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Study of aerobic exercise effect on the cardiopulmonary function of the middle-aged and elders based on the contrast experiment

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ABSTRACT

With the continuous development of social economy, people's living standards continue to improve, and material life has also been greatly enriched, many people pursue not only the basic needs of life, but pay more attention to keep healthy, adhere to the sports. Aerobic exercise, as a simple and easy to insist on sport, is accepted by majority of fitness enthusiasts, especially some old friends who are keen on fitness. Through consulting the relevant data and combining with the experimental data, the research selects 200 old people who adhere to aerobic exercise for a long time and 200 old people who barely participate in aerobic exercise in a given area. Among them, there are 150 male, 50 female who adhere to aerobic exercise and 150 male, 50 female who not participate in aerobic exercise. Compare and analyze the physical condition of the middle-aged and elders who adhere to aerobic exercise and no aerobic exercise, summarizing the effects of aerobic exercise on cardiopulmonary function of the middle-aged and elders. The research shows that proper aerobic exercise can stimulates physical and mental health of the middle-aged and elders, especially the cardiovascular health, to be specific speaking, the effects of aerobic exercise on physical health of middle-aged and elders mainly include the following aspects: coordinate the composition indicators of the middle-aged group, strengthen the pulmonary ventilation function of the middle-aged and elders and improve cardiopulmonary function of the middle-aged and elders. In order to enhance physique of the middle-aged and elders, the study also gives some Suggestions: starting from the short time, low intensity aerobic exercise, insisting quantitative and regular aerobic exercise for a long time, selecting suitable aerobic exercise programs, etc.

KEYWORDS

Contrast experiment; Aerobic exercise; The middle aged and elders; Cardiopulmonary function.



INTRODUCTION

With the deepening of China's population aging phenomenon, the living state and health of the middle-aged and elder has received widespread attention from all walks of life. After people entering middle age, due to the natural decline of a variety of physiological and biochemical function of body and the relative reduction of physical activity, the risk of suffering from various cardiovascular and cerebrovascular diseases has increased because of the increase of body fat and the decline of cardiovascular function. The exercise capacity will be limited because of their muscle atrophy and decline of lean body weight, resulting in all sorts of regressive dysfunction diseases, thus the health of the middle-aged and elders is threatened directly^[1]. To improve the physical condition of the old people, the old people not only start from the diet and living habits to improve, but also need to combine some simple effective and easy to insist on aerobic exercise. According to a survey, physical exercise which taking physical exercise as the main way can improve the physiology function of the organ system of the elderly people, this benefit has been widely recognized by the academic community^[2]. For a long time, many scholars at home and abroad have conducted investigation and study on the relationship between the sports and the health of the middle-aged and elder from different points of view. The research through the method of comparative analysis compares the physical condition of 200 middle-aged and elderly people who participate in aerobic exercise and other 200 middle-aged and elderly people who not participate in aerobic exercise in some region, and whether they participate in aerobic exercise or not and their gender have also been classified to summary. The effect of aerobic exercise on the body composition and cardiopulmonary function of the middle-aged and elders has been obtained from discussion, and the different effects of aerobic exercise on cardiopulmonary function of the middle-aged and elder male and female has been refined, so as to better promote the healthy development of China's elderly population.

THE RESEARCH OBJECT AND METHODS

The research object

The research randomly selects 200 middle-aged and elderly people who adhere to aerobic exercise in a certain region (male 150, female 50), these 200 middle-aged and elderly people all have adhere to aerobic exercise for a long time (aerobic exercise include shadowboxing, jogging, body mechanics and so on), at the same time, the research randomly selects 200 middle-aged and elderly people who rarely participate in aerobic exercise (male 150, female 50), people in the two groups are all health, and there was no serious disease and other conditions. The basic conditions of the selected samples are shown in TABLE 1. And as can be seen from Figure 1 and Figure 2, the most popular aerobic exercise programs with middle-aged and old male are mainly walking, jogging, shadowboxing, while the most popular aerobic exercise programs with middle-aged and old women are body mechanics, walking and jogging.

TABLE 1 : The basic conditions of sample

group	gender	popular(number)	age(year)	weight(kg)	height(cm)
Participate in aerobic exercise	Male	150	55.65±5.51	66.17±10.76	172±3.01
	Female	50	54.41±5.01	60.96±11.03	161±3.22
Not participate in aerobic exercise	Male	150	56.32±4.98	65.12±11.43	174±3.40
	Female	50	55.78±5.12	59.17±10.94	160±3.90

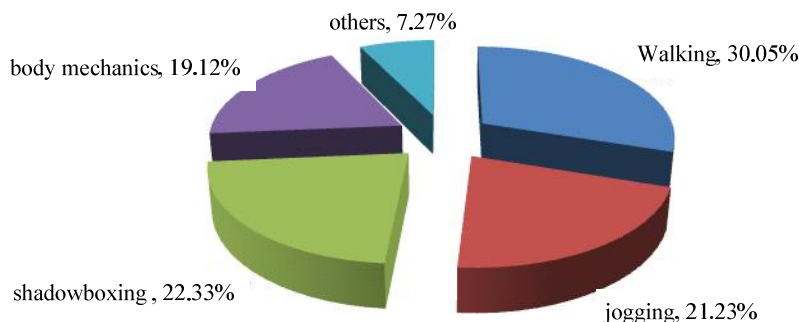


Figure 1 : The most popular aerobic exercise programs with the old man

The research method

The method of literature

Study medicine monographs including physiology, sports physiology and so on carefully, learning about aerobics exercise and other relevant information. And read classic, mastering quantitative measurements of the cardiopulmonary function.

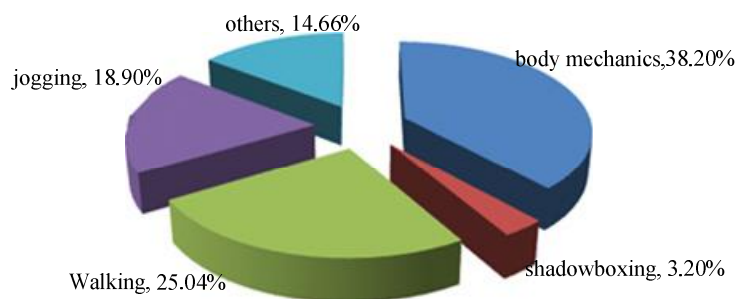


Figure 2 : The most popular aerobic exercise programs with the middle-aged and old women

Questionnaire method

The questionnaire will be designed on the basis of reading relevant literature, understand the physical indicators of the middle-aged and elders, at the same time, the basic conditions of the middle-aged and elder surveyed shall be mastered, such as age, education, sports, etc.

The method of physical test

The test tools mainly include some basic instruments such as electronic balance, scale and so on, and cardiopulmonary function measuring instruments such as InBody body composition analyzer imported from South Korea, Japan Aloka - SSD710 ultrasound cardiograph, etc.

The test indicators can be divided into three categories: body composition indicator, pulmonary function indicator and ultrasonic indicators. Among them, the body component indicator mainly includes weight, lean body mass, body fat content and weight index BMI and so on. Pulmonary function indicators mainly include maximal breathing capacity and vital capacity. Ultrasonic indicators mainly include stroke volume (SV), cardiac output (CO), ejection fraction (EF) and heart rate (HR), etc.

Statistical method

All the statistical data shall be deal with statistical software STATA12.1, the comparison of the mean adopts t test, and the significance level $P < 0.05$ stands for the significant difference, $P < 0.01$ stands for the very significant difference.

THE RESULTS AND ANALYSIS

The effect of aerobic exercise on body composition, pulmonary ventilation function and cardiopulmonary function of the middle-aged and elder

The effect of aerobic exercise on body composition of the middle-aged and elder

Body composition is the general term of various components that constitute the human body tissues and organs. According to different physiological functions of each components of human body, the weight can be divided into two parts including lean body mass and fat mass (body fat content)^[3]. Proper body composition data can confirm the body is healthy. According to the survey, exercise can improve lipid and sugar metabolism by reducing adipose tissue, and plays an important role in maintaining energy balance, and thus reducing various risk factors of the occurrence of chronic disease.

