

The Effect Of Deep Breath Relaxation And Isometric Handgrip Exercise On Reducing Blood Pressure In Older Adults With Hypertension

Yuyun Anggraini, Dhona Andhini, Putri Widita Muharyani

Nursing Departement, Faculty of Medicine, Universitas Sriwijaya, Sumatera Selatan, Indonesia

Corresponding : dhonaandhini@fk.unsri.ac.id

ABSTRACT

Intorduction : Hypertension is a major risk factor for death from cardiovascular disease. In addition to pharmacological therapy, companion therapy is also needed that aims to reduce blood pressure, including physical activity therapy and relaxation therapy. Isometric handgrip exercises and relaxation therapy can activate immediate impulses by increasing muscle tension and relaxing the body so that a blood pressure response can occur. This study aims to determine the effect of a combination of isometric handgrip exercise therapy and deep breathing relaxation on blood pressure in elderly people with hypertension.

Methods : This research is a pre-experimental quantitative research with a one group pretest posttest design. The intervention consisted of isometric grip exercises and deep breathing relaxation for 20 minutes. The sample for this research consisted of 17 respondents using purposive sampling. Statistical analysis of this research uses a paired t test with a value of $\alpha = 0.05$.

Results : The results of p value = 0.000 ($\alpha \leq 0.05$) which means that there is a significant effect of a combination of isometric handgrip exercise therapy and deep breathing relaxation on reducing blood pressure in elderly people with hypertension

Conclusion : The results of the research show that the combination of isometric handgrip exercise therapy and deep breathing relaxation can significantly reduce blood pressure in elderly people with hypertension. The combination of isometric handgrip exercise therapy and deep breathing relaxation can be recommended as a treatment to complement pharmacological therapy in reducing blood pressure. tructions for authors.

Keywords: Hypertension, Isometric Handgrip Exercise, Elderly, Slow Deep Breathing

INTRODUCTION

Hypertension is the main risk factor for death from cardiovascular disease and is the second-leading cause of disability in the world (Julianty Pradono, 2020). According to WHO (2015), there are 1.13 billion people with hypertension in the world; in other words, 1 in 3 people in the world are diagnosed with hypertension, and only 36.8% are taking medication. The number of people with hypertension in the world is increasing every year; it is estimated that by 2025 there will be 1.5 billion people with hypertension, and every year there will be 9.4 million people who will die from hypertension and its complications (Purwono., et al, 2020).

According to the results of the 2018 Basic Health Research (Riskesdas), the prevalence of hypertension in Indonesia is currently 34.1%, up from the previous value of 25.8% in 2013. In 2019, hypertension ranked first out of the 10 most common disease cases in the South with a total of 283,390 cases (Aisyah, M.M., & Rejeki, H., 2021). Palembang is the area with the highest prevalence of hypertension, namely 255,449 (Dinkes Prov. Sumatera Selatan, 2020). The prevalence of hypertension sufferers is quite high in Indonesia at the ages of 55–64 years (55.2%), 65–74 years (63.2%), and 75 years and over (69.5%) (Kemenkes RI., 2018).

The Global Action Plan recommended by WHO in an effort to control the spread of non-communicable diseases can be carried out by controlling risk factors that can affect such things as smoking, exercise, consuming excessive salt, and stress. Management of hypertension can be carried out in pharmacological and non-pharmacological ways, namely to control hypertension and prevent complications (Putri, & Sumarni., 2021). The elderly experience a decrease in various organ functions; apart from cardiovascular problems, the elderly also experience problems in the digestive system, so that the pharmacological management of hypertension becomes less effective. Management of hypertension in the elderly is more often recommended nonpharmacologically (Udani, 2016). Exercising by doing light activities such as isometric stretching and relaxing can lower blood pressure.

