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Effect of Taijiquan and slow walking on Chinese elderly female's cardiovascular function and quality of life.

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Abstract

Objective: To explore the effect of Taijiquan and slow walking on Chinese elderly female's cardiovascular function and quality of life.

Methods: A total of 140 elderly female were selected and divided into study group and control group randomly with 70 in each group. The study group took Taijiquan exercise, while the control group took slow walking exercise. The physical fitness levels, changes of blood volume and viscosity were observed and compared, as well as the improvement of quality of life, cardiovascular function related indicators, before and six months after the intervention, respectively.

Results: Six months after the intervention, the study group was significantly better than the control group in physical fitness related indicators such as handgrip, sit-and-reach, choosing reaction, stand on one leg with closed eyes, and body mass index (BMI) (P<0.05). The blood volume and blood viscosity of the study group were improved significantly, which both better than those of the control group (P<0.05). The study group' quality of life were better than the control groups' (P<0.05); and the cardiovascular function related indicators of the study group were significantly better than those of the control group, such as heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), cardiac output (CO), cardiac index (CI) and pre-ejection period (PEP) (P<0.05).

Conclusion: Compared with slow walking exercise, Taijiquan exercise can improve the physical fitness, cardiovascular function, and quality of life in Chinese elderly female population significantly, by promoting blood circulation and sleeping quality.

Keywords: Elderly, Taijiquan, Slow walking, Physical fitness, Cardiovascular function, Quality of life.

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Introduction

In recent years, the ageing of the population is becoming more and more serious. The health and quality of life of middle-aged and elderly people have aroused the great concern of the whole society. And in the elderly population, as the gradual decline of physiological and organic function with age, as well as fewer exercise relatively, functional diseases such as muscle atrophy or myopathy, osteoporosis and others, and cardiovascular disease due to accumulated fat and the weakening cardiovascular function, occurred frequently, which impaired the elderly's quality of life seriously and even threatened patients' life in some cases [1,2]. Good physical fitness is the basis of human health, while the physical level can reflect the health status [3]. However, the physical fitness of elderly population has declined widely due to unhealthy living habits, unreasonable dietary structure, lack of exercise and other factors, which promoted the prevalence rate of chronic diseases [4]. Therefore, it is very necessary to enhance the physical fitness of the elderly by effective ways like medication and nutrition, as well as the most safe and effective way-exercise [5]. Taijiquan and slow walking are both favourite physical exercise among the elderly [6]. At present, there are few reports on the comparative study of the effect of Taijiquan and slow walking on the cardiovascular function and quality of life of Chinese elderly female. For that, the study was aimed to compare the effect of Taijiquan and slow walking exercises on Chinese elderly female's physical fitness, cardiovascular function and quality of life.

Materials and Methods

Materials

A total of 140 elderly female with good compliance were selected after excluding these with mental illness and severe organ diseases, aged from 62 to 77 years old (68.4 ± 3.2), complicated with 60 cases of diabetes mellitus, 90 cases of high blood pressure, 40 cases of coronary disease and 23 cases of other chronic diseases; and 30 cases of elementary school or lower, 40 cases of junior school, 40 cases of high school, 30 cases of college or higher in educational level. The 140 females were divided into study group and control group randomly, with 70 cases in each group. There were no significant differences in age, complication and educational levels (P<0.05).

Methods

The control group took slow walking exercise for six months with 30 to 60 minutes once and four times a week. And the study group took Taijiquan exercise for six months likewise with 30 to 60 minutes once and four times a week. During the intervention, there were symptoms such as muscle swelling and fatigue after exercise in both groups, which disappeared after rest.

Observation indicators

(1) Physical fitness related indicators were observed and compared, including handgrip, sit-and-reach, choosing reaction, stand on one leg with closed eyes, and body mass index (BMI). A BMI of 24.0 kg/m^2 or higher was obesity.

(2) Blood volume and blood viscosity of the two groups were measured and compared.

(3) Quality of life of the two groups was evaluated by the Chinese version of WHOQOL-BREF, including four domains, namely psychological wellbeing, social relationships, physical health and environment conditions, with each scored from zero to 15 points, and zero to 60 points totally. And the higher the score, the higher the quality of life.

(4) Cardiovascular function related indicators such as heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), cardiac output (CO), cardiac index (CI) and pre-ejection period (PEP), were measured by AZN-J30 cardiovascular monitor and table type blood pressure monitor.

All subjects enrolled were measured before and six months after the intervention respectively in a specialized testing room by the same instruments and same technicians.

Statistics methods

All statistical analyses were processed with SPSS 19.0 software package. The measurement data were expressed as means ± SD and compared with t-test, while enumeration data compared with χ2-test, respectively. A p-value of 5% or lower was statistically significant.

Results

Comparison of physical levels between two groups

There was no significant difference between the two groups in handgrip, sit-and-reach, choosing reaction, stand on one leg with closed eyes, and BMI before the intervention (P>0.05). And the study group was significantly better than the control group in physical fitness related indicators, six months after the intervention (P<0.05) (Table 1).

