

Meta analysis of intervention effect of Aerobics on patients with essential hypertension

Yu Xiang¹, Zhao Gang¹, Zhang Fucheng¹, Guo Si¹, Wang Yue²

¹Chengdu University of technology, Chengdu 610095, China, ²Tongji University, Shanghai, 200092, China

DOI: <https://doi.org/10.5281/zenodo.7022951>

Published Date: 25-August-2022

Abstract: This study explores the influence of the current popular aerobics exercise on the blood pressure control level of systolic and diastolic blood pressure of hypertensive patients, provides theoretical support for the clinical treatment of hypertension, and provides methods to prevent and reduce the harm caused by hypertension. Through searching the database of China CNKI, 12 articles were included in this study, and meta-analysis was used to analyze the data. Data obtained: the effect of Aerobics Exercise on systolic blood pressure of hypertensive patients was statistically significant (WMD = -27.27, 95% CI [-28.92, -25.61], $z = 32.28$, $P < 0.01$), and the effect of Aerobics Exercise on diastolic blood pressure of patients was statistically significant (WMD = -14.14, 95% CI [-15.30, -12.98], $Z = 23.80$, $P < 0.01$). This paper uses the methods of literature, quality evaluation and data extraction to analyze, and concludes that aerobics exercise can reduce the systolic and diastolic blood pressure of hypertensive patients in different degrees, and can be used as a sports program for the treatment of hypertension, providing a theoretical basis for the clinical treatment of hypertension.

Keywords: Aerobics; Hypertensive patients; Intervention effect; Meta analysis.

1. INTRODUCTION

More than one-third of adults around the world now have hypertension, a rate growing with age, accounting for one in 10 of their 20s and 30s and 5 in 10 of those in their fifties^[1]. In the past 50 years, the prevalence of hypertension in China has been increasing year by year, and hypertension patients in China have growing rapidly. According to the average annual increase of people over 15 years old, the prevalence of hypertension is 24%, and it is estimated that 266 million people in China^[2]. Hypertension produces irreversible harm to the important target organs of human heart, brain and kidney, and becomes the most important risk factor for coronary heart disease, heart failure, renal failure and other diseases. It not only causes serious disability rate and lethality rate, but also brings heavy economic burden to families and causes the consumption of medical and health resources. The prevalence of hypertension in the elderly is increasing. It is urgent to analyze the unique characteristics and risk factors of the hypertension in the elderly, and to make regular exercise to prevent and control blood pressure levels while undergoing drug therapy. As a popular mode of home fitness exercise, the general demand for home fitness is gradually rising due to the impact of the COVID-19 epidemic. The current popular aerobics is actually a resistance exercise that combines dead-weight resistance training and aerobic resistance training, which can regulate the cardiovascular system, respiratory system, nervous system, endocrine and metabolic system and other systems to play a positive role^[3]. However, the treatment mechanism of aerobics on hypertension remains to be explored, and more research needs to be carried out. This study analyzed the effect of physical exercise on essential hypertension level by Meta-analysis, and further studied the effect of aerobics on BP level based on previous studies, aiming to provide a basis for the formulation of essential hypertension exercise prescription in the future. By consulting the relevant information in the CNKI literature database, found that the influence of aerobics on hypertension patients research results, many, in the CNKI literature database senior retrieval keywords: resistance exercise, aerobics, hypertension search, screening out some papers, trying to through the Meta analysis of aerobics exercise on the influence of high blood pressure.

2. RESEARCH METHODS

2.1 Literature search

By searching the CNKI database with the keywords "resistance exercise", "aerobics" and "hypertension", searching out the relevant literature on the role and impact of aerobics exercise on hypertension in the database, and then checking the contents of the input literature with the required research data was included in this study.

2.2 Quality assessment

Using JADAD SCALE scale for the final included reference generated from the random allocation sequence, hidden random allocation sequence, researchers subject blind, effect index blind inspection, complete report the main outcome data, selective report of experimental results, research quality of seven aspects of evaluation, meet a condition, perfect 7 points, points 3 is considered low quality research, > 3 points is considered high quality research.

