Mid Atlantic Regional Chapter
of the
American College of Sports Medicine

46th Annual Scientific Meeting, November 3rd - 4th, 2023
Conference Proceedings
International Journal of Exercise Science, Issue 9, Volume 12


**The Effects of Heel Elevation on Back Squat Performance**

Matthew L. Pierce, Racine R. Emmons. William Paterson University, Wayne, NJ

Heel-elevated back squats have been used in rehabilitative settings, research has suggested that the exercise promotes less trunk inclination and a more stable posture. Furthermore, the restricted state of plantar flexion during exercise requires less dorsiflexion, a common restriction preventing a complete back squat. There is little research that support these suggested biomechanical effects may have an impact on back squat performance. **PURPOSE:** to examine the differentiating effects of muscle activation and barbell metrics at different heel elevations (0.0 in., 0.5 in., and 1.0 in.). **METHODS:** Utilizing a repeated measures design, 10 resistance-trained (RT) individuals (N = 10, RT years: 4.85 +/- 2.789) performed three sets of 10 repetitions at 70% of their 1RM at the 3 predetermined heel positions. Testing days were randomized, participants were given at least 24 hours in between each session, and participants performed the exercise barefooted to avoid any additional heel elevation. Surface electromyography was used to obtain activation for the knee extensors (RF, VM, VL) and a single inertial measurement unit (IMU) centered on the barbell was used for force-velocity metrics. Mean muscle activation normalized to participants maximum voluntary contraction (MVC), movement velocity (m/s), peak power (W), peak force (N), and concentric distance (in.) were analyzed. **RESULTS:** Paired samples and repeated measures tests analyzed for differences in muscle activation comparing a participant's testing day at 0.0 inches to the days with heel elevations and if there were any enhancements in performance during heel raised conditions. Paired sample results showed significance in RF activation at 0.5 inches ($p = 0.035$; SD = 2.166%), VM activation at 0.5 inches ($p = 0.018$, SD = 7.151%) and slight significance comparing 1.0 inches ($p = 0.055$, SD = 9.544%), all showing a significant reduction in activation. Repeated measures showed a significant decrease in VM activation between sets 1 and 3 (MD = 4.115; SE = 1.126; $p = 0.001$). **CONCLUSION:** These findings support that in resistance-trained individuals, biomechanical changes can affect muscle activation though not enough to alter performance. **SIGNIFICANCE/NOVELTY:** Muscle activation changes during heel elevated back squats have yet to be researched extensively along with how these changes may relate to an individual's actual performance of the movement.