Age-Related Effects On The Vestibular System And Its Functions

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Objectives: The aim of this study was to investigate the effect of normal aging on the sensory weighting during static postural control using posturography measures in older adults compared to young adults. A secondary aim is to determine the relationship of vestibular electrophysiological assessment with posturography measures.

Background: Falls represent a leading cause of injuries and death among older adults. Considering the aging of the population, this issue can become a bigger society health concern. This makes aging of the sensory systems involved in maintaining posture an important phenomenon to study for the prevention of falls among elderly.

In order to reduce falls and target an appropriate intervention, postural control needs to be monitored. Postural control requires controlling body sway and involves mainly three sensory information including vision, proprioception and the peripheral vestibular system. Body sway can be determined by the deviations in the location of the center of pressure (CoP) of the body using a force platform. Static posturography measures spontaneous body sway on a firm platform. The cause of sway is attributed to many factors that may contribute to the degradation of the balance system with aging.

Numerous studies have shown how aging leads to a decrease in each of the sensory systems and increases body sway leading to a bigger risk of falling in older people. Many reported that body sway is greater in older adults that in younger adults from different sensorimotor perspectives. However, only a few studies have focused on the impact of aging on body sway comparing different age groups from a vestibular point of view.

Methods: Healthy young and older adults maintained quiet stance on a force platform while visual and somatosensory information were steady or altered by using a foam rubber. Each participant was tested in four postural conditions (A: eyes open on firm surface; B: eyes closed on firm surface; C: eyes open on foam; D: eyes closed on foam) on a force platform. Analysis of postural adjustments was assessed by measures of the area and sway velocity of the displacement of the center of pressure (COP). Vestibular assessment was completed prior to the posturography using Video Head Impulse Test (vHIT), cervical and ocular Vestibular Electrophysiological Myogenic Potentials (cVEMP and oVEMP) to be correlated with posturography measures.

Results: Aging has a significant influence on postural control measured by an increased sway area in older adults compared to younger adults. Older adults' somatosensory dependence is increased compared to younger adults. Indeed, the results showed a negative correlation between cVEMP rectified amplitude measures and somatosensory weight.

Conclusions: Maintaining static postural control represents a particular challenge for older adults. Our findings reveal age-related decline in the ability to adjust balance control when sensory information is altered. Our results suggest that cVEMP measures could be a predictor of postural control performance in healthy older adults. Our study corroborates that fall prevention in older healthy adults should consider the possible difference in sensory dependence with normal healthy aging.