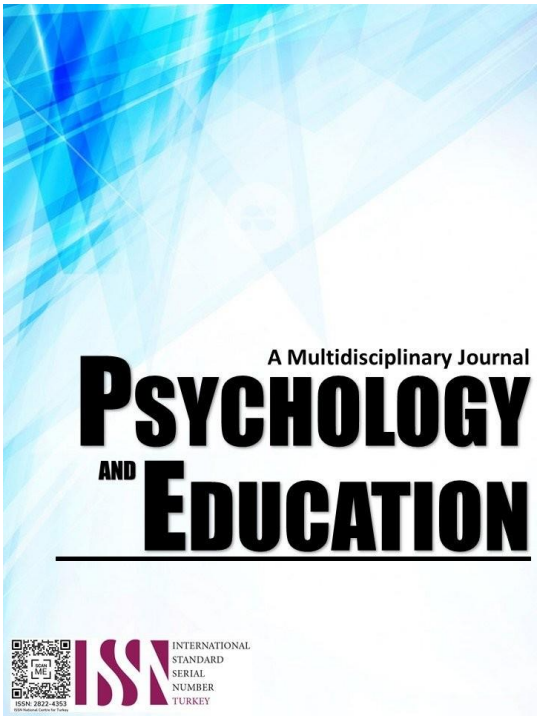
THE IMPACT OF CLASSICAL MUSIC AND POP MUSIC ON MEMORY RETENTION AMONG COLLEGE STUDENTS



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Research Article

The Impact of Classical Music and Pop Music on Memory Retention among College Students

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Abstract

Music is part of an individual's everyday living. Some studies show that classical music has a better effect on cognitive abilities while some studies recommended to further investigate the other genres effect on individuals' memory. This study focuses on the effects of pop and classical music on memory retention among college students. In this experiment, participants are divided into two groups: experimental group A which is under the treatment of classical music, and experimental group B for pop music. Each group has an equal number of participants. The experiment was conducted on a population of 60 college students for the initial study and 32 students for the follow-up study. The result shows that there is a significant difference between the two groups in both the initial and follow-up studies. A follow-up study was made to further investigate the effect of both genres on the memory retention of the students. Interestingly, the experiment reveals that pop music has a better effect compared to classical music. Researchers recommended that future studies may investigate other types of music genres to further assess the effect of music on memory retention.

Keywords: *experiment, classical music, pop music, memory retention, college students*

Introduction

Nowadays, listening to music is a normal activity for some people, it can be entertaining, might even make a person healthier, and serves as a source of pleasure and contentment that benefits the listeners. Since it provides positive energy and lightens the environment, it can relax the mind, boost the mood, and energize the body for its cognitive and psychological benefits. Other than pleasure and entertainment, music can also serve as a form of meditation that alleviates anxiety (Sharma, 2019). Biasutti et al. (2019) claimed that music training positively affects overall cognitive function and can alleviate depressive mood. Improvisation exercises included in music-related activities also help enhance social skills, emotional well-being, and cognitive abilities.

Many students enjoy listening to music while studying. Some of them believe that when they are listening to their favorite music it may improve their memory. Students always strive to find the best way to prepare for their exams, mainly to improve the retention of information. As stated by Jancke (2019,) music has been shown to enhance memory and make the consolidation of acquired knowledge easier. It basically illustrates the association between music and memory processes. As a matter of fact, nowadays, listening to music while studying has started to become a trending practice that many students are adopting. Some students like listening to music while studying or doing their schoolwork at home. This is proven by the statistics showing that approximately 50 to 60 percent prefer listening to music while studying or working (Angeles, 2023).

Studies show that classical music has a beneficial effect on individuals. Studies have shown that classical music is often utilized during study sessions to reduce stress levels and create a motivating learning environment. Zhang (2020) also proposed the implicit learning method, suggesting that listening to calming classical music can reduce stress, enhance focus, and speed up the learning process. Oppositely, music such as rock and pop with too loud or too jarring music distracts and may compete with attention.

Additionally, Eskine et al. (2020) found that listening to music can influence cognitive abilities and creative thinking. This effect is believed to stem from music's impact on arousal and mood. Other studies have indicated that listening to music regularly can enhance cognitive recovery and improve mood (Helsinki, 2020).

