TACSM Abstract

Title: Effects Of A 4-week Vibration-induced Hamstrings Fatigue Intervention On Quadriceps Weakness After ACL Reconstruction

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ABSTRACT

Arthrogenic muscle inhibition (AMI) results from an inability to voluntarily activate all motor units in the quadriceps due to ongoing neuronal inhibition. This may be due to changes in small diameter afferent activity that increase the excitability of the flexor withdrawal pathway, causing over-excitation of the hamstrings and reciprocal inhibition of the quadriceps. Reciprocal inhibition of the quadriceps from Ia afferents of the hamstrings may be reduced with prolonged muscle vibration of the hamstrings via fatigue of the intrafusal muscle fibers. **PURPOSE:** To determine the effects of vibration-induced hamstring fatigue on AMI after ACL reconstruction (ACLr). **METHODS**: Seven adults (28.7 ± 8.2 yrs) with unilateral ACLr (time since surgery: 19.4 ± 9.7 months) were recruited. Participants received a 4-week long (3x/week) training program. Vibration-induced fatigue of the hamstrings consisted of 20 minutes of prolonged vibration applied directly to the hamstrings. Then, a cuff was placed on the proximal thigh and inflated to 150 mmHg to trap the metabolites in the muscle, and maintain hamstrings fatigue; during which participants performed four sets of 15 reps at 30% RM unilateral knee extension (KE). Quadriceps strength and quadriceps inhibition were assessed before and after the intervention using KE 1-repitition maximum (RM) normalized to body weight, and the central activation ratio (CAR) measured by a superimposed burst. The co-activation of the hamstrings was assessed using hamstring EMG during KE. Paired t-tests were used to examine the effect of prolong vibration on KE strength, quadriceps CAR, and hamstrings co-activation before and after the intervention. **RESULTS:** KE strength increased significantly by 38.5% (from 0.45 ± 0.1 to 0.62 ± 0.2 %BW, P =0.004); quadriceps CAR also increased significantly by 5.8% (from 93 ± 0.1% to 98 ± 0.8%, P=0.02). Finally, co-activation decreased by 34% (from 12 ± 1.3% to 8 ± 0.9%, P=0.03). **CONCLUSION:** These results suggest that quadriceps weakness may be due to over excitation of the hamstrings which results in reciprocal inhibition of the quadriceps. Vibration-induced hamstrings fatigue can be used as a rehabilitation strategy to restore normal quadriceps function following ACLr by reducing the hamstrings over-excitability and restoring full quadriceps activation.