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

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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·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.