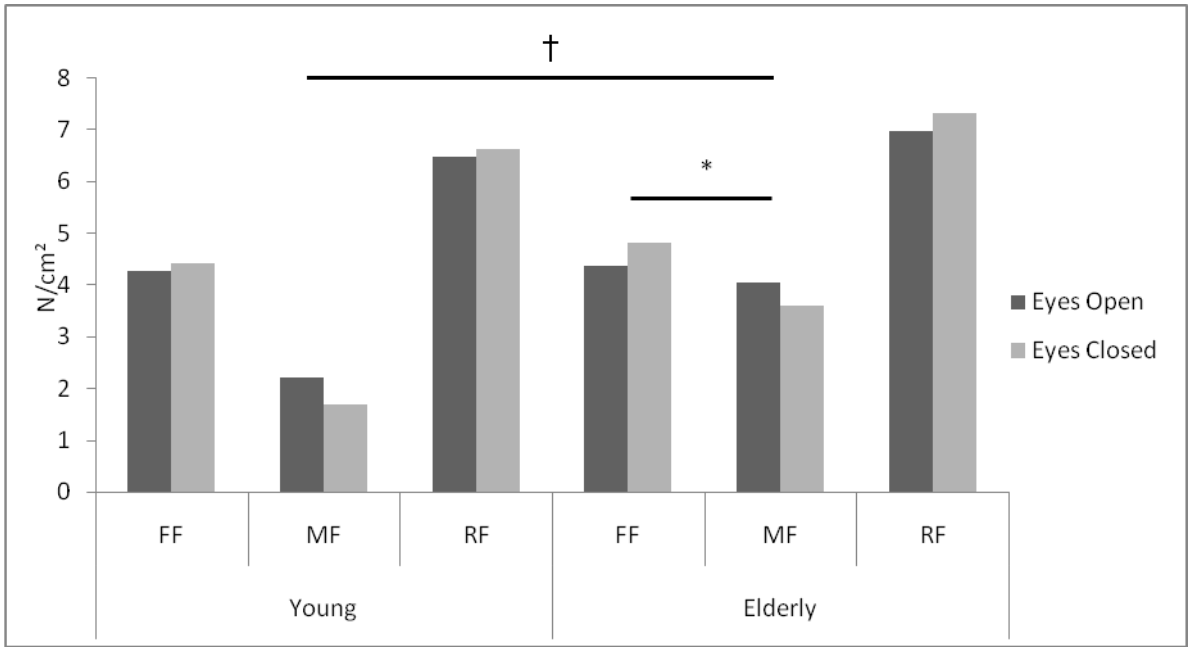

Fig. 1: Values about plantar pressure (N/cm²) for both elderly and young group and both condition eyes open and eyes closed in each foot regions: forefoot (FF), midfoot (MF) and rearfoot (RF). * significant similarity ($p>0.05$) between regions in the same group; † significant differences ($p<0.05$) between groups in the same region.