



Effectiveness of Isometric Handgrip Exercise on Blood Pressure in Hypertensive Patients in Tenajar Lor Village, Kertasemaya District, Indramayu Regency

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Abstract. Uncontrolled hypertension may result in numerous consequences; effective management is essential to regulate blood pressure in hypertensive individuals by both pharmacological and non-pharmacological interventions. Isometric handgrip exercise is a non-pharmacological therapy. This study sought to assess the impact of isometric handgrip exercise on blood pressure in hypertensive individuals in Tenajar Lor Village, Kertasemaya District, Indramayu Regency. This research design employs a quasi-experimental framework featuring a two-group pre- and post-test methodology alongside a control group design. The study sample comprised 30 respondents, categorized into intervention and control groups. The isometric handgrip exercise intervention was conducted daily for five successive days. The Wilcoxon test results indicated that the intervention group had an average systolic mean rank of 8.00 with a p-value of 0.000, and a diastolic mean rank of 7.50 with a p-value of 0.000. The control group exhibited a mean rank of 2.00 for systolic measurements with a p-value of 0.083, and a mean rank of 3.13 for diastolic measurements with a p-value of 0.157. The Mann-Whitney test yielded the average blood pressure disparity between the intervention and control groups. The p-values obtained were 0.001 for systolic blood pressure and 0.006 for diastolic blood pressure ($p < 0.05$). This study concludes that isometric handgrip exercise influences blood pressure in hypertensive patients. Individuals with hypertension are advised to perform isometric handgrip exercises autonomously at home. Healthcare professionals, particularly nurses, implement isometric handgrip exercises to regulate blood pressure in individuals with hypertension.

Keywords: Blood Pressure, Hypertension, Isometric Handgrip Exercise

INTRODUCTION

Health problems that are still the main contributors to premature death around the world, one of which is hypertension. Hypertension or high blood pressure is a condition in which systolic blood pressure ≥ 140 mmHg and or diastolic blood pressure ≥ 90 mmHg (Sari Riyanto

et al., 2024). Hypertension is often considered *the silent killer* because at first, not a few patients realize that they have been affected by hypertension; this condition can have an impact on the emergence of complications from hypertension and even damage to various target organs due to the lack of awareness of the patient to control blood pressure (Data and Information Center of the Ministry of Health of the Republic of Indonesia, 2019).

A global objective for non-communicable diseases is to decrease the prevalence of hypertension by 33% from 2010 to 2030. According to projections from the World Health Organization (WHO), in 2023, an estimated 1.28 billion persons aged 30 to 79 globally will be afflicted with hypertension. In Indonesia, the number of individuals afflicted with hypertension amounted to 63,309,620, with a mortality rate attributable to hypertension of 427,218 deaths (Riskesdas Ministry of Health of the Republic of Indonesia, 2018). In West Java Province, there are 1,956,417 cases of hypertension, representing 358.4% (West Java Provincial Health Office, 2022).

The number of hypertension patients in Indramayu Regency itself is estimated to reach 583,692 people, but only 568,726 people (97%) receive services; from the data several health center work areas have a high number of hypertension patient cases, including the Kertasemaya Health Center with 18,621 people, which is 2 of the health centers with the highest incidence of hypertension (Indramayu Regency Health Office, 2023). The number of hypertension patients at the Kertasemaya Health Center, according to the age group of 45-59 years from September 2023 to February 2024, is the highest in Tenajar Lor Village as many as 60 people.

The escalating prevalence of hypertension is influenced by several modifiable risk factors, including smoking, stress, obesity, physical inactivity, excessive salt intake, and alcohol consumption. Conversely, non-modifiable risk variables encompass gender, age, and genetic predispositions that contribute to hypertension (Helda & Seprianti, 2022). If left uncontrolled over time, hypertension can lead to numerous consequences, such as coronary heart disease, heart failure, stroke, and renal failure. Moreover, it adversely affects the deterioration of cognitive function and quality of life in hypertension patients (Ahmed et al., 2019).

Non-pharmacological hypertension therapy is very good if applied because it does not involve certain chemical substances, has minimal side effects, does not require expensive costs, and is very practical. However, the reality is that it has not been carried out optimally by hypertensive patients (Sunita et al., 2022). One of the non-pharmacological hypertension

therapies can be done with *isometric handgrip exercises*. *Isometrics* is an activity that trains strength or endurance through muscle contractions without changing the length of the muscles or joint movements. One of *the isometric* exercises is to wear *a handgrip* that can lower blood pressure by five mmHg (PERHI, 2023).

