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The Kacirebonan Gamelan Music Accompaniment in Ergonomic Exercise and Its Impact on Blood Pressure Hypertensive Elderly

Omay Rohmana[1]*, Ati Siti Rochayati[1], Dian Yuniar Syanti Rahayu[2], Susi Susanti[2]

[1]Department of Nursing Poltekkes, Ministry of Health, Tasikmalaya, Cirebon Campus, Indonesia.
[2]Department of Nursing of the Ministry of Health Polytechnic of the Ministry of Health Bandung, Indonesia
*Corresponding author email: orohmana3@gmail.com

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ABSTRACT

Ergonomic exercise has been recommended for older adults with hypertension. However, initially, it was carried out without music. Kacirebonan gamelan music is a traditional music that has characteristics of music therapy. The research objective is to determine the effects of ergonomic exercises accompanied by kacirebonan gamelan music and those not accompanied by kacirebonan gamelan music on systolic and diastolic blood pressure in hypertensive elderly in Cirebon. The research design is a quasi-experimental pretest-posttest intervention with two treatment groups: the first received ergonomic exercise accompanied by kacirebonan gamelan music, and the second received ergonomic exercise only. The intervention was carried out daily for 12 days, with two sessions per day, each lasting about 30 minutes, every 9 hours in the morning. The sample size was formulated by (t-1) (r-1) > 15, so the sample for each group consisted of 16 hypertensive elderly and 32 people for the whole sample, selected by simple random sampling and meeting the inclusion and exclusion criteria. Data analysis was performed using a t-test based on the Shapiro-Wilk normality test, with a p-value> 0.05. The result: there was no significant difference between before and after the intervention in systolic pressure (p=0.787>0,05) and diastolic pressure (p=0.229>0,05) in hypertensive elderly in the treatment group. There was no significant difference between the treatment and control groups in systolic pressure (p = 0.468 > 0.05) or diastolic pressure (p = 0.761 > 0.05) after treatment in hypertensive elderly. Ergonomic exercise without the accompaniment of kacirebonan gamelan music produces a greater effect on systolic (0.036 < 0.05) and diastolic (0.045 < 0.05) blood pressure in hypertensive elderly. The research conclusion is that the accompaniment of kacirebonan gamelan music during ergonomic exercises did not have a significant effect on systolic or diastolic blood pressure in elderly hypertensives. Ergonomic exercise without the accompaniment of kacirebonan gamelan music had a greater impact on reducing systolic and diastolic pressure in hypertensive elderly in Cirebon. Future research should formally operationalise and measure participants' cultural perceptions and expectations of an intervention before implementation.

Keywords: ergonomic exercise, kacirebonan gamelan, hypertensive elderly

INTRODUCTION

Hypertension is the primary disease in the group of Noncommunicable Diseases (NCDs). The World Health Organisation (WHO) estimates that in 2021, hypertension cases will account for 22% of the world's total population.(1) Two-thirds of the sufferers are in developing countries, including Indonesia, and cause about 8 million deaths each year.(2) Data from the 2023 Indonesian Health Survey (SKI) shows that 30.8% of the Indonesian population suffers from hypertension in 2023, which causes complications of kidney failure, stroke, heart disease, and is the fourth highest cause of death (10.2%) after these diseases.(3)(4)

Hypertension is common among the elderly. Although studies have shown cases at a young age.(5) As many as 42% of the world's elderly population has hypertension.(6) Meanwhile, in Indonesia, the elderly are diagnosed with hypertension by 22.9%.(7) This figure will continue to increase as the elderly population increases. Hypertension management is not enough with medication only. Combination therapy with lifestyle changes, including physical activity, will be more effective.(8)(9) The results of the 2023 SKI show that the elderly with hypertension who engage in less physical activity are 1.3 times more likely than the hypertensive elderly with sufficient physical activity.(7) Ergonomic exercise is a type of physical activity that is recommended.(9) The right choice for older people, because it is easy and safe.(10) It can improve posture, improve balance, and train flexibility and muscle strength without putting too much weight on the body.(11) If done regularly, it can increase the body's capacity to regulate blood pressure.(12)

