

Effect of three-style Taijiquan on senile hypertension

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Abstracts

As one of the first batch of national intangible cultural heritage, Taijiquan combines meridians, guidance techniques and tuna techniques in Chinese traditional Chinese medicine thought, and has been continuously inherited and developed with the concept of Confucian philosophy and yin and yang thought for thousands of years, forming a traditional boxing technique that combines internal and external cultivation, rigidity and softness, and roundness and lightness. After 1949, it was compiled by the National Sports Commission as a sport for gymnastics, sports performances, and sports competitions to strengthen the body. After thousands of years of inheritance and development, the Taijiquan movement has blossomed in a hundred flowers and many schools, forming a huge system dominated by the six major factions of Chen, Yang, Wu, Sun, Wu and He, supplemented by other branches, each faction has mutual inheritance and characteristics, and because Taijiquan has become a fist in modern times, there are many practitioners, and it has a broad mass base, so that Taijiquan has developed into a fist with vitality in Chinese martial arts boxing.

In this study, 20 elderly patients with hypertension were randomly divided into groups by literature review, experiment and other methods. Through 12 weeks of experimental observation, through the practice of taijiquan related mono-movements, and after the practice of blood pressure, blood lipid index changes and the indicators before the practice of correlation analysis. To explore the effect of taijiquan on hypertension.

The main research content of this paper is to explore the influence of taijiquan exercise on hypertension in the elderly. And carry on the concrete research with the concrete experiment case. In this paper, different analytical methods are adopted for specific analysis. And after analysis and research of this article found that taijiquan exercise can effectively reduce the body of the systolic pressure, diastolic blood pressure, pulse pressure difference, triglyceride, cholesterol, high-density lipoprotein cholesterol (hdl-c), low density lipoprotein, has certain positive effects on hypertension in the elderly, for future research provides a good direction.

Keywords: Taijiquan exercise; middle-aged and elderly patients with hypertension; exercise effect analysis

Introduction

1.1 Hypertension and hypertension

Blood pressure, known as systemic arterial blood pressure, refers to the lateral pressure per unit area held by the vessel wall. Hypertension is a common clinical symptom. It is caused by the abnormality of the vascular center caused by arteriosclerosis, and the arterial blood pressure continues to increase. The index of hypertension is produced compared with normal people. It is called hypertension in medicine(ZHANG Yongpeng,TAO Fei,YANG Jiaying,JIA Zhijie & WEI Qiongyuan,2019). According to the revised edition of the Chinese Guidelines for the Prevention and Treatment of Hypertension in 2005, hypertension is defined as: the systolic blood pressure is higher than 140mmHg, the diastolic blood pressure is higher than 90mmHg, or there is a history of hypertension. The systolic blood pressure is lower than 140mmHg, and the diastolic blood pressure is lower than 90mmHg through taking drugs. Table 1 shows the relevant classification of blood pressure(FENG Lijuan,GUAN Li,ZHANG Dailiang,LING Zhongchun,LI Mengxiao & JIN Rongjiang,2018).

Table 1 Definition and classification of blood pressure level

| classify | systolic pressure (mmHg) | diastolic pressure (mmHg) |
|---------------------------------|-----------------------------|------------------------------|
| Normal blood pressure | <120 | <80 |
| Normal high value | 120-139 | 80-89 |
| hypertension | ≥140 | ≥90 |
| Grade 1 hypertension (mild) | 140-159 | 90-99 |
| Grade 2 hypertension (moderate) | 160-179 | 100-109 |
| Grade 3 hypertension (severe) | ≥180 | ≥110 |
| Simple systolic hypertension | ≥140 | <90 |

1.2 Pathogenesis of hypertension

Most experts engaged in the clinical research of hypertension believe that the occurrence of hypertension is caused by the dysfunction of the cerebral cortex, and the factors that lead to the abnormality of the cerebral cortex are related to the stimulation of the internal and external environment, such as excessive excitement and tension of the spirit, and the disorder of blood pressure regulation will affect the human kidney system, endocrine system, and humoral system(WANG Fengxian,2014). Age also affects the prevalence of hypertension and presents a positive correlation trend; For women, the prevalence rate before menopause is lower than that after menopause; Altitude and geographical location also affect the incidence rate of hypertension. The incidence rate of hypertension in high altitude and high latitude areas is higher than that in low altitude and low latitude areas; Eating habits also affect human blood pressure. The incidence rate of hypertension in people with high salt, sugar and fat content in their daily diet is higher than that in people with relatively normal diet; Hypertension is also affected by genetic factors, and blood pressure correlation between immediate relatives is very obvious(HAN Yanjin & LIANG Guanghui,2012).

