Brainwaves and Beats: A Study on the Effects of Music on Cognitive Processes

Moha (Sara) Dole

Smt Sulochanadevi Singhania School, Pokharan Road No. 1 in J K Gram, Maharashtra, India,400606

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BRIEF. By examining listening patterns and productivity, this study reveals that calm and structured music can support mental focus in students.

ABSTRACT. This study investigates the perceived effects of music on students' concentration and productivity during studying. Specifically, it examines whether listening to music, and the type of music selected, are associated with differences in self-reported focus and cognitive performance. A survey-based approach was used to collect data from individuals aged 13–23. Participants reported their study habits, music preferences, and perceived effects of music on focus, concentration, and productivity. The data were analysed descriptively to identify patterns and trends in responses. The results indicated that a substantial proportion of participants reported listening to music while studying, with classical and lo-fi music most commonly associated with improved focus and reduced cognitive fatigue. However, a notable proportion of respondents reported that music was distracting or ineffective, particularly when tasks required sustained attention. A minority of participants preferred no music, suggesting that silence may be more effective for certain individuals. It is hypothesised that instrumental forms of music (e.g., classical and lo-fi) are more likely to be associated with improved concentration, whereas lyrical or high-energy music may be perceived as more distracting, particularly during cognitively demanding tasks. Overall, the findings suggest that the effects of music on studying are not uniform and vary depending on individual preferences and task demands. These results support the view that music may function as either a cognitive aid or a distraction, depending on context, rather than having a universally beneficial effect on concentration.

INTRODUCTION.

Music is often used by students while studying, yet its effect on concentration and learning remains debated by psychiatrists, psychologists and educators alike. Some research suggests that background music may support attention and emotional regulation by providing an optimal level of arousal, thereby facilitating cognitive performance under certain conditions. Sometimes students use music to promote the level of concentration, some use White Noise [1], while some, though a minority, use Study Drugs.

The primary function of the report will be to focus on the stimulation provided by music. Moderate levels of concentration have been associated/observed with improved task performance. In contrast, excessive stimulation may impair concentration, as described by the Yerkes–Dodson Law [2] known as the Arousal theory. For example, when a student is tired, soothing classical or instrumental music might arouse them enough to focus. (However, if the arousal levels become too high, it can result in overstimulation, and performance or concentration may decline). In contrast, other studies indicate that music with lyrics can interfere with verbal working memory, reducing comprehension and retention during cognitively demanding tasks. This is often explained through Cognitive Overload Theory [3], which proposes that the brain has a limited capacity for processing information, and additional auditory input may increase cognitive burden. This explains why more than 34% of the participants reported that music distracts them. Music has been shown to influence emotional states and physiological stress responses, which may indirectly affect cognitive performance and focus, as stated by the Mood Regulation Theory [4]. This theory supports the 20% who believe that music supports mental output and reduces cognitive fatigue. Many individuals listen to music for relaxation, and such positive emotional conditions promote learning. Research has also explored the relationship between music preferences and cognitive performance, particularly in adolescents and young adults. For example, individual differences in personality and music use have been shown to influence how people engage with music in everyday life.

However, findings across studies remain inconsistent. Some report beneficial effects of music on focus and productivity, while others highlight its potential to act as a distraction, especially during tasks requiring sustained attention and deep cognitive processing [5,6]. These inconsistencies may arise from differences in study design, task complexity, type of music (e.g., lyrical vs. instrumental), and individual variability. Understanding these perceptions is important, as students often shape their own study environments and may use music as a self-regulation strategy to manage attention, mood, and motivation. Unlike experimental studies that focus on objective cognitive outcomes, examining subjective experiences can provide valuable insight into real-life study behaviours. This study adopts a survey-based approach to explore how individuals aged 13–23 use music while studying and how they perceive its effects on focus, concentration, and productivity. However, rather than directly measuring cognitive outcomes, this study focuses on perceived effects within naturalistic academic settings.

Notably, much of the existing research has been conducted in controlled laboratory settings, which may not accurately reflect real-world study environments. As a result, there is limited understanding of how students themselves perceive the effects of music in everyday academic contexts. The goal of the report is to explore how individuals aged 13–23 perceive the effects of music and different music genres on their concentration and productivity during studying.

MATERIALS AND METHODS.

