TACSM Abstract

Electromyographic Activation of the Quadriceps During the Concentric Phase of the Squat

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ABSTRACT

Mechanical muscle properties such as length-tension relationship in conjunction with electromyography (EMG) allow greater insight into the overall motor coordination. The different morphologies of the quadriceps and their force generating capacities can be quantified through the differences in EMG amplitude. **PURPOSE**: To examine quadriceps activation during the squat exercise under various intensities. **METHODS**: Eleven participants (age 18-35; height: 181.1 ± 8.9cm; weight: 97.7 ± 19.1kg) were recruited for this study. Subjects completed three visits, one familiarization and two testing days separated by 48 hours. Ultrasound images were obtained from the three primary leg extensor muscles (vastus lateralis (VL), vastus medialis (VM), rectus femoris (RF)) prior to testing. Subjects then performed a randomized order of squats and knee extensions at 25%, 50%, and 75% of their maximal contraction (MVC). Three separate surface electromyography sensors were used to record the activation from the VL, VM, and RF from a .25 second time window at the time the peak force (N) occurred during the concentric portion of the squat. A 2-way mixed factorial ANOVA (muscle [VL v VM v RF] x intensity [25% v 50% v 75%]) was used to analyze EMG activation under each condition. **RESULTS**: There was no significant muscle x intensity interaction ($p>.05$); however, there was a significant main effect for muscle ($p=.003$). When collapsed across intensity, EMG amplitude of the RF was lower than the VL ($p=.025$) and VM ($p=.000$). **CONCLUSION**: The lower EMG amplitude in the biarticular RF is in line with previous findings revealing that morphological differences affect motor coordination during the squat performance. Thus, as the RF is shortening at one portion it is lengthening at the other with little change in length throughout the movement whereas the VL and VM have a greater net length change.