



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



Acute Physiologic Responses Between Voluntary Exercise and Electrical Stimulations

Kevin A. Rice, J. Jack Welsh, Drew M. Robinson, Scott J. Dankel. Rowan University, Glassboro, NJ.

Electrical stimulations (E-STIM) have been proposed as a feasible alternative for those unwilling or incapable of performing resistance exercise. Studies comparing the efficacy of E-STIM and voluntary exercise have employed different exercises for both conditions (i.e. comparing isometric E-STIM with isotonic voluntary exercises). This makes it difficult to make a fair comparison as the results are contingent upon the arbitrarily chosen voluntary exercises to be completed. **PURPOSE:** To assess differences in physiologic responses to isometric knee extensions completed either voluntarily or via E-STIM. **METHODS:** Two testing sessions were completed each separated by 48h. Each session involved three sets of 10 isometric leg extensions completed on a dynamometer. One leg completed maximal voluntarily isometric contractions and the opposite leg completed E-STIM with the amplitude increased to the maximal tolerable intensity. Before and after each of the exercises, individuals had their muscle thickness measured using B-mode ultrasound and isometric torque measured via dynamometry. **RESULTS:** Twenty-nine individuals (10 females and 19 males) completed the study. Results are expressed as mean (95% confidence interval). The magnitude of torque production during the exercises was greater ($p < 0.001$) in response to voluntary exercise [258 (227, 290) Nm] as compared to E-STIM [34 (13, 54) Nm]. There was no condition x day interaction ($p = 0.112$) nor were there main effects for muscle thickness which increased to a similar extent in response to both E-STIM [0.10 (0.02, 0.18) cm] and voluntary [0.15 (0.08, 0.23) cm] exercise. For isometric strength, there was no interaction ($p = 0.104$) nor were there main effects. Isometric strength did not change in response to either E-STIM [-1.4 (-11.5, 8.7) Nm] or voluntary [-6.5 (19.5, 6.4) Nm] exercise. **CONCLUSION:** Despite substantially greater torque production resulting from voluntary exercise, there were no differences in muscle swelling or fatigue between protocols. These results may suggest that long-term adaptations between voluntary exercise and E-STIM may be similar when the same exercises are employed. **SIGNIFICANCE/NOVELTY:** This is the first study to our knowledge to compare physiologic responses between E-STIM and voluntary exercise that incorporate the exact same exercise (isometric knee extensions). These results provide some support for the efficacy of E-STIM for those who cannot or are unwilling to perform resistance exercise.