SPORTS IMPROVE THE INDEXES CARDIOVASCULAR PHYSIOLOGICAL EFFECTS

ESPORTES LEVANDO À MELHORIA DOS ÍNDICES DE EFEITOS FISIOLÓGICOS CARDIOVASCULARES

DEPORTES LLEVANDO A LA MEJORÍA DE LOS ÍNDICES DE EFECTOS FISIOLÓGICOS CARDIOVASCULARES

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Jia Xu[1]
(Physical Education Professional)

1. Changzhou College of Information Technology, Changzhou, Jiangsu, China.

Correspondence:
Jia Xu
Changzhou, Jiangsu, China.
213161. czwangjingfang@163.com

ABSTRACT

Introduction: Cardiovascular function is one of the main factors affecting health. The influence of different exercise intensities on cardiovascular function needs further research. Objective: To study the relationship between physical activity and cardiovascular disease in the elderly. Method: The article conducted a follow-up survey of 1,564 older adults. Elders who practice sports and those who do not went through the hemodynamic index test, which analyzed the relevant effects of physical exercise on their cardiovascular function. Results: Older adults who exercise regularly show good adaptability to exercise. Conclusion: Physical exercise can promote the function of the cardiovascular system. ***Level of evidence II; Therapeutic studies - investigation of treatment results.***

Keywords: Sports; Cardiovascular system; Physiological Concepts, Cardiovascular.

RESUMO

Introdução: A função cardiovascular é um dos principais fatores que afetam a saúde. A influência da atividade física com diferentes intensidades na função cardiovascular precisa ser pesquisada mais a fundo. Objetivo: Estudar a relação entre atividade física e enfermidades cardiovasculares em idosos. Método: Este artigo realizou um questionário de acompanhamento com 1.564 idosos. Os idosos que praticam atividades físicas e aqueles que não o fazem passaram por testes de índices hemodinâmicos, que analisaram quais foram os efeitos relevantes da atividade física sobre sua função cardiovascular. Resultados: Idosos que praticam atividades físicas regularmente demonstraram boa adaptabilidade à atividade física. Conclusão: A atividade física pode ser benéfica para o funcionamento do sistema cardiovascular. ***Nível de evidência II; Estudos terapêuticos – investigação do resultado de tratamentos.***

Descritores: *Esportes; Sistema cardiovascular; Fenômenos Fisiológicos Cardiovasculares.*

RESUMEN

Introducción: La función cardiovascular es uno de los principales factores que afectan a la salud. La influencia de la actividad física con diferentes intensidades en la función cardiovascular necesita ser investigada más a fondo. Objetivo: Estudiar la relación entre actividad física y enfermedades cardiovasculares en ancianos. Método: Este artículo realizó un cuestionario de acompañamiento con 1.564 ancianos. Los ancianos que practicaban actividades físicas y aquellos que no lo hacen pasaron por pruebas de índices hemodinámicos, que analizaron cuáles fueron los efectos relevantes de la actividad física sobre su función cardiovascular. Resultados: Ancianos que practican actividades físicas regularmente demostraron buena adaptabilidad a la actividad física. Conclusión: La actividad física puede ser benéfica para el funcionamiento del sistema cardiovascular. ***Nivel de evidencia II; Estudios terapéuticos – investigación del resultado de tratamientos.***

Descriptores: *Deportes; Sistema cardiovascular; Fenómenos Fisiológicos Cardiovasculares.*

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INTRODUCTION

Cardiovascular function is one of the main factors that affect the health of the elderly. What is the effect of different exercise intensities on cardiovascular function is currently not detailed enough. In this study, the cardiovascular system of the elderly who participated in the exercise of different intensity items was tested and analyzed.[1] This article provides a theoretical basis for the scientific fitness of the elderly.

METHOD

Research object

We selected 45 retired men aged 61 to 70 as the subjects. The volunteers did not take long-term exercise upon inquiry.[2] We randomly divided the subjects into 3 groups: slow walking group (group A, n=15), fast walking group (group B, n=15), and jogging group (group C, n=15). The basic conditions of the subjects are shown in Table 1.

Experimental method

Exercise plan

Each group exercised at the required intensity for 30 minutes every morning, 4 days a week. The remaining 3d are all walking slowly.[3] The duration is 10 weeks. RPE controls exercise intensity. Compare changes in cardiovascular function before and after exercise.

Table 1. The basic situation of the experimental subjects.

Group	N	Age	Height/cm	Weight/kg
Group A	15	63.67±2.19	168.60±4.47	69.67±4.13
Group B	15	64.40±2.20	170.53±4.67	66.73±6.23
Group C	15	63.73±2.22	169.93±4.77	70.20±3.42

Test instruments and indicators

We use an AZN-J30 cardiovascular health monitor and desktop sphygmomanometer to measure cardiovascular function. Test indicators include heart rate, blood pressure, cardiac output (CO), stroke volume (SV), stroke index (SI), heart index (CI), myocardial oxygen consumption (HOV).