2.3 Data extraction

The selected references were screened, read the full text, and extracted the information and data from the literature, such as the author, length of publication, sample size, intervention measures of the experimental group, intervention measures of the control group, the average and standard deviation of outcome indicators, and made tables for preservation.

2.4 Data analysis

Data from the referenced literature were analyzed using the software RVE-MAN5.2 and tested for heterogeneity on the outcome measures of the reference using the chi-square test, when $I^2At = 0$, indicating that there is no inter-study heterogeneity for each study, when $I^2At < 50\%$, indicating that mild interstudy heterogeneity for each study, when $I^2At > 50\%$, inter-study heterogeneity was indicated, at which point a fixed-effect model was used to incorporate effect sizes.

3. RESULTS

3.1 Quality assessment

A total of 12 references were retrieved from the CNKI database, and were published between 2004 and 2022. The total sample number was 809 people, including 423 in the experimental group and 386 in the control group. The intervention means of the experimental group included at least aerobics exercise. Among them, only three articles were only by aerobics, while the remaining nine articles were accompanied by conventional drug intervention or other means of exercise, such as yoga, walking and aerobics. The control group is generally a conventional treatment method, among which two cases are to maintain the original living habits plus a moderate amount of exercise. Treatment cycles for all studies were 8 – 24 weeks, the exercise frequency was 3 – 7 sessions / week, and each duration of exercise was 20 – 120MIN. The reference literature was evaluated according to the JADAD SCALE scale, in which one sample had withdrawal. Rscoring according to JADAD SCALE scale, 4 articles with 3 points, 7 articles with 4 points and 1 article with 5 points, and the mean score of the included references was 3.75. See Table 1 for specific details.

Table 1: Basic characteristics of the literature included

the first author	Published fixed number of year	sample capacity T/C	Intervention program	Intervention cycle	exercise frequency	grade estimation
Yang Ye	2012	25/15	T: Exercise exercises C: conventional therapy	12 Weeks	7 Times / week 20MIN / times	4
Cheng Xuetian	2012	35/35	T: General treatment + aerobics exercise C: general treatment	1 year	Three times / week 30-60MIN / times	4
Lining	2014	38/42	T: Small and medium-sized intensity aerobics exercise C: - -Like treatment and guidance	8 Weeks	Two times / week 60MIN / time	4
Qiu Peng	2015	30/30	T: Resistance resistance aerobics exercise C: - -Like treatment and guidance	8 Weeks	7 Times / week 20MIN / times	3

Bao Wenli	2015	30/30	T: Resistance resistance aerobics exercise C: Routine, aerobic exercise	12 Weeks	Five times / week 60MIN above / time	4
Xu sai	2016	51/11	T: Additional aerobics C: Keep the original study and living habits	16 Weeks	Three times / week 30MIN / times	3
Mei wei	2018	30/30	T: aerobics C: Keep the original living habits unchanged	12 Weeks	Three times / week 60MIN / time	3
Wu Xiaoqing	2018	42/42	T: Resistance resistance aerobics exercise C: Other aerobics exercises	12 Weeks	Six times / week 60MIN / time	4
Huang jing	2019	55/55	T: Resistance and aerobics intervention C: Routine intervention method	24 Weeks	Three times / week 45MIN / time	4
Zhang Juli	2021	49/49	T: Water aerobics exercise intervention C: Onshore aerobics exercise intervention	12 Weeks	Six times / week 40-60MIN / times	4
Ma Hongyan	2021	20/29	T: Fitness includes aerobics intervention C: Pharmacotherapy and routine care methods	12 Weeks	not quite clear 30MIN / times	3
Liu xinhua	2022	50/18	T: Comprehensive fitness includes aerobics intervention C: Original living habits and medication basis	24 Weeks	Six times / week 30MIN / times	5

Note: T is the exercise group, and C is the control group

3.2 Meta, the analysis results

3.2.1 Effect and influence of aerobics exercise on systolic blood pressure in hypertensive patients

Analysis of SBP according to the 12 selected literature showed heterogeneity detection $P < 0.00001$, $I^2 = 88\%$, the data were heterogeneous, using a random effect model, with the combined effect size $WMD = -27.27, 95\%CI [-28.92, -25.61]$, $Z = 32.28$, $P < 0.01$, the exercise group's SBP was significantly lower and the difference was statistically significant, as shown in Figure 1

