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# REDUCING BLOOD PRESSURE AND PULSE RATE IN HYPERTENSION PATIENTS USING HATHA YOGA

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**ABSTRACT**

Several factors that can influence blood pressure and heart rate in hypertensive patients are physical activity, where hatha yoga can be a non-pharmacological intervention solution for hypertensive sufferers by emphasizing the effects of relaxation and blood circulation. The aim of this study was to analyze the effect of hatha yoga practice on reducing blood pressure and pulse rate in patients with hypertension. Methods: This research uses a quasi-experiment design with a pre-post test control group design. The research population was 72 elderly people with hypertension and 48 respondents were recruited as samples using purposive sampling techniques. This research was divided into 2 groups, namely the treatment group and the control group, each with 24 respondents. The independent variable hatha yoga was carried out using standard operating procedures (SOP), while blood pressure and pulse were the dependent variables measured using a sipgnomanometer, stethoscope, oximeter and observation sheet. Data analysis used a paired t-test with $p<0.05$ and because the data was normally distributed. Results: There was an effect of hatha yoga on blood pressure and pulse rate in hypertensive patients ($p=0.000$) in the intervention group. Systolic blood pressure decreased from 147.78 ± 6.014 to 131.08 ± 6.576. Diastolic blood pressure decreased from 95.08 ± 2.278 to 80.81 ± 6.032 and pulse rate decreased from 87.62 ± 5.570 to 79.49 ± 5.295. Conclusion: Non-pharmacological intervention using hatha yoga shows a positive influence in reducing blood pressure and pulse rate in elderly people with hypertension.

Keywords: blood pressure; hatha yoga; hypertension; pulse

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## INTRODUCTION

One of the factors that influences the circulatory system is blood pressure. Blood pressure that exceeds normal limits is often also called hypertension (Munawarah & Segita, 2023). Signs and symptoms can be seen and hypertension is not contagious, which is the main cause of death globally. If not treated immediately, it can cause complications such as heart, brain and kidney disease, therefore hypertension is often called the silent killer disease (Permana et al., 2020). Risk factors for hypertension include being overweight or obese, lack of physical activity, tobacco consumption, unhealthy diet, excessive alcohol consumption, stress, sleep apnea, and diabetes (Khandekar et al., 2021). Apart from that, hypertension is also caused by changes in lifestyle and more importantly, the possibility of blood pressure increasing due to increasing age is greater in people who consume foods that contain lots of salt (Tolbaños-Roche et al., 2022).

Data from the World Health Organization in 2015 shows that around 1.13 billion people in the world have hypertension, meaning that 1 in 3 people in the world are diagnosed with

hypertension. The number of people with hypertension continues to increase every year, it is estimated that by 2025 there will be 1.5 billion people affected by hypertension, and it is estimated that every year 10.44 million people die from hypertension and its complications (Jafri et al., 2023). According to the Indonesian Basic Health Research, the percentage of hypertension sufferers in the young age group has increased significantly, namely the 18-24 year age group at 4.5%, the 25-34 year age group at 5.4% and the 35-44 year age group. by 6.8%. Central Kalimantan Province alone has 34.5% cases of hypertension. These figures show that hypertension in Central Kalimantan Province is still above the national average. The estimated number of hypertension sufferers aged ≥15 years in Central Kalimantan Province in 2019 was 472,618 people. Based on gender, the percentage of hypertension in the female group was 39.4%, higher than in the male group, namely 35% (Dinas Kesehatan Provinsi Kalimantan, 2018). Meanwhile, the prevalence in Katingan Regency of hypertension is number 3 out of the 10 highest sufferers with a total of 28,868 cases. Based on data, there are 52 hypertension sufferers in Teangkat village who actively participate in the "Barigas Halajur" posyandu.

Lifestyle modification is recommended as the first line of therapy for all clients, after an initial diagnosis of hypertension. Adding lifestyle modifications, fluid restrictions, relaxation techniques and additional can normalize blood pressure in clients with hypertension. There are 5 natural physical activity treatments to control high blood pressure and also reduce stress and improve health, namely progressive muscle relaxation, medication, yoga, and breathing exercises and music therapy. Physical activity for hypertension sufferers, especially using yoga, is very beneficial, namely by increasing heart rate and output which circulates blood to all parts of the body (Nalbant et al., 2023; Tamba et al., 2021). The universal scope of yoga means that yoga can be done by all ages, from children, adults to the elderl. Gymnastics with a slow tempo is very suitable for all ages. The movements in hatha yoga exercises are done with simple movements that focus on controlling the respiratory system. These movements stimulate the release of endorphin hormones. This hormone can function as a natural sedative produced by the brain which creates a feeling of comfort and increases endorphin levels in the body to reduce high blood pressure (Grabara et al., 2020).

