

## DOES ISOMETRIC HANDGRIP EXERCISE REALLY HAS EFFECT ON BLOOD PRESSURE CHANGES AND LIFE QUALITY IN PEOPLE WITH HYPERTENSION?

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### ABSTRACT

In 2020, around 1.56 billion people worldwide were estimated to suffer from hypertension, making it one of the leading causes of death across the globe. The purpose of this research was to examine the impact that isometric handgrip training has on changes in blood pressure as well as the quality of life of people who have hypertension. This research used a quasi-experimental approach with a control group that had different characteristics before and after the tests. The hypothesis test carried out by the intervention group produced p-values that were less than 0.05 for the measures of systolic and diastolic blood pressure as well as quality of life. At the time of the pre-test, the independent statistical analysis of systolic blood pressure, diastolic blood pressure, and quality of life scores for both the intervention group and the control group produced p-values that were greater than 0.05. The p-values for systolic, diastolic, and quality of life scores between the intervention group and the control group at the time of the post-test were 0.013, 0.003, and 0.051, respectively. There were significant differences in the average blood pressure and quality of life scores before and after the intervention of isometric handgrip exercises in the intervention group, whereas there was no difference in the control group. The intervention group consisted of people who did the exercises.

**Keywords:** *Hypertension, isometric handgrip exercise, quality of life score, blood pressure.*

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### INTRODUCTION

Uncontrolled hypertension, often known as high blood pressure, can lead to a number of potentially fatal conditions, including heart failure, stroke, renal failure, and coronary artery disease (Ahmad & Nurdin, 2019). According to the World Health Organization (WHO), around 1.3 billion people worldwide suffer from hypertension. This also means that two-thirds of the world's population comes from lower and moderate-income brackets, which are responsible for the bulk of deaths worldwide (Ministry of Health RI, 2019). The prevalence rate in East Kalimantan Province is the third highest in the country at 39.3% and Samarinda has the highest prevalence of hypertension in East Kalimantan, with 86,501 instances, while there are 167,951 cases of hypertension in East Kalimantan overall.

Pharmacological therapy using hypertension medications such as D beta-blockers can be taken in conjunction with salt restriction, dietary change, and consistent physical activity. Continuous engagement in a wide range of physically demanding activities with the potential to improve one's quality of life and isometric handgrip exercise is a type of static exercise that involves the contraction of muscles without any changes in the length of the muscle being worked.

According to the findings of a preliminary study in 2021, there were 2,079 cases of hypertension happened in only one Public Health Center in Samarinda City. This number illustrates the prevalence of hypertension among the residents of East Kalimantan, particularly the city of Samarinda. This should be cause for concern given the fact that a number of factors

can contribute to the development of hypertension; however, many people are unaware of the factors that play a role in the disease's development, and this ignorance can lead hypertension sufferers to experience serious complications as a result of their condition (Lima-Junior et al., 2019). On the basis of the information presented above, a group of researchers has expressed an interest in conducting a study with the working focus on isometric handgrip exercise on changes in blood pressure and quality of life people with hypertension.

**METHOD**

This investigation was conducted in the Bengkuring Working Area in sub urban part of Samarinda city in February and March of 2022. This sort of study is a quasi-experiment with a non-equivalent pre- and post-test control group research design. Participants in this study were from the hypertension patients population registered for treatment. Using a random sampling method, this sample consisted of 34 participants.

The data collecting approach consisted of evaluating the quality of life and blood pressure questionnaire (pretest), administering isometric handgrip exercises three times per week for three weeks, and then re-measured blood pressure (posttest) and obtaining a Quality-of-Life questionnaire. Using the Paired t-test and independent t-test, the gathered data were analyzed univariately and bivariately.

**RESULTS AND DISCUSSION**

**Univariate Analysis**

**Characteristics of Respondents**

**1. Age, Gender, Education, Employment**

**Table 1.** Frequency Distribution based on characterization in the Intervention and Control group April 2022

No	Characteristic	I. INTERVENTION GROUP CONTROL GROUP			
		II.	N	%	N%
1. Age					
	26-45 years	7	41,2	7	41,2
	≥46 years old	10	58,8	10	58,8
Gender					

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No	Gender	III.		INTERVENTION GROUP CONTROL GROUP	
		n	%	N	%
2.	Male	6	35,3	5	29,4
	Female	11	64,7	12	70,6

*Source: Primary Data 2022*

The age features of respondents in the intervention and control groups were characterized by a substantial proportion of respondents aged  $\geq 46$  years, as many as 10 individuals (58.8%) based on table 4.1. In the intervention and control groups, the majority of participants were female, with as many as 11 of them being female.

