International Journal of Education and Humanities
ISSN: 2770-6702 | Vol. 14, No. 2, 2024

The Effect of Aerobic Exercise among Obese College Students: Towards an Intervention Program

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Abstract: Due to the improvement of the quality of life, people's intake of excess nutrition, the temptation of electronic and other technological products make people sit for a long time without exercise. With the intensification of urbanization, these problems directly lead to the emergence of a large number of chronic metabolic diseases such as obesity, which seriously threatens human physical and mental health. As a pilot study, U1 University, with more than 20,000 students, obtained their BMI from the results of physical health tests organized by the school for all college students. According to the health standards of the World Health Organization (WHO), 28≤BMI≤32 is considered to be obese, and BMI≥32 is considered to be very obese. According to the physical health test of the school once a semester, students with BMI≥28 were screened and aerobic exercise intervention was conducted for 8 weeks to explore the feasibility of exercise intervention program for obese college students to reduce weight and fat.

Keywords: Obese College Students, Body Shape, Body Composition, Body Function.

1. Introduction

In recent years, obesity caused by unhealthy diet and lack of physical labor has become an increasingly serious problem and a global public health issue. 2021, the Global Alliance for Improved Nutrition (GAIN) released a report on the state of global malnutrition in Washington, D.C., which showed that more than 300 million people in China are overweight and obese. The Scientific Research Report on Dietary Guidelines for Chinese Residents (2021) points out that the overweight and obesity rates of children and adolescents under the age of 6 and those aged 6 to 17 in China have reached 10.4% and 19% respectively, and more than half of the adult population is overweight or obese. Obesity is an independent risk factor for cardiovascular and cerebrovascular diseases such as vascular sclerosis and vascular obstruction, and the increasing number of obese people will greatly increase the base of chronic disease population in the future, resulting in a heavy medical burden and greatly affecting the physical condition of individuals. At the same time, obesity in college students will also bring a sense of inferiority and even guilt to individuals, thus affecting mental health.

Data from the National Physical Fitness Monitoring Bulletin released by the State General Administration of Sports show that the obesity rate of all age groups in China has been increasing every year. From 2000 to 2018, indicators such as body weight, waist and hip circumference, and the thickness of skin folds in various parts of the body have shown a continuous increase in all age groups of our nationals, with the largest increase in adult women over 20 years of age, ranging from 2.1% to 8.2%. In recent years, even though people's health awareness and health concepts have increased, and the level of sports consumption has increased, physical health has not significantly improved, and the obesity index has continued to grow. As a pilot study, U1 University, with more than 20,000 students, obtained their BMI from the results of physical health tests organized by the school for all college students. According to the health standards of the World Health Organization (WHO), 28≤BMI≤32 is considered to be obese, and BMI≥32 is considered to be very obese. According to the physical health test of the school once a semester, students with BMI≥28 are screened and defined as obese college students. A total of 17%, of which boys accounted for 19.5%, girls accounted for 14.5%. This is a high percentage for Chinese college students who are health-conscious and aesthetically attractive, which is why this study is of practical significance.

The improvement of the physical fitness of university students is of particular importance to the country because university students are the hope of the nation, the main driving force for future national construction and the backbone of social development. The physical health of college students is also related to school sports, family sports, social sports and many other aspects. Overweight and obese college students are the main part of the group that does not reach the standard of physical fitness test in colleges and universities, and to improve the health of overweight and obese college students is an indispensable process to effectively promote the physical fitness of college students. Therefore, in order to reduce the incidence of chronic diseases and ensure the mental health of college students, it is imperative for contemporary college students to reduce fat and weight.

Based on this, this study took U1 university as a pilot, and selected a part of subjects who had a strong willing to lose weight scientifically and were willing to participate in the experimental study within the school. A 8-week aerobic combined anti-group exercise exercise intervention (2023.10.23-2023.12.18) was carried out to reduce fat and weight at the same time to improve the subjects' joint stability and muscle strength, so as to make the exercise scientific, systematic, and refined, and to solve the problem of college students' blind weight loss as well as to provide ideas for the college students' obesity problem generally faced by other colleges and universities. The study was conducted by the University of California, Berkeley, and the University of

California, Los Angeles.

