



Effect of Musical Therapy on Malondialdehyde Levels on Male Mice Brain Tissue

Irmawan Farindra^{1*}, Akbar Reza Muhammad², Hafid Algristian³, Warda Elmaida Rusdi⁴, Dyah Yuniati⁵

¹Department of Anatomy and Histology, Faculty of Medicine, Universitas Nahdlatul Ulama Surabaya, Surabaya, Indonesia

²Faculty of Medicine, Universitas Nahdlatul Ulama Surabaya, Surabaya, Indonesia

³Department of Psychiatry, Faculty of Medicine, Universitas Nahdlatul Ulama Surabaya, Surabaya, Indonesia

⁴Department of Public Health, Faculty of Medicine, Universitas Nahdlatul Ulama Surabaya, Surabaya, Indonesia

⁵Department of Neurology, Faculty of Medicine, Universitas Nahdlatul Ulama Surabaya, Indonesia

*Corresponding Author: irmawanfarindra@unusa.ac.id

DOI: 10.33086/iimj.v5i2.5318

ARTICLE INFO

Keywords:
Music Therapy;
Classical Music;
Murottal Al-
Qur'an;
Malondialdehyde;
Oxidative Stress

Submitted: Oct
30th 2024

Reviewed: Feb
27th 2024

Accepted: May
20th 2024

ABSTRACT

Introduction: An example of a non-pharmacological therapy that is currently being developed is music therapy. The serenity created from classical music and *murottal* therapy is good for therapy performance, accelerating the healing process, and also reducing stress levels.

Objective: This study aimed to examine the effects of classical music "Mozart" and *Murottal* Al-Qur'an therapy on mice malondialdehyde levels

Methods: This study used 24 male BALB/c strain mice (10-12 weeks), in a true experimental setting using the Post-Test-Only Control Group Design. Four groups of mice were created: K (control), P1 (*murottal* Al-Qur'an), P2 (classical music "Mozart"), and P3 (combination therapy). Statistical analysis was used with a significance of $p < 0.05$.

Results: According to study findings, the P2 group had the highest average malondialdehyde level meanwhile the lowest average malondialdehyde levels were found in Group P1. The test results showed no significant relationship ($p = 0.213$)

Conclusions: The findings of this study showed that there was no significant correlation between malondialdehyde levels when "Mozart" classical music and *Murottal* treatment were given. The group who received the classical music "Mozart" nevertheless, had higher malondialdehyde levels, according to the findings.

Introduction

In the current era, the human body is very vulnerable to exposure to free radicals. The free radicals can come from inside and outside the human body itself. Free radicals originate from normal metabolic processes in the body such as phagocytosis, aerobic metabolism, prostaglandin (PGs) synthesis,

or certain external factors such as ionizing radiation (IR), xenobiotics, and pollutants (Fang et al., 2002; Mfotie Njoya, 2021). Free radicals damage various cell components, including deoxyribonucleic acids, membrane lipids, and proteins (Dobyns et al., 2006). All these factors involved in free radical production will

activate different pathways to induce oxidative stress.

Previous research has proven the influence of the Al-Quran on the behavior of mice. The Al-Quran recitation can improve conditions of depression at a hearing frequency of 60 decibels (dB) but triggers conditions of aggression at a frequency of 80 dB (Algristian et al., 2022). Mice-model of cancer that were exposed to the Al-Quran recitation at a therapeutic frequency were also able to prevent the development of cancer cells (Muhammad et al., 2022). Until now there has been no research comparing reading the Al-Quran recitation and music on individual health conditions. This research tries to make this comparison.

Music is a form of art that can be a crucial factor in human life. Not only does it serve as entertainment, but it can also influence human physiological and psychological processes (Rebecchini, 2021). In the medical context, music has been associated as one of the flexible treatment methods, aiming to improve various aspects of human health and well-being (Gooding, 2018; Yinger, 2018). Through several studies that have been conducted, music therapy has shown several benefits for human health, such as being able to improve the quality of life in mental illness patients, improve cognitive

skills, reduce anxiety, and so on (Gropper & Miller, 2020).

