

EFFECTS OF AEROBIC EXERCISE ON BODY MORPHOLOGY IN OBESE UNIVERSITY STUDENTS

EFEITOS DO EXERCÍCIO AERÓBICO NA MORFOLOGIA CORPORAL DE ESTUDANTES UNIVERSITÁRIOS OBEOS

EFFECTOS DEL EJERCICIO AERÓBICO EN LA MORFOLOGÍA CORPORAL DE ESTUDIANTES UNIVERSITARIOS OBEOS



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ABSTRACT

Introduction: The problem of obesity is relevant to the current social development model. In addition to the eminent physical health risks, obese university students also experience greater resistance to social development. Obese students participating in the national weight loss fitness program can perceive the benefits of aerobic exercise. **Objective:** Explore the effect of aerobic exercise on body morphology in obese university students. **Methods:** 60 obese university students were selected as study subjects and divided equally into a control and experimental group. The control group received no intervention, while the experimental group performed a battery of aerobic exercises of 60 minutes daily, four times a week for six weeks. Data before and after the experiment were compared. BMI, body fat rate, blood lipid monitoring, and blood glucose were also taken as body component monitoring indexes, and circumference measurements and proportions were taken as external body monitoring indexes. **Results:** Aerobic exercise can effectively reduce the body weight, body mass index (BMI), body fat rate, and body circumference of college students, decrease body weight, make the body shape more symmetrical, and also improve lipid and glycemic components, thus reducing the complications caused by obesity. **Conclusion:** University professors should perform aerobic training for university students to improve their physical fitness, regulate their physical function, and improve their physical appearance.

Level of evidence II; Therapeutic studies - investigation of treatment outcomes.

Keywords: Aerobic Exercise; Students; Obesity; Body Weight Maintenance.

RESUMO

Introdução: O problema da obesidade é um problema relevante no atual modelo de desenvolvimento social. Além dos riscos eminentes na saúde física, os estudantes universitários obesos também vivenciam uma maior resistência para o desenvolvimento social. Os alunos obesos que participam do programa nacional de condicionamento físico para a perda de peso podem perceber os benefícios do exercício aeróbico. **Objetivo:** Explorar o efeito do exercício aeróbico na morfologia corporal de estudantes universitários obesos. **Métodos:** 60 estudantes universitários obesos foram selecionados como sujeitos de estudo e divididos igualmente em grupo controle e experimental. O grupo controle não recebeu intervenção enquanto o experimental efetuou uma bateria de exercícios aeróbicos de 60 minutos diários, quatro vezes por semana, durante seis semanas. Dados antes e depois do experimento foram comparados. O IMC, a taxa de gordura corporal, monitoramento sanguíneo de lipídios e glicemia também foram tomados como índices de monitoramento dos componentes corporais, medidas de circunferências e proporções foram tomadas como índices de monitoramento corporal externo. **Resultados:** O exercício aeróbico pode reduzir efetivamente o peso corporal, o índice de massa corporal (IMC), a taxa de gordura corporal e a circunferência corporal dos estudantes universitários, diminuir o peso corporal, deixando a forma corporal mais simétrica, além de melhorar os componentes lipídicos e glicêmicos, reduzindo assim as complicações causadas pela obesidade. **Conclusão:** Os professores universitários devem realizar treinamento aeróbico de estudantes universitários a fim de melhorar seu condicionamento físico, regular sua função física e melhorar seu aspecto físico. **Nível de evidência II; Estudos terapêuticos - investigação dos desfechos do tratamento.**

Descritores: Exercício aeróbico; Estudantes; Obesidade; Manutenção do Peso Corporal.

