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RESEARCH ARTICLE

Differences in Short-Term Memory Who Listen to Music and Those Who Don't Listen to Music in Students of the Faculty of Medicine, University of Muhammadiyah North Sumatra

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Abstract: Short-term memory has an important role in cognitive function, especially in the process of learning and remembering information in a short period of time. One of the external factors that is often associated with memory abilities is music. A number of studies have found that music can improve focus and memory, but there are also studies that show that music can actually interfere with concentration. This difference in results became the basis for a study to find out whether there was a difference in short-term memory between the group that listened to music and the group that did not listen to music in students of the Faculty of Medicine, University of Muhammadiyah North Sumatra. The study used a quantitative approach with a quasi-experimental post-test with control group design and was analyzed using an independent t-test. The results showed a significant difference between the two groups. The average short-term memory score for students who listen to music is 9.6486, while for students who do not listen to music is 6.3784 with a p-value of 0.001. These findings suggest that listening to music can have a positive effect on short-term memory improvement, especially when the music chosen is in accordance with individual preferences and supported by memorization practice.

Keywords: Listening to music, short-term memory, FK UMSU 2021 students

INTRODUCTION

Short-term memory is one of the important components in the human cognitive system that plays a role in storing information for a short time before the information is further processed or forgotten. This function is crucial in learning activities, decision-making, and the implementation of daily tasks, especially in the student population that faces a high academic burden.[1] One of the external factors that is thought to affect short-term memory function is music. Music, as a complex auditory stimulus, is known to have a wide range of effects on the activity of the central nervous system, including on areas of

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the brain that play a role in attention, memory consolidation, and emotion regulation.[2]

Neurophysiologically, music affects the limbic system and increases the activity of neurotransmitters such as dopamine and serotonin which can strengthen the process of encoding and memory retrieval. Music with a certain rhythmic and harmonic structure is even able to increase blood flow to the prefrontal cortex and hippocampus, two areas closely related to short-term information storage. However, responses to music are strongly influenced by the type of music, individual preferences, and the subject's cognitive and emotional state.[3] Classical, instrumental, and slow-paced music have been reported in several studies to improve concentration and memory capacity, while fast-paced music or dominant lyrics can decrease cognitive focus.[4]

Several previous studies have shown a positive effect of music on short-term memory improvement, but the results are still inconsistent. Differences in methodology, type of music, duration of exposure, and characteristics of the research subjects were factors that also influenced the results.[5]

Based on this background, this study aims to analyze the difference in short-term memory between students of the Faculty of Medicine, University of Muhammadiyah North Sumatra who listen to music and those who do not listen to music, and evaluate the influence of the type of music chosen on cognitive performance.

METHOD

This study is a quasi-experimental study with a posttest only with control group design which was carried out from February to April 2024 at the Faculty of Medicine, University of Muhammadiyah North Sumatra on 60 students of the class of 2021 who were selected by purposive sampling and divided into two groups, namely the intervention group that listened to classical instrumental music for 10 minutes and the control group without exposure to music. then all participants underwent a short-term memory test using the Digit Span Test (DST) from the Wechsler scale, with data analyzed using SPSS version 26 through an independent t-test and a significance level of $p < 0.05$, and had obtained ethical approval from the Health Research Ethics Committee of the Faculty of Medicine, University of Muhammadiyah North Sumatra number 1519/KEPK/FKUMSU/2024.

RESULT

Table 1. Sample Characteristics Towards Music by Gender

L/P	n (%)	Samples Listening to Music	Samples That Don't Listen to Music
LK	41 (55,40%)	22 (59,45%)	19 (51,35%)
PR	33 (44,59%)	15 (40,54%)	18 (48,64%)

From table 1. showing 41 males (55.40%) and 33 females (44.59%). This shows that men are more numerous than women, both in the group that listens to music and does not listen to music.

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Table 2. Characteristics of the Type of Music Heard in the Sample

Types of Music	n (%)
Classical	6 (16,21%)
Pop	2 (5,4%)
Rock	5 (13,51%)
Jazz	9 (24,32%)
Rhythm and Blues (R&B)	5 (13,51%)
Dangdut	4 (10,81%)
Country	6 (16,21%)
Total	**37 (100%)**

From table 2. It can be said that jazz music is listened to more with a number of 9 (24.32%) and pop music with the least amount of 2 (5.4%).

Table 3. Average Short-Term Memory That Listens to Music and Doesn't Listen to Music.

	n	mean	p
Listening to Music	37	9.6486	
Not Playing Music	37	6.3784	<.001

From table 3. The average result was obtained that those who listened to music were 9.6486 and those who did not listen to music 6.3784 with a p value of 0.001 so that it was stated that there was a significant difference between short-term memory in the group that listened to music and the group that did not listen to music.

