



Effect of High Intensity Intermittent Training and Diet Intervention Management Mode on Body Composition and Cardiopulmonary Function of Obese College Students

Zeng Zhou
Central South University, Changsha
Hunan, Hunan, China
zt13066714983@126.com

Yufei Qi
Central South University, Changsha
Hunan, Hunan, China, ,
Corresponding author
zt13066714983@126.com

Jengsheng Yang
Chinese Culture University, Taipei,
Taiwan, China
zt13066714983@126.com

ABSTRACT

Obesity is one of the most serious public health problems. Obesity is an independent risk factor of cardiovascular disease, which poses a serious threat to our body and even the whole health system. College students are in the golden stage of long body, especially with the improvement of material conditions, college students are prone to obesity. At present, there are few studies on the effect of exercise on the body composition and cardiopulmonary function of college students with obesity. Therefore, this paper puts forward the research on the effect of high-intensity intermittent training and diet intervention management mode on the body composition and cardiopulmonary function of obese college students. In this paper, the relationship between high-intensity interval training and obesity and diet was studied. The results show that high-intensity interval training and diet control can play a positive role in controlling college students' obesity. In order to further verify the actual effect of high-intensity intermittent training and diet intervention on body composition and cardiopulmonary function of obese college students, the corresponding test experiment was established. In this experiment, 40 volunteers were given exercise training and diet intervention plan for 8 weeks. Through the analysis of the final experimental data, it can be seen that high-intensity intermittent training and diet intervention have a positive impact on the weight, BMI and blood pressure of obese college students. The analysis shows that after high-intensity intermittent training and diet intervention, the indexes of obese college students tend to be normal people, which reduce the health threat caused by obesity.

CCS CONCEPTS

• **Social and professional topics** → Professional topics; Computing and business; Economic impact.

KEYWORDS

Obesity Patients, High Intensity Interval Training, Diet Intervention, Cardiopulmonary Function

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1 INTRODUCTION

University is an important stage of growing up. Maintaining a healthy weight range is not only related to their future study and life, but also the premise of better serving the society in the future. Under the aesthetic standard of thin as beauty, obesity obviously does not meet the aesthetic standards of contemporary people. In addition, obesity can also lead to hypertension, hyperlipidemia and other complications [1-3]. And obesity also has direct and indirect effects on self-esteem, and even severe obesity will produce anxiety and depression. Therefore, it is of great significance to strictly control the obesity rate of college students and help them reduce obesity [4-5].

The main reason of College Students' obesity is their preference for greasy and spicy food and irregular eating time. Generally speaking, the higher the intake of meat and eggs, the higher the risk of obesity. At present, there are many ways to reduce obesity, such as surgery, medicine, diet and exercise [6-8]. Among them, exercise is the most safe and healthy way to lose weight, which is widely recognized as a way. Exercise can improve the metabolism of the body; increase the body's heat consumption, so as to achieve the purpose of weight loss. In addition, weight loss is a long-term process; we must establish a long-term exercise training and healthy diet plan [9-10].

This paper deeply studies the main causes of obesity of college students in China, and finds out that the university stage is in an important period of students' physical growth, and with the improvement of economic level, college students are generally rich in material and lack of control in diet, which leads to a higher and higher proportion of College Students' obesity. Obesity is a serious threat to the health of college students. However, there are few studies on the effect of high-intensity intermittent training and diet intervention on College Students' obesity. Therefore, this paper established the management model of high-intensity intermittent training and diet intervention on the body composition and cardiopulmonary function effect of obese college students, hoping that through the way of high-intensity intermittent training and diet intervention, the obesity of college students can be adjusted,

Table 1: Basic Information of Students Before the Experiment

Number of people	Average age	Average height (cm)	Average weight (kg)	Average BIM (kg / m ²)
40	20.4	166.7	79.8	31.7

and the influence of high-intensity intermittent training and diet intervention on body composition and cardiopulmonary function effect is analyzed. In this paper, an 8-week high-intensity intermittent training and diet intervention program was established, and relevant experiments were conducted by recruiting volunteers. The basic body indexes of obese students were collected before and after the experiment and compared before and after training. The experimental data further showed that the high-intensity intermittent training and diet intervention had a good effect on improving the obesity of college students, especially in the improvement of cardiopulmonary function, which played a positive role in promoting the health of obese students.