3.	Education				
	No School	1	5,9	0	0
	SD	3	17,6	5	29,4
	SMP	3	17,6	5	29,4
	SMA	7	41,3	4	23,6
	PT/Bachelor	3	17,6	3	17,6
4.	Employment				
	Civil servant	2	11,8	1	5,9
	Private Employees	1	5,9	2	11,8
	Self employed	4	23,5	3	17,8
	Farmer	1	5,9	0	0
	Unemployed	9	52,9	11	64,7
	Total	17	100,0	17	100,0

Based on the features of education background, it is evident that the majority of respondents (41.3%) in the intervention group had graduated from high school. In contrary, the majority of respondents in the control group held elementary and junior high school education for a total of five individuals (29.4%). According to the characteristics of the work, apparent that the majority of the participants in the intervention and control groups unemployed, notably nine (52.9%) and eleven (64.7%) individuals, respectively.

**Bivariate Analysis**

a. Normality Test

**Table 2.** Normality Test in Intervention Group and Control Group

Blood pressure	Shapiro Wilk Test	
	Pretest	Post test
Intervention Systole	0,603	0,507
Diastole	0,964	0,307
Control Systole	0,723	0,713
Diastole	0,204	0,646

**Table 3.** Normality Test of Quality of Life Score in Intervention Group and Control Group

Quality of Life Score	Shapiro Wilk Test	
	Intervention Group	Control Group
Pretest	0,717	0,798
Posttest	0,105	0,113

Table 4.2 and table 4.3 indicate the signification values of pre- and post- blood pressure are  $> 0.05$  with a normality test using the Shapiro Wilk Test, respectively, so it can be concluded that all data are normally distributed.

b. Paired t-test

1) Analysis of differences in average blood pressure before and after isometric handgrip exercise interventions

Blood pressure	N	Value	Pre test	Post test	P
Cystole Intervention	17	Mean±SD	154,00±11,36	140,82±11,62	0,003*
Diastole Intervention	17	Mean±SD	93,12±8,43	80,18±8,06	0,000*
Cystole Control	17	Mean±SD	147,47±15,33	151,12±11,12	0,065*
Diastole control	17	Mean±SD	87,00±10,58	88,82±7,56	0,280*

In light of the fact that the systole intervention group gained a p-value of  $0.003 < 0.05$  and the diastole intervention group obtained a p-value of  $0.000 < 0.05$ , it was concluded that there was a significant difference between pre-intervention and post-intervention isometric handgrip exercises in terms of average blood pressure.

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c. Independent t-test

<b>Blood pressure</b>	<b>Group</b>	<b>n</b>	<b>Mean±SD Difference</b>	<b>P</b>
<b>Pretest Systole</b>	Intervention Group	17	13,18±0,26	0,168*
	Control Group		3,65±4,15	
<b>Pretest Diastole</b>	Intervention Group	17	12,94±0,37	0,072*
	Control Group		1,82±3,02	

The above table represents the pre-test significance values of the systolic and diastolic blood pressure of the intervention and control groups, respectively p-values of 0.168 and 0.072 >0.05, indicating that there is no significant difference between the intervention and control groups' blood pressure.

<b>Blood pressure</b>	<b>Group</b>	<b>n</b>	<b>Mean±SD Difference</b>	<b>P</b>
<b>Post Test Systole</b>	Intervention	17	13,18±0,26	0,013*
	Control		3,65±4,15	
<b>Post Test Diastole</b>	Intervention	17	12,94±0,37	0,003*
	Control		1,82±3,02	

The above tableau shows the posttest significance values of systolic and diastolic blood pressure for the intervention and control groups, specifically p-values of 0.013 and 0.003 <0.05, indicating a significant difference in blood pressure between the intervention and control groups.

**Quality of Life Score**

<b>Quality of Life Score</b>	<b>Group</b>	<b>n</b>	<b>Mean±SD Difference</b>	<b>P</b>
<b>Pre test</b>	Intervention	17	5,46±0,64	0,057*
	Control	17	1,88±0,70	
<b>Post Test</b>	Intervention	17	5,46±0,64	0,051*
	Control	17	1,88±0,70	

The p-value for the pretest and posttest values of the Quality-of-Life score is more than 0.05; based on these values, it can be stated that there is no significant difference between the two groups in the pretest and posttest values of the Quality-of-Life score.

## **Discussion**

### **1. Characteristics of Respondents**

#### **a. Age**

The features of the respondents in this study were dominated by those who were older than or equivalent to 46 years of age. The incidence of hypertension is highest in those older than 45 years, because at that age, all organs in the human body undergo degeneration and there are natural changes in the body that impact the heart, blood vessels, and hormone (Maulidia et al., 2019). Researchers hypothesize that as people age, their susceptibility to degenerative disorders such as hypertension would increase.

