

Maximal Force and Motor Unit Recruitment Patterns are Altered across the Human Menstrual Cycle

MS Tenan¹, YL Peng¹, AC Hackney², L Griffin¹

¹Department of Kinesiology, University of Texas-Austin, Austin, TX

² Department of Exercise and Sport Science, University of North Carolina-Chapel Hill, Chapel Hill, NC

The excitability of the central nervous system may be altered with hormonal fluctuations. This study sought to determine if motor unit (MU) firing rates at recruitment were altered across the female menstrual cycle and in comparison with a male cohort. Female participants (n=7) were tested in each of the five menstrual phases (pseudo-counterbalanced design). Males (n=11) were tested once. The test was a maximal isometric knee extension (MVC) followed by a slow ramp up to 30% MVC. Fine wire EMG was collected from the vastus medialis and the vastus medialis oblique muscles. There was a 19.1% decrease in MVC at mid luteal phase which was significantly ($p < 0.05$) different from the late follicular, ovulation and late luteal phases. During the ramp contraction, the MU firing rate at recruitment was altered across the menstrual cycle ($p < 0.05$), but was not different from the male cohort ($p > 0.05$). Late luteal MU firing rate (9.11 ± 0.31 Hz) was significantly higher than early follicular (8.16 ± 0.31 Hz) and late follicular (8.01 ± 0.30 Hz). Menstrual phase and gender accounted for 5.1% of the variance in firing rate at recruitment after controlling for the effects of force generation, whereas force accounted for only 1.7%. To our knowledge, this is the first study to show that MU firing patterns are altered across the menstrual cycle and that hormonal status is more important than force generation for MU firing rate at recruitment.