EFFECT OF AEROBIC EXERCISE ON PHYSICAL FUNCTION INDICES IN THE ELDERLY

EFEITO DO EXERCÍCIO AERÓBICO NOS ÍNDICES DE FUNÇÃO FÍSICA DOS IDOSOS

EFECTO DEL EJERCICIO AERÓBICO EN LOS ÍNDICES DE LA FUNCIÓN FÍSICA DE LAS PERSONAS MAYORES

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ABSTRACT

Introduction: China is currently experiencing the problem of population aging, and the health status of the elderly has become a major focus of social attention. Objective: Study the effect of aerobic exercise on the indices of physical function in the elderly. Methods: 40 elderly people performed aerobic exercise 5 times a week for 8 weeks. Each exercise lasted 60 minutes, including 10 minutes of warm-up, 40 minutes of aerobic exercise (running, brisk walking, square dancing, among other activities), and 10 minutes of final cool-down. Data measurement included body indices, cardiopulmonary function, blood markers, and exercise capacity. Results: Aerobic exercise can effectively improve the body shape, cardiopulmonary function, and blood lipid content of the elderly, and improve their flexibility and physical quality, enhancing their activities of daily living. Conclusion: The results of this study show that aerobic exercise can effectively improve the body performance of the elderly in activities of daily living, effectively optimizing cardiopulmonary and lipid indexes. Engaging the elderly to participate in aerobic exercise should be considered by community social workers. ***Level of evidence II; Therapeutic studies - investigation of treatment outcomes.***

Keywords: Aerobic Exercise; Aged; Physical Fitness.

RESUMO

Introdução: A China enfrenta atualmente o problema do envelhecimento populacional, e o estado de saúde dos idosos tornou-se um dos principais focos de atenção social. Objetivo: Estudar o efeito do exercício aeróbico nos índices da função física nos idosos. Métodos: 40 idosos executaram exercícios aeróbicos 5 vezes por semana durante 8 semanas. Cada exercício teve duração de 60 minutos, incluindo 10 minutos de aquecimento, 40 minutos de exercício aeróbico (corrida, caminhada rápida, dança de quadrilha, entre outras atividades) e 10 minutos de relaxamento final. A mensuração dos dados incluiu índices corporais, função cardiopulmonar, marcadores sanguíneos e capacidade de exercício. Resultados: O exercício aeróbico pode efetivamente melhorar a forma corporal, a função cardiopulmonar e o conteúdo lipídico sanguíneo do idoso, além de melhorar a sua flexibilidade e a qualidade física, aprimorando suas atividades de vida diárias. Conclusão: Os resultados deste estudo mostram que o exercício aeróbico pode melhorar efetivamente o desempenho corporal dos idosos nas atividades de vida diária, otimizando efetivamente os índices cardiopulmonares e lipídicos. O engajamento dos idosos na participação em exercícios aeróbicos deve ser considerada pelos assistentes sociais comunitários. ***Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.***

Descritores: *Exercício Aeróbico; Idoso; Forma Física.*

RESUMEN

Introducción: China se enfrenta actualmente al problema del envejecimiento de la población, y el estado de salud de las personas mayores se ha convertido en un importante foco de atención social. Objetivo: Estudiar el efecto del ejercicio aeróbico sobre los índices de función física en los ancianos. Métodos: 40 ancianos realizaron ejercicio aeróbico 5 veces por semana durante 8 semanas. Cada ejercicio duró 60 minutos, incluyendo 10 minutos de calentamiento, 40 minutos de ejercicio aeróbico (correr, caminar rápido, bailar, entre otras actividades) y 10 minutos de relajación final. La medición de datos incluía índices corporales, función cardiopulmonar, marcadores sanguíneos y capacidad de ejercicio. Resultados: El ejercicio aeróbico puede mejorar eficazmente la forma del cuerpo, la función cardiopulmonar y el contenido de lípidos en la sangre de los ancianos, y mejorar su flexibilidad y calidad física, potenciando sus actividades de la vida diaria. Conclusión: Los resultados de este estudio muestran que el ejercicio aeróbico puede mejorar eficazmente el rendimiento corporal de los ancianos en las actividades de la vida diaria, optimizando efectivamente los índices cardiopulmonares y lipídicos. Los trabajadores sociales de la comunidad deberían considerar el compromiso de los ancianos de participar en el ejercicio aeróbico. ***Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.***

