The effect of Mozart’s classical music on blood pressure in Wistar white rats (Rattus norvegicus)

Rivans Jackson Tandirerung¹, Irwanto¹*, Anak Agung Ngurah Krisna¹

ABSTRACT

Introduction: Classical music has beneficial effects on heart rate variability and also reduces one’s stress levels due to parasympathetic dominance. Mozart’s classical music was shown to provide subsequent short-term enhancement of spatial-temporal reasoning ability. This research aimed to study the effect of Mozart’s classical music on blood pressure.

Methods: The design of this study is true experimental with a post-test-only design with a control group. Thirty Wistar white rats were randomized by simple random sampling method into the control group and experimental group receiving Mozart’s classical music for 90 minutes, twice daily for 1, 3, and 4 weeks. SBP, DBP, and MAP were measured and analyzed using descriptive analysis, Shapiro Wilk, Mann-Whitney U, and Wilcoxon Sign Rank test.

Results: DBP and MAP of the experimental group week 1 and 3 were significantly different from the control group. There were significant differences between SBP, DBP, and MAP of experimental group week 1 from week 3 (p=0.00, p=0.00, p=0.00 respectively) and week 1 from week 4 (p=0.00, p=0.00, p=0.00).

Conclusion: Listening to Mozart’s classical music has a direct effect on blood pressure.

Keywords: Blood pressure, Classical Music, Hypertension, Mozart, Normotension.


INTRODUCTION

Music therapy is relatively safe and is an inexpensive intervention technique.¹,² A study shows that listening to music benefits cardiology and neurological function.³ Music therapy provides many benefits for people with hypertension, such as lowering blood pressure and reducing anxiety, stress, and pain.⁴,⁵

Neuro-imaging studies have found that listening to music involves many brain structures important for emotional, sensory, and emotional motor skills, especially the mesocorticolimbic system. Music was proven to reduce the activity of the hypothalamus-pituitary axis (HPA) and the sympathetic adrenal (SAM) axis, helping the body feel relaxed and pleased.⁶ According to a study, orchestrated music, especially classical music, which is highly organized in tempo, pitch, and tonality, closely resembles a “symphony” of biological rhythms set in sub-conductor/suprachiasmatic (SCN) living subjects and can alter cardiovascular function in freely moving mice.⁷

Mozart classical music has various characteristics in the development of health sciences, including soft tone, which stimulates alpha waves, calms, and relieves stress. Relaxation, in response to cognitive, physiological and behavioral stimulation, promotes the emergence of chemicals useful for reducing tension and pressure on the arteries.⁸ Research with children aged 15-17 years reported that listening to classical music can reduce blood pressure in children with high blood pressure.⁹ It was also reported that classical music benefits heart rate variability and reduces stress levels due to parasympathetic dominance.¹⁰ Based on this description, this study wanted to see the effect of giving Mozart classical music stimulation on blood pressure in experimental animals.

MATERIAL AND METHODS

The design of this study is true experimental with a post-test-only design with a control group. Inclusion criteria included Wistar white rats (Rattus norvegicus) aged 3-4 weeks, body weight 80-100 grams, had never been used as research objects before, were not disabled, and were declared healthy by a veterinarian. In contrast, the exclusion criteria were sick or dead mice at the time of data collection.

Thirty Wistar white rats were randomized by simple random sampling method into two groups: the group that did not receive classical music stimulation (control group) and the group receiving classical music. The group with classical music stimulation was exposed to classical music for 90 minutes, twice daily at 8.00-9.30 AM and 3.00-4.30 PM, through a music player 30 cm away from the cage. The stimulation was given daily for 1, 3, and 4 weeks. The mice were then put into a measurement container according to the size of the mice. A cuff was subsequently attached to the mice’s tail then systolic blood pressure (SBP), diastolic blood pressure (DBP), and mean arterial pressure (MAP) were measured. The SBP, DBP, and MAP were then consequently analyzed using descriptive analysis, Shapiro Wilk, Mann-Whitney U, and Wilcoxon Sign Rank test.

Open access: www.balimedicaljournal.org
RESULTS
The descriptive statistic analysis was provided in detail in Table 1. According to Mann-Whitney analysis comparing the experimental and control groups, DBP and MAP of experimental group weeks 1 and 3 significantly differed from the control group. Based on the Wilcoxon Signed Rank Test, there were significant differences between SBP, DBP, and MAP of experimental group week 1 from week 3 (p<0.00, p=0.00, p=0.00 respectively) as well as week 1 from week 4 (p<0.00, p=0.00, p=0.00). In contrast, SBP, DBP, and MAP of the experimental group week 3 from week 4 have no significant differences.

DISCUSSION
The results of this study are in accordance with previous studies, such as those conducted by Suoto and Akiyama (2004), which stated that music could reduce blood pressure through the mechanism of increasing dopamine production in the brain. Another study conducted by Krout (2007) showed that music therapy also changes the limbic system by slowing brain activity. Those changes are associated with the changes in psychological status, such as mood, anxiety, and stress levels, which potentially cause physiological responses, including changes in blood pressure and pulse rate.

This study found that systolic blood pressure was not affected by Mozart’s classical music. However, the data obtained from MAP measurements in the music group and the control group obtained significant values in weeks 1 and 3. Four studies investigated the effects of classical music on blood pressure. Statistically significant reductions in blood pressure were noted in three of the four studies. Lemmer (2008) also shows a decreased heart rate exposure to Mozart’s music. These studies’ results are similar to our study’s, especially in week 1 and week 3.

However, the results of blood pressure measurements at week 4, which were not significantly different, are an interesting phenomenon. This result requires further research to ensure if the effect of Mozart’s classical music on blood pressure decreases after exposure to music for a certain time.

CONCLUSION
Listening to Mozart’s music directly affected diastolic pressure at weeks 1 and 3 and MAP at weeks 1 and 3. There was a significant difference in systolic and diastolic blood pressure between weeks 1 and 3, as well as a significant difference between weeks 1 and 4. However, there was no significant difference in systolic and diastolic blood pressure between weeks 3 and 4. The results found statistically that the Mann-Whitney or Wilcoxon tests were insignificant at weeks 3 and 4. This could result in desensitization of the dopamine receptors with a mechanism of decreased affinity or downregulation after exposure to the same music for a long time.

CONFLICTS OF INTEREST
The author reports no conflicts of interest in this work.

ETHICAL CLEARANCE
Ethical clearance for this research was obtained from the Health Research Ethics Committee, Faculty of Veterinary Medicine, Universitas Airlangga, number 2.KE.070.06.2021

ACKNOWLEDGMENTS
We would like to express our gratitude to the teaching staff, outpatient clinic staff, and residents at the Department of Child Health, Dr. Soetomo General Hospital, Surabaya, Indonesia.

REFERENCES