

Effects of twelve weeks program of aerobic training in young male

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ABSTRACT

The purpose of this study was to determine the effects of a twelve-week aerobic training program on the body composition of overweight or obese young men. The sample consisted of 21 males of 21.86 ± 1.85 years old. The training was carried out for twelve weeks, running it 3 times a week for a period of 60 to 90 minutes. Before and after the program, their weight, height, body mass index, percentage of lean mass, percentage of fat mass through bone densitometry were evaluated. It's concluded that the aerobic training of twelve weeks of duration in young men with overweight or obesity produces improvements in the studied parameters, being able to influence with this in the improvement of the health and quality of life of these population. **Keywords:** Overweight; Obesity; Aerobic training; Fat mass; Weight.

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INTRODUCTION

Obesity is currently considered a chronic disease according to the World Health Organization (WHO). It is identified by the Body Mass Index (BMI), a simple indicator that relates weight and height (weight in kilograms divided by the square of height in meters) and that's able to discriminate and establish different categories. According to the WHO, the BMI provides the most useful measure of overweight and obesity, being determined with a BMI greater than or equal to 25, greater than or equal to 30, respectively. (WHO, 2018).

An imbalance between the calories ingested and the energy expenditure can be the fundamental cause of overweight and obesity. Some factors that increase it are, on the one hand, the global modification of the diet with a tendency to increase the consumption of hypercaloric foods, rich in fats and sugars but with few vitamins, minerals and other macronutrients. And on the other hand, the tendency to decrease physical activity, due to the increasingly sedentary nature of many jobs, changes in means of transport and increasing urbanization (WHO, 2018). Focusing on the latter in our research.

Taking into account the previous information, one of the greatest challenges of this century in public health and economics will be the obesity treatment (Conroy et al., 2015, Delgado et al., 2015, Jakicic et al., 2015; Um et al. al., 2015), since this pathology has reached approximately 30% of the world population (Dobbs et al., 2014; Jakicic et al., 2015; Jassil et al., 2015), with a tendency to reach half of the population in 2030 (Jassil et al., 2015). This is due to the progressive increase of people with a sedentary lifestyle that accompanies other habits that contribute to have an increasing percentage of fatty tissue in body composition (Conroy et al., 2015, Ross, et al., 2015).

Today there is a solid scientific support for the physical activity benefits in the prevention and treatment of chronic diseases, among which we find obesity and other pathologies associated with it (Joseph et al., 2015; Delgado et al., 2015; Kim et al., 2015; Siu et al., 2015). The physical activity high levels are associated with a lower presence of obesity. Even if a significant weight loss isn't achieved through a physical activity program, it'll also bring benefits for overweight and obese people. Among the benefits are a lower risk of developing hypertension, cardiovascular diseases, diabetes, breast cancer and depression, as well as an increase in HDL cholesterol levels and improvements in immune function (Abe et al, 2015; Conroy et al., 2015; Jakicic et al., 2015; Wallman, 2009). However, the prescription of physical activity to achieve the best health benefits is still to be determined (Ross., Et al., 2015).

Most articles on the obesity treatment relate physical activity with diet (Maffioletti et al., 2005; Swendeman et al 2018; Dieli-Conwright, et al., 2018), indicating that study participants lose their weight without being able to determine if it's for food reasons or for physical training performed.

Sillanpää et al. (2008) compared the effects of a training program based on aerobic resistance, strength training, and a third one of mixed application that combined muscle strength and cardiorespiratory resistance on adult men, recording a loss of fat mass in all programs and in special in the aerobic work.

For all the above, it should be noted that currently there aren't articles on the treatment of obesity in young adult males only with an exclusively aerobic training program, so this is the objective of this study.

MATERIALS AND METHODS

Participants

The sample consisted of a total of 21 young male adults between the ages of 18 and 25 (21.86 ± 1.85 years), classified according to their BMI, calculated from the reported weight and height. In order to participate in the REPHASO (Rejecting overweight and obesity through healthy habits) research project, the participants had to have a BMI ≥ 25 kg/m², as anything above this threshold is considered overweight by the WHO (WHO, 2019).

Participants were recruited from a variety of sources, including advertisements on social networks, advertisements placed on bulletin boards located in university campus buildings and publications on the project website. Participants completed an online form and were selected based on their height and weight to determine BMI. Once selected, they met with the project coordinator who explained the nature of the study, indicating that anonymity would be preserved at all times. The ethical considerations of Sport and Exercise Science Research (Harriss, Macsween, and Atkinson, 2017) were followed, as well as the principles included in the Declaration of Helsinki (JAVA, 2013), which defines the ethical guidelines for research on human subjects and requires the consent of each of the participants prior to participation in the study. Similarly, throughout the intervention and thereafter, action was taken in accordance with the Spanish regulations contained in Organic Law 15/1999, of 13 December, on the protection of personal data.

