

Acute Effects of Squat Position and Whole-body Vibration Frequency on Muscular Function on Lower Extremities

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ABSTRACT

PURPOSE: The purpose of this study was to examine the acute effects of whole-body vibration frequency on muscular function of lower extremities and jump performance depending on squat depth. **METHODS:** Thirteen male and fifteen female recreationally active subjects (ages 18-40) volunteered to participate in the study. Once all necessary paperwork was completed, anthropometric and equipment settings were recorded. Feet placement for all squats were measured to ensure consistency throughout study. Using a goniometer, the subject's knees were positioned at 140° (high squat depth) or 90° (low squat depth) of flexion during squat exercises. Randomized testing sessions were as follows: 50 Hz with high depth squat (50Hz-140°); 50 Hz with low depth squat (50Hz-90°); 40 Hz with high depth squat (40Hz-140°); 40 Hz with low depth squat (40Hz-90°); 30 Hz with high depth squat (30Hz-140°); 30 Hz with low depth squat (30Hz-90°). For each of the preceding testing sessions, the subjects were required to complete: Two sets of five 60-sec static squat exercises, with 60 sec of rest between each repetition, and a five-min rest period between the sets. Once the squat exercise was complete, the subjects performed two counter movement jumps (CMJ) with 30 second rest in between attempts. After both jumps were completed, the subjects performed two maximum voluntary contraction (MVC) tests and 10 repetitions of knee extension tests at two different speeds (60°/sec and 180°/sec). **RESULTS:** The 50Hz-90° protocol resulted in significantly lower jump height when compared to both 40Hz-140° and 50 Hz-140° ($p<.02$; $p<.01$, respectively). Similarly, the 50Hz-90° protocol yielded significantly lower leg extension peak torque values tested at 180°/sec than the values observed following both the 30Hz-140° and 40Hz-140° protocols ($p<.01$). Overall, the 30 Hz and 40 Hz protocols at 140° squat depth proved to yield higher MVC than the 50Hz-90° protocol ($p<.03$; $p\leq.05$, respectively). **CONCLUSION:** The findings of this study showed that the subjects performed better in vertical jump and had better muscular function when completing static squat exercises at the higher of two squat depths (140°). Perhaps the loss of force production at a lower squat depth is due to greater mechanical tension and work, resulting in increased bioenergetic demands and by-product production, which were not properly matched.