1.3 Hazards of elevated blood pressure

High blood pressure poses a serious threat to human health. When human blood pressure rises, the central nervous system, viscera, visual organs and hearing organs will produce many adverse reactions, such as heart enlargement, myocardial infarction, cerebral congestion, blindness and other major diseases that endanger human life safety. According to relevant data, hypertension is one of the prime culprits causing coronary heart disease and cerebral congestion in Chinese citizens. Not only that, when the blood pressure rise of hypertensive patients is not effectively controlled, it will cause serious harm to the body, but also have persistent adverse effects on the body, such as fatigue, dizziness, headache, memory loss and other adverse conditions. Therefore, hypertension is one of the killers of human health(JIN Haolei,PANG Jiajia,2016).

1.4 Taijiquan exercise has a good effect on blood pressure

In the practice of Taijiquan, the main requirement is to relax the spirit and body, so as to combine the excitation and inhibition of stimulation in the central nervous system of the brain, and help the practitioners to adjust their mentality and reach a peaceful state. Therefore, it is worth advocating that the public use Taijiquan as a way of exercise in daily life(SUN Ke,2018). In Taijiquan exercise, the nervous system is mainly required to reach a state of relaxation. Practitioners can relax the muscles and joints of the whole body by combining Taijiquan action with personal thinking in practice, which is a state of relaxation both inside and outside the body. However, this relaxation is not a complete and powerless relaxation, but a relaxation based on certain strength and tension. It is through this constant stimulation of moderate tightness and alternating tightness that human blood vessels can produce rhythmic changes, increase human blood flow, increase blood vessel elasticity, and make blood flow rate correspond to the rhythm of mind, making the circulation in human body more stable, thus stabilizing human blood pressure. From beginning to end, Taijiquan is based on the theoretical system of combination of movement and static, combination of virtuality and reality, and harmony of yin and yang. It also incorporates reasonable breathing patterns to combine people's consciousness and movement, and achieve the result of both internal and external cultivation(Shen Xiaoyu, Zhang Dailiang, Lv Junling, Liu Mengxue, Lu Wei, Yang Xiaowen & Jin Rongjiang,2016).

Research status at home and abroad

2.1 The Positive Effect of Taijiquan Exercise on the Factors Related to Blood Pressure

2.1.1 Stabilize blood pressure by adjusting the mood of the elderly

Taijiquan exercises have a positive impact on the mental state of practitioners. Before practicing, you should first concentrate your mental attention and immerse yourself in the artistic conception related to it. Thus, people's attention can be diverted by practicing Taijiquan; At the same time, due to the influence of many Chinese classical philosophies, Taijiquan is the most deeply affected by the Taoist concept of "inaction", which makes the practitioners be affected by this idea in the practice process, easing the bad mental situation and facing life more optimistically(Me I Su,2015). The research of Chen Fusheng and others has strongly proved these functions of Taijiquan. Their research shows that after practicing Taijiquan, middle-aged women's negative emotions will be significantly reduced, such as tension, fatigue, anger, depression, etc. Reduce the violent fluctuation of blood pressure due to mood factors by easing and calming the mood, so as to play a positive role in reducing

blood pressure in hypertensive people(YUAN Yuning,2015).

