EFFECTS OF PHYSICAL EXERCISE ON THE PHYSICAL CONDITIONING OF COLLEGE STUDENTS

EFEITOS DO EXERCÍCIO FÍSICO SOBRE O CONDICIONAMENTO FÍSICO DOS UNIVERSITÁRIOS

EFECTOS DEL EJERCICIO FÍSICO EN LA CONDICIÓN FÍSICA DE LOS ESTUDIANTES UNIVERSITARIOS

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Zhipeng Zhao[1]
(Physical Education Professional)
Fei Xie[1]
(Physical Education Professional)
RuoBing Geng[1]
(Teaching Assistant)
Weiyu Yuan[2]
(Physical Education Professional)

1. Hebei Sport University, Shijiazhuang, Hebei, China.
2. Hebei Medical University, Shijiazhuang, Hebei, China.

Correspondence:
Weiyu Yuan
Shijiazhuang, Hebei, China, 050000.
18301113@hebmu.edu.cn

ABSTRACT

Introduction: The physical fitness of college students incites an alarming concern. Although the importance of fitness tests for college students has improved, the overall level and range are low. This requires colleges and universities to increase sports awareness and enrich their exercise methods. Relevant scientific articles can assist universities in promoting college students' physical and mental health. Objective: Analyze the effects of exercise on college students' physical fitness. Methods: We randomly selected 30 college students with normal cardiopulmonary function as volunteers for the research. Walking for 30 minutes was promoted, followed by a rapid walking test for college students. Factors such as breathing, heart rate, and other indicators during exercise were collected, measured, and evaluated. Results: The students in the research had good correlations with each index of oxygen uptake, CO2 exhalation, ventilation ratio, and heart rate during uniform running. The value of the indices tended to stabilize about 5 minutes after exercise. Conclusion: Active running exercise can improve aerobic endurance in college students. Physical fitness was improved in this trial. ***Level of evidence II; Therapeutic studies - investigation of treatment outcomes.***

Keywords: *Physical Endurance; Physical Conditioning, Human; Student Health; Exercise.*

RESUMO

Introdução: O condicionamento físico dos estudantes universitários incita uma preocupação alarmante. Embora a importância dos testes de condicionamento físico para os estudantes universitários tenha se aprimorado, o nível geral e sua faixa de variação são baixos. Isso exige das faculdades e universidades atitudes para aumentar a consciência dos esportes e enriquecer seus métodos de exercício físico. Artigos científicos relevantes podem auxiliar as universidades em seus esforços para promover a saúde física e mental dos estudantes universitários. Objetivo: Analisar os efeitos da prática de exercícios físicos sobre o condicionamento físico dos universitários. Métodos: Selecionou-se aleatoriamente 30 estudantes universitários com função cardiopulmonar normal como voluntários para a pesquisa. Foi promovida a caminhada por 30 minutos seguida de um teste rápido de caminhada nos estudantes universitários. Fatores como a respiração, frequência cardíaca e outros indicadores durante o exercício foram coletados, medidos e avaliados. Resultados: Os estudantes da pesquisa tinham boas correlações com cada índice de absorção de oxigênio, exalação de CO2, relação de ventilação e frequência cardíaca durante a corrida uniforme. O valor dos índices tendeu a estabilizar-se cerca de 5 minutos após o exercício. Conclusão: O exercício de corrida ativa pode melhorar a resistência aeróbica dos estudantes universitários. O condicionamento físico foi aprimorado nesse experimento. ***Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.***

Descritores: *Resistência Física; Condicionamento Físico Humano; Saúde do Estudante; Exercício Físico.*

RESUMEN

Introducción: La condición física de los estudiantes universitarios suscita una alarmante preocupación. Aunque la importancia de las pruebas de aptitud física para los estudiantes universitarios ha mejorado, el nivel general y su alcance son bajos. Esto requiere que los colegios y universidades adopten actitudes para aumentar la conciencia deportiva y enriquecer sus métodos de ejercicio físico. Los artículos científicos pertinentes pueden ayudar a las universidades en sus esfuerzos por promover la salud física y mental de los estudiantes universitarios. Objetivo: Analizar los efectos del ejercicio físico en la aptitud física de los estudiantes universitarios. Métodos: Seleccionamos al azar 30 estudiantes universitarios con función cardiopulmonar normal como voluntarios para la investigación. Se promovió el caminar durante 30 minutos seguido de una prueba de marcha rápida en estudiantes universitarios. Se recogieron, midieron y evaluaron factores como la respiración, la frecuencia cardíaca y otros indicadores durante el ejercicio. Resultados: Los estudiantes de la investigación tenían buenas correlaciones con cada índice de captación de oxígeno, exhalación de CO2, relación de ventilación y frecuencia cardíaca durante la carrera uniforme. El valor de los índices tendía a estabilizarse unos 5 minutos después del ejercicio. Conclusión: El ejercicio de carrera activa puede mejorar la resistencia aeróbica de los estudiantes universitarios. En este experimento se mejoró la aptitud física. ***Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.***