Various efforts have been made to overcome hypertension, namely controlling blood pressure by providing therapy, namely non-pharmacological therapy and pharmacological therapy. Treatment of high blood pressure using drugs can have side effects (Dhungana et al., 2021). So, it is necessary to carry out therapy that does not cause many side effects in hypertensive patients. Non-pharmacological therapy takes the form of lifestyle modification, reducing body weight, limiting sodium intake, modifying a low-fat diet, limiting alcohol, limiting caffeine, relaxation techniques, stopping smoking and physical activity (Parikh et al., 2021). One non-pharmacological intervention that focuses on managing environmental stimuli by changing, increasing, decreasing, moving or maintaining these stimuli is doing hatha yoga. Hatha yoga can guide individuals to maintain and improve adaptive behavior to change ineffective behavior to effective. Therapy to lower blood pressure using hatha yoga is not intended to replace the hypertension therapy currently used, but is expected to be able to create a feeling of comfort and relaxation. The aim of this study was to analyze the effect of hatha yoga practice on reducing blood pressure and pulse rate in patients with hypertension.

## METHOD

This research is a quantitative research with a quasi-experimental research design using a pre-post test control group design method which was carried out in August-December 2023. This

research focuses on analyzing the effect of hatha yoga therapy as a form of non-pharmacological therapy to influence blood pressure. elderly people with hypertension.

This study used a research target population of elderly people with hypertension in Gadung Village, Driyorejo District, Gresik Regency, East Java with a population of 72 elderly people with hypertension. The subjects in this research plan are part of the affordable population who suffer from hypertension, divided into two groups, namely the treatment group and the control group who meet the criteria 1) elderly aged >60 years; 2) female; 3) primary hypertension; 4) mild and moderate hypertension (systolic 140-159 mmHg and diastolic 90-99 mmHg); 5) elderly who can communicate well; 6) taking anti-hypertension medication (amlodiphine); and 7) able to sit and stand without the help of other people or tools. The criteria for respondents to drop out were respondents who did not participate in hatha yoga training or intervention more than 3 times in a row, withdrew from the sample for certain reasons and suffered from illness or injury. In this study, subjects were selected using a non-probability sampling method with purposive sampling. The sample size found from sample size calculations was 24 respondents in the treatment group and 24 respondents in the control group.

The independent variable in this study is Hatha Yoga therapy which is given to the elderly using module guides, videos and standard operating procedures for Hatha Yoga therapy. This training was carried out for 4 weeks and each week there were 2 meetings, so that in 1 month 8 training sessions were carried out. The intensity of the training is moderate, not too light and not too heavy, as evidenced by the way that during training you can still speak fluently without any intermittent speech problems (talk test). The duration of the exercise is 30 minutes with a rest period of 5 minutes. The dependent variables are blood pressure and pulse which are measured using a sphygmomanometer and oximeter, as well as using an observation sheet for assessing blood pressure and pulse.

The research implementation procedure begins with the preparation stage by submitting a research application letter to the institution and completing the research ethics test. After obtaining permission, researchers collected data on the elderly population with hypertension and divided the respondents into a treatment group and a control group. During the research and provision of hatha yoga exercises, respondents gathered at the Gadung Village Hall at 15.00 WIB. Before the intervention was carried out, respondents were given an explanation regarding the purpose of the research, the benefits of the research, the time span of the research, the rights of the respondent and the time contract for the research process, and asked for the respondent's agreement to sign an informed consent as a willingness to become a respondent. After the respondent was willing to become a research subject, the researcher provided a description or simulation assisted by an enumerator who was also a yoga instructor to help provide and direct the respondent in the hatha yoga practice process. Before and after the hatha yoga exercises were given, researchers assisted by enumerators measured the respondents' blood pressure and pulse. Descriptive analysis of research data is presented in a frequency distribution table and presented in descriptive analysis in the form of median, standard deviation, minimum and maximum values for each variable. The inferential analysis used in this research is a homogeneity test using Lavene's test, data is said to be homogeneous if the value based on the mean shows >0.05. The normality test was carried out using the Shapiro Wilk test and data was said to be normally distributed if the significance value was >0.05. Hypothesis testing uses Paired Sample T-Test with a significance level of $p \leq 0.05$. Meanwhile, to test significant differences between the pre-test and post-test of the two groups, the Independent T-Test was used.