Ergonomic exercise is performed without musical accompaniment. The positive effect on lowering blood pressure in the hypertensive elderly may be enhanced by adding musical accompaniment. This is based on the fact that music has been used as therapy and has been shown to improve physical, mental, emotional, social, and spiritual health as well as relaxation.(13) Appropriate music can reduce levels of the stress hormone (cortisol) and promote a sense of relaxation, which in turn contributes to a decrease in blood pressure.(14) Thus, the integration of music with physical activity, such as gymnastics or exercises, has the potential to produce a better effect in lowering blood pressure. Terry researched the combined effects of music and physical activity in 2020, finding that music can improve physical performance during aerobic exercise, enhance mood, and reduce fatigue.(15)

The age level and the purpose of therapy are considerations in determining the type of music.(13) Older adults

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generally prefer traditional or classical music.(16) Traditional music, such as gamelan, can affect the nervous system and provide a calming effect, functions as *an anxiolytic agent*, diverts sensations of stress, anxiety, despair, fear and fatigue, provides a relaxed and peaceful atmosphere so that heart function and blood vessel resistance are normal.(17)(18)

Kacirebonan Gamelan music has rhythmic and melodic characteristics typical of the Cirebon area. Besides being beautiful, it can also stir emotions, foster cosmic awareness (devotion to God Almighty), intellectual enlightenment, moral nobility, joy, and an understanding of life.(19) Gamelan Kacirebon also has a slow rhythm, which can bring significant therapeutic effects, especially in increasing relaxation and reducing anxiety.(20) However, there have been no studies examining the effects of Kacirebonan gamelan accompanying exercise activity, including ergonomic exercise. Therefore, this research is fundamental for answering whether the accompaniment of Kacirebonan gamelan music has a positive effect, as well as for examining the overall impact of gamelan music on health, particularly its effect on lowering blood pressure.

METHODS

This type of research is quasi-experimental, with a pretest and posttest and a 2-group intervention.(21) Group I was given an ergonomic exercise intervention accompanied by kacirebonan gamelan music, in the form of a YouTube music recording lasting 9.59 minutes, repeated 3 times, at a slow tempo of 70 BPM (based on an online tempo analyzer application: https://samples.landr.com/key-bpm-finder). Moreover, group II received an ergonomic exercise intervention without Kacirebonan gamelan music, serving as the control. The intervention was carried out daily for 12 days every nine in the morning. Each day, there were two exercise sessions, each lasting about 30 minutes. The exercise movements consisted of 1) Warm-up movements, 2) Core movements (Opening Movement, Perfect Standing, Open Chest Movement/Core Energy Rotation, Gratitude Bowing Movement, Mighty Sitting Movement, Burning Sitting and Gratitude Prostration Movement, and Lying Down in Surrender Movement), and 3) Cool-down movements. The population of this study is older adults diagnosed with essential hypertension, receiving oral antihypertensive drug therapy in the Sitopeng Health Centre area, Cirebon City. The sample size is determined by the Federer Formula (t-1) (r-1) > 15, where t is the intervention group and r is the replication/sample size.(22) In this study, it consisted of 2 intervention groups, so the sample size (r) was (2-1) (r-1) > 15, then r = (15/2-1) + 1 = 16. Based on these calculations, the sample size (replication) for each intervention group is 16, yielding an overall sample of 32 people, using a simple random sampling technique. If any respondent resigned, then the spare sample was determined by the formula 1/(1-f) where f is the proportion of the experimental unit that was lost, resigned, or dropped out. Inclusion Criteria: 1) Have been diagnosed with essential hypertension and received oral antihypertensive therapy, 2) Willing to be a respondent, 3) Age 60 – 65 years—exclusion Criteria: hypertensive elderly with complications of stroke, heart, or kidney failure. Measurement of respondents' blood pressure before and after the intervention was conducted by professional health workers (nurses) from the Sitopeng Health Centre, who were always present during the intervention. Data analysis in this study utilizes computer software, including both univariate and bivariate methods. The bivariate data analysis used a parametric approach based on the Shapiro-Wilk normality test, with a p-value > 0.05 for the research sample size less than 50 people, indicating that the data are typically distributed.

