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Perceptions on the Effects of Music on Academic Productivity

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This study was conducted to evaluate the general opinion on the relationship between listening to music and working on school assignments. A mixed methods survey was conducted seeking whether there is a connection between roles participants had in a learning environment and how it relates to their understanding of music's effects. Data was collected through a survey emailed out to 250 students graduating from a southwestern state university in the spring of 2021. Findings revealed no significant difference between how often the participant listened to music and how often they listened to music in combination with working on school assignments. Participants are less likely to listen to music while completing reading assignments in comparison with writing assignments and answering questions.

Perceptions on the Effects of Music on Academic Productivity

Today's society has music at the tips of its fingers, but there are times when this is not ideal. There is a debate on whether or not music impairs a person's concentration while focusing on other tasks. Some people argue that silence is the best for productivity, while others say there is no hindrance caused by music or sounds. Many studies have been conducted to investigate to target the effects of specific kinds of music or sounds on a person completing a task (Anderson & Fuller, 2015; Crncec, er al., 2006; Smith & Davidson, 1991; Thoutenhoofd, et al., 2016; Umzdas, 2015).

Existing research runs its experiments in a controlled location, without taking into consideration that it could be a variable to test alongside effects of music. Individual circumstances may need to be considered. Not every person completes their work in a distraction-less environment. In some cases, people might be listening to music or other kinds of sounds to tune out anything in their current surroundings in order to complete their tasks. Sometimes, a person might have a noisy environment, but they have the ability to choose what they can listen to instead. People do their work in a multitude of nontraditional locations, including coffee shops, restaurants, or their living rooms. These areas all have the potential of sounds that are uncontrollable to the person, so they have two choices. They could try to tune out the sound mentally, or they could choose to listen to something on their accessible technology themselves.

Theoretical Framework

In addition to stimulating basic enjoyment, music has the capacity to provide important physiological and psychological benefits. For example, music can induce physiological relaxation (Chanda & Levitin, 2013). Accordingly, young people report listening to music to relax (Miranda & Claes, 2009; North et al., 2000). Miranda (2019) reported that at a physiological level, being exposed to music may reduce stress as evidenced by a decrease in its biomarkers (e.g., cortisol). Thus, music can be effective in relieving anxiety, or the reaction to the stress. Lilley et al. (2014) focused on state anxiety and a correlation to music. State anxiety is an acute reaction to a particular situation that appears to be uncertain or threatening, inducing stress on the individual; a prime example is test anxiety. It was found that listening to slow-tempo, calm music prior to a test may lower a student's arousal to a more optimal level, leading to relatively greater performance on the test.

Interestingly, following stressful interpersonal conflicts with peers, adolescents may not only listen to songs to manage their mixed-feelings (emotional process) but also to think about solutions to the conflicts (cognitive process) ,or else to simply distract themselves and sidestep doing anything about it (behavioral process) (Miranda, 2019). Music can also foster physiological stimulation (Chanda & Levitin, 2013). It is thereby coherent that adolescents also report that music is energizing (Saarikallio & Erkkilä, 2007).

In addition to physiological and psychological benefits from listening to music, thre may be cognitive benefits as well. Lemaire (2019) found that there is some support for the influence of background music on episodic memory. It was suggested that the presence of music decreased the amount of effort required to encode the words due to the presence of a facilitating context.

It is important to note that the attention span is limited and multiple competing senses can detract from a person absorbing particular sensorial information (deHaan, 2010). For example, people will sometimes turn down the radio in their car while driving when they need to look for a particular location or sign. This is because the working memory can only process so much information at a time, known as the cognitive load (deHaan, 2010). In this scenario, lowering the amount of auditory data the brain is processing allows the mind to focus more on the visual data it is receiving. This works for other kinds of senses as well.

These connections between working memory and the cognitive load are not new. Part of the appeal comes from the everyday applications. Every day, people are bombarded with sensory information and passively sort through it while moving through life. These factors are central to conversations on distraction (Beasley & Chuang, 2006; Higgenson, et al., 2019). There is a limit to how much a human can process, but the question is where that is.

While research has explored several connections of the working memory, there is always room for testing other variables. Many studies have focused on the concept of distraction when analyzing music's effects on working memory and if particular characteristics, such as personality, gender, or age, would alter the levels of distraction on certain kinds of processing tasks (Higginson, et al., 2019).