2 HIGH INTENSITY INTERMITTENT EXERCISE AND OBESITY

2.1 High Intensity Intermittent Exercise

High intensity intermittent exercise refers to intermittent high-intensity exercise with peak oxygen intake of 85-90%. The constituent factors of high-intensity intermittent exercise include exercise intensity, exercise duration, interval time, exercise times and repetition times. One of the main advantages of high-intensity interval exercise is that it takes less time than traditional moderate intensity aerobic exercise and can obtain similar health benefits. Traditionally, continuous aerobic exercise is a kind of moderate intensity exercise without rest time, which is the most common exercise mode. However, intermittent exercise feels less intense than continuous exercise, which may help to stick to the exercise program. High intensity intermittent exercise may have a significant impact on body composition, improve the physiological adaptability of the body, and bring greater health benefits.

2.2 Obesity and Food cue Sensitivity

Weight gain leads to obesity, which is mainly caused by excessive consumption. Overeating, mainly eating high sugar, high fat food, can increase the probability of obesity. Individuals lack enough exercise to eliminate the intake of excess energy, resulting in a large amount of excess energy and fat accumulation. Studies have shown that for obese people, food suggestion is more likely to stimulate unhealthy eating behavior than hunger, and obese people also show stronger psychological and physiological responses to food suggestion. Some studies have found that it is difficult for obese people to eliminate the physiological response to food cues after repeated exposure to food related cues. Like obese adults, obese adolescents respond more strongly to food cues than lean children. Obese adolescents are more likely to be exposed to food related stimuli, suggesting that salivary flow is associated with increased food intake. These studies have shown a close link between food cue response and obesity risk.

3 RESEARCH OBJECT AND METHOD

3.1 Research Object

Through voluntary registration, 40 obese college students were selected from a university, including 20 males and 20 females. The details are shown in Table 1

3.2 Research Methods

3.2.1 Blood test. The changes of cholesterol, triglyceride, high density lipoprotein cholesterol, low density lipoprotein cholesterol, fasting blood glucose and fasting insulin were measured. Before and after exercise intervention, venous blood was collected on an empty stomach in the morning, and blood was collected twice from elbow and upper arm.

3.2.2 Blood pressure measurement method. The blood pressure was measured by medical electronic sphygmomanometer. After sitting for 5 minutes, the blood pressure was measured three times continuously and the average value was taken.

3.2.3 Exercise mode. Choose aerobic exercise with medium and low intensity, long time and large muscle group. There are jogging, walking, swimming, cycling, aerobics, badminton and so on. Each exercise time is 1-1.5 hours, 6 days a week, including morning and evening exercise. The training cycle is 8 weeks, in which there is a stage every 4 weeks.

3.2.4 Diet control. Based on the basal metabolic rate, the proportions of carbohydrate, protein and fat were 60%, 20% and 20%, respectively. The food composition is mainly vegetables, supplemented by fish and shrimp, less oil, less red meat.

3.2.5 Data statistics. All test indexes were expressed as mean \pm and the data were analyzed by SAS statistical software.

4 DISCUSSION

4.1 Experimental Results and Analysis

4.1.1 Comparative analysis of height, weight and BMI of obese students before and after the experiment. The height, weight and BMI of Obese College Students before the experiment were compared with the data of 4 weeks and 8 weeks after the experiment. The specific data is shown in Figure 1. From the results of Figure 1, it can be seen that the height change of students before and after exercise is not obvious, indicating that the experimental intervention has no effect on the height of obese college students. After 8 weeks of exercise and diet intervention, the average weight of Obese College Students decreased from 79.8 kg to 68.4 kg, which also showed that weekly exercise and diet intervention had an impact on body weight. Before the experiment, the average BMI of 40 obese college students was 31.7 kg / m², which dropped to 28.2 kg / m² after 4 weeks and 25.3 kg / m² after 8 weeks. The results show that the

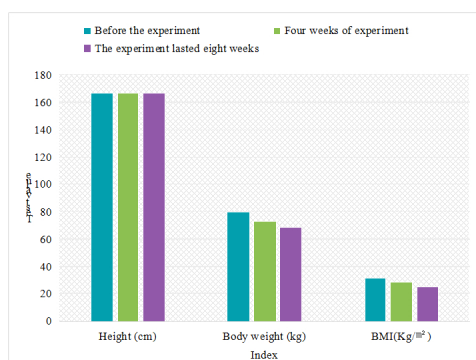


Figure 1: Comparison of height, weight and BMI of obese students before and after the experiment

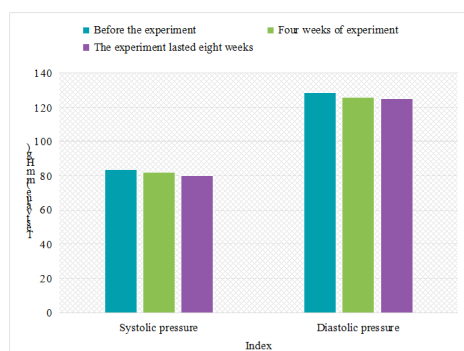


Figure 2: Comparison of blood pressure of Obese College Students before and after the experiment

overall effect of exercise intervention on College Students' obesity is very obvious.