RESULT

Table 1: Test of Data Normality

data variables	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Data of the systole intervention group before treatment	.181	16	.166	.935	16	.295
Data of the systole control group before treatment	.200	16	.086	.932	16	.258
Data of the diastole intervention group before treatment	.155	16	.200*	.972	16	.870
Data of the diastole control group before treatment	.154	16	.200*	.965	16	.754
Data of the systole intervention group after treatment	.127	16	.200*	.980	16	.967
Data of the systole control group after treatment	.110	16	.200*	.959	16	.647
Data of the diastole intervention group after treatment	.188	16	.135	.907	16	.106
Data of the diastole intervention group after treatment	.133	16	.200*	.935	16	.290

Based on Table 1, the research data variable is normally distributed. It can be seen in sig. The Shapiro-

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Wilk value for all data variables is greater than 0,05, so the data analysis technique was parametric, namely independent t-tests and paired t-tests.

Table 2: Characteristics of Subject

Variable		Groups				Total	
		Intervention		Control			
		f	%	f	%	f	%
Gender	Female	12	75	12	75	24	75
	Male	4	25	4	25	8	25
	total	16	100	16	100	32	100
Age	60 Years Old	2	12.5	2	12.5	4	12.5
	61 Years Old	2	12.5	1	6.3	3	9.4
	62 Years Old	4	25.0	3	18.8	7	21.9
	63 Years Old	1	6.3	5	31.3	6	18.8
	64 Years Old	5	31.3	2	12.5	7	21.9
	65 Years Old	2	12.3	3	18.8	5	15.6
	Total	16	100	16	100	32	100
Education	Elementary School	5	31.3	5	31.3	10	31.3
	Junior High School	4	25.0	5	31.3	9	28.1
	Senior High School	7	43.8	6	37.5	11	40.6
	Total	16	100	16	100	32	100
Job	Retired	3	18.8	3	18.8	6	18.8
	Housewife	11	68.8	10	62.5	21	65.6
	Selling	2	12.5	2	12.5	4	12.5
	Farmer	0	0.0	1	6.3	1	3.1
	Total	16	100	16	100	32	100

Based on table 2 above, it can be concluded that the majority of research subjects were female in both of the intervention (75%) and control (75%) groups, aged 64 years old in the intervention group (31.3%) and 63 years in the control group, had a high school education in both of the intervention (43.8%) and the control (37.5%) group, and worked as housewives in both of the intervention group (68.8%) and the control group (62.5%).

Table 3 Differences between before and after systole and diastole blood pressure interventions in the treatment and control group of hypertensive elderly in Sitopeng, Cirebon City

Treatment Groups		Mean	Std. Dev.	SE Mean	95% CI		t	Df	Sig. (2-tailed)
					Low	Upp			
Intervention	Pre – Post Systole	1.313	19.109	4.777	-8.870	11.495	.275	15	.787
	Pre – Post Diastole	2.000	7.430	1.857	-1.959	5.959	1.077	15	.299
Control	Pre – Post Systole	9.375	16.264	4.066	.709	18.041	2.306	15	.036
	Pre – Post Diastole	5.125	9.394	2.349	.119	10.131	2.182	15	.045

Based on Table 3, it can be concluded that systolic and diastolic blood pressure decreased in both the intervention and control groups. However, in the intervention group, the average decrease was smaller —systolic pressure of 1,313 mmHg and diastolic pressure of 2,000 mmHg —than in the control group —systolic pressure of 9,375 mmHg and diastolic pressure of 5,125 mmHg. There is no significant difference between pre- and post-treatment results for kacirebonan musical accompaniment during the implementation of ergonomic exercises, both for systolic pressure ($p = 0.787 > 0.05$) and diastolic pressure ($p = 0.299 > 0.05$). However, Ergonomic exercise without the accompaniment of kacirebonan gamelan music produces a more significant effect on systole ($0.036 < 0.05$) and diastole ($0.045 < 0.05$) in hypertensive elderly.

