ABSTRACT:

Background: Ankle sprain is one of the most frequent traumas of the musculoskeletal system, with an incidence rate of 2.15 per 1000 person-years in at risk populations (e.g., athletes) in the united states (Waterman, Owens, Davey, Zacchilli, & Belmont Jr, 2010). The purpose of this study was to investigate the balance and compare the electromyographic (EMG) activation of the most important muscles involved in postural control strategies during single-leg stance among athletes with chronic ankle instability (CAI), copers, and healthy athletes.

Hypothesis: Electromyographic activity of muscles and balance control involved in postural control strategies are different among CAI, copers, and healthy athletes.

Study design: Cross-sectional study.

Method: 34 participants, were classified into three groups, maintained her balance 3 times for 20 seconds at levels 3 and 12 of Biodex Balance System (BBS), resting for 10 seconds between each trials, and and EMG activation of the muscles were recorded by using surface EMG. In the present study, electrical activity in the muscles of tibialis anterior, medial gastrocnemius, rectus femoris, biceps femoris, extensor muscles of the vertebral column, and rectus abdominis was recorded; 1000 Hz sampling frequency; with surface EMG (the ME6000 16-channel EMG, Megawin, Finland) during single-leg stance on BBS.

Results: A statistically significant difference was found in the muscle activation in single-leg stance at both levels 3 and 12 of BBS among three groups (p <0.05). the EMG activity level of CAI group was lower than that of the other two groups. The activation of the medial gastrocnemius and rectus femoris muscles were decreased in CAI when compared with healthy individuals (p <0.05). Compared to copers, the activation of the tibialis anterior, medial gastrocnemius and rectus abdominis muscles were decreased in the CAI group (p <0.05). And no significant difference was observed between coper and healthy control groups in the balance indexes under two stable and unstable conditions (p <0.05). However, both medial/lateral, and overall balance indices were significantly higher in the CAI group than those in healthy group under two stable and unstable conditions (p≤0.05).

Conclusions: Decreased EMG activation in CAI may be one of the reasons for the lack of balance in these individuals because there was no reduction in muscle activity of copers. Individuals with
CAI showed a decrease in activity levels of muscles both proximal (rectus femoris and rectus abdominis) and distal (tibialis anterior and medial gastrocnemius) during single-leg stance, and it is impossible to say with certainty which strategy in these individuals is more likely to contribute to maintaining the balance in single-leg stance. Also, people with CAI had balance deficits in medial-lateral direction. Reduced activity level of the muscles in individuals with CAI could be one of the reasons for the balance weakness in these individuals. Increased activity level of the muscles in copers might be due to compensatory mechanisms, which resulted in more trunk and ankle stability.

**Keywords:** Electromyographic (EMG) activity, Chronic ankle instability (CAI), Coper, Athlete

Reference: