REVIEW ARTICLE

The effect of tai chi exercise on hypertension and hyperlipidemia – a systematic study and meta-analysis

Authors' Contribution:
A Study Design
B Data Collection
C Statistical Analysis
D Manuscript Preparation
E Funds Collection

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Abstract

Background and Study Aim: According to the World Health Organization, about 17.7 million people died of cardiovascular diseases worldwide in 2015, accounting for 31% of all global deaths. Various risk factors for cardiovascular diseases contribute to the increase in the number of people with cardiovascular diseases. The aim of this study was knowledge about the effect of tai chi exercise on the control of blood pressure values and other biochemical indices and the period and intensity of exercise in hypertensive patients.

Material and Methods: Computer search of Chinese and English databases. Including China Knowledge Network (CNKI), Web of Science (WOS), PubMed, Cochrane Library, Scopus, and others. The search terms were interventions: taijiquan, taiji, tai chi, tai chi chuan, and: ″hypertension″, ″high blood pressure″. The search was conducted by subject term + keyword, and the search time was from the library construction to January 2022. The included literature was forest plotted using Review Manager 5.4.1 software, and effect sizes were calculated using standardized mean differences (SMD) for analysis and 95% confidence intervals (95% CI) for fixed and random effect models. Effect sizes were estimated when SMD ≥0.2 was small, SMD ≥0.5 was moderate, and SMD ≥0.8 was large. Results $p<0.05$ were defined as having a significant effect.

Results: The results of tai chi intervention group compared with no intervention, usual care, and walking showed that the tai chi intervention group was more effective in blood pressure control compared with the control group, where the systolic blood pressure results were significant. Tai chi intervention was more effective in triglyceride, total cholesterol, and LDL control, but the total cholesterol and LDL results were not statistically significant. The cycle difference in tai chi exercise was not significantly associated with the effect on blood pressure control. More influential on blood pressure controls were the intensity of a single tai chi session and the frequency of tai chi training. The intensity of a single taijiquan exercise was correlated with the blood pressure control effect, and adherence to taijiquan exercise for more than 12 weeks and maintaining a single training time of 40 minutes or more could effectively control blood pressure.

Conclusions: Consistent participation in taijiquan exercise can effectively control blood pressure. The classification of the period and intensity of tai chi interventions was crude, and only roughly classified the intensity levels of tai chi interventions. This is why follow-up studies could be more detailed in a scientific sense when it comes to classifying the intensity of tai chi interventions.

Key words: blood pressure • exercise intensity • physical activity • taijiquan

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INTRODUCTION

Cardiovascular disease is a serious threat to human health. According to the World Health Organization [1], about 17.7 million people died of cardiovascular diseases worldwide in 2015, accounting for 31% of all global deaths. Various risk factors for cardiovascular diseases contribute to the increase in the number of people with cardiovascular diseases. These risk factors include smoking, hypertension, hyperglycemia, dyslipidemia, unhealthy diet, family history of cardiovascular disease, overweight, and physical inactivity. Not taking up physical activity is an important behavioral risk factor for cardiovascular disease and often occurs in conjunction with elevated blood pressure, elevated blood lipids, elevated blood glucose, and overweight and obesity. In contrast, regular moderate-intensity physical activity lowers blood pressure, blood glucose, and blood lipids and reduces the risk of heart attack and stroke [2]. Regular physical activity helps to reduce mortality from cardiovascular diseases [3]. Physicians, physical therapists, and other health care professionals, along with conventional medications, often encourage patients to participate in regular physical activity [4]. However, participants who engage in regular physical activity such as walking may not fully adhere to the program or maintain interest over time [5, 6]. Therefore, more and more patients are trying *tai chi* as a form of physical exercise. *Taijiquan* is a popular physical activity among the Chinese and is a multi-component mind-body exercise based on the holistic model of Chinese medicine [7, 8]. *Tai chi* adopts the Chinese philosophy of wellness and works on a holistic level it is based on slow conscious movements, coordinated with breathing and imagery, aimed at relaxing the mind and body and improving health and personal development [9, 10]. *Taijiquan* exercises are moderately intense, as is the intensity of brisk walking [11]. Considering the social and cultural influence of *taijiquan*, it may be easier to stimulate interest in exercise and persist in it than brisk walking. Moreover, *tai chi* is effective in reducing joint wear and tear compared to exercise modalities such as brisk walking [12].

Many scholars have conducted studies to evaluate the effectiveness of *tai chi* as a method of promoting health in older adults with chronic diseases. The results of these studies have shown that *tai chi* can improve age-related degenerative pathologies, including pulmonary function, cardiovascular function, balance, and cognitive function [13]. Several studies have shown that *tai chi* exercise can reduce systolic and diastolic blood pressure and improve patients' mental health to some extent, and patients with cardiovascular disease have also achieved good rehabilitation through *tai chi* exercise. For example, a study by Tsai showed that a 12-week *tai chi* program lowered blood pressure, improved lipid levels, and enhanced anxiety in healthy participants with normal high blood pressure or stage I hypertension [14]. A community study by Sun and Buys found that 12 months of *tai chi* helped patients aged 45-80 years with hypertension to lower blood pressure and body mass index (BMI), maintain normal renal function, and improved health-related quality of life [15]. The results of Xu's [16] study showed that hypertensive patients in the *tai chi* group reported physical benefits (e.g., lower blood pressure, BMI, cholesterol, triglycerides) and psychosocial well-being (e.g., lower anxiety and depressive symptoms) compared to the control group.