Some studies focused directly on music in comparison to other kinds of auditory material, such as irrelevant speech, city ambience noises, and nature ambience sounds (Alley & Greene, 2008; Iwanaga & Ito, 2002; Reaves et al., 2016; Reynolds et al., 2013). This method gave the studies a spectrum to analyze the distraction effects on rather than just a control (silence)

condition and a music condition. In these studies, it was found that the silence condition performed the best, followed by the extra auditory information, and music performed the worst.

When there was a division between music with lyrics and without, it was found that the lyrical, or vocal, music performed worse than the instrumental condition (Alley & Greene, 2008; Anderson & Fuller, 2010; Avila et al., 2011; Furnham et al., 1999; Iwanaga & Ito, 2002). However, researchers were interested in more than comparing just music to silence. Previous research began delving into other related questions. Some researchers started looking into specific qualities of music, such as the effects of the volume, the familiarity, and the complexity (Alley & Greene, 2008; Gonzales & Aiello, 2009).

Alley and Greene (2008) found a positive, but not significant, correlation between how familiar participants were with the music and how distracted they were with their tasks. For volume and music complexity, Gonzales and Aiello (2009) found an almost significant main effect for volume, a significant main effect for music complexity, and significant interactions with each and participants' preference for listening to music while working. While manipulating the music was a popular focus on this research of music's effects, there were more variables that could be manipulated.

Attention began turning to the individual characteristics of participants. While information about music is helpful, these kinds of studies are still focused on the people listening to the music, so it is relevant to look the characteristics that make people different and investigate how that could relate to the effects of music. A few studies have separated the participants by descriptive qualities and analyzed if these qualities allow someone to be more or less susceptible to music interference with working memory. Anderson and Fuller (2010) examined the effects of gender, finding a significant difference, and Reaves et al. (2016) found that older age had a main effect on music distraction. Taking it a step further, Avila et al. (2011) and Furnham et al. (1999) both chose to separate their participants into introverted and extraverted categories before testing to see if there would be a difference in the two groups to the same conditions. Reynolds et al. (2012) chose to examine the effects the level of neuroticism in the participants would have on music's effects. Similarly, Doyle and Furnham (2012) had their participants take a test that marked them as either being in the creative or non-creative group, but they found the categories to not have a significant main effect or interaction with task performance. Mohan and Thomas (2020) took a different approach by centering their study on the Indian culture of their participants and compared how distracting Indian and Western classical music was in relation to their culture. While this kind of study can limit the generalizability of the results, this centering on the individual can make the study arguably more intriguing. It has the opportunity to inspire other research topics that could have a wider generalizability. Research is inconclusive as to whether listening to music has a positive impact on student achievement; some recent studies suggest a positive correlation (Akpoghol, et al., 2016; Cooper, 2020; Jacob & Pillay, 2021; Mellizo, 2019) while other studies found no positive impact (Anderson & Fuller, 2010; Crncec et al., 2006; Smith & Davidson, 1991).

Focusing on the differences in individual people is something that can be overlooked in favor of an outcome that yields a wider generalizability. As for music's effects on attention and working memory, there is research that concludes that music impairs these functions. However, this research is not discussed as often as some studies that find an outcome relating to physical

repercussions. This kind of information would be especially relevant to share in learning atmospheres, like schools, as it could affect the atmospheres entire existence of being, but educators do not seem to take a stance on this issue. However, their opinion and their mannerisms can tell a different story. Perhaps they have more in common with the students on these kinds of opinions than previously thought. This study was conducted to gather the opinions of current academic scholars of various experiences on the effects music might have, whether impairing or beneficial, based on their own personal experience with their academic career that could not be replicated solely by manipulating variables. It focuses on three different characteristics of the participants, and how each might affect their opinion on the benefits or detriments of music, yielding in different results.

Purpose

This study was conducted to analyze, in midst of the COVID-19 pandemic, to examine how both students and educators viewed the relationship between listening to music while working on school assignments. This data could be used to help both teachers of all levels of experience and students be successful. Additionally, there was an interest in determining if there was a difference between the responses from graduate and undergraduate students in relation to the length and difficulty of their respective programs. It was assumed that not every kind of assignment was expected to benefit from music playing in the background while being worked on. Finally, there was an assumption that some participants would respond that music was too distracting to listen to while completing schoolwork.

Methods

A cross-sectional survey was conducted for this study. The target population was comprised of both school teachers and college students at the undergraduate and graduate levels. The participants were selected from the university's Spring 2021 commencement list. The study focused on students belonging to four colleges: the College of Arts and Media, the College of Education, the College of Humanities and Social Sciences, and the College of Science and Engineering Technologies. The Qualtrics program was utilized in creating the questionnaire. A sample of 250 participants were randomly selected and emailed instead of the intended 1,082 members of the target population of participants. Only 84 questionnaires were filled out, making the response rate 33.6%. Therefore, 166 people, or 66.4%, did not respond and complete the questionnaire in time to be included in the data.