2. Literature Review

2.1. Definition of Obesity

The World Health Organization defines the concept of obesity as an abnormal or excessive accumulation of fat that can harm health. Body Mass Index (BMI) is a direct indicator of body fat content. The concept of Body Mass Index (BMI) was first proposed by Kettler, a Belgian in the 19th century, and is a measurement parameter widely used internationally to define obesity and obesity grading standards. Also known as the body mass index or body mass index (calculated as: BMI = weight / height2), is currently the international measurement of the degree of fat and thin and nutritional status of the human body commonly used indicators. The World Health Organization (WHO) has given the official classification of health standards as follows:

Table 1. the official classification of health standards

Separate into Different Kinds	BMI
Too Light	BMI <18.5
Normalcy	18.5≤BMI≤23.9
Overweight (luggage)	24≤BMI≤27.9
obese	28≤BMI≤32
very fat	BMI ≥ 32

2.2. Overview of Obesity-Related Issues

Due to the improvement of the quality of life, people's intake of excess nutrition, the temptation of electronic and other technological products make people sit for a long time without exercise. These problems, along with increased urbanization, have led to the emergence of various chronic metabolic diseases such as obesity, which seriously threatens the physical and mental health of human beings. 1997 World Health Organization (WHO) regarded obesity as one of the most serious public health problems in the twenty-first century. In 1997, the World Health Organization recognized obesity as one of the most serious public health problems of the 21st century, and the American Medical Association (AMA) officially listed obesity as a disease in 2013. Currently, obesity is not only an epidemic in developed countries, but its incidence is also increasing dramatically in some developing countries, including many Asian countries, such as China, India, and Thailand. In China, the national physical fitness has not been optimistic. On December 30, 2021, the National Center for National Physical Fitness Monitoring released the Fifth National Physical Fitness Monitoring Bulletin (the Report), which shows that in 2020, the proportion of people who reached the "National Physical Fitness Measurement Standards" "qualified" level or higher was 90.4%, compared with the 2014 monitoring. Compared with the 2014 monitoring, although the overall pass rate has increased by 0.8%, it should not be ignored that, since 2000, the national physical fitness monitoring data, overweight and obesity rates of adults and the elderly in China have continued to rise. The Report said that in 2020, China's adult overweight rate and obesity rate were 35.0% and 14.6% respectively, an increase of 2.3 and 4.1 percentage points compared with 2014; in 2020, the overweight rate and obesity rate of the elderly were 41.7% and 16.7% respectively, an increase of 0.1 and 2.8 percentage points compared with 2014. At the same time, the grip strength, back strength and muscular endurance of adult males are on a downward trend.

The World Health Organization's Regional Obesity Report for Europe 2022, released on May 3, 2022, states that overweight and obesity have reached "epidemic" proportions in the European region, with nearly two thirds of adults and one third of children overweight or obese, and rates are still rising. Overweight and obesity rates were higher among men (63%) than women (54%). The report shows that the UK has the fourth highest number of overweight and obese adults in Europe. According to the National Health Service (NHS), in 2019-20, more than 1 million people in England were admitted to hospital because of obesity. At the same time, the WHO report also highlights that obesity rates are also increasing in the Asian region, and obesity is not only a risk factor, but also a condition that requires special treatment and management.

Pan Liying (2022) studied the influence of different degrees of obesity on body shape, function, glucose and lipid metabolism and physical fitness. 50 obese people were recruited into moderate or severe obesity group according to BMI value and underwent aerobic exercise for 6 weeks. Body weight, BMI, waist circumference, hip circumference, fat mass, body fat percentage and some blood indicators were tested at 3 weeks and 6 weeks. It is pointed out that aerobic exercise can improve the body shape, body composition and body function of obese people, and severely obese people are more sensitive to aerobic exercise than moderately obese people.