In China, many studies have demonstrated the beneficial effects of *tai chi* on hypertension patients in lowering blood pressure and improving quality of life. However, a Meta-analysis of hypertension and *tai chi* interventions in Chinese adults showed that most randomized controlled studies were of low quality and many studies lacked scientific basis and comparative trials on the duration and intensity of *tai chi* exercise.

Exercise – *noun* **1.** physical or mental activity, especially the active use of the muscles as a way of keeping fit, correcting a deformity or strengthening a part **2.** a particular movement or action designed to use and strengthen the muscles ■ *verb* **1.** To undertake physical exercise in order to keep fit and healthy **2.** to subject the body, or part of it, to repetitive physical exertion or energetic movement in order to strengthen it or improve [29].

Exercise intensity – in order to improve physical fitness, exercise must be hard enough to require more effort than usual. The method of estimating appropriate training intensity levels varies with each fitness component. Cardiovascular fitness, for example, requires elevating the heart-rate above normal [30].

Physical activity – *noun* exercise and general movement that a person carries out as part of their day [29].

In this paper, we conducted a Meta-analysis of included randomized controlled trials of *tai chi* intervention in hypertensive patients to systematically evaluate the effect of *tai chi* exercise on the control of blood pressure and other cardiovascular disease indicators, and to analyze the effect of *tai chi* intervention period (time) and intensity on the above indicators.

The aim of this study was knowledge about the effect of *tai chi* exercise on the control of blood pressure values and other biochemical indices and the period and intensity of exercise in hypertensive patients.

MATERIAL AND METHODS

Research content

Study type. A randomized controlled trial of *taijiquan* intervention in patients with hypertension.

Study subjects. The subjects included in the literature study were hypertensive patients of any age, gender, etiology, and duration of disease.

Diagnostic criteria. Hypertension diagnostic criteria were following the 2014 JNC8 diagnostic criteria of systolic blood pressure ≥140 mm Hg (1 mm Hg ≈ 0.133 kPa) and/or diastolic blood pressure ≥90 mm Hg; pre-hypertension was following the 2003 JNC7 diagnostic criteria of systolic blood pressure of 120–139 mm Hg and/or diastolic blood pressure of 80–89 mm Hg. The previous history of hypertension, currently using antihypertensive medication, blood pressure was diagnosed as hypertension even though it was lower than 140/90 mm Hg.

Intervention method. The intervention group used *tai chi* exercise; the control group was no intervention, conventional care (antihypertensive drugs, health education, etc.), or walking.

Study indexes. Primary index: blood pressure values; secondary indexes: triglycerides, total cholesterol, high-density lipoprotein, low-density lipoprotein.

Literature search

Computer search of Chinese and English databases. Including China Knowledge Network (CNKI), Web of Science (WOS), PubMed, Cochrane Library, Scopus, and other databases. The search terms were interventions: *Taijiquan*, *Taiji*, *Tai Chi*, *Tai Chi Chuan* and hypertension: hypertension, Hypertension, and High blood pressure. the search was conducted by subject term + keyword, and the search time was from the library construction to January 2022.

Literature inclusion criteria. The following criteria were required for literature inclusion: 1. the type of study was a randomized controlled study; 2. subjects were required to meet the diagnostic criteria for hypertension; 3. the intervention was *tai chi*, and the control group was no intervention, usual care or walking; 4. the period of *tai chi* intervention was 12 weeks or more; 5. the main test index was blood pressure value.

Data extraction. Literature search was conducted by 2 investigators according to the search strategy respectively, and according to the inclusion and exclusion criteria, the literature that did not meet the requirements was excluded, and the literature data that met the inclusion criteria were extracted and a general information sheet for inclusion in the study was made, and disagreements were resolved through discussion and consultation or consultation with a third party. Data extraction and entry were performed using EXCEL software, and the entry included: 1. basic information of the included studies: title, authors, year of publication, etc.; 2. baseline characteristics of the study subjects: sample size, age, etc. of each intervention group; 3. interventions: intervention methods, intervention period, etc.; 4. factors related to the risk of bias evaluation: randomized methods, blinded methods, etc.; 5. outcome indicators: primary indicators: blood pressure values and secondary indicators: triglycerides, total cholesterol, high-density lipoprotein, low-density lipoprotein, etc.

Risk of bias evaluation of the included literature

The Cochrane Collaboration Risk of Bias Assessment Tool was used to assess: 1. the use and description of the random sequence generation method; 2. whether the concealment of the allocation scheme was described; 3. whether the subjects were blinded; 4. whether the data collation and outcome evaluators were blinded; 5. the completeness of the outcome data; 6. whether selective reporting was available. For each of the included studies, the above six "yes" (low bias), "no" (high bias), and "unclear" (unknown risk) judgments were made, and the results were reported using Review Manager 5.4.1 to create a risk of bias map.

Statistical analysis

The included literature was forest plotted using Review Manager 5.4.1 software, and effect sizes were calculated using standardized mean differences (SMD) for analysis and 95% confidence intervals for fixed and random effect models. Heterogeneity was judged by I^2; when I^2 <50%, heterogeneity could be ignored and fixed models were used; 50% ≤ I^2 <75% had moderate heterogeneity, and when I^2 ≥75%, heterogeneity was large and both required the use of random-effects models and the sources of heterogeneity should be discussed and analyzed. Effect sizes were estimated when SMD ≥0.2 was small, SMD ≥0.5 was moderate, and SMD ≥0.8 was large. Results p <0.05 were defined as having a significant effect.

RESULTS

Literature inclusion process and results in the initial review of 399 literature (302 in Chinese, 97 in English), and after screening by inclusion and exclusion criteria, 7 kinds of literature were finally included [17-23], including 4 in Chinese and 3 in English. The literature screening process and results are shown in Figure 1.

Basic characteristics of the included studies

A total of 693 subjects were included in the seven literature, including 346 in the intervention group (TG) and 347 in the control group (CG). The general profile of the included studies is shown in Table 1 and 2.

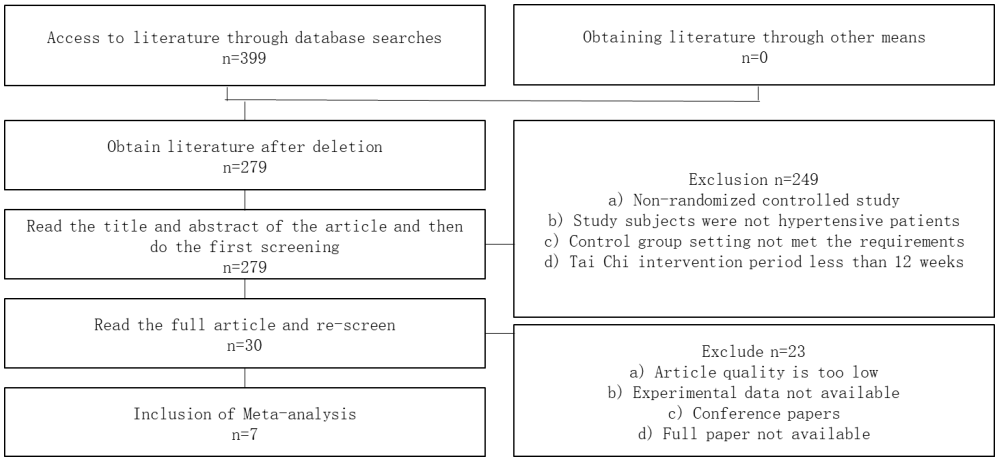


Figure 1. Literature screening process.

Table 1. Basic characteristics of the included studies.

Literature	Sample size		Age		Intervention	
	TG	CG	TG	CG	TG	CG
2018 Feng et al. [17]	36	37	67.51 ±4.09	66.33 ±4.74	tai chi	walking
2018 Ma et al. [18]	79	79	70.24 ±10.25	69.71 ±10.84	tai chi	routine care
2018 Mendoza-Núñez et al. [19]	48	37	67.40 ±4.70	68.20 ±6.60	tai chi	no intervention
2019 Shou et al. [20]	98	100	52.35 ±3.26	51.35 ±4.21	24 simplification tai chi	routine care
2019 Wang et al. [21]	50	50	67.60 ±4.50	67.40 ±4.20	24 simplification tai chi	routine care
2019 Xianwurina et al. [22]	20	29	40.50 ±12.64	50.52 ±17.59	tai chi	routine care
2021 Hu et al. [23]	15	15	54 ±60	53 ±80	24 simplification tai chi	no intervention

Table 2. Basic information about the included studies.

Literature	Intervention period	Intensity of intervention	Outcome indicators
2018 Feng et al. [17]	12 weeks	3 times a week, 60 min each time	blood pressure, triacylglycerol, total cholesterol, LDL, HDL
2018 Ma et al. [18]	24 weeks	3-5 times per week, ≥ 60 min per time	blood pressure, BMI, waist circumference, social support and depression, quality of life
2018 Mendoza-Núñez et al. [19]	24 weeks	5 times a week, 50 min each time	blood pressure, heart rate, RHR-SBP product, RHR-MAP product, glycated hemoglobin, oxidative stress markers, inflammatory markers
2019 Shou et al. [20]	12 weeks	45-60 min each time	blood pressure, heart rate, blood lipids, blood glucose, pulse pressure, BMI
2019 Wang et al. [21]	12 weeks	3 times a week for 40-60 min each time	blood pressure, fasting glucose, triacylglycerol, total cholesterol, LDL, HDL
2019 Xianwurina et al. [22]	16 weeks	3 times a week, 60 min each time	blood pressure, heart rate, physical parameters
2021 Hu et al. [23]	12 weeks	3 times a week for the first 6 weeks, 5 times a week for the last 6 weeks, 40-60 min each time	blood pressure, microvascular reactivity, NO level, NOS activity test

Quality and risk of bias evaluation. The results of the quality and bias evaluation of the included literature are shown in Figure 2.