Interestingly, the impact of music on memory has garnered attention in the field of educational psychology. Matosic's (2024) study aimed to explore how different music genres—such as metal, classical, and instrumental—affect students' academic achievement, particularly in tasks like reading comprehension. Likewise, Buerger-Cole et al. (2019) suggest that future studies may investigate whether various music genres affect learning and whether studying with or without music affects memory. While various studies indicate that music positively influences cognitive performance, some research suggests otherwise. Cheah et al. (2022) noted that studies examining how background music impacts cognitive task performance often produce inconsistent methods and conflicting results.

In this study, researchers focused specifically on the effects of listening to classical and pop music on students' memory retention. They explored how different music genres influence the encoding, processing, and recalling of information during memory tasks. An experiment was conducted to determine whether listening to classical or pop music affects students' memory. The findings of this study aim to expand students' understanding of how music can impact their memory retention.

The Mozart Effect was developed by Rauscher et al. (1993), which states that listening to Mozart's Sonata may positively impact

spatial abilities and enhance word memory across different types of words. Research reveals that after listening to Mozart's Sonata for a period, individuals show significant improvements in spatial and reasoning skills, as they achieve higher scores after exposure to the music. However, they also emphasized that the Mozart effect is only limited to spatial reasoning skills, and it may help an individual to enhance their performance in a short period of time. Consequently, Mozart Effect Theory will be utilized to further analyze whether listening to classical music can have a significant effect on the students' memory retention and consider if some genres of music, like pop music can enhance an individual's ability to memorize. This study will also be using Mozart's Sonata while performing a test on the students and the top 10 music mixes on Spotify for pop music. Through these kinds of tests, the researchers will further assess if the Mozart Effect can be proven to be true or if it can also happen in any kind of genre, such as pop music. Also, the researchers will further investigate whether music really affects college students' memory retention.

Research Questions

This study aims to determine the level of memory retention among the subjects before and after listening to different music genres. Also, the study will assess if music affects the student's memory retention skills. Specifically, this paper seeks to answer the following questions:

1. What is the level of memory retention after receiving the treatment condition among:
    1.1. experimental group A (Classical Music)
    1.2. experimental group B (Pop Music)
2. Is there any significant difference in the memory retention test scores among:
    2.1. experimental group A (Classical Music)
    2.2. experimental group B (Pop Music)
3. What is the effect of music genres on the memory retention of college students?

Literature Review

Music

Music is defined in the literature as the universal form of expression and communication in the daily lives of individuals (Menhr et al., 2019). Chen (2023) identifies rhythm, melody, texture, dynamics, texture, and form as the six important elements of a music piece. Each musical genre, such as classical, jazz, hip-hop, pop, and others, combines those elements in unique ways. Musical genres are artificial categories used to arrange musical compositions according to similar characteristics. These characteristics, that distinguish one genre distinct from one another typically involve instrumentation, rhythmic structures, and harmonic elements (Szabo et al., 2024). Music genres can define one's personality and musical taste as they show the classification of music they like or never listen to (Wijaya & Muslikh, 2024). Goltz and Sadakata (2021) non-vocal or non-lyrical music, such as classical music, provides the majority of people calm and less distraction, unlike jazz, upbeat, vocal, and pop music which often gets their attention.

Additionally, some researchers suggest that classical music has a beneficial influence on short-term memory as it has a soft melody and consistent rhythm that engage brain functions and enhance cognitive processes such as memory retrieval (Smith et al., 2020; Johnson & Williams, 2019). As stated by the study of Osmanoğlu and Yilmaz (2019), classical music originated in Europe with polyphonic music, or multiple independent melodies being played or sung. This style is generally associated with culture and separated from Eastern and Western folk music. Although classical music may not be as popular as folk music, it has been a style that music enthusiasts from different cultures listen to from the past to the present. On top of that, as shown in the result of a related literature review, classical music positively reduces anxiety and stress and promotes well-being. According to one of the studies they conducted, students who received the highest scores on exams listened to classical music, and students who got lower scores did not listen to it. However, this may be associated with classical music rather than Mozart (Ngo, 2022).

