

Experimental research on the influence of aerobic exercise combining resistance exercise on the physical health of middle-aged and elderly people.

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Abstract

Object: To discuss the application value of aerobic exercise combining resistance exercise on the physical health of elderly people.

Method: 100 cases of middle-aged and elderly people in the community were selected and divided into different groups for research through experiment and mathematical statistics.

Result: After ten weeks of exercise, indicators of the observation group, including weight, body fat content (FAT), skeletal muscle mass (SMM) and percent body fat (PBF) were statistically and significantly different from those of the control group, with $P < 0.05$; indicators of the observation group, including Body Mass Index (BMI), visceral fat area (VFA), and basal metabolic rate (BMR) were statistically and significantly different from those of the control group, with $P < 0.05$; indicators of the observation group, including right upper limb SL, left upper limb, and TR were statistically and significantly different from those of the control group, with $P < 0.05$.

Conclusion: Aerobic exercise combined with resistance to exercise is superior to simple aerobic exercise in increasing skeletal muscle content, reducing body fat content and promoting bone health. It is recommended that the middle-aged and elderly increase the appropriate strength exercises while aerobic exercise.

Keywords: Aerobic exercise, Resistance exercise, Middle-aged and elderly people, Physical health.

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Introduction

With the advancement of the aging society, the body of middle-aged and elderly people has changed. What's more, reduced exercise leads to fat accumulation, especially in limbs and abdomen. Besides, the reducing of skeletal muscle content may cause a series of cardiovascular and cerebrovascular diseases [1]. Skeletal muscle is one of the most important parts composing the body of middle-aged and elderly people, which may account for 35% to 40%. It is also one of tissues with the largest number, which facilitates physical activities. Our physical activities and sports are caused by skeletal muscle movement [2]. However, with the increasing of age, skeletal muscle will suffer from degenerative changes, including reduced muscle strength and skeletal muscle content. In some severe cases, it may cause a series of complications, such as osteoarthritis and osteoporosis, thus can have a serious impact on the life quality of middle-aged and elderly people [3].

Aerobic exercise is a physical exercise that is performed when the body is fully supplied with oxygen [4]. In the process of exercise, the inhaled oxygen equals the demanded oxygen of the human body to achieve the physiological equilibrium. It features long exercise duration (15 min or longer), moderate or higher exercise intensity (maximum heart rate ranges from

60% to 80%) Acute bouts of aerobic exercise seem to transiently improve several dimensions of cognitive function, whereby immediate and delayed benefits were pronounced for executive function [5]. A recent meta-analysis revealed that moderate aerobic exercise elicits particularly beneficial effects for inhibitory control, working memory and task-switching in preadolescent children and older adults compared to other age groups [6]. Various rhythmic movements belong to aerobic exercise. Sarcopenia is a common manifestation of ageing, and is defined as the loss of skeletal muscle mass and function [7]. However, there is strong evidence that resistance exercise is effective in counteracting sarcopenia [8]. Resistance exercise increases muscle strength [9]. Moreover, recent study suggested that resistance exercise improves mitochondrial respiration by altering mitochondrial proteins and transcriptional expression in skeletal muscle [10]. Resistance exercise is muscle resistance training with constant speed, such as lifting dumbbell and sandbag, lifting heavy weights through pulleys and ropes, stretching elastic objects such as springs and rubber, and special training equipment practice. It is a special aerobic exercise for middle-aged and elderly people.

Studies show that aerobic exercise combining resistance exercise can help middle-aged and elderly people with increasing muscle strength, curing and preventing muscle

atrophy, maintaining the joint stability, and improving and extending the joint mobility [11,12]. 100 cases of middle-aged and elderly people recruited from February 14, 2016 to September 20, 2017 were selected to study the application value of aerobic exercise combining resistance exercise on the physical health of middle-aged and elderly people. Please refer to the following for details.

Research Object and Methods

Research object

A 100 cases of middle-aged and elderly people recruited from February 14, 2016 to September 20, 2017 were selected and divided into observation group and control group, with 50 cases in each group. This research was approved by the Ethical Committee of Guizhou University of Finance and Economics according to the declaration of Helsinki promulgated in 1964 as amended in 1996, the approval number is 2016002.

Observation group: average age 59.91 ± 8.33 years old; average height 159.21 ± 4.84 cm; and average weight 62.42 ± 9.01 kg. Control group: average age 59.95 ± 8.36 years old; average height 159.26 ± 4.90 cm; and average weight 59.32 ± 8.95 kg. Data of 100 cases of middle-aged and elderly people showed no significant difference, with $P > 0.05$ which was applicable for scientific comparison.

Experiment

Control group: objects in the control group were given aerobic exercise. Specifically, they were guided to run on the treadmill to facilitate further backstage management. The exercise intensity was controlled based on their heart rates. Objects exercise for 45 min three times a week [13,14].

Observation group: objects in the observation group were given aerobic exercise combining resistance exercise; They were guided to carry out rhythmic fitness running with the music on the treadmill. The exercise intensity was controlled based on their heart rates. Resistance exercise was given after 30 min of aerobic exercise. They should carry out exercise covering 9 muscle groups, including musculus pectoralis major, latissimus dorsi, erector spinae, musculus deltoideus, musculus biceps brachii, musculus triceps brachii, musculus quadriceps femoris, musculus biceps femoris, and musculus rectus abdominis. Corresponding fitness equipment could be used. They should carry out 3 groups a time (8-12 times for each group) for twice a week [15].