The validity of the questionnaire is questionable, as there was no control group filling it out and the participants were not tested with a second instrument. To account for reliability, some questions were structured in a way where a short answer response was requested for more information that aligned with the initial response. At the beginning of the questionnaire was an informed consent form, detailing the study and asking for the participant's consent to be included in this report. The questionnaire consisted of mostly multiple-choice questions, two potential multiple response questions, and three possible short-answer questions related to what kind of larger group the participants were in, their music-listening and studying habits, and their opinions on overlapping music with schoolwork (see Appendix A). The main limitation of this survey is that it did not specify the term 'music' for the participants, as some reached out to say that it would have affected some of their answers. To collect the data, a link to the questionnaire

was included in an email sent out by a mail merge, so each participant would have a personalized email, with the request that it be completed within a week of receiving.

First, the data was analyzed to see if there was a difference in how teachers and students responded to how frequently they listened to music independently and how frequently they listened to music while working on school assignments. Music frequency refers to how often they listened to music and frequency with schoolwork reflect the concurrence of listening to music and working on school assignments. Both were measured on a scale of 0 to 4 (0 = never, 1 = once a week, 2 = 2-3 times a week, 3 = 4-6 times a week, 4 = daily). An independent-samples t-test (Table 1) indicated that the music frequency between teachers (M = 3.59, SD = 0.90) and students (M = 3.81, SD = 0.50) was not significantly different, $t(53) = 1.30$, $p = 0.20$, $d = 0.30$. Levene's test indicated unequal variances ($F = 8.03$, $p = 0.006$), so the degrees of freedom were adjusted from 82 to 53. An independent-samples t-test indicated that the frequency with schoolwork between teachers (M = 2.46, SD = 1.43) and students (M = 2.00, SD = 1.25) was not significantly different, $t(82) = -1.57$, $p = 0.12$, $d = 0.34$.

Table 1

Results of Independent-Samples t-Test Examining Based on Role

Variable	Teachers		Students		*t*(*df*)	*p*	*d*
	M	*SD*	*M*	*SD*			
Music frequency	3.59	.896	3.81	.495	1.304[a]	.198[a]	0.304
Frequency with schoolwork	2.46	1.426	2.00	1.251	-1.571[b]	.120[b]	0.343

[a]Levene's test found significant for music frequency, so equal variances was not assumed. The degrees of freedom was adjusted to 53 rather than 82.

[b]Levene's test did not find significance, so equal variances were assumed.

Next, the data was analyzed to look for a difference between graduate students and undergraduate students on music frequency and frequency with schoolwork. The same scale from 0 to 4 was used. An independent-samples t-test (Table 2) indicated that the music frequency between graduate students (M = 3.58, SD = 0.92) and undergraduate students (M = 3.83, SD = 0.44) was not significantly different, $t(51) = 1.52$, $p = 0.13$, $d = 0.35$. Levene's test indicated unequal variances ($F = 12.24$, $p = 0.001$), so the degrees of freedom were adjusted from 82 to 51. An independent-samples t-test indicated that the frequency with schoolwork between graduate students (M = 2.37, SD = 1.44) and undergraduate students (M = 2.07, SD = 1.25) was not significantly different, $t(82) = -1.03$, $p = 0.31$, $d = 0.22$.

Table 2

Results of Independent-Samples t-Test Examining Based on Collegiate Level

Variable	Graduate Student		Undergraduate Student		*t*(*df*)	*p*	*d*
	M	*SD*	*M*	*SD*			
Music frequency	3.58	.919	3.83	.437	1.521[a]	.134[a]	0.347
Frequency with schoolwork	2.37	1.441	2.07	1.251	-1.031[b]	.306[b]	0.222

[a]Levene's test was found significant for music frequency, so equal variances was not assumed. The degrees of freedom was adjusted to 51 rather than 82.

[b]Levene's test did not find significance, so equal variances were assumed.

The participants responses were analyzed to determine if their academic colleges would reflect a difference in music frequency and frequency with schoolwork. A one way between-subjects analysis of variance (ANOVA) was run (Table 3) to investigate if the academic colleges had an effect on the music frequency and an effect on the frequency with schoolwork. There was no significant effect found for music frequency at the $p < 0.05$ level for the four groups, $F(3, 80) = 1.03$, $p = 0.39$, $\eta^2_p = 0.04$. Additionally, no significant effect was found for the frequency with schoolwork at the $p < 0.05$ level for the four groups, $F(3, 80) = 0.03$, $p = 0.99$, $\eta^2_p < 0.01$.