On the other hand, listening to pop music has become immensely famous nowadays, especially in Asian countries like "Pinoy Pop Music," which comprises catchy melodies, heartfelt lyrics, and infectious rhythms as its characteristics. Often includes Filipino languages - Tagalog, Cebuano, and Ilocano. P-pop music also has its theme - love and relationships to social issues, cultural heritage, and national pride (Patria, 2024). Furthermore, participants reported that listening to K-pop completely changed their lives, inspiring them to strive for the best and enhance their quality of life (Koh & Baek, 2020). It also expanded the range of interests and hobbies, specifically in studying, created numerous new friendships, and broadened the public's aesthetic (Liu, 2023). According to Maynes and Nartea (2020), participants preferred to listen to pop music and loud music rather than other genres of music. Their respondents spent 30-60 minutes listening to loud music. Thus, they spend their free time listening to music, particularly pop music. With that, as shown in the research, when a person is engaged with other tasks like studying or working, exercising or doing housework, shopping or traveling, they tend to listen to music (Cheah et al., 2022).

Furthermore, listening to music benefits one's life, not only in entertainment but also in physiological processes that improve physical and mental well-being (Rebecchini, 2021). However, some studies show that the benefits of music were entirely restricted to conditions in which the music was familiar to participants. According to the study by Pavia et al., (2019), listening to songs with repeated listening, and frequent exposure contributes to vocabulary learning.

Memory Retention

Memory is an essential cognitive function because it enables one to gather, store, and retrieve information that shapes an individual's identity (Zlotnik and Vansintjan, 2019, as cited in Sridhar et al., 2023). Additionally, as defined by Radvansky (2022), we can retrieve, acquire, and store information through mental processes. Its processes involve activities that utilize data in certain ways to restore it into the present process stream and make it available later.

Zlotnik and Vansintajan (2019) define memory as "gradually changing as time passes." Back then, it was defined as recalling the events from the past, which were seen as more representational and subjective. However, the general definition of memory at this time is the storage of information. Generally, there are three kinds of memory: long-term, short-term, and working. Huizen (2021) differentiates short-term and long-term memory is the ability to recall a limited amount of information from current events or a short period of time, while long-term memory is the ability to retrieve information from past events or a longer period of time. On the other hand, retention is the ability of a person to retain information in the mind, whether for a long (long-term) or short (short-term) period of time, but more desirable for a long period of time (Valderama & Oligo, 2021).

According to Comighud, et al. (2020), students who have difficulty remembering class lectures may also have problems with memory retention, which plays an important role in the students' academic life, for instance, recalling lectures and solving mathematical problems. Effective learning retention of the students involves when they remember the information and when they can retrieve that information if needed (Wanzek et al., 2019). Active retrieval and re-organization can change the strength and content of the memory (Zhuang et al., 2022). Also, Omayma (2023) declared that learners should be provided with a variety of mnemonic techniques that they can choose from in order to improve their capacity to remember new information. Dahat (2023) indicated that sleep and emotion influence individuals' ability to remember and forget information. Working memory is assumed to be crucial for retaining information during complex tasks, such as learning, through interaction with other cognitive systems (Aslaksen & Loras, 2019).

Music and Memory Retention

Newly acquired words are retained in the mind more easily and have more meaning through the use of music. Playing music while storing information may assist memory retention. Suggesting that the extent to which music boosts these memory functions relies on experimental factors, such as the relative complexity of musical and verbal stimuli employed. Ferrari and Fornells (2022) prove that the enjoyment experienced during music listening, which is influenced by both the dopaminergic transmission and the participants' sensitivity to music reward, can enhance episodic memory performance for both the music and nonmusical-associated information. As stated by Hidayat et al. (2024), music has a remarkable potential to affect mood, boost focus, and excite feelings within individuals. Their findings suggest that memorable music positively influences learners' cognitive processes and that incorporating music into learning increases participants' attention, memory, and reasoning. Musical participation enhances the learner's personal expression, listening abilities, and cognitive skills (Taylor & Francis, 2023). In line with this, a study also shows improvement in working memory when participants listened to less familiar music (Giroux et al., 2020). The following study shows that music significantly affects memory retention: Ramos (2021) supports various research findings that background music can enhance students' performance. Among the three genres studied, classical music shows the most significant improvement in students' performance. Additionally, the experiment conducted by Khairu et al. (2023), divided into two groups, has shown that for students in the treatment group, music can improve their cognitive performance and help improve memory in the classroom compared to those in the control group.

