Whole-body electro stimulation, with Miha Bodytec, as a means to impact muscle mass and abdominal body fat.

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ABSTRACT

The primary aim of this study was to determine the effect of 12 months of whole-body electromyostimulation (WB-EMS) exercise on appendicular muscle mass and abdominal fat mass in subjects specifically at risk for sarcopenia and abdominal obesity, but unable or unwilling to exercise conventionally.

INTRODUCTION

Age-related shift towards decreased muscle mass and increased (abdominal) fat mass is an important cause of frailty, loss of independence, and metabolic and cardiac disease, resulting in impaired quality of life1 and increased mortality in the aged.

Regular exercise affects a wide range of risk factors and diseases of the aged. In this context, most trials have confirmed the positive effect of intense exercise training on muscle mass, functional capacity, and (abdominal) body fat mass in the aged.

However, in our fundamentally sedentary society, enthusiasm for regular exercise to prevent future complaints and mortality is less prevalent. In Germany, only 20% of women aged 65 years and older "reported" the exercise doses recommended for positively impacting body composition or bone mass. Even ignoring the possibility that self-reported physical activity may overestimate the real scenario, these statistics demonstrate that the majority of elderly subjects seem either unable or unwilling to participate in regular exercise programs.

ABSTRACT

Figure 2 Whole-body electromyostimulation electrodes (vest and sleeves).

For these individuals, whole-body electromyo-stimulation (WB-EMS) may overcome some of the limitations of conventional types of exercise training and may be an acceptable and time-saving option for favorably impacting body composition and functional capacity.

In addition to the tried and tested local application of electromyostimulation with its directly stimulating effect on the rate of skeletal muscle protein synthesis, WB-EMS enlarges this effect by its simultaneous activation of a total area of 2.800 cm2 (16 regions, Figure 2) with different dedicated intensities/regions, and thus extends the potential of electromyostimulation.

Recent WB-EMS trials in elderly cohorts not only demonstrated favorable effects on muscle mass, fat mass, and functional capacity, but also provided a strong body of evidence that this technology is highly acceptable to the aged user.

However, for an aged nonsportive cohort at risk for sarcopenia and abdominal obesity, the corresponding evidence that WB-EMS favorably impacts muscle mass as the main predictor of sarcopenia and abdominal body fat as a key factor of metabolic and cardiac disease has yet to be provided. Further, the long-term effects of WB-EMS with respect to feasibility parameters also remain to be established.

Thus, the primary purpose of this study was to determine the effect of 12 months of WB-EMS exercise on appendicular muscle mass and abdominal fat mass in subjects specifically at risk for sarcopenia and with abdominal obesity. Furthermore, we aimed to assess the WB-EMS-derived effect on muscle and fat mass of the upper leg region, an area with high relevance for independent living but specifically impacted by sarcopenia.

Our primary hypothesis was that WB-EMS training significantly increases appendicular skeletal muscle mass and decreases abdominal fat mass compared with a control group. Our secondary hypothesis was that WB-EMS training significantly increases upper leg muscle mass while upper leg fat mass decreases significantly compared with a control group.

METHODS:

Forty-six lean, nonsportive (<60 minutes of exercise per week), elderly women (aged 75 ± 4 years) with abdominal obesity according to International Diabetes Federation criteria were randomly assigned to either a WB-EMS group (n=23) which performed 18 minutes of intermittent, bipolar WB-EMS (85 Hz) three sessions in 14 days or an "active" control group (n=23). Whole-body and regional body composition was assessed by dual energy X-ray absorptiometry to determine appendicular muscle mass, upper leg muscle mass, abdominal fat mass, and upper leg fat mass. Maximum strength of the leg extensors was determined isometrically by force plates.

ABSTRACT

RESULTS:

After 12 months, significant intergroup differences were detected for the primary end-points of appendicular muscle mass (0.5% ± 2.0% for the WB-EMS group versus -0.8% ± 2.0% for the control group, P=0.025) and abdominal fat mass (-1.2% ± 5.9% for the WB-EMS group versus 2.4% ± 5.8% for the control group, P=0.038). Further, upper leg lean muscle mass changed favorably in the WB-EMS group (0.5% ± 2.5% versus -0.9% ± 1.9%, in the control group, P=0.033), while effects for upper leg fat mass were borderline nonsignificant (-0.8% ± 3.5% for the WB-EMS group versus 1.0% ± 2.6% for the control group, P=0.050). With respect to functional parameters, the effects for leg extensor strength were again significant, with more favorable changes in the WB-EMS group (9.1% ± 11.2% versus 1.0% ± 8.1% in the control group, P=0.010).

CONCLUSION:

Our results clearly demonstrate that WB-EMS (at least combined with slight movements) applied for 18 minutes per session, on three sessions per 14 days over 12 months, has a beneficial impact on muscle mass and abdominal body fat, and is also safe and feasible, at least in this cohort of lean elderly females with limited interest in exercise. Although WB-EMS was unable to generate all the benefits of multipurpose exercise programs specifically designed for the multimorbid aged, it can be regarded as an option for subjects unwilling or unable to participate in conventional exercise programs but looking to improve their muscular fitness for independent and healthy aging.

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DISCLOSURE

The authors report no conflicts of interest in this work.