



US DEPARTMENT OF DEFENSE

BLAST INJURY RESEARCH PROGRAM COORDINATING OFFICE

Neuromuscular Control and Balance

Trunk Muscle Activation Patterns During Walking Among Persons with Lower Limb Loss

Persons with lower limb amputation (LLA) experience an increased incidence of low back pain (LBP). Researchers at the DoD/Department of Veterans Affairs (VA) Extremity Trauma and Amputation Center of Excellence (EACE) studied the underlying trunk muscle activation patterns associated with walking to provide insight into neuromuscular control strategies post LLA and help determine causes of LBP (*Butowicz et al., 2018*).

Participants with unilateral LLA ($n = 8$) and controls ($n = 10$) walked over ground at 1.0, 1.3, and 1.6 m/s, and at self-selected speeds. Trunk muscle onsets and offsets were determined from electromyography activity of bilateral thoracic (TES) and lumbar erector spinae (LES). Trunk-pelvic kinematics were also recorded.

Initial TES onset times did not differ between groups; however, the LLA group demonstrated a second TES onset during mid-to-terminal swing that was not observed from the control group. In contrast, LES onset times were earlier for the LLA group than controls. For both TES and LES, the LLA group had activation for a greater percentage of the gait cycle than the controls at most speeds. In addition, those in the LLA group walked with increased frontal plane trunk range of motion and a more in-phase inter-segmental coordination than controls at all speeds.

These data suggest that trunk neuromuscular control strategies in those with LLA are driven by a functional need to proximally generate torque to advance the affected limb; this strategy may increase LBP risk over time.

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REFERENCES:

Butowicz, C. M., Acasio, J. C., Dearth, C. L., & Hendershot, B. D. (2018). Trunk muscle activation patterns during walking among persons with lower limb loss: Influences of walking speed. *J Electromyogr Kinesiol*, 40, 48-55. doi:10.1016/j.jelekin.2018.03.006

