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## PHYSICAL EXERCISE TO REGULATE AND/ OR IMPROVE HYPERTENSION

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### Abstract

*Aim.* The aim of this paper is to analyze the role of physical exercise in regulating and improving arterial hypertension. This study focuses on evaluating the evidence supporting physical exercise as a preventive and therapeutic tool.

*Methods.* A narrative review of the scientific literature was conducted using PubMed and Scopus databases. Articles published between 2000 and 2021 were considered, with inclusion criteria targeting studies that examined the relationship between physical activity and hypertension.

*Results.* The findings across the selected studies consistently highlight the benefits of physical exercise in both prevention and management of hypertension. Longitudinal cohort evidence showed that low exercise capacity is an independent risk factor for progression from prehypertension to hypertension. Large-scale epidemiological data demonstrated that hypertensive adults are less likely to meet physical activity guidelines compared to normotensive individuals. Expert consensus emphasized the importance of structured aerobic and resistance training as first-line treatment, with vigorous exercise considered safe under medical supervision.

*Conclusions.* The cumulative evidence indicates that physical exercise is a powerful and reliable non pharmacological strategy to regulate and improve hypertension. Aerobic exercise provides the strongest blood pressure-lowering effects, particularly when complemented with resistance training. Prescriptions must always be individualized, with moderate intensity recommended as standard, although vigorous activity can be tolerated when clinically supervised. The combination of exercise programs with pharmacological treatment appears to offer the most effective and sustainable outcomes for long-term management of hypertension and overall cardiovascular health.

**Keywords:** Hypertension, Physical exercise, Blood pressure, Cardiovascular health, Prevention.

### Introduction

Hypertension is a chronic condition characterized by persistently elevated arterial blood pressure, representing one of the leading risk factors for cardiovascular disease, stroke, and premature mortality. Its prevalence continues to rise worldwide, posing a major public health challenge. Given the global burden of hypertension, identifying effective non-pharmacological strategies is essential (Faselis et al., 2012). Non-pharmacological approaches, particularly lifestyle interventions such as physical exercise, have been widely recognized as effective strategies for preventing and controlling hypertension (Churilla & Ford, 2010). Exercise contributes to cardiovascular efficiency, weight management, stress reduction, and vascular function, all of which are key factors in blood pressure regulation (Sharman & Stowasser, 2009). Meta-analytical evidence further confirmed that aerobic exercise reduces ambulatory blood pressure during both daytime and nighttime, supporting its robust role in antihypertensive therapy (Saco-Ledo et al., 2020). Narrative reviews highlighted that lifestyle interventions combining endurance and resistance training provide the most comprehensive cardiovascular benefits and are effective in lowering blood pressure in hypertensive patients (Ruivo & Alcântara, 2012).

This paper examines scientific evidence on the role of physical exercise in regulating hypertension, highlighting its mechanisms, benefits, and clinical implications.

### Methods

A narrative review methodology was employed. Articles were retrieved from PubMed and Scopus databases, focusing on studies published between 2000 and 2021. The following inclusion criteria were applied:

- Studies addressing the relationship between physical activity and hypertension;
- Research involving adult populations;
- Randomized controlled trials, systematic reviews, meta-analyses, epidemiological surveys, and expert position statements.

Six key articles were selected for in-depth analysis. Data extracted included study objectives, participants, methodology, and main findings related to exercise and blood pressure regulation.

The selection prioritized randomized controlled trials, systematic reviews, meta-analyses, epidemiological surveys, and expert position statements. Six representative studies were analyzed in detail, covering a wide range of populations and methodological approaches. Data extraction focused on study design, participant characteristics, type and intensity

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of exercise interventions, and reported effects on blood pressure regulation.

## Results

Table 1. Summary of included studies

Author (s), Year	Study Design/ Population	Methods	Main Findings
<i>Faselis et al., 2012</i>	Longitudinal cohort study of >10,000 male veterans (1986–2009)	Exercise tolerance tests performed at Veterans Affairs Medical Center (Washington, DC) to assess cardiovascular function and exclude ischemia	Exercise capacity was an independent predictor of progression from prehypertension to hypertension. Individuals with low fitness had a substantially higher risk of developing hypertension, even after controlling for age, BMI, baseline blood pressure, and diabetes.
<i>Churilla &amp; Ford, 2010</i>	Cross-sectional analysis of 391,017 U.S. adults ( $\geq 18$ years) from the Behavioral Risk Factor Surveillance System (2007)	Self-reported physical activity categorized according to U.S. Department of Health and Human Services 2008 guidelines	27.2% of adults had hypertension. Among them, 60.2% adhered to activity recommendations, compared with 66.9% of normotensive adults. Adjusted odds ratio for adherence among hypertensives was 0.85, indicating lower engagement despite recommendations.
<i>Sharman &amp; Stowasser, 2009</i>	Position statement of the Australian Association for Exercise and Sport Science	Review of clinical and experimental evidence on exercise and blood pressure	Recommended aerobic exercise (moderate-to vigorous, $\geq 5$ days/week) combined with strength training ( $\geq 2$ days/week). Vigorous activity considered safe with appropriate medical evaluation. Health professionals play a crucial role in monitoring blood pressure and guiding exercise programs.
<i>Saco-Ledo et al., 2020</i>	Systematic review and meta-analysis of randomized controlled trials up to 2020	Literature search in PubMed and Scopus for RCTs evaluating exercise interventions in hypertensive patients	Aerobic exercise consistently reduced ambulatory blood pressure during day and night. Strength training did not provide consistent benefits. More evidence is needed to confirm whether aerobic exercise can replace medication, but combined therapy is highly effective.
<i>Ruivo &amp; Alcântara, 2012</i>	Narrative review of pathophysiological responses to exercise in hypertensive individuals	Review of studies addressing hemodynamic adaptations to endurance and resistance exercise	Lifestyle interventions, particularly exercise, are essential for prevention and treatment. Programs combining endurance and resistance training lower blood pressure and improve vascular health. Recommendations include daily moderate sessions of $\geq 30$ minutes.

