

Effects Of A Combination Of Microscopic Handgrip And Nature's Voice On A Client's Blood Pressure With Hypertension

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Abstract. Background: Hypertension is the number one cause of death in the world every year because it causes complex cardiovascular problems. Semarang City Department's 2023 health profile data shows the number of hypertension is 24,949. Practicing holding a handgrip is a non-pharmacological therapy for treating hypertension because it stabilizes blood pressure and heart rate. Many combination therapies are used, including combining handgrip exercises with sound waves. Natural sounds will stimulate the hypothalamus, resulting in a feeling of calm and have an effect on the blood pressure regulation mechanism. The aim of this study was to determine the effect of a combination of handgrip exercise and natural sounds on the blood pressure of clients with hypertension. This research method is a pre-experimental one group pre and post test design and sampling using purposive sampling technique. The population of this study were clients who were recorded as suffering from hypertension at the Sekaran Semarang Community Health Center. The research instrument uses a digital sphygmomanometer and SOP for action. The research stages consist of preparation, implementation and processing of research data. The steps in the preparation stage are literature study, field survey, discussions with lecturers and experts, developing procedures for the combination of handgrip exercise and natural sounds, expert review, and socialization of the combination of handgrip exercise and natural sounds to clients and families. The implementation stage is carried out by collecting data on clients registered at the Sekaran Semarang Community Health Center, pre and post tests by measuring blood pressure using a sphygmomanometer, implementing actions according to the prepared SOP, observing implementation using an observation sheet. In the data processing stage, a Paired Sample T-test was carried out to assess the effect of the combination of handgrip exercise and natural sounds on the blood pressure of clients with hypertension. The targeted output is publication in national journals indexed by Sinta and HAKI. The TKT target for this combination of handgrip exercise and natural sounds is level 2. The research results showed that 91.67% of respondents experienced an average reduction in systolic blood pressure of 10.69 mmHg and diastolic blood pressure of 6.11 mmHg. Based on the Paired Sample T-test, the results obtained were 0.000 for the systolic value and 0.001 for the diastolic value, both of which were smaller than the p value of 0.05, so it was concluded that there was an influence of the combination of handgrip exercise and natural sounds on the blood pressure of clients with hypertension. The results of this research can be input for related parties to implement a combination of handgrip exercise and natural sounds as non-pharmacological therapy for hypertension sufferers.

Keywords: Combination Of Handgrip Exercise, Natural Sounds, Blood Pressure, Hypertension

BACKGROUND

A family is a group of people who are related by marriage or birth, and have functions, one of which is health. A health case that is closely related to family function is hypertension. The family has a role in the successful management of hypertension therapy, starting from daily diet, physical activity, and stress management. (1) (2) (3) Hypertension is the number one cause of death worldwide every year because it is a complex cardiovascular problem. (4) (5) Hypertension is known as the silent killer because sufferers are not aware that they suffer from hypertension. (6)

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The World Health Organization (WHO) in 2023 stated that as many as 1.28 billion people worldwide, adults aged 30-79 years, experience hypertension, the majority (two thirds) live in low and middle income countries. (7) The prevalence of hypertension in the population in Central Java aged > 15 years in 2021 is 8,700,512 people or 30.4%. (8) Health profile data from the Semarang City Department in 2023 shows that the number of hypertension is 24,949. (9) The percentage of hypertension which increases every year is a health problem that must be controlled to prevent continued complications that result in death. (10)

Uncontrolled hypertension can cause long-term and potentially fatal complications, leading to decreased cognitive function and quality of life. (11) Pharmacological treatment for hypertension needs to be combined with non-pharmacological treatment. (12) (13) Handgrip training is one of the non-pharmacological therapies that is of interest for treating hypertension. The form of exercise involves statically contracting the hand muscles without excessive movement of the muscles and joints. (10) Handgrip exercises carried out continuously for 2-5 minutes can bring blood pressure and heart rate to stable values. This exercise has no risk of injury, the technique is simple, can be done anytime and anywhere, and only requires simple tools. (14)

