

Mechanical Efficiency of Repeated Jump Squats with Reduced Eccentric Load

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PURPOSE: The purpose of the present study was to examine the effect of reducing the eccentric load of repeated jump squats on mechanical efficiency (ME). **METHODS:** Nine strength trained male division II athletes (age: 21.5 ± 1.6 ; height: $186.6 \text{ cm} \pm 4.9$; mass: $108.3 \text{ kg} \pm 9.2$) attended six separate testing sessions where they performed 20 jump squats with three different external loads: 0% (bar only), 30%, and 60% of 1-repetition maximum (1-RM) back squat. During three of the testing sessions the load during the eccentric phase of each jump was reduced by 30% using a magnetic braking system. Mechanical work performed during each jump and the vertical velocity of the center of mass were calculated by integrating the ground reaction force recorded from force plates. Metabolic energy expenditure was calculated from VO_2 recorded using a portable metabolic unit. ME was calculated as the ratio of total mechanical work to metabolic energy expenditure. A 2 x 3 ANOVA (2 conditions [normal vs unloaded eccentric], 3 external loads [0%, 30%, 60% 1-RM]) was used to determine the differences in ME, mechanical work, and vertical velocity between the jump conditions with alpha set at $p < 0.05$. **RESULTS:** ME was not significantly different between the normal and unloaded eccentric jump conditions (mean difference: 0.58%, $p > 0.05$). Negative work increased significantly with increases in load (mean increase: 2071 J, $p = 0.010$) while peak negative velocity significantly decreased with increases in the external load (mean decrease: 0.26 m/s, $p < 0.001$) but there were no significant differences between the normal and unloaded eccentric jump conditions. **CONCLUSION:** Increases in negative work may not always lead to increases in ME and other factors such as negative velocity may exert a greater influence on ME during repeated jump squats.