

The Effects of Fatigue on Center of Pressure Measures During Front Lunges

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ABSTRACT

Front lunges are a common exercise in strength and conditioning programs. Extensive research on front lunge biomechanical movement exists previously, however, the existing research lacks information regarding fatigue or center of pressure (COP). **PURPOSE:** The aim of this study was to determine the effect of fatigue on COP behavior in front lunges. **METHODS:** Participants were ages 18 to 30 and recreationally active. Participants were guided through sufficient warm up and practiced the lunge movement, barefoot, at the cadence of 15 repetitions/minute. Step length was assigned as the length from their greater trochanter to lateral malleolus. Participants completed front lunges before and after a fatigue protocol. Two Kistler force plates (1200 Hz) collected ground reaction forces and BioWare software was used to determine COP (100 Hz). Total distance of the change in location of COP, average and standard deviation of the difference from the mean COP (MDIST and RDIST, respectively), and range during the lead leg lunge stance phase in the anteroposterior (A/P) and mediolateral (M/L) directions for lead and trailing legs was measured. Paired t-tests were performed to determine differences due to fatigue ($p < 0.05$). **RESULTS:** Post fatigue, the AP range and corresponding velocity trended towards being larger for the trail leg. For the lead leg, the ML range increased with fatigue (30.4 ± 12.3 mm vs. 36.8 ± 15.4 mm, $p = 0.019$). Additionally, the MDIST and RDIST values both increased after fatigue (5.7 ± 2.6 mm vs. 7.5 ± 2.8 mm, $p = 0.023$ and 7.2 ± 3.4 mm vs. 9.0 ± 3.4 mm, $p = 0.037$, respectively). MDIST, and MDIST AP trended to increase after fatigue, whereas total overall AP and ML distances both decreased. **CONCLUSION:** Fatigue created mostly greater mediolateral variability, primarily for the lead leg. This finding suggests greater instability and increased injury risk associated with fatigue during front lunges.