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The Effect of Combining Isometric Handgrip Exercise with Sundanese Degung Instrumental Music on Blood Pressure Changes in Elderly People with Hypertension

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Abstract: *Hypertension is defined as a condition that blood pressure is more than 140/90 mmHg. Because the aging process causes blood vessels to stiffen and the elasticity of the ventricular walls to decrease, the elderly are categorized as a health susceptible category. This disorder can lead to hypertension, which can have catastrophic effects such as stroke and even death. The purpose of this study was to determine how Isometric Handgrip Exercise (IHE) therapy accompanied by degung instrumental music affects blood pressure changes in elderly people with hypertension. A quantitative design with a quasi-experimental approach, pretest and post-test methodologies, and a control group was used for the study. The sample approach for this study will be probability sampling. 59 samples were collected and divided into two groups: intervention (30 respondents) and control group (29 respondents). This study lasted 2 × 2 minutes, was interrupted by 3 minutes of rest, and was conducted on three consecutive days. The result of the study revealed a p-value of 0.00, showing that the Isometric Handgrip Exercise intervention, coupled with Sundanese degung instrumental music, had an effect on blood pressure fluctuations in elderly people with hypertension. The IHE intervention accompanied by Sundanese degung instrumental music is recommended as IHE in decreasing blood pressure in hypertension patients.*

Keywords: Handgrip, Hypertension, Sundanese instrumental

INTRODUCTION

Hypertension is defined as a rise in systolic blood pressure beyond 140 mmHg or systolic blood pressure above 90 mmHg (Widiastuti et al., 2021). Obesity, excessive alcohol intake, and a lack of physical activity can all contribute to hypertension (Kunutsor et al., 2021). Hypertension in the elderly is caused by a decrease in the heart's ability to contract, changes in the elasticity of blood vessels, and thickening and stiffening of the heart valves, requiring the heart to pump harder to meet the oxygen needs of the entire body, increasing blood pressure. Apart from the symptoms mentioned above, Tzourio, (2019) noted in his study that hypertension symptoms can also cause dementia in a person, which is known as vascular dementia. However, dementia can develop as a result of a congenital stroke. Aside from the symptoms, this condition can also lead to the development of other diseases such as heart failure, stroke, and renal failure. To avoid difficulties, proper management and administration are required (Zainuddin & Labdullah, 2020).

In the city of Bandung, 22,041 people are suffering from primary hypertension, with a disease rate of 3.97% among those aged 15-44 years. Meanwhile, hypertension affected 113,022 people in 2018 with a proportion of 18.49% (the highest number of instances). According to Enisah, the Indonesian government has taken many steps to address this, including the introduction of the Chronic Disease Management Program (Prolanis) and Non-Communicable Diseases (Enisah et al., 2021). Aside from that, the Isometric Handgrip Exercise (IHE) is a non-pharmacological nursing intervention that can be performed. IHE is a type of static exercise treatment that uses a grip ergometer to perform muscle contractions without changing muscle length, such as lifting or pushing heavy objects and tightening the muscles against specific objects (Lea, 2021). IHE is an exercise that can be recommended to help enhance physical health, particularly in the elderly. A handgrip dynamometer is used in this exercise

(Shah & et.al, 2022). Other study also found a drop in systolic and diastolic blood pressure of 13 and 15 mmHg, respectively (Carlson & et.al, 2016).

According to Loaiza-Betancur et.al, (2020), the following reductions (mean differences) were found after handgrip training intervention: systolic blood pressure was decreased by 5.43 mmHg, diastolic blood pressure was reduced by 2.41 mmHg, and pressure mean arterial was reduced by -1.28 mmHg. Another study, indicated that the exercise was performed for 12 weeks with 2 x 2-minute intervals and a 15 second release movement. The results of the study revealed that the majority of the decline in systolic values was 16 mmHg, with diastolic values reducing by 8 mmHg, indicating that the respondents' average blood pressure decreased despite being in the first-degree hypertension category.

According to Kühlmann et al., (2016), in addition to IHE therapy, instrumental music can influence heart rate, which can cause peace because music with a soft rhythm will be heard through the ears and will go straight into the brain, which directs it to the limbic pathway and then activates Endorphin hormones, which have a relaxing effect, which is then used as an additional treatment to reduce high blood pressure.