Table 3

Results of One-Way Analysis of Variance of Academic Colleges

	Source	*df*	*SS*	*MS*	*F*(3, 80)	*p*	η^2_p
Music frequency	Between Groups	3	1.526	0.50	1.027	0.385	.037
	Within Groups	80	39.617	0.495			
	Total	83	41.143				
Frequency with schoolwork	Between Groups	3	0.186	0.062	0.033	0.992	0.001
	Within Groups	80	149.374	1.867			
	Total	83	149.560				

Finally, the study examined what kinds of schoolwork the participants did while listening to music. Only the participants who indicated they listened to music while working on school

assignments responded. There were three choices of assignments (writing assignments, reading assignments, and answering questions), and they were asked to select all that apply. 87.1% of respondents said they listened to music while working on writing assignments. 44.3% said they listened to music while completing reading assignments. Eighty-four per cent said they listened to music while answering questions.

Findings and Implications

This study was conducted to determine if independent factors such as the role of the participant in an academic atmosphere, the degree program they were enrolled in, or the academic unit the degree was from would have an impact on their opinions of music and its relationship with distraction on schoolwork. Studying these groups, no significant difference was found between how often the participant listened to music and how often they listened to music in combination with working on school assignments. It was determined that participants are less likely to listen to music while completing reading assignments in comparison with writing assignments and answering questions Much of the current published research indicates that music interferes with working on school assignments. This study's responders did not opine music impairs working on school assignments. In line with the current research, there was a difference seen in the kinds of tasks that showed more impairment than others.

In the analysis of teachers and students, the expectation was that the teachers' answers would be informed by their personal experience, both in front of and within the classroom, and unlike some of the research already conducted, this division of participants did not depend on an arbitrary spectrum of answers on a pre-test. Rather, the identification was a concrete label, preventing participants that could have been closer to the median of a spectrum needing to be considered. However, this grouping did not create enough variance in the population for the results to be affected. While the teacher group was made to diversify the participants, it is still a sub-group of the population, as all the participants are college students. Therefore, this result is more generalizable to students than teachers. To remedy this, the research would have to find participants that belong only in the teacher group instead of both the student and teacher group.

Examining differences in the degree level was conducted in hopes that the length of experience being a student and the different demands of the program . Undergraduate programs are less specialized, but the work is usually more specific. Graduate programs are more specialized for the individual, but the work allows for more open interpretation and freedom. However, the differences in degree level did not yield a significant difference. Perhaps the variability of this, in combination with different academic colleges, was too much to pinpoint a connection. It might have been more efficient if the examination of degree level focused on one academic college instead of four.

The academic units that were analyzed were chosen with the intention that the degrees earned within those colleges could aid in music's effect applying to subjects relevant to all ages instead of just college students. Similar to the idea of different degree levels, each college would have its own requirements and strengths, aligning with some of the more personal characteristics of participants in the current research. However, this also yielded an insignificant difference. This could also be due to too many variables not being controlled. It might have been more impactful if one academic college was chosen, sacrificing a wider generalizability, and opening up the potential participants used to more than those fulfilling graduation requirements.

There was the intention to see if the participants had an opinion, via personal experience, on what kinds of assignments are and are not hindered by music. Reading assignments being impacted concurs current research about working memory not being able to process information as well with conflicting data being processed. While not every participant received this question, the vast majority did, so this aids generalizability. This result allows the quantitative data from previous research to align with our participants, giving validity to the results. While this objective fulfilled expectations, it could be improved on. Using a scale, like the Likert scale, to reflect how the participant feels about listening to music while completing the specific task could show promising results while maintaining a focus on the individual.

Overall, the research examining music's effect on attention and task success are largely concentrated on the music and how to manipulate it. This survey takes a more person-centered approach, as they are all different in reality than just on paper. The current research might have asked the participants if they believe music is distracting, but the opinion is never the focus. It is understandable that it might be more difficult to calculate, but that does not make it less important. This study, while it did not find significant results, did show that the people have developed an opinion on music. There were no participants that indicated they never listen to music, meaning that there is a market to study the opinions. With growing technology allowing music to be more available to users than before, it is important to see how this can affect lives. Perhaps it would be more beneficial to conduct an experimental study, like the current existing research, but the focus on the participants could be more concrete than a dependent category that relies on another test.

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