Comparison of blood volume and blood viscosity between the two groups

There was no significant difference between the two groups in blood volume and blood viscosity before the intervention (P>0.05). And the study group was significantly better than the control group in increased blood volume and decreased blood viscosity after the intervention (P<0.05) (Table 2).

Table 1. *Comparison of physical levels between two groups ($\bar{\chi}$ ± s, n=70).*

Group	Handgrip (kg)		Sit-and-reach (cm)		Choosing reaction (s)		Stand on one leg with closed eyes (s)		BMI (kg/m^2)	
	Before	After	Before	After	Before	After	Before	After	Before	After
Control group	30.56 ± 3.71	32.42 ± 4.14	2.06 ± 0.76	2.47 ± 0.35	0.96 ± 0.11	0.87 ± 0.15	7.68 ± 0.55	10.43 ± 2.78	24.98 ± 1.37	24.34 ± 1.67
Study group	30.62 ± 3.95	38.67 ± 3.78	2.07 ± 0.95	3.52 ± 0.21	0.95 ± 0.13	0.44 ± 0.12	7.51 ± 0.61	15.26 ± 2.33	24.91 ± 1.25	22.75 ± 1.62
t	1.592	13.266	1.356	9.627	1.094	14.814	0.945	12.056	0.573	16.628
P	>0.05	<0.05	>0.05	<0.05	>0.05	<0.05	>0.05	<0.05	>0.05	<0.05

Table 2. *Comparison of blood volume and blood viscosity before and after the intervention between the two groups ($\bar{\chi}$ ± s, n=70).*

Groups	Blood volume (L)		Blood viscosity10-1Pa·S	
	Before	6 months later	Before	6 months later
Control group	3.75 ± 0.54	3.73 ± 0.37	3.72 ± 0.31	3.58 ± 0.27
Study group	3.74 ± 0.49	4.32 ± 0.42	3.69 ± 0.42	3.26 ± 0.29
t	0.805	13.772	1.124	8.239
P	>0.05	<0.05	>0.05	<0.05

Table 3. *Comparison of QOL between the two groups ($\bar{\chi}$ ± s, n=70).*

Groups	Psychological wellbeing		Social relationships		Physical health		Environment conditions		Total	
	Before	After	Before	After	Before	After	Before	After	Before	After
Control group	7.5 ± 1.2	9.3 ± 2.3	6.7 ± 1.3	8.6 ± 2.1	7.5 ± 1.4	9.6 ± 2.7	8.6 ± 1.2	10.1 ± 2.4	36.7 ± 4.2	42.4 ± 5.3
Study group	7.4 ± 1.5	12.7 ± 2.6	6.8 ± 1.4	12.5 ± 2.2	7.6 ± 1.3	13.1 ± 3.5	8.5 ± 1.4	13.3 ± 2.6	36.4 ± 3.9	52.7 ± 5.6
t	0.215	8.561	0.336	10.412	0.614	9.452	0.673	6.501	0.721	11.394

P	>0.05	<0.05	>0.05	<0.05	>0.05	<0.05	>0.05	<0.05	>0.05	<0.05

Comparison of quality of life between the two groups

There was no significant difference between the two groups in quality of life before the intervention (P>0.05). And the study group's quality of life was better than the control group's after the intervention (p<0.05) (Table 3).

Comparison of cardiovascular function between the two groups

There was no significant difference between the two groups in cardiovascular function related indicators before the intervention (P>0.05). And the study group was better than the control group in these indicators such as HR, SBP, DBP, CO, CI and PEP after the intervention (P<0.05) (Table 4).

Table 4. *Comparison of cardiovascular function between the two groups ($\bar{\chi} \pm sn$=70).*

Groups	HR		SBP (mmHg)		DBP (mmHg)		CO (L/min)		CI (L/min/m^2)		PEP (ms)	
	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After
Control group	73.4 ± 1.5	71.2 ± 0.8	162.7 ± 3.1	148 ± 2.4	96.4 ± 1.5	85.4 ± 0.8	4.2 ± 0.2	5.3 ± 0.7	2.7 ± 0.6	3.1 ± 0.4	122.7 ± 2.8	115.4 ± 1.7
Study group	73.3 ± 1.6	69.3 ± 0.4	163.1 ± 2.6	135.6 ± 1.9	96.6 ± 1.7	80.3 ± 0.9	4.2 ± 0.4	6.6 ± 0.8	2.7 ± 0.5	3.6 ± 0.2	122.5 ± 2.6	104.9 ± 1.5
t	0.321	5.166	0.464	6.377	0.525	9.445	0.416	10.321	0.673	11.541	0.804	12.095
P	>0.05	<0.05	>0.05	<0.05	>0.05	<0.05	>0.05	<0.05	>0.05	<0.05	>0.05	<0.05

Discussions

According to early clinical surveys, the elderly female in China have been generally suffered from low physical fitness and poor quality of life, with a great part complicated with cardiovascular disease, which has brought huge burden to their families and the society. And it has become the concern of the whole society to improve their physical fitness, reduce the incidence of cardiovascular disease and improve the quality of life through effective exercise interventions [7]. There have been reports arguing that it is very important for the elderly to improve activities by themselves, maintain a high level of quality of life, and to postpone the age of loss of self-care abilities as far as possible [8,9].

