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The Acute Effect of a Five Repetition Maximum on Vertical Jump Performance at Different Time Intervals

Troy Walter, Evan Courtney, Chris Zinn, Steven Yovic, Clayton Meyers, Joohee Sanders, Ph.D., Russell Robinson, Ph.D., Sally Paulson, Ph.D. Shippensburg University, Shippensburg, PA

The post activation potentiation theory and previous studies have indicated that a loaded squat of up to 65% 1 repetition maximum (RM) may help to improve short-term jump performance up to four minutes' post-squat. Other studies have found that increasing the load of the squat further increased subsequent vertical jump performance. **PURPOSE:** Thus, this study attempted to see how an 80% of 1-RM squat warm-up and post-squat rest-time intervals of up to 5 minutes would affect vertical jump performance. Blood lactate, ground reaction force, acceleration, and jump height (estimated based on flight time) were collected. **METHODS:** Subjects that participated in this study were 15 (6 male, 9 female) Shippensburg University (SU) division II aerobically-trained-athletes (age: 20 ± 1.26 years). Participants completed 4 days of exercise testing. The first testing day was used to estimate each subject's 1-RM value for the squat. On the subsequent 3 testing days, subjects completed 1 set of 5 repetitions of squats using 80% of their predicted 1-RM. Subjects then completed 3 countermovement jumps on a force plate after a rest-period of 1 (R1), 3 (R3) or 5 (R5) minutes. In addition, 3 control countermovement jumps were performed without a squat warm-up (CON). Blood lactate levels were taken at rest, post squat, and pre-jump. Two-way ANOVA with repeated measure was used to compare dependent variables at multiple time points across different conditions. **RESULTS:** Ground reaction force (GRF), maximum jump velocity and jump height were extrapolated using force plate data. No significant differences existed in maximum ($p=0.34$) or average force ($p=0.29$) production across all conditions. Maximum jump velocity (mean values) was significantly greater in the R1 compared to CON (2.37 ± 0.29 vs. 2.32 ± 0.27 m \cdot sec $^{-1}$, $p = 0.009$). Jump height (estimated by flight time) was also significantly higher in R1 compared to CON (26.9 ± 6.5 vs. 25.7 ± 6.1 cm, $p = 0.014$) but not R3 or R5. No significant differences were seen in blood lactate levels across post-squat conditions. **CONCLUSION:** This study found that R1 produced the greatest improvement in vertical jump performance when using an 80% of 1-RM squat warm-up. This protocol may be useful for anaerobically trained power athletes; however further study should be completed to help optimize the protocol.