Descriptores: *Ejercicio Aeróbico; Anciano; Forma Física.*

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INTRODUCTION

At present, China is facing the problem of population aging. The population base of the elderly is huge, which leads to many studies on the health problems of the elderly.[1] With the growth of age, people are faced with a series of problems, such as decreased immunity, decreased cell activity, decreased bone density, weakened cardiopulmonary function and so on.[2] Moreover, people in modern society have attached great importance to physical health problems. The elderly group has the willingness to take the initiative to participate in sports to improve their physical health.[3] Therefore, how to exercise effectively to improve their physical functions has become an important research topic in today's society. As we all know, exercise can be roughly divided into aerobic exercise and anaerobic exercise. While most of the anaerobic exercise is based on the muscle enhancement of bodybuilding related personnel, most elderly groups will choose aerobic exercise to improve their physical function.[4] Only by choosing the right exercise method can we effectively improve body function and maintain physical activity. And all sports need to be carried out in a safe environment, especially for the elderly. Various potential safety hazards in the body of the elderly, wrong methods and unsafe sports environment will increase the probability of safety problems.[5] The elderly group urgently needs a set of scientific and standardized aerobic exercise guidance suggestions to help the group improve exercise efficiency and improve physical health.[6] Therefore, we should analyze the exercise principle and study the impact of aerobic exercise on different physical function indexes of the elderly. Popularize relevant knowledge, so that the elderly group can more intuitively understand the function and pertinence of the exercise, so as to promote the improvement of the health status of the elderly group.[7]

METHOD

In this paper, 20 male elderly and 20 female elderly were selected as the research objects in a community university for the elderly The frequency of this experiment is 5 times a week for a total of 8 weeks. It is selected in the evening with appropriate climate. Each exercise lasts 60 minutes, including 10 minutes of warm-up, 40 minutes of aerobic exercise and 10 minutes of end relaxation. The study and all the participants were reviewed and approved by Ethics Committee of Shenyang Sports University (NO.SYSU20-ZF055). Aerobic exercise is carried out in the form of jogging, brisk walking and square dance according to the preferences of the elderly. The work and rest frequency of the elderly is basically the same, and there is no additional physical exercise, so as to reduce irrelevant variables as much as possible and ensure the research effect of the experiment.

The measurement of data mainly includes four major indicators: body shape index, cardiopulmonary function index, blood lipid index and exercise ability index, and several small indicators are included under each major indicator.

Body shape indexes: height, weight, BMI, waist circumference, body fat rate and fat free weight.

Indexes of cardiopulmonary function: step test index, vital capacity, quiet heart rate, diastolic blood pressure and systolic blood pressure.

Blood lipid indexes: TG, TC, HDL-C, LDL-C.

Indexes of exercise ability: 30s standing sitting, 30s arm flexion and extension, 2min standing still, both hands hooking back, chair body flexion forward.

With the help of staff, the elderly measured each index before the beginning of aerobic exercise training and after 8 weeks of aerobic exercise, and sorted and analyzed the data.

RESULTS

Effect of aerobic exercise on body shape indexes of the elderly

Aerobic exercise has many effects on the physical function of the elderly, the most intuitive performance is the change of body shape indicators. Due to the natural differences between men and women, when analyzing the body shape index, the elderly are divided into men and women to analyze the changes of their body shape index.

It can be seen from Table 1 that for the male elderly, the height basically changed little before and after aerobic exercise, but increased slightly, indicating that the elderly can be taller and straight by moderate aerobic exercise. In addition, the body weight index of the male elderly decreased from 70.557 ± 9.1943 kg to 68.535 ± 8.1368kg, and the BMI index decreased from 25.170 ± 2.4173 kg / m ^{2} Reduced to 24.157 ± 2.1049kg/m^2. The waist circumference index decreased from 90.913 ± 7.8531 cm to 87.693 ± 7.0659 cm, the body fat rate index decreased from 30.490 ± 6.0333% to 28.546 ± 5.2286%, and the fat free weight index increased from 48.813 ± 5.7985 kg to 50.145 ± 4.9043 kg ($P < 0.05$).

It can be seen from Table 2 that for the female elderly, the height increased slightly before and after aerobic exercise, making the elderly more tall and graceful. In addition, the body weight index of female elderly decreased from 57.278 ± 5.4022 kg to 55.909 ± 5.1454kg, and the BMI index decreased from 23.719 ± 2.6681 kg / m ^{2} Reduced to 23.031 ± 2.5621 kg / m^2, $P > 0.05$, indicating no significant difference. The waist circumference index decreased from 83.203 ± 8.6613 cm to 79.749 ± 7.1218 cm, the body fat rate index decreased from 33.742 ± 5.3464% to 31.783 ± 5.0432%, and the fat free weight index increased from 36.863 ± 2.9166 kg to 38.252 ± 2.7849 kg ($P < 0.05$).

A comprehensive analysis of the impact of aerobic exercise on the body shape indicators of the elderly can be seen that the height of the elderly has a slight increase in both men and women, indicating that aerobic exercise can improve the hunchback of the elderly and make them taller and straight. Before and after the experiment, the body weight index of male and female elderly has a downward trend, and the fat free body weight index has an upward trend, indicating that aerobic exercise can reduce the fat content in the elderly and make their BMI index more scientific. Through the analysis of the optimization range between male and female elderly people, it can be seen that the body fat rate of women is always higher than that of men, and the reduction range of BMI index is also lower than that of male elderly people. Therefore, the change of body shape of aerobic exercise is more obvious than that of male elderly people.

