

Effectiveness of music therapy as a non pharmacological intervention on lowering blood pressure in the elderly with hypertension

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ABSTRACT

The study aimed to test the effectiveness of instrumental classical music therapy in lowering blood pressure in the elderly with hypertension. This study used a quasi-experimental design with a non-equivalent control group. A total of 40 elderly people with mild to moderate hypertension were divided into two groups: intervention (n=20) and control (n=20). The intervention group was given 30 minutes of instrumental classical music therapy daily for 14 days, while the control group did not receive similar treatment. Systolic and diastolic blood pressure data were collected before and after the intervention, and analyzed using paired t-test and independent t-test. The results showed a significant decrease in systolic blood pressure in the intervention group by -9.4 mmHg ($p=0.004$) and diastolic blood pressure by -6.1 mmHg ($p=0.008$). In contrast, the control group did not show a meaningful decline. Comparisons between groups showed significant differences in systolic ($p=0.001$) and diastolic ($p=0.003$) blood pressure, which confirmed the effectiveness of the intervention. Instrumental classical music therapy has been shown to be statistically and clinically effective in lowering systolic and diastolic blood pressure in the elderly with hypertension. This intervention deserves to be considered as a complementary approach in geriatric nursing practice and community hypertension management programs.

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1. INTRODUCTION

Hypertension or high blood pressure is a chronic medical condition characterized by a persistent increase in blood pressure in the arteries. According to WHO (2021), hypertension is the leading cause of premature death worldwide. The elderly are the most vulnerable group to hypertension due to age-related physiological changes, such as decreased elasticity of blood vessels and increased peripheral vascular resistance (Chobanian et al., 2003).

In the management of hypertension, pharmacological therapy is the main approach. However, long-term use of medications can cause side effects and decrease patient adherence, especially in the elderly group who also have other comorbidities (James et al., 2014). Therefore, non-pharmacological approaches, such as lifestyle modification, low-salt diets, light exercise, and relaxation-based interventions are important to study further.

One of the relaxation approaches that is developing in alternative therapy is music therapy. Music can decrease the activity of the sympathetic nervous system, stimulate the release of endorphins, and lower cortisol levels in the body (Thoma et al., 2013). This mechanism can help lower blood pressure through a calming effect on the cardiovascular system. Various studies have shown that slow-tempo music, especially classical or instrumental genres, can lower blood pressure in various populations (Trappe & Voit, 2016).

Music therapy has advantages because it is non-invasive, safe, inexpensive, and can be applied individually or in groups. However, there are still doubts about the effectiveness of music therapy, especially in the elderly with hypertension. Some studies show varying results, depending on the duration, type of music, and characteristics of the participants (Lee et al., 2016).

Several previous studies have shown that instrumental classical music, especially works from composers such as Mozart and Bach, has a significant calming effect on the cardiovascular system (Okada et al., 2009; Trappe, 2010). However, the implementation of music therapy in the elderly in Indonesia is still limited, and local evidence on its effectiveness is still needed, especially in the context of Indonesian culture and music preferences.

This study aims to examine the effectiveness of music therapy in reducing blood pressure in the elderly with hypertension. It is hoped that the results of this study can strengthen scientific evidence and provide therapeutic alternatives that are easy to apply in community environments and health care facilities.

2. METHOD

2.1 Research Design and Location

This study used a quasi-experimental approach with a pretest-posttest control group design, which measured blood pressure in two groups (intervention and control) before and after treatment. This design was chosen because it allowed researchers to compare the effects of music therapy on blood pressure directly, even without full randomization. The research was conducted at the Nursing Home Bhakti Usia, an elderly service institution located in the city of Medan, North Sumatra, during the period from January 1 to February 14, 2025. This location was chosen based on consideration of the availability of the number of elderly hypertensive people who meet the criteria, as well as support from the orphanage manager for intervention activities.

2.2 Population and Sample

2.2.1 Population

The target population in this study is all elderly people aged ≥ 60 years who suffer from mild to moderate hypertension, and who are permanently domiciled in the nursing home.

2.2.2 Samples

Samples were taken using purposive sampling techniques, which are based on certain inclusion and exclusion criteria. Criteria included: Elderly ≥ 60 years old; Have a diagnosis of mild to moderate hypertension (systolic TD 140–159 mmHg and/or diastolic 90–99 mmHg) based on the results of the last measurement within the last 2 weeks; Can hear quite well (do not have severe hearing loss); Not having severe cognitive impairment (evidenced by Mini-Mental State Examination (MMSE) > 24); Be willing to be a participant and participate in the intervention for 14 days.

