TACSM Abstract

Cortical Activity Measured with Low-Intensity Fatiguing Contractions of the Quadriceps Muscle Group

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ABSTRACT

Modulation of force production required during exercise is regulated from various mechanisms in the central and peripheral nervous system. Fatigue is influenced by various mechanics that may hinder the ability to continuously sustain force production. The neural activation patterns of these systems can be recorded as electrical impulses using several non-invasive techniques. The ability to examine these during fatiguing exercise has provided further insight into activation patterns in the central nervous system (i.e., motor and pre-motor cortex) during sustained muscle contractions. Electroencephalography (EEG) has been recently utilized to examine changes associated with central fatigue, but limited advancements in technology for neuromuscular fatigue has inhibited progression in this area of research. **PURPOSE:** The purpose of this study is to discover the effects of low-intensity muscular fatigue on central mechanisms. **METHODS:** Following 3 Maximal Voluntary Contractions (MVCs), four lower-body resistance trained males (23yrs.±2, ht.176cm ±6., wt. 89kg ±16.) 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. Cortical activity was recorded with a 24-electrode electroencephalogram (EEG) soft cap. Once EEG signals were referenced, bandpass filtered, and cleaned, gamma and beta frequency band data and topographic maps were computed for electrodes over the cerebral cortex (C3, Cz, and C4). Two separate repeated measures ANOVAs were used to compare the band's during the first 3 seconds of the force plateau of the pre and post contractions. **RESULTS:** There were no significant differences over time in any of the electrodes/bands ($p > .05$). **DISCUSSION:** These data indicate that low-intensity muscular fatigue is not mediated by central mechanisms in the C3, C4, Cz electrode spaces in the higher frequency bands (beta and gamma). Future research will examine other central mechanisms that underlie the neural circuit involved in muscular fatigue.