

## **The Impact of Music on Memory**

*Arian Musliu, Blerta Berisha, Arjeta Musaj, Diellza Latifi & Djellon Peci*

*Heimerer College*

### **Abstract**

A lot of research has been done on the effects of music and sounds on performance in many study areas. However, there have been mixed results about what kind of effects music can have. The musical pleasure was found to influence task performance, and the direction of this effect was dependent on the individual factors (Gold, Frank, Bogert, & Brattico, 2013). According to Fassbender, Richards, Bilgin, Thompson, and Heiden (2012), music affects memory. Music during a study or learning phase hindered memory but increased mood and sports performance. The aim of this experiment was to investigate if music can help to memorize different tests like nonsense syllables, numbers, and rhyming poems. Students participating in this experiment were from different faculties ( $N = 74$ , 75% females) between the ages of 18-22 years old. The experiment consisted of four different self-created tests based on the experiment of nonsense syllables from Ebbinghaus (1885). The first phase of this experiment included the first test, which consisted of 50 nonsense syllables. Based on the results of the first tests, students were divided into three balanced groups. This was done in order to have three groups with students who showed almost the same prior memory test score. Then, three other tests were administered. The first group was taking the tests without music at all and in silence, the second group was taking the tests while listening to lyrical music, and the third group while listening to relaxing music. All three groups had five minutes to memorize whatever was required from each of the three different tests. Then, they were asked to write down whatever they could recall. The first test consisted of 50 other nonsense syllables, including three same syllables (e.g. zhgl and

zhgl), the second test consisted of 12 rhyming lines from poems, and the third test consisted of 50 different numbers. The music was the same—same volume and with headphones on—during the memorizing phase and was repeated during the recalling phase. The results showed that there were significant differences in memorizing rhyming lines from poems and in memorizing the three same nonsense syllables between students who were not listening to any kind of music and students who were listening to music. This study concluded that music affects memory negatively. This means that students who were not listening to any kind of music were able to memorize and recall more items. This study also concluded that silence helps to detect and memorize the same nonsense syllables more than while being distracted with music. When it comes to memorizing better keep the music down!

*Keywords:* Memory, music, memory tests, the effects of music.

## **The Impact of Music on Memory**

Memory is a complex ability. That being said, there are three types of memories: long-term memory, short-term (usually referred to as working memory), and sensory memory. In order to save the information into long-term memory, the information should be processed through sensory and short-term memory. Short-term memory is the working mechanism, however, it holds up to 6 items at the same time and it is limited from 10-60 seconds. The different types of memories differ substantially, however, they work together to memorization (Atkinson & Shiffrin, 1971). Other factors affecting memory, especially short-term memory, are still unknown. Thus, we believe that one of the factors that can have an effect on short-term memory is music. Music is a play of tones, which is fixed and is usually perceived as satisfying. In other words, it is a combination of sounds (Wiora, 1963).

A lot of research has been done on the effects of music and sounds on performance in many study areas. However, there have been mixed results about what kind of effects music can have. The musical pleasure was found to influence task performance, and the direction of this effect was dependent on the individual factors (Gold, Frank, Bogert, & Brattico, 2013). In this line, Martin, Wogalter, and Forlano (1988) showed that lyrical music impaired reading comprehension. However, the music and cognition literature suggests that music increases cognitive performance (Hallam, Price, & Katsarou, 2002; Särkämö et al., 2008). Thus, the causality of the effect of music is still unknown.

Other studies also showed mixed results when it comes to the effect of music on memory. For example, Christopher and Shelton (2017) showed that music negatively affected overall reading performance. It also showed that attention is a crucial factor that protects individuals from such music and sounds distractions when completing certain tasks. Short-term memory,

which is referred to as working memory, showed a moderation effect of the music on the overall reading performance. Similarly, Fassbender, Richards, Bilgin, Thompson, and Heiden (2012), found that music negatively affected memory during a study or learning phase but increased mood and sports performance. On the other hand, music was found to have a positive effect on adult working memory performance. This study, however, used only a specific type of music, which is an excerpt from Vivaldi's "Four Season" (Mammarella, Fairfield, & Cornoldi, 2007). Further benefits of music are positive emotions and mood regulation (Sloboda & O'neill, 2001; Saarikallio & Erkkilä, 2007). Studies showed that listening to music, which individuals found pleasurable, yielded in a significant increase in dopamine, which is the hormone of happiness (Nadler, Rabi, & Minda, 2010). Moreover, some studies imply that *Mozart Effect* can boost cognitive performance (Rauscher, Shaw, & Ky, 1993). However, it is still unknown if there are causal effects between these factors. Therefore, further subsequent studies have revealed that Mozart's compositions do not directly affect cognitive performance, but it rather affects mood and exploit positive emotions (Nantais & Schellenberg, 1999; Thompson, Schellenberg, & Husain, 2001).

