

ARTÍCULO ORIGINAL

Effects of high intensity intermittent training in adults with obesity

Efectos del entrenamiento intermitente de alta intensidad en adultos con obesidad

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ABSTRACT

Introduction. High-intensity interval training has become an important tool for weight loss in people who are overweight and obese, since it is based on the execution of exercises in short periods, which can range from seconds or even minutes, carried out at high intensity, followed by rest periods between each exercise series that prove to be very effective in reducing fat.

Objective: To establish the effects of a high intensity intermittent training program in obese subjects.

Materials and methods. Quantitative study of quasi-experimental design of pretest and posttest, in which 10 obese users participated, which were randomly divided into a control and experimental group. A high intensity intermittent training program was applied for 3 months with a total of 48 sessions and 120 minutes application time. Once the program was completed, the subjects were evaluated again.

Results. Statistically significant differences ($p < 0,05$) were found when comparing the average range of related samples in the variables weight ($p = 0,017$) BMI ($p = 0,029$) and VO_2 ($p = 0,038$) of the experimental group. However, despite presenting positive changes in the same variables of the experimental group, these were not statistically significant.

Conclusion. The results of the study showed a positive effect of Intermittent High Intensity Training on body weight, body mass index and maximum oxygen consumption. Likewise, it is concluded that this type of training is a good intervention strategy for people with obesity.

Keywords. Exercise; Physical Activity; Overweight; Obesity; Adult (MeSH).

DOI: <http://dx.doi.org/10.28957/rcmfr.v29n2a1>



RESUMEN

Introducción. El entrenamiento intermitente de alta intensidad se ha convertido en una herramienta importante en el tratamiento de personas con sobrepeso y obesidad. Esta técnica, que se basa en la realización de ejercicios en periodos cortos (desde segundos hasta minutos) a alta intensidad seguidos de periodos de descanso entre cada serie de ejercicio, resulta ser muy eficaz en la reducción de grasa.

Objetivo. Establecer los efectos de un programa de entrenamiento intermitente de alta intensidad en sujetos con obesidad.

Materiales y métodos. Estudio cuantitativo de diseño cuasi experimental pretest y postest en el que se incluyeron 10 pacientes con obesidad. Los participantes se dividieron de forma aleatoria en un grupo control y uno experimental. A este último se le aplicó un programa de entrenamiento intermitente de alta intensidad durante 3 meses con un total de 48 sesiones y tiempo de aplicación de 120 minutos. Una vez culminado el programa, los sujetos fueron evaluados de nuevo.

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Recibido:

13.12.19

Aceptado:

01.02.20

Citación:

Montealegre-Suárez DP, Romaña-Cabrera LF. Effects of high intensity intermittent training in adults with obesity. Rev Col Med Fis Rehab. 2019;29(2):75-82.

Conflictos de interés:

None.

Resultados. Se encontraron diferencias estadísticamente significativas ($p < 0,05$) al comparar el rango medio de las muestras relacionadas en las variables peso ($p = 0,017$), índice de masa corporal ($p = 0,029$) y consumo máximo de oxígeno ($p = 0,038$) del grupo experimental. El grupo control presentó cambios positivos en las mismas variables del grupo experimental, sin embargo estas no fueron estadísticamente significativas.

Conclusión. Los resultados del estudio mostraron un efecto positivo del entrenamiento intermitente de alta intensidad sobre las variables evaluadas, por tanto se puede asegurar que esta técnica es una buena estrategia de intervención para las personas con obesidad.

Palabras clave. Ejercicio; Actividad física; Sobrepeso; Obesidad; Adulto. (DeCS).

DOI: <http://dx.doi.org/10.28957/rcmfr.v29n2a1>



INTRODUCTION

Obesity is classified as the most prevalent chronic non-communicable disease in adults¹, which generates negative repercussions for the health of individuals², and is characterized by excess body fat due to a loss of balance between calories consumed and used³.