Meta-analysis results

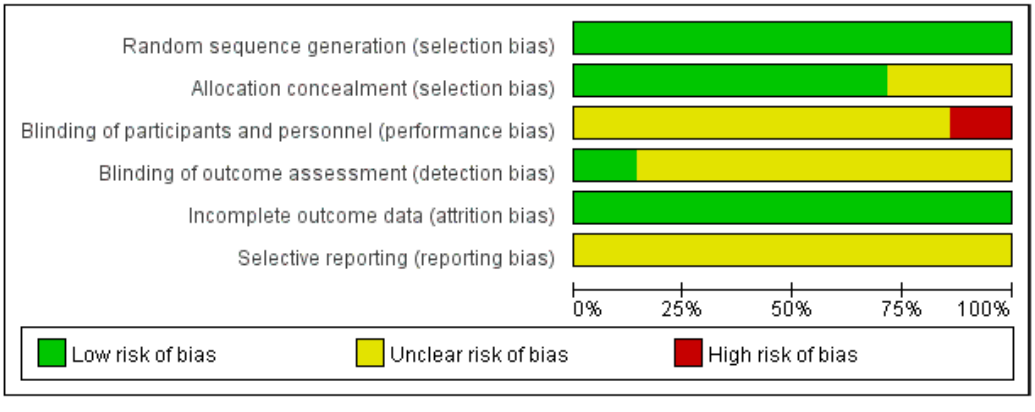
Analysis of blood pressure values

The results of the *tai chi* intervention group comparing no intervention, usual care, and walking in seven studies showed systolic blood pressure effect values: SMD = −0.94, 95% CI (−1.83, −0.05), p = 0.04 and diastolic blood pressure effect values: SMD = −0.54, 95% CI (−1.12, 0.04), p = 0.07. It indicates that the *tai chi* intervention group was more effective in blood pressure control compared to the control group, where the systolic blood pressure results were significant.

Subgroup analysis of the different intervention modalities showed the results in Figure 3. from the data in the table, it is clear that the most significant effect of *taijiquan* versus no intervention in systolic blood pressure, followed by walking and conventional care; and the most significant effect of *taijiquan* versus no intervention in diastolic blood pressure, with no difference from conventional care and walking.

Analysis of other physiological and biochemical indicators

The results of the *tai chi* intervention group versus the control group in the three studies showed that the triglyceride effect value: SMD = −0.93, 95% CI (−1.47, −0.39), P<0.0001; total cholesterol effect value: SMD = −0.44, 95% CI (−0.64, −0.23), p = 0.0008; HDL effect value: SMD = 0.32, 95% CI (−0.02, 0.67), p = 0.07; and LDL effect values: SMD = −0.56, 95% CI (−0.93, −0.20), p = 0.003. The *tai chi* intervention was more effective in controlling triglycerides, total cholesterol and LDL, but the HDL results were not statistically significant.



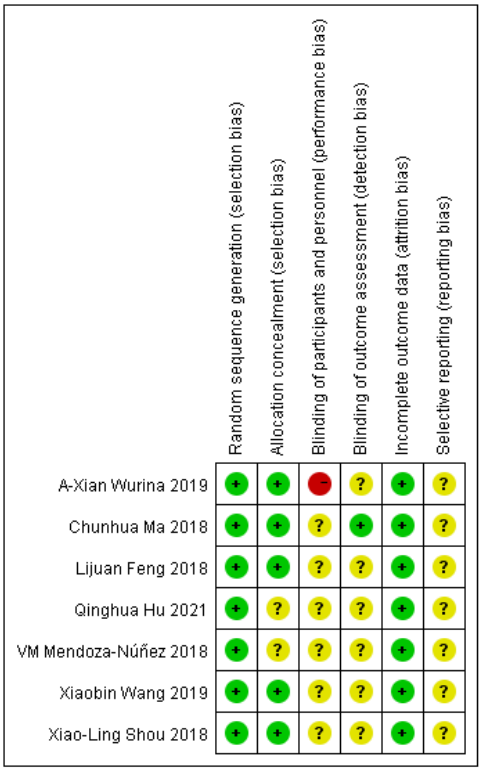
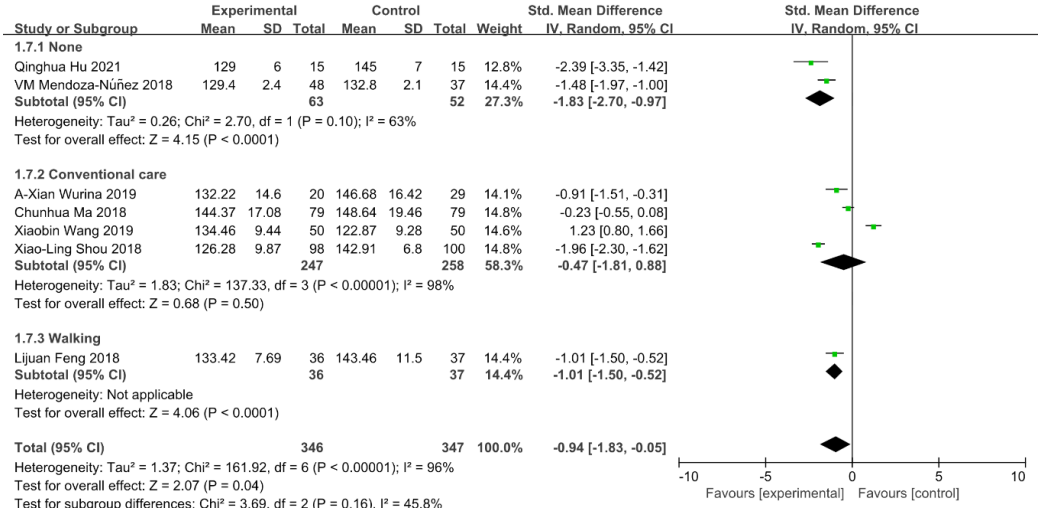


Figure 2. Risk of bias graph.

Intervention period and intensity analysis

Since there were only three studies on lipid items in the included literature, only the blood pressure values were analyzed for the intervention cycle and intensity. Four *tai chi* intervention cycles of 12 weeks, one intervention cycle of 16 weeks, and two intervention cycles of 24 weeks were included in the included literature. Intervention intensity was integrated considering weekly intervention frequency and single intervention duration and was divided into 2 articles of low intensity, 4 articles of medium intensity, and 1 article of high intensity.