Instruments

A Tanita model BC730 scale was used to weigh the participants, and a portable SECA model 213 stadiometer was used to measure height. A dual-energy x-ray densitometer (DXA, Hologic Explorer, United States) was used to evaluate body fat. In addition, the IPAQ-SF was administered.

Procedures

Each participant was given an initial assessment, in which they were weighed and measured to determine their BMI. Whole-body densitometry was performed to determine the amount of total body fat.

Once the initial evaluation was completed, the participants were prescribed a twelve-week aerobic training program (Table 1). The program comprised three days of training each week, with each session lasting approximately one and a half hours. The sessions were monitored by a personal trainer who supervised both the volume and intensity of the sessions. Participants who failed to complete at least 90% of the sessions were excluded from the study. The training period was divided into three stages, which increased in intensity and were regulated according to the subjective rate of perceived exertion (RPE) of the participants, based on the Börg scale (1982). After completing the twelve-week experimental phase of the training, the participants were re-evaluated with the same procedure carried out in the initial evaluation.

Data analysis

The data were compiled in an Excel spreadsheet, recording age, height, weight, BMI calculation and participant affiliations. Once the aforementioned information had been collected, the data were entered into SPSS Statistics V.22 program to be examined in the manner described in the results section.

Table 1. Design of the aerobic training program during the experimental phase.

Cycle	Week		Content	Börg
1	1	1	10' warm up + 5' continuous running + 5' walking + 10' stretching + 5' continuous running + 15' walking + 10' stretching	5-6
		2	5' warm up + 50' cycling + 10' stretching	
		3	10' warm up + 5' continuous running + 5' walking + 10' stretching + 5' continuous running + 15' walking + 10' stretching	
	2	1	5' warm up + 50' cycling + 10' stretching	
		2	10' warm up + 10' continuous running + 5' walking + 5' stretching + 10' continuous running + 15' walking + 10' stretching	
		3	5' warm up + 60' cycling + 10' stretching	
	3	1	10' warm up + 15' continuous running + 10' walking + 15' continuous running (finishing at very low intensity) + 10' stretching	6-7
		2	5' warm up + 60' cycling + 10' stretching	
		3	10' warm up + 15' continuous running + 10' walking + 15' continuous running (finishing at very low intensity) + 10' stretching	
	4	1	5' warm up + 70' cycling + 10' stretching	6-7
		2	15' warm up + 15' continuous running + 5' walking + 15' continuous running + 10' stretching	
		3	Meeting Days	
<i>Observations: All tasks are performed on terrain with no incline. "Cycling" is bicycling.</i>				
Cycle	Week		Content	Börg
2	1	1	10' warm up + 5' continuous running + 5' walking (with a gradient) + 10' stretching + 5' continuous running + 15' walking (if possible, 10' with a gradient and the last 5' gently with no gradient) + 10' stretching	6-7
		2	5' warm up + 50' cycling (if possible, intersperse with gradients, no more than 8' on a gradient) + 10' stretching	
		3	10' warm up + 5' continuous running + 5' walking (with a gradient) + 10' stretching + 5' continuous running + 15' walking (10' with a gradient and the last 5' gently with no gradient) + 10' stretching	
	2	1	5' warm up + 50' cycling (10' with a gradient) + 10' stretching	
		2	10' warm up + 10' continuous running (5' with a gradient) + 5' walking (with no gradient) + 5' stretching + 10' continuous running (5' with a gradient) + 15' walking (with no gradient) + 10' stretching	
		3	5' warm up + 60' cycling (15' with a gradient) + 10' stretching	
	3	1	10' warm up + 10' continuous running (intersperse with gradients) + 10' walking (with no gradient) + 15' continuous running (intersperse with gradients, finishing at very low intensity) + 10' stretching	6-7
		2	5' warm up + 50' cycling (20' with a gradient) + 10' stretching	
		3	Meeting days in the Pavilion at the University of Malaga	
	4	1	10' warm up + 15' continuous running (10' with a gradient) + 5' walking (on flat terrain, if possible) + 15' continuous running (the first 5' with a gradient, finishing at very low intensity) + 10' stretching	7-8
		2	5' warm up + 60' cycling (25' with a gradient) + 10' stretching	

