

# EFFECT OF SPORTS TRAINING ON THE REHABILITATION OF HYPERTENSIVE PATIENTS



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EFEITOS DE TREINO ESPORTIVO NA REABILITAÇÃO DE PACIENTES HIPERTENSOS

EFFECTOS DE ENTRENAMIENTO DEPORTIVO EN LA REHABILITACIÓN DE PACIENTES HIPERTENSOS

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## ABSTRACT

**Introduction:** Hypertension is one of the most common cardiovascular and cerebrovascular diseases and a major public health problem. Although, through the rational use of drugs, the blood pressure of hypertensive patients can be better controlled, a series of side effects of drugs and expensive medical expenses limit the ability of patients to comply with the demands of hypertension. **Objective:** To explore the effect of long-term exercise training on the rehabilitation of hypertensive patients. **Methods:** The patients were divided into a control group and an exercise group, and we used multiple measurements of blood pressure, a questionnaire, and registered the situation of each patient, after what results were compared and analyzed. **Results:** After 12 weeks of training, the subject's blood pressure has dropped significantly. The systolic blood pressure dropped by an average of 15.5mmHg compared to before the exercise prescription was implemented, diastolic blood pressure dropped by an average of 10.6mmHg. **Conclusions:** Continuous physical exercise in hypertensive patients has medium- and long-term effect on blood pressure control. **Level of evidence II; Therapeutic studies - investigation of treatment results.**

**Keywords:** Exercise-Induced; Essential Hypertension; Long-Term Effects.

## RESUMO

**Introdução:** A hipertensão é uma das doenças cardiovasculares e cerebrovasculares mais comuns e um importante problema de saúde. Embora a pressão de pacientes hipertensos possa ser melhor controlada através do uso racional de medicamentos, seus efeitos colaterais e os elevados custos médicos limitam a habilidade dos pacientes de atender às demandas da hipertensão. **Objetivo:** Explorar o efeito a longo prazo de exercícios na reabilitação de pacientes hipertensos. **Métodos:** Dividiram-se os pacientes em um grupo controle e um grupo de exercícios e realizaram-se múltiplas avaliações de sua pressão sanguínea. Além disso, foi aplicado um questionário e a situação de cada paciente foi registrada. Em seguida, os resultados foram comparados e analisados. **Resultados:** Depois de 12 dias de treino, a pressão sanguínea dos pacientes caiu significativamente. A pressão sanguínea sistólica após a implementação dos exercícios caiu em média 15.5mmHg, e a pressão diastólica caiu em média 10.6mmHg. **Conclusões:** Atividade física continua em pacientes hipertensos tem efeitos de médio e longo prazo no controle da pressão sanguínea. **Nível de evidência II; Estudos terapêuticos – investigação de resultados de tratamento.**

**Descritores:** Exercise-Induced; Hipertensão Essencial; Efeitos a Longo Prazo.

## RESUMEN

**Introducción:** La hipertensión es una de las enfermedades cardiovasculares y cerebrovasculares más comunes y un importante problema de salud. Aunque la presión de pacientes hipertensos pueda ser mejor controlada a través del uso racional de medicamentos, sus efectos colaterales y los elevados costos médicos limitan la habilidad de los pacientes de atender a las demandas de la hipertensión. **Objetivo:** Explorar el efecto a largo plazo de ejercicios en la rehabilitación de pacientes hipertensos. **Métodos:** Los pacientes fueron divididos en un grupo control y un grupo de ejercicios y realizaron múltiples evaluaciones de su presión sanguínea. Además, fue aplicado un cuestionario y la situación de cada paciente fue registrada. Luego, los resultados fueron comparados y analizados. **Resultados:** Después de 12 días de entrenamiento, la presión sanguínea de los pacientes disminuyó significativamente. La presión sanguínea sistólica, después de la implementación de los ejercicios, descendió en promedio 15.5mmHg, y la presión diastólica descendió en promedio 10.6mmHg. **Conclusiones:** La actividad física continua en pacientes hipertensos tiene efectos de medio y largo plazo en el control de la presión sanguínea. **Nivel de evidencia II; Estudios terapéuticos – investigación de resultados de tratamiento.**