The implementation of this research has received ethical approval from the Health Research Ethics Committee, Faculty of Nursing, Airlangga University, Surabaya with No. 2269-KEPK, as an effort to protect the human rights and welfare of health research respondents. Prospective respondents have received an explanation and understand the purpose, benefits of research and possible dangerous effects of research. The confidentiality of information provided by respondents as research subjects is guaranteed by the researcher. Respondents have the right to refuse or stop, not to continue as respondents and researchers highly uphold honesty in conducting research.

## RESULTS

Table 1.
Characteristics of Elderly Research Respondents with Hypertension (n=48)

| Respondent Characteristics | Treatment Group | | Control Group | | Homogenity Test |
|---|---|---|---|---|---|
| | f | % | f | % | |
| Age | | | | | |
| 60-65 Years | 19 | 79,2 | 20 | 83,3 | 0,326 |
| 66-70 Years | 5 | 20,8 | 4 | 16,7 | |
| Education | | | | | |
| Elementary school | 6 | 25 | 4 | 16,7 | 0,288 |
| Junior high school | 5 | 20,8 | 9 | 37,5 | |
| Senior high school | 8 | 33,3 | 7 | 29,2 | |
| Diploma | 3 | 12,5 | 2 | 8,3 | |
| Bachelor | 2 | 8,3 | 2 | 8,3 | |
| Work | | | | | |
| Housewife | 9 | 37,5 | 8 | 33,3 | 0,584 |
| Private | 7 | 29,2 | 11 | 45,8 | |
| Civil servants | 6 | 25 | 4 | 16,7 | |
| Soldier | 2 | 8,3 | 1 | 4,2 | |
| Ethnic group | | | | | |
| Java | 15 | 62,5 | 13 | 54,1 | 0,512 |
| Madurese | 5 | 20,8 | 6 | 25 | |
| Sunda | 3 | 12,5 | 3 | 12,5 | |
| Buginese | 1 | 4,2 | 1 | 4,2 | |
| Batak | 0 | 0,0 | 1 | 4,2 | |
| Religion | | | | | |
| Islam | 18 | 75 | 19 | 79,2 | 0,381 |
| Christian | 4 | 16,7 | 3 | 12,5 | |
| Catholic | 2 | 8,3 | 2 | 8,3 | |
| Long Diagnosed | | | | | |
| 1-5 Years | 11 | 45,8 | 14 | 58,3 | 0,935 |
| 6-10 Years | 12 | 50 | 6 | 25 | |
| ≥11 Years | 1 | 4,2 | 4 | 16,7 | |

Table 1 shows that the majority of respondents in the treatment group were in the elderly age category (79.2%). The education level of respondents in the treatment group was mostly high school (33.3%) and 37.5% worked as housewives. The tribe that showed the highest number was the Javanese tribe (62.5%) and 75% who were dominated by the Islamic religion. The longest duration of suffering from hypertension in the treatment group was the highest in the range of 6-10 years (50%). The age category in the control group showed that the majority were in the 60-65 year age range (83.3%). The education level 37.5% was junior high school, with 45.8% having jobs in the private sector. The ethnic category was mostly Javanese (54.1%) and the majority embraced Islam (79.2%). The duration of suffering from hypertension was 58.3% ranging from 1-5 years. All respondent characteristics show a p value >0.05, which means that all respondents from both groups are homogeneous.

Table 2.
Descriptive Analysis of Pre-Test and Post-Test Intervention Group and Control Group (n=48)

| Variable | *Pre-Test* | *Post-Test* |
|---|---|---|
| Systolic BP | | |
| Intervention | 147,78 ± 6,014 | 131,08 ± 6,576 |
| Control | 146,73 ± 6,496 | 146,73 ± 6,445 |
| Diastole BP | | |
| Intervention | 95,08 ± 2,278 | 80,81 ± 6,032 |
| Control | 93,73 ± 2,883 | 93,41 ± 2,872 |
| Pulse | | |
| Intervention | 87,62 ± 5,570 | 79,49 ± 5,295 |
| Control | 86,49 ± 4,770 | 86,89 ± 3,604 |

Table 2 explains that the results of bivariate variable testing show that blood pressure in the intervention group showed significant changes, namely systole 147.78 ± 6.014 to 131.08 ± 6.576 and diastole 95.08 ± 2.278 to 80.81 ± 6.032. Heart rate measurements also showed changes, namely from 87.62 ± 5.570 to 79.49 ± 5.295. In the control group, systolic, diastolic and pulse blood pressure tended to remain the same and there were no significant changes.