Table 1. Changes of body shape indexes of male elderly before and after aerobic exercise.

Item	Before	After	P
Height (cm)	171.732±5.6223	171.722±5.6223	0.6735
Weight (kg)	70.557±9.1943	68.535±8.1368	0.0192
BMI (kg/m^2)	25.170±2.4173	24.157±2.1049	0.0010
Waist (cm)	90.913±7.8531	87.693±7.0659	0.0081
Sensory fat ratio (%)	30.490±6.0333	28.546±5.2286	0.0000
Take fat weight (kg)	48.813±5.7985	50.145±4.9043	0.0000

Table 2. Changes of body shape indexes of female elderly before and after aerobic exercise.

Item	Before	After	P
Height (cm)	154.324±3.6197	154.402±3.6307	0.3348
Weight (kg)	57.278±5.4022	55.909±5.1454	0.1032
BMI (kg/m^2)	23.719±2.6681	23.031±2.5621	0.1458
Waist (cm)	83.203±8.6613	79.749±7.1218	0.0089
Sensory fat ratio (%)	33.742±5.3464	31.783±5.0432	0.0000
Take fat weight (kg)	36.863±2.9166	38.252±2.7849	0.0000

Effect of aerobic exercise on endocrine indexes of the elderly

The cardiopulmonary function and blood lipid indexes of the elderly are important factors affecting the physical function of the elderly, and are also closely related to many high-risk diseases of the elderly. Therefore, the endocrine indexes of the elderly are measured in this section, so as to explore the impact of aerobic exercise on the physical function indexes of the elderly.

It can be seen from Table 3 that before and after aerobic exercise, the step test index of the elderly increased from 61.847 ± 5.1475 to 66.354 ± 6.0217, the vital capacity increased from 2303.587 ± 301.6499 to 2587.541 ± 301.4744, the quiet heart rate decreased from 79.023 ± 3.7862 to 74.396 ± 3.7190, and the systolic blood pressure decreased from 131.192 ± 12.0949 to 123.023 ± 11.7953, $P < 0.05$, indicating a significant difference. Diastolic blood pressure decreased from 84.817 ± 3.7427 to 80.257 ± 3.6738, $P > 0.05$, indicating that there was no significant difference. It can be seen that aerobic exercise can better improve the heart and lung function of the elderly, so as to reduce the incidence of heart disease or sudden death, which is conducive to the physical and mental health of the elderly.

It can be seen from Table 4 that before and after aerobic exercise, the TG index of the elderly decreased from 1.534 ± 0.5784 to 1.339 ± 0.6119, the TC index decreased from 4.996 ± 0.6692 to 4.552 ± 0.7289, the HDL-C index increased from 1.417 ± 0.2914 to 1.768 ± 0.2127, and the LDL-C index decreased from 2.834 ± 0.5713 to 2.566 ± 0.5868, $P < 0.05$, indicating significant differences. Through the research, it can be seen that aerobic exercise can effectively improve the changes of blood lipid content of the elderly and make them healthier. The improvement of blood lipid indexes in the elderly can greatly reduce the occurrence of thrombosis, hyperlipidemia and hypertension, and can also play a good role in alleviating the existing related cardiovascular diseases, so it is worth popularizing.

Effect of aerobic exercise on exercise ability indexes of the elderly

It can be seen from Table 5 that before and after aerobic exercise, the motor score of 30s standing and sitting of the elderly increased from 24.329 ± 4.0055 times to 23.888 ± 4.9324 times, the motor score of 30s arm flexion and extension increased from 24.059 ± 3.9214 times to 27.148 ± 3.7278 times, the motor score of 2min standing still increased from 122.375 ± 14.5336 times to 138.883 ± 15.6138 times, and the motor score of both hands back hook increased from 4.660 ± 4.3503 cm to 2.176 ± 6.1279 cm, The motor score of chair body flexion increased from 10.998 ± 10.2164 cm to 18.133 ± 6.0404 cm, $P < 0.05$, indicating that there was a significant difference. According to the research results, the exercise ability of the elderly has been improved to a certain extent after aerobic training, which shows that an appropriate amount of aerobic exercise can improve the physical flexibility and physical quality of the elderly, so as to make the elderly more convenient in daily life.

Table 3. Changes of cardiovascular and pulmonary function indexes in the elderly before and after aerobic exercise.