One alternative to lowering blood pressure is physical activity, which has great benefits for all ages and also has an effect on reducing cardiovascular disease by 50% in people with hypertension (Carlson,D.J.,et al.,2014). Physical activity is a therapy that can reduce blood pressure by reducing systemic peripheral resistance, which is associated with an increase in blood vessel diameter due to adaptation to physical activity resulting in blood vessel dilation (Enisah, E.,et al, 2021). Exercise by doing light activities can prevent an increase in blood pressure due to the vasovagal response that occurs during continuous isometric muscle contractions (Yanti,D.D.,et al, 2021). Isometric handgrip exercise is one of the physical activity therapies that can activate impulses immediately due to increased muscle tension. This occurs by maintaining muscle tension, increasing stimulation of the central nervous system, increasing sympathetic outflow, and decreasing parasympathetic outflow, so that an increase in blood pressure response can occur (Aisyah,M.M & Rejeki,H,2021). Isometric handgrip exercise is a therapy that is carried out by gripping; the contraction occurs in the forearms and hands, so it can cause changes in hand muscle tension (Sefia Nurindra.,et al, 2016). Research conducted by (Rahmawati,et al, 2018) found that 9% did not experience a decrease in blood pressure after the isometric handgrip exercise. According to research by (Karthikkeyan.,et al,2020), isometric handgrip exercise therapy has a short-term effect if done at one time. Research conducted by (Andri.,et al, 2018; Ferreira, R. E., Silva, R. C., & Moraes, A. 2018; Boudet, F., Chabert, M. T., & Bonnaud, S. 2019) regarding a comparison of isometric handgrip exercise therapy and deep breathing relaxation showed a difference of 2.37 mmHg for isometric handgrip exercise and 2.69 mmHg for deep breathing relaxation.

In addition to physical activity to reduce blood pressure, there are other efforts that can be made, namely relaxation. Relaxation is related to the working human nervous system, namely the sympathetic nervous system and the parasympathetic nervous system. A relaxed state can stimulate the body to produce nitrate molecules (NO). Nitric oxide molecules act on vascular muscle tone so that they can reduce blood pressure (Kusyati, E.,et al, 2018). Deep breathing relaxation therapy is a movement that can cause relaxation in patients. The mechanism of breathing relaxation is the state of inspiration and expiration at 6–10 times per minute so that the cardiopulmonary stretch increases and afferent impulses from the baroreceptors reach the sympathetic nerve center, causing vasodilation throughout the body and decreasing heart rate and contraction power. This situation causes a decrease in cardiac output volume. In the skeletal muscles, some vasomotor fibers release acetylcholine, which causes dilation of blood vessels as a result of decreased cardiac output, cardiac muscle contractions, and blood volume, so it is expected that blood pressure can decrease, and in the effect of a of deep breathing relaxation on blood pressure in elderly people with hypertension (Epriza., et al 2018).

METHODS

Study Design

The independent variable in this study was a combination of isometric handgrip exercise therapy and deep breathing relaxation; the dependent variable in this study was blood pressure. This type of research is quantitative; this study uses a pre-experimental design, namely one group pretest and one group posttest (Notoatmodjo, 2012). The bivariate analysis in this study serves to determine the effect of a combination of isometric handgrip exercise therapy and deep breathing relaxation on blood pressure in elderly people with hypertension. The researcher conducted a data normality test using the Shapiro-Wilk test because the number of samples in the study was 50.

Participant

The research received ethical approval from the Faculty of Medicine Number 040-2023. This study was conducted to determine the effect of a combination of isometric handgrip exercise therapy and deep breathing relaxation on blood pressure in elderly people with hypertension, with sample size of 17 respondents by means of purposive sampling .

Instrument and Data Collection

Research instruments are tools used for data collection (Notoatmodjo, 2012). In the research, the instruments used are: The blood pressure measurement tool uses digital sphygmomanometer, handgrip, stopwatchd, observation sheet.

Data collection in this study used primary data, namely measuring blood pressure before and after the intervention combined with isometric handgrip exercise therapy and deep breathing relaxation, and demographic data from respondents, namely age, gender, education and secondary data obtained from Health Service reports Palembang City (2020) and Basuki Rahmat Health Center data (2022). Before conducting research, researchers first asked for informed consent from respondents. The researcher explained the aim of the combination of isometric handgrip exercise therapy and deep breathing relaxation, namely to reduce blood pressure in the elderly and explained the intervention time, namely the therapy was carried out for 3 days and 20 minutes for isometric handgrip exercise therapy and 15 minutes for deep breathing relaxation therapy in the elderly. When elderly people carry out therapy, the elderly are accompanied by researchers and elderly nurses at the research site's Community Health Center to carry out therapy together.

Data Analysis

The data was analyzed using a paired t-test. The results of the bivariate test obtained a p value with an alpha α value of ≤ 0.05 , which means the null hypothesis (H_0) is rejected, meaning that there is an effect of giving a combination of isometric handgrip exercise therapy and deep breathing relaxation on the blood pressure of the elderly.