The use of instrumental music, whether it is the flute harp or Sundanese song, is a therapy that may be performed on patients with heart disease; this can aid in promoting societal cultural values and building the value of transcultural nursing (Handayani et al., 2018). According to Gede et al. (2020), the average systolic blood pressure value before receiving flute harp therapy was 152.69 mmHg, and the average diastolic blood pressure value was 129.54 mmHg. When the diastolic blood pressure number is included in the spighmomanometer measurement, the result falls from 82.92 mmHg to 72.69 mmHg.

In addition to music therapy can have a significant impact on modifying the waves in the brain, making a person feel more relaxed, and this can help drop systolic blood pressure by 8.6 mmHg and diastolic blood pressure by 5.8 mmHg (Maisi & et.al, 2017). There were 1,500 old patients with hypertension at the Pangalengan District Health Center UPTD, with elderly data recorded at 150 persons. Aside from that, the majority of Pangalengan District residents live an unfavorable lifestyle, ranging from the prevalence of smoking among youngsters aged 7 to the elderly, to a lack of physical activity, and so on.

There have been a lot of studies on IHE, but this study is distinct. This study improved IHE by combining it with Sundanese music for elderly people aged 60-74 years, with a length of 2x2 minutes of contractions (on both hands) followed by 1-5 minutes of rest three times a week. Aside from that, the Pangalengan District Community Health Center Work Area was chosen as the study site because no research had been conducted there on the Effect of Isometric Handgrip Exercise (IHE) accompanied by Sundanese song instrumental music on lowering blood pressure in elderly people suffering from hypertension. The combination of IHE and Sundanese degung instrumental music is tailored to the research location's local wisdom. The aim of this study was to determine whether there was an effect of Isometric Handgrip Exercise (IHE) intervention accompanied by bedegung instrumental music on changes in blood pressure in elderly people with hypertension.

METHOD

A quantitative design with a quasi-experimental technique is used in this study so that this study occured spontaneously. Therefore, the respondents were divided into intervention groups and control groups. This study was conducted in one of the community health facilities in the Bandung district of West Java, with 59 elderly people who had a history of hypertension Based on the results of respondent selection using inclusion criteria, 59 respondents were obtained. The respondents were divided into two groups, 30 in the intervention group and 29 in the control group.

A research hall/place, observation sheets, and tools such as a sphygmomanometer, stethoscope, and speaker were included with this study instrument. The first step in this study was to find respondents who were willing to participate in the study series from beginning to end. The researchers then randomly separated them into intervention and control groups. After that, the researchers prepared a hall, observation sheets, and tools such as sphygmomanometer, stethoscopes, and speakers

to help the study succeed. Following the entry into the study stage, the researcher gathered respondents at the research site to perform collaborative research. This study was conducted over the course of three days. The researcher then processed the data from the respondents' blood pressure results both before and after the research was completed in the last stage of the study.

The following were the study procedures (see Diagram 1) for the intervention group: 1) Respondents were given informed consent; 2) their blood pressure (BP) was assessed; and 3) respondents were positioned as comfortably as feasible during the exercise. 4) the researchers played sundanese degung music, while the participants completed contractions. 6) the respondent relaxes for two minutes, 7) the respondent did an isometric exercise contraction of the right hand for two minutes, 8) the respondent relaxed for two minutes, and 9) the procedure was repeated four times. (Twice for each hand) or for 12 minutes, 10) Following the exercise method, the researchers monitored blood pressure. 11) this study was carried out over three days. Meanwhile, for the control group, the method was followed exactly as described above, except the IHE was not accompanied by Sundanese degung instrumental music.