Quality music therapy generally uses sounds that are calm, simple, and have a regular tempo (Saraswati, 2014). One type of music that can be used as therapy is *Murottal* Al-Qur'an. The sound of the *Murottal* Al-Qur'an has a constant and regular rhythmic characteristic and is quieter. Another type of music that can be used is classical music which consists of a combination of several instruments such as violin, piano, cello, and so on. This type of music is also known to have a calming, relaxing, and relaxing impression (Burrai et al., 2020) related to the impact of listening to classical music showed an improvement in the quality of life in heart failure patients. through the above background, research is needed regarding the effect of *murottal* Al-Qur'an and classical music "Mozart" listened to adult *Mus musculus* on brain tissue malondialdehyde levels.

Methods

Research design

This study is a true experimental study using male mice as experimental animals. The research design this time is a post-test-only control group design which aims to analyze the impact of giving Al-Qur'an *murottal* therapy, classical music "Mozart", and a combination of both on Malondialdehyde levels in mice.

Experimental animals

This study used male mice (*Mus musculus* strain BALB/c) obtained from the pharmacology laboratory, faculty of medicine, Hang Tuah University, Surabaya. A total of 24 mice (*Mus musculus*) with BALB/c strain. To minimize the homeostatic changes that occur during transportation and the hormonal changes caused by environmental changes, experimental animals will be acclimated for a week before treatment. The 24 mice were then separated into 4 groups (n=6): Group K (control group), Group P1 (Murotal Al-Qur'an treatment), Group P2 ("Mozart" classical music treatment), and Group P3 (combination of treatments).

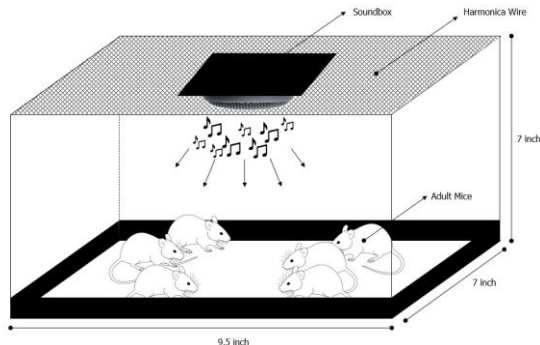


Figure 1. Treatment cage. Each treatment cage contained 6 mice with a soundbox placed on top of the cage facing down.

Treatment procedure

Furthermore, a sound source was placed above each group's cage at an effective distance of approximately 40 cm (Figure 1). According to the various experimental treatments, previously prepared mice were

placed into isolation cages in various rooms. Three soundboxes/tape recorders using Al-Qur'an Murrotal sound therapy (sura Al-Fatiha and Al-Baqarah by Qori' Al-Mathrud) and the well-known "Mozart" ("Sonata in D for two pianos, KV448-Allegro con spirito") music sound therapy was used for the treatment of mice for two hours every day for a total of 20 days.

Mice malondialdehyde level measurement

On the 21st day, the mice will be dissected and the right cerebral hemisphere tissue will be taken, and then placed in an Eppendorf tube. MDA levels were measured using the TBARS spectrophotometry method with a wavelength of 532 nm.

Data analysis

The value of Malondialdehyde levels of each mouse in the group obtained will be subjected to statistical tests. The significance of the data will be evaluated in this study using the One-Way ANOVA test. Post hoc Mann Whitney-U was used to determine which groups were different in terms of variables. The value of $p < 0.05$ is considered to indicate a statistically significant difference.