Globally, the number of people with obesity has increased, and this phenomenon is attributed in part to the changes that have occurred in people's diet and lifestyles⁴. Likewise, obesity is considered as a risk factor for the development of chronic noncommunicable diseases⁵.

Equally important, in Colombia, more than half of the adult population is overweight or obese⁵, thus being considered a public health problem⁶. That is why, at the national level, public policies have been developed aimed at promoting the practice of physical activity and healthy eating, as an important tool for mitigating this problem⁷. Since several studies reveal the positive effects of physical activity has in obesity^{8,9}.

Additionally, authors such as Torosa-Martínez *et al.*¹⁰, indicate that it is important that people with obesity perform 60 minutes or more of aerobic physical activity per day, with a frequency of at least three days per week. However, intervention programs must create strategies that motivate people with obesity to perform physical activity and thus prevent the population from dropping out of these programs⁷.

Therefore, it is necessary to implement training programs that can be carried out by unconditioned and overweight or obese individuals, which are effective in losing fat¹¹.

One of them is high intensity intermittent training, which is characterized by the execution of exercises in short periods ranging from seconds or even minutes, performed at high intensity, followed by rest periods between each exercise series¹², which is very effective in reducing the fat of overweight or obese individuals^{13,14}.

As can be seen, this study aimed to identify the effects of a high intensity intermittent training program in obese subjects.

METHODOLOGY

Participants

The total sample was 10 people over 18 years of age, 5 of whom were part of the EG: experimental group and 5 of the CG: control group. A simple random sampling was applied to the sample selection, avoiding possible biases on the results. As inclusion criteria, it was necessary for persons of legal age who had a time equal to or less than one month after entering the Physical Attention and Preparation Center to present a Body Mass Index (BMI) equal to or greater than 30 kg/m². Those who presented some alteration of their health that limited the process of assessment and intervention were

excluded. Similarly, those people who did not complete the assessment tests and all training sessions were excluded.

The sociodemographic characteristics of the sample determine that 68% are women, all participants were over 18 years old ($32,5 \pm 7,12$), marital status stipulates that most are married (72%) and single (28%).

To measure the Maximum Oxygen Consumption VO_2 , the Course Navette test was taken, which is calculated from the speed of the race that the performer reached in the last period that he can endure¹⁵. For adults 18 years of age or older, the following formula should be used: $VO_2 \text{ max} = (6 * FA) - 27,4$ ^{15,16}.

Instrument

About the anthropometric measurement, the following variables were taken into account: body weight (kg), height (m), body mass index (BMI): $PC \text{ (kg) height (m}^2\text{)}$, height, skin folds of the triceps, subscapular, pectoral, supra iliac, abdominal, anterior and medial thigh of leg, and also bone diameters such as humeral biepicondilar, radio-ulnar and femoral biepicondilar. Finally, the perimeters of arm, abdomen, hip, upper thigh, calf. The perimeters were measured with an inextensible measuring tape millimeter. Anthropometric parameters were measured in the dominant body of the subjects. All measurements were applied to each of the subjects, following the assessment protocol defined by The International Society for the Advancement of Kinanthropometry (ISAK)¹⁷.

The Flexitest was also applied, whose objective is to assess the passive static flexibility of each athlete, therefore the most prominent sports medicine organizations in the world such as the American College of Sport Medicine (ACSM), highlight worldwide^{18,19}.

In the same way, the horizontal jump test without impulse was applied in order to evaluate the explosive force of the lower train

by means of the maximum distance reached in two attempts, taking as reference the backward heel²⁰. This test evaluates the explosive force of the lower train by the maximum distance reached in two attempts, taking as reference the back heel. You only need a measuring tape and a non-slippery surface on which to perform the test.

Procedure

The evaluations were made by the same researcher in an approximate time of 60 minutes. The authorization and informed consent of all the elderly people involved in this investigation were available. Brief instructions were offered, and participants were assured of the confidentiality of the replies issued. The participation of the people was voluntary and there was no financial compensation towards them

Once the assessment process was completed, the training plan was applied, which was carried out four times a week, for 3 months, equivalent to a total of 48 sessions. Each session had an average duration of 120 minutes. Once the program was finished, the post test was carried out.