**Descriptor:** Ejercicio Inducido; Hipertensión Esencial; Efectos a Largo Plazo.



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## INTRODUCTION

Since the beginning of the century, the treatment and control of cardiovascular disease and its related risk factors have made significant progress in technology and drug therapy.<sup>1</sup> However, essential

hypertension is the most important independent risk factor among the many risk factors for cardiovascular and cerebrovascular diseases, it is still a major public health problem on a global scale.<sup>2</sup> Although many people are aware of this problem, the incidence of hypertension is still

on the rise and the control effect is not satisfactory. With the development of society towards aging, the prevention and treatment of chronic diseases in middle-aged and elderly people has become particularly prominent, in our country, with hypertension and concomitant heart, the medical expenses for chronic diseases, mainly cerebrovascular diseases, are increasing at an annual rate. Therefore, the management of middle-aged and elderly hypertensive patients has become the focus of medical and related scholars. Experts and scholars in medicine and related disciplines all over the world have been making unremitting efforts for the prevention and control of hypertension. In response to this research question, Best J R et al. studied the role of Tai Chi in the management of hypertension in the community.<sup>3</sup>

## METHOD

### Test object

Of the more than 150 hypertensive patients, 49 were initially selected, through multiple blood pressure measurements and questionnaire surveys, make a record of the situation of each patient, divided into a control group and an exercise group, learn more about the patient's family history, past medical history, current medical history, treatment status and whether to take medication on time, whether to conduct regular treatment, etc., and to the subject's exercise status, detailed records of living conditions, work pressure, etc. were made.

### Methods of measuring blood pressure

The subjects were screened by the method of occasional blood pressure measurement, measure three times per person, with an interval of not less than 30 minutes, take the average.<sup>4</sup> Those with a history of hypertension are automatically included in the screening, proceed to the next check. With a desktop mercury sphygmomanometer, the same tester is responsible for testing and recording the results. The exercise load test uses a vertical mercury sphygmomanometer to be measured by a dedicated person.

### Exercise measures

The first stage is 2 weeks for the initial stage. Get up to exercise for 20 minutes in the morning, prepare for activities 5 minutes before exercise, rest 20 minutes after exercise. People with poor physical strength can rest for 1 to 2 minutes. The inspector should closely observe the subject's reaction, in case of accidents, and make detailed records, including blood pressure at rest, pulse, check the pulse during exercise, blood pressure after exercise, heart rate, and their subjective performance. This stage is the second stage to achieve the full adaptation of the subject's body to sports stimulation, for the early stage of improvement, it lasts for 2 weeks. Get up in the morning and exercise for 30 minutes, prepare for the first 5 minutes, rest for 10 minutes 30 minutes after exercise. People with poor physical strength can rest for 1 to 2 minutes. It can be divided into two periods, each segment is 15 minutes. The inspector should closely observe the subject's reaction, in case of accidents, and make detailed records, including blood pressure at rest, pulse, check the pulse during exercise, blood pressure after exercise, heart rate, and their subjective performance, even adjust the exercise intensity according to the target heart rate of the exercise prescription. Measure and record blood pressure again 10 minutes after exercise.<sup>5</sup> The third stage, for the mid-term improvement phase, it lasts for 4 weeks. Get up to exercise for 40 minutes in the morning, prepare for activities 5 minutes before exercise, rest for 10 minutes after 40 minutes of exercise. People who are physically weak can rest for 5 minutes. It can be divided into two periods, each segment is 20 minutes.