Table 3.
Test of the Effect of Hatha Yoga Research Variables on Reducing Blood Pressure and Pulse Rate

| Variable | Intervention Group | | | Control Group | | |
|---|---|---|---|---|---|---|
| | Std | Effect size | *p* | Std | Effect size | *p* |
| Pre and Post Test BP Systole | 10,87 | 1,54 | 0,000 | 2,39 | 0,23 | 0,177 |
| Pre and Post Test BP Diastole | 5,57 | 2,56 | 0,000 | 3,88 | 0,08 | 0,614 |
| Pre and Posttest Pulse Rate | 7,67 | 1,06 | 0,000 | 2,5 | 0,16 | 0,330 |

Table 4 shows that the results of the paired t-test analysis show that the intervention group showed that the pre and post-test values for systolic blood pressure, diastolic blood pressure and pulse were p = 0.000 (p<0.05), so it can be concluded that the yoga intervention hatha has a significant effect on blood pressure and pulse rate in hypertensive sufferers. In the control group which was not given intervention, the p value was >0.05 so there was no significant decrease in blood pressure and pulse rate in hypertensive sufferers.

Table 4.
Independent T-Test of Research Variables

| Variable | Intervention Group | | | Control Group | | | P value |
|---|---|---|---|---|---|---|---|
| | Median | Min | Max | Median | Min | Max | |
| Pretest | | | | | | | |
| Systolic BP | 147,78 | 140 | 155 | 146,73 | 140 | 159 | 0,725 |
| Diastole BP | 95,08 | 90 | 99 | 93,73 | 90 | 99 | 0,728 |
| Pulse | 87,62 | 80 | 98 | 86,49 | 80 | 95 | 0,350 |
| Posttest | | | | | | | |
| Systolic BP | 131,08 | 120 | 140 | 146,73 | 140 | 158 | 0,000 |
| Diastole BP | 80,81 | 70 | 90 | 93,41 | 90 | 99 | 0,000 |
| Pulse | 79,49 | 70 | 88 | 86,89 | 82 | 95 | 0,000 |

The results of testing data between groups using an independent t-test showed that in the pretest for the control group and the intervention group the p value showed >0.05, so it was concluded that there were no significant differences between the control and intervention groups in the blood pressure and pulse rate values before the intervention was given. After being given the intervention, the results showed that there was a significant change between the control group and the treatment group in the post test results for blood pressure and pulse rate, as evidenced by a p value <0.05.

## DISCUSSION

The results of the study showed that non-pharmacological interventions using hatha yoga were proven to be effective in reducing blood pressure. The intervention group showed significant changes in blood pressure, while the control group, which was not given the intervention, did not show any significant changes (Papp et al., 2020). The changes that occurred were a decrease of around 10-15 mmHg during the 4 weeks after the intervention was given. In line with research that has been conducted, it shows that yoga regularly for 20-30 minutes and done regularly every week has an effect or impact on reducing blood pressure, to the point of being able to reduce systolic 5-10 mmHg (Verma et al., 2021).

Other research also suggests the same thing that the application of hatha yoga can reduce blood pressure with the mean systolic and diastolic results before doing yoga exercises, namely 156.00/92.83 mmHg and after doing yoga exercises, namely 146.97/86.27 mmHg. So it can be concluded that the application of hatha yoga is effective in lowering blood pressure in hypertension sufferers without taking anti-hypertension drugs (Vaghela et al., 2020). Practicing yoga every day can improve blood circulation, because the feeling of relaxation obtained from yoga helps smooth blood circulation in the body, so it is very beneficial for hypertension sufferers. Hatha yoga has been proven to increase b-endhorpin levels four to five times in the blood. When someone exercises, b-endorphin will come out and be captured by receptors in the hiphothalamus and limbic system which function to regulate emotions. Increased b-endorphin has been shown to be closely related to blood pressure and breathing (Żok et al., 2022).