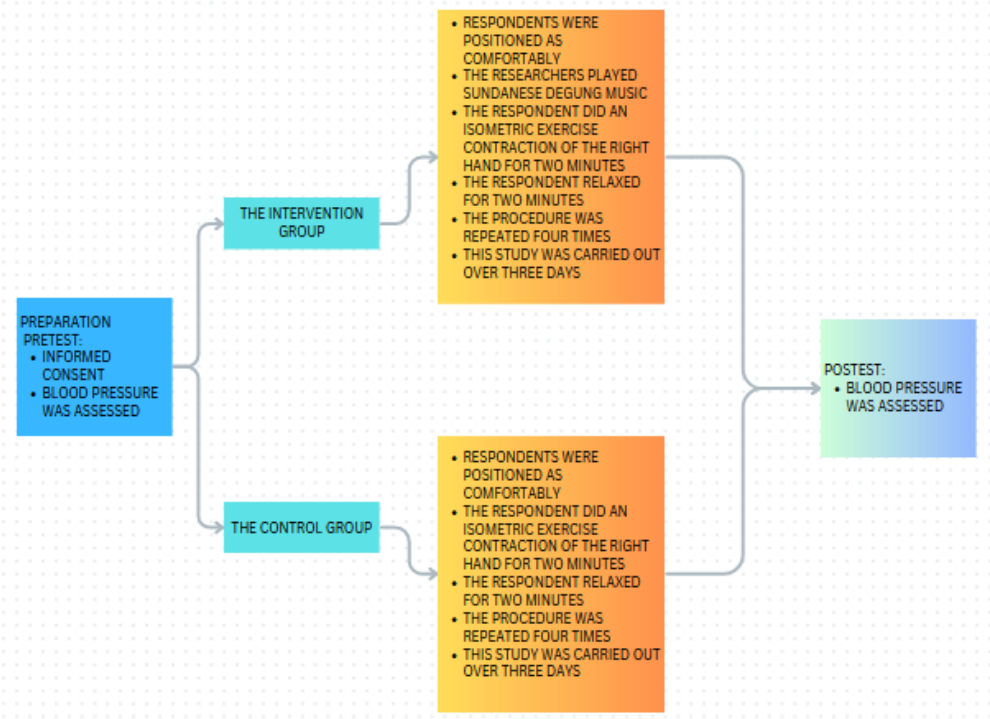

Diagram 1. Work flow IHE

The following criteria were used to select respondents: 1) Respondents were elderly with hypertension in degrees 1 and 2 who lived in the community health center area where the study was conducted, 2) Respondents were over the age of 60, 3) Respondents were taking anti-hypertension medication, 4) Respondents did not have hearing impairment, and 5) Respondents were willing to volunteer to be a respondent. Exclusion criteria were as follows: 1) respondents who declined to participate in the study at the time it was done, 2) respondents who did exercise but did not comply with the rules, 3) respondents with severe and uncontrolled hypertension, 4) having hearing issues, and 5) not using anti-hypertensive medication.

The data was analyzed in two stages: univariate analysis using a frequency distribution and bivariate analysis using the Wilcoxon Sign Test, which tries to assess the influence of one variable on another. This study was conducted after receiving approval from Nursing Ethics with the code SK 457/KEP. 01/UNISA-BANDUNG/V/2023.

RESULTS

This study was conducted with 59 respondents from May to June 2023 at the Work Area of one of the Community Health Centers in Bandung Regency. Table 1 shows the characteristics of the respondents.

Table 1. Frequency Distribution of Respondent Characteristics (N=59)

Characteristics		Frequency	Percentage
Age	60-64 y.o	23	39%
	65-69 y.o	23	39%
	70-74 y.o	13	22%
	Total	59	100%
Gender	Male	12	20.3%
	Female	47	79.7%
	Total	59	100%

According to the study result in Table 1, the data on the characteristics of respondents from 59 people revealed that there were 47 female respondents (79.7%) and 12 male respondents (20.3%). Meanwhile, the respondents with the greatest age group were 46 people (78.0%) in the 60-69 age range and 13 people (22.0%) beyond the age of 70.

Table 2 shows the results of the Systolic Blood Pressure (BP) research before and after the Isometric Handgrip Exercise (IHE) intervention with Sundanese music accompaniment in the intervention group. The results of the Systolic BP study before and after the Isometric Handgrip Exercise (IHE) intervention with Sundanese music accompaniment in the intervention group can be seen in table 2 as follows.