The analysis showed that the systolic blood pressure 12-week *tai chi* intervention effect



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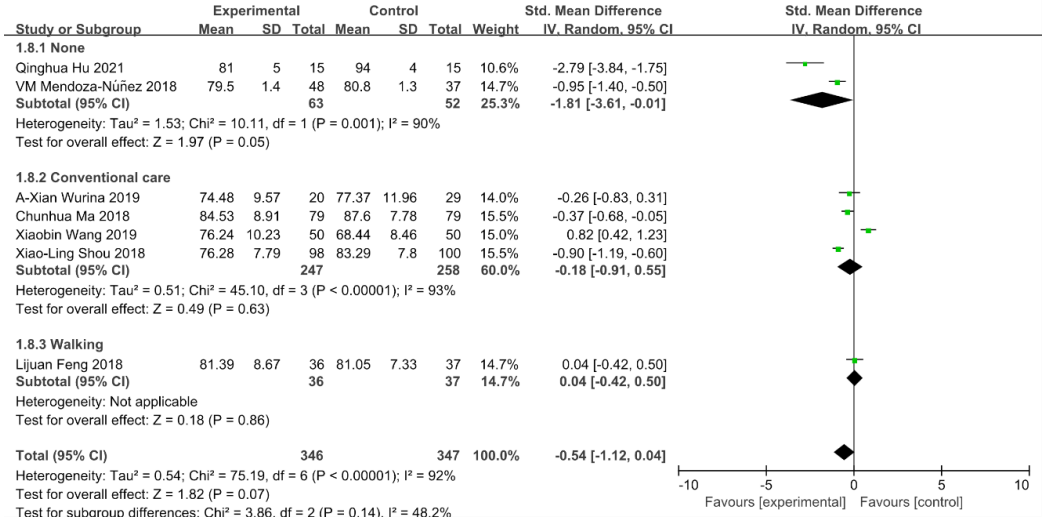
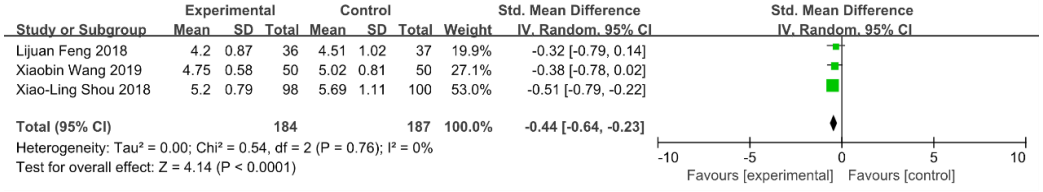


(b)

Figure 3. Results of meta-analysis of blood pressure values under different interventions (a — systolic blood pressure, b — diastolic blood pressure).

values: SMD = −1.01, 95% CI (−2.67, −0.65), p = 0.23; 16-week intervention effect values: SMD = −0.91, 95% CI (−1.51, −0.31), p = 0.003; 24-week intervention effect values: SMD = −0.84, 95% CI (−2.07, 0.38), p = 0.16. Systolic blood pressure results were significant for the 16-week *tai chi* intervention and not statistically significant for the 12- and 24-week interventions. The diastolic blood pressure 12-week *tai chi* intervention effect values: SMD = −0.62, 95% CI (−1.71, 0.47), p = 0.27; 16-week intervention effect values: SMD = −0.26, 95% CI (−0.83, 0.31), p = 0.38; and 24-week intervention effect values: SMD = −0.63, 95% CI (−1.20, −0.06), p = 0.03; and for diastolic blood pressure, the results were significant for the 24-week *tai chi* intervention and not statistically significant for both the 12- and 16-week interventions.

Systolic blood pressure low intensity *tai chi* intervention effect value: SMD = 0.17, 95% CI (−1.92, 2.26), p = 0.87; medium intensity intervention effect value: SMD = −1.35, 95% CI (−2.35, −0.36), p=0.008; high intensity intervention effect value: SMD = −1.48, 95% CI (−1.97, −1.00), p<0.00001. For systolic blood pressure, the low-intensity *tai*



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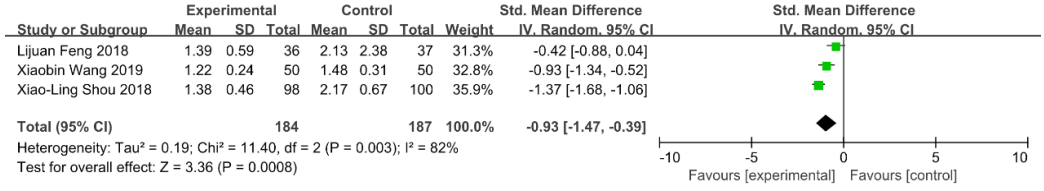

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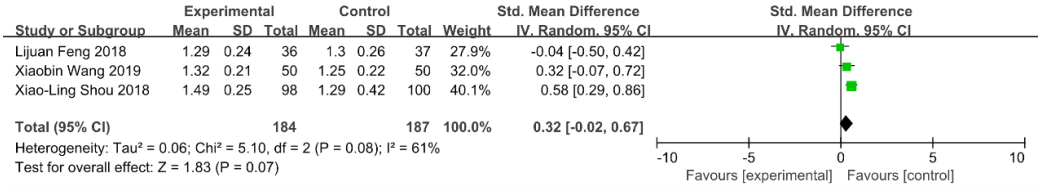