The survey was done in April 2025. A Google Form was shared on Quora and Reddit to collect responses from people in the target age group of 13 to 23. Approximately 70 viewers viewed the form (see Supporting Information for the questionnaire), and around 50 responded. Of them, 46% were aged 13-17, while 54% were aged 18-23. The survey had both multiple-choice questions and open-ended questions, gathering qualitative and quantitative data. Participants were allowed to select more than one music genre to widen the database and understand different preferences. All the answers were collected anonymously, so personal details were not recorded. Responses were automatically stored in Google Sheets, ensuring no manual data entry. Percentages and proportions were calculated and then represented graphically. After analysing each response to understand how different music patterns affect concentration, the results have been obtained. Despite these limitations, notable observations can be made in this report. Firstly, the sample size, although relatively small, yielded

significant data; secondly, platforms like Quora and Reddit are informal recruitment methods.

This study used a descriptive, survey-based design.

RESULTS.

In an extrospective manner, approximately 60% of individuals reported listening to music regularly (Figure 1), with around 46% of them using music while performing cognitively demanding tasks. 34% think it distracts them. 20% believe it reduces cognitive fatigue, but do not use it regularly or listen during breaks. As for genre preferences (Figure. 2), the highest (24%) chose classical or instrumental music, followed by 22% who preferred Lo-fi beats. Pop music was selected by 20%, and Rock by about 10%.

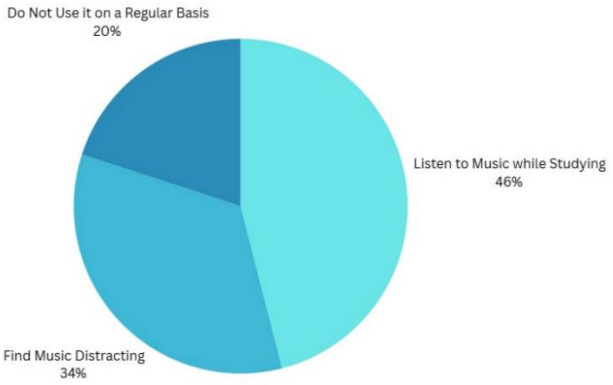

Figure 1. General Preferences of Music. Here, the categories being studied have been divided into three: those who find music distracting, those who regularly use music while studying, and those who do not use music daily or use white noise, though the latter has not been specified.

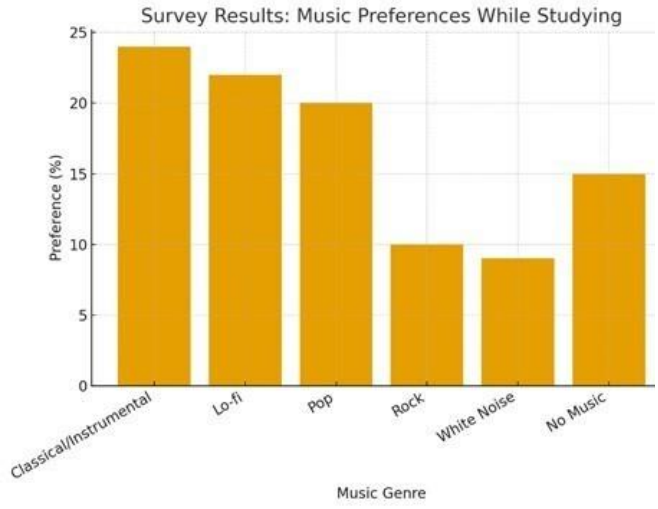

Figure 2. Music Preferences while Studying; Participants selected the primary genre they listened to while studying. Genres were categorised into classical, lo-fi, pop, rock, and other. Classical and lo-fi were the most preferred genres, while rock showed lower representation

DISCUSSION

Coming back to the main observations, clearly, the effects of this are not universal, but a significant portion of the population enjoys listening to music as a form of entertainment or as a cognitive aid. As this study relied on self-reported survey responses, the findings reflect perceived effects rather than objective cognitive or psychological outcomes. The results suggest that the effect of music on concentration varies between individuals. What works for one individual may not be effective for another, particularly when performing cognitively demanding tasks. The effectiveness of music may depend on factors such as the type of task, the study environment, and personal preferences. For example, tasks requiring deep concentration may be more sensitive to auditory distractions, while repetitive tasks may be less affected. A careful glance at the resultant responses revealed that more than 60% of people prefer listening to music as a means of entertainment, all preferring different genres. This suggests that quite a handful of students enjoy listening to music not only as a distraction and/or refreshment, but also might believe that it helps them increase productivity and focus. These findings further suggest that music preferences during studying are not uniform across individuals, with a subset of participants indicating that no music or, in some cases, White Noise [1] to be more effective and possibly increases concentration. This highlights the variability in study strategies and supports the idea that the effectiveness of music is highly individualised. It can be suggested that study methods be personalised to suit any individual's cognitive and emotional needs. Several theories also follow the regulation of mood and concentration with music, like the Arousal Theory [1], Cognitive Overload Theory [3] and Mood Regulation Theory [4].