Statistics

All test data uses SPSS13.0 statistical software for statistical processing. Paired Samples Test was used for intra-group comparison, and One way ANOVA was used for inter-group comparison.

Cardiovascular disease data modeling

The weight calculation process of the influence of human physiological parameter data on cardiovascular disease defines the positive and negative density of individual physiological parameter samples.[4] The density of the same category as the physiological parameter sample x_i of the person to be predicted is the positive density $\rho(x_i)^+$. The category density different from the sample x_i is negative density $\rho(x_i)^-$. The average physiological data sample density of the same category is

$$\rho^+ = \frac{1}{m^+}\sum_{i=1}^{m}\rho(x_i)^+ \quad (1)$$

If the positive density and negative density values of a physiological parameter sample are small, the probability that the physiological parameter data sample is an isolated point is very high.[5] If the positive density of a parameter sample is small and the negative density is large, the probability that this sample is redundant data is high. On the contrary, if the positive density of the sample is large and the negative density is small, it means that the sample is a sample of normal human physiological parameters. Therefore, the position and importance of the sample in the physiological data collection can be calculated. Set the density function of individual sample points as the normal distribution density function

$$p(x) = \frac{1}{\sqrt{2\pi\sigma}}\exp^{\frac{1}{2\sigma^2}(x-\mu)^2} \quad (2)$$

Then: 1) The weight of the support point is 1. 2) The weight interval of the normal sample except the support point is (0, 1). 3) The weights of noise and outliers are very small or zero. The weighted index can be calculated by the following formula

$$s_i = \frac{\rho(x_i)^+}{\rho(x_i)^+ + \rho(x_i)^-} * \frac{\rho(x_i)^+}{\rho^+} \quad (3)$$

The methods described above can be completed valuable data screening for predicting cardiovascular diseases.[6] The prediction results of potential cardiovascular diseases are obtained by comparing them with standard parameters.

RESULTS

Heart function

In the experiment, the resting heart rate before exercise, the resting heart rate after exercise, and the heart rate immediately after exercise were tested (Table 2). We compared the heart rates of the three groups before exercise, and the results showed no significant difference.[7] This shows that the test objects belong to the same population and meet the requirements of the experiment. Compared with the resting heart rate before exercise, the resting heart rate of groups B and C after exercise decreased, and the difference was significant (P<0.05). After a one-way analysis of variance, it was found that only group C had a decrease of 3.40. Compared with group A, the difference was significant (P<0.05). The results show that brisk walking and jogging can change subjects' heart rate at rest, especially in group C.

The heart rate immediately after exercise measured in the experiment is consistent with the exercise intensity of each group. The heart rate of the slow walking group (group A), fast walking group (group B), and jogging group (group C) showed a gradual increase after exercise.[8] The difference between group B and group A is significant. The differences between group C, group A, and group B are all significant. The results showed that the exercise intensity of group C stimulated the heart the most, followed by group B.

We test some of the main indicators of heart function SV, CO, SI, CI, HOV. At the same time, we compare the differences before and after the experiment in each group (Table 3).

The SV of the subjects before and after the experiment was significantly different, and the difference was significant (P<0.05). Among them, the SV of group C increased the most, and the difference was significant compared with the two groups A and B (P<0.05). The CO of subjects before and after the experiment did not change much. Only the difference between group C and group A was different (P<0.05). There was no significant change in the SI and CI of the subjects before and after the experiment. However, the difference in myocardial oxygen consumption HOV between group B and group C was significantly compared to before the experiment. In particular, the difference in group C is significant compared with group A. The results show that jogging and brisk walking can increase the subjects' SV and reduce the HOV. It has little effect on CO, SI, and CI.

Comparison of vascular function

The systolic and diastolic blood pressure of the subjects before and after exercise are shown in Table 4. It can be seen from Table 4 that the systolic blood pressure and diastolic blood pressure of subjects in either group decreased after exercise, and the difference was significant (P<0.05). The difference between group C is the most obvious. The test results show that the system's long-term physical exercise, especially jogging, can lower the subjects' blood pressure.

Table 2. Rest heart rate before and after exercise and heart rate immediately after exercise.

Group	Resting heart rate before exercise	Resting heart rate after exercise	Heart rate difference before and after exercise	Heart rate immediately after exercise
A	71.73±2.96	71.80±2.78	0.93±2.40	96.40±5.26
B	71.20±2.14	69.13±1.92	2.07±2.37	110.93±5.09
C	71.47±2.97	68.07±2.19	3.40±2.56	127.87±9.60

Table 3. Changes of cardiac function indexes SV, CO, SI, CI, HOV.