To further investigate the effect of positive emotions and mood on short-term memory, Carpenter (2012) experimented with older adults (aged 63-85). Participants were asked to complete a computer-based task, in which they had the opportunity to win money or lose money depending on the decision they made, which required memorization. Participants who were assigned to the positive-feeling condition demonstrated improved short-term memory capacity. This study concluded that the effect of feeling good can have an effect on short-term memory and in the decision making process. Based on similar studies, the Chinese University of Hong Kong used music as a training method for memory. They found that pupils who undergo musical

training demonstrated better verbal but not visual memory than did their counterparts without such training. These effects were found after one year as well. Pupils who begun or continued musical training showed better verbal memory capacity than pupils who discontinued it (Ho, Cheung, & Chan, 2003).

### **Study Aim**

This experimental study aimed to investigate if music can help to memorize different tests like nonsense syllables, numbers, and rhyming poems. Further, we aimed to answer this research question: “What is the impact of music in short-term memory?”

### **Hypotheses**

H1: Lyrical music hinders short-term memory capacity in comparison to the no-music condition.

H2: Relaxing music facilitates short-term memory in comparison to the no-music condition.

## **Methodology**

### **Sample**

Students were from different faculties of University of Prishtina “Hasan Prishtina” and Heimerer College ( $N = 74$ , 75% females) between the ages of 18-22 years old. Most of the participants (57.8%) had only one preferred type of music, where the most preferred music was R&B (21.6%). Above half of the participants (54%) listen to music while studying.

### **Instruments**

For this experimental study, four different tests were created based on the experiment of nonsense syllables from Ebbinghaus (1885). The first test consisted of 50 nonsense syllables, which was administered prior to the actual experiment. The first test during the experiment consisted of 50 other nonsense syllables, including three same syllables (e.g. zhgl and zhgl), the second test consisted of 12 rhyming lines from poems, and the third test consisted of 50 different

numbers. Furthermore, this experiment included two different kinds of music: (1) Shattered Lyrics and (2) Relaxing Music for Brain and Concentration, which is instrumental music.

### **Procedure**

Before administrating the tests, permission was granted from the faculties, and participants were told about the aim of the experiment. The experiment took place for two days in a row. On the first day, the first phase of the experiment took place. Participants completed the first test, which consisted of 50 nonsense syllables. Based on the results of the first tests, students were divided into three balanced groups. This was done in order to have three groups with students who showed almost the same prior memory test score. On the second day, three other tests were administered. The first group was taking the tests without music at all and in silence, the second group was taking the tests while listening to lyrical music, and the third group while listening to relaxing music. Participants were using headphones, including here the no-music group, to eliminate any potential distraction. All three groups had five minutes to memorize whatever was required from each of the three different tests. Then, they were asked to write down whatever they could recall. The music was the same—same volume and with headphones on—during the memorizing phase and was repeated during the recalling phase.

### **Results**

Below, the main findings of this experimental study were presented, which aimed to test the hypotheses and give an answer to the research question. The results presented in Table 1 showed that there were significant differences in memorizing and recalling the same nonsense syllables and rhyming lines of poems between the three groups but not numbers and nonsense syllables. Further, mean comparison analyses between groups were conducted. Results showed that there was a significant difference in the same nonsense syllables and rhyming lines of poems

between the no-music group and the lyrical music group. Furthermore, the results showed that there was a significant difference in the rhyming line of poems between the no-music group and the relaxing music group. The no-music group significantly memorized and recalled more same nonsense syllables ( $M = 1.91, SD = .51$ ) in comparison to the lyrical music group ( $M = 1.03, SD = .89$ ). Moreover, the no-music group significantly memorized and recalled more rhyming lines of poems ( $M = 8.13, SD = 2.30$ ) in comparison to the lyrical music group ( $M = 6.25, SD = 2.78$ ). Similarly, the no-music group significantly memorized more rhyming lines of poems ( $M = 8.13, SD = 2.30$ ) in comparison to the relaxing music group ( $M = 6.39, SD = 1.97$ ). However, no significant differences were detected regarding numbers and the total nonsense syllables between any of the groups. Also, there were no significant differences in any of the tests between the lyrical music group and the relaxing music group.

**Table 1**

*Mean Differences on Short-Term Memory Tests Between Three Groups*

		Sum of		Mean		
		Squares	df	Square	F	p
Numbers	Between Groups	18.83	2	9.41	0.50	.606
Total nonsense syllables	Between Groups	9.58	2	4.79	0.27	.759
Same nonsense syllables	Between Groups	9.58	2	4.79	6.70	.002
Rhyming lines of poems	Between Groups	51.85	2	25.92	4.50	.015

## Discussion

This study aimed to investigate the effect that music has on short-term memory. Previous findings showed mixed results regarding this effect. However, based on the results of the current study, music negatively affected short-term memory. Our first hypothesis, which stated that lyrical music hinders short-term memory in comparison to no-music condition, was partly

confirmed. The results showed that there were significant differences in the same nonsense syllables and rhyming lines of poems between the no-music group and the lyrical music group, where the no-music group participants memorized and recalled more items. However, there were no significant differences regarding the total nonsense syllables and numbers.