Regular engagement with music for leisure naturally prompts questions about the underlying origins of such preferences. Listening to music might be associated with the activation of the mesolimbic reward pathway, which may be associated with pleasure and motivation. This process is linked to the release of dopamine, the "feel-good" neurotransmitter involved in mood and reward processing. More dopamine can possibly be associated with increased concentration while studying [4]. Some research suggests that music processing involves multiple regions across both hemispheres of the brain [5]. This might be suggestive of involving multiple cognitive interactions between analytical and creative cognitive processes. In some contexts, repeated exposure to music while performing cognitive tasks might activate the hippocampus. The hippocampus plays a key role in memory formation. Exposure to music during cognitive tasks might influence memory-related processes, particularly in learning-based subjects, such as History, English, etc. In this study, 24% of participants preferred classical or lo-fi music, which typically contains fewer lyrics, possibly because this type might be statistically most used. It may be inferred that music without lyrics might reduce verbal interference, potentially supporting memorisation, though this has not been directly measured in the survey [6]. One hypothetical explanation could be the Mozart Effect [7,8], which refers to the possible link between listening to classical music, like that of Mozart, and maximising productivity and reasoning methods. However, these effects are not consistently observed, and their relevance to real-world studying remains debated. Taking a more neurocognitive approach, it can be because the Reticular Activating System, whose main function is to regulate attention and consciousness, might be stimulated by the beats, especially binaural beats. For a corresponding cognitive impact, it also might help maintain alertness and attention, particularly when performing repetitive or long-duration study tasks.

But what about those individuals who prefer no auditory input? The brain must balance both cognitive processes, such as reading and memorisation, along with musical information. Continuous auditory stimulation during study sessions can overstimulate the auditory cor-

tex and increase mental fatigue, especially in individuals prone to sensory overload. This may result in cognitive overload or divided cognitive attention, making it difficult for the individual to comprehend difficult tasks. In highly sensitive individuals, music, especially nostalgic tracks, can be prone to activating the DMN (Default Mode Network), which is the brain's "resting state", associated with mind wandering and daydreaming, which may potentially reduce focus during study sessions.

Now, to answer the most important question: should students listen to music while studying? Based on the results, music may be strategically selected to arouse the correct amount of stimulation that may support concentration. It also depends on the type of cognitive task being performed. The effectiveness of music may depend on the type of task being performed. Tasks that require sustained attention or memorisation may be more sensitive to auditory input, whereas less demanding tasks may be less affected [9]. For example, if the task involves drawing, organising notes, or finishing homework that does not involve mental processing, it can be suggested that the person use pop music that may boost motivation. While performing tasks like memorising classical music with minimal lyrics can be preferred, to arouse enough motivation for sustained focus, but not enough for overstimulation. Though heavy metal music or rock music is not recommended, it depends, again, on personal choices. Variations in personality traits and music consumption might possibly demonstrate how individuals interact with music in their daily lives [10]. Additionally, students are advised to pay attention to volume levels, as music played too loudly may be distracting, while low/moderate levels are more likely to support productivity.

However, this study is not without limitations. Firstly, the use of self-reported data introduces subjectivity, as participants' perceptions of productivity may not accurately reflect actual performance. Secondly, the sample size and demographics may not be fully representative of the wider student population, limiting the generalisability of the findings. Thirdly, this study also does not account for variables such as task difficulty, prior familiarity with music, or individual differences in attention span, all of which may significantly influence results. Fourthly, many students report improved focus when studying with music. This can be a problem as most standardised exams take place in quiet environments. This may create a mismatch, where students who rely on music find it harder to concentrate in exam settings. Overdependence on music might result in the candidate finding it difficult to concentrate in a silent exam setting. Lastly, this study does not measure the cognitive outcomes, such as memory and productivity or proven personality relations with music and concentration directly, but rather relies on external data and cited sources. Despite these limitations, the study provides valuable insight into how personal preferences and cognitive factors interact to shape study habits.

Future research could explore the neurological basis of these effects, particularly how different types of music influence brain activity in regions associated with attention, memory, and executive functioning. Methods such as EEG or fMRI could provide more objective measures of cognitive engagement, allowing for a deeper understanding of how auditory stimuli interact with neural processes during learning. Overall, this study highlights that the relationship between music and studying is complex and highly individualised, rather than universally beneficial or detrimental. It emphasises the importance of considering both cognitive mechanisms and personal preferences when determining effective study strategies, suggesting that optimal learning environments may differ significantly from one individual to another. Unlike the individual and non-invasive impact of music, pharmacological alternatives manipulate core neurological functions, often with unpredictable consequences [11].

