THE ACUTE EFFECTS OF FREE-WEIGHT AND ELASTIC BAND BACK SQUAT EXERCISE ON SUBSEQUENT VERTICAL JUMP PERFORMANCE

Mina, MA.1, Blazevich, AJ. 2, Tsatalas, T. 3, Giakas, G. 3, Seitz, LB. 2, Hooton, A. 1, Kay, AD.4
1: UoD (Derby, UK), 2: ECU (Perth, WA), 3: UoT (Thessaly, Greece), 4: UoN (Northampton, UK)

Introduction: The back squat exercise is a fundamental exercise for the development of lower limb strength and power. However, in successful attempts of one repetition maximum (1-RM), the upward barbell movement decelerates for a short period referred to as the "sticking point". The inclusion of elastic bands (EB) minimises the loading during the early concentric phase, while maintaining average loading throughout the lift may limit the impact of the sticking point and enables the athlete to work more closely to maximal throughout a greater range of the lift. Objective: To examine the influence of free-weight resistance (FWR) and EB squat exercise following a comprehensive warm-up on subsequent vertical jump (VJ) performance. Hypothesis: The use of EB during squatting following a comprehensive warm-up would:- (a) enhance subsequent VJ performance; (b) alter VJ mechanics; and (c) increase the neuromuscular activity of the lower limb extensor muscles, when compared to FWR.

Methods: Fifteen active men (n=15) visited the laboratory on two occasions under experimental conditions (FWR or EB). After completing a comprehensive warm-up procedure, three maximal VJs were performed and then three consecutive back squat repetitions were completed at 85% of 1-RM using either FWR or EB. Three VJs were then performed 30 s, 4 min, 8 min and 12 min later. During the VJs, knee joint kinematics, ground reaction force data and vastus medialis (VM), vastus (VL) lateralis and gluteus maximus (Glut) electromyograms (EMG) were recorded simultaneously using 3D motion, force platform, and EMG techniques, respectively.

Results: No change in any variable was found after the FWR warm-up ($p > 0.05$). Significant increases ($p < 0.05$) were detected in CVJ height (5.3-6.5%), net impulse (2.7-3.3%), take-off velocity (2.7-3.8%), peak power (4.4-5.9%), kinetic (7.1-7.2%) and potential (5.4-6.7%) energy, peak (12.9-19.1%) and mean (33.2-35.8%) normalized rate of force development (RFD) following the EB warm-up. Significant increases ($p < 0.05$) in peak concentric knee angular velocities (3.1-4.1%) and mean concentric VL EMG activity (27.5-33.4%) following the EB warm-up.

Discussion: The use of heavy squat lifts with EB increases vertical jump performance following a comprehensive warm-up. The use of EB manipulates the loading characteristics of the squat lift by reducing the effective load near the "sticking point". This modification in loading allows the athlete to operate at near-maximal levels for a greater proportion of the movement to enhance muscle force output and elicit a greater dynamic muscle performance, which likely provides a greater loading stimulus and may be a more effective training tool even when comprehensive task-specific warm-up is performed.

Contact: m.mina@derby.ac.uk