Ethical Test

This research has passed the ethical test from the Research and Health Ethics Committee, Faculty of Medicine, Sriwijaya University with ethical certificate protocol number: 040-2023 (13 March 2023).

RESULTS

The general description of the respondents in this study can be seen from Table 1, which shows that all respondents were aged 60–74 years (100.0%), the majority were female (52.9%), and the majority of respondents had last attended high school (52.9%).

Based on Table 2, systolic blood pressure before and after being given a combination of isometric handgrip exercise therapy and deep breathing relaxation has the highest value before being given an intervention of 170 and the lowest value before being given an intervention of 140. Meanwhile, after being given an intervention, the highest value is systolic blood pressure of 160 and the lowest value is 124. The average value of systolic blood pressure before being given an intervention was higher, namely 151.29, compared to the average value after being given an intervention, which was 139.06.

Based on Table 3, diastolic blood pressure before and after being given a combination of isometric handgrip exercise therapy and deep breathing relaxation has the highest value before being given an intervention of 98 and the lowest value before being given an intervention of 70. Meanwhile, after being given an intervention, the highest value is a systolic blood pressure of 93, and the lowest value is 65. The average value of systolic blood pressure before being given an intervention was higher, namely 87.82, compared to the average value after being given an intervention, which was 80.18.

Based on the results of Table 4 below, it shows that after a combination of isometric handgrip exercise therapy and deep breathing relaxation, changes in blood pressure occur with an average difference in systolic blood pressure of 12.23 and diastolic blood pressure of 7.64. The results of the significance value based on the paired samples t-test before and after showed a p value of 0.000 (p value 0.05) on systolic and diastolic blood pressure, so there were significant changes in blood pressure in respondents before and after being given therapy.

Table 1. The Frequency Distribution of Respondents

Variable		f	%
Age	60-74	17	100,0
Total		17	100,0
Gender	Woman	9	52,9
	Man	8	47,1
Total		17	100,0
Education	Elementary school	1	5,9
	Junior high school	2	11,8
	Senior high school	9	52,9

	Diploma	2	11.8
	Bachelor degree	3	17,6
Total		17	100,0

Table 2
Systolic blood pressure before and after Intervention

Variabel	n	Mean	SD	Minimum	Maximum
Systolic blood pressure before Intervention	17	151,29 mmHg	7,896	140	170
Systolic blood pressure after Intervention	17	139,06 mmHg	9,371	124	160

Table 3
Diastolic blood pressure before and after Intervention

Variabel	n	Mean	SD	Minimum	Maximum
Diastolic blood pressure before Intervention	17	87,82 mmHg	6,493	70	98
Diastolic blood pressure after Intervention	17	80,18 mmHg	8,141	65	93

Table 4
Difference in average blood pressure before and after intervention.

Variabel	Mean	n	SD	95% Confidence interval (CI)		p-value
				lower	upper	
Systolic Pre Test	151.29 mmHg	17	7.896	9,307	15,164	0,000
Post Test	139.06 mmHg	17	9.371			
Diastolic Pre Test	87.82 mmHg	17	6.493	4,861	10,433	
Post Test	80.18 mmHg	17	8.141			

DISCUSSION

Differences in blood pressure values before and after a combination of isometric handgrip exercise therapy and deep breathing relaxation

According to the results of the paired-samples t test statistical test, there is a significant difference between blood pressure before and after the intervention, with a p-value of systolic blood pressure = 0.000 and a p-value of diastolic blood pressure = 0.000, which means that the p-value of

each variable is 0.05. All respondents in this study experienced a decrease in blood pressure after a combination of isometric handgrip exercise therapy and deep breathing relaxation. When doing the combination of isometric handgrip exercise and deep breathing relaxation, respondents admitted that they felt tension in the muscles in the forearms and hands and felt relaxed and comfortable when doing deep breathing relaxation. This is supported by the research of (Aisyah,N.M.,& Rejeki,H, 2021) where isometric handgrip exercise can increase muscle tension, decrease blood pressure by maintaining muscle tension, increase stimulation of the central nervous system, increase sympathetic outflow, and reduce parasympathetic outflow, so that there can be an increase in response blood pressure while breathing deeply and slowly, which will improve oxygen saturation in the.