Research conducted by Sri Choirillailly and Diah Ratnawati in 2020 showed that the average blood pressure decreased after handgrip training for 5 days from systolic 146.25 mmHg to 140.31 mmHg and diastolic 91.25 mmHg to 87.19 mmHg. These results show that holding handgrip training is effective in reducing blood pressure. (10) Nowadays, combination therapy is widely used, including combining other non-pharmacological therapies such as using sound waves. Natural sound therapy, such as the sound of birds, sea waves, wind, flowing water, has many health benefits, including for treating hypertension. (15) Music and natural sounds are used as relaxation therapy for patients. (16) Music and rhythm can produce a healing effect because it can calm excessive activity from the left hemisphere of the brain. (17) (18) Music will stimulate the hypothalamus so as to produce a feeling of calm and have an effect on the production of endocrine, cortisol and catecholamines in the blood pressure regulation mechanism so that it can reduce hypertension (19)

Research conducted by Noor Kholifah, Setyowati, Sri Karyati with the title "The Effect of Giving Natural Sound Music Therapy on Reducing Blood Pressure in Hypertension Sufferers in Pelang Mayong Village, Jepara", showed that the results before being given natural sound music therapy in the intervention group, the mean was 149/94. mmHg and after being given natural sound therapy it became 135/87 mmHg. (19) This proves that natural sound therapy is effective for lowering blood pressure. The action that the author will implement is

to combine the two therapies. This action aims to determine changes in elderly blood pressure before and after being given a combination of handgrip training and natural sound therapy, as well as increasing the role of the family and community in controlling hypertension rates. Based on these problems, it is necessary to combine handgrip exercise and natural sounds as a solution to lower blood pressure in elderly people with hypertension. This research is in accordance with the research focus in the health sector, especially family nursing in the university's strategic plan.

LITERATURE REVIEW

Family

A family is a group of two or more people who live together through marital ties and emotional closeness, each of whom identifies themselves as part of the family. (1) The function of family health care which consists of five main family tasks in family health care, including: 1) recognizing health problems that occur, 2) deciding on family actions regarding health, 3) providing care if someone is sick, 4) modifying conditions around the house, and 5) accessing health facilities. (21) If the health care function is carried out well, the level of family independence will increase and the family will be able to independently prevent and resolve problems, as well as improve health status independently. The family's ability to carry out the five family health care tasks illustrates the family's independence through coaching and guidance by professional nurses at the community health center or work area. (20)

Hypertension

Hypertension or high blood pressure is a chronic condition characterized by increased blood pressure on the walls of the arteries (22). Hypertension can be defined as persistent high blood pressure where the systolic pressure is above 140 mmHg and the diastolic pressure is above 90 mmHg. (23)

Table.1 Blood Pressure Classification

Kategori	Tekanan darah sistole (mmHg)	Tekanan darah diastole (mmHg)
Normal	<130	<85
Normal-tinggi	130-139	85-89
Hipertensi Derajat 1	140-159	90-99
Hipertensi Derajat 2	≥160	≥ 100

Blood pressure

Blood pressure is the force of blood flow that the heart pumps against the walls of the arteries. (27) The normal increase in arterial pressure, namely up to 120 mmHg, is called

systolic pressure which occurs when the heart contracts to pump blood and when the ventricles relax, the aortic pressure tends to decrease to 80 mmHg, which is called diastolic pressure. (28) Several factors can influence blood pressure, namely the pumping power of the heart, the amount of circulating blood, blood viscosity, elasticity of blood vessel walls, peripheral resistance, blood flow speed. Blood pressure measurements are carried out using a sphygmomanometer. One of the sphygmomanometers that is often used is a digital one with measurements according to Figure 1 below. (23))