In the process of aerobic exercise such as Taijiquan exercise, it is of great importance to boost elderly female's physical fitness by improving muscle strength, flexibility and balance, consuming excessive fat, and avoiding obesity effectively [10]. At the same time, it helped to increase the blood volume by increasing plasma protein and colloid osmotic pressure to keep water storing in blood circulation, and enhance the activity of antioxidant enzymes to improve the ability to clear free radicals, reduce blood viscosity by promoting the flow of red blood cells and enhance their deformability, which played an important role in reducing the incidence of cardiovascular diseases in elderly female [11,12]. In addition, the elderly female contacted with the outside world inevitably during exercise to improve the quality of life in psychological and social relations for new friends and environment. The results of this study suggested that six months after the intervention, the study group was significantly better than the control group in physical fitness related indicators such as handgrip, sit-and-reach, choosing reaction, stand on one leg with closed eyes, and BMI (P<0.05); the blood volume and blood viscosity of the study group were improved significantly, which both better than those of the control group (P<0.05); the study group' quality of life were better than the control groups' (P<0.05). It suggested that compared with slow walking exercise, Taijiquan exercise can improve the physical fitness levels and quality of life in Chinese elderly female effectively.

The blood vessels in human body are normally elastic and with soft inner wall to make the blood flow smoothly. Hearts begin to grow aging and degenerative change in elderly population with contractility decreased gradually. The elasticity of vessel wall reduced due to fibrillation and calcification complicated with lipid deposition, which resulted together in the sclerosis and stenosis of coronary artery and myocardial atrophy. In this case, the resistance will increase when heart contract, cause the atrium and ventricle enlarged and blood volume decreased, and insufficiency of the blood supply to the coronary artery, then myocardial ischemia and hypoxia. Then the conduction system will be liable to be disturbed to irregular atrium and ventricle rhythm due to long-term ischemia, hypoxia, and tissue fibrosis, which tended to cause serious diseases such as cerebrovascular accident, angina pectoris and myocardial infarction. The elderly often suffers from long-term hypertension, which accelerates cardiovascular aging and causes cardiac and vascular diseases. But it is hard for elderly patients to accept treatment to control high pressure by medication for various side effects [13]. And during physical exercise, the body's metabolic level increased for more blood and oxygen demand, which achieved by the speeding heart and lung to supply more blood and oxygen to meet the balance. Physical exercise can also thicken myocardial fibers and strengthen contractility, prevent fibrosis and degeneration, increase the elasticity of valves, slow resting heart rate, increase cardiac output, improve cardiac compliance and pumping function, and decrease myocardial oxygen consumption. As for the elderly, it is more suitable to take aerobic endurance exercise rather than speed and strength exercise for their physiological and

biochemical characteristics [14]. The results of this study showed that the cardiovascular function related indicators of the study group were significantly better than those of the control group, such as HR, SBP, DBP, CO, CI and PEP after the intervention($P<0.05$). It suggested that Taijiquan exercise can improve the physical fitness more effectively. It is presumable that as a kind of medication oriented exercise, Taijiquan belongs to aerobic exercise from the view of energy supply, which can make the capillaries in the body open to improve the metabolism of the body and the activity of the enzyme. And muscle fibers wrapped and massaged vascular smooth muscle repeatedly when body vibrated dramatically in low frequency. Besides, lipid metabolism will be improved when lipoprotein activity in muscle and adipose tissue increased, which accelerate the decomposition of LDL, reduce the delivery of cholesterol to the artery wall and relieve its inhibition to HDL to increase the blood concentration of HDL, and inhibit atherosclerosis by improving phospholipid-cholesterol acyltransferase activity to transport and eliminate intracellular cholesterol deposition by HDL, reduce the resistance of peripheral vascular and improve the elasticity and compliance, postpone the decline of vascular function, reduce the cardiac load. It is of great significance for the prevention and treatment of hypertension and other organic diseases such as heart, brain and kidney. However, for the elderly with cardiovascular disease or others, the exercise intervention should be developed according to the specific conditions to reduce the intensity to ensure safety and avoid accidents by inappropriate or unnecessary strength exercises. The right reaction to appropriate exercise for the elderly will be comfortable and happy after exercise with increased appetite and good sleep, but no palpitation, shortness of breath, or chest tightness.

In conclusion, compared with slow walking exercise, Taijiquan exercise can improve the physical fitness, cardiovascular function, and quality of life in Chinese elderly female population significantly, by promoting blood circulation and sleeping quality.

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