		3	10' warm up + 20' continuous running (10' with a gradient) + 5' walking (with no gradient) + 20' continuous running (the first 5' with a gradient, finishing at very low intensity) + 10' stretching			
<i>Observations: the slope or gradient of the terrain should not exceed 5%.</i>						
Cycle	Week		Content	Börg		
3	1	1	10' warm up + 5' continuous running + 5' walking (with a gradient) + 5' continuous running + 15' walking (10' with a gradient and the last 5' gently with no gradient) + 10' stretching	7-8		
		2	5' warm up + 50' cycling (intersperse with gradients, con un total de 15' with a gradient) + 10' stretching			
		3	10' warm up + 5' continuous running + 5' walking (with a gradient) + 5' continuous running + 15' walking (10' with a gradient and the last 5' with no gradient) + 10' stretching			
	2	1	5' warm up + 50' cycling (15' with no gradient + 20' with a gradient + 15' with no gradient) + 10' stretching			
		2	10' warm up + 10' continuous running (if possible, 5' on a gradient) + 5' walking (on flat terrain, if possible) + 10' continuous running (5' with a gradient, if possible) + 15' walking (with no gradient) + 10' stretching			
		3	5' warm up + 60' cycling (15' with no gradient + 25' with a gradient + 20' with no gradient) + 10' stretching			
	3	1	10' warm up + 10' continuous running (intersperse with gradients) + 10' walking (on flat terrain, if possible) + 15' continuous running (intersperse with a gradient, finishing at very low intensity) + 10' stretching			
		2	5' warm up + 50' cycling (10' with no gradient + 30' with a gradient + 10' with no gradient) + 10' stretching			
		3	10' warm up + 10' continuous running (with a gradient) + 10' walking (with no gradient) + 15' continuous running (with a gradient, finishing at very low intensity) + 10' stretching			
	4	1	10' warm up + 15' continuous running (10' with a gradient) + 5' walking (with no gradient) + 15' continuous running (the first 10' with a gradient, finishing at very low intensity) + 10' stretching			
		2	5' warm up + 60' cycling (10' with no gradient + 30' with a gradient + 10' with no gradient) + 10' stretching			
		3	10' warm up + 20' continuous running (10' with a gradient) + 5' walking (with no gradient) + 20' continuous running (the first 15' with a gradient, finishing at very low intensity) + 10' stretching			
	<i>Comments: The gradient should be less than 10% and greater than 3%.</i>					

RESULTS

The Kolmogorov-Smirnov test was initially carried out in order to normalize the distribution of the results of the study variables of the companies used in the research.

Once the normality of the sample distribution was known, a descriptive and contrast analysis was performed, t test for related samples, in order to check whether the treatment of the experimental phase had had an effect on the variables evaluated.

Table 2. Descriptive statistics (mean \pm standard deviation) and comparison of anthropometric variables (n=21).

	Pretest	Posttest	p
Weight (kg)	91,02 \pm 17,43	89,15 \pm 17,23	,010
BMI (kg/m ²)	29,88 \pm 4,52	29,27 \pm 4,49	,010
Total body fat (kg)	27725,23 \pm 9605,70	26216,24 \pm 9942,15	,013
Total lean mass (kg)	63556,67 \pm 9025,16	63846,37 \pm 9068,55	,572
Total body fat (%)	29,75 \pm 5,64	28,35 \pm 6,57	,007

Significance value of $p > 0.05$.

All results except total lean mass experience statistically significant improvements, the former also but not with sufficient statistical power.

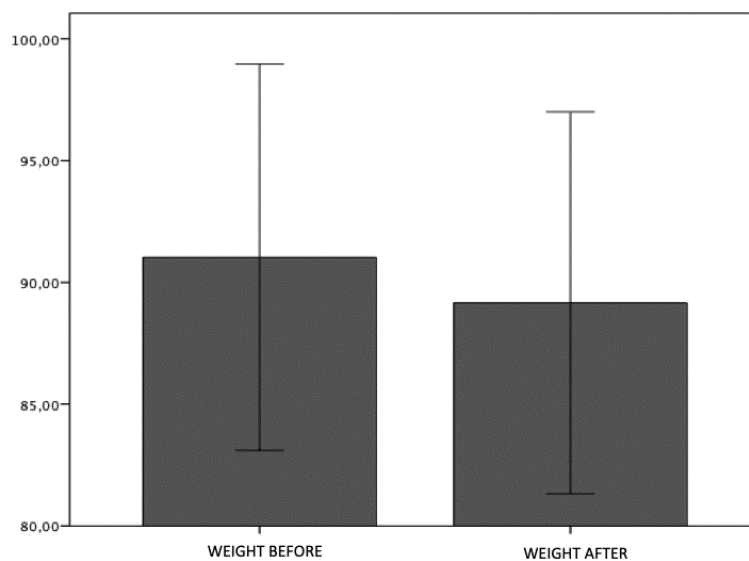


Figure 1. Weight evolution.