An isometric handgrip exercise is a form of gripping exercise that involves contraction of the muscles of the forearm and hands, hand muscle tension changes, blood pressure decreases through the process of changing the body's physiological pathways that occur minimally in controlling blood pressure, blood vascularization, and pulse through the autonomic nervous system (Pratiwi, 2020). *Isometric handgrip exercises* are straightforward without requiring a large space, from light to moderate intensity, relatively inexpensive equipment, and short-duration exercises (Putri & Melizza, 2022).

A preliminary study conducted on February 17-18, 2024, with 10 pre-elderly hypertensive patients aged 45-59 years, comprising 5 males and 5 females, revealed that blood pressure management was achieved only through medication. The 10 patients with hypertension reported being unaware of isometric handgrip exercises that help reduce blood pressure. The researcher aims to investigate the impact of isometric handgrip exercise on blood pressure in hypertensive individuals residing in Tenajar Lor Village, Kertasemaya District, Indramayu Regency.

RESEARCH METHODS

Research Methodology

This study employs a quantitative research methodology utilizing a quasi-experimental design, incorporating a data gathering method that features a two-group pretest and posttest approach with a control group. This study aims to assess the impact of isometric handgrip exercise on blood pressure in hypertensive individuals residing in Tenajar Lor Village, Kertasemaya District, Indramayu Regency. Data gathering occurred from May 21 to June 18, 2024.

Demographics and Sample Size

The study population included 60 pre-elderly hypertension patients aged 45 to 59 years, observed from September 2023 to February 2024. A sample of 30 participants was obtained through purposive sampling. The inclusion criteria for this study encompass hypertensive patients documented at the Kertasemaya Health Center, pre-elderly individuals aged 45-59 years, hypertension patients residing in Tenajar Lor Village, Kertasemaya District, Indramayu

Regency, respondents exhibiting controlled blood pressure in both stage I and stage II hypertension, and respondents who have experienced hypertension for a duration of 3-5 years.

The exclusion criteria for this study included hypertensive patients who were uncooperative and exhibited a decline in consciousness, those with comorbidities or complications related to hypertension such as cardiovascular disease or cerebrovascular accident, individuals suffering from arthritis in the hands, carpal tunnel syndrome, deformities, or other pain syndromes, respondents who relocated from Tenajar Lor Village, Kertasemaya District, Indramayu Regency, and participants who failed to engage in the intervention for two consecutive days.

Musical instruments The data collection instruments employed in this study include an aneroid sphygmomanometer, stethoscope, observation sheet encompassing name, age, gender, last education, occupation, duration of hypertension, history of antihypertensive drug usage, blood pressure measurements pre- and post-isometric handgrip exercise, handgrip strength, and the Standard Operating Procedure (SOP) for isometric handgrip exercise. The researcher did not do a calibration test in this investigation as the instruments employed were new and precise.

Data Collection

The provision of *isometric handgrip exercise intervention* was carried out 1 time a day with a duration of 10 minutes for 5 consecutive days. The implementation time was 8 hours after the respondents took antihypertensive drugs and the respondents who did not take antihypertensive drugs did not have a special time to do *isometric handgrip exercises*. The *isometric handgrip exercise* consists of 3 stages, namely 3-minute warm-up movements, 4-minute isometric handgrip exercise core movements and 3-minute cooling movements. Booklets and DVDs of isometric handgrip exercises have been developed by researchers in accordance with the Standard Operating Procedure (SOP) requirements. Daily pre-test and post-test blood pressure measures are documented in an observation sheet. All participants in this study provided informed consent, indicating their desire to partake in the research.

Data Examination

This study used univariate analysis to ascertain the frequency distribution and percentage of respondent attributes. Bivariate analysis was employed to assess the impact of independent variables on dependent variables utilizing the Wilcoxon and Mann-Whitney non-parametric tests.

RESEARCH RESULTS

The results of this study include univariate analysis and bivariate analysis.

Univariate Analysis

Table 1
Characteristics of Respondents Based on Age of Intervention Group and Control Group May - June 2024
(n=30)

Variable	Mean	Median	Standard Deviation	Minimum-Maximum	Confidence Interval (CI) 95%
Age	53,86	55,00	4,510	45-59	52,15-55,58

Based on table 1, it can be seen that the average age of the respondents is 53.86 or (54 years) with a standard deviation of 4.510. The minimum age of respondents is 45 years old and the maximum is 59 years old.

