

## Abstract 6

### **Age-related effects of a cognitive task on gait speed and frontal plane stability during narrow-base walking**

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**Purpose:** Age-related changes in frontal plane stability during walking are associated with impaired balance and increased fall risk in older adults. Clinically, tandem and narrow-base walking are used to assess gait stability. Adding a cognitive task to narrow-base walking (i.e. dual tasking) may further challenge stability, allowing identification of early balance deficits not detected under single task conditions. The purpose of this study was to examine age-related effects of a cognitive task on velocity and frontal plane stability during narrow-base walking.

**Methods:** Thirty-six healthy adults participated, categorized by age: <65, 65-74, ≥75 years. Participants were asked to walk at a comfortable pace within a narrow path under both single task and dual task conditions. In the dual task condition, participants were asked to say the days of the week backwards while walking within the narrow path. We examined spatiotemporal characteristics of gait and center of mass (CoM) parameters using a 3-dimensional VICON motion analysis system (Lake Forest, CA). Visual 3D (Gaithersburg, MD) was used to calculate the whole body CoM from a 13-segment model with head, trunk, pelvis, and bilateral foot, shank, thigh, upper arm, and forearm segments. Custom software was used to calculate gait velocity, step length, step width, mediolateral (M-L) CoM displacement and M-L CoM peak velocity. Data were analyzed in SPSS using general linear regression with 2 task conditions (within subjects: single v. dual) and 3 age groups (between subjects). Post hoc analyses were conducted for significant ( $p < 0.05$ ) main effects of age.

**Results:** The percent of accurate steps did not differ significantly between groups ( $p = 0.10$ ) and was not affected by performance of a secondary task ( $p = 0.90$ ). On average, about 16% of the steps were outside the narrow path. Both age ( $p < 0.001$ ) and the performance of a secondary task ( $p < 0.000$ ) decreased gait velocity, with no interaction effect. Similarly, both age ( $p < 0.001$ ) and a secondary task ( $p = 0.007$ ) decreased step length, with no interaction effect. Step width increased with age ( $p = 0.010$ ), but there was no effect of a secondary task on step width. Both CoM displacement and CoM velocity were greater for individuals ≥75 years compared to the younger individuals (displacement:  $p < 0.001$ ; velocity:  $p = 0.011$ ), but there was no effect of a secondary task on these measures (both  $p > 0.015$ ). Age-related changes in M-L CoM displacement and velocity remained when these parameters were normalized to subject height and to gait velocity.

**Conclusions:** Age-related changes in both gait velocity and frontal plane stability are evident during narrow-base gait. Performance of a secondary task resulted in decreased gait velocity and step length for all age groups, but frontal plane stability was not affected by a secondary task in this group of healthy older adults. Further research is needed to determine if changes in dynamic postural control during narrow-base walking with and without a secondary task can be used to identify older adults with a history of falls or to prospectively predictive fall risk in older adults.

**Funding Acknowledgements:** This research was funded by the National Institute on Aging.