

ORIGINAL RESEARCH

NEUROMUSCULAR CONTROL DURING PERFORMANCE OF A DYNAMIC BALANCE TASK IN SUBJECTS WITH AND WITHOUT ANKLE INSTABILITY

Federico Pozzi, PT, MA¹Marilyn Moffat, PT, DPT, PhD, FAPTA²Gregory Gutierrez, PhD²

ABSTRACT

Design: Cross-sectional, controlled laboratory study

Background: Lateral ankle sprains are common injuries and often lead to chronic ankle instability (CAI). Individuals who previously sustained a lateral ankle sprain, but did not develop CAI, termed copers, may have altered postural control strategies compared to individuals who have developed CAI. These altered postural control strategies may allow for more appropriate dynamic stabilization of the ankle joint after injury compared to those seen in patients who have developed CAI.

Objective: To compare lower leg biomechanics, as well as electromyographic (EMG) activation of the tibialis anterior and peroneus longus muscles, during the posteromedial reach of the Star Excursion Balance Test (SEBT) in individuals with healthy ankles, copers, and those with CAI.

Participants and Methods: 30 participants (12 control, 9 copers, 9 CAI) divided into three groups based on ankle sprain history and Cumberland Ankle Instability Tool score. Kinematic, kinetic, and EMG data were collected during three posteromedial reach trials on the SEBT.

Main Outcome Measures: Primary outcome measures include SEBT normalized reach distance in the posteromedial direction and average integrated EMG activation of the tibialis anterior and peroneus longus muscles during the reach. Secondary outcome measures included sagittal and frontal plane ankle complex angles and moments and sagittal plane knee angles and moments. Data were analyzed between groups using a one-way ANOVA model.

Results: No significant differences in reach distance or kinematic and kinetic outcomes were found between groups. The activation of the tibialis anterior and peroneus longus muscles was significantly different between groups ($p = 0.033$ and $p = 0.014$, respectively). The post-hoc analysis revealed that the copers group had significantly higher muscle activation compared to the control group, but not to the CAI group.

Conclusion: CAI did not alter kinematic, kinetic, or reach performance during the SEBT. When compared to controls, copers appeared to have greater activation of the ankle musculature, which may increase stability of the ankle complex during a dynamic balance task.

Level of Evidence: Prospective Cohort level II

Keywords: Copers, electromyography, motion analysis, Star Excursion Balance Test

CORRESPONDING AUTHOR

Federico Pozzi, PT, MA

Biomechanics and Movement Science
Program

University of Delaware

540 S College Ave, Suite 210

Newark, DE 19713

E-mail: fpozzi@udel.edu

¹ Biomechanics and Movement Science Program, University of Delaware, Newark, DE, USA

² Department of Physical Therapy, New York University, New York, NY, USA