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Original article

EFFECT OF HIGH INTENSITY INTERVAL TRAINING (HIIT) ONWEIGHT, BODY MASS INDEX AND BODY FAT PERCENTAGE FOR ADULTS

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Abstract

*Objective***.** HIIT corresponds to the English acronym of High Intensity Interval Training, which in Spanish means Training in High Intensity Intervals, a name that already gives us an idea of the subject and focus that this activity will have.It consists of performing exercises that usually involve the work of a large number of muscle groups, so that intervals of great intensity are alternated with intervals of medium and low intensity. Following this dynamic, it is possible that a complete recovery between the high intensity intervals will not occur.The exercises to be performed are very varied, including activities such as running or cycling, and also "static" exercises such as squats, jumps, pull-ups, push-ups.The aim of this investigation was to explore the effect of high intensity interval training (HIIT) on weight, body mass index and body fat percentage for adults.

Methods. Forty (20) physical fitness practitioners did not have any training experiences that were randomly. The researchers took written approval from the participants.

*Results:*The results showed statistically significant differences between the pre-and post-test for weight, BMI and BFP.

*Conclusion***.** In conclusion, we have demonstrated that HIIT conveys benefits to weight loss may be superior to the effect of traditional continuous training. HIIT may therefore be suitable as an alternative to continuous exercise training in the promotion of health and weight loss, more research is needed to determine both behavioral responses and clinical benefits over the longer term.

Keywords: HIIT, Body Mass Index, Body Fat Percentage.

Introduction:

In the first place, and as always when we are going to carry out a physical exercise of certain intensity, we must carry out the appropriate warming to adapt the organism to the activity that it will have to carry out later. Exercises will be carried out in which the intensity will gradually increase, so that the muscles that are going to be requested during training will be worked on.

HIIT corresponds to the English acronym of High Intensity Interval Training, which in Spanish means Training in High Intensity Intervals, a name that already gives us an idea of the subject and focus that this activity will have.

It consists of performing exercises that usually involve the work of a large number of muscle groups, so that intervals of great intensity are alternated with intervals of medium and low intensity. Following this dynamic, it is possible that a complete recovery between the high intensity intervals will not occur.(D. S. Buchan, et al. 2013)

The exercises to be performed are very varied, including activities such as running or cycling, and also "static" exercises such as squats, jumps, pull-ups, push-ups...

This method is famous for the high intensity that must be printed during the exercises, the reduced execution time it requires and, despite its high risk of injury due to overexertion, it is considered one of the best methods of metabolic training. It is a cardiovascular exercise that is tremendously hard and for which one must be physically prepared and psychologically motivated to carry it out, so it is more focused on people who start from a good physical basis and experienced in carrying out the exercises.

The idea with the HIIT is to bring the body up to its performance limit in the short load phase. The HIIT sets specific intervals for this purpose (for example, a 60-second loading period) in which the highest possible intensity is exercised at maximum heart rate. Subsequently, in a recovery phase (for example 120 seconds), a low load is continued.(A. García-Hermoso et al. 2016).

Due to the permanent interplay of peak loads and short recovery cycles, the endurance training with this training method is made significantly more effective and shorter. It can be completed in 15 - 20 minutes. The number of intervals can vary from 4 (training beginners), up to 12 high-intensity phases for professionals.

Fitness training based on high-intensity interval training is ideal for recreational and recreational athletes. The intensity of the intervals can be adjusted according to the training performance.(L. Mattar et al. 2017).

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The interesting thing about this training is its functionality, which can be applied to any discipline or cardiovascular activity; since the execution offers many possibilities, as we have already pointed out. Bike, elliptical, skipping, sprints, up and down to the bank, handling of the medicine ball, squats, jump rope, crunches, push-ups, pull-ups, swimming pools ... It is even possible to perform this method using the treadmill, the static bicycle or the elliptical, so the inclement weather will never be an excuse to postpone it.(I. Janssen et al. 2002)

Interval training has been an integral part of athletes training programs for many years because a variety of sport and recreational activities require short bursts of movement at high intensities. HIIT become an increasingly recognized and well-liked method of training. The incorporation of interval training into a general conditioning program will optimize the development of cardiorespiratory fitness as well as numerous other health benefits. High intensity interval training sessions are commonly called HIIT workouts. This type of training involves repeated bouts of high intensity effort followed by varied recovery times. Has been shown to improve energy fitness, blood pressure, cardiovascular health, insulin sensitivity, cholesterol profiles and abdominal fat and body weight while maintaining muscle mass. HIIT program should consider the duration, intensity, and frequency of the work intervals and the length of the recovery intervals. Intensity during the HIIT should more than 80% of Maximal heart rate.

If the body repeatedly raises the metabolism and oxygen demand during a load, the body has to re-energize after training in order to return to its normal state. The body consumes energy, calories and burns body fat for many hours after training. This "reworking" is known as the afterburning effect.

Also, for endurance athletes who want to improve their basic stamina and have no time to do multiple week-long training sessions, HIIT is perfect.(S.A. ostigan, et al. 2015).

But beware: Since not only the cardiovascular system, but also the passive musculoskeletal system (bones, joints, tendons, ligaments) must get used to the increased load of intensive endurance training, HIIT cannot be a complete replacement for long units in the basic endurance range.

High Intensity Interval Training is the ideal workout for losing weight.(I. Janssen et al. 2002)

There are many studies that emphasize the benefits of high intensity interval training on Body mass index BMI and body fat percentage BFP. Body mass index (BMI) is a mathematical formula for determining the normal weight of a person. Is a person's weight in kilograms (kg) divided by his or her height in meters squared?BMI Is the best-known standard in anthropometric measurements used to classify underweight, overweight and obesity in adults. The normal range for percent body fat (BFP) for males is 10-20% and 18-28% for females. People with a PBF greater than the range are regarded as obese or overweight. People with a PBF that is below the range have low levels of body fat. Individuals with low levels of body fat can be separated into two categories. The first has muscle mass that is deemed appropriate for the individual's body composition. The second has an inadequate amount of muscle mass in relation to their body composition, are considered unhealthy and have a higher possibility of contracting clinical diseases.

Fat loss can only be achieved if you produce an energy deficit. This is possible if you consume less energy through the diet than you consume, or even through constant caloric intake while increasing the energy requirement through more intensive training.(E. García-Artero, et al. 2007)

consists of a combination of intensive load periods and active regeneration phases. The most important component of training here is the total fatigue in the intensive intervals. You should always train to your limit, so the break is really necessary. The duration of your break is based on a simple principle - "the principle of rewarding pause," which means you only recover until you feel confident in doing the exercise again with 110%. The aim of this investigation was to explore the effect of high intensity interval training (HIIT) on weight, body mass index and body fat percentagefor adults.

Methods

Participants

Forty (20) physical fitness practitioners did not have any training experiences that were randomly.The researchers took written approval from the participants.

Excremental Design

The researchers used the experimental methods to design one experimental group, 20 practitioners for the group. The researchers applied the three-month high intensity interval training program.

BMI – BFP Measurements

Pre and Post BMI and BFP measurements for the experimental and control groups were applied using InBody770 Body Composition.

HIIT Program

A HIIT can be easily performed on one of the existing endurance equipment in the gym or alternatively in the open air. Important here are the load cycles. HIIT training does not take longer than 30 minutes including warm up and cooldown. The

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procedure varies, depending on the training goal. You go for a certain period of time to the load limit, about 15-45 seconds. Then three times the duration of the stress phase.

The training starts with a short warm-up phase to warm the muscles and prepare the body for the following exercise.

Warm-up: 5 - 10 minutes

Loading phase: For 30 - 60 seconds - load at the load limit

Recovery phase: This is followed by an active break for about two to three times the duration of the previous exercise with moderate exercise intensity. Then the next load phase starts. The length of recovery is based on the principle of "rewarding break". The break is over when the body is ready for the previous exercise.

Total Duration: The aim of the HIIT is to create as many intervals as possible in a total of 15 - 40 minutes.

Search experiment applied for two months. Because the participants did not have any training experience, they were trained to preparation period of cardio respiratory fitness and muscular endurance for one month with moderate intensity. The HIIT program was applied after the first month and table 2 shows the program characteristic.

Statistical analysis

All statistical analyses were calculated by the SPSS statistical package. The results are reported as means and standard deviations (SD). Differences between pre and posttests were reported as mean difference ±95% confidence intervals (meandiff ± 95% CI). Student's t-test for paired samples was used to determine the differences in parameters. The $p<0.05$ was considered as statistically significant.

Results

Table 1. Description of the research Participants

	N	Mean	Std. Deviation
Age	20	± 27.90	4.376
Length		± 174.00	7.152

Table 2. HIIT program characteristic

Months	Frequency days per week	Intensity HR %	Session Time	Work Ratio to Rest	Equipment
Preparation month					Treadmill Spinning Free-weights Weight-machines Kettlebell Medicine ball
First	3	50 : 70	45 min	1 : 1	
HIIT Program					
Second	3	80 : 90	30 min	1 : 1	
Third	3	90 : 100	30 min	1 : 1	

The results showed statistically significant differences between the pre-and post-test for weight,BMI and BFP.

Table 3. Paired Samples Statistics

Variables			Mean	Std. Deviation	T	Sig. (2 tailed)
Pair 1	Weight	Pre	94.60	9.489	15.893	.000
		Post	82.35	9.466		
Pair 2	BMI	Pre	31.35	2.796	9.040	.000
		Post	26.70	2.105		
Pair 3	BFP	Pre	32.55	4.718	15.340	.000
		Post	25.40	4.430		

P< 0.05

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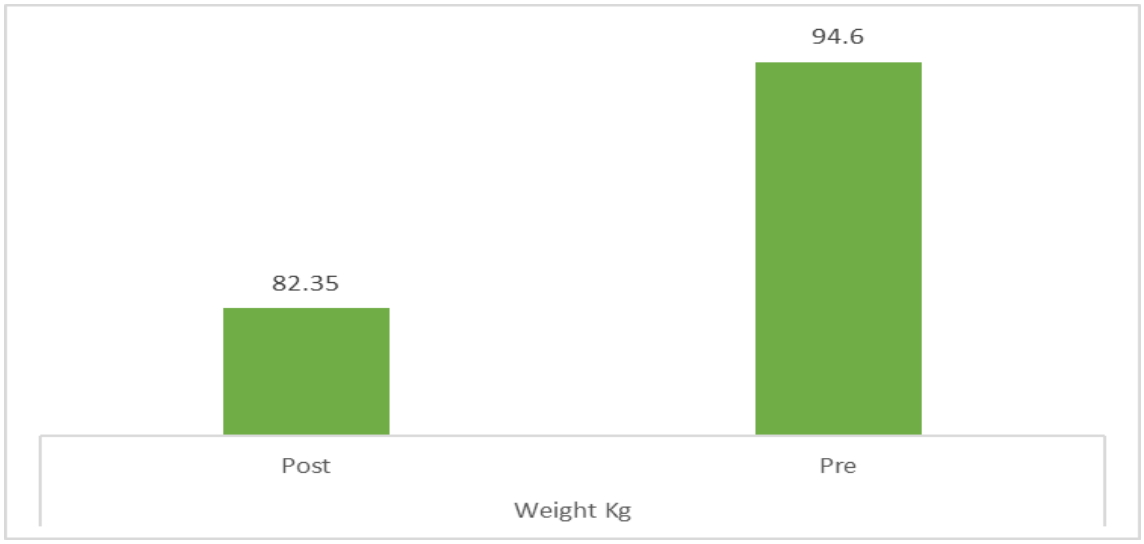

Figure 1. The differences between pre and post-test in mean weight n = 20

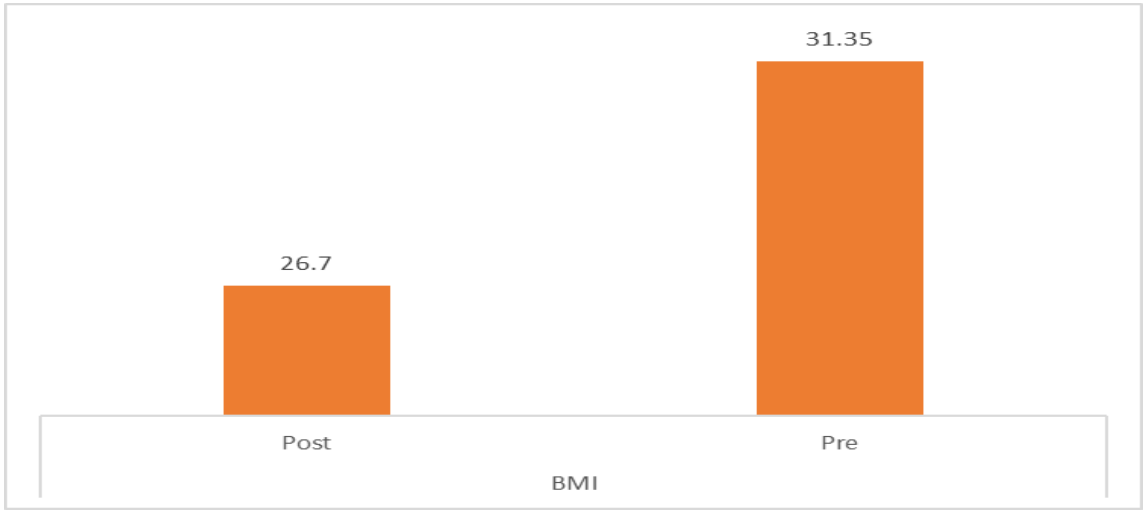

Figure 2. The differences between pre and post-test in mean Body Mass Index n = 20