## RESULTS

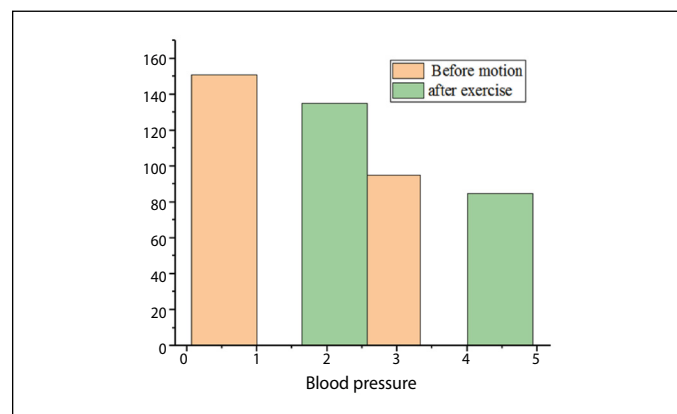
### Long-term effects of healthy walking on the rehabilitation of hypertensive patients

After 12 weeks of walking, the subject's blood pressure has dropped significantly. The blood pressure changes before and after exercise are shown in Table 1: The systolic blood pressure dropped by an average of 15.5mmHg compared to before the exercise prescription was implemented, diastolic blood pressure dropped by an average of 10.6mmHg, statistical analysis has very significant difference ( $P < 0.01$ ). Existing antihypertensive drugs, use one of them alone to treat grade 1 hypertension, most can reduce systolic blood pressure by about 10mmHg, diastolic blood pressure is about 5mmHg. Patients with grade 2, 3 hypertension, may cause the blood pressure to decrease continuously by 20/10mmHg or more, especially when drugs are combined with treatment.

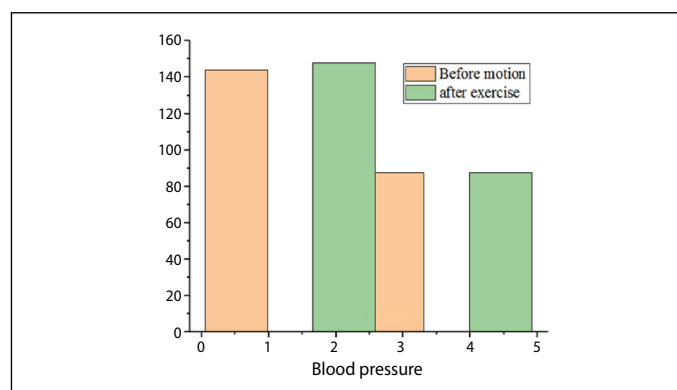
One of the impact mechanisms of walking on blood pressure is that systematic training makes the autonomic nervous system adaptive changes. Increase vagus nerve tone, decrease sympathetic excitability, thereby alleviating the spasm of the arterioles. The changes in blood pressure before and after exercise in the exercise group and the control group are shown in Figures 1 and 2. Aerobic exercise also affects the body's endocrine function, hemorheology has important effects. These factors together lead to a drop in blood pressure.

**Table 1.** Comparison of hypertension and heart rate before and after exercise.

Grouping situation		Blood pressure		Heart rate
		Systolic blood pressure	Diastolic blood pressure	
Sports group	Before exercise	148.3	93.9	74.7
	After exercise	132.8	83.3	73.7
Control group	Before the experiment	145.8	90.1	73.3
	After the experiment	147.3	89.9	72.6



**Figure 1.** Changes in blood pressure before and after the exercise prescription of the exercise group.



**Figure 2.** Blood pressure changes before and after the control group test.

## Active walking has a good medium and long-term effect on the rehabilitation of essential hypertension at all levels

The blood pressure changes of subjects of different grades and different risk strata were analyzed separately, the results showed that the blood pressure of subjects of different levels and different risk stratifications after exercise decreased to different degrees, as shown in Table 2-3. The changes in blood pressure of patients with grades 1 and 2 and intermediate-risk groups with a relatively concentrated distribution are also obvious, there are statistically significant differences. The level 3 and high-risk groups are small, failed to make statistical analysis. From a numerical point of view, there is also a very obvious effect of lowering blood pressure.