RESUMEN

Introducción: La cuestión de la obesidad es un problema relevante en el modelo actual de desarrollo social. Además de los riesgos eminentes en la salud física, los universitarios obesos también experimentan una mayor resistencia al desarrollo social. Los estudiantes obesos que participan en el programa nacional de acondicionamiento físico para la pérdida de peso pueden obtener los beneficios del ejercicio aeróbico. **Objetivo:** Explorar el efecto del ejercicio aeróbico sobre la morfología corporal en estudiantes universitarios obesos. **Métodos:** Se seleccionaron 60 estudiantes universitarios obesos como sujetos de estudio y se dividieron por igual en el grupo de control y el experimental. El grupo de control no recibió ninguna intervención, mientras que el grupo experimental realizó una batería de ejercicios aeróbicos de 60 minutos diarios, cuatro veces por semana durante seis semanas. Se compararon los



datos antes y después del experimento. El IMC, el índice de grasa corporal, la monitorización de lípidos y de glucosa en sangre también se tomaron como índices de monitorización de los componentes corporales, las medidas de circunferencia y las proporciones se tomaron como índices de monitorización corporal externa. Resultados: El ejercicio aeróbico puede reducir eficazmente el peso corporal, el índice de masa corporal (IMC), el índice de grasa corporal y la circunferencia corporal de los estudiantes universitarios, disminuir el peso corporal, hacer que la forma del cuerpo sea más simétrica, y también mejorar los componentes lipídicos y glucémicos, reduciendo así las complicaciones causadas por la obesidad. Conclusión: Los profesores universitarios deberían realizar un entrenamiento aeróbico de los estudiantes universitarios para mejorar su estado físico, regular su función física y mejorar su aspecto físico. **Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.**

Descriptores: Ejercicio Aeróbico; Estudiantes; Obesidad; Mantenimiento del Peso Corporal.

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INTRODUCTION

According to the statistical report released by WHO in 2012, the total number of obese people in the world has doubled since 1980. Among them, the total number of overweight and obese people in China also exceeded 200 million, accounting for 22% and 7.1% of the world respectively. Overweight and obesity will bring great pressure to the human body, which will lead to many diseases such as hypertension, hyperglycemia and even death. Obesity is not only an external manifestation, but also a malignant "disease" that causes irreversible damage to the body and human psychology, such as reducing cardiopulmonary function and affecting blood pressure.¹ Obesity is closely related to a variety of common chronic diseases. In other words, obese people are more likely to suffer from such diseases. In addition, obesity will have a psychological impact on people. Contemporary society values thin and beauty. Obese bodies are easy to bear the different eyes of others. For a long time, it will lead to psychological inferiority, autism, refusal to make friends and other behaviors, which will seriously affect their social and communication skills.² With the launch of the national fitness program and the implementation of the concept of human health, more and more students have joined the ranks of weight loss and weight control. Aerobic exercise, that is, the physical activity of large muscle groups in the human body based on aerobic metabolic cycle, is generally of medium intensity. The medical term "cardiopulmonary exercise" can be replaced by "aerobic exercise". On the one hand, aerobic exercise can improve endurance and strengthen cardiopulmonary function; On the other hand, it can consume excess fat and improve physical fitness. At the present stage, scientific research shows that the body weight can be reduced to a certain extent.³ By studying the effect of aerobic exercise on adolescent fat reduction, this paper compares the data of the experimental group and the control group before and after the experiment based on the experimental method and statistical analysis, so as to obtain the effect of aerobic exercise on fat reduction.⁴ Through the analysis and inspection of various items, obese students participating in fitness and weight loss can realize the benefits of aerobic exercise, so as to promote their attention to physical health.⁵

METHOD

Research object

On the basis of fully informing the specific situation and completely voluntary, this paper selects 60 Obese College Students from the sophomore year of a university as the research object. The study and all the participants were reviewed and approved by Ethics Committee of Xi'an Peihua University (NO.18XUPT-SD73). In order to ensure the effectiveness and safety of the overall experimental results, the research objects need to include the following characteristics: first, they are healthy, have no cardiovascular and cerebrovascular diseases or respiratory diseases,

and can complete relevant exercises normally and healthily; Secondly, there is sufficient time to complete the relevant training content with quality and quantity; Third, life is relatively regular, and there is little difference between them, without the interference of too many human accidental factors.

Experimental design

This experiment adopts the method of comparison before and after the group to reduce the interference of other factors as much as possible. The training scheme is shown in Table 1, four times a week, 60 minutes each time, with vigorous walking as the main aerobic exercise type. The whole experiment lasts for 6 weeks.