During the program, strength and power activities of lower limbs were developed intermittently, with activities that managed to reach submaximal levels of fatigue threshold. Medicinal balls, dumbbells, as well as squats and exercises overcoming body weight were used as attachments, since intermittent training focuses on developing a maximum requirement in the work period followed by rest or pause periods to achieve the recovery of functionality muscle¹⁴.

In order to determine the intensity of the exercise, the maximum heart rate was calculated using the Astrand test ($HR \text{ max} = 220 - \text{age}$) and was controlled and monitored with the radial pulse during rest periods. Which should be maintained between 60 at 80% of the HR max to maintain the high intensity of the exercise.

Similarly, the Modified Borg Effort Perception Scale was applied consistently²¹.

The participation was completely voluntary, and respondents received no compensation for their contribution. All research procedures were carried out in accordance with the bioethical principles established in the Declaration of Helsinki and resolution 8430 of 1999, considered as a proposal of ethical principles that serve to guide doctors and other people who perform medical research on beings human and which is considered minimal risk.

Data analysis

The data was incorporated into a datasheet created in Microsoft Excel and processed in the statistical program (SPSS) version 19. Where frequencies of all variables were generated for each of the groups.

Before performing the hypothesis contrast, it was checked whether the quantitative variables have a normal distribution with the Shapiro-Wilk test and in order to determine the differences between the two groups. The Mann-Whitney U test was used. Likewise, to apply the Wilcoxon test, in order to determine the differences between the pretest and posttest of the control group and the experimental group. In all cases, a level of statistical significance was taken into account when the value $p < 0,05$.

RESULTS

The results obtained show statistically significant differences ($p < 0,05$). When comparing the average range of related samples in the variables weight ($p = 0,017$) BMI ($p = 0,029$) and VO_2 ($p = 0,038$) of the experimental group. However, in spite of presenting positive changes in the same variables of the experimental group, these were not statistically significant (Table 1).

Figure 1 shows how the variables weight and body mass index decreased significantly after the 48 intervention sessions in the experimental group, and on the other hand variables such as VO_2 oxygen consumption increased at the end of the sessions.

DISCUSSION

Regarding the weight variable, a significant decrease in the experimental group was evident, data when contrasted with authors such as Fernandez *et al.*¹⁴, show similarity, since it reveals that the application of an intermittent physical activity program High intensity in malnourished subjects by excess, significantly decreases body weight and Z score of the Body Mass Index. In addition to significantly increasing aerobic capacity, improving their health condition.

Table 1. Changes in the variables weight, BMI, VO_2 and flexibility after 48 intervention sessions.

Variable	Control group No=5				Experimental group No=5			
	Media Pretest	Media Posttest	Z	P	Media pretest	Media posttest	Z	P
Size	1,66	1,66	-	-	1,64	1,64	-	-
Weight	78,54	74,8	-1,7	0,316	79,3	69,1	0,364	0,017
BMI	32,75	31,75	-1,2	0,547	32,48	29,87	0,027	0,029
VO_2	10,8	18,6	-2,11	0,282	11,2	25,4	0,039	0,038
Flexibility	14,5	15,02	-1,2	0,412	15,1	16,0	0,210	0,215

Source: Own elaboration.