3.2.2 Effect and influence of aerobics exercise on diastolic blood pressure in hypertensive patients

Data on the diastolic blood pressure changes of the experimenter were entered in the references in this study, and the META analysis showed that the heterogeneity was tested at $P < 0.00001$, $I^2 = 92\%$, with heterogeneity, using a random effects model. Using the pooled effect size analysis, the combined effect size was $WMD = -14.14, 95\%CI [-15.30, -12.98]$ $Z = -23.80$, $P < 0.01$, and the exercise group compared to the control group showed a statistically significant difference. See Figure 2 for details.

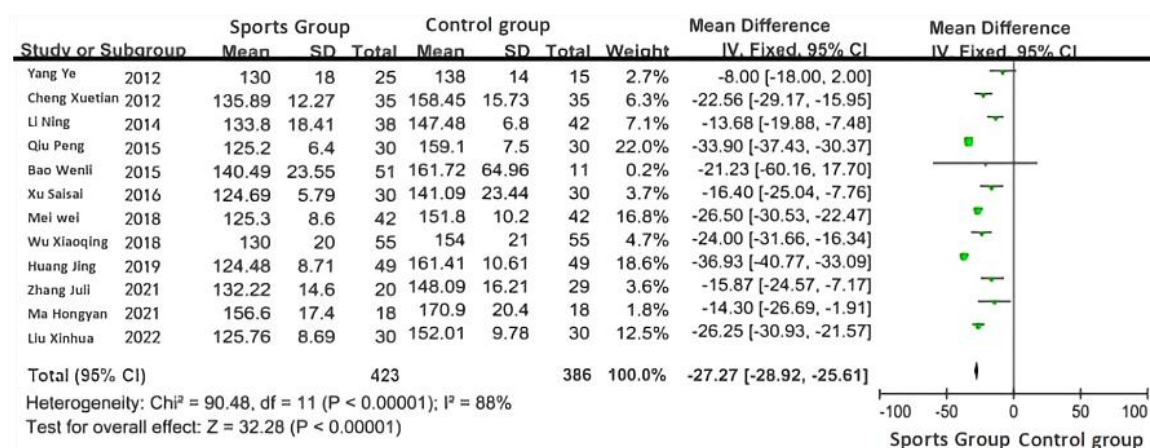


Figure 1: Forest of aerobics exercise in hypertensive patients

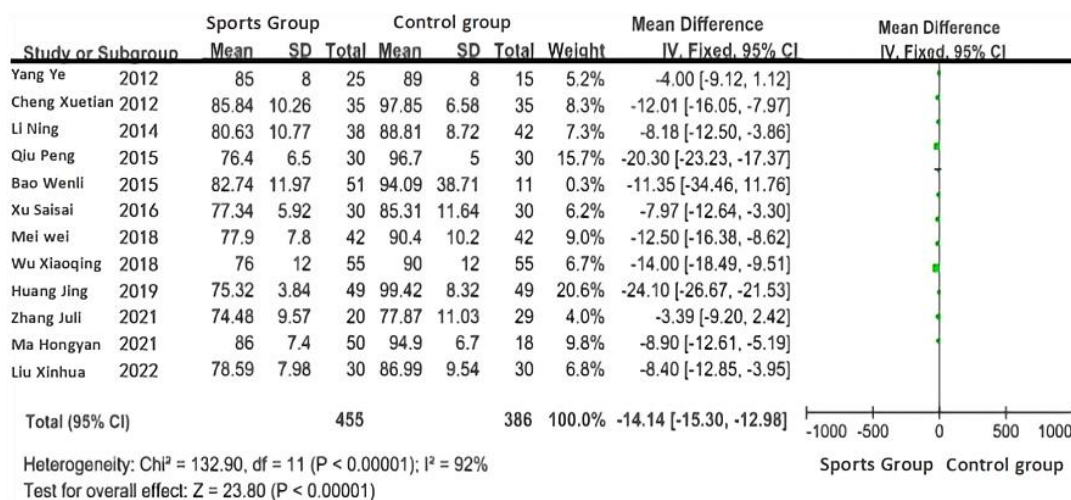


Figure 2: Forest chart of diastolic blood pressure exerted by aerobics exercise in hypertensive patients

