EFFECTS OF BALANCED DIET ASSOCIATED WITH SPORTS ON THE HEALTH OF OBESE UNIVERSITY STUDENTS

ANÁLISE DOS EFEITOS DA DIETA BALANCEADA ASSOCIADA AOS ESPORTES NA SAÚDE DOS ESTUDANTES UNIVERSITÁRIOS OBESOS

ANÁLISIS DE LOS EFECTOS DE LA DIETA EQUILIBRADA ASOCIADA AL DEPORTE EN LA SALUD DE ESTUDIANTES UNIVERSITARIOS OBESOS

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ABSTRACT

Introduction: The student, when entering university, is subject to new cycles and major changes in his routine, which includes exercise and nutritious habits. Objective: Explore the effect of a balanced diet and physical exercise on the health of university students. Methods: Through literature studies, a questionnaire was developed where the physical condition, nutritional habits, dietary structure, and exercise practice of obese college students were investigated and analyzed. Results: The BMI index of those investigated exceeded the standard limit of BMI > 25. The longer the time of physical exercise, the more evident the difference between male and female students in terms of physical endurance factor. The body weight, BMI, and body fat index of both groups showed a downward trend after the intervention. Six weeks of aerobic exercise combined with a proper diet can significantly improve body mass index, body mass index, and physiological and biochemical indices of obese college students. Conclusion: Balanced diet and exercise positively affect the health of obese college students. ***Level of evidence II; Therapeutic studies - investigation of treatment outcomes.***

Keywords: Food and Nutritional Health Promotion; Sports; Obesity; Student Health.

RESUMO

Introdução: O estudante, ao ingressar na universidade, está sujeito a novos ciclos e grandes mudanças em sua rotina, que inclui os hábitos de exercício e alimentares. Objetivo: Explorar o efeito de uma dieta balanceada e exercícios físicos na saúde de estudantes universitários. Métodos: Através de estudos da literatura, elaborou-se um questionário onde foram investigadas e analisadas a condição física, os hábitos alimentares, a estrutura alimentar e a prática de exercícios nos universitários com obesidade. Resultados: o índice de IMC dos investigados ultrapassou o limite padrão de IMC > 25. Quanto maior o tempo de exercício físico, mais evidente é a diferença entre estudantes do sexo masculino e feminino no fator da resistência física. O peso corporal, IMC e índice de gordura corporal dos dois grupos apresentaram tendência de queda após a intervenção. Seis semanas de exercícios aeróbicos combinados com dieta razoável podem melhorar significativamente o índice de massa corporal, índice de massa corporal e índices fisiológicos e bioquímicos de estudantes universitários obesos. Conclusão: Dieta balanceada e exercício físico possuem um efeito positivo sobre a saúde dos estudantes universitários obesos. ***Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.***

***Descritores*:** *Promoção da Saúde Alimentar e Nutricional; Esportes; Obesidade; Saúde do Estudante.*

RESUMEN

Introducción: El estudiante, al entrar en la universidad, se ve sometido a nuevos ciclos y a grandes cambios en su rutina, que incluye el ejercicio y los hábitos alimenticios. Objetivo: Explorar el efecto de una dieta equilibrada y el ejercicio físico en la salud de los estudiantes universitarios. Métodos: A través de estudios bibliográficos, se elaboró un cuestionario en el que se investigó y analizó la condición física, los hábitos alimentarios, la estructura de la dieta y la práctica de ejercicio en estudiantes universitarios con obesidad. Resultados: El índice de IMC de los investigados superaba el límite estándar de IMC > 25. Cuanto mayor es el tiempo de ejercicio físico, más evidente es la diferencia entre los alumnos y las alumnas en el factor de resistencia física. El peso corporal, el IMC y el índice de grasa corporal de ambos grupos mostraron una tendencia a disminuir después de la intervención. Seis semanas de ejercicios aeróbicos combinados con una dieta razonable pueden mejorar significativamente el índice de masa corporal, el índice de masa corporal y los índices fisiológicos y bioquímicos de los estudiantes universitarios obesos. Conclusión: La dieta equilibrada y el ejercicio tienen un efecto positivo en la salud de los estudiantes universitarios obesos. ***Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.***

***Descriptores*:** *Promoción de Salud Alimentaria y Nutricional; Deportes; Obesidad; Salud del Estudiante.*

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INTRODUCTION

With the progress of society and the development of science, human beings have raised their health to a high position, and their requirements for quality of life have also been continuously improved. Eating behavior is the sum of material and spiritual phenomena embodied in people's eating life.[1] Daily eating behaviors include dinner, snacks, drinking and eating out. College students are in the best period of physical and mental development. Eating attitude and behavior play a vital role in meeting their nutritional needs, and the resulting over nutrition or malnutrition is not conducive to their physical and mental health.[2] At present, there are many unhealthy phenomena among college students in China, such as increasing obesity rate, rising myopia rate, unhealthy lifestyle and unhealthy psychology.

