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Relaxing Melody from Flute Combined with a Foot Massage Can Reduce Systolic and Diastolic Blood Pressure in Elders

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Abstract

Background: Hypertension in elders is affected by physiological changes in the structure and cardiovascular functions. One alternative of non-pharmacological treatment for hypertension is the combination of foot massage and harp-flute (*kecapi suling*) music therapies, which can give a relaxing sensation in the blood pressure.

Objective: This study aims to observe the effect of the combination of foot massage and *kecapi suling* music therapies against systolic and diastolic blood pressure.

Method: This research uses the pre-experimental design (one group pretest-posttest design). The population was elders with hypertension in Werdha Hargo Dedali Nursing Home in Surabaya. Purposive sampling technique was used to obtain 14 respondents. The independent variables were foot massage and *kecapi suling* music therapies, whereas the dependent variable was the blood pressure reduction. The data were analyzed by using Paired-Samples T-Test with significance value ≤0.05.

Results: The study indicated that the combination of foot massage and *kecapi suling* music therapies affected systolic and diastolic blood pressure reduction in elders with hypertension. The systolic blood pressure average value in the pre-intervention was 154.64 mmHg, while the average value in the post-intervention was 138.86 mmHg. Diastolic blood pressure average value in the pre-intervention was 92.21 mmHg, while the average value in the post-intervention was 88.00 mmHg.

Conclusion: There is an effect of the combination of foot massage and *kecapi suling* music therapies on decreasing blood pressure in elders with hypertension. The decrease in systolic blood pressure occurred in all respondents, while not all respondents experienced diastolic blood pressure decline.

Keywords: *Foot massage therapy, kecapi suling music, hypertension, elders.*

Background

Hypertension becomes a common problem in elders as more than 50% of hypertension patients aged over 60 years old. The disease causes 50% of deaths due to coronary heart disease, and 51% of deaths due to stroke [(1)]. In Indonesia, hypertension is one of the public health issues. Hypertension is included among the top 10 rank of the causes of outpatient diseases in hospitals from the group age of 45-64 years and more than 65 years [(2)]. Sufferers with hypertension usually use pharmacological therapy, including captopril, hydrochlorothiazide (HCT), and amlodipine. However, the administration of antihypertensive drugs in elders in an extended period can cause various side effects, including the risk of postural hypotension, kidney impairment, mental and behavioral changes [(3)].

Regarding the various side effects that arise from antihypertensive drugs, non-pharmacological treatment can be used as an intervention. Research by Milan (2019) stated that patients with hypertension who use

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antihypertensive drugs and followed classical music therapy interventions for 15 minutes/day experienced blood pressure reduction by 80%, while sufferers with hypertension who only use antihypertensive drugs experienced blood pressure reduction by 50% [4].

Previous studies in which the elders were given intervention of foot reflexology massage for 15 minutes, showed changes in systolic and diastolic blood pressure in pretest-posttest. Foot reflexology provides stimulation that can cause the body to release hormones such as serotonin, histamine, bradykinin, and a slow-reacting substance. These hormones result in the dilation of capillaries and arterioles, which cause improvements in vascular microcirculation and prompts relaxation effects[5].

Listening to music at a moderate frequency makes the limbic system activated, receives signals from the limbic cortex and then to the hypothalamus [6]. Based on previous research where the elderly were given traditional Sundanese *kecapi suling* music therapy for five consecutive days with a duration of 15 minutes, showed that there were differences in systolic and diastolic blood pressure before and after an intervention [7]. Based on the background above, this study aims to identify systolic and diastolic blood pressure in elders with hypertension before and after the intervention of the combination of foot massage and *kecapi suling* music therapies.

Materials and Method

This study used a pre-experimental research design with one group pre-test to post-test design. This study aims to observe the respondents before and after the intervention[8]. The population in this study was 23 elders with hypertension.

Samples and sample size

The samples and sample size taken in this study were based on the inclusion criteria in this study, namely elders with hypertension aged 60-90 years, with grade II blood pressure (systolic 140-159 mmHg and diastolic 90-99 mmHg) and grade III blood pressure (systolic 160-179 mmHg and diastolic 100-109 mmHg), cooperative, in good condition to collaborate throughout the study, and able to communicate well. Finally, based on the inclusion criteria, the study obtained 14 elders as the samples. The sampling technique used was the non-probability sampling/purposive sampling [5].

Variables

The independent variables in this study were foot massage and *kecapi suling* music therapies. *Kecapi suling* music is a traditional Sundanese music genre which includes a *kecapi,* similar to a harp, and *suling*, similar to a flute. While the dependent variable is the blood pressure reduction in elders.

Research Instruments

The instruments used in this study to measure the independent variables included the Standard Operating Procedure (SOP) of foot massage therapy, SOP of *kecapi suling* music, and SOP for blood pressure measurement. For the dependent variable, the examination used a sphygmomanometer and a stethoscope to measure systolic and diastolic blood pressure.

