

## **Effects of Neuromuscular Electrical Stimulation on Energy Expenditure and Oxygen Consumption**

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### **ABSTRACT**

Exercise is beneficial to improve metabolic diseases such as obesity and type 2 diabetes. Physical activity results in an increase in energy expenditure (EE) and oxygen consumption due to increased energy demand. Neuromuscular electrical stimulation (NMES) is an alternative strategy to induce muscle contraction. Our previous work have shown that NMES induced muscle contraction can improve metabolic health in an overweight and obese population. However, it is not known whether NMES induced muscle contraction leads to greater energy expenditure. **PUPROSE:** To determine the effect of NMES induced muscle contraction on energy expenditure and oxygen consumption. **METHODS:** Eighteen sedentary overweight/obese men (n=6) and women (n=9) participated in this study (Age: 35.0 ± 13.3 years; BMI: 32.3 ± 8.4 Kg/m<sup>2</sup>). All participants received 30 minutes of stimulation up to maximum tolerable intensity to induce visible muscle contraction (pulse duration 300 μs; frequency 50 Hz). Whole body energy expenditure and oxygen consumption were measured continuously for 50 minutes using indirect calorimetry. After 20 minutes of resting measurement, NMES was performed for following 30 minutes. Energy expenditure and oxygen consumption data was sampled every 5 minutes during NMES and an average value for 30 minutes of NMES was calculated. Results were analyzed using Graph Pad Prism software (version 9.2). Paired t-test was used to compare baseline vs. mean energy expenditure and oxygen consumption. One-way ANOVA was also used to determine the significant changes in energy expenditure and oxygen consumption at different time points during stimulation. **RESULTS:** Average energy expenditure (18.6 ± 0.8 Kcal/Kg to 18.8 ± 1.0 Kcal/Kg, p<0.05) and oxygen consumption (237.7 ± 14.4 ml/min to 238.1 ± 15.5 ml/min, p<0.05) during 30 minutes of NMES was significantly greater compared to baseline. Additionally, energy expenditure trended to increase (p=0.07) and oxygen consumption significantly increased (p<0.05) after 5 minutes of stimulation compared to baseline. **CONCLUSION:** Neuromuscular electrical stimulation results in significant increase in energy expenditure and oxygen consumption. NMES could be used a viable alternative to increasing daily energy expenditure in a sedentary overweight and obese population and for people who are incapable of performing exercise.