College students' obesity will bring physical burden, which will affect their slow movement, resulting in the decline of their physical fitness. It is of great significance to strictly control the overweight rate and obesity rate of college students and help obese college students reduce the degree of obesity.[3,4] We should give full play to teachers' initiative and guiding role, give appropriate encouragement, help students establish clear goals, become interested in campus life, reform their mental health, and conduct psychological lectures from time to time, so as to solve psychological problems for college students, point out the way for life, and make students full of vitality and yearning for future life.

Research objects and methods

Forty-eight obese students (28 males and 20 females) from a sports fat-reducing class in a university were selected, whose BMIl>28 was above 28 and their ages ranged from 18 to 20 years old. The study is Purely observational studies which no need to registry ID of ICMJE, and all the participants were reviewed and approved by Ethics Committee of Xianyang Normal University of China (NO. 2020007). Before exercise intervention, the subjects were given physical examination to exclude patients with congenital heart disease and cardiovascular diseases. All subjects signed the consent form with knowledge. Table 1 below is the basic physical condition table of 48 intervention subjects.

Literature data method

In this paper, literature is used to search for relevant literature in domestic and foreign databases such as library collections and CNKI.

Questionnaire survey method

According to the principles of sociological questionnaire design and the basic requirements of questionnaire design, a questionnaire on college students' physical fitness and sports activities and a questionnaire on college students' lifestyle were designed for the purpose of research. It mainly includes the problems of body shape, physical quality, family inheritance, living habits, sports cognition and activities, dietary structure and so on.

Experimental method

One week before the exercise intervention and one week after the exercise intervention, all subjects were tested for physical form and function items. Body shape indicators include: height, weight, chest circumference, waist circumference, hip circumference, vital capacity, sitting forward flexion and grip strength.

Table 1. General data sheet of subjects before exercise intervention.

Gender	Number of cases	Height (cm)	Age	Weight (kg)	Body fat rate (%)	BMI
Man	28	171.20±8.02	19.36±0.27	92.61±13.96	39.88±4.01	30.14±3.24
Woman	20	162.33±7.51	19.21±0.37	78.33±10.24	38.74±3.26	29.71±2.01

Exercise intervention scheme: 48 obese college students were randomly divided into two groups, 20 in exercise intervention group and 28 in exercise plus diet intervention group. 28 subjects in the intervention group were given exercise plus diet intervention for 6 weeks. The exercise prescription and exercise intensity (target heart rate = quiet heart rate+heart rate reserve × 20% ~ 40%) were determined according to the health status of the subjects.[5] Jogging and walking are the main sports methods. Exercise three times a week for 90 minutes or 120 minutes each time. Prepare for 15 minutes before exercise and stretch for 15 minutes after exercise.

Dietary intervention plan: according to the daily energy consumption of the subjects, estimate the total daily physiological requirement and formulate the nutrition plan. According to the daily calorie requirements of boys and girls, professional nutritionists make diet plans and recipes. Pay attention to the variety of foods. Three meals a day should be cooked, stewed, mixed and marinated according to the ratio of 3: 4: 3. Avoid frying. Every student should prepare a food scale, eat three meals a day in strict accordance with the recipe, and take photos and send them to nutritionists before eating every day.

Mathematical analysis method

Data statistics and processing. After all the data are quantified, a database is established, and SPSS software package is used for statistical analysis. The experimental data are expressed as mean and variance (M, SD).[6] According to the data of physical self-description questionnaire, gender and physical exercise were used to analyze the dimensions of physical self-description, and the statistical results were analyzed with $P \leq 0.05$ as the significant standard and $P \leq 0.01$ as the very significant standard.

An analysis of the body shape and physical quality of obese students

Taking the body mass index specified by WHO as the standard and referring to the obesity standard specified in Redefinition of Obesity and its Treatment in Asia Pacific issued by WHO in 1999 according to the characteristics of Asians:[7,8] BMI < 18.5 is underweight, BMI < 18.5 < 23 is normal weight, BMI < 25 is overweight and BMI > 25 is obesity. The statistical results show that the BMI index of the surveyed obese college students is above 25, which exceeds the standard limit that BMI > 25 is obesity. (Table 2)

The difference of physical self-description in different time of participating in physical exercise

The subjects were asked to participate in the investigation of physical exercise, and the time of participating in physical activities every week was divided into four situations, namely, below 30min, above 1 ~ 3 ~ 6h, above 3 ~ 6h and above 6 h, and participated in the answer of the questionnaire of physical self-description. Taking the exercise time of boys and girls as the dimension, this paper studies the influence of exercise time on 11 dimensions of physical self-description, and carries out variance test. The results show that the longer the time of participating in physical exercise, the more obvious the difference between male and female students in endurance dimension. (Figure 1)

There is no significant difference in boys' understanding and recognition of endurance dimension with different time of participating in physical exercise. On the contrary, with the increase of physical exercise time, girls' evaluation of their endurance dimension changes

Table 2. Body shape index of obese college students.