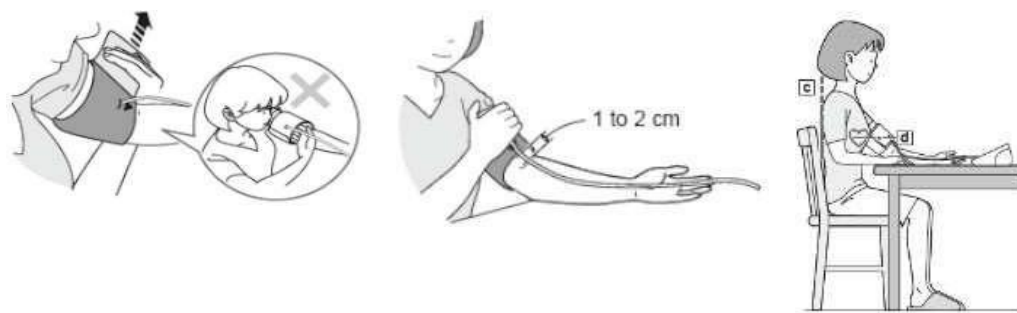


Figure 1 How to Measure Blood Pressure

Practice Gripping Handgrips

The exercise of holding a handgrip (isometric handgrip) is an exercise that involves statically contracting the hand muscles without excessive movement of the muscles and joints. This therapy is carried out using the resistance of a handgrip device. The effect of this exercise is to stimulate the ischemic stimulus mechanism and the tension causes muscle contractions in the blood vessels. This muscle tension activates nitric oxide in endothelial cells which is then transported to the muscles by diffusion. Nitric oxide then stimulates the production of guanylate cyclase which dilates blood vessels and relaxes smooth muscles. This exercise will improve blood circulation and reduce high blood pressure. (10) (11) Previous research suggests contraction (handgrip grip) using happyfit brand handgrips. The intervention was carried out for 7 days with 1 intervention per day. Each intervention carried out 2 contractions on each hand with a duration of 45 seconds. The movement to release the handgrip is carried out for 15 seconds between 2 hand contractions. Each exercise will be supervised by the author. Then blood pressure is measured after resting. (10)



Figure 2. How to Practice Handgripping

Nature Sounds

Natural sounds are a combination of music with a slow beat, such as the sound of rain, the sound of birds and the sound of crickets. Types of relaxation techniques that can be used to achieve a relaxed state are by listening to calm music, meditating, doing imagination or visualization exercises, or using progressive muscle techniques. (27) Music will stimulate calm feelings which will later influence the production of endocrine, cortisol and catecholamines in the blood pressure regulation mechanism. (19) Natural sound therapy is given once a day. This therapy is carried out for 20 minutes with moderate volume and is carried out regularly for 1 week. (29) The sound therapy provided is a combination of birds chirping and water splashing. Clients are asked to position themselves as comfortably as possible..



Figure 3. Listening to Nature Sounds After Handgrip Exercise

Here is the Roadmap of the Lead researcher from Year 2020 to Year 2025, which is as follows



RESEARCH METHODS

Stages of Research

The design of this study is a pre-experimental one group pre and post test design between independent variables of a combination of handgrip exercise and natural sounds with variables bound to blood pressure. The stages of research consist of:

1. Research preparation stage

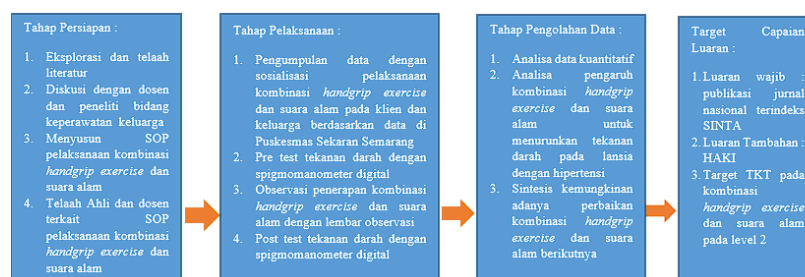
Research preparation starts from field surveys and research permits.

2. Research implementation stage

The implementation of the study was carried out by socializing the application of a combination of handgrip exercise and natural sounds to clients and families, determining the samples to be involved in the study with hypertension criteria with blood pressure $>140/90$ mmHg, subjects aged 36-55 years, can grip handgrips, did not experience hearing loss then TD measurements were carried out using a digital spigmomanometer as pretest data, the application of a combination of handgrip exercise and gamelan natural sounds was carried out for 30 minutes with 10 minutes of handgrip exercise followed by hearing 20 minutes of natural sounds in the respondent group, after that post test By remeasuring blood pressure 15 minutes post-therapy. Activities are carried out for 7 consecutive days.

3. Research data processing stage

Data processing is carried out after the research data is collected then data analysis is carried out using statistical tests.



RESEARCH SCHEDULE

Tabel 2. Research Schedule

No	Event Name	Moon											
		1	2	3	4	5	6	7	8	9	10	11	12
1	Field survey												
2	Reference studies												
3	Test the validity and reliability of the instrument												
4	Research preparation and administrative licensing												
5	Socialization of the application of a combination of <i>handgrip exercise</i> and natural sounds to clients and families												
6	Data retrieval												
7	Data analysis and interpretation												
8	Research evaluation and reflection												
9	Preparation of research reports												
10	Publication of national journals indexed by Sinta, IPR												

RESEARCH RESULTS

A. Characteristics of Respondents

Researchers have conducted a study on the Effect of the Combination of *Handgrip Exercise* and Natural Sounds on the Blood Pressure of Clients with Hypertension in the Sekaran Health Center Target Area which was conducted on April 10 – May 20, 2023. Based on inclusion criteria, researchers obtained 12 respondents .

