

## Monitoring Firing Behaviors of Motor Unit Action Potentials During Low-Intensity Fatiguing Contractions

DAKOTA HARRIS, LYRIC D. RICHARDSON, AMY E. RIERA, EMMA D. BOZARTH, MICHEAL J. LUERA

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

---

*Category: Undergraduate*

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

### ABSTRACT

Motor Units (MU) are systematically activated from increasing size in accordance to the size principle. As muscle fatigue sets in, MU firing rate increases in response to sustaining whole-body force production during a low-loaded sustained contraction with respect to MU size and MU interspike intervals (ISI). **PURPOSE:** The purpose of this study is to compare the motor unit firing behaviors during low-force isometric fatiguing contractions. **Methods:** Following 3 MVCs, eight lower-body resistance trained males ( $23.38 \pm 2.88$  yrs.;  $178.38 \pm 7.85$  cm;  $86.10 \pm 11.88$  kg) performed 60 second submaximal (30% MVC) isometric ramp contraction of the knee extension exercise. Knee extensions were performed on a custom-built seat using an S-beam load-cell to measure isometric force production of the quadriceps muscle group. During the fatiguing contractions, participants were encouraged to perform as many trapezoidal ramp contractions (i.e., 30%) as possible, until they could no longer sustain the required force production. Fatigue was established when the participant could no longer maintain the contraction force within 10% for no less than 3 seconds during the isometric hold. Surface electromyography signals from the vastus lateralis were collected and decomposed into constituent motor unit action potential (MUAP) trains for further analysis. Three separate one-way ANOVAs were used to compare the number of MUs, MFR, and ISI during the first, middle, and last (time) contractions. **RESULTS:** There were no significant main effects between contractions for the number of MUs, MFR, and ISI ( $p > 0.05$ ). **CONCLUSION:** The results of this investigation are likely due to the increased recruitment of higher threshold MUs as the muscle fatigued through the protocol. The size (i.e., amplitude) of the action potential, and its respective relationships with the recruitment threshold at which these MU initially fired, are preeminent indicators of MU firing behaviors during sustained force production to fatigue.