The left block represents the body weight study participants before the intervention and the right block represent the body weight after the intervention. In this graph we can see how the study participants have managed to reduce an average of more than two kilograms of weight in twelve weeks of training, being a significant result.

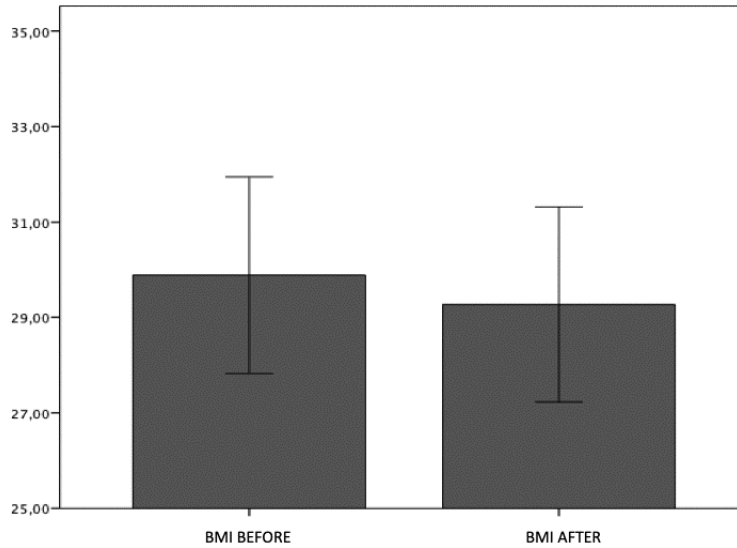


Figure 2. Body mass index evolution.

The left block represents the BMI study participants before the intervention, and the right block represent the BMI after the intervention. As we can see, it decreases an average of 0.6 after completing a twelve weeks training period.

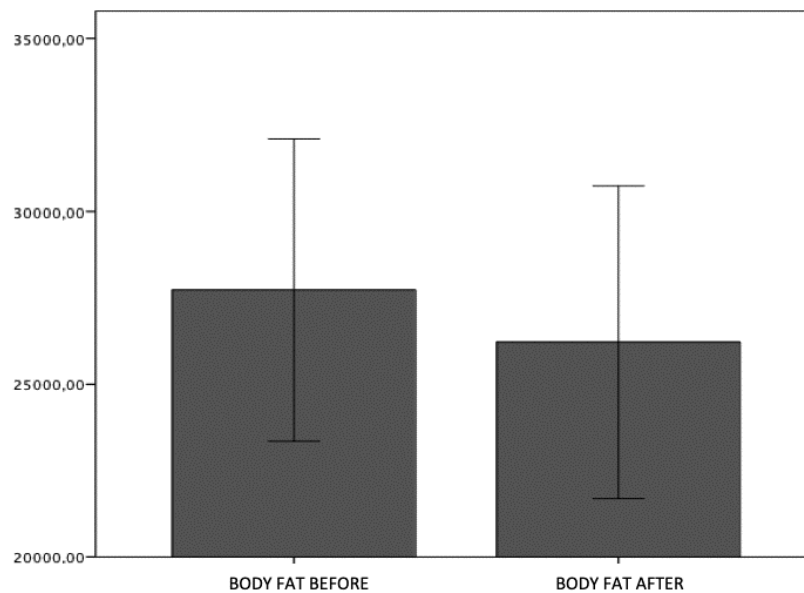


Figure 3. Total amount of body fat.

The left block represents the total amount of body fat of the study participants before the intervention, and the right block represent the total amount of body fat after the intervention. As we can see, it decreases an average of more than 1 kilogram after completing a twelve weeks training period.