1. Characteristics of respondents by gender

Table 3. Frequency Distribution of Respondents' Characteristics by Sex (n=12)

Gender	Frequency	Percentage (%)
Man	3	25
Woman	9	75
Total	12	100

Table 3. showed that of the 12 respondents who participated in the study, the majority were women, namely 9 respondents (75%).

2. Characteristics of respondents based on nutritional intake

Table 4. Frequency Distribution of Respondents' Characteristics Based on Nutrient Intake (n=12)

Food	Frequency	Percentage (%)
Controlled	3	25
Uncontrolled	9	75
Total	12	100

Table 4 shows that of the 12 respondents involved in the study, the majority did not control nutritional intake according to the recommended hypertension diet, which was 9 respondents (75%).

3. Characteristics of respondents based on the consumption of antihypertensive drugs

Table 5. Frequency Distribution of Respondents' Characteristics Based on Antihypertensive Drug Consumption (n = 12)

Consumption of Antihypertensive Drugs	Frequency	Percentage (%)
Yes	0	0
Not	12	100
Total	12	100

Table 5. It showed that of the 12 respondents who participated in the study, all (100%) did not take antihypertensive drugs.

B. Univariate Results

1. Frequency distribution of respondents' blood pressure before treatment

Table 6. Frequency distribution of respondents' blood pressure before treatment

Category	Frequency	Percentage (%)
Optimal	0	0
Usual	0	0
Boundary	0	0
Grade 1 hypertension	6	50
Grade 2 hypertension	3	25
Grade 3 hypertension	3	25
Isolated systolic hypertension	0	0
Total	12	100

Table 6 shows that the blood pressure of respondents before treatment, the majority fell into the category of grade 1 hypertension, which was as many as 6 respondents (50%).

2. Distribution of blood pressure frequency of respondents after treatment

Table 7. Frequency Distribution of Blood Pressure of Respondents After Treatment

Category	Frequency	Percentage (%)
Optimal	0	0
Usual	1	8,33
Boundary	3	25
Grade 1 hypertension	5	41,67
Grade 2 hypertension	2	16,67
Grade 3 hypertension	1	8,33
Isolated systolic hypertension	0	0
Total	12	100

Table 7. showed that the blood pressure of respondents after treatment, the majority fell into the category of grade 1 hypertension, which was as many as 5 respondents (41.67%).

3. Frequency distribution of changes in systolic blood pressure values after treatment

Table 8. Frequency distribution of systolic blood pressure changes after treatment

Change	Frequency	Percentage (%)
Climb	0	0
Stable	1	8,33
Go down	11	91,67
Total	12	100

Table 8. showed that the systolic TD of respondents after receiving treatmentn, the majority decreased by 11 respondents (91.67%).

4. Frequency distribution of changes in diastolic blood pressure values after treatment

Table 9. Frequency distribution of diastolic blood pressure changes after treatment

Change	Frequency	Percentage (%)
Climb	0	0
Stable	1	8,33
Go down	11	91,67
Total	12	100

Table 9. showed that the diastolic TD of respondents after receiving treatment, the majority decreased by 11 respondents (91.67%).

C. Bivariate Results

The statistical test used to determine the effect of the combination of *handgrip exercise* and natural sounds in this study is *the Paired sample T-test*. This statistical test is used to determine the effect of the combination of *handgrip exercise* and natural sounds on lowering blood pressure both systolic and diastolic before and after treatment because based on the Shapiro-Wilk normality test all data are normally distributed.

1. Decrease in systolic TD before and after treatment

Table 10. Decreased Systolic TD After *Handgrip Exercise* and Natural Sound Combination Treatment Paired Sample Test

Variable	N	Mean	Sd	t	p value
Systolic TD Before-After	12	10,69444	6,90697	5,364	,000

The *Paired Sample T-test* obtained a mean value of 10.69444, *standard deviation* of 6.90697, t table is 1.771, then the reception area Ho is between -1.771 to 1.771. In this study the calculated t value is 5.364, then the calculated t value is > t table. The *p value* of the *Paired Sample T-test* result is 0.000 which is smaller than the error level (α) 0.05, so it can be concluded that the hypothesis of the effect of the implementation of a combination of *handgrip exercise* and natural sounds on reducing blood pressure in clients with hypertension in the Sekaran Health Center Target Area is accepted.