Group		SV (ml)	CO(L/min)	SI(m/lb/m²)	CI(L/min/m²)	HOV(m/lmm)
A	Before	94.20±8.56	6.82±0.46	54.32±5.44	4.02±0.84	55.88±7.36
	After	94.67±8.40	6.83±0.46	55.64±4.32	3.96±0.76	55.43±6.92
	difference	0.47±1.46	0.01±0.11	1.32±2.86	0.06±0.26	0.45±7.65
B	Before	92.47±9.01	6.80±0.55	54.78±8.92	3.95±0.52	56.65±8.53
	After	93.33±9.01	6.78±0.54	56.13±8.65	4.12±0.56	55.18±8.32
	difference	0.87±1.36	0.02±0.16	-1.35±3.54	-0.17±0.24	1.47±7.26
C	Before	92.27±6.75	7.04±0.36	57.21±6.41	3.88±0.62	56.44±8.14
	After	94.77±6.90	6.90±0.47	58.79±11.06	4.00±0.78	54.13±10.12
	difference	2.40±1.60	0.14±0.28	-1.58±8.68	0.12±0.32	2.31±9.47

Table 4. Changes in blood pressure.

Group	Systolic blood pressure (mmHg)		
	Before exercise	After exercise	difference
Group A	138.55±12.96	136.42±11.12	2.13±11.78
Group B	137.43±15.12	135.06±14.17	2.37±13.65
Group C	138.12±16.33	134.48±13.14	3.64±13.48
Group	**Diastolic blood pressure (mmHg)**		
	Before exercise	**After exercise**	**difference**
Group A	86.98±12.40	83.14±11.44	3.84±12.12
Group B	85.67±15.26	80.45±15.12	5.22±14.56
Group C	86.42±15.13	80.62±14.08	5.80±14.75

DISCUSSION

The impact of different exercises on the heart function of the elderly

The experimental results show that older people with different exercise intensities have improved and improved their cardiovascular function to varying degrees after exercise. Jogging exercise can improve the cardiovascular function of the elderly. This exercise increases the strength of the myocardium and is beneficial to the blood circulation of the human body. Compared with slow walking and fast walking, jogging has a greater impact on the blood circulation of the elderly, and the demand is higher. Therefore, the resulting functional response and adaptive changes in form are also more obvious.

With the increase of age, the human body begins to age gradually, and the contractility of the heart also gradually decreases. The parenchymal cells in the heart of the elderly have decreased for several days. Myocardial fibrosis and amyloidosis have occurred. This causes the myocardium to shrink, and the coronary arteries gradually harden. This also leads to reduced myocardial contractility and poor pumping function. Secondly, the elasticity of blood vessels in the elderly decreases, the arterial wall is hardened, and the lumen becomes narrow.[9] This increases the peripheral resistance of blood vessels, increases arterial pressure, and increases blood viscosity. The above results lead to an increase in the workload of the heart. Generally, older adults have a heavy heart load, poor blood vessel wall elasticity, and high blood pressure. The arterial wall has a high degree of hardening, so they are more likely to induce cardiovascular diseases.

The impact of different exercises on the vascular function of the elderly

The experimental results show that brisk walking and jogging can effectively reduce diastolic blood pressure, which positively affects the prevention of cardiovascular diseases. Brisk walking does not affect the systolic blood pressure of the elderly. Only jogging can reduce systolic blood pressure. Jogging has a good effect on the blood vessel function of the elderly. This exercise mode mainly reduces the peripheral resistance of blood vessels and improves the elasticity of blood vessels. This achieves the effect of reducing the load on the heart. The decrease of diastolic blood pressure is directly related to the decrease of peripheral vascular resistance. The decrease of systolic blood pressure indicates that the decrease of peripheral resistance reduces the load on the heart, and the function of the heart is also reduced.

The choice of exercise intensity for the elderly

The effect of fitness exercise mainly depends on the appropriate exercise load. Among them, exercise intensity is the key. Exercise intensity plays an important role in the fitness effect. Heart rate is a simple and easy test index to understand the cardiovascular function, and it is often used to reflect the intensity of exercise. Heart rate is an objective indicator of the impact of exercise on the human body and the exerciser's self-monitoring. The results of this experiment showed that the exercise heart rate of the jogging group reached 127.87±9.60 times a min. Exercise at this intensity can effectively improve cardiovascular function. According to the age characteristics of the experimental subjects and the purpose of the exercise, we can suggest that healthy elderly people between 60 and 70 years old should adopt "190-age" to determine the target heart rate when improving cardiovascular function. This calculation method is higher than the result of the heart rate calculation method suggested in the textbook. Therefore, you should pay attention to safety while considering fitness effects. This result is only applicable to healthy older people aged 60 to 70 without cardiovascular disease.

CONCLUSION

1) Different exercise intensities have different degrees of influence on the cardiovascular function of the elderly. 2) Jogging exercise can reduce systolic blood pressure and save myocardial function while reducing diastolic blood pressure. 3) It may be more scientific for healthy elderly people aged 60-70 to adopt "190-age" to determine the target heart rate when improving cardiovascular function.

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