3.3 Analysis of the influence of aerobics on the outcome indicators of hypertensive patients

3.3.1 Analysis of the effect of aerobics on SBP outcomes in hypertensive patients

In this study, data analyzed the changes in SBP index of subjects after the experiment. In the systolic blood pressure index of hypertensive patients after a period of aerobics exercise, A total of 11 literature studies on "60MIN / time" in the group of intervention time, The combined effect size calculated from the data is $\text{WMD} = -30.20$, $95\% \text{CI}[-31.79, -28.60]$, $Z = 37.11$, $P < 0.01$, The conclusions drawn were statistically significant, Only one literature study of "> 60MIN / time" in the group of intervention time, The calculated combined effect size is $\text{WMD} = -13.68$, $95\% \text{CI}[-19.88, -7.48]$, $Z = 4.32$, $P < 0.01$, same, The conclusions were statistically significant. Six articles were included in "5 times / week" in the group of intervention frequency, combined effect size $\text{WMD} = -22.75$, $95\% \text{CI}[-25.13, -20.37]$, $Z = 18.74$, $P > 0.01$, this conclusion was not statistically significant, and 5 articles were included in "> 5 times / week" in the group of intervention frequency, combined effect size $\text{WMD} = -29.61$, $95\% \text{CI}[-32.65, -26.56]$, $Z = 19.05$, $P < 0.01$. respectively. A total of "12 weeks" articles included 8 articles, including effect size $\text{WMD} = -28.94$, $95\% \text{CI}[-30.86, -27.01]$, $Z = 29.45$, $P < 0.01$, with statistical significance, 4 articles including "> 12 weeks", with combined effect size $\text{WMD} = -29.14$, $95\% \text{CI}[-31.58, -26.71]$, $Z = 23.46$, $P < 0.01$.

Table 2 Analysis of the effects of aerobics on the outcome measures of hypertensive patients

Outcome	Type of intervention	Group	The amount of	Weighted mean difference (95%CI)	P
systolic pressure	All literature		12		
		Intervention time (min / time)	<60	11	-30.20[-31.79,-28.60]
		>60	1	-13.68[-19.88,-7.48]	<0.01
	Frequency of intervention	<5	6	-22.75[-25.13,-20.37]	>0.01
		>5	5	-29.61 [-32.65,-26.56]	<0.01
	Intervention cycle	<12	8	-28.94[-30.86,-27.01]	<0.01
>12		4	-29.14[-31.58,-26.71]	<0.01	
diastolic pressure	All literature		12		
		Intervention time (min / time)	<60	11	-14.61 [-15.82,-13.40]
		>60	1	-8.81[-12.50,-3.86]	>0.01
	Frequency of intervention	<5	6	-13.18[-14.80,-11.56]	<0.01
		>5	5	-18.05[-20.04,-16.06]	<0.01
	Intervention cycle	<12	8	-16.00[-17.35,-14.65]	<0.01
>12		4	-8.79[-11.49,-6.08]	>0.01	

3.3.2 Analysis of the effect of aerobics on diastolic BP outcome indicators in hypertensive patients

In this study, the data analysis of the change of the diastolic blood pressure index of the subjects after the experiment was conducted. The diastolic blood pressure index was calculated after different times of aerobics exercise to determine whether it was statistically significant. A total of 11 "60MIN / time" were included in the intervention time group, and the combined effect size of WMD=-14.61,95%CI [-15.82, -13.40], $Z = 23.67$, $P < 0.01$, the difference was statistically significant, one "> 60MIN / time" was included in the combined effect size was WMD= -8.18,95%CI [-12.50, -3.86], $Z = 3.71$, $P > 0.01$, the difference > 0.01. A total of 6 "5 times / week" articles in the combined effect size WMD = -13.18,95%CI [-14.80, -11.56], $Z = 15.92$, $P < 0.01$, the difference was statistically significant. For 5 articles > 5 times / week, the combined effect size was WMD = -18.05,95%CI [-20.04, -16.06], $Z = 17.7,80$, $P < 0.01$. Eight articles with "12 weeks" were included, with the combined effect size WMD= -16.00,95%CI [-17.35, -14.65], $Z = 23.26$, $P < 0.01$, differences were significant, four articles with "> 12 weeks" were included, and the combined effect size was WMD= -8.79,95%CI [-11.49, -6.08], $Z = 6.00$ weeks, $Z = 6.37$, $P > 0.01$.

