Review Article

Exploring the Effect of Music on Focus and Attention

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ABSTRACT

The impact music has on focus and memory has been studied with a number of different factors. With the arrival of Mozart Theory and other hypotheses, this topic has been seen from a different angle; having an indirect effect. In this paper, we will discuss the impact that different types of music have on various factors such as memory, attention, focus, and cognitive performance. We expected to find that the lyrics and rhythm of the song are the most impactful part of the song. We will get this information by reviewing different studies related to the topic. This literature review revealed the varying effects that music has on memory and focus while studying. Furthermore, this variability is largely attributed to the tempo and presence of lyrics. Similar behavioral changes are also found in other organisms. One study found that, because a tamarin monkey's heart rate is much higher than a humans, the tempo follows closer to the beat of heavy metal music, leading it to show signs of relaxation and vice versa. Some studies show that music is linked to the prevention of mind wandering and can indirectly help focus by increasing mood. In contrast, another study reported that music in general, especially with lyrics, is detrimental to attention and focus.

Keywords: language comprehension, Cognitive performance, Learning with Background music, Music perception

INTRODUCTION

Music can be found in almost anything, from the large harmonious whale calls to the sound of small raindrops hitting the ground. From the start of humankind, people of all cultures have produced music (1). Emotion is an integral part of the music experience, music can make us feel, think, and do. Music is a large part of our lives and humans love being in the presence of music. From 2015 to 2020 alone, the number of Spotify users increased from 82 to 286 million (2).

When listening to music, different regions of the brain are activated, such as the hippocampus- which contributes to learning and memory, the auditory cortex- the part that analyzes the tone and melody, and the frontal lobe- the part responsible for the way you think, how you move, how you remember things and more. These regions of the brain are all activated differently and aid in the comprehension of the music. From the tone to the lyrics, all of the aforementioned brain regions play an integral role in perception which refers to the natural process of sensory information being understood.

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Received July 9, 2024**; Accepted** September 16, 2024
https://doi.org/10.70251/HYJR2348.238690

The story in songs is created by both the melody and the lyrics (3). The non lyrical music refers to music with little to no lyrics, most commonly being classical instrumental music. The messages lyrics have are what makes music personal and entertaining. Research has shown that background music in the work environment can increase worker efficiency (4). However, in terms of cognitive performance, music with lyrics is detrimental (5). Knowing that different music affects the brain in different ways, people still choose to listen to more stimulating music. This is because even though upbeat music is detrimental to performance it is found to be more pleasurable to listen to (5). Because of this, upbeat music is perceived as beneficial (5). Though this sounds great, some studies show background music has caused reverse effects such as distracting people and slowing down the working process (6).

With these various outcomes, there is no definite result on whether it is good or bad for your concentration. The different factors that make songs unique and enjoyable also create a challenge when studying the impact of music academically. The type of work that you are doing also varies your music taste. For example, generally, people are more particular about their background music (BGM) when engaged in more difficult tasks, however, when engaged in easier tasks they become less critical about the type of BGM they listen to (7).

This research paper aims to review and compare past studies on music's effect on cognitive abilities and focus, exploring the different outcomes of various types of music played while studying. Secondly, we hope to find the most or least productive genre of music. While this review explores the relationship between lyrics/story, rhythm, notes, tone, and sound in association with focus and memory, we hypothesize that the greatest difference will be found between lyrical and non lyrical/ instrumental music and its effect on the brain's ability to comprehend and focus. This research also will be focused on exploring genres that promote productivity and enhance focus while studying among high school students.

THE INFLUENCE OF MUSIC ON ATTENTION AND FOCUS

Actively focusing on something is hard, especially if it is boring, and mind wandering makes it hard to be productive. That's why music is a relief and can make working fun. Research led by Luca Kiss and Karina J. Linnell examined background music's effect on five different factors; mind-wandering (thoughts that drift from the task and are not engaged with the task), task-focus (the ability to solely focus on a single task), external-distraction states (anything around you that takes the attention away from the task), and a simple attention-demanding task (8).