2.3. Effects of Aerobic Exercise, Aerobic Combined with Resistance Exercise on Obese College Students

Zhou Qingsong (2022) pointed out that sustained for a certain period of time moderate-intensity aerobic exercise is conducive to mobilizing fat consumption decomposition, participate in the body's energy supply, aerobic exercise to improve the body's cardiorespiratory function at the same time can also reduce the heart and blood vessel walls attached to the fat, fat loss and weight loss at the same time, reduce the cardiovascular workload. It was also pointed out that the intervention of 10 weeks of aerobic exercise could be utilized to improve the body fat percentage, BMI, and waist-hip ratio of obese female college students at school, which provided a reference for the training method of weight loss in the obese population.

Chen Rong (2018) also pointed out in his study that after sustained implementation of aerobic exercise intervention for a certain period of time, obese college students' defatted body weight and muscle mass increased significantly, and fat mass and body fat percentage decreased significantly, which can be seen that the body composition of obese college students participating in the experiment has been significantly improved. At the same time, the subjects' fasting blood glucose, total cholesterol and low-density lipoprotein were significantly reduced and high-density lipoprotein was elevated relative to their control group classmates, which improved body composition and body morphology while reducing the risk of cardiovascular diseases such as

hypertension, and the personalized exercise prescription based on aerobic exercise was confirmed.

In addition, Xinyi Zhao (2021) pointed out that lasting 8 weeks, aerobic exercise combined with resistance exercise prescription 3-4 times per week can significantly reduce the relative and absolute amount of fat in the whole body of obese college students, and the thickness and content of fat in the waist, abdomen, thighs, upper arms, and below the shoulder blades, etc. Aerobic exercise combined with resistance exercise improves body composition and at the same time strengthens the strength qualities of the subjects. The purpose of increasing muscle and decreasing fat is achieved.

It can be seen that the effects of aerobic exercise, aerobic combined with resistance exercise and other different forms of exercise on body morphology, body composition, physical function and lung capacity have been studied more and the effects of the interventions have varied, which was be categorized in terms of the different indicators of improvement obtained.

2.4. Effects of Aerobic Exercise, Aerobic Combined with Resistance Exercise on Body Morphology in Obese College Students

Body shape is an important indicator of a person's physical health, representing the external shape and characteristics of various body parts, mainly including body shape, body posture, nutritional status and body composition, reflecting the level of growth and development of the human body. Among them, height, weight, and chest circumference are the three most basic developmental indicators of body shape. If a subject has a well-proportioned body shape, correct posture, and good nutritional status, we consider him/her to be in good physical condition. Our research team has done a review of related literature, which all reflect that aerobic exercise and aerobic combined with resistance exercise have positive effects on the improvement of body shape of obese college students.

In summary, adhering to a certain intensity and lasting for a certain period of time of scientific exercise determines that it can improve the waist-hip ratio, chest circumference, hip circumference and other body shape indexes of obese college students as well as the thickness of skin folds in all parts of the 7. Moreover, aerobic combined with resistance exercise has a better effect on the intervention compared with pure aerobic exercise. Subjects can choose the appropriate exercise prescription for scientific and reasonable fat and weight reduction according to their own status and needs.

2.5. Effects of Aerobic Exercise, Aerobic Combined with Resistance Exercise on Body Composition in Obese College Students

Body composition refers to the content of various components in the body (e.g. muscle, bone, fat, water and minerals, etc.), and is often expressed in terms of the composition and proportion of various substances in the body, which is affected by factors such as gender, age, heredity and exercise. Body composition is an indicator that reflects the internal structure of the human body in proportion to the characteristics of the body, and is also the most intuitive embodiment of whether the body physique is healthy or not. To ensure the health of the body, it is necessary to improve and control the body composition indicators such as bone content, muscle content, fat content, water and mineral elements to a healthy range in order to ensure the normal operation of the body.