Exclusion criteria: Have heart rhythm disorders or other severe cardiovascular conditions (such as congestive heart failure); Undergoing psychopharmaceutical therapy that can affect blood pressure; Have hearing loss that prevents the reception of musical stimuli; Elderly who are uncooperative or often leave the orphanage.

2.2.3 Number of Samples

The total number of samples was 40 people, divided evenly into two groups: Intervention Group: 20 elderly people who were given music therapy. Control Group: 20 elderly people who were given no intervention other than daily routine and standard medication. This sample size was determined based on references to previous studies (Bradt & Dileo, 2014) and took into account time constraints and population availability at the study site.

2.3 Intervention Procedures

The intervention group was given classical instrumental music therapy daily for 14 consecutive days, with a 30-minute music listening session per day. The music used is: *Mozart – Piano Sonata No. 16 in C major, K. 545*; *Bach – Air on the G String*.

Music is played using stereo headphones with a stable volume at 50–60 dB. The elderly sit or lie quietly in a special quiet and comfortable room, provided by the orphanage manager. Therapy is carried out every afternoon at 15.00–15.30 WIB, with supervision from researchers and accompanying nurses.

The control group went through the daily routine as usual without music intervention, but still received the same blood pressure checks and surveillance to ensure the equality of the procedure.

2.4 Instruments and Measurements

Blood pressure measurements are performed using an automated digital sphygmomanometer (Omron HEM-7130) that has been calibrated and tested for accuracy. Each measurement is performed: Two consecutive measurements, with a 5-minute gap between measurements; The average result is used as a daily blood pressure value; It is done before the first session (pre-test) and after the last session (post-test). In addition, the cognitive status screening instrument uses MMSE (Mini Mental State Examination) to ensure respondents do not have severe dementia disorder that can affect auditory stimulus processing.

2.5 Data Analysis

Data were analyzed using SPSS software version 25. The analysis steps include: Normality test with Kolmogorov-Smirnov to see the distribution of data; The paired t-test was used to test for changes in blood pressure in the intervention and control groups intra-group; An independent t-test was used to compare changes in blood pressure between the intervention group and the control group; The significance level was set at $p < 0.05$.

3. RESULTS AND DISCUSSION

3.1 General Characteristics of Respondents

This study involved 40 elderly respondents who were divided into two groups, namely the intervention group (n=20) and the control group (n=20). The characteristics of respondents in both groups are shown in Table 1.

Table 1. Characteristics of Respondents in Both Groups

Characteristics	Intervention Group (n=20)	Control Group (n=20)	p-value
Age (years), average ± elementary school	68.5 ± 5.9	67.8 ± 6.2	0,712
Gender (P/L)	13 / 7	12 / 8	0,749
MMSE Value	27.4 ± 1.8	27.1 ± 2.1	0,638

Analysis of independent t-test and chi-square tests showed no significant differences between the two groups on the variables of age, sex, and cognitive status ($p > 0.05$). This showed that both groups were equal before the intervention.

3.2 Changes in Blood Pressure Before and After the Intervention

Blood pressure measurements were taken before (day 1) and after (day 14) of the intervention. The results of systolic and diastolic blood pressure analysis in each group are shown in Tables 2 and 3.

Table 2. Average Systolic Blood Pressure Before and After Intervention

Group	Pre-Test (mmHg)	Post-Test (mmHg)	Average Difference	p-value (Paired t-test)
Intervention	149,6 ± 7,1	140,2 ± 6,8	-9,4	0,004
Control	150,1 ± 6,9	148,3 ± 6,5	-1,8	0,312

Table 3. Average Diastolic Blood Pressure Before and After Intervention

Group	Pre-Test (mmHg)	Post-Test (mmHg)	Average Difference	p-value (Paired t-test)
Intervention	93,2 ± 5,6	87,1 ± 4,9	-6,1	0,008
Control	92.7 ± 5.2	91.9 ± 5.1	-0.8	0,404

3.3 Comparison of Effectiveness Between Groups

To see whether the changes in blood pressure that occurred in the intervention group were statistically different from the control group, an independent t-test was analyzed on the difference in mean blood pressure (delta) between the two groups. The results are shown in Table 4.

Table 4. Comparison of Blood Pressure Changes Between Groups

Types of Pressure	Blood Average (mmHg)	Intervention Change Average (mmHg)	Control Change Average (mmHg)	p-value (Independent t-test)
Systolic	-9.4 ± 5.2	-1.8 ± 4.7		0,001
Diastolik	-6.1 ± 3.9	-0.8 ± 3.6		0,003

These results showed that there was a significant difference between the intervention and control groups in terms of decreased systolic and diastolic blood pressure ($p < 0.01$).

