



# Mid Atlantic Regional Chapter of the American College of Sports Medicine

Annual Scientific Meeting, November 2<sup>nd</sup> - 3<sup>rd</sup>, 2018  
Conference Proceedings  
International Journal of Exercise Science, Issue 9, Volume 7



## The Effect of Cognitive Strategies on Brain Dynamics and Muscular Force during Maximal Voluntary Movement

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Self-initiated cognitive strategies for movement preparation include arousal, attentional focus, visualization, and imagery. Torque output responses to mental preparation prior to strength tasks has shown to be elevated when compared to distracting conditions. Understanding this brain-body relationship may yield insights into the dynamics of the cortical processes that underlie the quality associated with musculoskeletal activity and performance outcomes.

**PURPOSE:** To investigate using self-initiated arousal, the influence of cerebral cortical activation and networking with musculoskeletal activity and maximal voluntary isokinetic contraction. **METHODS:** Ten healthy young adults (19-30 years of age), were recruited and required to have a minimum of one year strength training experience. Electroencephalography (EEG), electromyography (EMG) and torque output (Isokinetic) were measured. Visit one consisted of informed consent, background questionnaires and baseline measures. EEG, EMG and Isokinetic data were conducted during visit two and participants were exposed to three cognitive conditions, psyching (PSY), mental arithmetic (MA), and reading comprehension (RC). Each condition (PSY, MA, RC) consisted of three maximal effort trials with a 20-second task period provided prior to movement. **RESULTS:** EEG analysis revealed PSY ( $-6.611 \pm 1.539$ ) having greater cerebral activation in the central region compared to MA ( $-5.111 \pm 1.628$ ) and RC ( $-5.592 \pm 1.423$ ) as indexed by alpha band power and lessened levels of networking in PSY ( $0.187 \pm 0.004$ ) compared to MA ( $0.214 \pm 0.20$ ) and RC ( $0.188 \pm 0.008$ ) as indexed by alpha band coherence. Average peak torque output within participants for PSY ( $110.697 \pm 7.49$ ) was higher compared to MA ( $106.135 \pm 9.01$ ) and RC ( $104.823 \pm 8.30$ ). **CONCLUSION:** Average peak torque output following PSY exceeded torque following distraction conditions. Cerebral cortical activity in the central motor regions exhibited elevated activation for PSY compared to MA and RC. Heightened cortico-cortical networking was displayed in MA and RC conditions from the frontal region to all regions of the cortex compared to PSY. The study suggests promising results in the use of cognitive strategies (psyching) as a method to improve performance during maximal effort movement.