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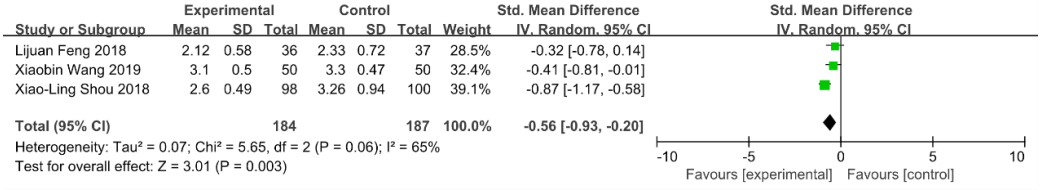


(d)

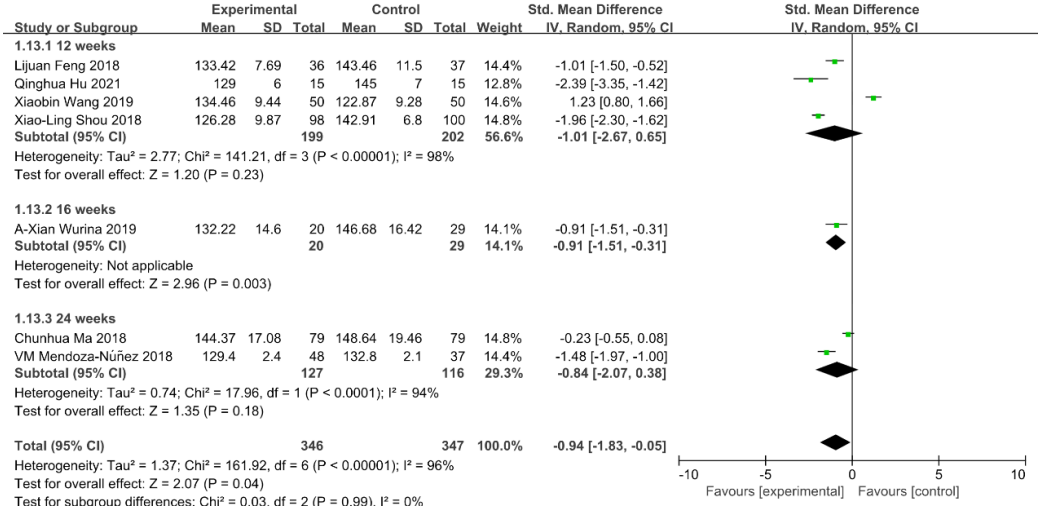
Figure 4. Results of meta-analysis of lipids (a — total cholesterol, b — triglycerides; c — HDL; d — LDL).

chi intervention did not provide blood pressure control, whereas the medium- and high-intensity *tai chi* intervention provided a good effect, and the high-intensity intervention was more effective than the medium-intensity.

The diastolic blood pressure low intensity *tai chi* intervention effect value: SMD = 0.30, 95% CI (−0.76, 1.36), p = 0.58; the medium intensity intervention effect value: SMD = −0.83, 95% CI (−1.51, −0.16), p = 0.02; and this intensity intervention effect value: SMD = −0.95, 95% CI (−1.40, −0.50), p<0.00001. For diastolic blood pressure, the results were the same as for systolic blood pressure, with no blood pressure control effect for the low-intensity intervention and a better effect for the medium-intensity intervention.

DISCUSSION

The results of the meta-analysis showed that the *tai chi* intervention had a significant control effect on systolic blood pressure and a slightly weaker control effect on diastolic blood pressure compared to no intervention, conventional care, and walking. Conventional care was more effective in the control of diastolic blood pressure. This is related



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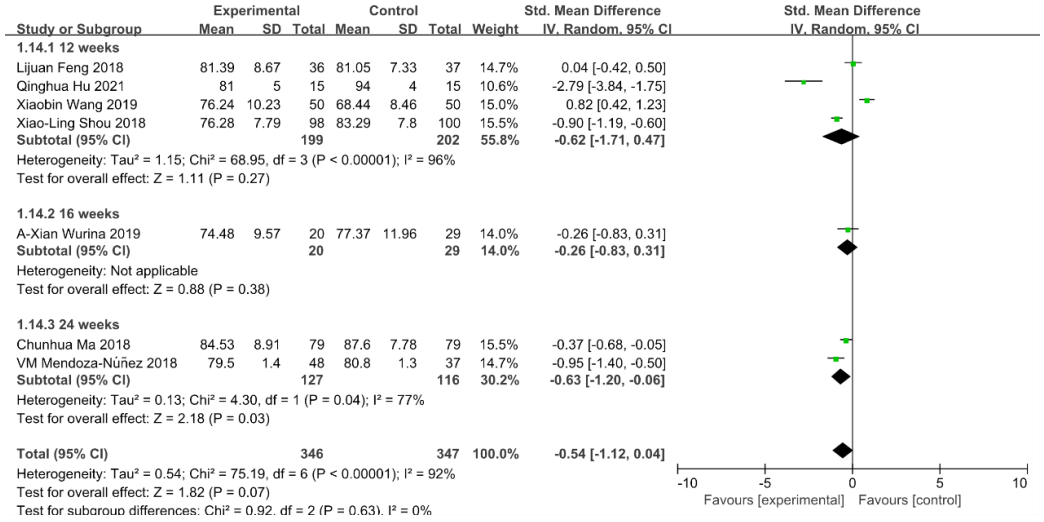

