*TACSM Abstract*

# Effects of Visual Deprivation on Dynamic Stability of Young and Older Adults during Treadmill Walking

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ABSTRACT

Vision plays an essential role in human locomotion by providing information about the environment in which we navigate. Research has focused primarily on the effects of visual deprivation on human gait during overground walking; however, overground walking introduces several limitations such as fewer steps to analyze and uncontrolled gait speed between trials. The purpose of this study was to examine the effect of visual deprivation on dynamic stability during treadmill walking. Fifteen participants (six older adults 69.33 ± 4.88 yrs. and nine young adults 22.67 ± 1.87 yrs.) performed two 90-sec trials at their preferred walking speed on a treadmill: first with eyes open (EO) and then with eyes closed (EC). Prior to performing these two trials, participants walked on the treadmill approximately ten times with each lasting 12 sec to become acclimated to the treadmill. While wearing a safety harness, full-body kinematics were recorded during the two primary trials from 26 reflective markers using an 8-camera motion capture system. Spatial gait parameters including step length, step width, and foot landing angle were computed for both walking conditions. Measurements of dynamic stability were calculated as the variability (i.e., the standard deviation) of all gait parameters. Analyses of variance with repeated measures were used to analyze the gait parameters and stability measurements. The between-subject factor was the age (young vs. older) and the within-subject factor was the condition (EO vs. EC). Our results revealed no significant age by condition effect for all measurements of interest. However, a significant main effect of condition was detected for step length ($p < 0.001$), foot angle ($p < 0.001$), step length variability ($p = 0.003$), foot angle variability ($p < 0.001$), and step width variability ($p < 0.001$). Specifically, both age groups took a shorter step with reduced foot landing angle during EC walking in comparison with EO walking. Similarly, both age groups demonstrated reduced stability as indicated by the elevated variability of the step length, step width, and foot landing angle during EC gait than during EO gait. Our findings showed that both young and older adults adopted a "cautious gait" when walking without visual input. Furthermore, the dynamic stability was deteriorated while walking with visual information removed. Visual deprivation seems to affect both age groups equally. Although the finding from this project could provide guidance for designing fall prevention interventions targeting individuals with visual impairments, more studies based on large sample sizes are needed to examine comprehensively the impact of visual deprivation on dynamic stability and the risk of falls among humans.