Descriptores: *Resistencia Física; Acondicionamiento Físico Humano; Salud del Estudiante; Ejercicio Físico.*

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INTRODUCTION

Aerobic exercise is closely related to human health. There have been many studies on aerobic exercise and human health. At present, the academic burden of college students is too heavy, and the physical activity is too small, which leads to a decline in physical health. College girls tend to participate in fitness activities, mainly aerobic gymnastics and small ball games. Boys mainly participate in large-scale sports such as football and basketball. These items are all aerobic sports.[1] Participating in these physical activities on health is also a concern of many scholars. Jogging aerobic exercise has made many efforts to improve human health. Running has not been paid enough attention to in university physical education. We should make college students better understand the role of running aerobic exercise. Through experiments, this paper makes quantitative research on the science and rationality of physical exercise in colleges and universities. This paper aims to provide a scientific idea and approach for the in-depth development of sports in China.

METHOD

Subjects

This study selected 30 healthy subjects with normal cardiopulmonary function and no motor impairment as experimental subjects.[2] The basic information of the test subjects is shown in Table 1.

This article conducted a 30-minute healthy brisk walk test for college students. After setting the speed on the treadmill, the subjects walked quickly on the treadmill according to the prescribed pace.[3] The subject's respiration and heart rate were measured on this basis.

The test time for healthy running is 30 minutes. This article sets the speed of the treadmill. Subjects wore a portable sphygmomanometer at the left wrist joint for one minute before completing the constant-speed training.[4] Measure their blood pressure immediately after the measurement.

Simulation of cardiorespiratory endurance model in aerobic exercise

In this paper, the heart and lung detection system is used to collect the stable heart rate of the test subjects fifteen minutes before exercise, the instantaneous heart rate before exercise, and the heart rate five minutes after exercise.[5] This paper builds a model based on the collected data (1)

$$\lambda = \frac{r}{\omega} \tag{1}$$

r represents the subject's heart rate is standard. ω stands for lung function index. α_i represents the subject's blood pressure during regular activity and $\bar{\alpha}_{ij}$ represents the blood pressure during recovery during each exercise.

$$1 = \alpha_i - \bar{\alpha}_{ij} \tag{2}$$

This article calculates the magnitude of its rise from the blood pressure during exercise and the blood pressure during recovery.

$$S = \sum_{j=1}^{i} \left(\alpha_i - \bar{\alpha}_{ij}\right)\left(\alpha_i + \bar{\alpha}_{ij}\right) \tag{3}$$

This paper analyzes the blood pressure before and after exercise using the following formula.

$$F = \frac{\alpha_i - \bar{\alpha}_{ij}}{S/(\beta'-)\chi \quad 1} \tag{4}$$

β' represents blood pressure 10 minutes after exercise. χ' stands for highest blood pressure. The subjects were divided into normal and abnormal blood pressure groups according to the different degrees of physical movement.

$$z = (\alpha_i - \bar{\alpha}_{ij}) * \beta' \chi \tag{5}$$

$$t = \frac{\beta' \chi}{\bar{\alpha}_{ij}} \tag{6}$$

The following is the exercise frequency corresponding to the endurance of the heart and lungs of different subjects:

$$Q = \frac{(\alpha_i - \bar{\alpha}_{ij})}{b} \tag{7}$$

The action frequencies corresponding to the rule actions are given below:

$$P = \frac{S/(\beta'-)\chi \quad 1}{b} \tag{8}$$

ETHICAL COMPLIANCE

Research experiments conducted in this article with animals or humans were approved by the Ethical Committee and responsible authorities of Hebei Sport University and Hebei Medical University following all guidelines, regulations, legal, and ethical standards as required for humans or animals.

RESULTS

Determination of various physiological indicators for healthy brisk walking

In the uniform fitness brisk walking, the technical indicators such as oxygen uptake, exhaled CO2 volume, minute ventilation, heart rate, and other technical indicators have a linear relationship with the health value.[6]

Table 1. Subject profiles.