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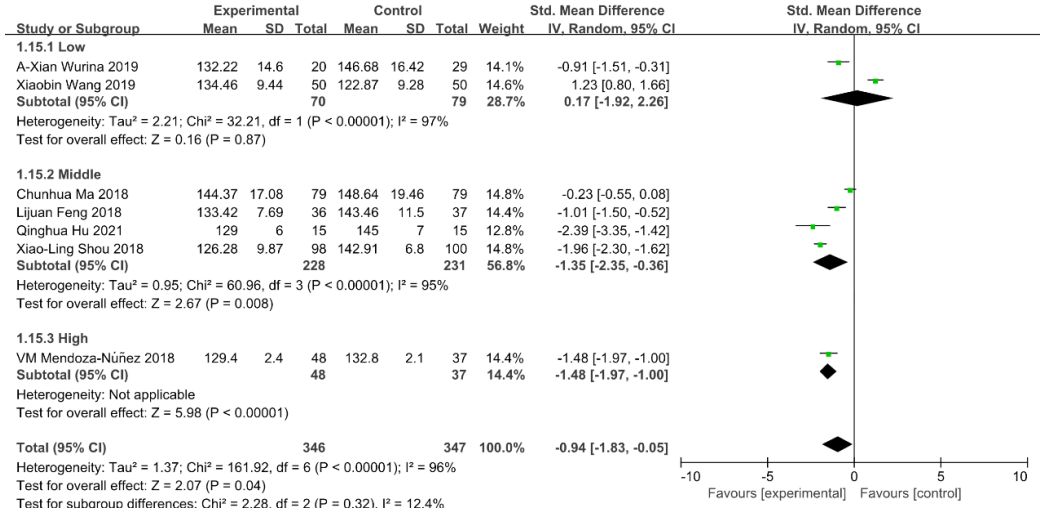
Figure 5. Results of a meta-analysis of blood pressure values for intervention cycles (a — systolic blood pressure; b — diastolic blood pressure).

to the physiological characteristics of systolic and diastolic blood pressure, and the effective means of controlling diastolic blood pressure is pharmacotherapy. *Tai chi* is a potential non-pharmacological approach to lowering blood pressure. It may help to reduce the use of antihypertensive drugs or adverse drug side effects [14]. A study by Tsai and colleagues conducted 12 weeks of *tai chi* exercise training in adults with normal high blood pressure or stage 1 hypertension. The results showed significant reductions in systolic and diastolic blood pressure of 15.6 mmHg and 8.8 mmHg; these blood pressure lowering effects were like those of some anti-hypertensive medications. This provides clinical evidence that *tai chi* is a partial or total alternative to medication for blood pressure control, which would reduce the burden on the liver and kidneys in hypertensive patients. A Meta-analysis by Ettehad et al.[24] included 123 studies with 613,815 participants to evaluate the prevention of cardiovascular disease and reduction of patient mortality by lowering blood pressure. This Meta-analysis found that a 10-mmHg reduction in systolic blood pressure reduced the risk of major cardiovascular disease by 20%, the incidence of coronary heart disease by 17%, the incidence of stroke



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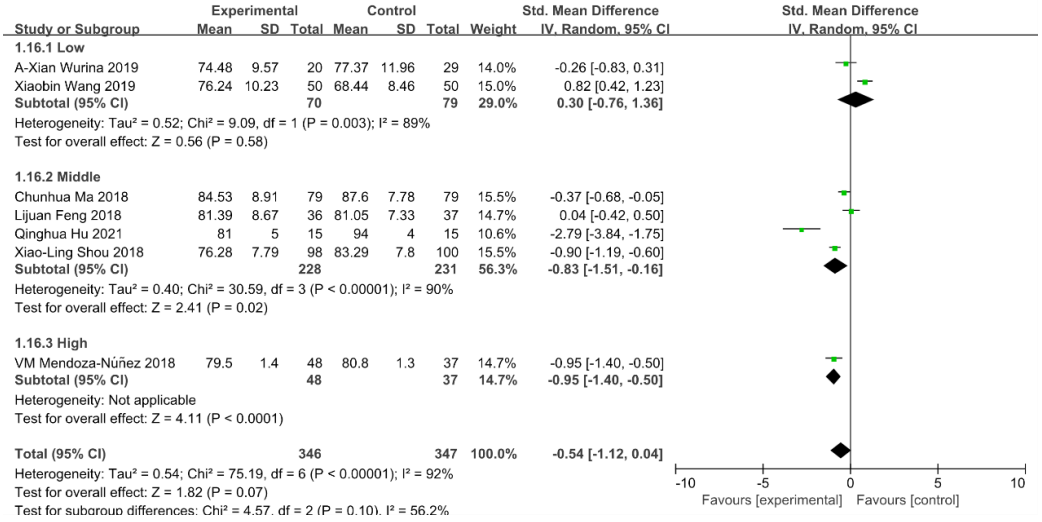

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Figure 6. Results of meta-analysis of blood pressure values for different intervention intensities (a — systolic blood pressure; b — diastolic blood pressure).

Table 3. Subgroup analysis effect values for exercise period and exercise intensity.