Music might be considered a tool to increase productivity by some individuals, while others rely on certain drugs and pharmacological alternatives, known as Study Drugs. Research suggests that around 35% (Figure.3) of individuals consume these substances to boost their productivity. (DISCLAIMER: The present study did not collect PRIMARY data regarding pharmacological study aids. This discussion is included solely to provide a broader context regarding different strategies students may use to regulate focus).

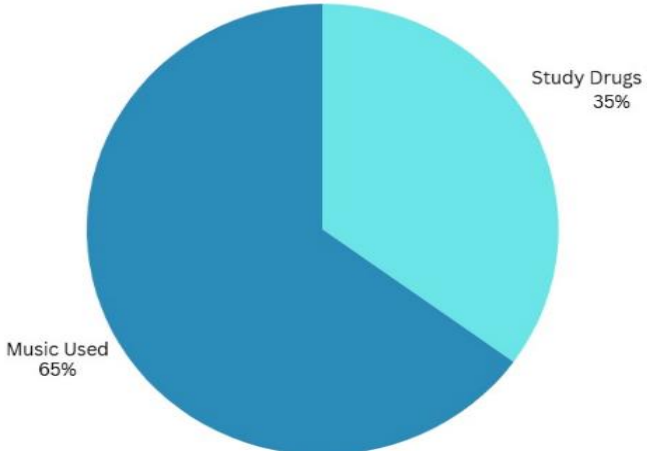

Figure 3. Comparison of Music and Study Drugs; According to the results, (amongst those who use external stimulators) a majority of the participants prefer to use music over any kind of study drugs.

CONCLUSION

This study investigated the effects of different types of music on students' concentration and productivity while studying. The findings indicate that music does not have a uniform effect, as some participants reported improved focus, particularly with instrumental genres such as classical and lo-fi, while others experienced distraction, especially with lyrical or high-energy music.

These results suggest that the effectiveness of music depends on both the nature of the task and individual cognitive preferences. Overall, the study highlights that study strategies should be personalised, as no single approach is universally beneficial for all learners.

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SUPPORTING INFORMATION.

Supporting information available online includes the questionnaire used in this study.

REFERENCES

1. Söderlund, G. B., Sikström, S., & Smart, A. (2007). Listen to the noise: Noise is beneficial for cognitive performance in ADHD. *Journal of Child Psychology and Psychiatry*, **48**(8), 840–847.
2. Yerkes, R. M., & Dodson, J. D. (1908). The relation of the strength of stimulus to the rapidity of habit-formation. *Journal of Comparative Neurology and Psychology*, **18**(5), 459–482.
3. Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive Science*, **12**(2), 257–285.
4. Thoma, M. V., Scholz, U., Ehlert, U., & Nater, U. M. (2012). The effect of music on the human stress response. *PLOS ONE*, **7**(8), e43663.
5. Sridharan, D., Levitin, D. J., Chafe, C. H., Berger, J., & Menon, V. (2007). Neural dynamics of event segmentation in music. *Neuron*, **55**(3), 521–532.

6. Rentfrow, P. J., & Gosling, S. D. (2003). The do re mi's of everyday life: The structure and personality correlates of music preferences. *Journal of Personality and Social Psychology*, **84**(6), 1236–1256.
7. Rauscher, F. H., Shaw, G. L., & Ky, C. N. (1993). Music and spatial task performance. *Nature*, **365**(6447), 611.
8. Thompson, W. F., Schellenberg, E. G., & Husain, G. (2001). Arousal, mood, and the Mozart effect. *Psychological Science*, **12**(3), 248–251.
9. Perham, N., & Currie, H. (2014). Does listening to preferred music improve reading comprehension performance? *Applied Cognitive Psychology*, **28**(2), 279–284.
10. Chamorro-Premuzic, T., & Furnham, A. (2007). Personality and music: Can traits explain how people use music in everyday life? *British Journal of Psychology*, **98**(2), 175–185.
11. Lakhan, S. E., & Kirchgessner, A. (2012). Prescription stimulants in individuals with and without ADHD: Misuse, cognitive impact, and adverse effects. *Brain and Behavior*, **2**(5), 661–677.

Moha (Sara) Dole is a student at Smt Sulochanadevi Singhanaia School in Thane, Maharashtra, India.