In conclusion, the intervention time was "<60MIN / time", the intervention frequency was "> 5 times / week", and the intervention period was "12 weeks" did not affect the lowering effect of aerobics exercise on SBP and DBP indicators in hypertensive patients.

4. ANALYSIS AND DISCUSSION

4.1 Analysis

Yang Ye^[4]Through the research on the status quo and pathology of hypertension population, summarize the key technology of hypertension population fitness, using the combination of sports and medicine, with the purpose of comprehensive exercise, combined with the characteristics of hypertension population, targeted aerobics of hypertension population, so as to carry out scientific exercise. Cheng Xuétian^[5]Through boxing, fitness equipment, aerobics and other exercises for a year, 3 times a week, each time more than 30 minutes of exercise, adhere to long-term and medium and low intensity exercise, for no serious organic heart disease and exercise contraindications of community hypertension patients, has a more obvious antihypertensive effect. After one year of exercise, the systolic BP and DBP were significantly different between the exercise group and the control group ($P < 0.05$), and the systolic depression was 5.57mmHg, and the diastolic depression was 3.35mmHg. Studies show that in the community to carry out aerobics fitness programs of low intensity exercise, rehabilitation for patients with hypertension, can effectively control the blood pressure in patients with hypertension, and convenient implementation, but also can improve the patient's constitution, reduce the side effects of medication, reduce the economic burden of patients, is a worth promoting rehabilitation treatment in the community. Similar are Li Ning and Zhang Yihong^[6]et al, observe the effect of aerobics on blood pressure and arterial function in middle-aged and elderly hypertensive women. It is concluded that aerobics exercises can help reduce the blood pressure level and improve their arterial function in middle-aged and elderly women. Qiu Peng^[7]To explore the efficacy of systemic resistance aerobics on SBP, DBP and PP in elderly with mild essential hypertension and to explore the resistance exercise prescription for hypertensive elderly. The results showed that resistance aerobics had a good effect on SBP, DBP and PP in quiet in elderly people with mild essential hypertension, and had no obvious effect on EBP. Conclusion Resistance aerobics with low weight bearing and high movement frequency is an indispensable auxiliary exercise in the people with mild essential hypertension. Bao Wenli^[8]It mainly studies the influence of different exercise methods on the antihypertensive effect of essential hypertension, and provides available exercise rehabilitation measures for the prevention and treatment of hypertension. Methods According to the diagnostic criteria of China 2011 hypertension diagnosis guidelines, the patients aged 38 to 60 years old were selected for their blood pressure, heart rate, lung capacity and body function indexes before and after the experiment. The change of each index was observed separately. Conclusion: exercise helps to improve the level of human body function, cardiopulmonary function on essential hypertension antihypertensive effect has a positive effect, high intensity exercise to reduce the blood pressure level of patients with essential blood pressure has certain effect, and low intensity walking exercise can more effectively improve the blood pressure level of patients in patients with primary hypertension, is worth promoting in the prevention and treatment of primary hypertension. Xu Saisai^[9]explorationThe influence of aerobics on its physical fitness and cardiopulmonary function was analyzed. It is concluded that aerobics can improve the blood circulation system, improve the body resistance, increase the working efficiency of the cerebral cortex, improve the cardiopulmonary function, improve the quality of muscle, and can better prevent and reduce the occurrence of hypertension and hyperlipidemia diseases. It can not only promote national fitness, but also plays an important role in