Data Collection Procedures

The data collection process in this study was grouped into two stages, namely the preparation and the implementation stages. At the preparation stage, the interviews were conducted to the nurses in Werdha Hargo Dedali Nursing Home, Surabaya, Indonesia, to obtain information about the population of elders aged over 60 years with hypertension. The stage was conducted for one week. During the implementation stage, the leading researchers were helped by five volunteer researchers. During the study, the leading and volunteer researchers experimented with the respondents accompanied by nurses at the nursing home. Pretest and posttest were carried out every day for seven consecutive days, namely measuring systolic and diastolic blood pressure using a sphygmomanometer and a stethoscope, for 15 minutes before and after the intervention [9].

The respondents were given foot massage therapy and *kecapi suling* music, with medium frequency using earphones, once a day for seven consecutive days with a duration of 15 minutes, starting at 9:00 a.m. at the respondents' desired place. The analyzed data was the pretest on the first day and the posttest on the seventh day. Interventions were conducted to 14 elders at the same time, accompanied by researchers and volunteers for each elder.

Data Analysis

The researchers collected the pretest and post-test data contained with each participant's code and tabulated to inspect any differences in the results before and after the intervention was given. Analyzed data is the pretest on the first day and the posttest obtained on the seventh day. At the data analysis stage, the researchers used a Paired-Samples T-Test with a significance value of $\alpha \leq 0.05$, which means if the Paired-Samples T-Test resulting in $\alpha \leq 0.05$, then interpreted as there is an effect of giving an intervention of combination of foot massage and *kecapi suling* music therapies against blood pressure in elders with hypertension.

Results

Specific data in this study consisted of systolic and diastolic blood pressure before and after a combination of foot massage and *kecapi suling* music therapies.

Table 1: Observation results of systolic blood pressure values before and after the combination of foot massage and *kecapi suling* music therapies

	Systolic Blood Pressure (mmHg)		
Respondents	**Pre-Intervention**	**Post-Intervention**	**Systolic Blood Pressure Shift**
1.	165 mmHg	142 mmHg	-23
2.	145 mmHg	135 mmHg	-10
3.	160 mmHg	140 mmHg	-20
4.	160 mmHg	145 mmHg	-15
5.	160 mmHg	140 mmHg	-20
6.	155 mmHg	135 mmHg	-20
7.	140 mmHg	136 mmHg	-4
8.	160 mmHg	140 mmHg	-20
9.	160 mmHg	145 mmHg	-20
10.	160mmHg	143 mmHg	-17
11.	145 mmHg	133 mmHg	-12
12.	160 mmHg	145 mmHg	-15
13.	150 mmHg	135 mmHg	-15
Mean	154.64	138.86	
Paired-Samples T-Test p= 0.000			

According to the Table 1, the highest value of systolic blood pressure among 14 elders before being given a combination of foot massage and *kecapi suling* music therapies was 165 mmHg, which indicated moderate hypertension (grade III) and the average value was 154.64 mmHg at grade II. Comparatively, the highest value of systolic blood pressure after being given a combination of foot massage and *kecapi suling* music therapies was 145 mmHg, which indicated mild hypertension (grade II) and the average value was 138.86 at grade I. The most significant shift in systolic blood pressure was 20 mmHg in 5 respondents. Obtained Paired-Samples T-Test p-value = 0,000, which indicated that there was an effect of the combination of foot massage and *kecapi suling* music therapies on systolic blood pressure in elders with hypertension.

Table 2: Observation results of diastolic blood pressure values before and after the combination of foot massage and *kecapi suling* music therapies.

Respondents	**Diastolic Blood Pressure (mmHg)**		**Blood Pressure Shift**
	Pre-Intervensi	Post-Intervensi	Diastolic
1.	90 mmHg	88 mmHg	-2
2.	95 mmHg	93 mmHg	-2
3.	98 mmHg	90 mmHg	-8
4.	95 mmHg	89 mmHg	-6
5.	90 mmHg	80 mmHg	-10
6.	90 mmHg	83 mmHg	-7
7.	90 mmHg	85 mmHg	-5
8.	85 mmHg	85 mmHg	0
9.	93 mmHg	90 mmHg	-3
10.	90 mmHg	90 mmHg	0
11.	100 mmHg	97 mmHg	-3
12.	95 mmHg	85 mmHg	-10
13.	90 mmHg	90 mmHg	0
14.	90 mmHg	87 mmHg	-3
Mean	92.21	88.00	
	Paired-Samples T-Test p = 0.001		

Table 2 shows that among 14 respondents, the values of diastolic blood pressure decreased but did not occur in all respondents. The highest value of diastolic blood pressure before the intervention of the combined foot massage and *kecapi suling* music therapies was 90 mmHg with the average was 92.21 mmHg, which indicated mild hypertension (grade II). Moreover, the average value of diastolic blood pressure after being given the combined foot massage and *kecapi suling* music therapies was 88.00 mmHg, which indicated a high normal blood pressure. The significant shift in diastolic blood pressure is 10 mmHg in two respondents, and no shift indicated for three respondents after the intervention. The result of Paired Samples T-Test was p = 0.001, which means no intervention effect of combined foot massage and *kecapi suling* music therapies in diastolic blood pressure in elders with hypertension.