The second hypothesis, which stated that relaxing music facilitates short-term memory in comparison to no-music condition, was rejected. Results showed that the no-music group did significantly better detecting and remembering the same nonsense syllables and the rhyming lines of poems in comparison to the relaxing music conditions. However, there were no significant differences regarding other tests. Moreover, no significant differences were detected between the lyrical music group and the relaxing music group.

Although we were able to detect some significant differences, that helped us to understand the effect of music on short-term memory, we could not detect such differences in other tests. This study also showed mixed results, therefore, causality cannot be inferred. However, it is in line with other studies that suggested that the effect of music should be further investigated (Christopher & Shelton, 2017; Fassbender et al., 2012). As music helps to exploit positive emotions and mood regulation (Sloboda & O'neill, 2001; Saarikallio & Erkkilä, 2007), it is still a good tool to increase good feelings (Saarikallio, 2007).

### **Conclusion and Recommendation**

Based on the findings of this study we conclude that trying to memorize and recall rhyming lines of poems while listening to music—lyrical or relaxing music, it does not matter—is less effective than memorizing them without music at all. In other words, without the distraction of music, students are able to code, memorize, and recall rhyming lines of poems better.

Furthermore, according to the findings of this study, we also conclude that music is a distraction to students, making them unable to detect, memorize, and recall the same nonsense syllables. Although one out of three same nonsense syllables was detected and memorized from all the students in every group, participants in the no-music group did better in comparison to other groups.

Music is a good tool to motivate, exploit positive emotion, increase mood and dopamine in the brain, however, when trying to memorize and recall the numbers, rhyming lines of poems, and nonsense syllables, better keep the music down. Even though students like to listen to music while reading, this study suggests keeping the music down if dealing with rhyming lines.

## References

- Atkinson, R. C., & Shiffrin, R. M. (1971). The control of short-term memory. *Scientific American*, 225(2), 82-91.
- Christopher, E. A., & Shelton, J. T. (2017). Individual differences in working memory predict the effect of music on student performance. *Journal of Applied Research in Memory and Cognition*, 6(2), 167-173.
- Ebbinghaus, H. (1885). *Über das gedächtnis: untersuchungen zur experimentellen psychologie*. Duncker & Humblot.
- Fassbender, E., Richards, D., Bilgin, A., Thompson, W. F., & Heiden, W. (2012). VirSchool: The effect of background music and immersive display systems on memory for facts learned in an educational virtual environment. *Computers & Education*, 58(1), 490-500.
- Gold, B. P., Frank, M. J., Bogert, B., & Brattico, E. (2013). Pleasurable music affects reinforcement learning according to the listener. *Frontiers in Psychology*, 4, 541.
- Hallam, S., Price, J., & Katsarou, G. (2002). The effects of background music on primary school pupils' task performance. *Educational Studies*, 28(2), 111-122.
- Ho, Y. C., Cheung, M. C., & Chan, A. S. (2003). Music training improves verbal but not visual memory: cross-sectional and longitudinal explorations in children. *Neuropsychology*, 17(3), 439.
- Mammarella, N., Fairfield, B., & Cornoldi, C. (2007). Does music enhance cognitive performance in healthy older adults? The Vivaldi effect. *Aging Clinical and Experimental Research*, 19(5), 394-399.
- Martin, R. C., Wogalter, M. S., & Forlano, J. G. (1988). Reading comprehension in the presence of unattended speech and music. *Journal of Memory and Language*, 27(4), 382-398.

- Nadler, R. T., Rabi, R., & Minda, J. P. (2010). Better mood and better performance: Learning rule-described categories is enhanced by positive mood. *Psychological Science*, *21*(12), 1770-1776.
- Nantais, K. M., & Schellenberg, E. G. (1999). The Mozart effect: An artifact of preference. *Psychological Science*, *10*(4), 370-373.
- Rauscher, F. H., Shaw, G. L., & Ky, C. N. (1993). Music and spatial task performance. *Nature*, *365*(6447), 611-611.
- Saarikallio, S., & Erkkilä, J. (2007). The role of music in adolescents' mood regulation. *Psychology of Music*, *35*(1), 88-109.
- Särkämö, T., Tervaniemi, M., Laitinen, S., Forsblom, A., Soinila, S., Mikkonen, M., ... & Peretz, I. (2008). Music listening enhances cognitive recovery and mood after middle cerebral artery stroke. *Brain*, *131*(3), 866-876.
- Sloboda, J. A., & O'Neill, S. A. (2001). Emotions in everyday listening to music. *Music and Emotion: Theory and Research*, 415-429.
- Thompson, W. F., Schellenberg, E. G., & Husain, G. (2001). Arousal, mood, and the Mozart effect. *Psychological Science*, *12*(3), 248-251.
- Wiora, W. (1963). Zwischen absoluter und Programmusik. *Festschrift Friedrich Blume zum, 70*, 381-388.