

Creatine kinase, lactate dehydrogenase, and myoglobin responses following repeated Wingate anaerobic tests versus barbell back squats: a pilot study

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ABSTRACT

The results from many previous studies have demonstrated that muscle damage and delayed onset muscle soreness are due primarily to high force, eccentric muscle actions. However, the majority of investigators have examined these responses following single-joint, isokinetic assessments. The purpose of this study was to examine creatine kinase (CK), lactate dehydrogenase (LDH), and myoglobin responses following repeated Wingate anaerobic tests versus multiple sets of the barbell back squat exercise. Six recreationally resistance-trained men (mean \pm SD age = 23 \pm 2 years, body mass = 88.0 \pm 17.8 kg, one repetition-maximum [1RM] back squat = 150.0 \pm 28.3 kg) volunteered for this investigation, and visited the laboratory on five separate occasions. For the back squat protocol, the subjects performed six sets until volitional exhaustion using 75% of the 1RM with two minutes of rest between each set. For all repetitions, the subjects squatted to the parallel position. For the Wingate protocol, the subjects performed three tests with a 10 minute recovery period between each attempt. The order of these two protocols was randomized, and all testing for the study occurred at the same time of day. The subjects were required to refrain from vigorous physical activity during the study. Immediately prior to and 24 hours following each protocol, the subjects provided a venous blood sample from a superficial forearm vein. At the conclusion of the study, all samples were processed for CK, LDH, and myoglobin analyses. Three separate two-way (time [Pre versus Post] \times protocol [squats versus Wingate anaerobic tests]) repeated measures analyses of variance were used to examine the CK, LDH, and myoglobin data. For CK, there was a significant time \times protocol interaction (partial eta squared = .761). Follow-up paired samples t-tests indicated that the mean CK values increased following the squat protocol (Pre mean \pm SD = 233.2 \pm 97.4; Post = 457.0 \pm 119.9 IU/L), but not the Wingate anaerobic tests (Pre = 218.5 \pm 103.9; Post = 231.7 \pm 65.3 IU/L). There was no mean difference between the protocols for both LDH and myoglobin. The primary finding from this pilot study was that performing six sets of barbell back squats using 75% of the 1RM significantly increased blood CK levels in resistance-trained men. Although additional studies with larger sample sizes are needed to confirm our findings, CK appears to be a more sensitive measure of muscle damage than both LDH and myoglobin.