Age Related Differences in Neck Muscle Mechanics and its Implications on Head Impact During Falls

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Introduction. Previous studies have shown that older adults are more likely to experience head impact when they fall and thus are at greater risk for Traumatic Brain Injury (TBI). We hypothesized older adults would exhibit reduced Sternocleidomastoid (SCM) muscle cross-sectional area (CSA), weaker neck flexor strength, and higher frequency of head impacts during falls.

Methods. This study analyzed data from 8 young adults (YA, 18-30 years) and 10 older adults (OA, 65+ years), consisting of qualitative head impact videos and quantitative muscle strength measurements. ANOVA analysis of YA + Low Risk, YA + High Risk, OA + Low Risk, OA + High Risk groups was used to evaluate possible differences among groups.

Results. 6/10 tested older adults experienced head impact during falls, compared to 1/8 young adults, indicating a significantly higher rate in OA. Ultrasound imaging showed an age-related increase in SCM echogenicity, suggesting muscular degeneration. Older adults in the low-risk group had significantly decreased anterior neck flexion force, while lateral flexion remained unchanged across all groups. Flexion in the left and right directions remained the same.

Conclusions. This study confirms that older adults are more likely to experience head impact during falls. Decreased SCM echogenicity in older adults suggested age-related degeneration of muscular properties, which potentially relates to this increased head impact. However, neck flexion strength differences were inconsistent, as significant reductions were seen only in low-risk older adult group. Future research is needed to clarify findings and implications for fall prevention and TBI risk reduction in aging populations.

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