Table 2
Respondent Characteristics by Gender, Last Education, Occupation, Long Duration of Hypertension, and History of Antihypertensive Drug Consumption in the Intervention Group and Control Group in May – June 2024
(n=30)

Variable	Intervention (%) (n = 15) f	Control (n=15) f	Total (n=30) f	Percentage (100%)
Gender				
Man	2	3	5	16,7
Woman	13	12	25	83,3
Last Education				
No School	3	3	6	20,0
Primary Education	9	11	20	66,7
Secondary Education	3	1	4	13,3
Work				
Self employed	1		1	3,3
Farmer	1	4	5	16,7
IRT	8	9	17	56,7
Others	5	2	7	23,3
Long Suffering from Hypertension				
3 years	4	6	10	33,3
4 years	4	3	7	23,3
5 years	7	6	13	43,3
History of Consumption of Antihypertensive Drugs				
Exist	12	12	24	80,0

Variable	Intervention (%) (n = 15) f	Control (n=15) f	Total (n=30) f	Percentage (100%)
Not	3	3	6	20,0

According to Table 2, the female respondents comprise 25 individuals (83.3%), those with basic education total 20 individuals (66.7%), and respondents employed as IRT amount to 17 individuals (56.7%). Thirteen individuals (43.3%) have experienced hypertension for five years, whereas twenty-four respondents (80.0%) have a history of antihypertensive medication use.

Bivariate Analysis

The Wilcoxon *test* is used to determine the difference in the average pre-test and *post-test* blood pressure for each group.

Table 3

Wilcoxon Test Results in the Intervention Group in May - June 2024 (n = 15)

Variable	Group	Mean Rank	<i>p-value</i>
Systolic Blood Pressure	Intervention		
	Before 1	8,00	0,000
	After 1		
	Before 2	8,00	0,000
	After 2		
	Before 3	8,00	0,000
	After 3		
	Before 4	8,00	0,000
	After 4		
	Before 5	8,00	0,001
After 5			
Diastolic Blood Pressure	Intervention		
	Before 1	7,50	0,000
	After 1		
	Before 2	1,50	0,180
	After 2		
	Before 3	1,50	0,180
	After 3		
	Before 4	2,00	0,564
	After 4		
	Before 5	2,00	0,083
After 5			

Table 3 indicates that the average systolic blood pressure difference before and after exercise in the intervention group from the first to the fourth day yielded a mean rank of 8.00 with a p-value of 0.000, and on the fifth day, a mean rank of 8.00 with a p-value of 0.001, signifying a significant difference in average systolic blood pressure before and after the isometric handgrip exercise in the intervention group. The average diastolic blood pressure difference before and after the initial day of activity in the intervention group yielded a mean rank of 7.50, accompanied by a p-value of 0.000. On the second and third days, a mean rank of 1.50 was recorded, accompanied by a p-value of 0.180. On the fourth and fifth days, a mean rank of 2.00 was recorded, with p-values of 0.564 and 0.083, indicating a difference in average diastolic blood pressure before and after isometric handgrip training in the intervention group.

Table 4
Wilcoxon Test Results in the Control Group in May - June 2024 (n = 15)

Variable	Group	Mean Rank	p-value
Systolic Blood Pressure	Control		
	Before 1	2,00	0,083
	After 1		
	Before 2	0,00	1,000
	After 2		
	Before 3	2,00	0,564
	After 3		
	Before 4	1,50	0,180
	After 4		
	Before 5	0,00	1,000
After 5			
Diastolic Blood Pressure	Control		
	Before 1	3,13	0,157
	After 1		
	Before 2	2,50	0,317
	After 2		
	Before 3	1,50	0,180
	After 3		
	Before 4	3,00	0,034
	After 4		
	Before 5	0,00	1,000
After 5			

Based on table 4, it can be seen that the average difference in systolic blood pressure before and after in the control group on the first day was obtained a mean rank of 2.00 with a *p-value* of 0.083. On the second day, a mean rank of 0.00 was obtained with a *p-value* of 1,000. On the third day, a mean rank of 2.00 was obtained with a *p-value* of 0.564. On the fourth day, a mean rank of 1.50 was obtained with a *p-value* of 0.018. On the fifth day, a mean rank of 0.00 was obtained with a *p-value* of 1,000, meaning that there was no difference in the average systolic blood pressure before and after in the control group. The difference in the average diastolic blood pressure before and after in the control group on the first day was obtained a mean rank of 3.13 with a *p-value* of 0.157. On the second day, a mean rank of 2.50 was obtained with a *p-value* of 0.317. On the third day, a mean rank of 1.50 was obtained with a *p-value* of 0.180. On the fourth day, a mean rank of 3.00 was obtained with a *p-value* of 0.034. On the fifth day, a mean rank of 0.00 was obtained with a *p-value* of 1,000, meaning that there was no difference in the average diastolic blood pressure before and after in the control group.