Indicators including weight, body fat content (FAT), skeletal muscle mass (SMM), percent body fat (PBF), body mass index (BMI), visceral fat area (VFA), basal metabolic rate (BMR), right upper limb SL, left upper limb SL, and TR of middle-aged and elderly people in both groups were observed [16].

Mathematical statistics

SPSS22.00 was adopted for data processing in this experiment. T test was used for indicators. mean was expressed by standard

deviation; when there was significant difference between both groups, $P < 0.05$.

Results and Analysis

Comparison of weight, FAT, SMM, and PBF

As is seen from Table 1, after ten weeks of exercise, indicators of the observation group, including weight, FAT, SMM, and PBF were statistically and significantly different from those of the control group, with $P < 0.05$.

Table 1. Comparison of weight, FAT, SMM, and PBF of both groups.

Group	Weight (kg)	FAT (kg)	SMM (kg)	PBF (%)
Observation group				
Before intervention	62.42 ± 9.01	22.05 ± 5.41	21.35 ± 2.80	36.12 ± 5.21
After intervention	65.21 ± 10.45	29.65 ± 6.36	25.36 ± 3.45	31.01 ± 4.12
Control group				
Before intervention	59.32 ± 8.95	21.00 ± 5.30	21.40 ± 2.85	36.10 ± 5.15
After intervention	60.21 ± 9.32	25.32 ± 5.46	22.13 ± 2.96	34.25 ± 5.01
T value after intervention	5.52	4.78	5.02	3.53
P value after intervention	0.01	0.01	0.01	0.01

Note: After intervention, the difference of observation group and control group was statistically significant, with $P < 0.05$.

Comparison of BMI, VFA, and BMR

As is seen from Table 2, after ten weeks of exercise, indicators of the observation group, including BMI, VFA, and BMR were statistically and significantly different from those of the control group, with $P < 0.05$.

Table 2. Comparison of BMI, VFA, and BMR of both groups.

Group	BMI (kg/m ²)	VFA (cm ²)	BMR (kCal)
Observation group			
Before intervention	24.30 ± 2.15	84.12 ± 10.56	1225.41 ± 105.21
After intervention	27.32 ± 3.56	75.01 ± 8.21	1345.15 ± 121.25
Control group			
Before intervention	24.25 ± 2.10	84.15 ± 10.60	1225.46 ± 105.30
After intervention	25.05 ± 2.12	83.25 ± 9.25	1230.12 ± 110.21
T value after intervention	3.87	4.71	4.96
P value after intervention	0.01	0.01	0.01

Note: After intervention, the difference of observation group and control group was statistically significant, with $P < 0.05$.

Comparison of right upper limb SL, left upper limb SL, and TR

As is seen from Table 3, indicators of the observation group, including right upper limb SL, left upper limb SL, and TR were statistically and significantly different from those of the control group, with $P < 0.05$.

Table 3. Comparison of right upper limb SL, left upper limb SL, and TR of both groups.

Group	Right Upper Limb SL (kg)	Left Upper Limb SL (kg)	Upper TR (kg)
Observation group			
Before intervention	1.81 ± 0.40	1.82 ± 0.32	17.56 ± 2.31
After intervention	2.12 ± 0.58	2.10 ± 0.41	20.21 ± 4.25
Control group			
Before intervention	1.80 ± 0.38	1.81 ± 0.31	17.50 ± 2.30
After intervention	1.85 ± 0.41	1.92 ± 0.32	18.21 ± 3.12
T value after intervention	2.69	4.25	2.68
P value after intervention	0.01	0.02	0.01

Note: After intervention, the difference of observation group and control group was statistically significant, with $P < 0.05$.

Conclusion

Previous studies have shown that aerobic exercise combining resistance exercise can promote the increasing of muscle mass to different levels; The former can increase the relative quality of muscles through reducing body fat and abdominal fat; while the latter can help promote the increasing of muscle mass from the following two aspects: 1) turning protein into muscle through training to increase muscle content and reduce body fat; and 2) expanding muscle cross sectional area by stimulating muscle cells through exercise and increasing muscle mass [17,18]. However, there are some scholars who have shown that resistance exercise has no significant effect on the fat content of middle-aged and elderly people. It is found in this study that middle-aged and elderly people in the observation group eat more after the resistance exercise. That's probably the reason why the effect is not significant. In addition, with the continuous development of the economy and living standard, people's diet structure has been changed greatly, which leads to the fat accumulation, especially in the abdomen, of middle-aged and elderly people [19,20]. The previous results [21] are consistent with ours. With the lack of physical activity in the elderly, simply aerobic exercise can-not meet the quality of life in the elderly, combined with appropriate strength to practice more effectively to ensure the health of the elderly. With the lack of physical activity in the

elderly, simply aerobic exercise can-not meet the quality of life in the elderly, combined with appropriate strength to practice more effectively to ensure the health of the elderly.

Both exercises can promote reducing fat content of middle-aged and elderly people. The combination of both features better effect than each of them in separate. Due to the lack of the enthusiasm in exercise, aerobic exercise only cannot meet the need of middle-aged and elderly people in exercise. Therefore, resistance exercise is especially important as one of the most effective means to ensure the physical health of middle-aged and elderly people. To sum up, aerobic exercise combing resistance exercise can help promote the physical health of elderly people, with increasing skeletal muscle content, reducing fat content, and reducing skeletal muscle wastage rate, which is worth application and promotion. This study has two limitations. Firstly, this study is only a cross-sectional study. Secondly, the sample size of the study was not large enough. In the further study, we will conduct a large sample cohort study.

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