As can be seen from TABLE 2, whether the middle-aged and elderly man or women, the body fat content, muscle weight, lean body mass, body fat rate, and body mass index of people who adhere to aerobic exercise for a long time seems more healthy than people who rarely participate in aerobic exercise, which suggests that aerobic exercise has played a positive role in reducing the elderly body fat and increasing lean body mass me percentage. As the saying goes "it's different to buy thin in old age with money." And TABLE 2 also shows the weights of middle-aged and elderly men and women who adhere to aerobic exercise for a long time are 1 ~ 2 kg lighter than that of who do not participate in aerobic exercise. From the traditional sense, it shows that adhering to aerobic exercise for a long time is very helpful for the health of the middle-aged and elders.

TABLE 2 : The effect of aerobic exercise on body composition of the middle-aged and elder

Indicator	Male		Female	
	Sporting group	Control group	Sporting group	Control group
Body fat content(kg)	21.45±4.18	22.97±5.11*	19.84±4.16	20.08±5.73*
Muscle weight (kg)	40.18±5.73	39.01±6.03*	37.42±4.26	35.01±4.68*
Lean body mass(kg)	44.97±9.42	43.08±8.12*	40.56±4.27	39.94±4.52*
Body fat%	32.42±9.14	35.27±5.54*	32.61±10.07	34.03±9.17*

Body mass index	22.35±3.42	23.16±4.58*	22.98±3.12	24.01±4.71*
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The effect of aerobic exercise on lung ventilation function of the middle-aged and elders

The senility of the middle-aged and elders not just reflects in the surface, but reflects in the respiratory system and failure of the various body organ. The changes of the respiratory system mainly embody in alveolar wall thinning, alveolar increase, the decline of pulmonary capillary number, the weakening of the elasticity and expansion ability of the lungs, respiratory muscle weakness and so on, which lead to the reduction of effective area of the spread of alveolar, increase of pulmonary residual volume and the decrease of pulmonary ventilation and air exchange function, resulting in progressive decline of the function indexes such as lung capacity, maximal breathing capacity, time vital capacity^[5].

As can be seen from TABLE 3, the vital capacity of the middle-aged and elderly man is much higher than that of the middle-aged and elderly man who not participates in aerobic exercise, and this is not particularly evident in middle-aged and old woman. As for the maximal breathing capacity, the maximal breathing capacity of the middle-aged and elderly man is much higher than that of the middle-aged and elderly man who not participates in aerobic exercise, and this is slightly reflected in middle-aged and old woman who adheres to aerobic exercise. Thus it can be seen, adhering to aerobic exercise has very important significance for improving the middle-aged and elders, especially for the pulmonary ventilation function of the middle-aged and old man.

TABLE 3 : The effect of aerobic exercise on lung ventilation function of the middle-aged and elders

Indicator	Male		Female	
	Sporting group	Control group	Sporting group	Control group
Vital capacity (ml)	2615±313.72	2101.65±420.72*	2165.18±315.78	1986.83±513.46*
Vital capacity/weight	41.42±3.15	33.54±8.15*	37.35±3.68	35.37±7.43*
Maximal breathing capacity(l/s)	104.4±5.48	93.4±4.73*	94.75±4.18	91.78±6.47*

