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The Influence of Various Types of Physical Activity on Blood Pressure - A Literature Review

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Abstract

Blood pressure is a key indicator of cardiovascular health, playing a significant role in the diagnosis, prevention, and treatment of heart and vascular diseases. In recent years, interest in the influence of physical activity on blood pressure has increased among researchers and health-conscious individuals. Among the studies presented, researchers examined the effects of various types of physical activity on blood pressure in individuals with hypertension and the level of hypertension control, as well as other components affecting the overall health of patients, such as blood lipid levels, arterial pressure variability over 24 hours, and BMI. The conclusions of the presented studies seemed to be consistent regarding the positive impact of engaging in physical activity on blood pressure and thus the better well-being of patients.

Keywords: blood pressure, physical activity

Introduction

Blood pressure is a key indicator of cardiovascular health, playing a significant role in the diagnosis, prevention, and treatment of heart and vascular diseases¹⁻³. There are many factors that can influence blood pressure values, including lifestyle, genetic factors, diet, and the level of physical activity of an individual⁴.

In recent years, interest in the influence of physical activity on blood pressure has increased among researchers and health-conscious individuals⁵⁻⁸. Scientific studies suggest that regular physical activity may play a significant role in regulating blood pressure. However, there are many aspects concerning this relationship that still require in-depth analysis and understanding⁶.

The aim of this literature review is to analyze current scientific research on the relationship between physical activity and blood pressure. This work aims to identify the main trends and synthesize the results to better understand how different forms of physical activity may affect blood pressure levels in various population groups.

Literature Correlating Physical Activity with Blood Pressure

In the study "Physical activity, cardiovascular health, quality of life and blood pressure control in hypertensive subjects: randomized clinical trial," which lasted for 9 months, 207 individuals with diagnosed hypertension - whether controlled or uncontrolled - participated⁹. Controlled blood pressure was defined as pressure below 140/90 mmHg during a 3-time measurement, with the 2nd and 3rd measurements taken after 5 minutes of rest in a seated position. Uncontrolled blood pressure was considered any measurement not meeting these criteria¹⁰.

Participants were divided into two groups: the experimental group (152 individuals) engaged in walking for 120 minutes per week in two sessions of 60 minutes each, and participated in

cultural events once a month. The control group (55 individuals) received only medical care without engaging in additional physical activity⁹.

The study covered topics regarding the impact of physical activity on blood pressure, body mass index (BMI), cardiovascular disease (CVD) risk, and health-related quality of life (HRQoL).

The study demonstrated a statistically significant decrease in systolic blood pressure (SBP) in the intervention group compared to baseline values - from 134.5 to 131.8 mmHg. Physical activity also influenced the reduction of cardiovascular risk, based and initially calculated on the Framingham point scale considering age, gender, diabetes occurrence, smoking, systolic and diastolic blood pressure (DBP), and serum cholesterol concentration. A statistically significant decrease in CVD risk by 0.2 points was observed in the intervention group⁹.

In the conducted study, attention was also drawn to the change in the percentage of individuals who exhibited uncontrolled hypertension before the study and achieved controlled blood pressure after the study. In the experimental group, a statistically significant increase in the percentage of individuals with controlled blood pressure was demonstrated, rising from 32.4% to 51.3%⁹.

During the study, the impact of physical activity on HRQoL was also assessed based on the SF-36 questionnaire, which consists of two components - physical and mental - each defining four areas of functioning¹¹. For the physical component, these areas include physical functioning, role limitations due to physical health problems, bodily pain, and general health perception. For the mental component, they include vitality, social functioning, role limitations due to emotional problems, and mental health perception. Participants assessed each area on a scale from 0 to 100, where a higher score indicated better quality of life. The study demonstrated a statistically significant improvement in quality of life, encompassing physical functioning (increase from 78.8 points to 84.6 points), general health perception (increase from 57.1 points to 60.9 points), and vitality (increase from 63.7 points to 65.2 points).

The study showed a beneficial impact of physical activity on reducing blood pressure, decreasing CVD risk, and improving health-related quality of life⁹.