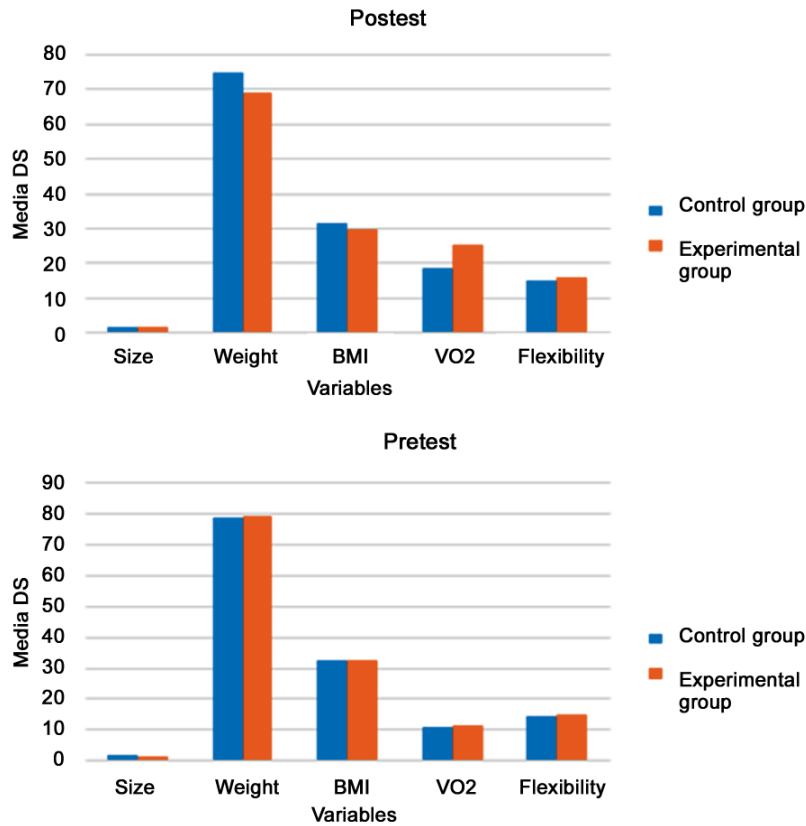


Figure 1. Changes in size, weight, BMI, VO₂ and flexibility of the control and experimental group after the intervention. Source. Own elaboration.

Likewise, a study by Boutcher *et al.*²², concluded that twelve weeks of high intensity intermittent exercise produces significant reductions in total fat, abdominal fat, trunk fat, and visceral fat, and significant increases in fat free mass and aerobic power in overweight youth.

A study by Poblete-Aro, *et al.*²³, reveals that adult patients (between 50 and 70 years old) with controlled type 2 diabetes mellitus, both moderate intensity continuous training and high intensity interval training, seem to be equally effective in normalization. Of markers of the lipid profile and in the increase of the general physical condition.

Furthermore, in the present study there was a significant improvement in aerobic capacity through oxygen consumption, data that when contrasted with authors such as Santos-Barbosa-

Machado *et al.*²⁴, reveal that the practice of regular physical exercise with intensities between 75-90% of the MHR, in sedentary individuals with excess weight promotes improvements in body composition and physical capacity over time, regardless of the type of training offered, either continuous or intermittent and both sexes. In the meantime, or intermittent exercise seems to have better clinical contributions on physical fitness.

Fernandez¹⁴, concluded that another important result obtained in his study was in relation to the variable VO₂ max, data that corroborates the idea that interval methods and, not only, continuous ones favor the improvement of the cardiovascular capacities of practitioners as noted by Helgerud *et al.*²⁵.

In the same way, similarity is evidenced with the data obtained by Galdames-Maliqueo, *et*

al.²⁶, since in their study they showed a positive effect of Interval Training of High Intensity on maximum oxygen consumption.

The results of the study showed a positive effect of Intermittent High Intensity Training on body weight, body mass index and maximum oxygen consumption. Likewise, it is concluded that this type of training is a good intervention strategy for people with obesity.

FUNDING SOURCE

Diana Paola Montealegre Suárez. Elaboración del artículo.

Luisa Fernanda Romañana. Aportes a los resultados y discusión. Traducción del artículo al idioma inglés.

ACKNOWLEDGEMENTS

Each research process involves several efforts, dedication and is always the reward of ideas and hard work. In this case, my sincere appreciation to Fundación Universitaria Maria Cano and practitioners of the VIII semester of the Physiotherapy program, who facilitated and contributed to the development of each of the objectives set. As well as to the managers and users of the Conditioning Center and Physical Preparation CAPF of the south of the Comfamiliar del Huila facilitated its execution. Thank you for your kindness, your time and ideas.

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