2.1.2 Have a positive effect on blood pressure by improving the function of the trainees' viscera and organs

Jiang Zhoucun's research results show that the cardiovascular function of the elderly can be effectively improved after long-term Tai Chi exercise, and their arteriosclerosis, hypertension, and coronary heart disease can be effectively treated. Chen Zhijun's research results show that Taijiquan can strengthen and prevent diseases by its movement characteristics. Its movement maintains the circular, arc and spiral movement trend, promotes the regular movement of body joints, helps the blood circulation of the whole body, significantly improves the functions of the body's liver, gallbladder, kidney and other viscera, and achieves the effect of stable blood pressure. Jiang Guoxiong's research and demonstration on sports physiology pointed out that the changes of various parts of the body, organs and cardio-cerebrovascular system of the elderly through long-term adherence to Taijiquan exercise, summarized the body-building and maintenance mechanism and function of Taijiquan exercise, as well as its positive impact on cardio-cerebrovascular diseases(HE Youping & LV Pin,2012).

2.1.3 Lower blood pressure by changing the body shape of the elderly

According to Fu Xiao's research, the body fat rate of the elderly can be reduced with the help of scientific and effective exercise and diet, thus indirectly preventing cardio-cerebrovascular diseases and improving health. With the continuous development of the national economy, people's income is increasing, and the number of obese people in China is also increasing. The cardio-cerebrovascular diseases, hypertension, hyperlipidemia, and hyperglycemia associated with it are also on the rise. For middle-aged and elderly people, the body fat content is also rising with the growth of age, resulting in changes in body shape, which will lead to the rise of blood pressure, thus increasing the possibility of hypertension and related diseases. The relevant data also shows that the people who practice Taijiquan regularly, their body-related indicators are more in line with the normal standard. With the same weight, their body fat decreases, which makes their blood pressure significantly lower, which is beneficial to their health(CHEN Ming&HAN Qiaoqing,2011).

2.1.4 Stabilize blood pressure by improving the physical quality of the elderly

Taijiquan is a movement that emphasizes the combination of movement and static, soft and light, and smooth breathing. It has a good effect on regulating the circulation of the body. Fu Xiao has studied the people who have been exercising Taijiquan for a long time and found that their physical indicators have been improved, including: the strength of respiratory muscles has been strengthened, the range of chest movement has been expanded, the number of alveoli has been increased, and the ability to absorb oxygen has been improved while accelerating the metabolism of the body and delaying aging. At the same time, because of the characteristics of Taijiquan, the lower limb strength of the people who often practice Taijiquan has significantly improved compared with the previous. Through comprehensive analysis, the physical strength, flexibility, agility, balance and other qualities of the elderly who have been practicing Taijiquan for a long time will be improved. By improving the body of the elderly, the daily burden of their heart and cardiovascular system will be reduced, and the blood pressure of the elderly will be stabilized(WANG Xiaojun,JING Zhikun & ZHENG Ningning,2011).

2.1.5 Reduce the complications of hypertension by improving the physical quality of the elderly

The concept of physical exercise to strengthen the body has been deeply rooted in people's minds. Through physical exercise, we can promote the development of human body functions and improve the quality of life. Long-term Taijiquan exercise can improve the muscle strength of the human body, prevent osteoporosis in the elderly, increase the contraction rate of the human heart, increase the output of pulse, and regulate the function of the central nervous system on the cardiovascular system, thus delaying aging and strengthening the physique; It makes the elderly strong in muscles, flexible in joints, maintain physical toughness, accelerate tissue metabolism, and significantly improve physical indicators(WEI Deyang,2011). The abdominal breathing method of Taijiquan can have a similar effect to massage on the liver, spleen and stomach of the human body, thus improving the working efficiency of the digestive system. The way of practice with no effort can enhance the sensitivity of the human nervous system and the memory ability of the muscle system. At the same time, Taijiquan is also a group sport. Middle-aged and elderly people can interact with others and improve their communication with the outside world when practicing Taijiquan. Taijiquan, with its low-intensity sports characteristics, can also effectively avoid other complications such as hypertension caused by high-intensity sports(CHANG Shuping & DENG Jingjuan,2010).