Patients with hypertension have better compliance with the use of low-to-medium-intensity fitness exercise programs, its short-term effect has also been confirmed, there were 31 patients whose blood pressure dropped significantly, a 10mmHg drop in systolic blood pressure and/or a 5mmHg drop in diastolic blood pressure is effective, the effective rate is as high as 93.94%. The incidence of hypertension in people who persist in exercise for a long time is significantly lower than that of people who lack exercise.<sup>6</sup>

## DISCUSSION

It is an indisputable fact that sports can lower blood pressure. In research, it has also been observed that 8 weeks of walking in

**Table 2.** Changes in blood pressure before and after exercise in patients with different levels of hypertension in the exercise group.

Classification and number of people	Before exercise		After exercise	
	Systolic blood pressure	Diastolic blood pressure	Systolic blood pressure	Diastolic blood pressure
Level 1 13 people	152.4	96.9	130.9	85.5
Level 2 16 people	147.5	91.8	135.5	83.6
Level 3 4 people	142.5	97.0	129.5	83.3

**Table 3.** Changes in blood pressure of hypertensive patients with different risk stratification before and after exercise.

Risk stratification	Before exercise		After exercise	
	Systolic blood pressure	Diastolic blood pressure	Systolic blood pressure	Diastolic blood pressure
Low risk	150	97.5	133	86
In danger	149.1	94.1	134.7	85.6
High risk	150.6	93.1	129.9	82.6
Very high risk	138.8	93.3	128.8	82.0

subjects with primary hypertension and high normal blood pressure have a good effect, in particular, walking with 45%-60% F.C. intensity significantly reduces both systolic and diastolic blood pressure (5.34/4.00mmHg), in this study, implement intervention measures that use walking as the main exercise method for patients with different levels of essential hypertension, after 12 weeks of monitoring and comprehensive testing, obtained a good recovery effect in the long-term blood pressure reduction.<sup>7</sup> The results of this study show that, walking has a very good effect on the reduction of blood pressure. Of the 33 subjects in this study, only 2 people had no obvious blood pressure reduction effect after 12 weeks of exercise intervention, it may be related to the improvement of the vasodilation and contraction function, it is related to the improvement of heart function.<sup>8</sup> But in this study, after implementing a 12-week walking intervention, from another perspective, according to the risk stratification of hypertensive patients, "very high risk" blood pressure  $\geq 180/110$ mmHg, there are 3 or more cardiovascular disease risk factors, the blood pressure dropped from  $138.8 \pm 2.5/93.3 \pm 9.1$  before the intervention of walking exercise to  $128.8 \pm 10.3/82.0 \pm 4.0$ mmHg after exercise. It shows that more serious hypertension patients can still achieve good fitness effects if they perform fitness exercises in accordance with appropriate exercise prescriptions.<sup>9</sup> Compared with "very high-risk" hypertension patients, patients with hypertension level 3, the former has better antihypertensive effect, may further explain, the more risk factors for cardiovascular disease, the more factors that affect the effect of blood pressure reduction, therefore, while taking antihypertensive measures, attention should be paid to controlling and mitigating the risk factors of cardiovascular disease.<sup>10</sup>

## CONCLUSION

Under the condition that the dosage is unchanged or reduced, the 33 subjects in this study, there were 31 patients whose blood pressure dropped significantly, a 10mmHg drop in systolic blood pressure and/or a 5mmHg drop in diastolic blood pressure is effective, the effective rate is as high as 93.94%. Walking has a good mid- to long-term effect on the decrease of blood pressure. In the future, it will be reflected in the exercise prescriptions of hypertensive patients for obesity, smoking, principles of dealing with risk factors such as diabetes and corresponding guidance, so that these risk factors can be effectively controlled, in the end, blood pressure can be effectively controlled.

The author declare no potential conflict of interest related to this article

**AUTHORS' CONTRIBUTIONS:** The author made significant contributions to this manuscript. Yanlong Hao: writing and performing surgeries; data analysis and performing surgeries; article review and intellectual concept of the article.

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