However, Carroll (2022) shows no significant difference between doing memory tasks with and without background music. Additionally, the outcome of the study indicates that there is no significant evidence that music influences the students' exam scores, leading to the conclusion that music does not affect memory retention. Hence, researchers stated that the benefits of listening to music on cognitive performance cannot be directly seen in the study. In a Rwandan sample, the study findings show that familiar, pleasant, and stimulating music does not enhance their working memory (Giroux et al., 2020). Besides, Prahbu et al. (2022) results show that music can affect memory negatively as it reduces memory recall, while participants who are not exposed to music have the highest memory recall scores, indicating that they can focus without any distraction without background music. In addition, Gonzalez and Aiello's (2019) study also shows that background music can negatively impact cognitive factors such as memory, attention, and concentration. Rhythms of music can be distracting for students, and it is suggested that students concentrate easily on studying with white noise (Simoneau, 2022). Listening to music while completing cognitive activities may impair performance (Echaide et al.,2019).

Methodology

Research Design

The study utilized quantitative-experimental research as the design of the study. Quantitative-experimental research is used to identify the cause-and-effect relationship between two or more variables (Salmons, 2021). The purpose of this design was to test the hypothesis through giving treatments and controlling variables to establish causality (Hassan, 2024). Furthermore, the study also follows a between-subject design or two-independent group design, where participants were assigned into two different treatment groups under different conditions (e.g., Treatment A and Treatment B), allowing the researchers to assess the effect of independent variables (Bhandari, 2021; Simkus, 2023). Thus, with these research design, researchers could determine the significant differences between the

groups to which the participants are randomly assigned. The study comprises two groups: experimental A and experimental B, in which the randomly assigned participants received treatments for listening to different types of music, classical and pop.

In addition, the study performed an equivalent group method or matching method wherein it helps the researchers to randomly and equally separate the participants into matches based on their profiles and other pertinent factors (Iddon, 2023). In line with this, the experimenters distributed the participants randomly across all groups, using their sex. Random assignment is a technique of randomly placing the participants into different groups (Bhandari, 2021). By using this technique, participants have an equal chance of being placed in different groups, which allows the researchers to limit the possible contamination of extraneous variables on the effect of listening to music on the memory retention of the participants.

Respondents

Random sampling is utilized to obtain participants, and every participant has an equal chance to be selected. This selection method ensured that the participants had an equal chance of being selected for the study and eliminated sampling bias that may affect the results of the experiment (Simkus, 2023). One of the advantages of simple random sampling is that it guarantees fairness, representation, and an equal probability for all the members of the population to be included in the study (Noor et al., 2022). With this, the target participants must be enrolled at Lipa City Colleges for the academic year 2023-2024 under the following departments: CELA (College of Education and Liberal Arts), CON (College of Nursing), CBA (College of Business and Accountancy), CCJE (College of Criminal Justice and Education), CITHM (College of International Tourism and Hospitality Management) and CCTE (College of Computing Technology and Engineering).

A total sample size of 60 participants was needed in the study. The researchers utilized matching and random assignment to ensure the study had equivalent groupings. According to Simkus (2023), random assignment uses randomization to arrange the participants into different experimental groups. It is used to avoid biases and ensures that each participant has an equal chance to be assigned to any group in the study.

The researchers randomized the participants according to their gender using the fishbowl draw method. Each treatment group consisted of different departments. Afterward, the researchers gathered the participants from their assigned treatment group of 15 males and 15 females (n = 30 participants). A minimum of 30 participants per treatment ensures statistical power, reliability, and validity in research, especially in preliminary studies (Serdar et al., 2020)

Furthermore, the researchers conducted a pilot experiment to ensure that the methods and equipment were ready for the actual research experiment. The researchers gathered 15 participants from the 1st year of AB Psychology students. The participants were divided into 2 in assessing the treatment conditions conducted.

Instrument

Upon measuring the data, the researchers utilized the memory retention test based on Ebbinghaus's research on memory. Elizaga et al. (2023) implemented the same test utilizing 50 three-letter incomprehensive words with a consonant-vowel-consonant pattern.

Word sheets are a tool to assess the number of words the participants could recall. Sakai et al. (2021) presented that word sheets measure the memory retention and subsequent retrieval process, which could then be examined at the brain level. In line with this, bond paper and pen were utilized to list the number of words the participants could recall. According to Hu (2024), children learn better when prompted to use their hands and fingers or a pen to write letters or do other visual objects. This shows that using pen and paper in memory tests gives more reliable results.