The *Mann Whitney test* was used to determine the average difference in blood pressure between the intervention group and the control group.

Table 5
Results of the *Mann Whitney Test* in the Intervention Group and Control Group in May - June 2024
(n=30)

Variable	Group	n	Mean Rank	<i>p-value</i>
Systolic	<u>Intervention</u>	30	<u>10,13</u>	0,001
	Control		20,87	
Diastolic	<u>Intervention</u>	30	<u>11,40</u>	0,006
	Control		19,60	

Table 5 indicates that the mean systolic blood pressure difference between the intervention group, with a mean rank of 10.13, and the control group, with a mean rank of 20.87, yielded a *p-value* of 0.001. Additionally, the mean difference in diastolic blood pressure between the intervention group, with a mean rank of 11.40, and the control group, with a mean rank of 19.60, resulted in a *p-value* of 0.006. Consequently, it can be inferred that a disparity exists in the average blood pressure before and after the isometric handgrip exercise intervention between the intervention and control groups, indicating that the hypothesis of this study is validated due to the *p-value* being less than 0.05.

DISCUSSION

Respondent Characteristics Based on Age, Gender, Last Education, Occupation, Long Suffering from Hypertension, and History of Consumption of Antihypertensive Drugs

The research results, derived from 30 pre-elderly respondents, indicated an average age of 53.8 years, or around 54 years. According to the research conducted by Maulidah, Neni, and Mayawati (2022), the predominant age of respondents with hypertension was 54 years. The majority of individuals with hypertension belong to the pre-elderly demographic. Upon age 45, arterial walls thicken due to collagen accumulation in the muscular layers, resulting in the gradual narrowing and rigidity of blood vessels. The constriction of blood vessels attributable to advancing age might influence the circulatory system, resulting in elevated blood pressure (Maulia et al., 2021).

The study's results indicated that most respondents were female, comprising 25 individuals (83.3%). A further study indicated that females exhibited a higher prevalence of hypertension, with 25 individuals (62.5%) out of 40 diagnosed with the condition (Ladyani et al., 2021). Decreased estrogen levels increase blood viscosity, complicating cardiac output and thus elevating blood pressure (Yasa et al., 2023).

In addition to age and gender, another factor that also affects the incidence of hypertension is a person's level of education. The research results showed that the respondents' last level of education was primarily basic education for 20 people (66.7%). According to the theory of *health belief model*, it is explained that individual behavior and perception in preventing their disease are influenced by various factors, including low education levels related to the lack of individual knowledge about the factors that cause disease (Irawan, 2017).

Hypertension can be caused by a high type of individual work triggered by stress factors (Kusumaningtias et al., 2024). The study's results showed that most respondents were housewives (IRT), as many as 17 people (56.7%). The magnitude of the job responsibility as a housewife (IRT) causes stress reactions, lack of physical activity, excessive calorie consumption, consumption of fast food or *fast food*, and contraceptive pills that trigger hypertension (Rasdiyanah et al., 2020).

The length of suffering from hypertension is the time from when a person is diagnosed with hypertension. The results of the study showed that the longest duration of suffering from hypertension was 5 years, for as many as 13 people (43.3%). The long-term factor of suffering from hypertension increases the workload of the cardiovascular system. Chronic inflammation can damage organs, especially the heart and blood vessels, disrupting blood

circulation (Suirvi et al., 2022).

The study's results showed that most of the respondents had a history of consumption of antihypertensive drugs, with 24 people (80.0%). Hypertension pharmacological therapy is needed for a long time to keep blood pressure under control, even if hypertensive patients no longer complain of symptoms. This is because hypertension often does not have typical signs and symptoms. As a result, it is difficult for hypertensive patients to notice it (Wycidalesma & Yuswantina, 2021).

