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Electromyostimulation Combined with Ramadan Intermittent Fasting: An Effective Way in the Management of Obesity

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ABSTRACT

Introduction: *Obesity and overweight are a real global public health problem. The dramatic increase of their prevalence tends to worsen with the spread of physical inactivity. In this context fasting and physical training are among the non-pharmacological and inexpensive methods that can help manage overweight and obesity. The aim of this study was to evaluate the effect of a combined whole-body electromyostimulation (WB-EMS) and intermittent fasting on anthropometric parameters and body composition in obese or overweight subjects.*

Methods: *Sixty voluntary participants (55% male, 45% female), aged 37 ± 6 years, were included in this study. A control group (WB-EMS-CG (n = 30)) having continued their spontaneous feeding during the 12 weeks of study, and an ramadan intermittent fasting (WB-EMS-IF group (n = 30)). All participants were trained via the WB-EMS. Body composition and weight were measured by Bio-impedancemetry .Data analysis was performed using BILNUT software and the SAS system.*

Results: *After 12 weeks of experimentation, significant intragroup and intergroup differences were detected. We noted that intermittent fasting accompanied by the training by WB-EMS resulted in a decrease in weight (96,07 ± 14,72 vs 90,65 ± 15,13 kg), BMI (31,88 ± 4,27 vs 30,23 ± 4.68 kg/m²), waist circumference (108,2 ± 10,98 vs. 101,6 ± 11,15 cm) and hips circumference (101,1 ± 10,17 vs 103,16 ± 9,85 cm) (p <0.001). Compared to the control group (WB-EMS-CG), the fasters had very significantly lost more body fat (-5,43 ± 2,46 vs -1,57 ± 1,76). Contrariwise, their skeletal muscle mass had significantly increased as well as the percentage of body water. Their basal metabolism rate had significantly decreased (1710,8 ± 304 vs 1687 ± 418,8 kcal; p <0,05).*

Conclusion: *This study confirmed a better, statistically proven, impact on the parameters of overweight and obesity when the WB-EMS application is associated with a suitable diet, such as intermittent fasting.*

Keywords: *Whole Body ElectroMyoStimulation, Fasting, Nutrition, Obesity, Training.*

INTRODUCTION

Obesity and overweight are a real global public health problem [1]. They are associated with an increased risk of cardio-metabolic diseases such as diabetes, high blood pressure, cardiovascular diseases and certain cancers [1,2,3]. Tunisia is not spared by this epidemic. It progresses as well in adults, adolescents, children and even the elderly [4]. The dramatic increase of obesity and overweight prevalence tends to worsen with the changes in the nutritional habits and the spread of physical inactivity. Thus, the treatment for obesity is based not only on dietary recommendations but also regular physical activity [5]. In this context, fasting and physical training are among the non-pharmacological and inexpensive approaches' that can help manage obesity and overweight as well as the associated complications. According to recent publications ramadan intermittent fasting caused a statistically significant weight loss [6]. The practice of physical activity is also crucial because of its strengths that have been widely demonstrated. However, the constraints associated with this practice are obvious. Therefore, the use of alternatives to physical activity, combined with nutritional education of patients, could and should be considered as a new way in the management of obesity. Recently, muscular electrostimulation has experienced certain popularity in high-level

sport circles. This process, known since the end of the 17th century [7], aims to artificially stimulate the skeletal muscle using a low-voltage electric current from skin electrodes. Basically, it's mainly used in the medical and rehabilitation fields to treat many muscular illnesses [8]. Its field of application diversified greatly over the past twenty years [9]. Its contribution to fight against obesity has been the subject of many scientific discussions. Indeed it has been shown that electrostimulation can serve as an additional intervention in weight loss [10]. The same, Whole Body Electromyostimulation (WB-EMS) is considered as a time-saving, joint-friendly and high customizable training approach that can be a perfect candidate for populations with low propensity for exercise [10]. Its positive effects on anthropometric parameters and body composition has been clearly demonstrated in elite athletes and in sedentary overweight subjects [11, 12].

In light of these findings, the aim of the present study was to assess how ramadan intermittent fasting combined with WB-EMS affects anthropometric parameters and body composition in obese or overweight cohorts.