Data acquisition and processing

In order to more comprehensively explore the impact of aerobic exercise intervention on College Students' body shape, this paper selects the indicators from the two aspects of body composition and external shape, takes BMI, body fat rate, blood lipid and blood glucose as the monitoring indicators of body composition, and takes the circumference and its proportion as the monitoring indicators of external shape.

The equipment used in this experiment is height and weight meter, tape measure and blood glucose meter. With the help of the staff, the obese college students participating in the experiment measured the relevant indicators before and after exercise, sorted and collected the data, analyzed the obtained data with Excel software and SPSS software, and used the independent variance t-test. If $P < 0.05$, there was a significant difference, if $P > 0.05$, there was no significant difference.

RESULTS

Effect of aerobic exercise intervention on body composition of College Students

In order to explore the effect of aerobic exercise intervention on College Students' body shape from the inside, this section takes BMI index, fat rate of each part, blood lipid and blood glucose changes as indicators to explore the effect of aerobic exercise intervention.

The changes of body composition of Obese College Students before and after exercise intervention are shown in Table 2.

Table 1. Motion scheme design.

Option		Solution details
Exercise frequency		Over Thursday
Sports total length		60 minutes
Among	10 minutes	10 minutes
	40 minutes	40 minutes
	10 minutes	10 minutes
Movement mode		Walk away

It can be seen from the table that with the development of aerobic exercise intervention, the height index of obese college students fluctuated from (172.804 ± 6.806) cm before exercise intervention to (173.053 ± 6.593) cm after exercise intervention, and there was no significant difference ($P > 0.05$); The body weight index decreased significantly from (105.784 ± 9.181) kg before exercise intervention to (102.784 ± 0.940) kg after exercise intervention ($P < 0.05$); BMI index decreased significantly from (33.260 ± 2.070) kg / m² before exercise intervention to (32.285 ± 2.018) kg / m² after exercise intervention ($P < 0.05$). The results show that aerobic exercise can effectively reduce the weight and BMI index of obese college students, so as to improve their body shape.

The changes of fat rate of Obese College Students before and after exercise intervention are shown in Table 3. The trunk fat rate of Obese College Students decreased significantly from (33.337 ± 3.151)% before exercise intervention to (32.428 ± 4.058)% after exercise intervention, $P < 0.05$, indicating that there was a significant difference; The upper limb fat rate decreased significantly from (25.516 ± 1.775)% before exercise intervention to (24.706 ± 2.204)% after exercise intervention ($P < 0.05$); The lower limb fat rate decreased significantly from (28.586 ± 2.024)% before exercise intervention to (27.766 ± 2.036)% after exercise intervention ($P < 0.05$); The overall fat rate decreased significantly from (30.792 ± 2.548)% before exercise intervention to (30.050 ± 2.234)% after exercise intervention ($P < 0.05$). It can be seen that with the progress of aerobic exercise, the fat rate of trunk, upper limb and lower limb of obese college students has decreased, and the overall fat rate has also decreased to a certain extent.

(Table 4) shows the changes of blood lipid and blood glucose of Obese College Students before and after exercise intervention. It can be seen from the table that the TC (total cholesterol) index of college students decreased significantly from (4.303 ± 0.682) mmol / L before exercise intervention to (3.626 ± 0.678) mmol / L after exercise intervention, $P < 0.05$, indicating that there was a significant difference; FPG (fasting plasma glucose) index increased from (4.669 ± 0.250) mmol / L before exercise intervention to (4.681 ± 0.511) mmol / L after exercise intervention ($P > 0.05$); Fins (fasting insulin) index decreased significantly

Table 2. Changes of body composition of Obese College Students before and after exercise intervention.

Index	Before intervention	After intervention
Height (cm)	172.804 ± 6.806	173.053 ± 6.593
Weight (kg)	105.784 ± 9.181	102.784 ± 0.940
BMI (kg/m ²)	33.260 ± 2.070	32.285 ± 2.018

Table 3. Changes of fat rate of Obese College Students before and after exercise intervention.