Pre-Intervention Blood Pressure Measurement for Isometric Handgrip ExerciseThe study's results revealed that the average blood pressure before the Isometric Handgrip Exercise intervention in the experimental group was 160.66/100.66 mm Hg. In contrast, the mean blood pressure prior to the control was 164.00/102.66 mm Hg. As per the hypertension classification set forth by the Joint National Committee (JNC) VIII, the intervention group included two individuals with stage I hypertension and 13 individuals with stage II hypertension. In the control group, three participants demonstrated stage I hypertension, while twelve participants exhibited stage II hypertension. The majority of respondents exhibited no signs of hypertension, resulting in their omission of necessary hypertension therapy, which should be complemented with a healthy lifestyle. Nonetheless, sure responders have failed to adopt this healthy lifestyle, resulting in unstable blood pressure.

Factors that exacerbate hypertension include obesity, smoking, insufficient physical activity, excessive salt intake, dyslipidemia, alcohol drinking, and inadequate stress management. These factors can lead to inadequate management of hypertension or exacerbate the condition (Rhamdika et al., 2023). Adopting a healthy lifestyle is essential for enhancing the health of hypertension patients, particularly through non-pharmacological therapies such as isometric handgrip exercises (Mursudarinah et al., 2021).

The isometric handgrip exercise functions by mitigating the factors contributing to physical and psychological stress linked to cardiovascular responses in patients with hypertension. Isometric exercise is an alternative for individuals unable to perform isotonic exercises to manage their blood pressure (Suyanto & Solekhah, 2022). Isometric handgrip training offers several advantages, including hypertension reduction, muscle mass and stability, augmentation of bone density, and a decreased chance of bone fractures (Rohmana, 2022).

Blood Pressure After *Isometric Handgrip Exercise Intervention*

Following the intervention of isometric handgrip exercise over five consecutive days, the study revealed a reduction in blood pressure among the participants in the intervention group. Prior to the intervention, the responders exhibited an average systolic and diastolic blood pressure of 160.66/100.66 mmHg, which subsequently decreased to 158.13/91.33 mmHg. In comparison to the control group, the participants' mean systolic and diastolic blood pressure was 164.00/102.66 mmHg, subsequently reducing to 162.00/100.00 mmHg. The data analysis indicates that the group performing isometric handgrip exercises exhibited a significant reduction in blood pressure, transitioning from stage II hypertension to stage I hypertension, in contrast to the control group.

Siauta, Embuai, & Tuasikal (2020) assert that the mechanism for reducing blood pressure during isometric handgrip exercise is attributed to its emphasis on stimulating energy flow within the meridian pathways, thereby aiding in the restoration of the body's homeostatic energy balance, which is interconnected with various organs and emotions via the nervous system. The reflection sites on the hand elicit a reflexive or involuntary response upon the release of the grasp. Isometric handgrip exercise physiologically enhances the body's regulation of the interplay between the nervous and cardiovascular systems, influencing the sympathetic nerve, which leads to reduced peripheral nerve resistance and heart contractions, ultimately resulting in lowered blood pressure (Damayanti & Widarti, 2024).

The findings of this study align with the research by Mabruroh, Sunanto, & Ro'isah (2023) on the impact of isometric handgrip exercise therapy in reducing blood pressure among elderly individuals with hypertension, which demonstrated a significant decrease in blood pressure post-exercise, yielding a p-value of 0.000 (p-value < 0.05). The isometric handgrip exercise contractions elicit a metaboreflex to restore blood flow, whereby the blood pressure and heart rate responses during the exercise are influenced by the intensity of muscle contractions, muscle diameter, and the duration of contraction.

Effect of *Isometric Handgrip Exercise* on Blood Pressure in Hypertensive Patients in Tenajar Lor Village, Kertasemaya District, Indramayu Regency

The Mann-Whitney test results indicated that isometric handgrip exercise significantly reduced systolic blood pressure ($p = 0.001$) and diastolic blood pressure ($p = 0.006$), both below the threshold of $p < 0.05$. Consequently, the alternative hypothesis (H_a) was accepted, demonstrating that isometric handgrip exercise interventions effectively lower

blood pressure in hypertensive patients in Tenajar Lor Village, Kertasemaya District, Indramayu Regency. Consistent with prior research by Haslyanti & Maria (2023) on the impact of isometric handgrip exercise on blood pressure alterations in elderly and menopausal women with rheumatoid arthritis, systolic blood pressure yielded a p-value of 0.000, while diastolic blood pressure presented a p-value of 0.015. Isometric handgrip exercise reduces blood pressure and arterial stiffness, attributed to enhanced antioxidant agents and improved endothelial cell activity.