Table 4. Average Short-Term Memory for Music Type

Types of Music	N	Mean ± SD
Classical	6	9.67±2.160
Pop	2	9.00±2.828
Rock	5	9.40±2.702
Jazz	9	9.44±2.833
R&B	5	10.80±2.168
Dangdut	4	9.50±2.887
Country	6	9.50±2.429

From table 4. The results showed that R&B music had the highest average score compared to other types of music, at 10.80, indicating that R&B music tended to have the highest positive influence on respondents' short-term memory. Meanwhile, the type of Pop music was recorded to have the lowest average score of 9.00, but it should be noted that the number of respondents who listened to Pop music in this study was very small, namely only 2 people.

Overall, this table indicates that there are differences between the types of music listened to and short-term memory abilities, although the different sample sizes between musical groups warrant further research with a larger number of respondents in order to come to stronger and broadly generalizable conclusions.

DISCUSSION

The results of this study show that listening to music has a significant influence on increasing short-term memory capacity in college students. The group that received music stimulation showed a higher average memory value than the control group without music, with a statistically significant difference ($p < 0.001$). These findings confirm that music can function as a cognitive stimulus that supports the learning process, especially in strengthening information retention in short-term memory.[6]

From the analysis by gender, it is known that the majority of respondents who

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listen to music are men (59.45%). Men also tend to have higher short-term memory capacity than women. This is thought to be related to differences in brain area activation in short-term memory function, as well as the influence of reproductive hormones and stress.[7] Estrogen, for example, is known to enhance synapse facilitation as well as affect the regulation of dopamine and acetylcholine, both of which play a role in memory function. However, some other studies reported no meaningful differences between men and women in short-term memory performance.[8]

Holcomb's research stated that the results of *the word recall test* and *the Memory Functioning Questionnaire* (MFQ) did not show significant differences between the sexes. In contrast, another study by Zilles and Solianik showed that women had slightly lower short-term memory capacity than men. This shows that differences in performance by gender are not consistent, so biological, hormonal, and psychosocial factors may play a complex role.[9]

Jazz music is also reported to provide positive benefits by improving concentration, focus, and cognitive work performance, in accordance with the improvisational and harmonious nature of jazz music that stimulates brain activation that supports memory. Country music with a clear melodic structure and a moderate tempo also contributes similarly to increased concentration and memory retention.[10]

The findings are in line with the Mozart Effect theory, which states that music can improve cognitive function, including short-term memory, by stimulating both hemispheres of the brain. Instrumental music or music with a calming tempo is considered more beneficial because it does not interfere with the focus of learning, in contrast to lyrical music that has the potential to distract.[11]

Some studies have also reported an increase in short-term memory scores after listening to classical music, including Mozart's music, which is reported to improve performance on standard IQ tests. Classical music is believed to not only improve concentration, but also balance the functions of the right and left brains, which ultimately favors the development of intellectual and emotional aspects.[12]

In addition to the classics, other genres such as jazz, country, and blues also provide cognitive benefits. Musik blues, misalnya, dikaitkan dengan peningkatan kreativitas, kemampuan berbahasa, pengurangan stres, serta perbaikan mood.[13] Karawitan music is also reported to have a positive effect on memory function through soft and soothing melodies, which help reduce psychic and physiological tension thereby increasing concentration. Thus, it is clear that different types of music can provide cognitive benefits, although the mechanisms and effects can vary depending on the characteristics of the music as well as individual preferences.[14]

However, not all music has a positive influence. Some studies have found that rock or heavy metal music has a negative impact

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on emotions and memory, especially because of the intensity of rhythms and lyrics that can trigger psychological tension. This emphasizes that the selection of music genres in the context of learning cannot be done carelessly. Music that is instrumental, harmonious, and soothing tends to support the learning process more than music that is rhythmic and loud or has complex lyrics.[15]

Neuropsychologically, music is able to stimulate brain areas related to memory and attention, such as the hippocampus and prefrontal cortex. Listening to music while studying can create a more relaxed, focused, and receptive brain state.[16] Music can also act as an emotional cue, so when the same music is listened to again during the recall process, the brain can more easily access stored information. This mechanism supports the role of music as a cognitive tool in learning activities.[17]

With these findings, it can be concluded that music has great potential to be used as a learning strategy. Certain types of music, especially instrumental, classical, jazz, or R&B music, can help improve short-term memory retention while improving concentration and mood. Although there were variations in results between studies, the consistency of the findings regarding the positive effects of music on cognitive function showed that music is not just entertainment, but also a simple, inexpensive, and effective means of intervention in supporting student learning performance.

CONCLUSION

The short-term memory function profile of students of the Faculty of Medicine, University of Muhammadiyah North Sumatra showed a fairly clear difference in average scores. Based on the results of the study, those who listen to music have better short-term memory abilities compared to those who do not get exposure to music. When viewed by type of music, the R&B genre appears to have the highest influence on improving short-term memory function, while pop music tends to provide lower results. The overall analysis showed that there was a significant difference between the group that listened to music and the group that did not, so it can be affirmed that music plays a positive role in supporting the improvement of students' short-term memory capacity.

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