Gender	Male (n=15)	Female (n=15)	P
Age	23.1 ± 1.1	22 ± 1.1	P>0.05
Height/cm	191.4 ± 5.28	179.3 ± 2.86	P>0.05
Weight/kg	71.5 ± 4.62	58.74 ± 4.84	P>0.05
Basal heart rate/n	72.6 ± 5.5	78.1 ± 4.4	P>0.05
Basal blood pressure/mmHg	133.1 ± 8.82/72.25 ± 6.61	138.6 ± 10.11/72.26 ± 7.7	P>0.05

The index value was stable from the beginning of the exercise to about 5 minutes, and then the value gradually increased. (Table 2)

Determination of various physiological indicators of a healthy jogging

The oxygen uptake, CO2 exhalation, minute air volume, heart rate, and other indicators of the research subjects showed a linear relationship when jogging at a uniform speed. From the beginning of the exercise to 5 minutes, the index value gradually stabilized and then gradually increased.[7] The physiological indicators of the research subjects were relatively stable and relatively high during healthy jogging at a uniform speed. (Table 3)

Maximum oxygen absorption test

The participants' heart rate and oxygen uptake will gradually increase with the load.[8] The values decreased until the VO2max was reached and showed a downward trend. (Table 4)

DISCUSSION

Aerobic exercise can decrease the resting heart rate of college students and increase reflexive cardiac output. The results of this study showed that after jogging aerobic exercise, resting heart rate decreased and cardiac function improved.[9] Exercise can improve the physical function level of male college students.

Heart and lung function quality is an essential indicator of an athlete's physical fitness. Different fitness methods have different effects on heart and lung function. Many researchers at home and abroad have conducted many stress tests on different populations.[10] The results showed that moderate load exercise had the best effect on healthy exercise. The results of lactate metabolism and myocardial lactate uptake by isotope analysis showed that the lactate uptake in the myocardium was only 3%-9% during exercise with 40% V. O2max intensity. The exercise above this intensity can improve the resistance of the heart muscle to lactic acid and thus improve the body's function.

When the exercise load was low, the oxygen uptake index was relatively stable, and there was no significant difference in oxygen uptake between male and female athletes.[11] The heart rate index t-test value was $P<0.05$. The significant difference between men and women may be that men and women have different sensitivities to the healthy brisk walking environment, and the heart rate indicators are easily affected under load and time.

This experiment adopts the healthy running method. The subjects ran evenly on the treadmill and set the running speed for 30 minutes. This experiment evaluates the effect of human heart and lung function through the results of a 20-meter run and a Cooper 12-minute run. This method is much better than the current domestic and Harvard ladder methods.

Some experts have researched the heart and lung function changes of men and women who exercise to the "exhaustion" stage and of all age groups. At the same time, they analyzed the relationship between technical indicators such as heart rate and exercise time and the amount of oxygen uptake when exercised to "exhaustion." The study found that all indicators showed apparent age and gender characteristics. In this study, the oxygen uptake t-test value of fitness running was 0.0002 ($P<0.05$), and there was a significant difference between men and women. This indicated that with increasing load, there were significant differences in cardiorespiratory function and exercise capacity between men and women. We recommend paying attention to the intensity of exercise between men and women when engaging in physical activity. The heart rate t-check value was 0.094 ($P>0.05$), indicating no significant difference between the male and female groups. This is mainly due to the gradual stabilization of the heart rate index under high-intensity exercise loads.

The oxygen uptake t-test ($P>0.05$) of healthy brisk walking and healthy jogging has no data significance. Although the exercise load of the two is

Table 2. Physiological parameters of healthy brisk and jogging subjects.