4.1.2 Comparative analysis of blood pressure of Obese College Students before and after the experiment. The systolic blood pressure and diastolic blood pressure of Obese College Students before the experiment were compared with the data of 4 weeks and 8 weeks after the experiment. The specific data is shown in Figure 2. The experimental results are shown in Figure 2. Before the experiment, the average diastolic blood pressure of 40 obese college students was 83.87 mmHg and the average systolic blood pressure was 128.75 mmHg, which was higher than that of normal people; after 4 weeks of exercise intervention, the average diastolic blood pressure decreased by 82.14 mmHg and the average systolic blood pressure was 126.23 mmHg. The mean diastolic blood pressure decreased to 80.31 mmHg and the systolic blood pressure decreased to 125.11 mmHg. Diastolic blood pressure and systolic blood pressure gradually tend to normal. This also shows that exercise intervention can consume a large number of Obese College Students' body fat, reduce the accumulation of fat in the vascular wall, reduce the pressure on the vascular wall, and improve the cardiopulmonary function of obese college students.

4.2 Fatty Heart

At present, magnetic resonance imaging and echocardiography can clearly distinguish epicardial and myocardial fat, and calculate the "fat free" heart weight. Through the quantitative analysis of nuclear magnetic resonance spectroscopy, it was found that the content of triacylglycerol in myocardial cells of obese patients was significantly higher than that of normal weight people, and the number of visceral adipose tissue was corresponding to that of epicardial fat in obese patients. Some scholars have found that epicardial fat may enter the free wall of ventricle through magnetic resonance imaging technology, and replace ventricular muscle. Epicardial adipose tissue has metabolic activities, which affect the shape and function of the heart by secreting adiponectin and free fatty acids. Epicardial fat has higher lipolysis activity, release more free fatty acids and increase myocardial energy supply.

4.3 High Intensity Intermittent Exercise and Food Reward, Appetite

Appetite and energy intake are regulated by complex interactions between peripheral gut hormones and brain central receptors. Transient eating behavior is mediated by neurons located in OFC, insular cortex and striatum, which are part of the central reward system. Peripheral orexin, which sends energy state signals to the brain, has been shown to interact with the central reward system. Exercise can not only affect the regulation of peripheral appetite, but also affect the regulation of central appetite. Exercise inhibits neural responses in areas of the brain associated with food reward and eating motivation, including insular cortex and OFC. Since physical exercise itself is a reward, habitual exercise is recommended to cushion the need for other rewards, such as delicious food. When opioids are fully activated, exercise can significantly enhance the reward process. The hedonic side of food can stimulate eating and may also lead to overeating and weight gain. However, physical exercise may interfere with the process of food reward. Compared with no eating, aerobic exercise decreased the nerve response of bilateral insular to high calorie food and increased the nerve response of left precuneus. Compared with non-food images, the neural response of orbital prefrontal cortex to high calorie food image was weaker, while the activation of hippocampus and dorsolateral prefrontal cortex was enhanced. To sum up, these results suggest that high intensity interval exercise may help reduce the reward for fat and sweets, that is, both aerobic exercise and high intensity interval exercise can change food reward.

5 CONCLUSIONS

In the research on the effect of high-intensity intermittent training and diet intervention management mode on body composition and cardiopulmonary function of obese college students, this paper deeply studies the main causes of College Students' obesity and the main improvement measures for college students' obesity. According to the characteristics of high-intensity intermittent training and diet intervention, combined with the physical status of obese college students, this paper established a physical improvement experimental plan based on high-intensity intermittent training and diet intervention. In this experiment, the height, weight, BMI and blood pressure of the subjects were tested. The test was divided into

three stages: before the experiment, after four weeks of training, and after eight weeks of training, the average values of the subjects in each stage were statistically analyzed. The results showed that high-intensity intermittent training and diet intervention had an effect on all indexes except height of obese students. It is considered that obesity is an important factor threatening people's health, and various heart disease caused by obesity has become a normal. In recent years, college students have become a high-risk group of obesity, the higher the proportion of obesity among students, which needs to be paid attention to. This study shows that high-intensity intermittent training and diet intervention have a good effect on Improving College Students' obesity, which contributes to the health research of college students.

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