Table 4 Differences between systole and diastole blood pressure treatment and control groups before and after

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the intervention of hypertension in the elderly in Sitopeng, Cirebon City

Variable			Levene's Test		t-test for Equality of Means						
			F	Sig.	t	Df	Sig. (2-tailed)	Mean Diff	SE Diff	95% CI	
										Low	Upp
Pre Interv.	Systole	Eq var. Ass.	.187	.668	-.603	30	.551	-3.063	5.081	-13.439	7.314
		Eq var. Not ass.			-.603	27.480	.552	-3.063	5.081	-13.479	7.354
	Diastole	Eq var. Ass	.030	.865	-1.345	30	.189	-4.188	3.114	-10.548	2.173
		Eq var. Not ass.			-1.345	29.990	.189	-4.188	3.114	-10.548	2.173
Post Interv.	Systole	Eq var. Ass	1.461	.236	.736	30	.468	5.000	6.796	-8.879	18.879
		Eq var. Not ass.			.736	26.776	.468	5.000	6.796	-8.949	18.949
	Diastole	Eq var. Ass.	1.057	.312	-.307	30	.761	-1.063	3.461	-8.132	6.007
		Eq var. Not ass.			-.307	29.478	.761	-1.063	3.461	-8.137	6.012

Based on Table 4 above, the data in the study, both before and after treatment, are homogeneous. This can be seen from Sig Levene's test Eq. Variant Assumed value for pre-systole 0.668 > 0.05, pre-diastole 0.865 > 0.05, post-systole 0.236 > 0.05, and post-diastole 0.312 > 0.05. There was no significant difference between the treatment and control groups on systolic pressure (p = 0.551 > 0.05) and diastolic pressure (p = 0.189 > 0.05) before the intervention. There were also no significant differences between the treatment and control groups on systolic pressure (p = 0.468 > 0.05) and diastolic pressure (p = 0.761 > 0.05) after the intervention.

DISCUSSION

This study's primary finding is the notable lack of a significant effect of Kacirebonan gamelan music accompaniment on blood pressure reduction (systolic: p=0.787; diastolic: p=0.299) when integrated with ergonomic gymnastics. Conversely, the control group, which performed ergonomic gymnastics without music, demonstrated a statistically significant reduction in both systolic (p=0.036) and diastolic (p=0.045) blood pressure. This discrepancy suggests that the ergonomic exercises possess intrinsic therapeutic efficacy for hypertension management in this cohort.(23)(24) The addition of Kacirebonan gamelan music did not enhance this effect; instead, it appeared to neutralise it. One possible explanation is a 'ceiling effect', in which the ergonomic exercises alone were sufficiently potent in lowering blood pressure, leaving no statistically significant margin for an adjunctive benefit of music therapy.(25)

In contrast to the results of other studies, which showed the effectiveness of gamelan music accompaniment. Research on elderly individuals with hypertension in Semarang indicates that the accompaniment of Javanese gamelan music during elderly gymnastics activities lowers both systolic and diastolic blood pressure.(17) Also, in walking physical activity, the accompaniment of Javanese gamelan music showed the same results.(24) Other studies have shown that the accompaniment of music in taichi sports activities has a calming effect and a feeling of enjoying the movement more.(26)

