The Effects of Fatigue on Single Leg Landing Mechanics

Abstract

Background
Faulty positional mechanics at the knee during single limb landing have been associated with non-contact soft tissue injury\(^1\). In particular, landing with increased knee extension and knee valgus have been associated with increased risk of ACL injury. Athletes perform single limb landings during sport in both fatigued and non-fatigued states. Current literature sites conflicting evidence regarding the effect of fatigue on positional mechanics at the knee during these tasks. While some studies have identified increased knee valgus and extension post-fatigue\(^2\) \(^3\) \(^4\), others have found no correlation between fatigue and positional risk factors\(^5\). With the current discrepancy in the literature, further study is necessary to investigate the relationship between fatigue and lower extremity mechanics during single limb landing. This study examines single limb landing mechanics at the knee before and after an established fatigue protocol\(^6\) \(^7\).

Methods
Baseline height, weight, leg length, and ankle/knee girth were assessed in two subjects, one adult male and one adult female. The subjects were recorded performing three maximum vertical double leg hops to single leg landings using skin-mounted markers and an 8-camera 3D motion capture (Vicon). This data was recorded both before and immediately following an established fatigue protocol. The fatigue protocol consisted of 5 jump squats and a 15 meter run, repeated until the subjects reached a rating of perceived exertion (RPE) of 17/20. Angular displacement of the knee was recorded in the frontal and sagittal planes upon landing.

Results
The researchers found that the fatigue protocol did not increase positional risk factors at the knee during single limb landing. Relative to data from pre-fatigue trials, no change, or slight increase in knee flexion angles was observed during post-fatigue trials. These results suggest more optimal knee mechanics following a fatigue protocol.

Conclusions/Discussion
Fatigue conditions resulted in a reduced knee valgus angle and slightly increased knee flexion angle during single-limb landing in the two subjects. Warming up before exercising has shown to decrease injury instincances\(^8\). The fatigue protocol may have acted as a dynamic neuromuscular warm-up for the subjects in this study. Further studies involving more subjects and analytics are indicated to establish the effect of fatigue on knee mechanics during single-limb landing.
Works Cited