

## Effects of Inducing Post Activation Potentiation on Leg Extensors using Isotonic Movements

SAMUEL J. RAMIREZ, DAKOTA R. HARRIS, CALVIN D. SMITH, KASE J. PENNARTZ, & MICHEAL J. LUERA

Human Performance Laboratory; Health and Human Performance; Tarleton State University; Stephenville, TX

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*Category: Masters*

*Advisor: Luera, Micheal (luera@tarleton.edu)*

### ABSTRACT

Post Activation Potentiation (PAP) has been documented in previous studies as evoking greater muscle activation and velocities in submaximal contractions. Literature has additionally shown that isotonic contractions have increased motor unit activation when compared to isokinetic. **PURPOSE:** Induce PAP using different interventions and evaluate PAP differences between interventions in the vastus lateralis (VL), rectus femoris (RF), vastus medialis (VM) and evaluate velocity and muscle activation differences. **METHODS:** 8 recreationally active males ( $n=8$ , age =  $20.6 \pm 1.8$ , height =  $178.2 \pm 12.1$  cm, weight =  $83.2 \pm 48.3$  kg) with no previous lower extremity injuries completed this study. Following a familiarization visit, subjects completed three randomized visits separated by 24 hours. Each visit consisted of one of the following interventions to induce PAP: 2 sets of 6 isotonic leg extensions at 50% MVC, 4 isometric MVCs, or two sets of 6 isotonic extensions at 60% MVC. Following each intervention subjects performed 20 isotonic knee extensions at 30% MVC. Peak velocity was recorded during these contractions in the familiarization day as well as subsequent visits using a robotic dynamometer (Biodex System 4). Three 4-pin Surface electromyography (EMG) sensors were placed over the VL, RF, and VM to record muscle activation. After collecting EMG signals root mean square (RMS) values were calculated for each muscle. 3 separate one-way analyses of variance (ANOVA) were completed to compare RMS values for each muscle across each visit. 1 separate one-way ANOVA was run to compare peak velocity across each visit. A 2-way repeated measures ANOVA (Muscle [VL v RF v VM] x Intervention [2 sets of 6 isotonic contractions at 50% MVC v four isometric MVCs v 2 sets of 6 isotonic contractions at 60% MVC]) was used to compare RMS values across visits. **RESULTS:** There were no significant differences ( $p>0.05$ ) in RMS values the VL, or the RF across visits in the one-way ANOVAs comparing muscular differences. The one-way ANOVA for peak velocity also showed no significant differences across visits ( $p>.05$ ). However, a main effect was found between visits in the VM ( $p = .014$ ). **CONCLUSION:** PAP intervention has been shown in previous studies to increase velocity; however, this was not found to a significant effect. A larger sample size could result in this being induced to a larger degree. Additionally, intrasubject differences could also have contributed. The VM having increased activation between visits may be caused by PAP evoking a larger response in this muscle compared to the other leg extensors. Further research should be performed to examine these findings. Additionally, motor unit behavior analysis could reveal additional differences between the interventions and the effects on each of the leg extensors.