#### **b. Gender**

Gender can be a contributing factor in the development of hypertension. Within the scope of this investigation, female respondents accounted up the vast majority of the sample. Women are more likely to develop hypertension as a result of hormonal variables that contribute to an increase in overall body fat or obesity. In addition, menopause tends to occur in women at an older age than it does in males, which can result in lower estrogen levels, which in turn can cause a narrowing of the blood vessels due to a decrease in HDL levels and an increase in blood pressure (Sutriyawan, 2021). According to the hypotheses of researchers, women have hormones that contribute to an increase in blood pressure, which leads them to believe that women are more likely to suffer from hypertension than men.

#### **c. Education**

The majority of participants in this study have completed their secondary education; hypertensive illness is typically associated with low and falling levels of education. The high prevalence of hypertension among people with low levels of education is likely attributable to a lack of health knowledge as well as a delay in receiving information at a rate at which it can have an effect on the individuals' actions and ways of life with regard to the regulation of blood pressure (Anggara, 2016; Sukartini et al., 2020).

Researchers hypothesize that a person's level of education has no bearing on whether or not they are at risk for developing hypertension. Among the many factors that play a role in this assumption is the degree to which an individual is knowledgeable about the factors that regulate healthy lifestyles and patterns of physical activity.

#### **d. Employment**

The prevalence of hypertension in this study was primarily attributable to respondents who were not employed, which is not surprising given that complaints related to hypertension are similar to other common complaints. As a result, these individuals were unaware that the symptoms they were experiencing were in fact signs of hypertension (Manuntung, 2017).

The work that housewives do, which includes performing physical activities that frequently lead to stress and engaging in repetitive activities on a daily basis, has the potential to stimulate the release of endothelium in the bloodstream or blood vessels, which can lead to a significant rise in blood pressure (Ikhwan, 2021). Experts believe that a person who does not work or who is a housewife has a bigger risk factor for hypertension. This is due to the fact that less activity and monotony can produce stress, which in turn can cause a rise in blood pressure.

2. Differences in the intervention group's average blood pressure and quality of life scores before and after they were given isometric handgrip exercises.

The results of the paired t-test obtained the results of the p-value of systolic and diastolic blood pressure, which were respectively 0.003 and 0.000  $< \alpha = 0.05$ . This indicates that there is a significant difference between the average systolic blood pressure and the diastolic blood pressure before and after the posttest ( $H_0 =$  rejected). In the meantime, the results of the study obtained through the paired t-test in the intervention group obtained a p-value of a quality-of-life score of  $0.002 < \alpha = 0.005$ , which indicates that there is a significant difference between the average pretest and posttest scores for quality of life ( $H_0 =$  rejected).

In accordance with the findings of the study, which demonstrated that there was a difference in the average systolic blood pressure of respondents between before and after the intervention with an average difference of 12.5 mmHg and a p value of 0.005, there was also a difference in the average diastolic blood pressure of respondents between before and after the intervention with an average difference of 9 mmHg and a p value of 0.024; consequently, it is possible to draw the conclusion Isometric exercise causes a suppression of the vascular muscles, which leads to the production of an ischemic stimulus and the subsequent activation of a shear stress mechanism. A lower systolic blood pressure has been linked to the occurrence of increased resting capacity in the production system, which has contributed to the drop in blood pressure (Yanti & Rizkia, 2022).

Doing physical activity is one of the things that can be done to improve one's quality of life because people who have hypertension tend to experience limitations in their ability to carry out daily activities, which in turn can lower their overall quality of life. Since this is the case, the best way to improve one's quality of life is to engage in physical activity (Aslan et al., 2020). Researchers believe that performing isometric handgrip exercises by holding a device that can compress muscles in conjunction with routinely taking drugs can effectively control blood pressure. The reduction in the number of complaints that respondents have regarding the illnesses that they have can be seen as a sign that their quality of life has improved. Also, the passion with which respondents participate in physical activity is also indicative of this improvement.

3. Differences in average blood pressure and quality of life scores in the control group.

The results of changes in pretest and posttest blood pressure obtained from the Paired t-test in the control group obtained a p-value result of  $0.407 > = 0.05$ . This indicates that there is no significant difference between the average blood pressure value and the pretest and posttest quality of life scores in the control group ( $H_0 =$  failed to be rejected).

This is due to the fact that the control group was not given the isometric handgrip exercise intervention. Despite this, there were some respondents in the control group who experienced a decrease or increase in blood pressure as well as changes in quality-of-life scores. This was due to the fact that there were factors that could not be controlled such as diet, drug consumption, and physical activity. previous investigations into the relationship between food and the prevalence of hypertension. The findings indicated that with the data collected using questionnaires and analysed using chi-square, the results of  $p = 0.000$  were obtained, which means that  $0.005$  so that there was an influence of diet on the incidence of hypertension in the Working Area of the Dungaliyo Health Center, Gorontalo Regency (Kadir, 2019).