Discussion

Based on the results above, foot massage therapy sent soothing signals to the central nervous system mediated by peripheral nerves in the legs. The signal instructed the body to reduce the level of tension, which triggered relaxation and improved blood circulation. The stimulation resulting from foot reflexology stimulates the body to release endogenous morphine hormones such as endorphin, encephalin, and dynorphin while reducing levels of stress hormones such as cortisol, norepinephrine, and dopamine. These hormones cause the capillary dilatation resulting in improvements of microcirculation in blood vessels. This condition stimulates the relaxing effect to stiff muscles, and due to the vasodilation, the shift in blood pressure is affected [(10)].

The therapeutic effect of foot massage influences the cardiovascular system, which can increase the dilation of blood vessels. The superficial blood vessel wall widens due to a reflex response to a decrease in sympathetic nerve activity, which increases venous blood flow to

the heart and lowers blood pressure[11]. Increased blood flow in the foot area is proportional to a workout, and when the local circulation is massaged, the blood flow increases to three times than when the circulation is at rest. Moreover, massage therapy also stimulates the release of acetylcholine and histamine. The release of these two substances results in vasomotor activity, thus helping to extend the vasodilation[12].

Music produces vibrational waves that can cause a stimulus to the acoustic drum[11]. The stimulus is sent from axons, sensory ascending fibers to neurons, and the reticular activating system (RAS). The stimulus is transmitted by specific nuclei of the thalamus through the area of the autonomic nervous system and the neuroendocrine system. Music can stimulate the body to produce nitric oxide (NO) molecules that work on blood vessel tone. NO is an endothelium-derived relaxing factor that plays an essential role in the regulation of vascular homeostasis. A decrease in NO production results in arterial stiffness and reduces lumen in the blood vessel, which increases blood pressure [13].

Listening to music makes the limbic system activated, and then the input continues to the hypothalamus. The hypothalamus delivers nerve impulses to the nuclei in the brain stem that control the functioning of the autonomic nervous system, namely the sympathetic and parasympathetic nerves. The parasympathetic nerves are increased, which inhibits the work of the sympathetic nerve, and the endothelial nitric oxide in the blood vessels increases. Nitric oxide has a role as a vascular vasodilator[14]. Vascular vasodilation causes enhancement in vascularization, which decreases the blood pressure [15].

Hypertension that occurs in elders is a result of the endothelial system dysfunction, which causes nitric oxide (NO) and functions as a vasodilator begins to diminish in later age. NO has a vital role in smooth muscles proliferation because it is known as a potent vasodilator. The decrease in NO results in stiffness of the arteries, shrinking the lumen in blood vessels, which increases the blood pressure [16]. Changes in physiology, structure, and cardiovascular functions due to the aging process also cause interference in the cardiovascular system, including the aortic wall [17].

Blood pressure reduction occurs because of the concentration of plasma catecholamine that influences the activity of sympatho-adrenergic and also causes the release of stress hormones [12]. The release of stress hormones with a combination of foot massage and *kecapi suling* music therapies arouse a comfortable, calm, and relaxing feeling. It was observed by researchers on the respondents' expression when given a combination of foot massage and *kecapi suling* music therapies. The feeling of relaxation produced a positive final effect on blood pressure, which was the blood pressure reduction in elders with hypertension [8].

Conclusion

Based on the research results conducted by the researchers to the elders, it can be concluded that there is an effect of the combination foot massage and *kecapi suling* music therapies on the blood pressure reduction in elders with hypertension. The decrease in systolic blood pressure occurred in all respondents, while not all respondents experienced diastolic blood pressure decrease. The average value of systolic blood pressure in the pre-intervention was 154.64 mmHg, while the average value in the post-intervention was 138.86 mmHg. The average value of diastolic blood pressure in the pre-intervention was 92.21 mmHg, while the average value in the post-intervention was 88.00 mmHg.

Research Ethics

This research did not conflict with any research ethics. The researchers have obtained permission from the relevant parties before conducting the research, especially in conducting survey to participants using a questionnaire. This research has been tested ethically and obtained ethical approval with Number 480-KEPK from the Health Research Ethics Committee, Universitas Airlangga, Faculty of Nursing.

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