A speaker was used to measure the effect of music (Classical and Pop music) on the participants while studying. Zelechowska et al. (2020) highlighted that speakers may prevent the "in-head" feeling associated with sound played through headphones. Aside from that, as opposed to headphones, which have the issue of "splitting" music between the left and right ears, speakers bring the sound to life in the room. The music was played at a moderate volume, approximately 70-75 decibels, to minimize distraction while maintaining concentration in cognitive tasks (e.g., studying). Schempp and Sanders (2023) applied the same volume level to navigate the effect of music in studying.

A stopwatch measured the number of words a participant could recall in a given time frame (2 minutes). Manaruzzaki (2022) presented that a stopwatch can serve as an indicator of measuring time intervals. It can be widely used to track productivity rates and overall efficiency. Hence, participants were only reminded when the time started and ended. De Jose and Pasia (2021) show that giving alerts of time remaining while doing an activity will negatively affect performance as it puts pressure on the students.

A demographic data form was used to distribute the number of participants in every treatment equally. The form contains the name, age, and gender of the participants. Call et al. (2022) stated that demographic data provides information about the participants involved in the study and can transform inequities into equity.

To maintain the participants, focus and comfort in the study, the researchers conducted the experiment in a ventilated room. Makadia et al. (2020) stated that the brain does not concentrate on learning when a classroom is excessively warm or chilly. Instead, it seeks to maintain the body cold or warm as required. Proper lighting was observed before experimenting. According to Natsir et al. (2021),

light is an important element of visual perception; hence, the amount of light must be sufficient as it affects the psychological and physiological aspects of a person.

Procedure

The researchers prepared the pertinent documents such as approved letters, letters of invitation, letters to deans, and informed consent. After the preparation, the researchers submitted the research experiment for validation and approval to subject matter experts who were part of the ethical committee reviewer. Once the committee assessed and validated the research experiment, the researchers submitted a copy of the research methodology and the validation form approved by the ethical committee to the VP for Academic Affairs, seeking approval for conducting the research experiment among the college students of the institution. After the approval of the VP for Academic Affairs, the researchers presented all the approved letters together with a copy of the research methodology to the deans of each department, formally asking for their approval to conduct the study involving their students. Following the approval, the researchers conducted the experiment.

The researchers invited 60 randomly selected participants from the institution. The researchers used a cover story for the experiment. The purpose of utilizing a cover story was to persuade the participants to participate in the experiment without knowing the true purpose of the study and to avoid biases like social desirability bias. In order to gather participants, the researchers stated that it was a game activity instead of research. Once the participants confirmed their participation and involvement in the study, the researchers devised a schedule that included the specific location, date, and time of the experiment to ensure that this would not affect the classes of the participants.

After the schedule was approved, the researchers set up the experiment room. Researchers prepared the necessary materials for the experiment, such as word sheets, blank bond papers, pens, speakers, cellphones, blue curtains, and stopwatches, to ensure the participants' comfort before, during, and after the experiment.

Before the actual experiment, the researchers conducted a pilot experiment. They invited 15 psychology students to ensure that everything was working and that no extraneous and confounding variables could affect the experiment. Participants received and answered a basic demographic data form, including their name, gender, and age. After answering the basic demographic data form, researchers briefed the participants about the flow of the activity. To distribute all of the participants equally, the researchers utilized a matching method utilizing the gender of the participants.

At the beginning of the experiment, participants were given informed consent, which contained information about the researchers' cover story. The researchers briefly discussed the content of the informed consent form to address possible questions or clarification from the participants. After the briefing, participants were assigned into two groups: experimental group A and experimental group B. Each participant was given a paper wherein 50 incomprehensible words were listed for them to memorize in 2 minutes; participants were reminded when the given time started and ended.

The music was played during the experiment at a moderate volume level, approximately 70-75 decibels. For experimental group A, the music that was played was Mozart's Sonata, while in experimental group B, the top 10 pop music mix on Spotify was played during the experiment. Afterward, the researchers requested the participants to put the word sheets on the table backward. The researchers collected all of the papers containing 50 incomprehensive words with three letters (consonant-vowel-consonant) from the participants. After the time of studying, participants received a piece of blank paper and a pen to list all the words they memorized within the given time frame. Afterward, the researchers counted the number of words they listed. Lastly, the top three scorers were rewarded, and others were given tokens of appreciation for participating.