Table 2. Systolic and Diastolic Blood Pressure Values before and after the Intervention Group (N=30)

Criteria	Before Intervention		After Intervention	
	Frequency	Percentage	Frequency	Percentage
Systolic BP of Intervention Group				
120 mmHg	0	0%	0	0%
130 mmHg - 139 mmHg	0	0%	11	36.7%
140 mmHg - 159 mmHg	24	80%	19	63.3%
160 mmHg - 179 mmHg	6	20%	0	0%
Total	**30**	**100,0%**	**30**	**100,0%**
Diastolic BP of Intervention Group				
80 mmHg	11	36.7%	28	93.3%
85 mmHg - 89 mmHg	0	0%	2	6.7%
90 mmHg - 99 mmHg	15	50.0%	0	0%
100 mmHg - 109 mmHg	4	13.3%	0	0%
Total	**30**	**100%**	**30**	**100%**

In Table 2, systolic blood pressure data was gathered prior to intervention in the intervention group, beginning from the value range for the "Grade 1 Hypertension" category for 24 elderly people (80.0%)

and the "Grade 2 Hypertension" category for 6 people (20.0%). Meanwhile, the BP value after the intervention decreased significantly, with a decrease in the BP value in the "Pre-Hypertension" category of 11 people (36.7%), in the "Grade 1 Hypertension" category of 19 people (63.3%), and in the "Hypertension Degree 2" category of 0 people (0.00%).

Meanwhile, before the intervention, diastolic blood pressure in the intervention group ranged from "Normal" to 11 individuals (36.7%), "Grade 1 Hypertension" to 15 elderly people (50.0%), and "Grade 2 Hypertension" to 15 elderly people (50.0%). 4 (13.3%). There was a significant decrease in BP values after the intervention, indicated by a decrease in BP values in the "Normal" group by 28 elderly people (93.3%) and in the "Pre-Hypertension" category by 2 elderly people (6.7%).

Table 3. Systolic and Diastolic BP values before and after in the Control Group (N=29)

Criteria	Before Intervention		After Intervention	
	Frequency	Percentage		Frequency
Systolic TD of Control Group				
120 mmHg	0	0%	0	0%
130 mmHg - 139 mmHg	0	0%	11	37.9%
140 mmHg - 159 mmHg	23	79.3%	18	62.1%
160 mmHg - 179 mmHg	6	20.7%	0	0%
Total	**29**	**100%**	**29**	**100%**
Diastolic TD of Control Group				
80 mmHg	12	41.4%	18	62.1%
85 mmHg - 89 mmHg	3	10.3%	11	37.9%
90 mmHg - 99 mmHg	11	37.9%	0	0%
100 mmHg - 109 mmHg	3	10.3%	0	0%
Total	**29**	**100%**	**29**	**100%**

According to Table 3, the number of participants in the control group with systolic blood pressure in the "Grade 1 Hypertension" category was 23 (79.3%), and the number of people in the "Grade 2 Hypertension" category was 6 (20.7%). Meanwhile, based on the BP value after the intervention, 11 people (37.9%) fell into the "Pre-Hypertension" category, 18 people (62.1%) fell into the "Grade 1 Hypertension" category, and 0 people (0%) fell into the "Grade 2 Hypertension" category.

Meanwhile, before the intervention, diastolic blood pressure in the control group ranged from "Normal" to 12 people (41.4%), "Grade 1 Hypertension" to 3 people (10.3%), "Grade 2 Hypertension" to 11 people (37.9%), and "Grade 3 Hypertension" to 3 people (10.3%). Furthermore, 18 people (62.1%) had BP values in the "Normal" group after receiving the intervention, 11 people (37.9%) in the "Pre-hypertension" category, and "Grade 1 Hypertension" as many as 0 people (0%).

Bivariate analysis comparing the average blood pressure in elderly people with hypertension in both the control group and the treatment group can be seen in Tables 4 and Table 5.