In keeping with findings from prior research on the effects of increasing levels of physical activity on blood pressure in older adults aged 60–74 years old. According to the findings, the p-value was lower than the critical value, which indicates that the null hypothesis,  $H_0$ , was not supported, and the alternative hypothesis,  $H_a$ , was accepted. This indicates that the Wilcoxon test yielded a significant difference in blood pressure before and after physical activity, with a p-value of 0.000 (Makawekes et al., 2020).

4. Differences in average blood pressure and quality of life scores between the intervention and control groups.

In accordance with the results of the independent t-test, the p-value for the systolic pretest value is greater than 0.05, but the p-value for the diastolic pretest value is greater than 0.05. This indicates that there was no significant difference between the two groups in either the systolic or the diastolic pre-tests. As a result of the fact that the quality-of-life score obtained a p-value at the time of pretest of  $0.057 > 0.005$ , it is possible to draw the conclusion that there is no difference in quality-of-life scores at the time of pretest between the intervention group and the control group. Systolic and diastolic blood pressure values were obtained at the time of the posttest, and based on the results of an independent t-test, the p-values for systolic and diastolic blood pressure values were 0.0013 and  $0.003 < 0.005$ , respectively. This means that during the posttest, there were significant differences in systolic and diastolic pressure for both groups. The Quality-of-Life score was determined to have a p-value that was more than 0.005, which indicates that there was no significant difference between the two groups in regard to the posttest.

In the meantime, there were significant differences in the diastolic and systolic posttest values in both the intervention group and the control group, as indicated by p-values of 0.013 and 0.003 respectively 0.05. It is possible to draw the conclusion that there was a statistically significant difference between the two groups based on the average difference in blood pressure changes that occurred in each of the groups.

At the time of the posttest, the intervention and control groups were compared. In the meantime, the p-value for the pretest was higher than 0.05, which indicates that there was no significant difference between the intervention group and the control group.

Research that was done in the past on the efficacy of isotonic exercise with handgrips in controlling blood pressure in hypertensive patients in Bandung showed that this exercise did not have a significant difference or a p-value greater than 0.005 due to lower tension or lower contraction rates in the healthy or because the study population was lacking or normotensive. In other words, this exercise did not have a p-value greater than 0.005 (Setiawan et al., 2021).

Isometric handgrip exercises, for example, provide a systemic cardiovascular response that differs depending on the type of contraction that predominates in the muscles during the exercise. During isometric contractions, there is an increase in the frequency of the heart rate. This rise takes place when there is a local expansion of neuromuscular inhibitors, which prevents muscle contractions from taking place. This happens when the medulla oblongata is stimulated psychically, and as a result, after a few seconds of isometric contractions, the blood flow in the muscles that are still contracting diminishes, which causes the blood vessels in those muscles to get compressed (Rahmawati et al., 2018).

The researchers made the assumption that there was no difference at the time of the pretest because the two groups had not simultaneously been given isometric handgrip exercise

interventions. However, at the time of the posttest in the intervention group, they had been given isometric handgrip exercises, which meant that there were meaningful differences and there was an awareness among respondents to improve their lifestyle. In the meantime, the people in the control group were not given any isometric handgrip exercises. As a result, no one in the control group was able to regulate the factors that contributed to their high blood pressure, such as their lifestyle and their lack of physical activity. There was not a statistically significant difference between the intervention group and the control group in terms of quality of life when comparing results from the pre-test and the post-test in the intervention and control groups. On the other hand, the average value of the participants in the isometric handgrip exercise intervention group reported an increase in their quality of life, whereas the participants in the control group reported a deterioration in their quality of life.

## **CONCLUSION**

Using a paired t-test with p-values of 0.003, 0.000, and 0.002 = 0.05, it can be concluded that there was a significant difference in the average blood pressure and quality of life score between pre and post in the intervention group. This difference was found between pre and post in the intervention group.  $H_0$  was disproved of.

On the basis of the findings of the statistical tests, it is known that the p-values of 0.065, 0.280, and 0.407 are all greater than 0.05, which means that it is possible to draw the conclusion that there is no significant difference between the control group and the hypertensive patients in terms of blood pressure and quality of life. There was a statistically significant gap between the intervention group and the control group for the hypertensive patients' blood pressure values.

It is anticipated that the findings of this research will serve as a reference for future researchers, providing them with knowledge, experience, and insights, as well as providing preliminary information regarding the prevention of hypertension complications with isometric handgrip exercise interventions. In addition to this, it is anticipated that it will pay a greater amount of attention to the factors that influence changes in blood pressure and quality of life, just like the control group did.

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