Kacirebonan gamelan music is a traditional music as part of Indonesia's cultural heritage.(27) It has characteristics similar to Javanese gamelan music. The type, rhythm, and tempo are the same. Older people like this music; it meets the criteria for music therapy and has immense potential for health and well-being.(28)(29) Various studies have shown that traditional gamelan music is a non-pharmacological therapy for health. It has a significant influence on the nervous system and the centre of the human body, has a calming effect, diverts the sensations of stress, anxiety, despair, fear, and tiredness, helps express emotions and improve mood, and supports mental health by engaging in various activities while listening to music.(24)·(30)It can also relieve a person's negative emotions while treating physical illness or be used as an effective adjunct treatment.(31)

However, this study found no significant effect, despite a decrease in systolic and diastolic pressure. The difference may lie not in the music's acoustic properties, but rather in its perceived cultural function. In Cirebon, Kacirebonan gamelan is deeply embedded in specific ritual-cultural contexts, particularly as an accompaniment to traditional dances (e.g., mask dances) and religious services.30 Unlike gamelan, which is more broadly associated with relaxation or entertainment in the other region in Central or East Java.(32)(33)Consequently, applying it to non-ritualistic physical contexts, such as physical exercise, can create cognitive dissonance rather than relaxation, causing participants to feel their movements are "awkward" (stiff), less perfect, and to interfere with therapeutic goals. However, the perfection of movement is the key to the effectiveness of ergonomic exercises in lowering systolic and diastolic blood pressure.(34)(35)

Fundamentally, music is universal, but a person's cultural background also influences emotional responses and perceptions of music therapy.(33) Cirebon's public understanding of the expanded function of Kacirebonan gamelan music in therapy is still limited to its essential function. People are not yet accustomed to using Kacirebonan gamelan to accompany physical activities for health. Their limited understanding of its broader function leads them to reject this music. This is consistent with the results of interviews conducted with

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research subjects in the intervention group at the end of the treatment period. The data obtained showed that 13 of the 16 participants (80%) stated that the music used was inappropriate and made the exercise less enjoyable.

This study's most significant contribution is its demonstration that even an ostensibly "local" or "traditional" intervention can fail if its specific cultural meaning is incongruent with its therapeutic application. It extends cross-cultural intervention research, which often focuses on the failure of Western-centric models in non-Western cultures, by showing that this principle of *cultural congruence* applies at a micro-regional level.(33)(36) For practice, this implies clinicians cannot assume all traditional music is inherently therapeutic; a thorough ethnographic understanding of the music's local function and meaning is a prerequisite. For research, the clear implication is the need to identify and test auditory accompaniments that this specific Cirebon population *already* associates with.

This research has limitations. The Kacirebonan gamelan music used was downloaded from YouTube, so no direct validation tests were conducted with respondents regarding the music's beat and tempo. However, researchers have overcome this by conducting tests using an online free beat-and-tempo test application. The result shows that kacirebonan gamelan music is suitable for music therapy; it has a tempo of 70 beats per minute (BPM) and is slow. Even though it is obvious, in the literature, Kacirebonan gamelan is considered therapeutic music. Besides that, the researcher did not measure the subjects' perceptions of the music to be used as an intervention before this study began. Therefore, it is essential for researchers to formally operationalise and measure participants' cultural perceptions and expectations of an intervention before implementation.

CONCLUSION AND RECOMMENDATIONS

The accompaniment of kacirebonan gamelan music during ergonomic exercises did not significantly effect on systolic or diastolic blood pressure in elderly hypertensives. Ergonomic exercise without the accompaniment of kacirebonan gamelan music had a greater impact on decreasing systolic and diastolic pressure in hypertensive elderly in Cirebon. Future research should formally operationalize and measure participants' cultural perceptions and expectations of an intervention before implementation.

AUTHOR'S CONTRIBUTION

This article was written by some authors. All authors have contributed in accordance with their assigned roles. The main author wrote the main manuscript, made revisions, and carried out correspondence to the journal. The member authors who helped edit the article, checked the language using the Grammarly application, and verified similarity with the Turnitin application, also contributed to the financing of the article's publication.

CONFLICTS OF INTEREST

The authors declare that the research was conducted without any commercial or financial relationships that could be construed as a potential conflict of interest.

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