2.2 Effect of taijiquan exercise on hypertension

Medical research and experiments show that the slow and gentle movements of Taijiquan have positive significance for the health care and rehabilitation of hypertensive patients, and are conducive to the daily health care and blood pressure control of hypertensive patients. The practice of Taijiquan is to change the body's operating state, eliminate pathological excitement, reduce the tension of blood vessels and central nerves, and gradually normalize the blood pressure of the body by regulating the degree of inhibition and excitation of the brain, strengthening the endocrine reflex connection, and strengthening the connection between the brain, heart, and muscle systems. In the aspect of human body balance, Taijiquan's quiet and calm requirements for practice environment and mental state can regulate the tension of human head nerves, reduce the degree of human adrenaline response, and improve the vagus nerve tension. The movements and concepts of Taijiquan can improve the blood circulation of the human body, strengthen the cardiopulmonary function and reduce the peripheral resistance(YANG Huixin,2011). Practitioners can strengthen the strength of myocardial contraction and relaxation, increase the flow of blood vessels per unit time, reduce the contraction and elasticity of coronary artery myocardium, improve blood rheology and reduce blood viscosity by practicing Taijiquan, and continuously improve cardiac function and increase vital capacity to help hypertensive patients recuperate and improve their physical condition through long-term practice. Practicing Taijiquan can calm the mind, cultivate sentiment, reduce the pressure of life, improve negative emotions, and prevent the occurrence of unhealthy excessive behaviors. As for the digestive system, Li Yanhong mentioned in "The Fitness Function of Taijiquan" that the deep and long breath and the deep and deep breath required in Taijiquan can increase the range of activity of the abdominal muscles and diaphragm, accelerate the gastrointestinal peristalsis, gastrointestinal blood circulation, digestion and secretion, help the body to accelerate the absorption, digestion and utilization of food, and improve the role of the digestive system(CHEN Jianxiong,2010).

Experimental objects and research methods

3.1 Experimental objects

The research object selected for this study is Henan Province × × Twenty prisoners with hypertension aged between 60 and 65 in prison were randomly divided into an experimental group and a control group, with 10 persons in each group. Whether the participants in the experiment are hypertensive patients is based on the physical examination report issued by the local tertiary or higher hospitals.

3.2 Research methods

3.2.1 Literature method

In this study, I have a detailed understanding of the current research on hypertension, meridians, and Taijiquan in the field of research by using relevant literature in the library, searching for relevant data and materials on the Internet, reading and consulting a large number of documents, and have a certain understanding of the current situation of the course, and sorting out the data, which provides theoretical guidance for the smooth progress of this study.

3.2.2 Mathematical statistics

The relevant data collected in the experiment were processed with SPSS16. O software, and the test results were expressed in mean \pm standard deviation ($M \pm SD$). The paired t test was used for intra-group comparison between the experimental group and the control group. When the two groups were compared, the analysis of covariance was used. The significance level was $p < 0.05$, the very significant level was $p < 0.01$, and the extremely significant level was $p < 0.001$.

3.2.3 Experimental method

The participants in the experiment were randomly divided into the experimental group and the control group by the method of comparative experiment. The analysis was supported by the data measured by the members of the two groups before, during and after the experiment. Among them, the experimenters in the experimental group need to perform the exercises of Taiji Zhenzhuang, left and right foot pedaling, arm curling, and seabed acupuncture for 10-15 minutes every morning according to the requirements. The control group personnel, according to their daily habits, do not participate in any physical exercise except for 10-15 minutes of Taiji Zhenzhuang warm-up with the members of the experimental group every morning.

Experimental design

4.1 Experimental group and control group

4.1.1 Experimental group

The experimenters in the experimental group need to practice the three movements of kicking left and right, rolling back the arm, and seabed needle according to the requirements. Subjects adjust the exercise intensity according to their physical conditions when exercising. During the test, the subjects should exercise every day for 45 min to 60 min, a total of 84 days. Before each exercise, the subjects first do preparatory activities for 10-15 minutes, and then complete the three movements of left and right foot pedaling, arm curling, and seabed needle (each action is repeated for 10 minutes).

The exercise prescription developed in this experiment is as follows:

(1) Movement mode: left and right foot pedaling, reverse arm rolling, seabed needle.

(2) Exercise intensity: In order to ensure the physical health of the participants and the smooth progress of the experiment, the exercise intensity of this experiment is determined based on 60% - 80% of the maximum heart rate of the participants (the appropriate exercise heart rate for people over 60 years old = $170 - \text{age}$), and the heart rate can be slightly lower than the appropriate heart rate when exercising according to the actual situation.