The main findings of the reviewed studies are summarized below:

*Exercise capacity and hypertension progression (Faselis et al., 2012).*

A cohort of over 10,000 male veterans underwent exercise tolerance tests. Results indicated that low exercise capacity significantly increased the risk of progressing from prehypertension to hypertension, highlighting cardiorespiratory fitness as a protective factor.

*Physical activity patterns in hypertensive vs. normotensive adults (Churilla & Ford, 2010).* An analysis of over 391,000 U.S. adults revealed that while 60.2% of hypertensive individuals met recommended activity guidelines, they remained less active compared to non-hypertensive adults (66.9%). Even after adjusting for demographics and comorbidities, hypertensive patients were less likely to adhere to physical activity recommendations (odds ratio = 0.85).

*Exercise and hypertension guidelines (Sharman & Stowasser, 2009).*

The Australian Association for Exercise and Sport Science recommended regular aerobic activity combined with resistance training as a primary non-pharmacological intervention. A minimum of 5 days/week of moderate-to-vigorous



aerobic exercise plus at least 2 sessions/week of strength training was advised. Vigorous exercise was found to be generally safe with proper medical supervision.

*Systematic review and meta-analysis (Saco-Ledo et al., 2020).*

A review of randomized controlled trials demonstrated that aerobic exercise significantly reduced both daytime and nighttime ambulatory blood pressure in hypertensive patients. Strength training alone showed less consistent benefits.

*Hypertension and exercise – narrative review (Ruivo & Alcântara, 2012).*

This review concluded that lifestyle modifications, including regular physical activity, are essential for both prevention and treatment of hypertension. Combined endurance and resistance programs reduced blood pressure values in hypertensive patients and contributed to long-term cardiovascular health.

Table 2. Effects of different exercise modalities on hypertension

Exercise Modality	Recommended Frequency/ Intensity	Effects on Blood Pressure
Aerobic exercise	≥5 days/week, moderate-to vigorous	Significant reductions in systolic and diastolic BP
Resistance training	≥2 non-consecutive days/week	Improves vascular function; moderate BP reduction
Combined training	Aerobic + resistance in same program	Greatest overall benefits for BP and cardiovascular health
Vigorous exercise	High intensity under medical supervision	Safe for most patients; enhances cardiorespiratory fitness

### Discussions

The reviewed evidence confirms that physical exercise plays a central role in the management of hypertension. Despite common concerns, vigorous activity can be tolerated by many hypertensive patients provided they undergo medical screening and supervision (Sharman & Stowasser, 2009). Exercise physiologists and healthcare professionals are crucial in monitoring blood pressure responses during training to ensure safety and effectiveness.

Aerobic exercise remains the most effective modality for reducing blood pressure, particularly when combined with resistance training. Meta-analytic evidence supports its role as an adjunct to pharmacological treatment (Saco-Ledo et al., 2020). Additionally, epidemiological studies demonstrate that adherence to physical activity guidelines remains insufficient among hypertensive individuals, suggesting the need for more effective public health strategies (Churilla & Ford, 2010).

### Conclusions

Physical exercise represents a safe, effective, and widely accessible non-pharmacological strategy for both the prevention and management of hypertension. Among the different modalities, aerobic exercise produces the most consistent and clinically significant reductions in systolic and diastolic blood pressure, while resistance training contributes additional improvements in vascular health, muscular strength, and functional capacity. When combined, these modalities provide the most comprehensive cardiovascular benefits and long-term protective effects. Exercise prescriptions should always be individualized, with moderate intensity generally recommended, although vigorous activity may also be appropriate under medical supervision. Finally, the integration of structured exercise programs with antihypertensive medication yields the most effective approach for optimizing blood pressure control and reducing the burden of cardiovascular disease.

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