

ORIGINAL ARTICLE

Comparing Effects Between Music Intervention and Aromatherapy on Blood Pressure Among Hypertensive Patients: A Feasibility Study Conducted in Indonesia

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ABSTRACT

Introduction: The primary purpose of this study was to investigate the effects of music therapy versus aromatherapy on blood pressure among hypertensive patients in Indonesia. **Methods:** A quasi-experimental with pretest-posttest control group design was used. A music therapy was delivered classical music Beethoven symphony number 5 (the duration was 5 minutes) by using earphones and another group received dropped lavender essential oil on cotton as many as three drops, then inhaled for 10 minutes and inhaled every 2-3 breaths. The inclusion criteria were aged over 18 years old, stage I hypertension, and stage II. **Results:** A total of 44 subjects have participated in the study (22 in both music and aromatherapy). Subjects ranged from 31-60 years old (mean= 54, SD=5.9), and most subjects were female (72.7 %). In the aromatherapy group, the average delta systolic was significantly higher than in the music therapy group ($p<.05$). Despite not significant, the delta diastolic of the music therapy group tended to higher compare to the aromatherapy group. **Conclusion:** Patients with high blood pressure may benefit from both music and aromatherapy. Nurses can employ music to create a healing environment and possibly lower blood pressure in hypertension patients utilizing low-cost, non-invasive, and simple procedures.

Keywords: Aromatherapy, Blood pressure, Hypertension, Intervention, Music therapy

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INTRODUCTION

Hypertension is a public health concern due to its high prevalence and mortality. Approximately 7.5 million people worldwide die each year from hypertension complications (1). The number of people with hypertension is continuing to increase every year, around 1.13 billion people in 2019; and by 2025 it is predicted that 1.56 billion people worldwide will continually increase (1). Indonesia ranked 87th for the world's number of hypertension, which has caused 25,868 or 1.54 percent of total deaths (2). The age-adjusted death rate for the Indonesian population is 14.41 per 100,000 (2). Also, hypertension prevalence

is rising in Indonesia, from 25.8 percent in 2013 to 34.1 percent in 2018 (3). Interestingly, in Indonesia, some people with hypertension are under the age of 30. The enforcement rates, however, is fairly low, about 32.3 percent do not take medications consistently, and only 13.3 percent do not use antihypertension medication at all. Many various challenges faced by hypertensive clients in Indonesia, including 59.8 percent feeling safe, 14.5 percent taking conventional medications, 8.1 percent being effortless to regularly purchase drugs, and 2 percent of drugs not available in health facilities (3).

Hypertension may cause various complications which may increase morbidity and mortality risk (4). A higher-than-average risk of cardiovascular disease and death from any cause was found to be closely linked to high blood pressure (5,6). Besides, these conditions usually include long-term treatment, medication use, and health care costs, which can greatly raise family

and society's financial constraints (7). Consequently, the main goal of hypertension care is to manage controlled blood pressure of the patient to minimize the risk of cardiovascular disease and all-cause mortality (8).

The definition of music therapy is "functions as a distractor, diverting attention away from a negative catalyst and focusing awareness on soothing stimuli" (9). Music therapy and aromatherapy are used as part of a therapeutic approach to reducing preoperative anxiety (10). Besides, the impact of music therapy on ICU patients' reduced anxiety has been confirmed in various clinical trials (11–13). Researches have shown that music, alongside changes in heart rate, blood pressure, and breathing, can effectively elicit and modulate feelings and emotions (14). Consequently, the research results emerge from the literature: in response to exciting music, the heart and respiratory levels are higher than in the case of tranquilizing music. Furthermore, music causes changes in behavior in brain structures assumed to modulate heart function (14). Limbic system activation causes a person to relax when listening to music, so a relaxed state can lower blood pressure. The strains also induce the body to create nitric oxide (NO) molecule (15). This molecule acts on a blood pressure-reducing vascular tone (15). Classical music is a music that has a calming impact at a tempo of about 60 beats/min (15). This musical stimulus stimulates different pathways in various areas of the brain, such as the emotionally linked limbic system (15). Music has increased systolic blood pressure relative to the control group, but there has been no substantial change in diastolic blood pressure compared to the control group for Music group participants (16).