(3) Exercise time: The exercise time of the three movements selected in the experiment group in Taijiquan every day is about 30 minutes (10 minutes for each single movement).

(4) Exercise frequency: 84 days (12 weeks) in total.

4.1.2 Control group

In the process of this experiment, the control group members did not participate in any physical exercise except for the 10-15 minutes of Taiji shock pile warm-up with the experimental group members every morning according to their daily habits.

4.2 Test time

45 min - 60 min per day, 84 days (12 weeks) in total.

4.3 Test content

This experiment was recorded by tracking and measuring three physical indicators, and explored relevant issues through comparative analysis.

4.3.1 Blood pressure measurement:

Measured by Henan Province × × Two doctors from the prison hospital chose to use the "Omron" HEM-6111 wrist electronic sphygmomanometer. In order to ensure the accuracy of the test results, the test was conducted at the same time (after the detainees got up at 6:00 in the morning). The experimenter was on an empty stomach and did not take the relevant drugs before the measurement. The standing measurement was used, with the right wrist flat on the abdomen, to maintain the calm state during the measurement. The interval between repeated measurements was more than 30 minutes for each person, and the average value was taken for three times. A total of 12 measurements were made within 12 weeks, at about 6:20 a.m. on Monday.

4.3.2 Blood lipid measurement:

Measured by Henan Province × × Two doctors from the prison hospital carried out the test, and the selected equipment was "Kefu" bkm13-1 blood glucose, blood lipid, total uric acid cholesterol detector. The test method is to wipe and disinfect the left index finger of the subject with alcohol cotton, puncture the left index finger with a blood collection needle and a

blood collection pen to squeeze out a small amount of blood, collect it with a test paper, put the test paper into the device and wait for 10 seconds to read the results. A total of 6 measurements were made within 12 weeks, at about 6:40 a.m. on Monday.

4.3.3 Data record:

All experimental data of this time will be recorded, summarized and made into relevant record sheets, which will be recorded in the appendix of the paper (the names of the participants in the experiment shall not be disclosed according to the relevant laws and regulations, so the "surname+ × × " Formal records).

Results

5.1 Blood pressure measurement results before and after the experiment

Systolic blood pressure: There was no significant difference between the experimental group and the control group before the experiment, but the systolic blood pressure decreased significantly at the 6th and 12th weeks of the experiment ($P < 0.01$); Similarly, the systolic blood pressure of the experimental group also decreased significantly at the 6th and 12th weeks of the experiment compared with that before the experiment ($P < 0.01$).

Diastolic pressure: there was no significant difference between the measured data of the experimental group before the experiment and the sixth week of the experiment and the control group; At the 12th week of the experiment, the diastolic blood pressure of the experimental group decreased significantly ($P < 0.05$); There was no significant change in diastolic blood pressure in the experimental group at the 6th week compared with that before the beginning of the experiment, and the diastolic blood pressure decreased significantly at the 12th week of the experiment ($P < 0.01$).

Pulse pressure difference: the pulse pressure difference in the experimental group decreased significantly before the experiment and at the 6th and 12th weeks of the experiment ($P < 0.05$).

There was no significant change in systolic blood pressure, diastolic blood pressure and pulse pressure difference in the control group before the experiment compared with the relevant data in the 6th and 12th week of the experiment. The systolic blood pressure decreased slightly, the diastolic blood pressure decreased in the early stage and rebounded in the later stage, and the pulse pressure difference increased in the early stage and decreased in the later stage.

See Table 2 for detailed data analysis.