improving physical health. Mei wei^[10]pass through Build with the characteristics of the elderly resistance exercise prescription (including aerobics), the nursing care elderly (isolated systolic hypertension, ISH) patients with exercise intervention, evaluation of the method of elderly ISH pulse pressure index and body function, so as to explore the possible mechanism of sports rehabilitation in the elderly antihypertensive, to provide the basis for making targeted exercise prescription. It is concluded that low-intensity resistance exercise (including aerobics) can reduce the systolic blood pressure and reduce the pulse pressure in the elderly patients with simple systolic hypertension, and can improve the muscle strength of the upper and lower limbs in the physical function of the elderly. Resistance exercise (including aerobics) in group exercise, and maintaining the frequency of exercise every 3 times every 1 to 2 days at about 60MIN per time, can improve the quality of life of patients and enhance the mental health ability of the elderly. Wu Xiaoqing^[11]To explore the effect of exercise therapy in type 2 diabetes patients with hypertension. Conclusion: aerobics exercise, patients are easy to master, can insist after discharge. After exercise, blood glucose, glycosylated hemoglobin, BMI and blood pressure decreased at 2h after meals significantly compared with other exercise exercises, and the effect was ideal. Huang jing^[12]Explore the effect of aerobics on blood pressure in patients with mild essential hypertension, and compare the changes of blood pressure before and after the experiment. It is concluded that: after the implementation of resistance aerobics exercise, the number of patients with ideal blood pressure and normal blood pressure increased, the number of high normal blood pressure decreased significantly, the hypertension situation was basically zero, $P < 0.05$, and the difference was statistically significant. Conclusion: Resistance aerobics exercise in patients with mild essential hypertension can better control their blood pressure, improve their condition and improve their quality of life, which is worthy of promotion. Zhang Juli^[13]Aned to experiment the scientific, feasibility and effectiveness of water aerobics confirmation and promotion, in theory to promote the new health training way to provide certain theoretical basis and support materials, from practice for health training project related coaches to provide a safer and more effective water fitness method, promote the development of the water aerobics this project, active sports market. Conclusion: (1) compared with the land aerobics training, the water aerobics training can consume the body more heat, and in the adjustment of the physical function and physical quality is also slightly better.(2) Water and land aerobics training can reduce the weight, body fat rate, waist-to-hip ratio and BMI of simple obese youth, but the effect of water training is more significant.(3) Water and land aerobics training can effectively reduce the heart rate and blood pressure of simple obese young people, and the effect is no obvious difference, and in terms of improving lung capacity, the effect of water aerobics training is more obvious.(4) Water and land aerobics training can effectively improve the physical quality of simple and obese young people, and in the improvement of strength and endurance, the effect of water aerobics training is more significant. Based on the research conclusion, the following suggestions are proposed to promote the development of water aerobics: (1) enrich the publicity forms and strengthen the publicity efforts of water aerobics; (2) increase the training intensity of water aerobics coaches; (3) the school should vigorously open water aerobics courses; (4) the state should encourage and support the development of water aerobics. Ma Hongyan^[14]The effect of aerobics on the rehabilitation effect of elderly hypertension was observed. Display: The blood pressure and heart rate of the observation group were lower than the control group ($P < 0.05$). The total cholesterol content decreased ($P > 0.05$), and the serum triglycerides decreased from the control group ($P < 0.05$). It is concluded that aerobics has a positive effect on reducing patient blood pressure and improving their physical fitness. Liu xinhua^[15]and so on This paper proposes the scientific fitness knowledge base mode of the people with hypertension (including aerobics), consisting of organizational mode, technical mode and incentive mode. The theoretical basis for the construction of fitness activity knowledge base model for hypertensive people was created.

To sum up, each literature using aerobics exercise for hypertension treatment or slow, but each study sample number is small, and subjects are not unified, hospital patients, there are retired staff, lack of reliability, this study using Meta analysis to the experiment in the reference sum, expand the object base and type, reanalysis, finally concluded whether aerobics has positive significance for extensive patients with hypertension. Basic literature research in the CNKI database. The researchers selected and divided hypertension patients, and generally divided them into exercise group and control group. The intervention methods included aerobics exercise, and the final blood pressure level of the exercise group was significantly lower than that of the control group. In this study, hypertension-related indicators after intervention in ref.