In the study "Effect of Exercise Training on Ambulatory Blood Pressure Among Patients With Resistant Hypertension" conducted by Susana Lopes et al., the aim was to investigate

whether aerobic exercise represents an effective form of treatment for patients with resistant hypertension¹²⁻¹⁴.

The study involved a total of 53 individuals aged 40-75 years diagnosed with resistant hypertension. Resistant hypertension is defined as having an average systolic blood pressure exceeding 130 mmHg in a 24-hour measurement and/or exceeding 135 mmHg during the day while taking maximal doses of at least 3 antihypertensive medications, including a diuretic, or as controlled hypertension whose average daily does not exceed 130 mmHg but requires the use of at least 4 medications to maintain control¹⁵.

During the study, participants were divided into two groups - experimental and control - based on age criteria (40-55, 56-65, and 66-75 years) and gender. Patients in the experimental group performed a 3-month aerobic exercise program consisting of three-hour sessions, while patients in the control group received only medical care. Both groups underwent 24-hour ambulatory blood pressure monitoring (ABPM) before the study and 48 hours after its completion¹².

The results of the study showed a statistically significant decrease in SBP in the 24-hour measurement by 7.1 mmHg, a statistically significant decrease in DBP by 5.1 mmHg, a statistically significant decrease in daytime SBP by 8.4 mmHg, and a statistically significant decrease in daytime DBP by 5.7 mmHg. The authors of the study demonstrated that aerobic exercises effectively reduce systolic blood pressure in 24-hour and daytime measurements and should be considered as an additional form of treatment for resistant hypertension¹².

In the pilot study "Effects of Moderate Combined Resistance- and Aerobic-Exercise for 12 Weeks on Body Composition, Cardiometabolic Risk Factors, Blood Pressure, Arterial Stiffness, and Physical Functions, among Obese Older Men: A Pilot Study" by Wonil Park et al., the researchers presented the results of a 12-week experiment aimed at assessing the impact of physical activity on body composition, cardiometabolic risk factors, blood pressure and physical functions in obese men over the age of 65^{16,17}.

The group of 20 men meeting the criteria of no medication use, BMI >25 kg/m², and engaging in minimal physical activity defined as no exercise in the past 6 months were randomly divided into two 10-person groups - experimental and control. Before the study began, all participants had their parameters measured: height, body mass, BMI, blood pressure (systolic, diastolic, mean arterial pressure [MAP], and pulse pressure [PP]), blood biochemical markers (including HDL and LDL cholesterol levels, epinephrine), and physical

fitness by measuring grip strength using a dynamometer and exercise tolerance using peak oxygen consumption (VO₂ peak)¹⁶.

Patients in the experimental group underwent a 12-week exercise program, consisting of resistance band exercises with 3 sets of 10-15 repetitions each and aerobic exercises - treadmill walking for 30 minutes and cycling for 30 minutes. Patients in the control group did not participate in any exercises¹⁶.

The results of the conducted study indicated statistically significant changes in body composition: patients in the experimental group reduced their body weight from an average of 70.7 kg to 69.2 kg, BMI from average values of 26.2 to 25.7 kg/m², and percentage of body fat from 32.4% to 30.4%. Through the exercise program, statistically significant reductions were observed in the experimental group's SBP from 136.8 to 134.4 mmHg, MAP from 107.4 to 106.6 mmHg, and PP from 44.1 to 41.8 mmHg. Patients undergoing the exercise program also showed statistically significant reductions in LDL cholesterol levels from 133.5 mg/dL to 122.5 mg/dL and epinephrine levels from 56.8 pg/mL to 49.2 pg/mL¹⁶.

In the presented study, the authors demonstrated that resistance band exercises and aerobic exercises positively influence improvements in body composition, blood pressure, cardiometabolic risk factors and physical functions in older obese men, which is also supported by the results of other studies^{18,19}. They also pointed out the necessity of expanding the study to a more representative group of individuals to further objectify the results¹⁶.

In the study "Effects of 12 weeks of aerobic versus combined aerobic plus resistance exercise training on short-term blood pressure variability in patients with hypertension" by Giuseppe Caminiti et al., a group of researchers compared the effects of two exercise programs over a 12-week period - one consisting solely of aerobic exercises (aerobic group - AG) and the other a combination of aerobic and resistance exercises (mixed group - MG) - on arterial blood pressure variability (BPV)^{20,21}.