Results and Discussion

This study aimed to prove whether or not exposure to "Mozart" classical music and *murottal* Al-Qur'an music had any effects. *Murottal* Al-Qur'an therapy is one of the

non-pharmacological therapies that has been developed in recent years. *Murottal Al-Qur'an* treatment has been the topic of research that has been successful in showing a good effect on several illness problems, including high blood pressure (hypertension), levels of stress and anxiety, and depression. (Irmachatshalihah et al., 2019; Yunus et al., 2021; Zahra et al., 2019)

We obtained an average value of malondialdehyde levels that varied through each group through the results of the tests carried out in each group. The P2 group, or the group that received Mozart music, had the highest average malondialdehyde level, with a value of 341.33 and 184.06—with a total of 204.83 45.50, group P1, who received the *murrotal Al-Quran* therapy, had the lowest average number of malondialdehyde levels. The analysis findings were further investigated by doing a One-way ANOVA test, which showed that there was no significant correlation between Mozart classical music and *murottal Al-Qur'an* treatment on increasing mice malondialdehyde levels ($P > 0.05$).

Observation results showed that mice induced by *murottal Al-Qur'an* therapy tended to be calmer and less aggressive than other groups. Meanwhile, the combined group had the most aggressive and hyperactive tendencies, as evidenced by the injuries found in almost every combined treatment group. Table 1 shows the findings

of the overall observation of the study subjects' behavior.

According to Figure 2, the P1 group's average MDA level was the lowest among all the test groups, at 204.83 nmol/g. The result indicates the group of mice exposed to the *Murrotal Al-Quran* therapy method does not experience stress. The same outcomes were found in Kurniasari's research from 2017; one group of mice ($n = 5$) exposed to the *Murrotal Al-Quran* for two hours each day had an average MDA level of 0.42 nmol/mL. Kurniasari et al., 2017)

Several other scientists have widely researched the use of classical music as a method of music therapy. A prior study found that when it comes to improving mice's (*Mus musculus*) spatial memory, Mozart's and *Murottal's* classical music have the same effect. However, when mice are given both approaches, their spatial memory is superior and their level of aggression is higher (Muhammad et al., 2023).

In this study, we found that the group that was treated with classical music "Mozart" had a malondialdehyde level of 341.33 ± 184.06 , which was the highest among the other groups. This increase in malondialdehyde levels indicates that the mice in the P1 group experienced stress due to the classical music of "Mozart". Apart from these results, we realize that the

effectiveness or success rate of using this therapy method varies in different cases. Research on classical music therapy (Guétin et al., 2009) on anxiety, depression, and mood experienced by 13 patients with traumatic brain injury for 20 weeks. The results showed that music therapy was able to improve patient mood in patients from the first session to the next. The provision of music therapy also significantly reduced anxiety and depression starting from week 10 to week 20 (the end of the study).

The results of the observation of the behavior of the *murottal* Al-Qur'an and Mozart group mice were better than the combined and control groups during the study period and the malondialdehyde level test. Mice who were given Koran therapy showed the lowest level of aggressiveness and were the calmest than the other treatment groups. This can be attributed to the optimal effect of dopamine and endorphins in the Qur'an group compared to

other groups. Both have the potential to create a calmer state in mice and tend to be less obsessive. Amanah & Esterlita Purnamasari, 2015; Olshansky et al., 2008) According to research by Kent Berridge, the two systems of “want” (dopamine) and “liking” (opioids) are complementary. The dopamine system is stronger than the opioid system. This system will make a person continue to seek satisfaction over and over again and continue to feel less so that they always want more than before. Berridge & Robinson, 1998)

Apart from the results obtained from this study, we realize that there are limitations in this study, one of which is the natural process that occurs biochemically in the body of mice. So that researchers cannot directly control the biomolecular changes that occur during the study. Another limitation is the genetic dominance in each mouse that is derived also cannot be controlled optimally.

Table 1. Test results for malondialdehyde levels and observation of animal behavior

Group	Total (n)	MDA Level (nmol/g)*	General Behavior	
			Aggressiveness	Agility
K	6	218,67 ± 89,06	++	++
P1	6	204,83 ± 45,50	-	+
P2	6	341,33 ± 184,06	+	++
P3	6	266,33 ± 108,76	+++	+++
<i>P</i> - Value		0,213		

Notes: + (low), ++ (medium), +++ (high). *) The results of the one-way ANOVA test showed insignificant results ($P > .005$) for both variables with Sig. of 0.213 in the malondialdehyde level. Data are shown as mean ± SD.