2. Decrease in diastolic TD before and after treatment

Table 11. Decreased Diastolic TD After *Handgrip Exercise* and Natural Sound Combination Treatment Paired Sample Test

Variable	N	Mean	Sd	t	p value
Diastolic TD Before-After	12	6,11111	4,51335	4,690	,001

The *Paired Sample T-test* obtained a mean value of 6.11111, *standard deviation* of 4.51335, t table is 1.771, then the acceptance area of Ho is between -1.771 to 1.771. In this study the calculated t value is 4.690, then the calculated t value is > t table. The *p value* of the *Paired Sample T-test* result is 0.001 which is smaller than the error level (α) 0.05, so it can be concluded that the hypothesis of the effect of the implementation of a combination of *handgrip exercise* and natural sounds on reducing blood pressure in clients with hypertension in the Sekaran Health Center Target Area is accepted.

DISCUSSION

A. Characteristics of Respondents

1. Characteristics of respondents by gender

The characteristics of respondents who participated in the study, the majority were women, namely as many as 9 respondents (75%). The incidence in men is generally higher than in women, but in middle age and later age, the incidence in women begins to increase.

Hypertension is more prevalent in women over the age of fifty than in men due to menopausal factors (16). Menopause causes a decrease in the hormone estrogen in women. This hormone works to reduce LDL concentration and increase HDL concentration in the blood. A decrease in estrogen results in an increase in the concentration of LDL in the body. Excess LDL results in the deposition of cholesterol in blood vessels resulting in narrowing and hardening of the arteries. The heart will work hard to pump blood if this process takes place continuously, because the diameter of the blood vessels is narrow and not elastic. This is what causes an increase in blood pressure (13).

2. Characteristics of respondents based on nutritional intake

The characteristics of respondents who followed the study, the majority did not control the food consumed according to the hypertensive diet, which was as many as 9 respondents (75%). All respondents have stayed away from salty foods, but the majority (75%) are unable to stay away from fatty foods. Male respondents (25%) have a habit of consuming coffee. Fats contained in food will be broken down into cholesterol, triglycerides, phospholipids and free fatty acids when digested in the intestine. These four fatty elements will be absorbed from the intestine and enter the blood. Someone who consumes too many fatty foods then cholesterol in the blood becomes excessive. Cholesterol is easily attached to the inner wall of blood vessels so that it can result in narrowing of the lumen of blood vessels. Coffee is a drink that contains a lot of caffeine. This substance stimulates sympathetic nerves, which increases the work of the heart and makes blood vessels narrow, thereby increasing blood pressure (28).

3. Characteristics of respondents based on the consumption of antihypertensive drugs

The characteristics of respondents who followed the study were all (100%) not taking antihypertensive drugs. The use of antihypertensive drugs is done to reduce blood pressure below 140/90 mmHg, highly recommended in patients with hypertension grade 2 and 3. Management of hypertension in patients with grade 1 hypertension can be done with therapy without drugs, namely lifestyle modification (5). Treatment of hypertension in the elderly is more complicated because it must pay attention to the presence of comorbid diseases and complications of target organs that have occurred. The selection of drugs should be based on possible side effects that may aggravate the disruption of the target organ or its comorbid disease. Treatment of hypertension generally also needs to be done throughout the patient's life (4). All respondents (100%) did not take antihypertensive drugs for fear of drug side effects

caused by having to take drugs continuously. All respondents (100%) prefer therapy without drugs because they feel cheaper and safer.

B. Effect of *Handgrip Exercise* Combination on Blood Pressure Reduction in Clients with Hypertension

1. Blood pressure of respondents before treatment

The majority of respondents' blood pressure before the elderly exercise treatment was in the grade 1 hypertension category, namely 6 respondents (50%). Blood pressure naturally tends to increase with age (6). Increased blood pressure is influenced by various factors. Factors that cannot be controlled are heredity, gender, race and age, while factors that can be controlled include exercise, food, alcohol, stress, smoking and being overweight (7).

The degeneration process in the elderly causes changes and deterioration in the cardiovascular system. Changes that occur include reduced elasticity of blood vessels, heart valves become thick and stiff, the heart's ability to pump blood decreases by 1% every year after the age of 20 years (5). This situation is exacerbated by calcification as a result of long-lasting fat deposition in the inner lining of blood vessels (8). The factors that played the most role in increasing blood pressure in respondents were food and activity.