Subgroup			Sample size	Efficacy value	95% CI	p-value
SBP	Intervention period	12weeks	401	−1.01	(−2.67, 0.65)	0.23
		16 weeks	49	−0.91	(−1.51, −0.31)	**0.003**
		24 weeks	243	−0.84	(−2.07, 0.38)	0.16
	Intervention intensity	Low	149	0.17	(−1.92, 2.26)	0.87
		Mid	459	−1.35	(−2.35, −0.36)	**0.008**
		High	85	−1.48	(−1.97, −1.00)	**<0.00001**
DBP	Intervention period	12 weeks	401	−0.62	(−1.71, 0.47)	0.27
		16 weeks	49	−0.26	(−0.83, 0.31)	0.38
		24 weeks	243	−0.63	(−1.20, −0.06)	0.03
	Intervention intensity	Low	149	0.30	(−0.76, 1.36)	0.58
		Mid	459	−0.83	(−1.51, −0.16)	**0.02**
		High	85	−0.95	(−1.40, −0.50)	**<0.00001**

by 27%, the incidence of heart failure by 28%, and all-cause mortality by 13%. These results underscore the clinical significance of changes in resting blood pressure. Antihypertensive treatment significantly reduces the risk of cardiovascular disease and death in patients with various types of cardiovascular disease.

The results of this Meta-analysis for cycle and intensity of *tai chi* interventions showed no significant association between cycle differences in *tai chi* exercise and the effect on blood pressure control without considering the intensity of a single training session. After maintaining *tai chi* exercise for at least 12 weeks, extending *tai chi* exercise did not enhance the decrease in blood pressure. More influential on blood pressure controls were the intensity of the single *tai chi* session and the frequency of *tai chi* training. Single sessions of 40–60 minutes and more than 60 minutes of *tai chi* exercise had a more significant effect on blood pressure control, while single sessions of 30 minutes of *tai chi* exercise had an average effect. In another study, the *tai chi* group had significantly lower systolic and diastolic blood pressure than the control group after

3 months of *tai chi* intervention. At the 6-month follow-up assessment, *tai chi* participants exhibited a slight increase in systolic blood pressure, possibly due to adjustment of blood pressure medications after the initial 3-month *tai chi* exercise. Considering the differences in the type and dose of antihypertensive medication, analysis of the effect of medication adjustment on blood pressure was outside the scope of the study. However, the sustained positive effect of *tai chi* on blood pressure resulted in a significant improvement at the 9-month follow-up assessment compared with the control group. This partly explains the variability in the results of the 16- and 24-week groups of *tai chi* exercise cycles in the Meta-analysis, possibly as a result of subjects taking reduced antihypertensive medication use after blood pressure was controlled.

The results of the effect of *tai chi* exercise on lipid indices mostly showed no statistical significance. In one study, the results showed no significant improvement in triglycerides, total cholesterol, and LDL in participants randomly assigned to the *tai chi* or brisk walking groups. The opposite result was found in Hui's study [25]. This can be explained by the fact that using only exercise interventions without changing dietary habits or using a combination of dietary and exercise interventions was not effective in regulating lipid parameters [26].

The mechanism of blood pressure control by *taijiquan* is still under investigation. From the perspective of Chinese medicine, the Gongfu exercise stimulates the function of the internal organs, harmonizes the qi, blood, and fluids, and brings the internal yin and yang in order, while the external tendons and muscles flourish so that the human body tends to be in a relaxed and quiet state and achieves the purpose of stable blood pressure reduction. From the perspective of Western medicine, aerobic exercise [27] may improve the structural basis of hypertension by reducing body mass, improving the metabolism of substances in the body, reducing the risk factors of hypertension; reshaping or reconstructing the heart and vascular structure of hypertensive patients to improve the structural basis of hypertension formation; increasing the content of antioxidant substances and the activity of antioxidant enzymes in the body; regulating the function of the neuroendocrine-immune system, reducing sympathetic excitability, eliminating human It also regulates the function of the neuroendocrine-immune system, reduces sympathetic excitability, eliminates anxiety and other tensions, and improves immune function. Since *taijiquan* is also an aerobic exercise, the antihypertensive mechanism of *taijiquan* must have similarities to that of aerobic exercise. The mechanism of blood pressure and lipid-lowering by *tai chi* exercise may be through the regulation of gas signaling molecules [28]. *Tai chi* exercise can reduce patients' epinephrine and BMI and improve their lipid profile; it enhances patients' vascular endothelial function by reducing their endothelin-1 content and elevating nitric oxide content. Therefore, *tai chi* exercise is an affordable, safe, and effective exercise therapy recommended for elderly patients with hypertension. *Taijiquan* can lower and stabilize blood pressure, improve the internal environment of the body, reduce target organ damage, prevent, and control complications, and improve the quality of life of patients.

Cardiovascular disease is an important factor threatening human health. Controlling blood pressure and blood lipids can effectively reduce the risk of cardiovascular diseases. Based on the results of this study, consistent participation in *taijiquan* exercise can effectively control blood pressure. The intensity of a single session of *tai chi* exercise was correlated with the effect of blood pressure control, and adherence to *tai chi* exercise for more than 12 weeks and maintaining a single session of 40 minutes or more was effective in controlling blood pressure.

LIMITATIONS OF THIS STUDY

Only seven papers were included in the Meta-analysis of this paper, and only some of them used blinded experimental design and had some loss of experimental subjects. This put an impact on the results of the randomized controlled trials.

CONCLUSIONS

The classification of the period and intensity of *tai chi* interventions was basic, and only roughly classified the intensity levels of *tai chi* interventions; follow-up studies could be more detailed and scientific in classifying the intensity of *tai chi* interventions. In addition, drug intake has a non-negligible effect on blood pressure control, but this study did not take a comprehensive and detailed study of drug intake and could only determine that there was no drug intake in the no-intervention group, which brought some variability to the study results.

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