Then, during the debriefing, the researchers finally revealed the true objective of the experiment while presenting another informed consent containing the objectives of the study. Participants were asked if they were still willing to participate in the experiment in this part. When the participants agree about the true purpose of the study, they are requested to sign the informed consent form as proof of their willingness to participate in the study. On the other hand, when the participants disagreed about participating in the experiment, they could withdraw their participation, and the data obtained from them would be properly discarded. Data written on paper would be shredded, and the copy of the data from the system would be permanently deleted. The data obtained was analyzed based on the statistical treatment of the study.

Data Analysis

After conducting the experiment and gathering data, researchers tested the formulated hypothesis of the study. To analyze statistical data, researchers utilized JAMOVI. According to Sahin and Aybek (2019), JAMOVI is a statistical tool that provides different core functions such as data entry and manipulation, rule-based data filtering, variable transformations, and computing variables.

The statistical test assumptions were assessed through the weighted mean and standard deviation. As Keni (2019) stated, the weighted mean and standard deviation allow for the integration of data items with various degrees of value or significance. Giving weights to each value represents the relative importance of distinct aspects, making it a useful tool in circumstances where certain values are more important or relevant than others.

An Independent sample t-test was also utilized to measure the effect of the experiment. An independent sample t-test is a sort of test that compares the mean of two independent groups. The mean of the two groups helps the researchers draw conclusions about the population. Furthermore, it examines the means of two groups and is only used when the data for each group is normally distributed and the two groups are independent (Banda et al., 2021).

When the statistical data do not meet the assumptions, Welch's T-Test or Mann Whitney U can be applied to analyze the data. According to Banda et al. (2021), the Mann-Whitney U test, like an independent sample t-test, is used to compare two independent groups. Thus, Delacre et al. (2019) stated that when the assumption of variance homogeneity is not fulfilled, Welch's t-test gives superior control of Type 1 error rates than the student's t-test and loses minimal robustness.

Additionally, to ensure the validity of the analysis, the assumptions of each statistical test will be assessed, including:

Shapiro Wilk test of normality: As cited by Malato (2023), it is a hypothesis test that is performed on a sample assuming the null hypothesis that the data comes from a normal distribution. If the p-value is low, we can reject the null hypothesis and conclude that the sample was not derived from a normal distribution.

Homogeneity test of variances: Testing variance homogeneity in factorial experiments comparing the amount of variability between groups or to a hypothetical distribution would result in similarities or, at a minimum, demonstrate a lack of significant deviation from the predicted distribution (Odoi et al., 2022).

Cohen's d: Cohen's d is widely used to interpret the study's effect size. Cohen's d-effect size can be used to compare the differences between the means of the two experimental groups. This is frequently used to compare the treatment group with the other group. It can also be utilized along with the results of t-tests and ANOVA. Cohen's d effect size can also be used in meta-analysis (Funder & Ozer, 2019).

Ethical Considerations

Before gathering the data from the participants, the researchers used a cover story. Instead of saying the study's purpose, the researchers used a cover story to encourage the participants to join the experiment. Also, the researchers developed two informed consent forms for the participants (one for the cover story, and one for the debriefing). Two informed consents were given to ensure that the participants knew the risks, benefits, and rights of the participants in the study. The researchers prepared all the materials that were validated by the research adviser, followed by the reviewer, to reduce the unforeseeable risks and harm to the participants.

The first condition that the researchers did in the experiment was deception; this was not an experiment but a game activity. After the experiment, the researchers revealed the true purpose of the experiment. The researchers presented informed consent to the participants so they were aware of the risks and benefits of the study. On the other hand, the researchers asked the participants if they were willing to continue their participation or withdraw when the study was revealed. If the participants withdraw their participation, it has no consequences, and their information is properly discarded.

After the experimentation, the participants' answers and participation were securely kept private, and only the researchers and the research adviser had access to information on the study. The anonymity and confidentiality of the information among the participants were strictly observed to ensure their safety and security.

Hence, the researchers strictly adhere to the ethical standards and regulations of the Data Privacy Act of 2012, also known as RA 10170, which seeks to protect human rights aligned to participants' personal data information and interactions with the experiment. It includes the participant's demographic profile, learning information, and location information, which were kept secure to protect the participants' data. Their personal information was not used inappropriately.

