

Physical Training Augmented With Whole Body Electronic Muscle Stimulation Is Superior To Conventional Training Alone In Healthy Subjects - A Pilot Randomized Controlled Trial

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Background

- Physical activity is protective against cardiovascular disease (CVD), disability, and death, and favorably improves CVD risk profile and cardiorespiratory fitness
- However, more than 25% of American adults report no participation in leisure-time physical activity
- Further, a significant proportion of elderly individuals are unable or unwilling to perform exercise at doses recommended to favorably impact body composition and CVD risk
- Whole body electronic muscle stimulation (WB-EMS) training is a novel FDA-approved technology which offers a time-efficient, joint friendly and customizable method for physical training
- WB-EMS simultaneously stimulates all the main muscle groups using percutaneous electrical impulse transmission
- Preliminary studies have demonstrated increased muscle mass reduced fat mass and improved functional capacity in elderly sedentary individuals after training with WB-EMS
- Studies evaluating the role of WB-EMS training on CVD risk profile are lacking

Methods

- We performed a pilot randomized controlled trial in healthy adults who were randomized to physical training with versus without WB-EMS for one session of 20 minutes duration per week across 16-weeks

PHYSICAL TRAINING

- Study participants abstained from any additional strength training during the study
- Participants wore a specifically designed vest and arm and leg straps that were connected using electrical wires to the WB-EMS device (Miha Bodytec, Germany)
- Biphasic electrical stimulation was delivered through the vest and straps (4 sec on, 4 sec off) at a frequency that elicited a score of 5-6 on the Borg perceived exertion scale in study participants when each of the major muscle groups were stimulated
- Frequencies were 'titrated' during the first 4 weeks and were then fixed for the remainder of the study
- Individuals randomized to no WB-EMS wore the same equipment but received no stimulation
- Sessions were provided by trainers certified in WB-EMS training and consisted of a fixed number of exercises such as squats and lunges

STATISTICAL ANALYSES

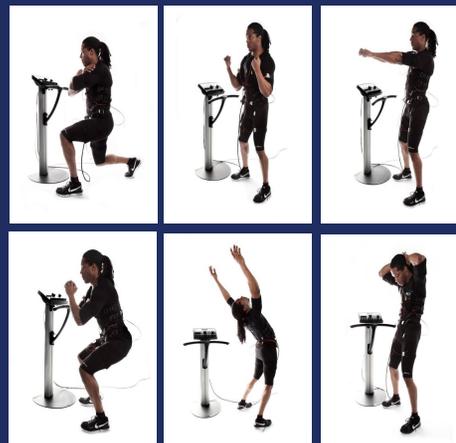
- We measured a number of cardiovascular and biomechanical parameters at baseline and post-intervention and compared differences across groups

Results

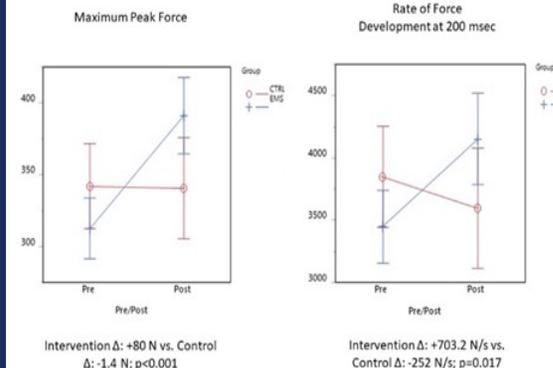
- Forty-one individuals were recruited between January 2021 and March 2022 of which 24 were randomized to physical training with WB-EMS and 17 were randomized to training without WB-EMS: mean age 35.9±11.2 years, 61.3% females, median BMI (range) 24.3 (21.8 - 28.1)
- After 16 weeks of training, we demonstrated significant differences in waist: hip ratio (Δ waist : ratio: -1.2 cm in intervention vs. 0.9 cm in controls, $p=0.05$); total cholesterol (Δ : -1.1 mg/kg in intervention vs. 14.2 mg/kg in controls, $p=0.02$), anaerobic threshold (68.2% in intervention vs. 30.8% in controls, $p=0.03$), breathing efficiency (Δ VE/VCO₂: -10.36 in intervention vs -7.38 in controls, $p=0.01$) and peripheral endothelial function, measured using reactive hyperemia peripheral arterial tonometry, with borderline significance (Δ : -0.009 in intervention vs. -0.29 in controls $p=0.06$)

Study Aims

- To evaluate the impact of physical training with WB-EMS on biomarkers of cardiovascular, metabolic, and biomechanical health



Findings from Biomechanical Testing



Conclusions

- Once weekly physical training with WB-EMS, under close supervision, yielded significantly greater improvements in important biomarkers of cardiovascular, metabolic, and biomechanical health compared to conventional training alone in healthy subjects
- Thus WB-EMS may provide a time-efficient form of physical training that could help enhance the widespread and regular uptake of physical activity, particularly in those unable or unwilling to exercise conventionally