Gender	Height (m)	Weight (kg)	BMI
Man	1.73±0.21	79.06±8.28	26.74±1.3
Woman	1.66±0.05	65.03±6.53	25.66±0.49

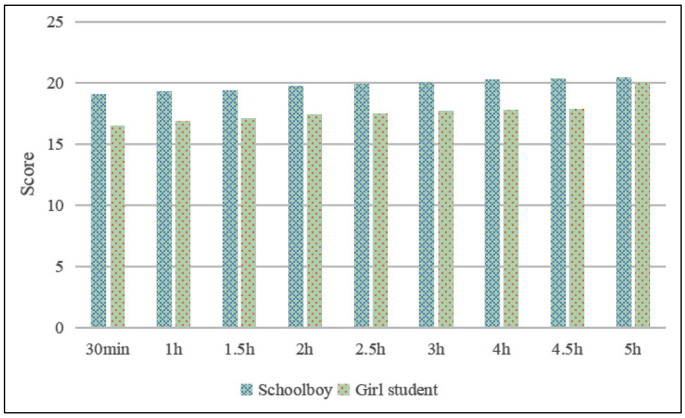

Figure 1. Changes of physical endurance dimensions of boys and girls with time.

more obviously. They think that their endurance is getting better and better with the increase of exercise time. They used to feel tired after one hour of exercise, but now they are not so tired after about one and a half hours of exercise. There are also significant differences between male and female students in sports ability and activity, but in other upper dimensions of physical self-description, the amount of exercise time has no significant effect on physical self-description of male and female students.

Influence of college students' eating attitude on body image consciousness

Taking diet attitude as independent variable and body image consciousness as dependent variable, the linear regression analysis is carried out, and the regression model obtained by analyzing the data by forcing method is shown in Table 3.

The results in the table show that the dietary attitude of college students has no significant effect on the actual body image (β = 0.071, P = 0.007). Self-cognitive body image has significant influence on their eating attitude (β = 0.103, P = 0.028). The effect of expected body image on eating attitude is very significant (β =-0.147, P = 0.003). PA is the difference between self-body image and actual body image. The results show that college students' eating attitude has no significant effect on body image consciousness (β = 0.068, P = 0.261). AD is the difference between the actual body image and the expected body image. The results show that eating attitude has a significant effect on the body image consciousness of college students (β=0.177, P=0.000). PD is the difference between self-cognition body image and expectation image. The results show that eating attitude has a significant effect on body image consciousness (β=0.239, P=0.005).

Influence of exercise intervention on physical fitness of obese college students

As shown in Table 4, after six weeks of exercise intervention for obese college students, both boys' and girls' physical quality evaluation indexes such as 1-minute sit-up, 1-minute skipping, standing long jump, sitting forward flexion, 50m, l000m for boys, 800m for girls, 2400m for boys, 2000m for girls, and vital capacity showed an obvious upward trend.

Table 3. Influence of dietary attitude on body image consciousness.

Body image consciousness	B coefficient	P value
Actual volume image	0.071	0.077
Self-cognitive body image	0.103	0.028*
Expected volume image	-0.147	0.003**
PA	0.068	0.261
AD	0.177	0.000**
PD	0.239	0.005**

Note: "*" means P < 0.05, "* *" means P<0.01.

In this experiment, obese college students were given exercise intervention for 6 weeks, and each index was tested one week before and one week after the intervention. During the 6-week exercise intervention, there were aerobic endurance exercises such as running, jogging, climbing and so on, and the running action, pace and breathing steps of the subjects were improved, so the results in the 50m, 800/l000m and 2000/2400m sports events were significantly improved. During the exercise intervention, the subjects' vital capacity, explosive power and aerobic endurance were improved, so the performance of 50m, 800/800 m, 2000/2400 m and vital capacity were improved.

Changes of body weight, BMI and body fat rate of subjects

Body weight, BMI and body fat rate are the most direct and important indicators to reflect the degree of obesity. At present, BMI is widely used as the criterion of obesity in medical clinic.[9] In this study, after 6 weeks of moderate-intensity, long-term exercise plus diet intervention, the body shape of the diet intervention group and the simple exercise intervention group were improved. Body weight, BMI, and body fat rate of both groups decreased significantly compared with those before intervention.