	Go fast		Jogging	
	Male	Female	Male	Female
Oxygen uptake/L·min^{-1}	1.91 ± 0.37	1.32 ± 0.18	2.13 ± 0.41	1.71 ± 0.25
Oxygen max/%	58.5 ± 16.01	60.17 ± 19.54	65.02 ± 15.07	78.02 ± 17.41
Heart rate/time·min^{-1}	138.6 ± 16.5	152.9 ± 15.4	167.2 ± 15.4	173.8 ± 14.3
VO2max heart rate/%	69.52 ± 8.53	76.23 ± 7.81	84.14 ± 8.01	86.87 ± 7.24
Respiratory rate/time·min^{-1}	32.69 ± 5.46	31.53 ± 4.35	41.24 ± 7.11	39.39 ± 6.49
Minute ventilation/L·min^{-1}	42.37 ± 8.84	31.01 ± 4.05	59.31 ± 9.8	42.46 ± 6.56
CO2 exhaled volume/L·min^{-1}	1.52 ± 0.26	1.1 ± 0.14	1.82 ± 0.33	1.49 ± 0.22
respiratory exchange rate	0.88 ± 0.06	0.92 ± 0.04	0.95 ± 0.09	0.96 ± 0.08
Relative oxygen uptake/mL·min·kg^{-1}	30.09 ± 5.42	24.97 ± 2.59	32.86 ± 6.41	32.35 ± 4.61
Oxygen pulse/mL	15.27 ± 2.34	9.27 ± 1.08	14.15 ± 2.84	10.69 ± 1.84
Systolic blood pressure/mmHg immediately after exercise	146.3 ± 13.31	138.6 ± 10.45	149.6 ± 16.5	144.1 ± 13.75
Diastolic blood pressure immediately after exercise/mmHg	83.6 ± 13.2	78.98 ± 8.02	80.3 ± 16.5	78.1 ± 11.00
Post-exercise REP scale values	11.99 ± 1.42	12.31 ± 1.83	13.53 ± 1.6	14.25 ± 1.65

Table 3. Oxygen consumption and heart rate t-test for healthy brisk walking and healthy jogging.

Gender	Male	Female
Fitness walking oxygen intake	1.91 ± 0.37	1.32 ± 0.18
Fitness running oxygen uptake	2.13 ± 0.41	1.71 ± 0.25
Oxygen uptake t	0.06	1.52
Fitness walking heart rate	138.6 ± 16.5	152.9 ± 15.4
Fitness running heart rate	167.2 ± 15.4	173.8 ± 14.3
Heart rate t	1.56	0.0015

Table 4. Information on All Physiological Parameters During the Maximum Oxygen Intake Test.

	Male	Female
Maximum oxygen uptake/L·min^{-1}	3.65 ± 0.43	2.45 ± 0.39
relative maximum oxygen uptake	56.45 ± 8.04	46.57 ± 6.68
VO2max heart rate/time·min^{-1}	205.7 ± 9.9	204.6 ± 6.6
Post-exercise REP scale values	21.07 ± 0.83	21.01 ± 0.77
Fitness running heart rate	167.2 ± 15.4	173.8 ± 14.3
Heart rate t	1.56	0.0015

different, both belong to aerobic exercise. There are significant differences in heart rate indicators between women's healthy brisk walking and healthy jogging. This is because men and women differ in their perceptions of brisk walking and jogging. The heart rate index is susceptible to disturbance and instability during exercise. Comparing these experimental data can provide a basis for evaluating the effect of aerobic exercise training.

The endurance duration of the trunk muscle group can not only reflect the stability of the body's center of gravity but also predict the risk of its occurrence. Students must perform core stabilization exercises to improve trunk extensor and left and proper flexor endurance. Existing studies have shown that the number of exercises significantly affects trunk flexor endurance time. The duration of trunk flexor endurance was significantly longer in those with less than three times. The average of more than five times in 150 seconds. This value is increased by 56% compared with 3~5 times. The average college student wants to improve the endurance of the trunk flexor muscles at least three times a week. More than five workouts will work better. Currently, many sports, such as core stability training, functional training, aerobic training, resistance training, etc., are suitable for ordinary college students to exercise. The isometric contraction test of the lumbar flexor and extensor showed that the duration of isometric exercise endurance of trunk flexor, extensor, and left flexor was prolonged, and its mechanism was related to human body shape, limb explosive force, upper limb tendon exercise endurance, cardiac exercise endurance, and other indicators. The exercise endurance of trunk extensor muscles of ordinary college students is significantly worse than that of flexor muscles. This paper discusses the effects of different exercise frequencies, exercise times, and various exercise forms on exercise, which can improve the exercise endurance of the trunk extensor muscles of general college students and achieve the stability of the center of gravity on the sagittal plane. This is good for their physical health.

CONCLUSION

The 30-minute fitness brisk walk is a moderate-intensity workout. It has a particular role in promoting the health of college students. There was no significant difference in the exercise load levels of male and female students under different load levels. For those willing to participate in physical exercise, this exercise is more scientific and beneficial. There are significant differences in oxygen uptake between men and women. Men and women should pay attention to the appropriate exercise intensity when doing fitness jogging. There was no significant difference in oxygen uptake between men and women in fitness brisk walking and jogging. This shows that fitness brisk walking and fitness jogging are both aerobic exercises. It is helpful to improve the cardiopulmonary function of college students. Students are susceptible to interference in detecting heart rate indicators during moderate-intensity physical exercise. This requires our attention.

The authors declare that they have no competing interests.

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