

Isokinetic and Functional Fatigue Protocols Have Similar Effects on Balance

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Muscular fatigue has been induced using both isokinetic and functional protocols. The efficacy of the fatiguing protocol is often examined by comparing balance before and after exercise. Comparisons between different fatiguing protocols have not been examined. The purpose of this study was to compare the effects of isokinetic and functional fatigue protocols on balance. Two separate repeated measures 2x10 ANOVAs (fatigue protocol x test trial; $p < 0.05$) assessed sway differences from baseline in the anterior-posterior and medial-lateral direction (in). The two levels of fatigue protocol were isokinetic and functional; the 10 levels of test trials were baseline and post-fatigue trials 1-9. Isokinetic testing was performed in Wenner-Gren Biodynamics Laboratory and functional testing was performed in the College of Health Sciences Musculoskeletal Laboratory. Sixteen, healthy subjects (8 males and 8 females, age = 22.69 ± 2.98 years, ht = 173.43 ± 8.65 cm, wt = 67.76 ± 7.46 kg) volunteered for this study. On each testing day, subjects balanced on the NeuroCom Balance Master[®] (Clackamas, OR) to obtain baseline sway distances, then completed one of the two muscular fatigue protocols (the knee isokinetic test or the functional test). After completion of the respective fatigue protocol, subjects balanced on the NeuroCom Balance Master[®] for nine time intervals over three minutes (10 seconds balancing, 10 seconds rest). The isokinetic protocol consisted of a knee flexion/extension, concentric/concentric exercise at $180^\circ/\text{s}$ until peak torque dropped 50% below maximum for three consecutive trials. The functional test consisted of an anaerobic exercise protocol, which included forward sprinting, retro running, side shuffling, and cariocas. Subjects performed trials until their time to completion increased 50% above their initial trial. Thirty seconds rest was provided between trials. The repeated measures ANOVAs revealed no main effect for fatigue protocol in the anterior-posterior direction ($F_{1,15} = 1.991$, $p = .179$) or the medial-lateral direction ($F_{1,15} = 1.205$, $p = .290$). Results revealed a main effect for time in both the anterior-posterior ($F_{9,135} = 7.079$, $p = .000$) and medial-lateral ($F_{9,135} = 3.804$, $p = .000$) direction. A Bonferroni Holm Post-Hoc analysis ($p < .05$) indicated that anterior-posterior post-fatigue trial 1 (11.30 ± 4.28), trial 8 (5.96 ± 4.92), and 9 (5.02 ± 4.64) were significantly different from baseline and medial-lateral post-fatigue trials 1 (5.03 ± 1.63), 3 (2.79 ± 2.79), and 8 (3.15 ± 2.63) were significantly different from baseline. The two fatigue protocols, isokinetic and functional, had similar effects on balance. It appears that either an isokinetic or a functional protocol is effective and thus gives the clinician flexibility in application.