Table 4. IHE intervention with classical instrumental music accompaniment in the Intervention Group

Rank		N	Mean Rank	Sum of Ranks
Pre test – Post test Sistolik	Negative Ranks	15[a]	8.	120
	Positive Ranks	0[b]	0.001	0001
	Ties	15[c]		
	Total	**30**		
Test Statistics[b]	**Pre test – Post test**	**Z** -3.690[a]	**Asymp. Sig. (2-tailed)** 0.001	
Pre test – Post test Diastolik	Negative Ranks	19a		
	Positive Ranks	0b	10.00	190
	Ties	11c	0.001	0.001
	Total	**30**		
Test Statistics[b]	**Pre test – Post test**	**Z** -3.977[a]	**Asymp. Sig. (2-tailed)** 0.001	

The results of data analysis in Table 4 using the Wilcoxon Sign Test with a sample size of 30 people in the intervention group show that the pre-test and post-test decreased in systolic blood pressure were in the average range of 8.00, with 15 respondents experiencing decreases and 15 experiencing the same blood pressure values. Meanwhile, the average diastolic blood pressure value was around 10, nineteen respondents had lower blood pressure levels, and 11 others remained in the same range.. According to the "Test Statistics" report, the Sig (2-tailed) value for systolic and diastolic blood pressure was 0.00.

Table 5. IHE intervention without musical accompaniment in the Control Group

Rank		N	Mean Rank	Sum of Ranks
Pre test – Post test Sistolik	Negative Ranks	17[a]	9	153
	Positive Ranks	0[b]	0.001	0.001
	Ties	12[c]		
	Total	**29**		
Test Statistics[b]	**Pre test – Post test**	**Z** -4.123[a]	**Asymp. Sig. (2-tailed)** 0.001	
Pre test – Post test Diastolik	Negative Ranks	19a	16,47	178.00
	Positive Ranks	0b	0.001	0.001
	Ties	10c		
	Total	**29**		
Test Statistics[b]	**Pre test – Post test**	**Z** -3.448[a]	**Asymp. Sig. (2-tailed)** 0.001	

The data analysis results in Table 5 using the Wilcoxon Sign Test with a sample size of 29 respondents in the control group demonstrated that the pre-test and post-test decreased in systolic BP was in the average range of 9.00, with 17 respondents seeing declines. The same blood pressure levels were found in 12 .other respondents. Furthermore, the average diastolic blood pressure value was about 16.47, 19 respondents experiencing a decrease in blood pressure levels, and 10 others were remained in the same range. According to the "Test Statistics" report, the Sig (2-tailed) value for systolic and diastolic blood pressure was 0.001.

DISCUSSION

In this study, 46% of respondents were between the ages of 60 and 69, with women accounting for 79.7%. The intervention group's blood pressure values obtained an average of 8.00 for systolic blood pressure and 10.00 for diastolic blood pressure during the pre-test and post-test. Meanwhile, the average blood pressure value in the control group of elderly people with hypertension was 9.00 for systolic blood pressure and 16.47 for diastolic blood pressure. Aside from that, statistical tests performed by researchers demonstrated that the output value of Asymp. Sig (2-tailed) for both blood pressure values in the intervention and control groups was 0.00. This signifies that the value of 0.00 was less than 0.05 (<0.05), indicating that Ha is accepted and that the Isometric Handgrip Exercise (IHE) intervention accompanied by classical instrumental music has an effect on older adults with hypertension in the region of the Pangalengan DTP Community Health Center.

Isometric *Handgrip* exercise (IHE) is an upper-extremity exercise that emphasizes hand muscle contractions over movement. This activity has been found to have the ability to assist manage blood pressure (Choirillaily & et.al, 2020). According to studies by Zainuddin & Labdullah, (2020), this IHE exercise has been shown to promote arousal through the bioavailability or mediation of nitric oxide and increased antioxidant activity, which can worsen endothelial dysfunction. Furthermore, this isometric exercise can help with muscle hypertrophy, upper extremity strength, and bone density.

Someone who reaches old age is classified as a health vulnerable group. The aging process can cause blood arteries to stiffen and the suppleness of the ventricular walls to deteriorate, which can lead to hypertension or an increase in blood pressure (Salami et al., 2018). The elderly are people who have reached the end of their lives. The aged will go through a process known as the Aging Process. Humans endure many impairments in physiological function during this phase, including damage to blood vessels induced by a drop in the hormone estrogen, particularly in women. This usually happens between the ages of 45 and 55 and can damage blood vessels. According to the World Health Organization (WHO), there are four criteria for elderly age limits: middle age (45-59 years old), elderly (60-74 years old), and elderly (75 years old). -90 years, and very old is age greater than 90 years.