Aromatherapy is a procedure used for psychological and physical wellbeing, using essential oil (17,18). Aroma or scent and the good smell can induce the thalamus to secrete enkephalin which is a hormone that can spontaneously alleviate pain and relax or feel relaxed. Aromatherapy oils obtained from lavender flowers are extracted. Lavender oil is a powerful oil that is ideally suited to treat sunburn, peeling, psoriasis, and also helps with insomnia (17,18). Lightly scented lavender flowers and essential oils with aromatherapy are known to provide suicidal sedatives and anti-neuro depressive. Aromatherapy lavender also has a main linalool acetate material, which can loosen and relax the nervous and muscular functioning of the muscle (17,18). Inhaling lavender raises the alpha wave frequency and the conditions are correlated with exercise (relaxation) by the stimulation of parasympathetic nerves which then decreases blood pressure and pulse rate (17,18). Aromatherapy can also give the body, spirit, and mind a sense of peace and relaxation (19). Another advantage of the anti-inflammatory aromatherapy lavender, which reduces swelling, and can neutralize toxins (20). The previous study conducted by (21,22) found that

systolic blood pressure before administration lavender aromatherapy 154.44 mmHg and diastolic blood pressure of 95 mmHg and after being given the lavender aromatherapy decreased (138.89 mm Hg systolic and 85 mmHg diastolic) (21,22). However, most music intervention studies (11–13,23,24) examined the effect on psychological aspect and few studies investigate the effect of music intervention and aromatherapy on blood pressure in hypertensive patients. To help clinicians make clinical decisions, this topic should be examined further. Music intervention and aromatherapy both have low costs and minor side effects, making them excellent options for those on a budget (23). The primary purpose of this study was to investigate the effects of music therapy versus aromatherapy on blood pressure among hypertensive patients in Indonesia.

MATERIALS AND METHODS

Research Design

A quasi-experimental with pretest-posttest control group design was used to compare the effect of aromatherapy and music therapy in lowering the blood pressures among individuals with hypertension. This study has obtained an ethical review from the Health Research Ethics Committee of an affiliated university (reference No. E.5.a/029/KEPK-UMM/III/2019). The data collection was conducted from October to December 2019.

Intervention

In the classical music group, subjects were provided a classical music Beethoven symphony no.5 (the duration was 5 minutes) by using earphones. They asked to listen to music for 15 minutes. While in the lavender aromatherapy group, subjects were prepared in a relaxed position and then dropped lavender essential oil on cotton as many as three drops, then inhaled for 10 minutes and inhaled every 2-3 breaths. In the current study, the music used for therapy was classical music from Beethoven symphony no. 5, which has a duration of 5 minutes. In the classical music group, the researchers asked whether respondents liked classical music used these therapies, as well as researchers, scrutinize and examine whether hearing the respondent has been reduced, if the respondent does not like classical music and has a hearing loss, the patient will be in exclusion but a study conducted by researchers, respondents the classical music group had a pretty good hearing and loved classical music.

The lavender aromatherapy used a pure lavender essential oil Natural Gift that easily found in the local market. Both interventions were conducted in the patients' houses. In the classical music group, subjects were provided with classical music by using earphones. They asked to listen to music for 15 minutes. While

in the lavender aromatherapy group, subjects were prepared in a relaxed position and provided with three drops of lavender essential oil that applicated on cotton, then asked to inhale for 10 minutes and inhaled every 2-3 breaths.

To control the effect of therapy, the researchers asked subjects about the previous medication uses, including how many hours of the last consume the antihypertensive drugs. Evidence suggests that the effect of antihypertensive drugs occurs within 1 to 2 hours, thus if the subjects were just taking the medication, then we wait for at least 2 hours for the intervention. Both in the music therapy and lavender aromatherapy, the blood pressure measurements were taking pre-and post-intervention for seven days, once a day.

Sample

The sample was patients diagnosed with hypertension in three public health centers in East Java, Indonesia. The inclusion criteria were aged over 18 years old, stage I and II hypertension,. The determination of stage I and stage II hypertension based on the definition that stage I hypertension is a systolic pressure of 140-159 mmHg and a diastolic pressure of 90-99 mmHg and stage II is a systolic pressure of 160-179 mmHg and a diastolic pressure of 100-109 mmHg.