METHODS

This study was conducted in a fitness center in Tunis (Tunisia) during 12 weeks and included 60 volunteers among the members of the center (women (45%) and men (55%) aged between 28 and 55 years old)(mean 37,6 ± 6,01 years), obese (BMI ≥ 30 kg/m²) or over weighted (BMI : 25 – 29,9 kg/m²) according to WHO criteria. We excluded participants with a total or partial limb amputation and those who presented a contraindication for WB-EMS training (eg, cardiac pacemaker). All participants were trained by the WB-EMS and their spontaneous food intake was analyzed by a nutritionist. We have subdivided the participants into 2 groups: A control group **(WB-EMS-CG** (n = 30)) who continued their spontaneous diet, and ramadan intermittent fasting group **(WB-EMS-IF** (n = 30)). We used WB-EMS equipment (miha bodytec®, Gersthofen, Germany). In practice, a bipolar electric current has been applied based on the literature [13]. We used a frequency of 85 Hz and a pulse width of 350 beats per second with alternation between 4 seconds of rest and 4 seconds of EMS [13]. All the subjects included benefited from an anthropometric evaluation before and after our interventions using calibrated devices. Weight and body composition were measured by bio-impedancemetry using the "TANITA DC-430 MA" impedance meter.

RESULTS

After 12 weeks of experimentation, significant intragroup and intergroup differences were detected. We noted significant weight loss in **WB-EMS-CG** (p <0,05) and significant decreased in their BMI (p <0,05). Their waist circumference as well as their hip circumference also decreased, but this decrease was significant only for the hip circumference (p <0,001). We also noted a significant decrease in body fat compared to the baseline values (p < 0,05). However, theier skeletal muscle mass had not undergone any significant change. It was the same for body water "table 1". The basal metabolism rate of these subjects has been significantly decreased (1820,6 ± 405,1 to 1750,9 ± 500,3 kcal ; p <0.05). In **WB-EMS-IF** group, intermittent fasting combined with the WB-EMS resulted in a significant decrease in weight, waist and hips circumferences (p < 0,001). In addition, their body fat had significantly decreased (p <0,05). Their skeletal muscle mass has significantly increased (p < 0,05) "table 1". Their body water percentage had also statistically increased (p < 0,001) and their basal metabolism rate has significantly decreased (1710,8 ± 304,4 vs 1687 ± 418,8 kcal ; p < 0,05).

Table1: *Anthropometric parameters and body composition before and after interventions on study groups*

	WB-EMS-IF (n=30)		WB-EMS-CG (n=30)		P- value
Age (years)	37 ± 6		36 ± 8		
Sexe (M/F)	16/14		13/17		
	Baseline	**Changes**	**Baseline**	**Changes**	
BMI (Kg/m²)	31,88	-1,65**	31,85	-0,61*	< 0,05
Weight (Kg)	96,07	-5,42**	94,17	-1,86*	< 0,05
waist circumference (cm)	108,2	-6,6**	108,45	-3,35	
Hips circumference (cm)	110,1	-7**	112,96	-2,37**	< 0,001
Total body fat (%)	34,96 ± 6,64	-4,03 ± 2,64*	34,04 ± 7,57	0,56 ± 0,77	< 0,001
Total body fat (kg)	33,17 ± 6,29	-5,43 ± 2,46*	31,73 ± 7,13	−1,57 ± 1,76*	< 0,001

Skeletal Muscle Mass (kg)	36,49 ± 5,01	0,73 ± 1,03*	38,3 ± 4,63	-0,09 ± 0,89	< 0,05
Total body water (%)	41,4 ± 7,77	2,10 ± 1,24**	44,04 ± 7,87	0,60 ± 0,45	< 0,05
Total body water (kg)	39 ± 5,19	-0,45 ± 0,51	41,47 ± 9,82	-0,24 ± 1,45	

