

**Music and the Brain: Effect of Listening to Music on UC Davis Students When
Studying For Exams**

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Abstract

The study investigates the influence of music on cognitive tasks, such as exam review, for UC Davis students. The primary focus of the study is to determine if music can enhance the performance of UC Davis students. And further investigate how this effect varies among different UC Davis students. For this purpose, a literature review and survey analysis were used. The sources for the literature are mainly from the database of the UC Davis library. The literature illustrates findings regarding the neurological effects of music on the alpha and beta bands. The survey for UC Davis students reveals their music listening habits during study and how their personality may affect their preference toward background music. The combined results of the survey analysis and literature review show that extroverts may not experience negative effects from background music when studying for exams. Additionally, for extroverts, listening to preferred music while studying in a consistent manner would maximize the positive effect of background music.

Introduction

The influence of music on cognitive tasks, in the context of exams revision, has been a subject of interest in cognitive and educational psychology research. This study aims to explore the factors determining the helpfulness of background music when UC Davis students' study for exams. The factors may include personality, familiarity to task, and playlist listening. To seek for answer to whether music could aid students preparing for exams, both literature review and survey are conducted. Based on the responses of the survey, the UC Davis students consider themselves extroverts and tend to listen to music when reviewing for exams. Yet, most of them find the music has no effect on their focus. The UC Davis students may listen to their preferred playlist while listening if they would consider themselves as extroverts.

Literature Review

Music affects the performance of an individual when reviewing for exams. According to Kirk et al. (2022), individuals who listened to music while engaging in the study demonstrated better performance compared to those who did not listen to any music (pp. 4-9). And the study also indicates that the genre of music might not have an influence on this effect (ibid). Furnham & Kathryn Allass (1999) has similar finding that the complexity of the music has no significant effect on the performance of cognitive tasks (p. 9). However, recent studies proved that the impact of music on the performance might be influenced by individual characteristics such as personality, task familiarity, and music preference. The effects are not uniform and depend on several factors.

One study by Hernandez-Ruiz et al. (2021) investigated music's effect on mindfulness exercises. The findings were intriguing: "the music seems to have no effect on 'attention and awareness'" (p. 5). This suggests that music neither distracted nor benefited the participants in the

mindfulness context. These results did not match the researchers' expectations and were almost inconclusive. However, the study revealed a significant language-based disparity. Native English speakers scored an average of 39 on the Self-Mindfulness Scale (SMS), whereas non-native speakers scored only 15 (Hernandez-Ruiz et al., 2021, p. 3). This difference is likely attributable to the experiment's use of English, paralleling the full English environment of UC Davis exams. Moreover, Hernandez-Ruiz et al. (2021) observed that the music experience of an individual may have no impact on how well one performs the mindfulness exercise (Hernandez-Ruiz et al., 2021, p. 3).

Mats Küssner (2017) has a different perspective, focusing on personality's role. Citing "Eysenck's theory of personality", Küssner notes that "the extraverts' cortical arousal" is lower than that of introverts (Küssner, 2017, p. 1, as cited in Eysenck, 1967). This suggests that extraverts might find music more beneficial than introverts during cognitive tasks. Küssner also recommends investigating the "effect of beta power on cognitive task performance" (Küssner, 2017, p. 5) more thoroughly, instead of focusing primarily on the alpha band.

The familiarity of music also appears to be a significant factor. Studies by Rosario Naokano & C. de Dios (2021) indicate that individuals show "increased activity for their preferred music compared to non-preferred music in the gamma, beta, and alpha frequency band" (Nakano & de Dios, 2021, p. 1). Bauer et al. (2015) further supports this, finding a "significant positive correlation between motor beta and measures of preferred tempo" (Bauer et al., 2015, p. 3). However, Bauer notes that the influence of music's tempo is not significantly linked to musical expertise (Bauer et al., 2015, p. 4), aligning with Hernandez-Ruiz's findings.

Lastly, the familiarity with study tasks, akin to dancers' familiarity with their routines, can affect how music impacts concentration. Naokano & de Dios (2021) observed that when both

dancer and non-dancer individuals are listening to their preferred music, the gamma and beta band increase significantly. Yet, "the change in alpha activity over time was more robust in dancers compared to non-dancers" (p. 5). The alpha activity would not directly indicate the rise in attention of the individual, but it may indicate the enhancement in short-term memory. As the found of study by Ole Jensen (2002), "the 9-12 Hz increased parametrically with memory load and the load-dependent enhancement" (p. 3). This suggests that students who constantly use their familiar study manner might benefit from music, as dancers do with familiar routines. And the familiar study manner might not help them focus but do enhance their short-term memory.

Methodology

To find out if the finding is reasonable and matches the preference among UC Davis students, a few survey questions are designed to collect statistical data from the UC Davis students. Google form is used and spread among these students around using social media. The Apps used to spread the Google form include WeChat, Instagram, and discord. The survey was collected from November 15th to 17th. After the data is collected, the pie charts from the Google form are presented.

1. Would you say you listen to music often, sometimes, rarely, or never when studying for exams?

Choices: Not at all; sometimes; usually; always

2. Would you say that music helps you focus, distracts you, or has no effect when you are studying for exams?

Choices: Helps me focus; Makes me get distracted; Has no effect

3. Would you consider yourself an extroverted individual or an introverted individual?

Choices: Extroverted; Introverted.

4. Would you use a similar study strategy for each review session?

Choices: Yes; No

5. Would you play the playlist that you listened to frequently? If you do not listen to music while studying for exams, ignore this question.

Choices: Yes, Playlist Frequently listened to; No, Playlist varies

Data Analysis

A total of 17 responses are collected from the UC Davis students. Among those students, 10 students usually or always listen to music while studying for exams but 7 of students sometimes listen to music or not at all. According to the result, it may be concluded that most of the students from UC Davis listen to music while studying for exams. And among these students, most of them find that music has no effect on their focus. Interestingly, 12 participants considered themselves extroverted. According to the literature review, the extroverted students shall benefit more from listening to music while reviewing. Yet, among 12 extroverted students, 6 of them think that there is no effect; 2 of them think that it helps them focus; while last 2 of them think that the music distracts them. For the other 5 introverted students, all of them consider music as no effect or distraction. The response from those students with two different personalities yielded results that were not quite as expected. There are no extroverted students who find that the music distracting but none of them find music helps them focus which is the expected result. Plus, as found out from the previous studies of researchers, the expertise in certain task potentially raises the beta band when doing task with music playing. From the results of the survey, most of the students find the music helpful or no effect at all. Yet, the number of students who listen to their preferred music and students who listen to different playlist while studying are almost the same so that is inconclusive for whether preferred music help students focus or not according to the result of the survey.

17 responses

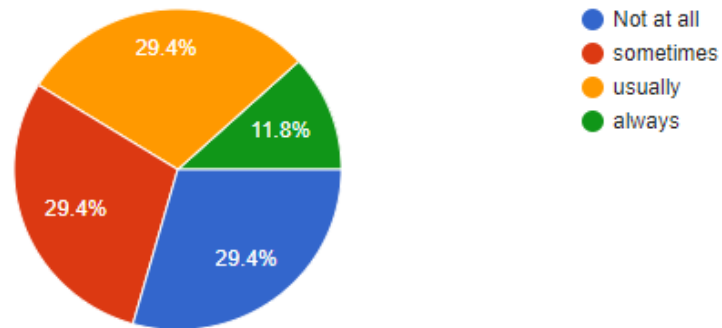


Figure 1: Frequency of students listening to music while studying for exams.

17 responses

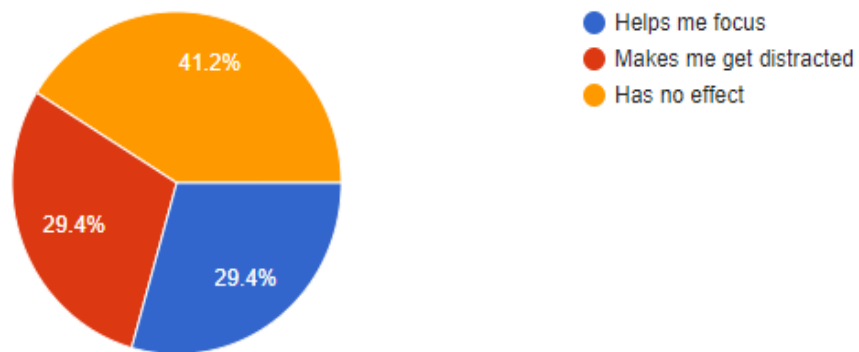


Figure 2: Effect of music on attention of students while studying for exams.

17 responses

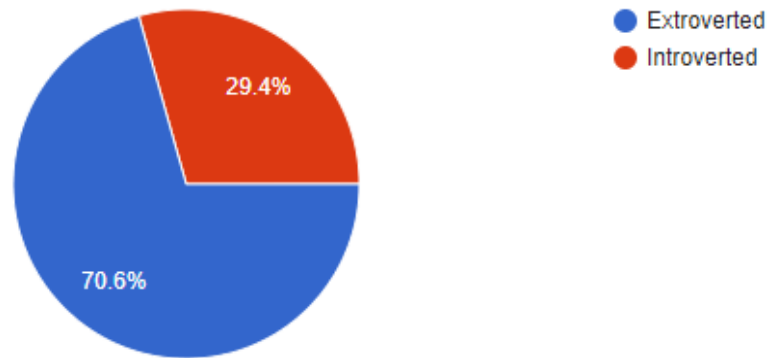


Figure 3: Proportion of introverted and extroverted students.

