ASYMMETRIC STABILITY MARGIN OF POSTURAL RESPONSES TO PERTURBATION IN UNILATERAL TRANSTIBIAL AMPUTEES

Yi-Ying Tsai\(^1\) and Lena H. Ting\(^{1,2}\)

\(^1\) Georgia Institute of Technology, Atlanta, GA, USA
\(^2\) Emory University, Atlanta, GA, USA

E-mail: lting@emory.edu, Web: http://www.neuro.gatech.edu/groups/ting/

**INTRODUCTION:** Falling is an important clinical problem in amputee population. In unilateral transtibial amputees, increased postural sway in quiet standing and asymmetric EMG reactions in anticipatory postural adjustments to rapid arm raises have been done previously. The goal of this study is to quantify directional deficits in postural control in individuals with unilateral transtibial amputation. We used the concept of **stability margin**, which is the difference of peak center of pressure (COP) and center of mass (COM) displacement, to characterize direction stability in response to multiple directions of support-surface perturbations in the horizontal plane.

**METHODS:** Three subjects with unilateral, traumatic, transtibial amputation and three able-bodied subjects as a control group we recruited. Subjects were instructed to stand quietly with their arms crossed on the perturbation platform and were presented with a randomized set of support surface perturbation in the horizontal plane. We collected five replicates of each of the 8 perturbation direction (0°, 45°, 90°, 135°, 180°, 225°, 270°, 315°). Kinematic, kinetic and EMG data were recorded.

**RESULTS:** Surprisingly, the stability margin in anterioposterior and mediolateral directions in amputee group was not significantly different from controls. However, stability margin was significantly reduced in the diagonal directions when the amputated side was loaded (45° and 315° perturbations, p <0.05). CONCLUSIONS: Our results show that the stability margin in amputees is reduced in diagonal directions where the amputated side in loaded and the intact side is unloaded.

Reference:


