

EFFECTS OF HIGH-INTENSITY INTERVAL TRAINING ON PHYSICAL FITNESS AND BODY COMPOSITION OF OBESE COLLEGE STUDENTS



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EFEITOS DO TREINAMENTO INTERVALADO DE ALTA INTENSIDADE SOBRE A APTIDÃO FÍSICA E COMPOSIÇÃO CORPORAL DE ESTUDANTES UNIVERSITÁRIOS OBESOS

EFFECTOS DEL ENTRENAMIENTO POR INTERVALOS DE ALTA INTENSIDAD SOBRE LA APTITUD FÍSICA Y LA COMPOSICIÓN CORPORAL DE ESTUDIANTES UNIVERSITARIOS OBESOS

Xu Yuan¹
(Physical Education Professional)
Jingwen Hu²
(Physical Education Professional)

1. Guangdong University of Finance & Economics, Physical Education Department, Guangzhou, Guangdong, China.
2. College of Sports Management, Guangdong Vocational Institute of Sport, Guangzhou, Guangdong, China.

Correspondence:

Jingwen Hu
Guangzhou, Guangdong, China.
510663.
20021258@gdufe.edu.cn

ABSTRACT

Introduction: Maintaining body composition and physical fitness is important for the well-being of college students. Recent data indicate an increase in obesity among young college students and new techniques have been studied to control this situation. Among the current resources is high-intensity interval training. **Objective:** Explore the effects of high-intensity interval training on physical fitness and body control in obese male college students. **Methods:** The experimental control involved 100 obese male college students, divided into experimental and control groups. The experimental group participated in a high-intensity interval training protocol while the control group performed general aerobic training. Data before and after the experiment, which lasted 12 weeks, were collected and statistically analyzed. **Results:** The conditions of male college students in the experimental group were statistically improved, and the fitness index changed expressively. The sitting forward bending increased from 5.91 ± 5.16 to 9.47 ± 5.27 , the standing balance index with eyes closed increased from 5.87 ± 5.58 to 10.47 ± 6.08 , the long jump index went from 1.96 ± 0.15 to 2.14 ± 0.21 , in the supine sitting position it went from 19.97 ± 8.46 to 31.24 ± 9.42 , and the running time in 50 meters was reduced from 9.61 ± 1.53 to 8.53 ± 1.25 s. **Conclusion:** High-intensity interval training positively impacted both physical fitness and body composition in obese college students. **Level of evidence II; Therapeutic studies - investigation of treatment outcomes.**

Keywords: High-Intensity Interval Training; Physical Fitness; Obesity; Students.

RESUMO

Introdução: A manutenção da composição corporal e aptidão física são importantes para o bem estar dos estudantes universitários. Dados recentes apontam um aumento da obesidade entre os jovens universitários e novas técnicas são estudadas para o controle dessa situação, entre os recursos atuais destaca-se o treinamento intervalado de alta intensidade. **Objetivo:** Explorar os efeitos do treinamento intervalado de alta intensidade sobre a aptidão física e o controle corporal de estudantes universitários masculino obesos. **Métodos:** O controle experimental envolveu 100 estudantes universitários masculinos obesos, divididos em grupo experimental e controle. O grupo experimental participou de um protocolo de treinamento intervalado de alta intensidade enquanto o grupo de controle efetuou o treino aeróbico geral. Dados prévios e posteriores ao experimento, que durou 12 semanas, foram coletados e analisados estatisticamente. **Resultados:** As condições dos estudantes universitários masculinos no grupo experimental foram estatisticamente aprimoradas, o índice de aptidão física alterou-se expressivamente. A flexão sentada para frente elevou-se de $5,91 \pm 5,16$ para $9,47 \pm 5,27$, o índice equilíbrio de pé com os olhos fechados subiu de $5,87 \pm 5,58$ para $10,47 \pm 6,08$, o índice do salto à distância foi de $1,96 \pm 0,15$ para $2,14 \pm 0,21$, na posição sentada supina foi de $19,97 \pm 8,46$ para $31,24 \pm 9,42$, e o tempo de corrida em 50 metros foi reduzido de $9,61 \pm 1,53$ para $8,53 \pm 1,25$ s. **Conclusão:** O treinamento intervalado de alta intensidade demonstrou um impacto positivo tanto na aptidão física quanto na composição corporal dos estudantes universitários obesos. **Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.**

Descritores: Treinamento Intervalado de Alta Intensidade; Aptidão Física; Obesidade; Estudantes.

RESUMEN

Introducción: El mantenimiento de la composición corporal y la aptitud física son importantes para el bienestar de los estudiantes universitarios. Datos recientes indican un aumento de la obesidad entre los universitarios y se están estudiando nuevas técnicas para controlar esta situación, entre los recursos actuales se destaca el entrenamiento por intervalos de alta intensidad. **Objetivo:** Explorar los efectos del entrenamiento interválico de alta intensidad sobre la condición física y el control corporal de estudiantes universitarios obesos de sexo masculino. **Métodos:** En el control experimental participaron 100 estudiantes universitarios varones obesos, divididos en grupo experimental y grupo control. El grupo experimental participó en un protocolo de entrenamiento por intervalos de alta intensidad,



mientras que el grupo de control realizó un entrenamiento aeróbico general. Se recogieron datos antes y después del experimento, que duró 12 semanas, y se analizaron estadísticamente. Resultados: Las condiciones de los estudiantes universitarios varones del grupo experimental mejoraron estadísticamente, el índice de aptitud física cambió de forma expresiva. La flexión hacia delante sentado aumentó de $5,91 \pm 5,16$ a $9,47 \pm 5,27$, el índice de equilibrio de pie con los ojos cerrados aumentó de $5,87 \pm 5,58$ a $10,47 \pm 6,08$, el índice de salto de longitud pasó de $1,96 \pm 0,15$ a $2,14 \pm 0,21$, en posición sentada supina pasó de $19,97 \pm 8,46$ a $31,24 \pm 9,42$, y el tiempo de carrera en 50 metros se redujo de $9,61 \pm 1,53$ a $8,53 \pm 1,25$ s. Conclusión: El entrenamiento en intervalos de alta intensidad demostró un impacto positivo tanto en la forma física como en la composición corporal en estudiantes universitarios obesos. **Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.**

Descriptores: Entrenamiento de Intervalos de Alta Intensidad; Aptitud Física; Obesidad; Estudiantes.

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INTRODUCTION

In today's society, there is an efficient and time-saving way of sports training, namely, interval training.¹ In recent years, interval training has been proved to be applicable to many types of people through a lot of practice, such as people who are body-building, obese patients, patients with diabetes, people who are recovering from stroke, and most elderly people. Both can carry out indirect training for physical exercise, and have received a good response in practice, which can promote people's physical and mental health as well as physical health, and can obtain people's positive response.² This depends on the unique exercise mode of interval training. Interval training covers several training modes, including several groups of high-intensity training in a short time, You can insert some low-intensity recovery training or short rest, which can accelerate the metabolism of the body.³ After high-intensity exercise, the body has excessive oxygen consumption, which can improve the speed of oxygen consumption of the body, thus promoting the consumption of body fat, and improving the body's physique in a relatively short time. In addition, the forms of interval training are also diverse.⁴ People do not have to be rigidly bound to the sports field, so they are suitable for a wide range of people. After people become obese, they will bring many diseases, especially cardiovascular diseases. Some studies show that obesity is an important factor causing cardiovascular diseases.⁵ Among contemporary college students, there are especially many people who lack physical exercise. Lack of physical activity will lead to a gradual increase in the proportion of obesity.⁶ Generally, after readjusting the amount of exercise, the association between sitting for a long time and obesity will be reduced, but some studies have obtained different results. Therefore, in order to further explore the relationship between interval training and obese and sedentary male college students, this paper will add some targeted interventions to improve the physical fitness and posture of male college students.⁷

METHOD

Research object

Before the start of the experiment, 100 male college students who are relatively obese in school were selected as the experimental subjects. During the selection process, the body weight of male college students was accurately measured to ensure that the selected experimental subjects meet the Hefei obesity standard. The study and all the participants were reviewed and approved by Ethics Committee of Guangdong University of Finance & Economics (NO.GUFED078). The age of the subjects in this experiment is mainly 22 years old, with a weight of about 90kg. All functional indicators of the body meet the experimental standards, and can withstand the exercise load during the experiment. During the experimental period, 100 male college students kept the same work and rest time as usual at school, and there was no significant change in the diet rules. There was no difference in eating in peacetime. They all ate in the canteen.

Experimental method

During the 12-week experiment, the 100 male college students were divided into two groups, the experimental group and the control group. The members of the experimental group were given intermittent training, and the members of the control group were given ordinary aerobic training. Before the experiment, the basic physical conditions of male college students were measured and recorded by professional equipment to facilitate the subsequent data comparison. The measurement indicators of physical quality include body weight, BMI value, body fat, muscle mass, subcutaneous fat, visceral fat, body fat and body weight after fat removal. During the experiment, the physical fitness and body shape indexes of 100 male college students were monitored, and the data before and after the experiment were recorded and compared.

Test location

This 12-week experiment was always carried out in a professional training classroom. Before the experiment began, all the facilities in the training classroom were strictly checked, and the facilities needed for interval training were supplemented as necessary to facilitate qualified interval training and aerobic training for all the experimental subjects. After testing, all the facilities in the training room meet the safety training standards, and will not cause any unnecessary sports injury to the male college students participating in the experiment during the training process.

RESULTS

Effect of interval training on basic condition of obese and sedentary male college students

The physical basis of male college students in the experimental group was carefully measured before and after the experiment, and further detailed records were made, as shown in Table 1.

Table 1. Changes in basic conditions of male college students in the experimental group.

Experience group	Before experiment	After experiment	Rate of change	P
Body weight (kg)	91.945±7.192	88.044±7.333	-4.431%	<0.05
BMI (kg/m ²)	29.424±2.395	29.232±2.676	-0.657%	<0.05
Body fat%	27.112±2.711	24.491±2.068	-10.701%	<0.01
Muscle mass (kg)	61.280±3.730	61.141±4.711	-0.227%	<0.05
Subcutaneous fat volume (kg)	21.546±5.155	19.370±4.994	-11.239%	<0.01
Visceral fat (kg)	3.872±1.691	3.249±1.346	-19.146%	<0.01
Body fat (kg)	25.685±2.930	22.342±3.667	-14.961%	<0.01
Degreasing body weight (kg)	65.467±3.596	65.820±4.307	0.536%	<0.05

According to the difference standard of P value, the basic physical condition indexes of male college students in the experimental group were all less than 0.05, and the P value of body fat rate, subcutaneous fat, visceral fat and body fat were all less than 0.01. It can be seen that the physical condition of male college students has improved significantly after interval training. In addition, the absolute value of the change rate of visceral fat volume in the experimental group was the largest, 19.146%, followed by the absolute value of the change rate of body fat volume, 14.961%, while the absolute value of the change rate of muscle volume in male college students was the smallest, 0.227%, followed by the absolute value of the change rate of decreased weight, 0.536%. From this, we can see that interval training can effectively reduce the visceral fat and body fat of male college students, but it has little effect on the muscle mass and fat-free weight of male college students.

Table 2 shows the data changes of the basic physical condition indicators of male college students in the control group before and after the 12-week experiment.

According to the difference standard of P value, the P value of the basic physical condition of male college students in the control group is mostly less than 0.01, but there are also two indicators with P value greater than 0.05, which proves that there is no significant difference between the indicators of muscle mass and fat-free weight. The absolute value of the change rate of visceral fat of male college students in the control group is the largest, and the absolute value of the change rate of BMI value is the smallest. Therefore, it can be seen that the effect of ordinary aerobic training on visceral fat is the most significant, and the effect on BMI value is not obvious.

According to the comparison of the P value and the change rate of the experimental data between the experimental group and the control group, it can be seen that interval training can improve the basic physical condition of male college students more than ordinary aerobic training.

Effect of interval training on physical fitness of obese and sedentary male college students

As shown in Table 3, the physical fitness changes of male college students before and after the experiment.

From the data in the table, it can be seen that the indicators of the experimental group members changed significantly, P value was less than 0.05, and the distance of standing long jump, the number of sit-ups per minute, the time of 50 meters run and 50 meters x 8 round trips is less than 0.01. Among them, the change rate of standing time length with closed eyes and one leg is the largest, 43.944%, and the change rate of standing long jump distance is the smallest, 8.359%. Therefore, interval training has a greater impact on the standing time of male college students with eyes closed and one foot, while it has a smaller impact on the standing long jump.

As shown in Table 4, the physical fitness data of the control group members before and after the experiment.

Table 2. Changes in basic conditions of male college students in the control group.

Control group	Before experiment	After experiment	Rate of change	P
Body weight (kg)	92.953±7.597	89.033±7.009	-4.403%	<0.01
BMI (kg/m ²)	30.800±2.711	30.529±2.417	-0.888%	<0.01
Body fat%	30.575±2.093	29.684±2.578	-3.003%	<0.01
Muscle mass (kg)	59.011±3.233	57.712±3.440	-2.251%	>0.05
Subcutaneous fat volume (kg)	23.874±3.374	22.981±3.279	-3.886%	<0.01
Visceral fat (kg)	4.687±0.965	4.166±0.910	-12.485%	<0.01
Body fat (kg)	28.853±4.117	26.819±4.041	-7.584%	<0.01
Degreasing body weight (kg)	63.334±3.687	62.357±3.720	-1.567%	>0.05

According to the specific changes of the P value difference standard and the change rate, it can be seen that ordinary aerobic training has no significant impact on the physical fitness of the experimental subjects, especially in the number of sit-ups and the duration of the 50-meter run. In addition, comparing the data of the experimental group and the control group, it can also be concluded that interval training has a greater impact on the physical fitness indicators of male college students.

Effect of interval training on body shape of obese and sedentary male college students

As shown in Table 5, the P values of the chest circumference, right arm circumference and right thigh circumference of male college students in the experimental group are all less than 0.01, indicating that interval training has a greater impact on these three aspects than the other five indicators.

Table 6 shows the change of body shape indicators of male college students in the control group. The change rates of chest circumference, waist circumference, hip circumference, left arm circumference, right

Table 3. Changes in physical fitness of male college students in the experimental group.

Experience group	Before experiment	After experiment	Rate of change	P
Forward flexion in sitting position (cm)	5.912±5.166	9.479±5.277	37.634%	<0.05
Standing on one foot with eyes closed (s)	5.871±5.581	10.473±6.088	43.944%	<0.05
Standing long jump (m)	1.969±0.159	2.149±0.214	8.359%	<0.01
Sit-ups (pcs/min)	19.974±8.465	31.248±9.422	36.079%	<0.01
50 meters (s)	9.619±1.534	8.535±1.256	-12.708%	<0.01
50 meters x 8 Round trip (s)	92.520±5.441	76.072±5.947	-21.621%	<0.01

Table 4. Changes in physical fitness of male college students in the control group.

Control group	Before experiment	After experiment	Rate of change	P
Forward flexion in sitting position (cm)	5.357±4.436	5.066±4.163	-5.739%	<0.01
Standing on one foot with eyes closed (s)	5.761±4.284	5.682±4.098	-1.389%	<0.01
Standing long jump (m)	1.959±0.239	1.960±0.173	0.026%	<0.01
Sit-ups (pcs/min)	20.612±6.536	19.746±7.193	-4.389%	<0.05
50 meters (s)	9.778±2.127	9.806±1.724	0.279%	<0.05
50 meters x 8 Round trip (s)	92.377±4.984	90.934±4.611	-1.587%	<0.01

Table 5. Changes in body shape of male college students in the experimental group.

Experience group	Before experiment	After experiment	Rate of change	P
Bust circumference (cm)	104.555±8.903	103.113±7.992	-1.398%	<0.01
Waist circumference (cm)	95.310±11.260	94.797±10.226	-0.541%	<0.05
Hip circumference (cm)	104.479±5.432	103.514±5.400	-0.932%	<0.05
Left arm circumference (cm)	32.980±2.696	33.730±2.683	2.225%	<0.05
Right arm circumference (cm)	33.046±2.573	34.441±2.731	4.052%	<0.01
Left leg circumference (cm)	64.166±5.213	63.174±4.581	-1.569%	<0.05
Right thigh circumference (cm)	64.515±5.143	63.953±4.639	-0.878%	<0.01

Table 6. Changes of body shape of male college students in the control group.

Control group	Before experiment	After experiment	Rate of change	P
Bust circumference (cm)	106.139±11.719	104.330±11.881	-1.734%	<0.05
Waist circumference (cm)	98.968±12.309	98.929±12.763	-0.039%	<0.05
Hip circumference (cm)	108.278±11.802	107.901±12.623	-0.349%	<0.01
Left arm circumference (cm)	34.205±3.104	34.747±3.289	1.558%	<0.01
Right arm circumference (cm)	33.842±3.226	35.491±3.778	4.646%	<0.01
Left leg circumference (cm)	66.886±7.262	66.015±6.778	-1.319%	<0.05
Right thigh circumference (cm)	66.351±7.276	66.121±6.614	-0.347%	<0.01

arm circumference, left leg circumference and right thigh circumference are -1.734%, -0.039%, -0.349%, 1.558%, 4.646%, -1.319% and -0.347% respectively. The P values of chest circumference, waist circumference and left thigh circumference were all less than 0.05, and the P values of the other five items were all less than 0.01.

DISCUSSION

In recent years, interval training has been widely used in sports science, especially in the field of mass fitness and rehabilitation medicine training for patients. The comparative study of many experiments shows that the intermittent training and continuous aerobic exercise are more effective in controlling the body mass, reducing fat and muscle weight, and the time and effect of intermittent training are more effective, and

the safety is also recognized by everyone. Some studies have shown that, compared with most conventional aerobic exercise training, intermittent training can more effectively reduce body fat, or reduce abdominal fat and visceral fat beyond the normal range. Through the research and analysis of this paper, it is found that the male college students who have received intermittent training can improve the body mass, body composition and physical fitness, and can also improve the quiet heart rate and blood pressure of the human body, which can well reduce the degree of arteriosclerosis. Further research and analysis in this paper found that after intermittent training, the physical fitness and body shape of the experimental subjects have significantly changed, which indicates that intermittent training in a short time can effectively reduce the visceral fat content of male college students, thereby reducing the obesity rate of male college students.

CONCLUSION

According to the experimental results, it can be seen that interval training can effectively improve the physical basis of male obese college students, reduce weight, body fat rate and fat volume, but aerobic training plays a significant role in this regard. But in the improvement of physical fitness and body shape of male obese college students, the effect of interval training is significantly greater than that of ordinary aerobic training. In addition, body shape and physical fitness are very important for college students, which can reflect the overall mental outlook of college students. Interval training also contributes to the physical health of obese male college students. Therefore, interval training for obese male college students is very necessary.

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