Hatha yoga emphasizes balancing the two opposing forces in the body, such as masculine energy (the sun) and feminine energy (the moon), yin and yang, left and right, inhalation and exhalation, feelings of sadness and joy, and so on, the aim of which is to maintain the body's natural balance. Hatha yoga is a training system that uses various body posture techniques accompanied by breathing techniques to achieve a balance between two different forces in the body, such as the upper and lower body, the left and right parts of the body. , inhalation and exhalation, positive energy and negative energy and so on (Mathew et al., 2024). Similar research using hatha yoga also shows that there is a significant effect on reducing systolic and diastolic blood pressure in elderly people suffering from hypertension.

In accordance with previous research which has shown significant changes. The results of research conducted through hatha yoga also have a good influence on blood pressure, namely reducing systolic blood pressure by around 4-15 mmHg and reducing diastolic blood pressure by 5-20 mmHg. So the results can be obtained that the non-pharmacological intervention of hatha yoga has a significant influence in reducing blood pressure. This is one solution that can be applied in the fields of nursing and public health, so that it becomes a non-pharmacological intervention that is friendly and socially based. The research results show that yoha hatha can influence the pulse. Changes in the pulse rate in the intervention group showed significant changes, where before the intervention was given the pulse rate was in the high category, and after the hatha yoga exercise the respondent's pulse rate experienced a significant decrease (Munawarah & Segita, 2023; Permana et al., 2020). Giving hatha yoga showed that both groups had a normal pulse rate, but the pulse rate was better shown in the intervention group. The pulse will be identical to the condition of the individual's heart pump, the pulse will show how hard the heart pumps blood, so the pulse can be an indicator of problems with the human heart. A pulse that tends to be fast or tachycardic requires relaxation and exercise to make the pulse return to normal and not cause the patient's body to pound even more. So, through hatha

yoga you can relax your body and mind, one of the effects of which is lowering your pulse rate (Khandekar et al., 2021; Tamba et al., 2021).

The results of research that has been carried out show that practicing Hatha yoga with regular doses and intensity will be able to reduce the pulse rate, especially in people who often experience muscle tension, anxiety and have high blood pressure. Through hatha yoga with a minimum duration of 20 minutes, it has been proven to be able to reduce the pulse rate which was initially fast to become more relaxed (Grabara et al., 2020; Nalbant et al., 2023). Yoga, which is an exercise that focuses on the mind, can make the mind comfortable, relaxed and stimulate the excretion of endorphin hormones in the body. Endorphins are chemicals produced by the body to relieve stress and restore the body's condition to a more relaxed state, so that the pulse rate increases and blood vessel tension decreases. The pulse is a wave that is palpable in the arteries when blood is pumped out of the heart. This pulse is easily felt in a place where an artery passes. Blood pushed towards the aorta through systolic pressure creates a pressure wave that travels along the artery. In line with research results, if a person's blood pressure increases, this will also have an impact on their pulse rate (Dhungana et al., 2021; Parikh et al., 2021). Providing Hatha yoga intervention has been proven by several studies to show its effect on muscle relaxation and reducing resistance in blood vessels, thus having an impact on the pressure on the heart pump and pulse rate.

The results of the study concluded that giving yiga hatha had a positive effect on the heart rate, but overall giving hatha yoga had a better effect than without giving hatha yoga. So even though there wasn't much change in heart rate, the results in the intervention group showed a stronger influence. However, researchers could not control activities outside of hatha yoga practice, so there were several factors that caused the decrease in blood pressure and pulse rate in respondents to be less significant, including the daily behavior of respondents, during the research process the subjects still consumed fatty foods and did not exercise, other than that. Stress and lack of rest also influenced the decrease in blood pressure in this study.

## CONCLUSION

Non-pharmacological intervention with hatha yoga practice can reduce blood pressure and pulse rate in elderly people with hypertension, as evidenced by changes in systole, diastole and pulse rate in research respondents. Before the intervention was carried out, the majority of respondents in the treatment group showed values far above the normal threshold for blood pressure and pulse rate, but after being given the intervention during the research period, the values for blood pressure and pulse rate became closer and almost to the normal threshold. This shows that hatha yoga has a positive influence on reducing blood pressure and pulse rate in people with hypertension. The results of this research provide input for health workers, especially nurses, to carry out complementary or non-pharmacological therapy and can also be used to support self-management in hypertension sufferers. The results of this research can be applied to society, especially for elderly people who suffer from hypertension in addition to medical therapy. This exercise can be done with the help of a hatha yoga instructor or with hatha yoga exercise videos.

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