Zhao Jun (2019) randomly divided 36 obese college students into a control group, aerobic exercise group aerobic combined with resistance training exercise group, and carried out a 12-week exercise intervention experiment on them, and the results showed that the subjects in the aerobic exercise group and aerobic combined with resistance training exercise group had a significant decrease in the indices of body mass, body mass index, body fat put, and percentage of body fat in comparison with the control group, and the muscle content was significantly higher, and the The intervention effect of aerobic combined with resistance training exercise group was better than that of aerobic exercise group alone.

It can be seen that adherence to a certain intensity, sustained for a certain period of time of scientific exercise can also improve the subject's body composition, increase the subject's body muscle content, enhance the strength of the body's skeletal muscles, and have an all-round improvement of the subject's body.

2.6. Effects of Aerobic Exercise, Aerobic Combined with Resistance Exercise on Physical Functioning in Obese College Students

Physical function is the life activity of the human organism as a whole and of the organs and systems that make up the organism working together. Human body function reveals the phenomenon, process, basic law and mechanism of the normal functional activities of the human body from the overall level of function, the activity level of internal organs and systems, the operation level of body cells and body molecules, and elucidates the influence of internal and external environmental changes on life activities, as well as changes in body function and metabolism in the case of disease, the occurrence of the disease and the development of the law, so as to reveal the nature of the disease, and provide a basic theoretical basis for the prevention and treatment of disease and nursing care. This was revealed the essence of diseases and provide basic theoretical basis for disease prevention and care. Therefore, physical function is a direct reflection of physical health, and to achieve comprehensive improvement of physical health, it is necessary to ensure the smooth and orderly healthy operation of physical function.

3. Synthesis

The synthesis of this literature emphasizes that adherence to scientific exercise at a certain intensity for a certain period of time has been determined to improve skinfold thickness in obese college students, and that aerobic combined with resistance exercise is a much more effective intervention compared to aerobic exercise alone. It can also improve the subject's body composition, increase the subject's body muscle content, enhance the body's skeletal muscle strength, and have an all-round improvement of the subject's body. At the same time, aerobic exercise can effectively improve the resting heart rate, maximum oxygen uptake and other physical function indicators of obese college students, and aerobic combined with resistance exercise or pure resistance exercise can effectively improve cardiovascular indicators. Therefore, this study takes aerobic exercise combined with

resistance training as the main basis of exercise prescription, in order to enable the subjects to achieve the purpose of weight loss and fat loss, and at the same time to provide a reference exercise program for other colleges and universities with the same needs.

3.1. Theoretical Framework

According to a large number of literatures, the mechanism and theoretical basis of exercise to lose weight include the increase of energy consumption. Exercise can significantly increase the energy consumption of the human body, resulting in negative heat balance of the body, that is, the amount of heat consumed is greater than the amount of heat absorbed. This is the basic premise of exercise weight loss, only when the body consumes more energy than the intake of energy, it will use the stored fat to supply energy, so as to achieve the effect of weight loss. Improve fat metabolism, exercise acts on the neuroendocrine system to reduce fat storage by improving the body's regulation of fat metabolism. Promotes lipolysis. In human tissues, fat cells store large amounts of fat. When aerobic exercise is performed, these fats can directly produce energy through the REDOX reaction for the body to move. Maintain good health, long-term aerobic exercise in addition to weight loss, exercise can also enhance physical fitness, improve the body's metabolic level, improve cardiopulmonary function.

Aerobic exercise can increase the consumption of energy, reduce the fat in the fat cells and make their size decrease. Therefore, for obese people who want to lose weight and fat, scientific and reasonable aerobic exercise is particularly important. Studies have shown that during aerobic exercise, active fatty acid oxidase, can break down a large number of fatty acids in the body; at the same time, long-term aerobic exercise was activated the body's endothelial cells on the lipoprotein lipase system, so that the fat as an energy source of the ability to enhance, help to burn fat to reduce body fat, increase lean body mass. It has also been shown that aerobic combined with resistance exercise can control the accumulation of adipocytes, thereby reducing their size, and can also control obesity by influencing insulin resistance in the body. This provides a theoretical basis for the present study of exercise prescription based on aerobic combined with resistance exercise.