The sample size calculation using G-Power analysis software by assigning alpha 0.05, power 0.80, and medium effect size (0.25) The samples were obtained in this research is 44 respondents who experienced hypertension; 2 respondents in the classical music therapy group and 22 respondents in the group of lavender aromatherapy group. A convenience sampling was used to select a participant due to resource constraints.

Measures

Data of age, gender, education level, working status, medication, smoking status, and current blood pressure were obtained.

The blood pressure was measured using a Riester manual sphygmomanometer. Any intervention on the classical music group or a group of lavender aromatherapies, then after the measurement of blood pressure back on those days.

Data Analysis

After obtaining descriptive statistics, bivariate analyses were conducted with an α level at 0.05. The General Linear Model (GLM) Repeated Measure was used to test the effect of interventions. Statistical analyses were conducted using the Statistical Package for Social Sciences (SPSS) version 23.

RESULTS

Demographics characteristics

About 44 subjects have participated in the study (22 subject in each group y). Subjects ranged from 31-60 years old (mean= 54, SD=5.9), and most subjects were female (72.7 %) (Table 1). Less than half (47.7%, n=21) had an elementary school, and unemployed (68.2%). About 38.6% have used a diuretic as medication. Despite all subjects reporting hypertension, 20.5% (n=9) continued to smoke. There were no significant differences among demographic characteristics between the two groups.

The effects of music therapy and aromatherapy on blood pressure

The data were collected from seven days of observation. The delta calculated from the differences in blood pressures in pre- and post-intervention were used in the analysis to evaluated and compares the effects of interventions on blood pressures. In the aromatherapy group, the average delta systolic was significantly higher than in the music therapy group ($p<.05$). However, despite not significant, the delta diastolic of the music therapy group tended to higher compare to the aromatherapy group (Table 1). Figure 1 showed the mean profiles of both interventions.

DISCUSSION

Our Study found that systolic blood pressure was significantly higher than in the music therapy group than in the aromatherapy group. Empirically, listening to classical music will produce a sensation that was sent to the axon fibers to the nerves of the reticular activating system (RAS), the signal will then be transferred by the nucleus information of the thalamus transfer region of the adrenal cortex, the limbic system and the corpus callus and the autonomous nervous system and endocrine system neurons will transfer through the region (14). Though the mechanisms underlying by which music therapy works in the human body are unknown, music therapy has been shown to reduce sympathetic nervous system and increase endorphin release (25). Interestingly, it is well recognized that hypertension physiopathology entails the overstimulation of the sympathetic nervous system. Recent research found beneficial effects of music therapy in people with prehypertension and hypertension on heart rate variability (26), which supports the impact of music therapy on the nervous system. This intervention could be an alternative to reduce blood pressure to hypertensive patients. However, future studies using more rigour method is needed with large sample size and follow-up.

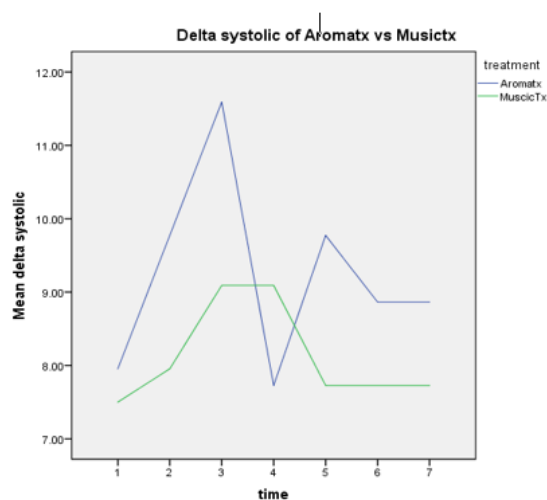


Figure 1 : Mean profiles of delta blood pressures in the aromatherapy group.