In addition to Isometric Handgrip Exercise (IHE) therapy, classical instrumental music therapy is a therapy that can help reduce or control blood pressure values because instrumental music therapy is thought to relieve physiological pain, tension, and anxiety. Sound or rhythm are utilized in healing procedures to reduce blood pressure, which is induced by the concentration of catecholamines. Blood plasma has an effect on sympathetic adrenergic activation, which results in the production of stress hormones. Listening to slow-tempo music induces the release of catecholamines into the blood vessels, causing the body to relax, the heart rate to drop, and blood pressure to fall (Yulinda & Kusumawardani, 2023).

Instrumental music is music that is exclusively sung by instruments or background vocals. Instrumental music therapy has been frequently used to help hypertensive patients balance their blood pressure readings (Gede & et.al, 2020). Music therapy is a type of treatment that can help with recovery. Music that can be used has a constant, energetic, harmonious, and stable beat with no abrupt shifts in tone (Yulinda & Kusumawardani, 2023).

Gamelan music, Sundanese flute music, and other traditional Sundanese music can all help decrease blood pressure. Sundanese degung, or gamelan music, is one of the characteristics that define a Sundanese person's identity. Sundanese gamelan musicality has a very delicate tone, which can have a calming impact on the body. To assist reduce blood pressure levels in elderly people with

hypertension, researchers performed holding exercises accompanied by classical instrumental music (degung Sundanese), namely the sabilulungan instrumental. This is essentially an exercise to contract the hand muscles using a handgrip that is done three times a week for a duration of 2x2 minutes of contraction and 3 minutes of rest (done on both hands and alternately) and accompanied by Sundanese degung instrumental music played in accordance with the duration given during training.

Hypertension is caused by decreased vasodilation in blood arteries, which happens owing to a lack of Nitric Oxide (NO) in the endothelium, where NO is a vasodilator and prevents Low Density Lipoprotein attachment. In addition to decreasing blood pressure, practice holding a handgrip helps improve joint stability and prevent muscle atrophy.

The intervention, which was carried out on 59 participants over three days, resulted in a drop in blood pressure levels. Measurements before and after exercise on a daily basis resulted in a decrease in blood pressure readings, both systolic and diastolic, ranging from 5-10 mmHg, whereas changes in systolic and diastolic values average 3-5 mmHg in the control group. The therapy for mild to moderate intensity exercise may be done anyplace because it is simple to execute, requires no equipment, and causes no cardiovascular stress over a short period of time. Practice 42 minute contractions at 20-50% MVC (Maximum Voluntary Contraction), followed by a 1-5 minute rest period. This therapy can be performed 3-5 times per week for 10-20 minutes each time.

This therapy will be more effective if done regularly to maintain body health. Apart from the elderly, researchers are of the opinion that tool holding exercises can also be done by hypertension sufferers who are in the adult or teenage age range because this exercise requires sufficient strength. Therapy carried out on each individual will have different results, this is influenced by family history, age, smoking habits, alcohol consumption and poor lifestyle. Therefore, hypertension sufferers must pay attention to these things (Mayasari & et.al, 2022).

IHE intervention, accompanied by Sundanese degug instrumental music, has been shown to help hypertension patients lower their blood pressure levels. However, various variables must be considered in order to assist the reduction of high blood pressure, including nutrition, restricting salty foods, and adhering to medication because this can also help patients lessen pain in the nape of the neck. Traditional medicine, such as boiled celery, boiled chayote, and boiled star fruit juice, can also assist people reduce their high blood pressure (Choirillaily & et.al, 2020).

CONCLUSION

Based on the study on the effects of IHE accompanied by Sundanese heartgut instrumental music on blood pressure changes in the elderly with hypertension, it can be concluded that IHE intervention accompanied by Sundanese heartgut instrumental music has a significant influence on lowering blood pressure. This technique is advised for senior hypertensive patients on a regular basis, Aside from that, taking anti-hypertension medications such as beta-blockers, angiotensin converting enzyme inhibitors (ACE-I), angiotensin receptor blockers (ARB), direct renin inhibitors, calcium channel blockers (CCB), and alpha-blockers on a regular basis can help control hypertension. Based on the results of this study, nurses can use IHE as a nursing intervention in geriatric nursing care to keep the elderly healthy.

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