Physically engaging in exercise theoretically contributes to the physical activity component that may diminish the risk of hypertension. It is conducted per a plan, systematically, and scheduled through repetitive physical activities, to optimize bodily vitality. A suggested form of physical exercise is aerobic activity combined with muscle strength training (PERHI, 2015).

Isometric handgrip exercises consist of strength training that incorporates relaxation through grip activities involving the arms and hands. These activities result in muscle contraction and a reduction in blood pressure due to variations in hand muscle tension. An isometric muscle contraction occurs when the muscles of the hand contract without any alteration in muscle length or joint movement. This activity can reduce the physical and emotional stress affecting the cardiovascular system of hypertension patients, particularly blood pressure (Siska et al., 2024).

Prastiani, Rakhman, and Umaroh (2023) conducted prior research supporting this study regarding the application of Isometric Handgrip Exercise. To reduce blood pressure in patients with first-degree hypertension, a p-value of 0.000 was obtained. This can be attributed to a reduction in the activity of sympathetic nerves that govern blood pressure. The activation of chemoreceptors or specialized nerve cells transmits messages to the brain to reduce blood pressure (Putri & Sumarni, 2021).

Furthermore, isometric handgrip exercise is associated with a relaxation mechanism that transmits signals to the hypothalamus, prompting the release of corticotropin-releasing hormone (CRH), which subsequently stimulates the anterior pituitary gland to secrete endorphins. These endorphins contribute to mood enhancement and mental relaxation, facilitating a reduction in blood pressure (Ratri, 2024).

The results of this study are corroborated by research conducted by Nirnasari, Tania, and Ernawati (2023) on the efficacy of isometric handgrip exercise in reducing blood pressure among hypertension patients, which yielded a p-value of 0.000 from statistical analyses.

Rohmana & Rochayati (2024) assert that engaging in continuous isometric handgrip exercise for a brief duration (2 minutes) stabilizes blood pressure and heart rate, enhances cardiovascular control via the sympathetic nervous system, reduces myocardial contractility, diminishes peripheral resistance, and ultimately lowers blood pressure.

Multiple confounding variables, including stress, nutrition, sleep deprivation, smoking, and physical inactivity, induced fluctuations in respondents' blood pressure changes, so limiting the researchers' ability to regulate these conditions thoroughly. Hypertensive individuals engaging in isometric handgrip exercises alongside antihypertensive medication will have a more significant reduction in systolic and diastolic blood pressure. The onset of primary hypertension is attributed to a reduction in the availability of Nitric Oxide (NO), a vascular vasodilator. Nitric Oxide is perpetually synthesized by vascular endothelial cells from the amino acid L-arginine, a process catalyzed by the enzyme Nitric Oxide Synthase (NOS), to sustain vascular muscle tone (Sutrisno & Rekawati, 2021).

The theory posits that isometric exercises induce ischemic stimuli due to muscle pressure on blood vessels, subsequently initiating shear stress or frictional forces on the vascular walls. This process results in dilating the brachial artery's walls, prompted by the release of Nitric Oxide (NO) derivatives synthesized by endothelial cells, serving as a vascular vasodilator. Nitric Oxide (NO) permeates the arterial and venous walls (smooth muscles), generating enzymes that activate and relax muscular components, thereby inducing vasodilation; this enhances blood circulation and reduces blood pressure (Olyverdi et al., 2023). Consistent isometric handgrip exercises will enhance capillary density, oxygen extraction, and the activation of oxidative enzymes in skeletal muscle. They will also diminish the concentration of interstitial metabolism, resulting in a minor activation of metaboreceptors. This then elevates the sympathetic response marginally and mitigates the rise in blood pressure (Widiastuti et al., 2021).

A reduction in sympathetic nervous system activity leads to decreased synthesis of the hormone adrenaline, which influences the smooth muscles of blood vessels, resulting in vasodilation. Vasodilation reduces peripheral resistance, hence lowering blood pressure (Azizah et al., 2022).

CONCLUSIONS AND SUGGESTIONS

The statistical analysis employing the Mann-Whitney test revealed a p-value of 0.001 for systolic blood pressure and a p-value of 0.006 for diastolic blood pressure in both the intervention and control groups, indicating a significant effect of isometric handgrip exercise on blood pressure alterations following the intervention. Patients with hypertension should be encouraged to independently perform isometric handgrip exercises at home, while healthcare professionals, particularly nurses, ought to engage in promotional and preventive initiatives for hypertension using these exercises. Additional research into additional factors, such as alterations in vital signs among hypertension individuals, is necessary.

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