TACSM Abstract

Effects of vision on dynamic stability against backward loss of balance in young and elderly subjects.

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ABSTRACT

Injuries sustained from falls in elderly can lead to injury, sustained hospital stays, and is one of the leading causes of death in the elderly. An individual's postural stability has been shown to be a reliable predictor of fall risk. However, postural control in previous research has typically been determined under static balance conditions. Despite this, clinical observations indicate that falls in elderly individuals are more likely to occur under low-light conditions during movement. The purpose of this study was to determine anterior/posterior dynamic stability in young and elderly subjects while walking with eyes open and eyes closed. An inverted pendulum model derived from a 14 segment full-body kinematic (120 Hz) and kinetic (1080 Hz) data set was used to determine dynamic stability against backward loss of balance. Five young subjects (age 24.8 ± 4.2 years, height 177.8 ± 9.7, mass 74.0 ± 14.2 kg) and seven elderly subjects (age 74.7 ± 7.7, height 174.2 ± 6.7, mass 82.3 ± 15.5 kg) were recruited. All procedures were approved by the IRB and subjects gave informed consent. Data were collected in the Biomechanics Laboratory at the University of Texas at Arlington using two AMTI force plates (1080 Hz) and a Vicon Motion Capture System (120 Hz). Each subject was allowed multiple practice trials to ensure contact with both force plates was made. Each subject completed five walking trials with eyes open and five with eyes closed. Dynamic stability was determined by computing the momentum of the extrapolated center of mass (Hof, 2005). A 2 x 2 repeated measures ANOVA was used to determine the effect of vision (eyes open, eyes closed) and age (young, elderly) on dynamic stability. There were no significant differences in dynamic stability for the young subjects for eyes open (330.2 ± 19.8 kg·mm/s) and eyes closed (323.8 ± 31.9 kg·mm/s), $p < 0.05$. There were no significant differences in dynamic stability for the elderly subjects for eyes open (304.5 ± 28.2 kg·mm/s) and eyes closed (288.2 ± 40.8 kg·mm/s), $p < 0.05$. Finally, the interaction between vision and age group was not significant, $p < 0.05$. A larger subject number could potentially yield significant differences for both between- and within-subjects factors. While not statistically significant the inverted pendulum model did illustrate that elderly subjects had lower dynamic stability. In addition dynamic stability was lower for both groups when walking with eyes closed.