

Acute Effects of Squat Position and Whole-body Vibration Frequencies on Muscular Function and Jump Performance

JONATHAN TYLER GONZALEZ, IMTIAZ MASFIQUE DOWLLAH, NANCY CALLE, GUALBERTO GARZA IV, GALILEA CHAPA, JULISSA PEREZ, JOSE M. SOSA, LIANA CHEE, ULKU KARABULUT, & MURAT KARABULUT FACSM

Neuromuscular Performance Laboratory; Department of Health and Human Performance; University of Texas Rio Grande Valley; Brownsville, TX

Category: Undergraduate

Advisor / Mentor: Karabulut, Murat (murat.karabulut@utrgv.edu)

ABSTRACT

PURPOSE: To determine the acute effects of different whole-body vibration (WBV) frequencies and squat depths on lower extremity isometric and isokinetic muscle function and vertical jump performance. **METHODS:** Thirteen healthy male (age = 23.8 ± 5.3 years) and fifteen healthy female subjects (age = 22.45 ± 3.04 years) performed six randomized sessions of vibration protocols (VPs) in different squat positions with 90° (low-squat) and 140° (high-squat) knee flexion angle at 30 Hz (30Hz 90° ; 30Hz 140°), 40 Hz (40Hz 90° ; 40Hz 140°) & 50 Hz (50Hz 90° ; 50Hz 140°). Each subject performed 5 sets x 1-min of static squats with 30-sec rest between each set. Then they rested for 5-min and repeated 5 more sets. Once completed, vertical jump performance was measured. Furthermore, subjects were tested for maximum 5-sec right knee extensor isometric contractions at 60° of knee flexion, and isokinetic concentric knee extension and flexion at 180° /sec, utilizing standard Biodex protocol. All VPs were performed on the same commercial side to side alternating vibration platform and foot placement for all squats was recorded to ensure consistency. **RESULTS:** Two-way repeated measures ANOVA indicated a significant condition main effect in average jump height ($p < .01$) and average jump time ($p < .001$), denoting enhanced jump performance following 40Hz 140° ($p < .05$) and 50Hz 140° ($p < .01$) compared to 50Hz 90° . A significant condition main effect was found in peak-torque during the isokinetic test, where observed changes were greater for both 30Hz 140° and 40Hz 140° compared to 30Hz 90° ($p < .05$) and 50Hz 90° ($p < .01$). Lastly, the best performance on peak-torque during the isometric test was significantly higher after 30Hz 140° ($p < .05$) and 40Hz 140° ($p \leq .05$) compared to 50Hz 90° . **CONCLUSION:** The findings are suggestive of greater muscular strength and explosive power production following a high-squat WBV warm-up compared to low-squat WBV warm-up. This can be attributed to augmented muscle fatigue and/or increased muscle length due to the plasticity of skeletal muscle while performing low-squat WBV warm-up, resulting in impaired ability to produce muscular force.