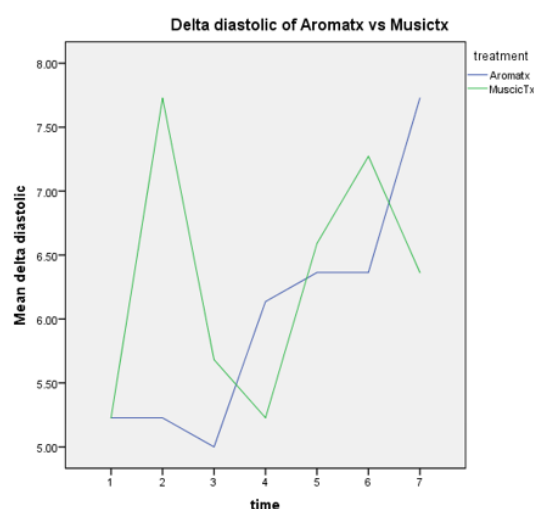


Figure 2 : Mean profiles of delta blood pressures in the music therapy group.

Table 1 : Demographic Characteristics (n=44)

Variables	Aromatherapy Group (n=22, 50 %)	Music therapy Group (n=22, 50%)	Total (n=44)	p-value
Age				
Range	31 – 60	49 - 60	31 – 60	0.172
Mean (SD)	52.5 (7.3)	55.5(3.4)	54 (5.9)	
Gender				
Male	6 (27.3)	6 (27.3)	12 (27.3)	0.087
Female	16 (72.7)	16 (72.7)	32 (72.7)	
Education level				
Elementary school	11 (50.0)	10 (45.5)	21 (47.7)	0.573
Junior high school	4 (18.2)	7 (31.8)	11 (25.0)	
Senior high school	6 (27.3)	3 (13.6)	9 (20.5)	
University	1(4.5)	2 (9.1)	3 (6.8)	
Occupation				
Employment	14 (63.6)	16 (72.7)	14 (31.8)	0.057
Unemployment	8 (36.4)	6 (27.3)	30 (68.2)	
Medication				
ACEI	5 (22.7)	6 (27.3)	11 (25.0)	0.714
Diuretik	8 (36.4)	9 (40.9)	17 (38.6)	
Ca Blocker	6 (27.3)	6 (27.3)	12 (27.3)	
ARB	3 (13.6)	1 (4.5)	4 (9.1)	
Smoking				
Yes	5 (22.7)	4 (18.2)	9 (20.5)	0.421
No	17 (77.3)	18 (81.8)	35 (79.5)	
ΔΔ systolic Mean ±SD	9.2 ± 4.9	8.1 ± 4.6	8.7 ± 4.7	0.043
ΔΔ diastolic Mean ±SD	6.0 ± 3.6	6.2 ± 4.2	6.2 ± 3.9	0.357

Table II : Correlation between age, gender, medication, smoking status, and blood pressures changes

ΔΔ blood pressures				
	ΔΔ systolic		ΔΔ diastolic	
	Analysis	p-value	Analysis	p-value
Age	r = 0.004	0.673	r = -0.030	0.223
Gender				
Male	t = -0.218	0.453	t = 0.748	0.056
Female				
Medication				
ACEI				
Diuretic	F = 0.688	0.459	F = 4.879	0.003
Ca blocker				
ARBs				
Smoking	t = -2.371*	0.020	t = 2.77	0.320

Table III : Linear mixed models of blood pressures changes

	estimate	SE	t value	p-value
Fixed effect to systolic				
Intercept	8.12	.46	17.746	.000
Aromatherapy	1.1	.64	1.707	.095
Aromatherapy	0 ^b	0	0	0
Fixed effect to diastolic				
Intercept	6.28	.37	16.941	.000
Aromatherapy	-.189	.53	-.362	.718
Aromatherapy	0 ^b	0	0	0

Note: based on a linear mixed model using covariance structure ARH1

According to the findings of this study, aromatherapy may be useful in lowering blood pressure. The use of lavender aromatherapy in an intermediate care unit has been shown to improve patients' health status and quality of sleep in a previous study (27). Compared to the control group, treatment participants' blood pressure was considerably lower. Researchers discovered that inhaling essential oils can reduce blood pressure, stress, and cortisol levels in patients with essential hypertension (28). However, another study on the effects of aromatherapy did not have any significant on hypertension (29). Lavender, from

the Labiatae family, is widely used. Lavender oil contains linalyl (51%) and linalyl acetate (35 %) (30). Implementing some amounts of essential Lavender oil to the handkerchief and inhaling it helps treat insomnia, tiredness, tension, and anxiety. In particular, strategies have been vigorously explored in nursing to scientifically demonstrate the benefits of aromatherapy as a therapeutic technique, and as a relaxation mediator (31).

