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The effect of isometric handgrip exercise on blood pressure reduction in hypertensive patients: A literature review

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ABSTRACT

High blood pressure remains a significant non-communicable disease that continues to rise within society. Known as a silent disease, it can lead to complications with other conditions, causing various symptoms and discomfort for sufferers. While numerous pharmacological therapies have been implemented, they often fall short of effectively addressing this condition. Consequently, additional supportive therapies are required, such as Isometric Handgrip Exercise, which is an easy and cost-effective method that can be performed independently without special training. Articles were sourced from ScienceDirect, PubMed, and the Directory of Open Access Journals using advanced search terms like "isometric handgrip exercise, lowering blood pressure, hypertension." A review of five selected articles revealed a significant reduction in both systolic and diastolic blood pressure among hypertension patients following routine Isometric Handgrip Exercise, with a significant p-value of <0.05. In conclusion, Isometric Handgrip Exercise has been demonstrated to effectively lower systolic and diastolic blood pressure when performed consistently every morning over an extended period.

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INTRODUCTION

Hypertension is a major risk factor for cardiovascular diseases such as coronary heart disease and stroke, which are leading causes of death worldwide. The prevalence of hypertension continues to rise along with changes in modern lifestyle, including poor diet, lack of physical activity, and high levels of stress and alcohol consumption. According to WHO data, approximately 1.28 billion adults aged 30-79 years worldwide suffer from hypertension, with the majority of cases either undiagnosed or inadequately treated (WHO, 2021).

One non-pharmacological method that has gained attention in managing hypertension is isometric exercise, particularly Isometric Handgrip Exercise (IHE). IHE has been proven to have a

positive effect in lowering blood pressure across various age groups. This exercise is considered simpler, more affordable, and more efficient compared to other exercise methods, allowing hypertensive patients to perform it independently without the need for expensive equipment or special skills (Yuniartika et al., 2021).

Several studies have shown that isometric exercises have a complex mechanism in reducing blood pressure, including the activation of the pressor reflex that enhances the release of vasodilator factors, stimulation of afferent nerves, and improved baroreflex sensitivity and endothelial reactivity (Muhlisin et al., 2021)(Afiani, 2024)(Sundaryati et al., 2024). Additionally, IHE can modulate neurohumoral function, reduce sympathetic nerve activity, and enhance the antihypertensive therapeutic effects in hypertensive patients (Palmeira et al., 2021).

Although scientific evidence regarding the effectiveness of IHE in hypertensive patients continues to grow, the optimal intensity and duration protocol for exercise still requires further research. Most existing studies use submaximal intensity (20%-50% of maximum contraction) with relatively long exercise durations. This literature study aims to determine the effect of high-intensity IHE on lowering blood pressure in hypertensive patients and to explain its potential benefits as an easily understandable non-pharmacological intervention for the general public.

RESEARCH METHOD

The research method used is a literature review. The literature study method is a data collection technique that involves reviewing articles related to the problem to be solved. A literature study is a mandatory activity in research. The literature research method is a type of research used to collect information and data in-depth from various literature sources of previous studies, which are used to obtain answers and theoretical foundations regarding the problem to be investigated.

The literature study used in this research involves five articles from previous studies that serve as sources for gathering various information to support the research based on the subject chosen by the author. The article search was conducted through the Sciencedirect, PubMed, and Directory of Open Access Journals websites using advanced search with the keywords "isometric handgrip exercise, lowering blood pressure, hypertension," which resulted in 13 articles.

Inclusion criteria were primary studies in the form of Randomized Controlled Trials (RCTs) and Controlled Trials, full-text, and in English. The subjects in the articles were hypertensive patients. The intervention used was isometric handgrip exercise therapy.

Table 1. Literature search process

Stage	Details	Number of Articles
Identification	ScienceDirect	N = 4
	PubMed	N = 6
	Directory of Open Access Journals	N = 3
Screening	Title: Same Title	N = 10
Eligibility	Full Text Articles	N = 10
	Abstract Only	N = 1
Included	Met Inclusion Criteria	N = 5
	Did Not Meet Inclusion Criteria	N = 5

After conducting the literature search based on the defined criteria, five articles were selected. One article used the RCTs (Randomized Controlled Trials) method, one article used a quasi-experimental method, and three articles used a quasi-experimental design. The articles obtained indicate that the application of Isometric Handgrip Exercise can lower blood pressure in hypertensive patients.

RESULTS AND DISCUSSIONS

Veralia et al. (2023) demonstrated that IHE performed over 10 consecutive days with a frequency of 4 sets of 3 minutes was effective in lowering systolic blood pressure in hypertensive patients from 154 mmHg before the intervention to 140 mmHg. Aathira & Sivakumar (2024) showed that IHE performed three times a week for four consecutive weeks significantly reduced both systolic and diastolic blood pressure. Each session consisted of isometric contractions at 30% of maximum contraction intensity for two minutes, repeated five times with a five-minute rest between each contraction. Systolic Blood Pressure (SBP) showed a significant decrease, with an average from 113.68 mmHg to 112.87 mmHg at the end of the third week ($p < 0.001$). Meanwhile, Diastolic Blood Pressure (DBP) decreased significantly from an average of 74.59 mmHg to 73.29 mmHg after two weeks of exercise ($p < 0.003$). Zulantay & Cancino-Lopez (2020) showed that IHE performed over eight weeks with two sessions per week significantly reduced both systolic and diastolic blood pressure. Richards et al. (2022) demonstrated that IHE using two different devices, a computerized dynamometer and an inflatable stress ball, also lowered blood pressure. Each session included four isometric contractions for two minutes at 30% of maximal voluntary contraction (MVC), with a one-minute rest between contractions.