3.4 Equivalence of Respondents' Basic Characteristics

The balance of basic characteristics between the intervention group and the control group is an important aspect of the quasi-experiment because it guarantees that the differences in outcome that arise come from the intervention given, not from confounding variables. In this study, the mean age of the intervention (68.5 years) and control (67.8 years) groups did not differ significantly ($p = 0.712$), as did the sex distribution ($p = 0.749$) and MMSE value ($p = 0.638$). This is in line with the principle of internal validity in quasi-experimental design as affirmed by Creswell (2014), that homogeneity between groups increases the inferential power of results.

The cognitive status of the respondents was measured by MMSE and the results showed that all respondents were within the normal range (MMSE > 24), which indicated adequate cognitive capacity to receive and process musical stimuli. This is important because music therapy, as a sensory and affective stimulus-based intervention, requires the integrity of the basic cognitive and cognitive processing systems (Bradt & Dileo, 2014).

Age equality is also important considering that age factors affect vascular tone, vascular elasticity, and response to relaxation. According to Whelton et al. (2018), the elderly over the age of 65 experience an increased blood pressure response to stress, but also show increased sensitivity to non-pharmacological relaxative interventions, such as music therapy.

Gender balance also strengthens the argument that intervention outcomes are not influenced by hormonal differences or psychoaffective responses to music, which sometimes differ between men and women. Research by Thoma et al. (2013) stated that the effects of music on stress and blood pressure tend to be uniform in terms of gender in the elderly population.

Thus, the balanced characteristics in this study support the conclusion that the differences in blood pressure observed after intervention may be more validly associated with the effects of music therapy, rather than due to demographic or cognitive differences between groups.

3.5 Effects of Music Therapy on Systolic Blood Pressure

The decrease in mean systolic blood pressure of -9.4 mmHg in the intervention group was a statistically significant finding ($p = 0.004$) and had important clinical value. Instrumental classical music used in the intervention is likely to affect the autonomic nervous system, in particular increasing parasympathetic activity and reducing sympathetic activity, which ultimately lowers blood pressure (Okada et al., 2009; Bernardi et al., 2006).

The effects of music on the autonomic nervous system have been described neurophysiologically in various studies. Music with a slow tempo and stable harmonies—such as the works of Mozart and Bach—has been shown to induce alpha brain waves that correlate with deep relaxation states (Chuang et al., 2011). These waves lead to the release of neurotransmitters such as calming dopamine and serotonin, as well as a decrease in cortisol levels in response to stress.

Bradt and Dileo (2014) in their meta-analysis concluded that music therapy can reduce systolic blood pressure by 8–10 mmHg in the adult population, including the elderly, and this effect is increased when music is given in a quiet setting with a duration of at least 20 minutes per session. This condition is in accordance with the protocol used in this study, namely music is played for 30 minutes indoors with minimal distractions.

A decrease in systolic blood pressure of >5 mmHg has been associated with a 14% reduced risk of stroke and a 9% risk of coronary heart disease (Law et al., 2009). Therefore, the effect of music intervention in this study is not only statistically significant but also clinically impactful in lowering cardiovascular risk in the elderly.

These findings are consistent with an experimental study by Lee et al. (2016) that found that listening to classical music for two weeks lowered systolic blood pressure in hypertensive patients by 6–10 mmHg. Therefore, the data of this study adds empirical weight that music therapy is effective and replicable in the context of the elderly in Indonesia.

3.6 Effects of Music Therapy on Diastolic Blood Pressure

The average decrease in diastolic blood pressure of -6.1 mmHg found in the intervention group was also statistically significant ($p = 0.008$), and showed that music therapy had a dual effect, both on systolic and diastolic pressure. A decrease in diastolic blood pressure generally reflects an influence on peripheral vascular resistance, which is strongly influenced by sympathetic tone.

A decrease in diastolic blood pressure was also obtained in a study by Hirokawa et al. (2012), in which slow music played daily for 10 days led to a diastolic decrease of 4–7 mmHg. This effect is explained through the relaxation of the peripheral arterioles due to a decrease in vasomotor center excitation in the medulla oblongata.

According to Bernardi et al. (2006), music therapy can modulate blood pressure fluctuations through synchronization between respiration, heart rate, and musical rhythmic patterns, a phenomenon known as entrainment. This response leads to increased heart rate variability (HRV) which is associated with increased parasympathetic tone and decreased blood pressure.

In the context of geriatrics, high diastolic blood pressure is associated with increased afterload and the risk of damage to target organs such as the kidneys and retina. Therefore, the effects of music therapy that have been shown to lower diastolic also have therapeutic significance in preventing long-term hypertension complications (Whelton et al., 2018).

Thus, the results of this study not only reinforce the results of international studies, but also provide empirical evidence based on local populations that music therapy is a holistic approach, significantly influencing both blood pressure parameters.