The research has certain limitations to it. First, this research wasn't rigorous because we didn't use

randomized trials randomized. Second, there was little in the way of music or aromatherapy selections to choose from only one form of music for the music and aromatherapy types). Music stimulation and aromatherapy may be less effective because patients may not have chosen their favorite music or oil. The generalizability of our findings may be limited because all participants were recruited from the same institution, and similar demographic characteristics may have been shared.

CONCLUSION

Among hypertensive patients, both a music intervention and aromatherapy can reduce blood pressure. Both treatments can be used as an alternative to non pharmaceuticals by healthcare professionals. Clinical nurses will be able to use music as a tool to promote a curative atmosphere and possibly reduce blood pressure among hypertensive patients using low-cost, non-invasive, and easy-to-administer treatments. Although aromatherapy does have promising results, appropriate education is essential. Hence, we recommend that clinical nurses can understand and develop the procedure if appropriate. A future study using a robust method is needed to confirm these findings.

ACKNOWLEDGEMENT

All author would like to thanks to all participant in this study. All author declare no funding for this study, and no conflict of interest.

REFERENCES

1. WHO. World Hypertension Day 2019. 2019.
2. WHO. Global Health Observatory (GHO) data. 2017.
3. Riskesdas. <https://www.kemkes.go.id/resources/download/info-terkini/hasil-riskesdas-2018.pdf>. 2018;
4. Forouzanfar MH, Liu P, Roth GA, Ng M, Biryukov S, Marczak L, et al. Global Burden of Hypertension and Systolic Blood Pressure of at Least 110 to 115 mm Hg, 1990-2015. *JAMA*. 2017 Jan;317(2):165–82.
5. Zhou D, Xi B, Zhao M, Wang L, Veeranki SP. Uncontrolled hypertension increases risk of all-cause and cardiovascular disease mortality in US adults: The NHANES III Linked Mortality Study. *Sci Rep*. 2018;8(1):9418.
6. Pierdomenico SD, Pierdomenico AM, Coccina F, Clement DL, De Buyzere ML, De Bacquer DA, et al. Prognostic value of masked uncontrolled hypertension systematic review and meta-analysis. *Hypertension*. 2018 Oct;72(4):862–9.
7. Kaborň J, Metzger M, Helmer C, Berr C, Tzourio C, Drueke TB, et al. Hypertension Control, Apparent Treatment Resistance, and Outcomes in the Elderly Population With Chronic Kidney Disease. *Kidney Int Reports*. 2017 Mar;2(2):180–91.
8. Bundy JD, Li C, Stuchlik P, Bu X, Kelly TN, Mills KT, et al. Systolic Blood Pressure Reduction and Risk of Cardiovascular Disease and Mortality: A Systematic Review and Network Meta-analysis. *JAMA Cardiol*. 2017 Jul;2(7):775–81.
9. Gooding L, Swezey S, Zwischenberger JB. Using music interventions in perioperative care. *South Med J*. 2012 Sep;105(9):486–90.
10. Setzer WN. Essential oils and anxiolytic aromatherapy. *Nat Prod Commun*. 2009 Sep;4(9):1305–16.
11. Chan MF, Chung YFL, Chung SWA, Lee OKA. Investigating the physiological responses of patients listening to music in the intensive care unit. *J Clin Nurs*. 2009 May;18(9):1250–7.
12. Han L, Li JP, Sit JWH, Chung L, Jiao ZY, Ma WG. Effects of music intervention on physiological stress response and anxiety level of mechanically ventilated patients in China: a randomised controlled trial. *J Clin Nurs*. 2010 Apr;19(7–8):978–87.
13. Korhan EA, Khorshid L, Uyar M. The effect of music therapy on physiological signs of anxiety in patients receiving mechanical ventilatory support. *J Clin Nurs*. 2011 Apr;20(7–8):1026–34.
14. Montinari MR, Giardina S, Minelli P, Minelli S. History of Music Therapy and Its Contemporary Applications in Cardiovascular Diseases. *South Med J*. 2018 Feb;111(2):98–102.
15. Hidayah N', Damanik SRH, Elita V'. Comparison of the Effectiveness of Classical Music Therapy with Aromatherapy of Roses on Blood Pressure in Patients with Hypertension. *J Online Mhs Progr Stud Ilmu Keperawatan Univ Riau*. 2016;2(2):1317–26.
16. do Amaral MAS, Neto MG, de Queiroz JG, Martins-Filho PRS, Saquetto MB, Oliveira Carvalho V. Effect of music therapy on blood pressure of individuals with hypertension: A systematic review and Meta-analysis. *Int J Cardiol*. 2016 Jul;214:461–4.
17. Ali B, Al-Wabel PDN, Shams S, Ahmad A, Khan S, Anwar F. Essential oils used in aromatherapy, A systemic review. *Asian Pac J Trop Biomed*. 2015 Jul;5:589–98.
18. Koulivand PH, Khaleghi Ghadiri M, Gorji A. Lavender and the nervous system. *Evid Based Complement Alternat Med*. 2013;2013:681304.
19. Astuti R, Nugrahwati F. Intervention using rose aromatherapy to lowering blood pressure of elderly with hypertension. *Int J Sci Technol Res*. 2018 Apr;7:246–50.
20. Silva GL da, Luft C, Lunardelli A, Amaral RH, Melo DA da S, Donadio MVF, et al. Antioxidant, analgesic and anti-inflammatory effects of