Table 2 Blood pressure changes of participants

| group | time | systolic pressure(mmHg) | diastolic pressure(mmHg) | Pulse pressure difference (mmHg) |
|--------------------|---------|-------------------------------------------|-----------------------------------------|------------------------------------|
| control group | Before | 143.00±7.25 | 83.20±7.55 | 59.80±8.93 |
| | Week 6 | 142.70±8.45 | 81.55±5.25 | 61.40±8.15 |
| | Week 12 | 142.70±7.75 | 83.30±7.65 | 58.90±7.46 |
| Experimental group | Before | 139.35±8.45 | 83.50±9.45 | 56.13±11.38 |
| | Week 6 | 131.52±10.25 ^① ^② | 78.35±6.15 | 53.07±9.12 ^③ |
| | Week 12 | 126.65±9.85 ^① ^② | 76.75±7.85 ^③ ^② | 50.40±10.64 ^③ |

Note: T test between groups was compared with control group, ^③ p<0.05, ^① p<0.01; The intra-group T test was compared with that before the experiment, ^② p<0.01

5.2 Blood lipid measurement results before and after the experiment

Triglyceride and high-density lipoprotein: there was no significant difference in the index concentration between the experimental group and the control group before the experiment, and there was no significant difference in the index concentration between the experimental group and the control group before and after the experiment; There was no significant difference in the index concentration between the experimental group and the control group at the 6th and 8th weeks of the experiment.

Cholesterol and low density lipoprotein: There was no significant difference in the index concentration between the experimental group and the control group before participating in the experiment. The index concentration of the experimental group was significantly different from that of the control group before and after the experiment (P<0.01); The index concentration of the experimental group decreased significantly (P<0.01) at the 6th and 12th weeks of the experiment compared with that before the experiment, while the index concentration of the control group did not change significantly at the 6th and 12th weeks of the experiment compared with that before the experiment.

See Table 3 for specific data and analysis.

Table 3 Changes in blood lipids of participants

| group | time | triglyceride (mmol/L) | cholesterol (mmol/L) | High-density lipoprotein (mmol/L) | Low density lipoprotein (mmol/L) |
|---------------|---------|-----------------------|----------------------|-----------------------------------|----------------------------------|
| control group | Before | 2.02±1.35 | 5.67±0.93 | 1.38±0.36 | 3.25±0.81 |
| | Week 6 | 1.93±0.71 | 5.37±1.07 | 1.30±0.38 | 2.98±0.96 |
| | Week 12 | 2.17±0.87 | 5.77±1.01 | 1.28±0.36 | 3.27±0.91 |
| | D-value | -0.15±1.46 | -0.10±0.20 | 0.10±0.23 | -0.02±0.34 |
| Experi | Before | 1.40±0.60 | 5.77±0.88 | 1.48±0.26 | 3.13±0.71 |

| | | | | | |
|-----------------|----------------|------------|-------------|------------|------------|
| mental group | experime nt | | | | |
| | Week 6 | 1.81±0.87 | 5.00±0.94① | 1.49±0.30 | 2.48±0.79① |
| | Week 12 | 2.08±1.84 | 5.26±0.79① | 1.49±0.24 | 2.68±0.59① |
| | D-value | -0.68±1.99 | -0.50±0.57② | -0.01±0.03 | 0.44±0.39② |

Note: T tests between groups were compared with those in the control group ② p<0.01, and T tests within groups were compared with those before the experiment ① p<0.01

Conclusions

According to relevant research and experiments, Taijiquan exercise can play a positive role in the elderly hypertensive patients with hypertension, helping them stabilize blood pressure, lower blood pressure and reduce blood lipid concentration. Therefore, for elderly patients with hypertension, it is a good choice to carry out health care and rehabilitation of related diseases by practicing Taijiquan, which has universal significance and is worth promoting vigorously.

Suggestions

In this experiment, the three-style Taijiquan movements formed by combining the meridians stimulated by the Taijiquan movements with the blood pressure related movements were combined. After the experiment, it was found that they have the corresponding hypotensive effect. Therefore, it is suggested that the traditional Taijiquan movements should be grouped into the corresponding single-style movements according to the meridians stimulated, so that the patients can practice the corresponding movements according to the meridians connected by their diseased body parts, So as to achieve the function of health care and rehabilitation.

Since the main content of this experiment is the experimental study on the influence of three-style Taijiquan on elderly hypertension, only two groups of experimental samples of the experimental group and the control group have been set, and there is still a lack of relevant research in other aspects of exercise intensity, exercise duration, etc., which may produce different results in actual operation, so the specific practice needs the guidance of professionals.

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