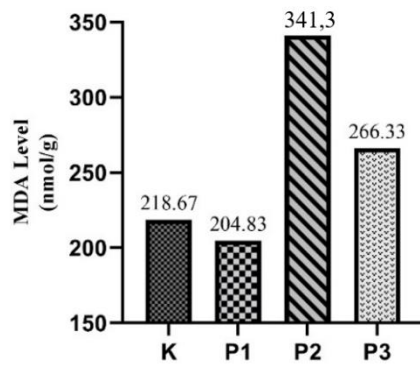


Figure 2. The average level of malondialdehyde levels in all study groups, Group K = Negative control (n = 218.67), P (1) = mice treated with Murrotal Al-Quran (n = 204.83), P (2) = Mice were treated with "Mozart" classical music, P(3) = mice were given a combination of Al-Quran Murrotal and Classical Music treatment

Conclusion

This study shows new insights into non-pharmacological therapeutic methods using classical music "Mozart". Based on the findings of this study, classical music therapy "Mozart" has the highest average score of malondialdehyde levels which indicates stress. Meanwhile, the group that was given Al-Qur'an *murottal* therapy had the lowest average score of malondialdehyde levels. Other findings on the general behavior of rats showed that the *murottal* Al-Qur'an treatment group showed calmer behavior, while the group with combined therapy treatment showed aggressive behavior. Therefore, further

research is needed to determine other factors that affect the aggressiveness of experimental animals.

Acknowledgment

We would like to thank the Universitas Nahdlatul Ulama Surabaya for their assistance so that this research can be carried out.

Conflict of Interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

References

- Algristian, H., Bintari, T. W., Iradatus Solihah, Andik Ferdiantoro, Fatmanagri Napstyawati, & Handajani, R. (2022). Quran recitation as noise-induced aggression and resilience in animal model of depression. *Bali Medical Journal*, 11(2), 994–1002. <https://doi.org/10.15562/bmj.v11i2.343>
- Amanah, L., & Esterlita Purnamasari, S. (2015). Efektivitas Mendengarkan Bacaan Al-Qur'an Terhadap Penurunan Tingkat Depresi pada Lansia. *Insight: Jurnal Ilmiah Psikologi*, 17(1), 11–28. <https://doi.org/10.26486/PSIKOLOGI.V17I1.681>