17 responses

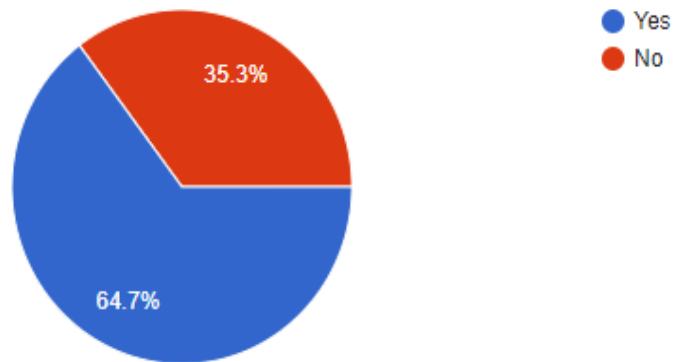


Figure 4: Proportion of students using similar study strategy for each review session.

13 responses

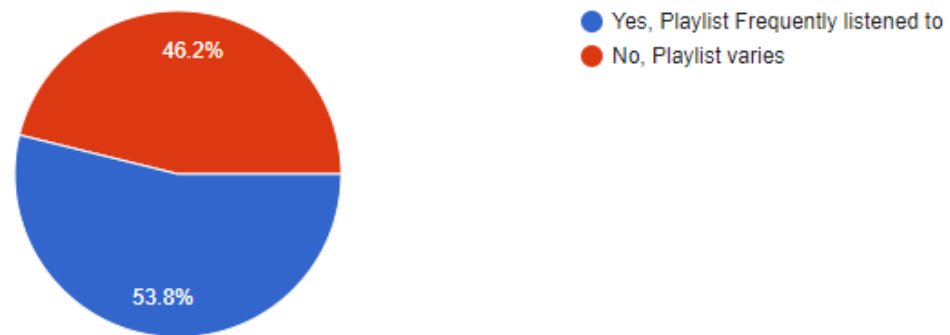


Figure 5: Proportion of students who listened to preferred music.

Limitation

In this study, some limitations are encountered. Firstly, the recruitment process of participants was conducted through social media and primarily within my personal network. As a result, most of the participants are biological science relevant majors. This approach inherently introduces a selection bias, as the sample may not adequately represent the broader student population at UC Davis. Additionally, the sample size is relatively small, which limits the generalizability of the findings. Ideally, the utilization of UC Davis Sona System, designed for cognitive science research to gather a more representative sample of students, would have been beneficial. Unfortunately, time constraints are present and not able to apply for use of the system. Future studies could leverage this resource to enhance sample representativeness and validity of results.

Discussion

The findings of this study present a complex picture of the relationship between music and cognitive performance during exam preparation. While literature suggests a potential for music to enhance focus by modulating alpha and beta activity in brain or by rising of score of the cognitive tasks, the data of survey indicate a muddier reality. Interestingly, extroverted students, who were expected to benefit more from music, did not uniformly find it helpful. This contrasts with existing literature that suggests extroverts might be more positively influenced by background music, but for these extroverted students, the music seems to have less negative effect relative to the introverted students.

The extroverted students may benefit from the background music the most when they are relaxed. The mood of the individual when they are reviewing while listening to music. Referring to Oldham et al. (1995), mood relaxation makes the music more effective when working comparing to “nervousness, enthusiasm and fatigue (p. 14)”. And therefore, future studies could involve the variable of mood in the experiment protocols. Moreover, the fact that students' preferences for specific music playlists did not clearly correlate with improved focus further complicates the understanding of music's role in study environments. The focus on the music playlist could be a variable, such as the low tempo music versus high tempo music playlist. Finally, the view looking at long-term and short-term performance on cognitive tasks like memory from the reviewing of exams might be worth studying. According to Lewis J. Kleinsmith & Stephen Kaplan (1964), the long-term memory of extroverts listening to music while reviewing is relatively stronger compared to the extroverts without listening to music.

The result from the survey indicates that there are no extroverted students who find music to be a disruption. Hence, this could apply to reality. For example, to apply it to the educational contexts, university libraries may consider creating the designated study zone where the

background music is played so that it caters to varied preferences of student. This potentially improves their study efficiency and assists them to form long-term memory. Additionally, college students at UC Davis may find it helpful to begin studying for exams after relaxing by taking a shower or hanging out with friends.

Conclusion

Overall, the majority of students listen to music during study, but they report varied effects on their focus according to the survey result. Therefore, the study sought to understand the impact of music on exam revision among UC Davis students, and the findings highlight the complexity of this relationship. It depends not only on the personality of the listener but also on their familiarity with the music and the study manner. Therefore, recommendations for music use during study should be adjusted to individual preferences and needs, rather than prescribing a one-size-fits-all approach. For the extroverted, music might be less likely to have negative impact but with preferred background music playing, studying for exams with a constant manner may maximize the positive effect. For introverted students, the background music might not be beneficial, so the background music is not recommended. Yet, further research might need to explore how personal factors like study habits impact cognitive performance in academic tasks. For the indicator of cognitive performance, the EEG focusing on alpha and beta bands might be one of the indicators. Plus, to qualify the performance, one could keep the score of individual working on memory retention tests or concentration exercises.

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