*$P < 0,05$; **$P < 0,001$

DISCUSSION/ CONCLUSION

The key result of the present study was that both WB-EMS isolated and combined with ramadan intermittent fasting significantly affected anthropometric parameters and body composition in obese and overweight subjects. First of all, it seems interesting to study the effects of WB-EMS isolated without any nutritional intervention. This was the reason why we considered the control group. The subjects included in this group continued their spontaneous feeding. The food survey shows that their average spontaneous calorie intake was 2943,7 ± 301 kcal, of which 46,4 ± 11,7% in the form of carbohydrates, 41,2 ± 8,3% in the form of lipids and 12,3 ± 4,9% as protein. Compared to the recommendations of health authorities in terms of nutrition, this diet was high in calories and unbalanced with predominance of lipids to the detriment of carbohydrates [14]. Our findings showed that the subjects belonging to this group had significantly lost weight, decreased their BMI and their waist circumference. All of these anthrometric changes, could be induced by WB-EMS. Substantial evidence showed the benefits of exercise for at least 30 chronic diseases [15,16]. However, this type of exercise was very close to training based on WB-EMS, which would explain the improvement in the anthropometric parameters of the participants in this group. The results of bio-impedancemetry showed that when the fat mass decreases significantly, skeletal muscle mass did not undergo any significant change. These results are supported by the statistically significant decrease in basal metabolism. This positive impact of WB-EMS on total body and abdominal fat in obese or overweight subjects had also been found by Kemmler and al [17]. These authors concluded that after 12 months of training with WB-EMS, there was an improvement in sarcopenia and decrease in visceral fat in older adult women. Recently, Kirisciogluand al [18] showed that 8 weeks of training with WB-EMS resulted in a significant decrease in weight of the participants, an improvement in their body composition and a decrease in body fat and BMI. Fasting was an old practice, which was currently finding renewed interest in a wide variety of contexts: religious rituals, medical practice and even a simple choice of life. Despite the paucity of randomized, controlled studies in humans, fasting therapy was often offered in certain chronic conditions, such as diabetes, high blood pressure and cancer. It was also practiced for the purpose of losing weight in over weighted or obese subjects. This practice was not without risks and its effects were the subject of many controversy. Nonetheless, it was interesting to note that the intermittent fasting resulted in a significant drop in body fat in WB-EMS-IF group. In contrast, their skeletal muscle mass increased significantly as well as body water. A recent review identified 12 studies involving 183 participants from different sports disciplines and showed that BMI and body fat were generally lower after fasting Ramadan which represents one of the modalities of intemittent fasting , while muscular mass and total body water were unchanged [19]. Anthropometrically, several studies had looked at the effect of fasting on abdominal circumference [20-22]. Their results were divergent. This disparity in the results obtained between studies can be explained by the heterogeneity of the individuals studied (age, sex and body composition) or by the quality of food intake, the amount of calories ingested, times of food intake, and physical activity habits.

This study was, to our knowledge, the first Tunisian publication who confirmed a better, statistically proven, impact on body composition and anthropometric parameters of over weighted and obese subjects when WB-EMS application was associated with ramadan intermittent fasting. Indeed, our intervention led to a significant decrease in weight and in fat mass with a gain in skeletal muscle mass. These findings imply that with encouragement to regular exercise, as well as dietary guidance and advice, during the fasting period, the positive impacts could be enhanced. Moreover, our results suggest that the return to pre-intermittent

fasting parameters of body composition could be possibly prevented. So, this method may be a suitable startup to fight the global obesity and overweight epidemic. Therefore, it would be important to further develop strategies to sustain the beneficial effects of fasting on obesity in the long term, while emphasizing the complementary role of WB-EMS.

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REFERENCES

[1] Agborsangaya B, Ngwakongnwi E, Lahtinen M, Cooke T and Jeffrey AJ. Multimorbidity prevalence in the general population: the role of obesity in chronic disease clustering. BMC Public Health 2013;13:1161.

[2] Calle EE, Kaaks R. Overweight, obesity and cancer: epidemiological evidence and proposed mechanisms. Nat Rev Cancer 2004;4(8):579-91.

[3] Olshansky SJ, Passaro DJ, Hershow RC, Layden J, Carnes BA, Brody J et al. A potential decline in life expectancy in the United States in the 21st century. N Engl J Med 2005;352(11):1138-45.