2. Respondent's blood pressure after treatment

The majority of respondents' blood pressure after the elderly exercise treatment decreased into the grade 1 hypertension category, namely 5 respondents (41.67%). A total of 11 respondents (91.67%) experienced a decrease in systolic and diastolic blood pressure. There was 1 respondent with stable blood pressure before and after treatment. A decrease in blood pressure, both systolic and diastolic, occurred on the fourth and fifth days, however, because on the sixth day the respondent's eating pattern became increasingly uncontrolled, there was an increase in blood pressure again reaching pre-treatment levels. This is what caused the respondent's blood pressure to remain constant during the first exercise and the eighteenth exercise.

3. The Effect of a Combination of Handgrip Exercise and Natural Sounds on Reducing Blood Pressure in Elderly People with Hypertension

The results of statistical tests to determine the effect of the combination of handgrip exercise and natural sounds on reducing blood pressure are the Pired Sample T-test. The results obtained by the p value are 0.000 and 0.001, which is smaller than the error level (α) of 0.05. So it can be concluded that the hypothesis that there is an influence of the combination of

handgrip exercise and natural sounds on reducing blood pressure in hypertension sufferers in the Sekaran Community Health Center target area is accepted.

The decrease in respondents' blood pressure after receiving the combination of handgrip exercise and natural sound therapy was due to the isometric handgrip holding exercise, which is an exercise that contracts the hand muscles statically without excessive joint muscle movement. The effect of this exercise is to stimulate the ischemic stimulation mechanism and the tension causes muscle contractions in the blood vessels. This muscle tension activates nitric oxidants in endothelial cells which are then transported to the muscles by diffusion. Nitric oxide then stimulates the production of guanylate cyclase which dilates blood vessels and relaxes smooth muscles. So this exercise will improve blood circulation and reduce high blood pressure. (28) Handgrip training is effective in reducing high blood pressure by improving oxidative stress and increasing resistant vessel endothelial function. Hypertension occurs due to impaired vasodilation in the blood vessels. One of the causes of impaired vasodilation is due to the endothelium lacking the availability of nitric oxide. Nitric Oxide is an Endothelial Derived Releasing Factor (EDRF) which has vasodilator properties to prevent Low Density Lipoprotein. (14)

This exercise, when combined with therapy that utilizes sound waves, can optimize the post-exercise relaxation effect. Listening to music is the right choice to achieve a relaxed state so that it will reduce the stress and depression experienced. Music will stimulate the hypothalamus so that it will stimulate feelings of calm which will later influence the production of endocrine, cortisol and catecholamines in the blood pressure regulation mechanism. (19) This mechanism explains that natural sound music can reduce blood pressure or hypertension. This is also in line with research conducted by Noor Kholifah, Setyowati, Sri Karyati entitled "The Effect of Providing Natural Sound Music Therapy on Reducing Blood Pressure in Hypertension Sufferers in Pelang Mayong Village, Jepara".

C. Limitations

The number of samples obtained by researchers was relatively small for the size of experimental research. Researchers managed to get 17 respondents at the first meeting. Four respondents were included in the exclusion criteria because they were unable to follow the scheduled action routine during the 7 meetings in the study. The final sample size obtained by the researchers was only 12 respondents. Researchers also have not been able to control dietary factors that can influence blood pressure in this study.

CONCLUSIONS AND SUGGESTIONS

A. Conclusion

1. Characteristics of respondents based on gender, the majority are female (75%), based on nutritional intake, the majority are uncontrolled (75%), based on consumption of antihypertensive drugs, all (100%) do not consume antihypertensive drugs.
2. The majority of respondents' blood pressure before treatment was in the grade 1 hypertension category, namely 6 respondents (50%).
3. The majority of respondents' blood pressure after treatment was in the grade 1 hypertension category, namely 5 respondents (41.67%).
4. The significance value of the Paired Sample T-test results is 0.000 for the systolic value and 0.001 for the diastolic value, both of which have values smaller than the error level (α) of 0.05, so it can be concluded that the hypothesis is that there is an influence of the combination of handgrip exercise and natural sounds on reducing blood pressure in hypertensive sufferers in the Sekaran Community Health Center target area.

B. Suggestions

Further research needs to be carried out with a larger number of samples and controlling for factors that can influence blood pressure such as the food consumed, which was not controlled in this study.

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