Isometric handgrip exercise, besides being able to reduce hypertension, has other benefits, namely can also prevent muscle atrophy, increase joint stability, increase muscle volume, and reduce edema. Isometric handgrip exercise lowers blood pressure by improving oxidative stress and increasing endothelial function in resistant vessels. Generally, someone with hypertension experiences impaired vasodilation of their blood vessels, one of which is caused by impaired vasodilation because the endothelium lacks the availability of nitric oxide. Nitric oxide is an endothelial-derived releasing factor (EDRF) that has vasodilator properties to prevent low-density lipoprotein from sticking (Chorilailly S & Ratnawari D, 2020). Isometric handgrip exercises can be done 3-5 times a week for 10–20 minutes each time (Zainuddin & Labdullah, 2020).

Deep breathing relaxation can lower blood pressure by means of relaxation related to the work of the human nervous system, namely the sympathetic nervous system and the parasympathetic nervous system. A relaxed state can stimulate the body to produce nitric oxide (NO). Nitric oxide molecules act on vascular muscle tone so that they can reduce blood pressure (Kusyati, E., et al, 2018).The mechanism of the deep breathing relaxation technique is the state of inspiration and expiration achieved by taking deep breaths six times per minute with a 10-second rest for 15 minutes (Andri.,et al, 2018).

The combination of isometric handgrip exercise and deep breathing relaxation can reduce blood pressure due to static contraction of the hand muscles without being followed by excessive movement of the muscles and joints. The effect of isometric handgrip exercise stimulates ischemic stimulation and shear stress mechanisms as a result of muscle contraction in blood vessels. This shear stress can activate nitric oxide in endothelial cells, after which it diffuses into smooth muscle. Nitric oxide will then stimulate the release of guanylate cyclase, which can widen blood vessels by relaxing smooth muscles, thereby improving blood circulation and reducing hypertension (Sri & Choirilailly, D, 2019; Kolb, T. L., & Milani, R. V. 2017). If you have done isometric handgrip exercises followed by deep breathing relaxation, slow and regular breathing exercises can increase baroreceptor sensitivity and chemoreceptor activity to lower blood pressure. Afferent impulses from the baroreceptors reach the heart center, which will stimulate parasympathetic nerve activity and inhibit the sympathetic center (cardio accelerator), resulting in systemic vasodilation and decreased heart rate and power (Andri., et al, 2018.; Nemoto, Y.,et al, 2021).

According to the researcher's assumption, the decrease in blood pressure in respondents occurs because in isometric handgrip exercise therapy there is an emphasis on the blood vessel muscles and on relaxation through deep breathing, which is done slowly and deeply and will improve oxygen saturation in the body, causing a feeling of relaxation. The tool used in the combination of isometric handgrip exercise therapy and breathing relaxation is simple and does not take much time to use for therapy, so it makes respondents interested in lowering blood pressure. This is in line with (Yanti,D.A & Rizkia,D, 2022) regarding isometric handgrip exercise therapy, which states that isometric exercise can result in an emphasis on the vascular muscles, which can produce an ischemic stimulus and cause a stimulus resulting in a shear stress mechanism. This is due to a stimulus resulting in increased stretching of the blood vessels. According to research by (Kusyati, E.,et al, 2018) regarding deep breathing relaxation, when the body is relaxed and not stressed, the blood vessels will experience vasodilation without resistance. This condition can maximize oxygen supply and improve blood circulation throughout the body. The combination intervention of isometric handgrip exercise therapy and deep breathing relaxation using a handgrip device has the advantage that the tool is simple, does not take much time, and is not affected by the weather because it can be done indoors (Ridwan, S & Sudiyat, R, 2021).

CONCLUSION

The average blood pressure of the respondents decreased after the intervention, namely the systolic blood pressure 12,23 mmHg and the diastolic blood pressure 7,64 mmHg. The results of the analysis showed that there was a significant difference in the average blood pressure before and after the intervention in the form of a combination of isometric handgrip exercise therapy and deep breathing relaxation, with a p value of 0.000 (0.05).

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NURSING IMPLICATION

Hypertension is a risk factor for heart disease, kidney failure, diabetes mellitus, and stroke, which are the main risk factors for death from cardiovascular disease. Apart from pharmacological therapy, companion therapy is also needed, which aims to lower blood pressure and includes physical activity therapy and relaxation therapy. The results of this study show that the intervention given to patients in the form of isometric handgrip exercise and deep breathing relaxation has an effect on reducing the patient's blood pressure by immediately activating impulses due to increased muscle tension and relaxing the body. The implications of this research can be used as a reference for health agencies, especially for nurses, in providing nursing care to hypertensive patients.

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