

## **Regional Motor Unit Firing Behaviors of Mono- and Bi-Articular Leg Extensor Muscles**

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### **ABSTRACT**

Motor unit (MU) activation patterns provide vast insight into skeletal muscle contractions and may differ depending on architectural differences. Previous findings have suggested that MU activation patterns, specifically within the quadriceps group, are region-specific; this, along with the architectural differences between the quadriceps muscles, may further influence force production as reflected within the relationships between the firings. **PURPOSE:** To examine regional activation in proximal and distal regions of biarticular [rectus femoris (RF)] and monoarticular [vastus lateralis (VL)] knee extensors during submaximal isometric knee extensions. **METHODS:** On two separate randomized visits, eight lower-body resistance trained individuals, 6 males (n=6, age= 25.2 ±3.77) and 2 females (n=2, age= 21 ±1.4), performed submaximal isometric contractions at 30% and 70% of their maximal voluntary contractions (MVC) in a custom-built seat using an S-beam load-cell. Two separate 5-pin surface electromyography (EMG) sensors were used to record activation in the proximal and distal locations of either the VL or RF. Signals were recorded and decomposed into their constituent motor unit action potential (MUAP) trains, validated, and assessed for relative behavioral properties. For subsequent analysis of firing behaviors, the relationships (Slopes and intercepts) between motor unit action potential size (MUAPsize,) recruitment threshold (RT%), and mean firing rate (MFR) were calculated. Twelve separate two-way repeated measures analyses of variance (ANOVA) (location [proximal v distal] x muscle [VL v RF]) were used to compare slopes and intercepts of MFR vs. RT%, MUAPsize vs. RT%, and MFR vs. MUAPsize at both 30% and 70% MVC. **RESULTS:** There was a significant location x muscle interaction in the MFR v MUAPsize slopes during 30% MVC contraction (p<0.05, η<sup>2</sup>= 0.429). **CONCLUSION:** The location by muscle interaction in the MFR v MUAPsize slopes during 30% MVC may indicate muscle fiber type distribution differences between sensor locations specifically, more type II fibers in the distal location of the VL.