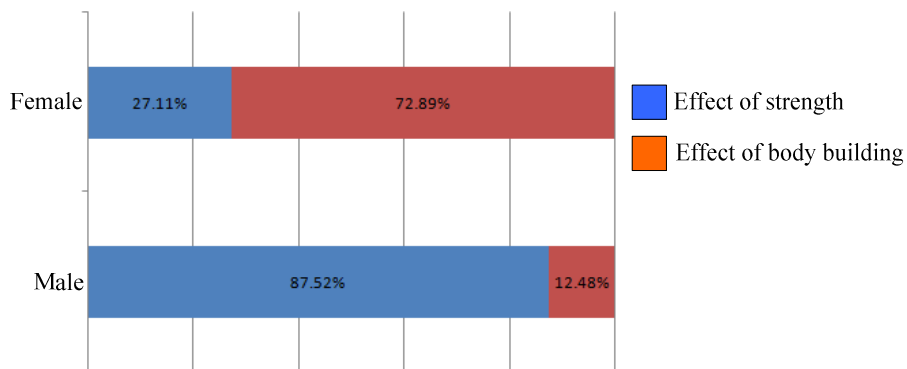
The effect of aerobic exercise on cardiopulmonary function of the middle-aged and elders

With the senility of bodily each function of the middle-aged and elders, their cardiopulmonary function has decreased in different degree. Generally speaking, the elderly heart volume remains unchanged, but the SV reduces when the heart is at rest. However, when carrying out exhaustive work, the output of the elderly stroke volume is 10 %~20 % less than that of the young^[6]. The decline of cardiopulmonary function has brought about different levels of influence and stimulation of three middle-aged and old people health.

As can be seen from TABLE 4, various indicators including SV, CO, HR and so on of the middle-aged and elders who adhere to aerobic exercise are much healthy than those of who not participate in aerobic exercise, among them, the indicators of the middle-aged and elderly man who adhere to aerobic exercise seems more healthy than those of the middle-aged and elderly woman who adheres to aerobic exercise. This suggests that, in terms of cardiopulmonary function, the middle-aged and old man have a greater significance in adhering to aerobic exercise for a long time.

TABLE 4 : The effect of aerobic exercise on cardiopulmonary function of the middle-aged and elders

Indicator	Male		Female	
	Sporting group	Control group	Sporting group	Control group
SV (ml)	70.15±12.71	68.12±10.46*	68.12±3.83	65.73±7.45*
CO (l/min)	4.69±0.81	4.53±0.94*	4.48±3.71	4.15±6.78*
EF (%)	67±0.07	64±0.07*	63±0.06	60±0.02*
HR (bpm)	71.12±3.42	74.83±8.43*	73.15±3.32	75.86±6.17*



**Figure 3 : Main effect of aerobic exercise on middle-aged and old male and female people
Different effects of aerobic exercise on middle-aged and old male and female people**

Aerobic exercise has a very important significance for the health of the middle-aged and elders. And there is slight difference in the level of effect between the middle-aged and elderly man and the middle-aged and elderly woman. As for the middle-aged and elderly men, the main differences between the middle-aged and elderly man who adhere to aerobic exercise for a long time and the middle-aged and elderly man who not participate in aerobic exercise lie in the power data such as vital capacity and maximal breathing capacity. While for the middle-aged and old woman, the effect of adhering to the aerobic exercise is reflected in body shape including weight loss, waistline shrinking, hip circumference increase, more beautiful waist line (see Figure 3 and TABLE 5).

TABLE 5 : The main effect of aerobic exercise on middle-aged and old women

Indicator	participate in aerobic exercise(n=50)	not participate in aerobic exercise (n=50)	P
Height(cm)	159.8±5.00	157.5 ±4.70	< 0.05
Weight(kg)	61.0 ±8.90	60.0 ±7.50	> 0.05
Waistline(cm)	82.3 ±8.70	84.2 ±8.10	> 0.05
Hipline (cm)	93.7 ±5.30	92.6 ±4.70	> 0.05

OPINION AND SUGGESTIONS

Start with short time, low intensity aerobic exercise

For the people who begin to participate in the fitness exercise, it is very important for them to select suitable aerobic exercise program, appropriate exercise intensity and proper exercise time, especially for the middle-aged and elders. Generally speaking, walking and jogging are the best exercise ways for beginners, the exercisers need not to care about the length of time and movement posture deliberately, and you can stop to have a rest as long as you feel a little tired. As time goes on, the physical condition of exerciser can accept longer time fitness programs. At this time, the selection of shadowboxing and other aerobic exercise programs can minimize the possibility of conditions, so as to ensure the physical health of the middle-aged and elders. Adding the amount of exercise slowly is very helpful for the health of the middle-aged and elders. However, exercise intensity of the middle-aged and elders needs some restrictions to prevent unnecessary accidents. So proper aerobic exercise program, time length, exercise intensity shall be paid attention to by exercisers, especially the middle-aged and elders.