The sequence of devices was randomized for each participant with a 30-minute stabilization period between sessions, showing similar effects on blood pressure but no significant difference between the two methods used. Bertoletti et al. (2022) showed that IHE performed in the morning between 7:00-11:00 AM with four sets, each consisting of two minutes of exercise followed by one-minute rest, significantly increased short-term blood pressure variability (BPV), but the effect did not last for 24 hours after the intervention(Hudiyawati et al., 2019). Masruroh, (2020) indicate that isometric handgrip exercise can physiologically lower blood pressure, including changes in the autonomic nervous system, vascular function, and heart rate. The steps involved in IHE offer three main benefits: balancing the autonomic nervous system, repairing damage, and encouraging blood vessels to dilate, resulting in smoother blood flow. Additionally, IHG stimulates the release of endorphins, which can create comfort for hypertensive patients (Melizza & Putri, 2022). A study by Kemi et al. (2020) on the possibility that long-term isometric handgrip exercise contributes to left atrial enlargement in hypertensive patients concluded that IHE is safe for use in hypertensive patients.

Table 2. Data extraction

Researcher	Method	Respondents	Intervention	Duration	Measuring Instrument	Results
Veralia et al. (2023)	Quasi-experimental	25 respondents in the intervention group and 25 in the control group	The intervention group performed Isometric Handgrip Exercise, alternating between both hands.	Ten consecutive days. Each session included 4x3 minute isometric contractions.	Digital sphygmomanometer and General Comfort Questionnaire (GCQ)	The intervention group showed a decrease in blood pressure on day 10.
Aathira & Sivakumar (2024)	Quasi-experimental with pre-test and post-test, no control group	75 respondents	Respondents performed Isometric Handgrip Exercise using a handheld dynamometer.	Three times a week for four consecutive weeks.	Sphygmomanometer	Systolic Blood Pressure (SBP) decreased by the end of the third week ($p < 0.001$). Diastolic Blood Pressure (DBP) decreased after two weeks of exercise ($p < 0.003$).

Researcher	Method	Respondents	Intervention	Duration	Measuring Instrument	Results
Zulantay & Cancino-Lopez (2020)	Quasi-experimental with pre-test and post-test, no control group	23 respondents	Performed twice a week, with 32 contractions held for 5 seconds at 90% of maximum contraction intensity, with 5-second rest between contractions.	Eight weeks with two sessions per week.	Aneroid sphygmomanometer	Systolic Blood Pressure decreased after eight weeks ($p < 0.0001$). Diastolic Blood Pressure decreased ($p < 0.0001$).
Richards et al. (2022)	Comparative experimental	20 respondents	Respondents performed IHE sessions using two different devices: (1) computerized dynamometer and (2) inflatable stress ball. Each session included four isometric contractions for two minutes at 30% of maximal voluntary contraction (MVC), with one-minute rest between contractions.	Two sessions, each conducted in the morning to control circadian rhythm effects on blood pressure.	Dinamap Carescape v100 with Critikon cuff, RPE recorded using the CR-10 scale. MVC for dynamometer calculated automatically, while MVC for stress ball was based on air pressure achieved using a digital pressure gauge.	Both devices, including the stress ball as an alternative, produced comparable cardiovascular and psychophysical responses.
Bertoletti et al. (2022)	Randomized Controlled Trial (RCT)	72 hypertensive patients aged 30-75, physically inactive, and consuming two antihypertensive medications.	The IHE group performed handgrip exercises with four sets of two minutes each at 30% MVC, with one-minute rests between sets. The control group performed the same procedure at minimal intensity (approximately 0.3% MVC).	The intervention was performed in the morning between 7:00-11:00 AM to minimize circadian variation effects on blood pressure. Blood pressure was monitored for 24 hours after the experimental sessions.	BIOPAC Systems and Ambulatory Blood Pressure Monitoring (ABPM)	A short-term increase in blood pressure variability (BPV) during the experimental sessions, but no significant difference in short-term variability when assessed through 24-hour ABPM.

Based on the literature review of the five articles above, the results indicate that Isometric Handgrip Exercise has an effect on lowering blood pressure in hypertensive patients, with a significant p-value <0.05:

CONCLUSION

In conclusion, one of the non-pharmacological therapies for hypertensive patients is performing Isometric Handgrip Exercise (IHE) with a longer duration and repeated sessions, as this has been shown to significantly reduce blood pressure and provide comfort for those with hypertension. This therapy should be complemented with regular medication, a proper diet, and stress

management. It is recommended that the general public, especially elderly individuals suffering from hypertension, incorporate IHE as a simple, self-administered exercise to support the treatment of hypertension.

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