The study noted that most monotonous, boring, cognitive attention tasks have been linked to negative mood. That being said, the addition of music would increase mood and arousal. Interestingly, when in stressful situations and not doing the task, the accompaniment of music might have the opposite effect, decreasing arousal (8). They created two similar experiments. One key difference is that along with regular music one also includes continuous background noise to simulate an office environment as a baseline condition, as opposed to silence. At the end of their experiment, they concluded that mind wandering had the most negative effect on mood and arousal, but in both experiments, participants preferred background music regardless whether it was lyrical or not. This is because music improves mood and arousal, decreasing mind wandering and increasing task focus and external- distraction states (8). This shows the indirect influence that music has on focus, by eliminating or decreasing external distractions.

A study by Cloutier et al. sheds light on a different angle of this topic. The assessments that Clooutier used were the Flanker task (visual-spatial and reaction tests). After this experiment, they found that during the exposure to relaxing music, visual-spatial attention tasks were impaired by the music, compared to silence and stimulating music (9), which did not align with many of the prior studies researched. The researchers hypothesized this was due to the tempo of the music which might not have been at the same tempo as some of the other studies. This study also differed from the Arousal- and -Mood hypothesis, which is a hypothesis used to potentially describe the mixed results with the controversial Mozart effect; a theory that listening to Mozart's sonata K448 can increase spatial-temporal performance tasks for up to 15 minutes (10). Arousal- and -Mood hypothesis describes that music does not change cognitive functions directly, but instead by indirect effects through individual emotional reactions to pieces of music (11). For example, in the present study led by Cloutier et al, after the flanker task, participants were asked to evaluate relaxing music (mean tempo of 59.29 BPM) and stimulating music (mean tempo of 153.14 BPM) on a scale of 0 to 100, with various questions such as for familiarity, pleasant or unpleasantness and relaxing or stimulating (9). Contrary to some of the other studies the participants found relaxing music more pleasant than the stimulating ones. Indicating that the changes in results

could be a result of different reactions to the music than in other studies. Directly relating to the hypothesis, the results of these papers show the change in types of music and the direct and indirect effects that different types of music have on attention and focus.

EFFECTIVENESS/INEFFECTIVENESS OF LYRICAL MUSIC ON FOCUS AND COMPREHENSION

Music that needs to convey messages often uses lyrics to create a story in a musician's music. The versatility of lyrical music makes it extremely popular and a common choice for studying music. A study by Sun et al. on bilingual Chinese college students takes a look at lyrical and non-lyrical music effects of music on comprehension. The objective of the research was to explore the effects that music can have on reading comprehension in both first and second languages, as well as the influence of listening habits. The students were asked to read a text in English and Mandarin and fill out a questionnaire based on the text while listening to two different pieces of popular music, one in English and one in Mandarin, to get the best results, they chose the two songs with the same tempo and rhythm. The results of the experiment found that the students with experience listening to background music had been accustomed to background music, while those who didn't found it to be detrimental (12). Additionally, Sun et al. found students were more distracted while listening to music in the same language as the text that they were reading as opposed to music that was in a different language than the text they were reading.

Comparatively, research conducted by Alessandra S. Souza and Luís Carlos Leal Barbosa on college students found similar results: a decrease in focus with lyrical music. This study aimed to determine the effect of background music on four different cognitive functions: verbal and visual memory, reading comprehension, and arithmetic. In this study, Souza and Barbosa used a series of online tasks using college students to get their results. This study's results show that music with lyrics had a substantial adverse effect on the student's results compared to silence in the visual and verbal memory tasks. In the reading comprehension tasks, the student responded better with the instrumental than with the lyrical. On the other hand, the arithmetic task results did not appear to differ regardless of the music (5). At the end of this study, the researchers concluded that across all the tasks, performance was generally better in silence as opposed to lyrical music. Taken together these two studies support the statement that the best working conditions are those in the absence of any music. The results of these studies add to the initial hypothesis by describing the difference between performances with lyrical music and silence. The results show that the task is not a determining factor in the effectiveness of music.