Adherence to timing and quantitative aerobic exercise for a long term

There is an old Chinese saying goes that the most important thing is perseverance. And it is also very suitable for using the sentence on the sport, if you adhere to a sport for a few days and give up halfway, the effect is extremely limited. Adhering to aerobic exercise for a long time can not only enrich old People's daily life, but also can provide a healthy body, so is kill two birds with one stone. Of course, the time of aerobic exercise is also very important, for the middle-aged and elders, it is appropriate for them to do exercise for half an hour to an hour^[7]. And excessive aerobic exercise may have a negative impact due to various body function decline of the middle-aged and elders. Therefore, timing and quantitative aerobic exercise is very important for the health of the middle-aged and elders. As can be seen from Figure 4, the exercise time of the middle-aged and elders is between 10 minutes and 50 minutes, the average time is around 30 minutes.

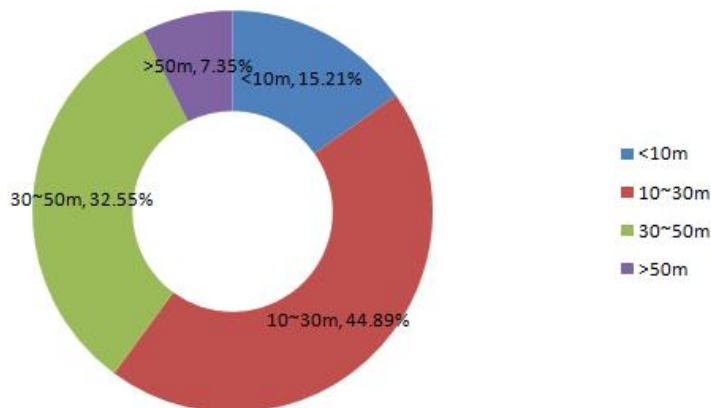


Figure 4 : The middle aged and elders daily exercise time statistics

Choose suitable aerobic exercise program

Aerobic exercise includes jogging, fast walking, body mechanics, rope skipping, etc, according to your own situation, selecting suitable aerobic sports is very important for the sports enthusiasts, especially for the middle-aged and elders^[8]. Generally speaking, jogging, walking, body mechanics are the most widely spread aerobic exercise program, and suitable for people of all ages. Different aerobic exercise programs shall be selected according to different weather, in the cold autumn and winter season and the rain and snow weather, the middle-aged and elders should choose more indoor aerobic exercise such as body mechanics, shadowboxing, etc. while in spring and summer, the middle-aged and elders can choose more outdoor aerobics programs such as jogging, fast walking, etc. and the middle-aged and elders should combine a variety of aerobic exercise programs, in order to exercise your body comprehensively, rather than just stick to one single aerobic exercise. At the same time, due to difference in gender, appropriate activity is also different, the middle-aged and elderly men are appropriate for some activities that requiring power and strength, while the middle-aged and elderly women are appropriate for quiet and beautiful body mechanics program.

CONCLUSION

Through the comparison and study of body composition and cardiopulmonary function of 200 middle-aged and elderly people who participate in aerobic exercise and 200 middle-aged and elderly people who not participate in aerobic exercise in a given area, this research obtains the effect of aerobic exercise on the cardiopulmonary function of the middle-aged and elders, and puts forward reasonable opinions and suggestions for the middle-aged and elders to carry out aerobic exercise correctly and effectively. The study shows that aerobic exercise program has played an important role in enhancing and improving the cardiopulmonary function of the middle-aged and elders. Thus, in order to improve the body composition and enhance the cardiopulmonary function of the middle-aged and elders, they must choose suitable aerobic exercise program and develop good exercise habits in order to maintain their physical and mental health, improve the quality of China's urban ageing population.

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