- Berridge, K. C., & Robinson, T. E. (1998). What is the role of dopamine in reward: Hedonic impact, reward learning, or incentive salience? *Brain Research Reviews*, 28(3), 309–369. [https://doi.org/10.1016/S0165-0173\(98\)00019-8](https://doi.org/10.1016/S0165-0173(98)00019-8)
- Burrai, F., Sanna, G. D., Moccia, E., Morlando, F., Cosentino, E. R., Bui, V., Micheluzzi, V., Borghi, C., & Parodi, G. (2020). Beneficial Effects of Listening to Classical Music in Patients With Heart Failure: A Randomized Controlled Trial. *Journal of Cardiac Failure*, 26(7), 541–549. <https://doi.org/10.1016/J.CARDFAIL.2019.12.005>
- Dobyns, E. L., Carpenter, T. C., Durmowicz, A. G., & Stenmark, K. R. (2006). Acute Respiratory Failure. *Kendig's Disorders of the Respiratory Tract in Children*, 224–242. <https://doi.org/10.1016/B978-0-7216-3695-5.50017-1>
- Fang, Y. Z., Yang, S., & Wu, G. (2002). Free radicals, antioxidants, and nutrition. *Nutrition*, 18(10), 872–879. [https://doi.org/10.1016/S0899-9007\(02\)00916-4](https://doi.org/10.1016/S0899-9007(02)00916-4)
- Gooding, L. F. (2018). Music Therapy in Mental Health Treatment. *Music Therapy: Research and Evidence-Based Practice*, 47–61. <https://doi.org/10.1016/B978-0-323-48560-9.00004-8>
- Gropper, M. A., & Miller, R. D. (2020). *Miller's anesthesia* (9th Edition). Elsevier.
- Guétin, S., Soua, B., Voiriot, G., Picot, M. C., & Hérisson, C. (2009). The effect of music therapy on mood and anxiety–depression: An observational study in institutionalised patients with traumatic brain injury. *Annals of Physical and Rehabilitation Medicine*, 52(1), 30–40. <https://doi.org/10.1016/J.ANNRMP.2008.08.009>
- Irmachatshalihah, R., Armiyati, Y., Studi, P., Keperawatan, I., Kesehatan, D., & Semarang, U. M. (2019). Murottal Therapy Lowers Blood Pressure in Hypertensive Patients. *Media Keperawatan Indonesia*, 2(3), 97–104. <https://doi.org/10.26714/MKI.2.3.2019.97-104>
- Kurniasari, S., Hepi Yanti, A., & Rima Setyawati, T. (2017). Kadar Malondialdehyde Induk dan Struktur Morfologis Fetus Mencit (Mus musculus) yang Diperdengarkan Murottal dan Musik Rock pada Periode Gestasi. *Protobiont*, 6(3), 89–97.
- Mfotie Njoya, E. (2021). Medicinal plants, antioxidant potential, and cancer. *Cancer: Oxidative Stress and Dietary Antioxidants*, 349–357.

- <https://doi.org/10.1016/B978-0-12-819547-5.00031-6>
- Muhammad, A. R., Palupi, Y. D., Astri, M., & Algristian, H. (2022). The effect of Quran recitation on t-cell lymphocyte activity in mice model of breast cancer. *Bali Medical Journal*, 11(3). <https://doi.org/https://doi.org/10.15562/bmj.v11i3.3473>
- Muhammad, A. R., Yuniati, D., Farindra, I., Fitriyah, F. K., & Algristian, H. (2023). Mozart's or murotal, which is more effective for spatial memory? an experimental study on mice (*Mus musculus*). *Bali Medical Journal*, 12(2), 1886–1891. <https://doi.org/10.15562/BMJ.V12I2.4299>
- Olshansky, B., Sabbah, H. N., Hauptman, P. J., & Colucci, W. S. (2008). Parasympathetic nervous system and heart failure: pathophysiology and potential implications for therapy. *Circulation*, 118(8), 863–871. <https://doi.org/10.1161/CIRCULATIONAHA.107.760405>
- Rebecchini, L. (2021). Music, mental health, and immunity. *Brain, Behavior, & Immunity - Health*, 18. <https://doi.org/10.1016/J.BBIH.2021.100374>
- Saraswati, D. A. G. P. (2014). *Pengaruh Terapi Musik Relaksasi Instrumental Terhadap Tingkat Kecemasan Pasien Stroke di Ruang HCU BRSU Tabanan*. Universitas Udayana.
- Yinger, O. S. (2018). Music Therapy in Gerontology. *Music Therapy: Research and Evidence-Based Practice*, 95–110. <https://doi.org/10.1016/B978-0-323-48560-9.00007-3>
- Yunus, E. S., Arismunandar, P. A., & Rukanta, D. (2021). Scoping Review: Pengaruh Mendengarkan Murottal Al-Quran terhadap Tingkat Stres Orang Dewasa. *Jurnal Integrasi Kesehatan & Sains*, 3(1), 110–116. <https://doi.org/10.29313/JIKS.V3I1.7503>
- Zahra, A., Nugroho, W., & Kusrohmaniah, S. (2019). Pengaruh Murattal Alquran Terhadap Tingkat Stres Mahasiswa Muslim di Yogyakarta. *Gadjah Mada Journal of Professional Psychology (GamaJPP)*, 5(2), 108–119. <https://doi.org/10.22146/GAMAJPP.50354>