Figure 2 shows that the weight loss of girls is greater than that of boys, and the weight loss of exercise plus diet intervention group is higher than that of simple exercise intervention group. The decrease of BMI of female students is higher than that of male students. The decrease of BMI of male students in exercise plus diet intervention group is higher than that in simple exercise intervention group, while the decrease of BMI of female students in exercise plus diet intervention group is lower than that in simple exercise intervention group. From the body fat rate, the decrease degree of body fat rate in exercise plus diet intervention group was higher than that in simple exercise intervention group. Losing weight is not only the present weight loss, but also the body fat rate and BMI.

Table 4. Influence of exercise intervention on physical fitness of obese college students.

Index	Schoolboy		Girl student	
	Before intervention	After intervention	Before intervention	After intervention
Sit-ups for 1 minute	38.01±12.63	47.99±11.34	33.67±8.36	46.77±8.69
Jump rope for 1 minute	107.66±30.28	134.25±31.62	106.21±32.81	129.41±30.28
standing long jump	1.78±0.69	1.83±0.61	1.56±0.79	1.66±0.23
Sit and reach	10.37±6.31	12.21±7.88	16.33±5.73	18.49±4.72
50m	7.96±0.43	7.56±0.49	10.01±0.66	9.74±0.52
800/1000m	4.73±0.82	4.49±0.71	4.33±0.78	4.01±0.67
2000/24000m	18.08±1.52	16.78±1.08	14.52±1.73	13.89±1.27
Vital capacity/ml	2890.55±457.53	3471.59±488.24	2973.21±449.72	3389.57±457.39

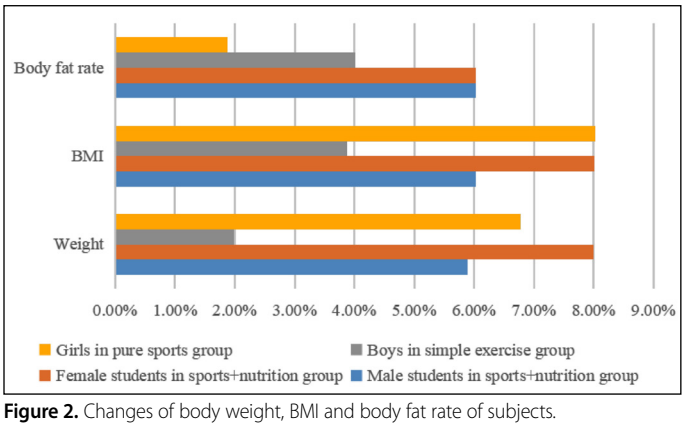

Figure 2. Changes of body weight, BMI and body fat rate of subjects.

No matter the weight, BMI or body fat rate of the girls in the exercise plus diet intervention group decreased obviously. The reason is that during the 6-week exercise intervention period, the girls in the exercise intervention group carried out diet control strictly according to the nutritionist's nutrition collocation, and were able to complete the exercise intervention during the exercise intervention period, so the weight loss and fat reduction effect was the most obvious.

CONCLUSION

After 6 weeks' exercise-diet intervention, the body shape indexes such as body weight, BMI and body fat rate of the two groups showed a downward trend. The effects of body weight and BMI in the exercise-diet intervention group are better than those in the simple exercise intervention group, but the difference is not obvious, but the body fat rate is obviously better than that in the simple exercise intervention group. The change of body fat rate more intuitively reflects the increase and decrease of body fat. The effect of reducing fat in exercise diet intervention group is obviously better than that in exercise intervention group. Long-term exercise intervention can achieve the effect of slimming, shaping and reducing body fat, and the effect of reducing fat is more obvious if it is combined with dietary intervention during exercise intervention.

After 6 weeks' exercise intervention, the physical fitness items of obese college students are improved by 50m, 800m for girls, l000m for boys, 2000m for girls and 2400m for boys, and the aerobic capacity of obese college students can be improved to some extent by 6 weeks' exercise intervention.

There is a significant correlation between college students' dietary attitude and physical activity. The higher the score of dietary attitude, the greater the physical activity.

Eat less foods with high sugar, fat and calories, and don't drink. Relatively reduce the intake of cereals and saturated fatty acids and oils. Eat less or no fried food; When frying dishes, choose oils with high unsaturated fatty acids and put them as little as possible; After the dishes are fried, cover them with clean napkins, and absorb the excess oil on the surface of the dishes before eating; Try to use boiling, stewing and steaming instead of frying, frying and stir-frying.

Because body symmetry and weight are also important components of human health. Health is what everyone pursues, but keeping healthy is a long and complicated process. Only when people take an active part in physical exercise and keep a reasonable diet in daily life can they have a healthy body.

Physical exercise can promote the improvement of physical fitness, improve physical self-efficacy, and achieve the purpose of enhancing self-confidence. The formation of self-confidence is gradually cultivated through the comparison between oneself and others and the process of others' evaluation of oneself, especially the comparison between individual's current evaluation of oneself and past evaluation of oneself.

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