Index	Before intervention	After intervention
Torso fat ratio (%)	33.337 ± 3.151	32.428 ± 4.058
Upper limb fat ratio (%)	25.516 ± 1.775	24.706 ± 2.204
Lower limbs (%)	28.586 ± 2.024	27.766 ± 2.036
Overall fat ratio (%)	30.792 ± 2.548	30.050 ± 2.234

Table 4. Changes of blood lipid and blood glucose in Obese College Students before and after exercise intervention.

Index	Before intervention	After intervention
TC (mmol/L)	4.303 ± 0.682	3.626 ± 0.678
FPG (mmol/L)	4.669 ± 0.250	4.681 ± 0.511
FINS (pmol/L)	85.260 ± 30.928	60.629 ± 28.517
TG (mmol/L)	1.737 ± 0.923	0.838 ± 0.351
HDL-C (mmol/L)	1.153 ± 0.230	1.087 ± 0.201
LDL-C (mmol/L)	2.741 ± 0.669	2.228 ± 0.668
VLDL (mmol/L)	0.792 ± 0.390	0.369 ± 0.160

from (85.260 ± 30.928) pmol / L before exercise intervention to (60.629 ± 28.517) pmol / L after exercise intervention ($P < 0.05$); TG (triglyceride) index decreased significantly from (1.737 ± 0.923) mmol / L before exercise intervention to (0.838 ± 0.351) mmol / L after exercise intervention ($P < 0.05$); HDL-C (high density lipoprotein cholesterol) index decreased from (1.153 ± 0.230) mmol / L before exercise intervention to (1.087 ± 0.201) mmol / L after exercise intervention ($P > 0.05$); LDL-C (low density lipoprotein cholesterol) index decreased significantly from (2.741 ± 0.669) mmol / L before exercise intervention to (2.228 ± 0.668) mmol / L after exercise intervention ($P < 0.05$); VLDL (very low density lipoprotein) index decreased significantly from (0.792 ± 0.390) mmol / L before exercise intervention to (0.369 ± 0.160) mmol / L after exercise intervention ($P < 0.05$). It can be seen that exercise intervention can effectively regulate the blood lipid and blood glucose of obese college students, promote their health and reduce the impact of various complications caused by obesity.

Effect of aerobic exercise intervention on the external form of College Students

The most intuitive expression of aerobic exercise intervention on College Students' body shape is the change of their circumference, including chest circumference, waist circumference, hip circumference and related proportion. Therefore, this section analyzes it.

(Table 5) shows the changes of circumference of Obese College Students before and after exercise intervention. Among them, the chest circumference decreased significantly from (103.707 ± 10.718) cm before exercise intervention to (96.936 ± 9.629) cm after exercise intervention, $P < 0.05$, indicating that there was a significant difference; Waist circumference decreased significantly from (101.303 ± 10.391) cm before exercise intervention to (88.573 ± 6.530) cm after exercise intervention ($P < 0.05$); Hip circumference decreased significantly from (108.717 ± 6.547) cm before exercise intervention to (102.691 ± 3.086) cm after exercise intervention ($P < 0.05$). It can be seen that aerobic exercise can effectively reduce the body circumference of obese college students, so as to improve the external shape.

(Table 6) shows the changes of circumference ratio of Obese College Students before and after exercise intervention. Among them, the waist circumference / hip circumference ratio decreased significantly from (0.932 ± 0.050) before exercise intervention to (0.858 ± 0.060) after exercise intervention ($P < 0.05$), indicating that there was a significant difference; Waist circumference / height ratio decreased significantly from (0.612 ± 0.080) before exercise intervention to (0.528 ± 0.080) after exercise intervention ($P < 0.05$); Hip circumference / height ratio decreased significantly from (0.651 ± 0.070) before exercise intervention to (0.609 ± 0.070) after exercise intervention ($P < 0.05$). The results show that aerobic exercise intervention can effectively adjust the circumference ratio of college students, so as to make the body shape more symmetrical.

Table 5. Changes of circumference of Obese College Students before and after exercise intervention.