Item	Before	After	P
Stairs experiment index	61.847±5.1475	66.354±6.0217	0.0337
Lung capacity	2303.587±301.6499	2587.541±301.4744	0.0278
Quiet heart rate	79.023±3.7862	74.396±3.7190	0.0346
Diastolic	84.817±3.7427	80.257±3.6738	0.0691
Shrink pressure	131.192±12.0949	123.023±11.7953	0.0435

Table 4. Changes of blood lipid indexes of the elderly before and after aerobic exercise.

Item	Before	After	P
TG	1.534±0.5784	1.339±0.6119	0.0319
TC	4.996±0.6692	4.552±0.7289	0.0384
HDL-C	1.417±0.2914	1.768±0.2127	0.0433
LDL-C	2.834±0.5713	2.566±0.5868	0.0215

Table 5. Changes of exercise ability indexes of the elderly before and after aerobic exercise.

Item	Before	After	P
30s standing (times)	24.329±4.0055	23.888±4.9324	0.0738
30S arm flexion (times)	24.059±3.9214	27.148±3.7278	0.0440
2MIN original stepping (times)	122.375±14.5336	138.883±15.6138	0.0110
Hand Hook (cm)	4.660±4.3503	2.176±6.1279	0.1446
Sithing body flexion (cm)	10.998±10.2164	18.133±6.0404	0.0033

DISCUSSION

Different aerobic exercises have a positive impact on the health status of the elderly in different aspects.

Proper aerobic exercise has a positive impact on various physical function indexes of the elderly. It plays a positive role in maintaining the health of the elderly. Aerobic exercise can improve the cardiopulmonary function of the elderly, and can effectively alleviate and prevent cardiovascular diseases in the elderly; Improve the physical immunity of elderly groups and prevent disease invasion; Reduce the probability of respiratory system problems, improve the respiratory problems of the elderly, increase the amount of oxygen inhaled and exhaled, improve the oxygen delivery efficiency and improve the oxygen utilization efficiency; Maintain bone and muscle health and effectively prevent osteoporosis caused by age; Effectively improving the brain can delay the weakening of brain level and prevent Alzheimer's disease; Maintain cell activity and delay aging; Maintain the basic metabolic level and maintain the level of body muscle mass; Strengthen the body's blood circulation ability and maintain the content of body active cells; Improve the activity of nervous system and ensure the integrity of nervous system function; Maintain the normal function of endocrine system and promote the secretion of various positive hormones in the body; Collective aerobic exercise is conducive to the mental health of the elderly. Through social behavior with other lovers, it can help the elderly achieve physical and mental health at the same time.

CONCLUSION

The results of this study show that aerobic exercise can effectively improve the body shape of the elderly, reduce the fat content and make their body more symmetrical. In addition, aerobic exercise can effectively optimize the cardiopulmonary indexes and blood lipid indexes of the elderly, so as to reduce the occurrence of acute or chronic diseases such as hypertension, hyperlipidemia, cerebral thrombosis and coronary heart disease. Finally, aerobic exercise can effectively promote the daily exercise indicators of the elderly, so as to make the elderly more convenient in their daily life. In view of these advantages, the author believes that relevant community social workers and personnel of relevant departments should seriously study the relevant sports knowledge of the elderly, and purposefully organize the elderly to participate in aerobic exercise, moderate exercise, scientific exercise and reasonable exercise, so as to improve the physical health of the elderly.

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REFERENCES

1. UNFPA and HelpAge International. Ageing in the 21st Century: celebration and challenge. New York: UNFPA; 2012.
2. Pereira JC, Barreto SM, Passos VM. O perfil de saúde cardiovascular dos idosos brasileiros precisa melhorar: estudo de base populacional. Arq Bras Cardiol. 2008;91(1):1-10.
3. Long X, Xun L. Construction of community sports public health platform from the perspective of "Internet +" and "Healthy China". Shandong sports science and technology. 2019;41(4):71-4.
4. Ferrari R, Umpierre D, Vogel G, Vieira PJ, Santos LP, De Mello RB, et al. Effects of concurrent and aerobic exercises on postexercise hypotension in elderly hypertensive men. Exp Gerontol. 2017;98:1-7.
5. Chodzko-Zajko WJ, Proctor DN, Fiatarone Singh MA, Minson CT, Nigg CR, Salem GJ, et al. American College of Sports Medicine position stand. Exercise and physical activity for older adults. Med Sci Sports Exerc. 2009;41(7):1510-30.
6. Balboa-Castillo T, León-Muñoz LM, Graciani A, Rodríguez-Artalejo F, Guallar-Castillón P. Longitudinal association of physical activity and sedentary behavior during leisure time with health-related quality of life in community-dwelling older adults. Health Qual Life Outcomes. 2011;9:47.
7. Alves CR, Gualano B, Takao PP, Avakian P, Fernandes RM, Morine D, et al. Effects of acute physical exercise on executive functions: a comparison between aerobic and strength exercise. J Sport Exerc Psychol. 2012;34(4):539-49.