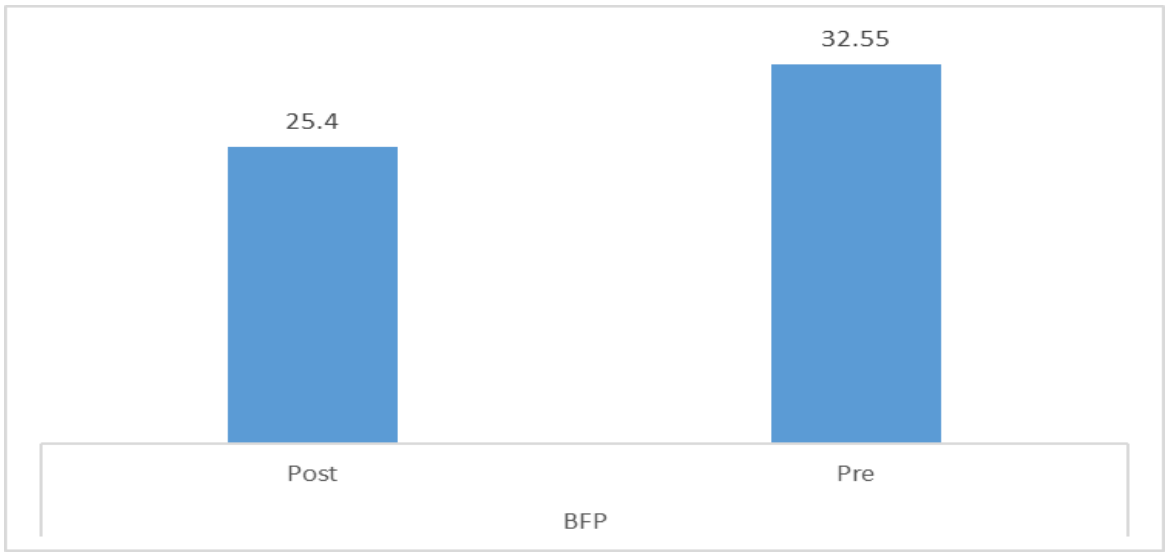

Figure 3. The differences between pre and post-test in Body Fat Percentage Index n = 20

Discussion

The results of the experiment applied to the random sample indicate the importance of high intensity training on the body mass index and the fat percentage for the fitness customers who are overweight. Those results are consistent with (Abbie AE. Smith-Ryan, 2017; D. Søgaardet al. 2018; C. Lukas et al. 2018; I. Janssen et al. 2002; E. García-Artero, et al. 2007; KADias, et al. 2017) (Lukas Cipryan, et al.) (Ian Janssen, et al.) (A. García-Hermoso, et al.) (K. A. Dias et al).

In 2011, the American College of Sports, an organization that also ensured that two weeks of HIIT equals between six and eight of resistance training.

Recent studies show that HIIT is far superior to classic muscle training with larger training scopes and multiple sets of exercises for body fat reduction.

The short interplay of 30-60 seconds of full throttle and at least 90 seconds of active recovery shortens the total duration of the training time to 15 to 20 minutes. The HIIT is therefore particularly suitable for those who have little time for long training sessions in the gym or jogging in the park. Including the warm-up phase and cool down, it is sufficient to carry out the high-intensity interval training two to three times a week.(I. Janssen et al. 2002)

Through the interplay of intense stressful and active recovery phases, the body is pushed to its limits. For this he needs above average oxygen and the metabolism is boosted. Due to the high intensity phases, the maximum oxygen uptake capacity increases. This leads to improved processing of oxygen under load. Compared to 30- to 60-minute steady-state training with consistent intensity, high-intensity interval training improves endurance three to four times faster.(C. Lukas et al. 2018)

Scientific studies show that HIIT maximizes fat burning despite the 15-30-minute time it takes. The release of hormones such as epinephrine and norepinephrine, which is increased by exercise, also promotes fat burning. In particular, subcutaneous adipose tissue (abdominal fat) is significantly degraded. The reason for this is the particularly high number of receptors for adrenaline in the abdominal fat tissue. (D. Søgaard D, et al. 2018).

If the metabolism is in full swing, it increases the hormone level. Specifically, the production of growth hormones such as epinephrine, norepinephrine and dopamine promote muscle growth and muscle maintenance while fat is constantly being broken down. Due to the short-term and extreme stress the muscle fibers are claimed, which are increasingly responsible for the development of muscle.

