The Effects of Pulsed Electrical Stimulation on the Quadriceps Femoris Muscle Prior to Exercise

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Neuromuscular electrical stimulation (NMES) is a commonly employed modality for rehabilitation and is growing in utilization due to its physiological effect in muscular activation. Recent comparative studies have examined utilizing stimulation versus isometric exercise and differences between genders on the effects of administering NMES after physical activity for recuperative purposes, but very little information exists regarding the effects of pre-stimulation to specific muscle groups for strength enhancement. This study aimed to answer this question by pre-stimulating the quadriceps femoris muscle prior to resistance training to determine if there is greater improvement in overall strength performance of the lower body. Fifteen healthy, recreationally and/or competitively active college students (male and female, ages 21 + 3 years, weight 152.8 + 42.2 lbs, height 66.1 + 6 inches) with at least 2 years of resistance training experience performed a 8-week strength training program targeting the quadriceps femoris muscle and its synergists (gluteus maximus, adductor magnus, soleus, gastrocnemius) for three nonconsecutive days each week. Individuals were randomly selected for placement in either the experimental (n=7) or control group (n=8). The experimental group received pulsed NMES prior to the workout for 15 minutes. Training volume for each participant was collected weekly to measure participants' progress, and 1-repetition maximums were collected before and after the workout program to quantitatively determine any impact on strength from pulsed NMES. A Mann-Whitney U-test was used to statistically compare the improvements in strength performance between groups. The results indicated that pre-stimulation of the quadriceps muscle before exercise will result in enhanced strength performance. This study shows that administering NMES prior to resistance training is an efficient method of pre-activating muscle fibers, conditioning the muscle to tolerate longer and more forceful contractions during exercise, and allow for greater improvement in strength to be achieved more quickly.