4.2 Discussion

Primary hypertension is a cardiovascular syndrome with elevated arterial pressure as the main clinical manifestation. It often exists with other cardiovascular risk factors and is an important risk factor for cardiovascular and cerebrovascular diseases. It can damage the structure and function of important organs, such as heart, brain and kidney, and eventually lead

to the failure of these organs^[16]. As one of the most popular and convenient fitness sports during the current epidemic period, aerobics has virtually expanded the aerobics demand market due to the increase of home time, and the public needs more fitness activities that can be realized at home. The attention caused by Liu Genghong well combines his own professional experience and combines entertainment and fitness in one furnace. On the one hand, the movements he designed are easy to learn and easily imitated to spread; on the other hand, the interaction of his family gives his live fitness broadcast some small theater elements, which makes people feel "immersive" like "watching TV dramas". In addition, as a good friend of Jay Chou, he himself compiled the aerobics movements of Jay Chou's famous song "Compendium of Materia Medica", which soon triggered the collective memory and emotional resonance of the mainstream live broadcast audience group.^[17] Has been loved by more and more people.

The results of Meta-analysis concluded that the combined effect size of aerobics on systolic blood pressure in hypertensive patients was WMD= -27.27, 95%CI [-28.92, -25.61], Z= -32.28, and P <0.01; The combined effect size of aerobics on diastolic blood pressure in hypertensive patients was WMD= -14.14, 95%CI [-15.30, -12.98], Z= -23.80, and P <0.01. It shows that aerobics has a hypotensive effect on hypertension. This conclusion is also consistent with the findings of a paper in ref^[18]. While obtaining the systolic and diastolic blood pressure indexes for patients with hypertension, This study also studied the aspect of the intervention, To vining the intervention time "60MIN / time", Intervention frequency "> 5 visits / week", The "12 weeks" of the intervention period did not affect the effect of aerobics exercise on reducing the systolic and diastolic BP indicators in hypertensive patients, The results derived from this set of data indicate that, While doing aerobics, Not that every exercise is done the longer the better, According to one's own physical condition, Make a reasonable plan, Although many studies have shown that aerobics exercise has therapeutic effects on hypertension, And, according to the condition, With the drug, And the habits of living and eating, Add the aerobics exercises for treatment.

Through the literature review, it is found that the antihypertensive effect of aerobics is reversible. If the practitioner stops exercising, the exercise effect can completely disappear within two weeks^[20] While ensuring the effect of each exercise, hypertension patients should also adhere to the aerobics exercise, aerobics exercise as a habit, recorded in the daily activities, in the long run, hypertension patients can get a very good antihypertensive effect.

The limitations of this study are: (1) the intervention methods are not uniform in the research literature, and there may be different conditions that will affect the final blood pressure level.(2) The frequency of exercise found in the research literature is unknown.(3) The number of included literature is relatively small in similar studies.

5. CONCLUSION

Aerobics exercise has a positive significance to the blood pressure control level of hypertension patients. The systolic and diastolic blood pressure indexes of the patients undergoing aerobics exercise are significantly reduced, and there is no adverse reactions or aggravation phenomenon among the subjects undergoing aerobics intervention. In the aerobics exercise, not every exercise exercise time the longer the better, should be according to their own physical conditions, make a reasonable plan. So aerobics exercise is a kind of safe and reliable treatment auxiliary measures, and compared to only rely on drugs and change life diet habits to control blood pressure, regular aerobics exercise can not only effectively reduce blood pressure, due to the increase during the outbreak of the home time, the public need more at home or community can realize the fitness activities. Nowadays, the prevalence of hypertension is increasing year by year, and hypertension needs long-term physical conditioning and drug treatment. Through the research of many scholars, the treatment theory of hypertension has been gradually improved. The results of this study can provide a theoretical basis for exercise and fitness for the clinical treatment of hypertension.