HIIT training is a mixture of extreme stress phases and relaxation phases. In the stress phases, it is about maximizing your pulse and getting everything out of yourself that you can. The stress phases are usually about 15 - 40 seconds long (depending on the level of training) and the relief phases about 60 to 90 seconds, (about three times as long as the stress phase) when you perform HIIT training on endurance equipment.(AE. Smith-Ryan, 2017).

When it comes to fat loss, HIIT is a highly effective, time-efficient way to push the afterburning effect, ensuring long-lasting fat loss after your workout. Compared to other training methods, you burn not only the most calories but also the most fat in HII training. Why? After other training sessions, your metabolism goes down quickly - not with the HIIT. International studies show that in HII training your metabolism is in full swing and you not only burn calories during your workouts but also up to 48 hours later.(A. Camacho-Cardenosa, et al. 2016).

Conclusion

In conclusion, we have demonstrated that HIIT conveys benefits to weight loss may be superior to the effect of traditional continuous training. HIIT may therefore be suitable as an alternative to continuous exercise training in the promotion of health and weight loss, more research is needed to determine both behavioral responses and clinical benefits over the longer term.

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References

Buchan, D. S., Ollis, S., Young, J. D., Cooper, S.-M., Shield, J. P. H., & Baker, J. S., 2013, High intensity interval running enhances measures of physical fitness but not metabolic measures of cardiovascular disease risk in healthy adolescents. BMC Public Health, 13 (1), 498.

Camacho-Cardenosa, A., Brazo-Sayavera, J., Camacho-Cardenosa, M., Marcos-Serrano, M., Timón,R., &Olcina, G., 2016, Effects of High Intensity Interval Training on Fat Mass Parameters in Adolescents. Revista Espanola de Salud Publica, 90, e1–e9.

Dias KA, Ingul CB, Tjønna AE, Keating SE, Gomersall SR, Follestad T, Hosseini MS, Hollekim-Strand SM, Ro TB, Haram M, Huuse EM, Davies PSW, Cain PA, Leong GM, Coombes JS, 2017, Effect of High-Intensity Interval Training on Fitness, Fat Mass and Cardiometabolic

Biomarkers in Children with Obesity: A Randomised Controlled Trial. Sports Med

García-Artero, E., Ortega, F. B., Ruiz, J. R., Mesa, J. L., Delgado, M., González-Gross, M., … Castillo, M.J., 2007, [Lipid and metabolic profiles in adolescents are affected more by physical fitness than physical activity (AVENA study)]. Revista Espanola de Cardiologia, 60 (6), 581–8.

García-Hermoso A, Cerrillo-Urbina AJ, Herrera-Valenzuela T, Cristi-Montero C, Saavedra JM, Martínez-Vizcaíno V, 2016, Is high-intensity interval training more effective on improving cardiometabolic risk and aerobic capacity than other forms of exercise in overweight and obese youth? A meta-analysis. Obesity reviews 17, 531–540.

Janssen I, Katzmarzyk PT, Ross R., 2002, Body Mass Index, Waist Circumference and Health Risk: evidence in support of current National Institutes of Health guidelines, Arch Intern Med.:162:2074-2079

Lukas Cipryan, Daniel J. Plews,Alessandro Ferretti, Phil B. Maffetone and Paul B. Laursen, 2018, Effects of a 4-Week Very Low-Carbohydrate Diet on High-Intensity Interval Training Responses. Journal of Sports Science and Medicine 17, 259-268.

Mattar L, Farran N, Bakhour D,, 2017, Effect of 7-minute workout on weight and body composition. Journal of Sports Med Phys Fitness. Oct;57(10):1299-1304.

Ostigan, S. A., Eather, N., Plotnikoff, R. C., Taaffe, D. R., &Lubans, D. R., 2015, High-intensity interval training for improving health-related fitness in adolescents: a systematic review and meta-analysis. British Journal of Sports Medicine, 49 (19), 1253–1261.

Smith-Ryan AE, 2017, Enjoyment of high-intensity interval training in an overweight/obese cohort: a short report. Clin PhysiolFunct Imaging. Jan;37(1):89-93

Søgaard D, Lund MT, Scheuer CM, Dehlbaek MS, Dideriksen SG, Abildskov CV, Christensen KK, Dohlmann TL, Larsen S, Vigelsø AH, Dela F, Helge JW., 2018, High-intensity interval training improves insulin sensitivity in older individual. Acta Physiol.;222: e13009.