3.2. Research Paradigm

In this study, 30 obese college students were screened through a questionnaire survey, and the causes of obesity in obese college students were explored through understanding their names, ages, years of obesity, dietary habits, exercise habits, and work and rest habits, and individualized exercise prescriptions were formulated. Under the premise of informing the purpose of the experiment, the duration of the experiment, the experimental process, and seeking the consent of the subjects and signing the informed consent form, all the subjects were tested for body shape, body composition, physical function and other indicators before the experiment. The 30 obese college students in the experimental group were subjected to 8 weeks of aerobic and resistance exercise interventions, and after the experiment was completed, the above indexes were tested again for the obese college students in the experimental group. During the eight-week exercise prescription intervention process, in order to facilitate the time of the participants, ensure the attendance and ensure the effect of the experiment, two periods of 5:30 PM and 7:00 PM were arranged for the participants to choose every day. The obese college students participated in the exercise intervention at least six times a week. After eight weeks of experimental intervention, the test results were analyzed to explore the causes of obesity and the feasibility of exercise prescription, in order to provide methodological guidance for college students with obesity problems in other universities. This experimental procedure and test results was provided us with the basis for a physical strengthening program.

3.3. Statement of the Problem

Revise the Statement of the Problem to:

1) What is the profile of the respondents?
2) What is the BMI status of the participants?
3) What are the measurements before training?
4) What are the measurements after training?
5) Are there significant difference between pre- and post intervention.

3.4. Hypothesis

This study tested the following hypotheses at 0.05 level of significance:

H1: After 8 weeks of exercise intervention in the experimental group, they showed significant differences in body morphology, body composition, and physical functioning.

3.5. Significance of the Study

The results generated from this study may have several implications.

The significance of the study is that the findings will have positive implications for several groups such as obese students, school mental health departments, academic institutions, health departments, and obese college students in similar schools.

3.6. Scope and Delimitation

This study is a targeted and applied research in the context of the general decline in college students' physical fitness and the continuous rise in obesity rate. 30 obese college students were screened as the exercise participation group through questionnaires and physical fitness test results, and the diet, sleep and daily participation in exercise of obese college students were understood. A scientific, systematic and reasonable exercise intervention prescription was designed for them under the premise of their voluntariness. After 8 weeks of exercise intervention, the relevant exercise indexes were measured, and the changes in the indexes were explored and analyzed to confirm the feasibility of the exercise prescription. The obese college students involved in this study and some of the volunteers to ensure the high efficiency of the experiment were able to abide by the ethics and maintain the rigor of academic research. The participants of this study included the obese college students, me and some volunteers to ensure the efficiency of the experiment.

Among the subject inclusion and exclusion criteria:

(1) Non-sports majors college students (Non-sports majors college students were selected because they basically do not do other physical activities except for the exercise program of exercise prescription. And the daily courses of physical education majors are mostly skill classes, which themselves need to consume exercise and physical energy. at the end of the 8-week experiment, if there is a significant difference in the indicators, it is impossible to judge whether it is the cause

of the daily classes or the credit of the exercise prescription. (Therefore, in order to make the experiment more pure and the results more objective, some other factors need to be excluded as much as possible);

(2) Body fat percentage >20% for men and >30% for women or BMI ≥28;

(3) No systematic physical activity other than the necessary daily physical activity for six months;

(4) No chronic diseases such as coronary heart disease, hypertension, heart attack, heart failure, chronic hepatitis and some sudden acute diseases;

(5) Mental health, without depression, autism or other mental illnesses;

4. Methodology

4.1. Research Design

The research Design of this study mainly adopts Quasi-Experimental design to fully understand the name, age, obesity years, eating habits, exercise habits, rest habits and other relevant information of obese college students. The body shape, body composition, body function and other relevant indicators of the obese college students in the experimental group were systematically measured before and after the experiment, and the differences in the quantitative indicators of the participants before and after the exercise intervention were discussed and analyzed, so as to explore the feasibility of the intervention program for fat and weight loss of obese college students, aiming at testing the real effect of the intervention measures. In order to ensure the rigor of the experiment, the inclusion criteria of participants need to be strictly controlled, and the inclusion criteria are shown in P. And seriously control the test process to ensure the accuracy of indicators.