3.7 Consistency of Decrease in Both Components of Blood Pressure

The effectiveness of simultaneous interventions on systolic and diastolic blood pressure shows that music does not only affect one physiological aspect, but also works on the systemic blood pressure regulation system. This is in line with the theory that music decreases the activity of the sympathetic nervous system, increases the parasympathetic system, and lowers stress hormones such as cortisol and adrenaline (Thoma et al., 2013).

The consistency of the decrease in these two blood pressure parameters is important, since not all non-pharmacological interventions show symmetrical effects on systolic and diastolic. Many previous studies have found that relaxation or mediation only effectively lowers one of the parameters. In this study, it was found that the effects of music therapy were balanced, showing the depth of the intervention's influence on systemic circulation.

According to Trappe's (2010) research, certain genres of music can affect various body systems through auditory processing in the midbrain, which is directly related to the hypothalamus and autonomic regulatory centers. This effect extends to the cardiovascular and respiratory systems, which explains why blood pressure can drop consistently.

Studies from White (1999) also support that structured, repetitive music therapy over several days provides a consistent effect on blood pressure, regardless of age or gender. That is, the effect is universal physiological mediated by neurovegetative mechanisms, not merely suggestive or psychological effects.

The consistency of these results adds to the credibility of the music intervention method in the management of hypertension in the elderly. It also shows that the influence of music on blood pressure regulation is not fluctuating, but stable throughout the intervention period.

3.8 Statistical Validation of Intervention Effectiveness

Strong statistical validation of the results of this study was obtained through a combination of paired t-test for intra-group change and independent t-test for intergroup comparison. The p-value obtained (<0.01) across the test showed that the effect of music therapy on blood pressure reduction was real and consistent, not due to random fluctuations.

According to Field (2013), the combination of the two tests can test two important dimensions of the effectiveness of the intervention: consistency in groups (paired) and the strength of differences between groups (independent). When both types of tests show significance, then the validity of the intervention effect can be ascertained with a high level of confidence.

Previous research by Chang et al. (2008) also used a similar statistical approach and found that music therapy significantly lowered blood pressure in hemodialysis patients. These results suggest that the effects of music therapy can be replicated across populations and clinical contexts.

Further, these results show that although music therapy is simple and inexpensive, its effects can be quantitatively verified and proven through established statistical methods. This is important to support the integration of music therapy in evidence-based clinical service protocols.

With high statistical validity, the results of this study have the power to be used as a basis for policy recommendations in geriatric nursing practice, especially in community and nursing homes.

4. CONCLUSION

Based on the results of a study that has been conducted on 40 elderly respondents with mild to moderate hypertension, it can be concluded that instrumental classical music therapy has been proven to be statistically and clinically effective in lowering systolic and diastolic blood pressure. An average decrease in systolic blood pressure of 9.4 mmHg and diastolic blood pressure of 6.1 mmHg in the intervention group suggests that these interventions may provide significant physiological benefits for the elderly population. The effectiveness of this music therapy can be attributed to neurophysiological mechanisms in the form of activation of the parasympathetic nervous system, decreased sympathetic activity, and influence on stress hormones such as cortisol. Music with the characteristics of slow rhythm and stable harmony plays a role in stimulating a state of deep relaxation that favors a decrease in blood pressure. The results of this study are also in line with various previous studies that stated that music can be a non-pharmacological therapeutic tool that is safe, cheap, and easy to implement. The consistency of blood pressure reduction in both components (systolic and diastolic) showed that the effect of music therapy was comprehensive, systemic, and not selective on just one of the parameters. This strengthens the argument that music therapy has the potential to be included in complementary approaches to hypertension management in the elderly, both in the context of the community and nursing home services. The internal validity of the study was strengthened by a quasi-experimental design with a balanced control group, as well as statistical analysis demonstrating high significance. Thus, the results of this study provide a strong foundation to consider music therapy as part of routine interventions in the integrative management of blood pressure in the elderly. Overall, this study proves that music therapy is not just an entertainment tool, but also has scientifically proven therapeutic value, especially in supporting blood pressure reduction in at-risk populations such as the hypertensive elderly. Music therapy can begin to be integrated into routine activities in nursing homes, elderly service centers, and primary health facilities as a form of non-pharmacological therapy that is supportive. Music therapy can be combined with other relaxation techniques such as breathing exercises or meditation to synergistically enhance the therapeutic effect, especially in the elderly with hypertension and anxiety. This research can be replicated in populations with different clinical conditions, such as post-stroke patients, people with hypertensive diabetes, or in urban and rural elderly communities with diverse musical preferences. The selection of music used in therapy needs to take into account the cultural preferences and backgrounds of the elderly individual, so that the intervention can be well received emotionally and more physiologically impactful.

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