[4] Badr W, Ghammam R, MaatougJ, Ammar A, Ben FredjS, GhannemH. Prévalence de l’obésité et du surpoids chez les adolescents et association avec les facteurs de risques comportementaux Sousse, Tunisie 2016. Ann Endocrinol 2018;79,4:504-5.

[5] Fernando HA , Zibellini J , Harris R , Seimon R, Sainsbury A. Effect of ramadan fasting on weight and body composition in healthy non-athlete adults: A Systematic Review and Meta-Analysis. Nutrients 2019;11(2) 478.

[6] Osman F, Haldar S, Christiani J C. Effects of time-restricted feeding during ramadan on dietary intake, body composition and metabolic outcomes. Nutrients 2020;12(8):2478.

[7] Ziltener JL, Chantraine A. Méthodologie de la stimulation électrique fonctionnelle. Annales de réadaptation et de médecine physique 1996;40:43-8.

[8] Bax L, Staes F, Verhagen A. Does neuromuscular electrical stimulation strengthen the quadriceps femoris? A systematic review of randomised controlled trials. Sports Med 2005; 35: 191-212.

[9] Hsu MJ, Wei SH, Chang YJ. Effect of neuromuscular electrical muscle stimulation on energy expenditure in healthy adults. Sensors (Basel) 2011;11(2):1932-42.

[10] Kemmler W, Kohl M, Freiberger E, Sieber C, Von Stengel S. Effect of whole-body electromyostimulation and / or protein supplementation on obesity and cardiometabolic risk in older men with sarcopenic obesity: the randomized controlled Franso trial. BMC Geriatr 2018;18(1):70-5.

[11] Maffiuletti NA, Cometti G, Amiridis IG, Martin A, Pousson M, Chatard JC. The effects of electromyostimulation training and basketball practice on muscle strength and jumping ability. Int J Sports Med 2000; 21:437-43.

[12] Kemmler W, Weissenfels A, Willert S, Shojaa M, Von Stengel S, Filipovic A et al. Efficacy and safety of low frequency whole-body electromyostimulation (WB-EMS) to improve health-related outcomes in non-athletic adults. A systematic review. Front Physiol 2018;9:573-9.

[13] Ziltener JL, Chantraine A. Méthodologie de la stimulation électrique fonctionnelle. Annales de réadaptation et de médecine physique 1996;40:43-8.

[14] Gibney M, Sandström B. A framework for food-based dietary guidelines in the European Union. Public health nutrition 2001;4(2a):293-305.

[15] Pedersen BK, Saltin B. Exercise as medicine - evidence for prescribing exercise as therapy in 26 different chronic diseases. Scand J Med Sci Sports 2015;25(3):1-72.

[16] Strasser B, Pesta D. Resistance training for diabetes prevention and therapy: experimental findings and molecular mechanisms. Biomed Res Int 2013:805217.

[17] Kemmler W, Stengel VS. Whole-body electromyostimulation as a means to impact muscle mass and abdominal body fat in lean, sedentary, older female adults: sub-analysis of the TesT-III trial. Clin Interv Aging 2013;8:1353-64.

[18] Kiriscioglu M, Bicer M, Pancar Z, Dogan I. Effects of electromyostimulation training on body composition. Turkish J Sport Exer 2019;21(1):34-7.

[19] Aloui A, Baklouti H, Souissi N, Chtourou H. Effects of Ramadan fasting on body composition in athletes: a systematic review. Tunisie Médicale 2019; 97(10):1087-94.

[20] Nematy M, Alinezhad-Namaghi M, Rashed MM, Mozhdehifard M, Sajjadi SS, Akhlaghi S et al. Effects of Ramadan fasting on cardiovascular risk factors: a prospective observational study. Nutr J 2012;11(1):69-71.

[21] Norouzy A, Hasanzade Daloee M, Khoshnasab AH, Khoshnasab A, Farrokhi J, Nematy M et al. Trend of blood pressure in hypertensive and normotensive volunteers during Ramadan fasting. Blood pressure monitoring 2017; 22(5):253-7.

[22] Sezen Y, Altiparmak IH, Erkus ME, Kocarslan A, Kaya Z, Gunebakmaz O, Demirbag R. Effects of Ramadan fasting on body composition and arterial stiffness. J Pak Med Assoc 2016;66(12):1522-7.

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