The study involved 55 men diagnosed with hypertension who were enrolled in a cardiac rehabilitation program and were taking antihypertensive medication. Before starting the exercise programs, all participants had their 24-hour ambulatory blood pressure monitoring (ABPM) values measured, and their physical fitness was assessed using a treadmill. Both groups exercised three times a week for 80 minutes each session. The AG performed treadmill walking, while the MG combined 40 minutes of treadmill walking with 40 minutes of resistance exercises²⁰.

Following the completion of the 12-week study, the participants had their 24-hour ABPM values measured again. Patients in both groups had similar baseline blood pressure values and numbers of medications taken. The results of the study indicated a statistically significant increase in physical fitness in both groups - for the AG, the duration of treadmill walking increased from 398.7s to 455.3s, and for the MG, it increased from 413.5s to 470.3s, with no significant differences between the groups²⁰.

The study also showed statistically significant changes in ABPM readings in both groups. These changes included reductions in 24-hour SBP, daytime (from 6:00 to 00:00) SBP, nighttime (from 00:00 to 6:00) SBP, 24-hour DBP, and daytime DBP. A statistically significant reduction in nighttime DBP was only observed in the AG²⁰.

In the study, the researchers also examined the effect of exercises on BPV. In addition to ABPM measurements for both the AG and the MG, the results were also compared between the groups. A statistically significant difference was found in nighttime DBP measurements in favor of the AG. The study also showed a statistically significant reduction in BPV amplitude for 24-hour SBP and daytime SBP measurements in both groups. Additionally, the MG exhibited a statistically significant reduction in BPV amplitude for nighttime SBP measurements. Comparing BPV results between the groups revealed a statistically significant difference for 24-hour systolic BPV and nighttime systolic BPV, both in favor of the MG (indicating a greater decrease in measurement amplitudes)²⁰.

Based on the above study, the authors demonstrated that the type of physical activity influences the degree of arterial pressure reduction. One limitation mentioned in the study is that only men participated, and there was no control group where no additional interventions beyond medication were implemented²⁰.

One of the aspects of the study "Different exercise training modalities produce similar endothelial function improvements in individuals with prehypertension or hypertension: a randomized clinical trial Exercise, endothelium and blood pressure" conducted by Marinei. L. Pedralli and colleagues was to indicate the relationship between the type of physical activity and its impact on blood pressure²²⁻²⁴.

The group of 51 patients was divided into three training groups: aerobic group (AG), strength group (SG), and mixed group (MG). Over the course of 8 weeks, AG performed 40 minutes of stationary bike riding, SG performed a set of strength exercises (4 sets of 8-12 repetitions each), and MG performed 20 minutes of stationary bike riding and 2 sets of strength exercises

(8-12 repetitions each). Before starting the exercise programs, patients in all groups had similar blood pressure values²².

After completing the exercise program, the results of each group were compared to the values before the start of the program. The study showed that during ABPM conducted after 8 weeks, there was a statistically significant decrease in SBP in AG by 5.1 mmHg and in SG by 4.0 mmHg. However, there was no statistically significant decrease in SBP for MG. On the other hand, only for the GM was a statistically significant decrease in DBP observed, by 3.2 mmHg²².

Summary

The above analysis aimed to examine the impact of the type, frequency, and intensity of physical exercise on arterial hypertension, which has become an increasingly significant clinical problem over the years, carrying numerous health consequences such as heart attack, stroke, heart failure, kidney failure, or generalized atherosclerosis, all of which, when left untreated along with hypertension, shorten both healthy lifespan and overall lifespan²⁵.

Cardiovascular incidents are among the leading causes of death in the population - cardiovascular diseases accounted for nearly 35% of all deaths recorded in Poland in 2021²⁶.

The studies cited in the work clearly demonstrate that physical exercise, regardless of its type, has a beneficial effect on lowering blood pressure, and therefore reducing the risk of developing cardiovascular diseases and cardiovascular incidents, thereby highlighting the importance of physical activity not only for maintaining good bodily condition but also for preventing lifestyle-related diseases.

Disclosure:

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