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Presentation Abstract

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Presentation Title: Sensory reweighting of proprioceptive input during balance control in healthy elderly

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Abstract: Sensory (re)weighting is the automated and unconscious process of combining sensory inputs, e.g. proprioception, graviception and vision, during human balance control. Typically reliable sensory inputs are weighted more than unreliable and noisy sensory inputs, to prevent deterioration of human balance control. Malfunctioning of sensory reweighting may be an important determinant of balance deficits in elderly with the consequence of falls. In this study we compared sensory (re)weighting of prioprioceptive input of the ankle joints, as one of the available sensory inputs, in healthy young versus healthy elderly during upright stance.

Ten healthy young (aged 20-30 years) and ten healthy elderly (aged 75-80 years) were asked to maintain balance while proprioceptive input of each ankle was perturbed by rotations of the support surfaces around the ankle axes. Support surface rotations were applied with specific frequency content and increasing perturbation amplitude over trials. Body sway and reactive ankle torques were recorded. The sensitivity of the ankle torques to perturbation amplitude was determined using system identification techniques. The gain of a sensitivity function describes the ratio of perturbation amplitude and response amplitude as a function of frequency.

Overall, elderly had a significant higher gain of the sensitivity function than young subjects. Increasing amplitude of the sensory perturbation resulted in a significant decrease of the gain of the sensitivity function from the perturbation amplitude to the ankle torque. Significant frequency-dependent interactions between group and perturbation amplitude could be established.

A significant higher ankle torque sensitivity to perturbations indicates that elderly rely more strongly on proprioceptive input to maintain

balance compared to younger subjects. Different reactions of elderly versus young subjects to perturbation amplitudes are indicative of differences in sensory reweighting. Results are important to understand interplay between available sensory inputs in balance and falling.

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PROPRIOCEPTION

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