Index	Before intervention	After intervention
Bust (cm)	103.707 ± 10.718	96.936 ± 9.629
Waist (cm)	101.303 ± 10.391	88.573 ± 6.530
Hip circumference (cm)	108.717 ± 6.547	102.691 ± 3.086

Table 6. Changes of circumference ratio of Obese College Students before and after exercise intervention.

Index	Before intervention	After intervention
Waist / hip ratio	0.932 ± 0.050	0.858 ± 0.060
Waist / height ratio	0.612 ± 0.080	0.528 ± 0.080
Hip circumference / height ratio	0.651 ± 0.070	0.609 ± 0.070

DISCUSSION

Obesity is mainly caused by the imbalance of energy budget and excess energy stored in the body in the form of fat. Research shows that regular aerobic exercise for a long time can effectively improve body composition and reduce cardiovascular risk factors for obese people. The total composition of human tissues and organs is called body composition. After exercise, the triglyceride level in obese subjects with weight loss decreased significantly, while the triglyceride level in subjects with low weight loss after exercise did not decrease significantly. There are different conclusions about the effect of exercise on total cholesterol at home and abroad, but most research data show that exercise can reduce the level of total cholesterol in the body. Studies have shown that moderate intensity aerobic exercise can significantly reduce the contents of total cholesterol, apolipoprotein B and low-density serum cholesterol. An epidemiological study found that athletes who received endurance training had lower plasma total cholesterol levels than normal people who took physical exercise.

In addition, studies have shown that strenuous exercise will increase blood pressure and increase the tension of arterial wall during exercise. Long time training can reduce the thickness of arterial wall. Therefore, it can be seen that different forms of physical exercise can regulate the difference between pro atherosclerotic genes and anti atherosclerotic genes. In addition, the study found that acute stress stimulation

can increase blood pressure compared with chronic stress stimulation, but some evidence suggests that short-term increase in circulating pressure may lead to anti atherosclerotic changes in the arterial wall. This is only a current hypothesis, and future studies should further clarify the stimulating effect of specific blood pressure patterns on arterial wall changes.

CONCLUSION

From the research results of this paper, it can be seen that aerobic exercise has a good improvement effect on the body shape of obese college students. It can not only reduce the weight of college students and improve their BMI index, but also effectively adjust the body fat rate of limbs and trunk, reduce their circumference and adjust the proportion of circumference, so as to reduce the weight of college students and make their body shape more stretch and symmetrical. In addition, aerobic exercise can also regulate college students' blood lipid and blood glucose, which can not only further improve their body shape, but also reduce the impact of complications caused by obesity. Therefore, college teachers and students should purposefully train college students in aerobic exercise, so as to improve their body shape, regulate their body function and improve their physique.

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REFERENCES

1. Michalsky MP, Inge TH, Simmons M, Jenkins TM, Buncher R, Helmrath M, et al. Cardiovascular Risk Factors in Severely Obese Adolescents: The Teen Longitudinal Assessment of Bariatric Surgery (Teen-LABS) Study. *JAMA Pediatr.* 2015;169(5):438-44.
2. Wittels P, Mansfield L. Weight stigma, fat pedagogy and rediscovering the pleasures of movement: Experiencing physical activity and fatness in a public health weight management programme. *Qual Res Sport Exerc Health.* 2021;13(2):342-59.
3. Lazzar S, Tringali G, Caccavale M, De Micheli R, Abbruzzese L, Sartorio A. Effects of high-intensity interval training on physical capacities and substrate oxidation rate in obese adolescents. *J Endocrinol Invest.* 2017;40(2):217-26.
4. Kim J, Son W, Headid R. Corrigendum to: The effects of a 12-week jump rope exercise program on body composition, insulin sensitivity, and academic self-efficacy in obese adolescent girls. *J Pediatr Endocrinol Metab.* 2020;33(5):681.
5. Morrissey C, Montero D, Raverdy C. Effects of Exercise Intensity on Microvascular Function in Obese Adolescents. *Int J Sports Med.* 2018;39(6):450-5.