THE INFLUENCE OF MUSIC ON LEARNING AND MEMORY

Music can be incorporated in most classrooms. From math to history, there is an educational song to go along with the lesson plan. The intent is that through music students would remember the educational content of the song better. But does it contribute to learning more efficiently or is it just a myth? The studies conducted by Musliu et al. and Janina A. M. Lehmann aimed to explore the effects of music on memory and learning. Musliu et al's experiment involved testing the impact of lyrical music, instrumental music, and silence on short-term memory in college students. Musliu et al. used four different tests, the first being a placement test to ensure the groups were even. Based on the first test, the participants were separated into three similar groups, each with a different independent variable: one with lyrical music, one instrumental, and one in silence. The next day, the participants were each given three more tests and were then given five minutes to memorize what the test required. After, they wrote what they could recall on a piece of paper. The results indicated significant differences in memorization and recall of certain types of stimuli between the three groups. Specifically, the study found a significant difference in the memorization and recall of rhyming lines of poems between the no-music group and the relaxing music group (13). In contrast, the no-music group significantly memorized and recalled more of the same nonsense syllables. These findings suggest that different types of music can have varying effects on memory and recall.

On the other hand, Lehmann's study investigated the impact of music on learning using three different theoretical approaches: the Mozart theory, the arousal mood hypothesis, and the seductive detail effect. While researching the topic, Lehmann found that the results from other studies were not consistent. One study could argue that it hinders learning, while another argues it helps. One reason for this Lehmann hypothesis is that the experiments were made with music not taking into account the tempo, intensity, or characteristic of each piece of music (14). Because of this many of the previous

studies are inconsistent. The goal of Lehmann's study is to compare and discuss whether music directly or indirectly influences learning, particularly working memory. In this study, Lehmann used two mood and arousal pre-tests before playing various music and silence while the participants engaged in learning. After they were done they took another mood and arousal questionnaire. The results of Lehmann's experiment did not align with her initial hypotheses. The comprehension test showed better results without any background music, indicating that most music had no significant effect on arousal, mood, and recall tests. This suggests that further research is needed to understand the complex relationship between music and its impact on learning and memory. Both of these studies contribute to the hypothesis by describing the relationship between different types of music, mood, arousal, and performance in memory tasks.

RELATIONSHIPS WITH MUSIC IN OTHER MODEL ORGANISMS

Research has shown that various animals, such as monkeys, apes, dogs, and rodents, react differently to different types of music. Charles T. Snowdon conducted a study demonstrating this diversity in animal responses to music. Snowdon found that animals and humans communicate in similar ways through music. For example, calm, long notes can soothe an animal, while staccato notes with an increasing pitch can arouse them (15). This is similar to how parents use music to calm or stimulate their infants. Snowdon collected data on the animals' blood pressure and heart rate to measure their responses to music. The results of Snowdon's study varied based on the species and characteristics of the animals involved. He explained that these variations were due to the different conditions and abilities of the animals. One significant factor was the tempo of the music. Like humans, animals respond differently to music based on whether its tempo is similar to their resting or active heart rate (15). Snowdon noted that smaller animals, such as rodents, have a higher resting heart rate than humans, which affects their response to music. Another factor that influences animals' response to music is the frequency they can hear and communicate. Due to differences in octaves, some animals may be unresponsive to human music. Snowdon experimented with tamarin monkeys, creating music tailored to their specific heart rate and listening octaves, which are almost three times higher than those of humans. The monkeys did not show notable reactions to most human music, but they appeared more relaxed when exposed to heavy metal music, as its tempo matched their resting heart rate (15).

When the tamarin monkeys were presented with music intended to calm them, they showed decreased activity and appeared more relaxed. On the other hand, music designed to arouse them led to increased activity. Snowdon concluded that the tamarin monkeys reacted significantly more to their specific music than to human-made music. This highlights the importance of considering the species when conducting music-based animal testing and the flexibility of each musical genre. The results of this experiment demonstrate the individuality between music for a difference of results.

CONCLUSION

These findings show that music, both lyrical and non-lyrical, is detrimental to attention and focus. Lyrical music is a distraction to the brain and draws attention from the tasks at hand and while the non-lyrical music is not as detrimental, it still did not perform as well as silence. In terms of tempo, a calmer, slow tempo is better than a faster beat, similarly with the lyrical music it is too stimulating, hence is a larger contributor to a lack of focus. Knowing this we can conclude the effects that lyrics vs non, and tempo and melody have on the effectiveness of music on attention and focus, as well as memory. The results of this paper can contribute by providing insight into a potentially unproductive environment.

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