REFERENCES

- [1] Lei Yaling, Yang Haixia, Han Hongyan, Lu Yuan. Study on the influence of chronic diseases on clinical management of hypertension [J]. Journal of Integrated Traditional Chinese and Western Medicine, 2019,17 (24): 3904-3907
- [2] Wang Junwei, Yuan Qiongia, Yang surging, Shan Jixin, Yuan Jiang Tao, Song Guangwen, Jiang Yu. A meta-analysis of the effect of exercise therapy on essential hypertension intervention in China [J]. Chinese Journal of Rehabilitation Medicine, 2017,32 (4): 454-460
- [3] Wang Aiming. Effect of varying degrees of aerobic exercise on blood pressure in hypertensive patients [J]. Electronic Journal of Integrated Chinese and Western Medicine.2015,2 (1): 36-38

- [4] Yang Ye. The creation of aerobics for hypertension crowd [J]. Intelligence, 13 (1): 260.2012
- [5] Cheng Xuetian. Exercise therapy and rehabilitation assessment for community hypertensive patients [J]. Massage & Rehabilitation Medicine, 2012,3 (12): 128-129
- [6] Li Ning, Zhang Yihong. Effect of fitness and antihypertensive exercises on blood pressure and arterial function in middle-aged and elderly hypertensive women [J]. Chinese Journal of Gerontology, 2014,3 (1): 736-738
- [7] Qiu Peng. Effect of resistance aerobics on blood pressure in patients with mild essential hypertension [J]. Chinese Journal of Gerontology, 2015,11 (1): 3009-3011
- [8] Bao Wenli. Study on the effect of exercise style on the antihypertensive effect of essential hypertension [J]. Sichuan Sports Science, 2018,37 (5): 32-35
- [9] Xu Saisai. The influence of aerobic aerobics on the physique of female college students [J]. Sports and Sports and Technology, 2016,10 (1): 163-164
- [10] Mei wei. Effect of resistance exercise on pulse pressure index and somatic function in elderly patients with simple systolic hypertension [D]. Nanchang: Nanchang University, 2018
- [11] Wu Xiaoqing. Aerobics: the nursing experience of exercise therapy during the treatment of type 2 diabetes patients combined with hypertension [C]. China Translational medicine and integrated medicine seminar thesis comprehensive journal. Beijing: Chinese Hypertension Journal, 2015-03-26:498
- [12] Huang Jing. Effect of resistance aerobics on blood pressure in patients with mild essential hypertension [J]. Guide to Health care, 2019,15 (1): 294
- [13] Zhang Juli. Comparative study on the fat reduction effect of water and land aerobics on pure obese youth [D]. Chengdu: Chengdu Institute of Physical Education, 2021
- [14] Ma Hongyan. Observation of the rehabilitation effect of fitness in elderly patients with hypertension [J]. Special Health, 2021,1 (1): 178
- [15] Liu Xinhua, Chen Qi, Feng Qiang, Xue Birui, Zhi Chaoxu, Wang Yuanfeng. Study on the construction model of scientific fitness knowledge base in hypertensive population [C]. The Twelfth National Sports Science Conference. Shandong: Shandong Sports University Press, 2022-03-25:3887-3889
- [16] Lv Lifang, Zhang Daqing, Wang Qiang, Jin Yi. Study on rehabilitation of moderate intensity aerobic exercise in patients [J]. Management of rural health undertakings in China.2014,9(1): 1162-1164
- [17] Zhao Liangchen. Why can liu geng hong make aerobics "break the circle"?[N] Yangcheng Evening News, 2022-04-24 (A04) Sports; special topics
- [18] Aram V.Chobanian,George L.Bakris,Henry R.Black,William C.Cushman,Lee A.Green,Joseph L.Izzo,Daniel W.Jones,Barry J.Materson,Suzanne Oparil,Jackson T.Wright,Edward J.Roccella.Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure[J].Hypertension: Journal of The American Heart Association.2003,42 (6): 1206-1252
- [19] Kazuko Ishikawa-Takata,Toshiki Ohta,Hirofumi Tanaka.How much exercise is required to reduce blood pressure in essential hypertensives: a dose-response study[J].American Journal of Hypertension.2003,16(8): 629-633
- [20] MITSUGI MOTOYAMA, YOSHIYUKI SUNAMI, FUJIHISA KINOSHITA, AKIRA KIYONAGA, HIROAKI TANAKA, MUNEHICO SHINDO, TAKASHI IRIE, HIDENORI URATA, JUN SASAKI, KIKUO ARAKAWA. Blood pressure lowering effect of low intensity aerobic training in elderly hypertensive patients[J]. Medicine & Science in Sports & Exercise.1998,30(6): 818-823