THE EFFECT OF POST-ACTIVATION POTENTIATION ON THE SINGLE LEG HOP TEST

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This is a prospective, repeated-measures study with IRB approval. Research participant safety and personal data/information were kept in compliance with the standard-of-care.

Purpose/hypothesis: Post-activation Potentiation (PAP) is a recognized neuromuscular phenomenon within the sports performance literature and has demonstrated the ability to produce an acute increase in athletic performance during power-based tasks. However, the utility of PAP during return to sport rehabilitation is unknown. Neuromuscular deficits such as quadriceps weakness and muscle inhibition persist long after anterior cruciate ligament reconstruction (ACLR). Since PAP provides an excitatory neuromuscular stimulus, the purpose of this study was to investigate the effect of a PAP conditioning event on Single Leg Hop Test (SLHT) performance in individuals with a history of primary ACLR. Specifically, we investigated whether PAP would: (1) produce an acute improvement in SLHT performance, or (2) influence knee flexion kinematics during the landing phase of the test.

Methods: Active individuals with a history of a primary ACLR were recruited for this study, along with healthy controls. Subjects performed one SLHT both before and after a PAP conditioning event. The PAP conditioning event included two sets of a 5-second, single-leg maximal voluntary isometric contraction on a leg press. Only the ACLR or inferior performing control leg received PAP conditioning. Data was collected on the first successful SLHT both pre- and post-conditioning. 2D knee kinematics of the conditioned leg were captured via video recording. SLHT distance, leg symmetry index (LSI), and landing phase maximal knee flexion angle were used for data analysis.

Results: Six subjects were included in the ACLR Group (mean age = 23.2, range 20-27) and 5 subjects in the Control Group (mean age = 27.4, range 21-35). The ACLR Group showed a significant pre-to-post improvement in SLHT distances in both the surgical leg (156.5 vs. 164.7, p=.027) and uninvolved leg (173.7 vs. 178.3, p=.042). No significant pre-to-post difference was seen in the Control Group. LSI did not change from pre-to-post for either group (ACLR = .848 vs. .878, Control = .959 vs. .964, p>.05). There was no statistical difference between groups in pre-to-post changes in the conditioned leg, uninvolved leg or LSI (p>.05). The ACLR Group showed a significant increase in surgical leg maximum knee flexion during the landing phase from pre- to post-conditioning (50.9° vs. 61.4°, p=.033), as did the Control Group (60.8° vs. 73.2°, p=.040). The Control Group showed 10°-12° greater knee flexion at both pre- and post-conditioning as compared to the ACLR Group, these differences were not significant (p=.220 and p=.197).

Conclusion/Discussion: After ACLr, athletes demonstrate impaired performance during hop testing and land with lower levels of knee flexion. PAP conditioning may be utilized to address these impairments, as individuals with a history of primary ACLr received a greater performance benefit, bilaterally, compared to those with no history of knee pathology. These findings also suggest a PAP conditioning event may be utilized to increase the knee flexion angle during the landing phase of a hopping task.