- lavender essential oil. *An Acad Bras Cienc*. 2015 Aug;87(2 Suppl):1397–408.
21. Gultom A, Ginting S, Silalahi E. The Influence of Lavender Aroma Therapy on Decreasing Blood Pressure in Hypertension Patients. *Int J Public Heal Sci*. 2016 Dec;5:470.
22. Kim I-H, Kim C, Seong K, Hur M-H, Lim HM, Lee MS. Essential Oil Inhalation on Blood Pressure and Salivary Cortisol Levels in Prehypertensive and Hypertensive Subjects. *Mischoulon D, editor. Evidence-Based Complement Altern Med*. 2012;2012:984203.
23. Lee C-H, Lee C-Y, Hsu M-Y, Lai C-L, Sung Y-H, Lin C-Y, et al. Effects of Music Intervention on State Anxiety and Physiological Indices in Patients Undergoing Mechanical Ventilation in the Intensive Care Unit. *Biol Res Nurs*. 2017 Mar;19(2):137–44.
24. Lee OKA, Chung YFL, Chan MF, Chan WM. Music and its effect on the physiological responses and anxiety levels of patients receiving mechanical ventilation: a pilot study. *J Clin Nurs*. 2005 May;14(5):609–20.
25. Kowalski RE. Terapi hipertensi: Program delapan minggu mengurangi tekanan darah dan mengurangi risiko serangan jantung dan stroke secara alami. Rahmani Astuti, Rani S. Ekawati, editors. Bandung: Mizan Pustaka; 2010. 378 p.
26. Battaglia S. The Complete Guide to Aromatherapy. International Centre of Holistic Aromatherapy; 2003.
27. Lytle J, Mwatha C, Davis KK. Effect of lavender aromatherapy on vital signs and perceived quality of sleep in the intermediate care unit: a pilot study. *Am J Crit Care an Off Publ Am Assoc Crit Nurses*. 2014 Jan;23(1):24–9.
28. Hwang J-H. [The effects of the inhalation method using essential oils on blood pressure and stress responses of clients with essential hypertension]. *Taehan Kanho Hakhoe Chi*. 2006 Dec;36(7):1123–34.
29. Cho M-Y, Min ES, Hur M-H, Lee MS. Effects of aromatherapy on the anxiety, vital signs, and sleep quality of percutaneous coronary intervention patients in intensive care units. *Evid Based Complement Alternat Med*. 2013/02/17. 2013;2013:381381.
30. Prashar A, Locke IC, Evans CS. Cytotoxicity of lavender oil and its major components to human skin cells. *Cell Prolif*. 2004 Jun;37(3):221–9.
31. Lee E. The Effects of Aroma Hand Massage on Anxiety and Sleep in Cancer Patients during Hospitalization. 2011;42–3.