

## **The Effect of Neuromuscular Electrical Stimulation on Metabolic Changes in a Sedentary Population: A Pilot Study**

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### ABSTRACT

The Centers for Disease Control and Prevention (2015) declared that 80% of U.S. adults do not meet exercise recommendations by ACSM. Skeletal muscle contraction has been shown to increase mitochondrial content (energy production) and glucose uptake (decreased insulin resistance). Neuromuscular Electrical Stimulation (NMES) utilizes electrical impulses to induce muscle contractions and can be used as an alternate strategy to induce muscle contraction in sedentary adults. However, it is not clear if NMES induced muscle contraction may improve insulin sensitivity and metabolic health. **PURPOSE:** The purpose of this study was to investigate the effects of two weeks of NMES on insulin sensitivity, energy expenditure, and body composition in a sedentary population. **METHODS:** Five female participants (age  $23 \pm 1$  yrs, BMI  $24.08 \pm 1.36$  kg/m<sup>2</sup>, maximal aerobic capacity  $35.4 \pm 2.80$  ml/kg/min) performed six sessions (20-minutes, 3x/week) of quadriceps electrical stimulation over the course of two weeks. Maximal aerobic capacity was assessed by a maximal graded exercise test at baseline to assess aerobic capacity. Body composition by Dual X-Ray Absorptiometry (DXA), energy expenditure by indirect calorimetry, and insulin sensitivity by three-hour Oral Glucose Tolerance Test (OGTT) was measured at baseline and after two weeks of NMES intervention. **RESULTS:** Two weeks of NMES did not change fat mass ( $52.72 \pm 8.34$  kg to  $52.94 \pm 7.99$  kg,  $p = 0.77$ ) and fat free mass ( $103.80 \pm 10.23$  kg to  $103.20 \pm 10.69$  kg,  $p = 0.57$ ). Resting energy expenditure showed no significant changes ( $1797.00 \pm 159.40$  kcal/day to  $1552.00 \pm 11.73$  kcal/day,  $p = 0.20$ ). OGTT showed significant time effect ( $p < 0.0001$ ) in glucose response curve, as well as a trend to decrease area under the curve ( $p = 0.0675$ ). **CONCLUSION:** Two weeks of NMES did not show a significant change in body composition. However, there was a trend towards better glucose tolerance. Future studies should investigate the effectiveness of NMES to improve insulin sensitivity with a longer intervention period.