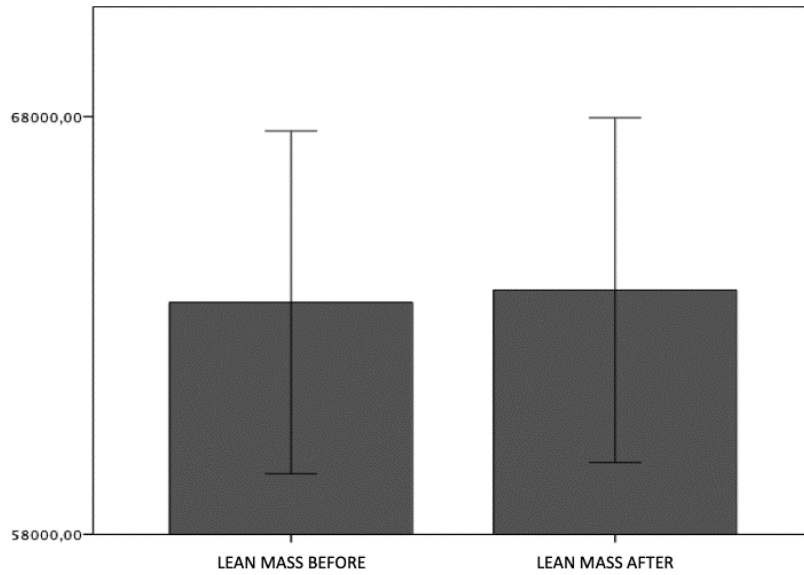


Figure 4. Total amount of lean mass.

The left block represents the total amount of lean mass of the study participants before the intervention, and the right block represent the total amount of lean mass after the intervention. This is the only result that doesn't represent a significant statistically improvement, but that can still be observed if there is a slight improvement, increasing the amount of lean mass by an average of 0.3 kilograms.

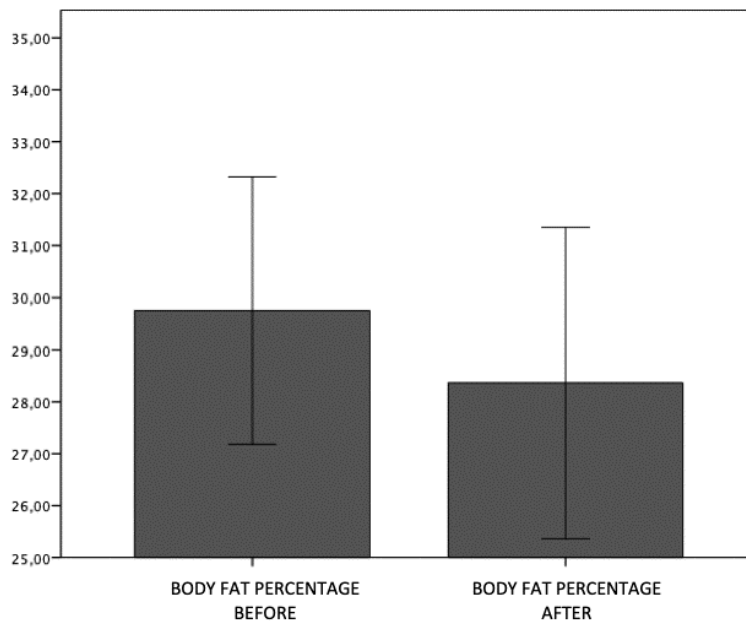


Figure 5. Body fat percentage.

The left block represents the total percentage of body fat of the study participants before the intervention, and the right block represent the total percentage of body fat after the intervention. The percentage of body fat has decreased by an average of 1.5% after a twelve weeks training period.

DISCUSSION

Many studies investigating aerobic endurance training and strength have not found significant improvements in physical performance or adaptations in body composition (Izquierdo et al., 2004; Schumann et al 2015; Sanal et al., 2013). However, the results obtained in this study show consonance with other investigations in which they apply mixed training programs (Loria, et al., 2013; Häkkinen et al., 2003; Izquierdo et al., 2004; Wallman, 2009). We must highlight the case of Sillanpää et al., 2008 and Eklund et al., 2016 who apply a mixed training with two and three weekly sessions respectively, find statistically significant improvements for muscle mass and fat mass, or the work of Rossi et al. (2016), who had two groups, one only aerobic in which they didn't obtain significant differences in the reduction percentage of fat mass and another of combined training in which they have significant differences in the reduction percentage of fat mass.

Our study, a twelve-week aerobic training program, we observe a decrease in the percentage of total body fat, as well as the decrease of body fat in different subregions of male participants with overweight and / or obesity. In addition, it should be noted that in most of the studies mixed programs are carried out and not only focused on aerobic work. This being the main characteristic of this research, in addition to the singularity of having participated young adults, which is a very little studied population.

Regarding the results on differences in muscle mass after a training program, they support the results of Abe et al. (2000) and Gálvez (2017) who also reported increases in muscle mass during a program, in their case twelve and four weeks of training respectively, although more focused on strength and not so much on aerobic endurance. In our study, the improvement is not as significant, but as we can see in Figure 4, there's an improvement.

CONCLUSION

A statistically significant improvement was observed in the different variables studied, highlighting weight loss and percentage of body fat after carrying out a twelve-week aerobic training program in young males.

It's considered necessary to open a line of research in this population stratum that has been so little studied in recent years. Especially taking into account the high sensitivity shown by the results of the population evaluated after aerobic resistance training in just twelve weeks.

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