

# Investigation of the Effect of Fatigue on the Change in Postural Control Strategies Using Surface EMG and Biodex Balance System

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**INTRODUCTION:** Balance allows maintenance of normal body posture and counteraction of opposing forces with or without physical activity. During static standing, hip and ankle balance strategies are utilized. Small perturbations require ankle balance strategy, whereas larger perturbations consume greater muscle recruitment that require hip strategy, along with higher trunk musculature activation. Central or whole-body fatigue may also have a similar effect on these balance strategies.

**PURPOSE:** In this study, we measured the effects of central fatigue on muscle activation and balance strategies as measured by surface electromyography (EMG) of ankle, hip, and trunk muscles, using the Biodex Balance System, before and after a treadmill protocol.

**METHODS:** Twenty-eight healthy, young individuals (14 men and 14 women) aged 18-45 years participated in the study. Evaluation of EMG activity occurred in 6 muscles of the ankle, hip, and trunk during a postural stability test on the Biodex Balance System before and after a running protocol. The running protocol resulted in central fatigue, measured by heart rate and the Rating of Perceived Exertion scale (RPE).

**RESULTS:** EMG of muscle activation during pre- and post-fatigue states revealed significant decreases in medial gastrocnemius and tibialis anterior and significant increase in lumbar erector spinae. The average overall stability index gathered from Biodex data decreased by 28.91% from pre- to post-fatigue states.

**CONCLUSION:** The results indicate that the effect of central fatigue on the human body demonstrates a shift from ankle to hip balance strategy, as well as significantly increasing erector spinae activation. Understanding this change in muscle activation with fatigue may lead to further research and rehabilitation techniques to reduce the risk of falls and injury after fatiguing activities.