To determine the sample size, we used the sample size measurement formula: n=N/(1+Ne2),32 obese non-physical education college students with eligible BMI ≥28, i.e., N=32, and e is the permissible error, taken as 0.05, thus the recommended sample size is 30. This size ensures that the findings are both statistically significant and realistically actionable.

4.2. Research Instrument

The research instrument was consisted of two distinct parts. The initial part was consisted of a profile questionnaire for current college students, obese college students' name, age, years of obesity, eating habits, exercise habits, work and rest habits, and other relevant information.

In the second part, the participants were tested twice before and after the test on relevant indicators such as Body shape, body composition and body function. The test instruments used were as follows: scale, measuring scale, sebum measuring scale, and high-end expert body composition analyzer In Body 770 (Korea). Scale, Measuring tape, Sebum measuring tape, Inbody770 expert body composition analyzer (Korea).In Body 770 expert body composition analyzer (Korea).In Body 770 Expert Body Composition Analyzer (Korea).In Body 770 Expert Body Composition Analyzer (Korea).In Body 770 Expert Body Composition Analyzer (Korea).

Preparation before the test. Remove all metal accessories, belts and other items, and remove shoes; Remove metal objects, such as keys, watches, mobile phones, etc. If the skin is too dry, wipe the palms and soles of the feet with a wet towel; Avoid heavy exercise or drinking lots of water before the test.

Start testing. Stand on the electrode plate to ensure that the sole of the foot is in uniform contact with the electrode plate; First the instrument measures body weight; Enter the necessary information such as height, gender, age, etc. Hold the measuring handle with both hands and press the start button to start measuring; During the measurement, the arm is straight and the body is at a 30 degree Angle until the end of the measurement.

Report printing and reading. Click the report to print according to the screen prompt, you can read the required muscle content, fat content and some other indicators according to the report.

It is important to note that the research questionnaires and test instruments used was underwent rigorous validation and reliability testing prior to implementation. This process was ensured that the instruments accurately measure the intended structures and produce consistent and reliable results. By adhering to this meticulous validation process, the study was maintained the integrity of its data collection methods and increase the credibility of its findings.

5. Conclusion

According to a large number of literatures, the mechanism and theoretical basis of exercise to lose weight include the increase of energy consumption. Exercise can significantly increase the energy consumption of the human body, resulting in negative heat balance of the body, that is, the amount of heat consumed is greater than the amount of heat absorbed. This is the basic premise of exercise weight loss, only when the body consumes more energy than the intake of energy, it will use the stored fat to supply energy, so as to achieve the effect of weight loss. Based on the above theoretical basis, this study combined with the living habits, eating habits, exercise habits and frequency of obese college students in U1 University, formulated exercise prescription, verified the effect of fat and weight reduction, and promoted it to other obese people.

Acknowledgments

Fund Project: Hubei Enshi University Teaching and Research Project (Project number: JYWZ202206).

Literature References

References must be cited in the text within brackets in numerical order, starting with [1]. Do not use Word's automated numbering features. Consecutive reference number citations should be indicated with an n-dash (–) [2–4] or a comma [5, 6] as necessary. In sentences, use the author names instead of "Reference [7]" or "as in [8]" (e.g., "Smith and Smith [9] show ...").

The reference list must be typed in manually. Do not use Word's References feature or numbered list. In the reference list, provide up to three authors' names; if more than three authors, use "et al." Place a space between an authors' initials. Papers that have not been published should be cited as "unpublished" [7]. Papers that have been submitted or accepted for publication should be cited as "submitted for publication" [8]. Please give affiliations and addresses for personal communications [9]. Use sentence case for the words in a paper title.

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