Results and Discussion

Study 1. Initial Study

Table 1. *Initial study on the levels of memory retention after receiving the treatment*

	Group	*N*	*Mean*	*SD*
Memory Retention	Classical	30	12.2	4.10
	Pop	30	10.2	4.44

Table 1 compares memory retention levels among the participants who listened to classical and pop music. The table shows that both groups (classical and pop) acquired the same number of participants (N=30, N=30). This means that participants are equally distributed before the experiment.

However, the initial study shows inconsistency between the variation of measured memory retention of the participants when compared to their mean score (Mean=12.2, SD=4.10; Mean=10.2, SD=4.44). A larger standard deviation indicates that the data points are spread further from the mean. To address the issue, further investigation was conducted to re-analyze the result.

On the other hand, the table also showed that the Classical group had relatively higher average mean memory retention than the Pop

music group (Mean = 12.2, Mean = 10.2). Therefore, classical music is likely to enhance retention positively. The higher variation of the pop group implies a less consistent retention result. According to Zatorre and Zarate (2020), classical music has cognitive benefits because of its complexity in a way-structured manner through harmony, improving memory and attention. In memory tasks, it has been observed that classical music enhances performance more than other music genres like pop music, which can be distracting as it contains both lyrics and rhythm (Perham et al., 2021). This argument is further supported by Schellenberg (2022), who found that listening to classical music can stimulate the brain areas involved in attention and memory encoding. Classical music can also improve everyone's active engagement in memory tasks and cognitive-oriented exercises, as it helps regulate mood and reduces stress, anxiety, and depression (Zhang 2020). Furthermore, Smith and Alvi (2024) stated that, in the general population, the consequences of the Mozart Effect, which are related to classical music's positive impact on cognition, are not limited to enhancing memory functions alone. In accordance with these viewpoints, the data stated above support the assertion that listening to classical music improves memory retention.

Table 2. *Normality distribution of the variables using the Shapiro-Wilk test*

	W	*p*
Dependent Variable	0.953	0.021

Table 2 presents the normality distribution of the variables using the Shapiro-Wilk test. The data reveals a p-value of 0.021 (W=0.953), indicating a normality violation. Therefore, researchers led to the assumption that the data was not normally distributed, which is why a non-parametric test (Mann-Whitney U) was utilized.

Table 3. *Identifying the equal variances of two groups using the homogeneity test of variance (Levene's test)*

	F	*df*	*df2*	*p*
Dependent Variable	0.150	1	58	0.700

Table 3 identifies the equal variances of two groups using the homogeneity test of variance (Levene's test). The data reveals that the assumption of homogeneity was not violated, as evidenced by a p-value of 0.700 (F= 0.150), indicating that the variances in the two groups were equal. Levene's test verified the homogeneity of variance because the p-value is bigger than the assumed level of significance $\alpha = 0.05$. The assumption is met, as evidenced by the data presented in Table 3 (Tomków et al., 2019).

Table 4. *Initial study on the effect of music on the memory retention of students*

Independent Samples T-test					
		Statistic	*p*		*Effect Size*
Memory Retention	Mann-Whitney U	311	0.039	Rank biserial Correlation	0.310

Note. H_a μ *Classical music* $\neq$ μ *Pop Music*

Table 4 presents the initial study of music's effect on the students' memory retention. Mann-Whitney U test was utilized to compare the scores of two groups, classical and pop music. The result indicates that the p-value of 0.039 shows a significant difference in listening to music, whether classical or pop music, on the students' memory retention, leading to the decision to reject the null hypothesis. To assess the effect of music on memory retention of the students, rank biserial correlation was used. The rank biserial correlation was utilized to measure the strength of the association between the two variables (Nikitina & Chernukha, 2023). The result shows an effect size of 0.310, indicating that music weakens memory retention. According to Musliu 2017, as cited in Effiong et al., 2024, music influences memory negatively as students are more able to memorize better without music. A study also concluded that music had either no effect or significantly hindered memory performance (Nguyen & Grahn, 2017, as cited in Trivedi, 2023).

Based on the result, the researchers identified an error in the experiment. Music was played continuously from the moment participants entered the room, which became a confounding variable that likely distracted them. According to Browne (2023), background music can affect the sustained attention of the students. Music negatively affects memory retention by attracting the participants' attention to the information that needs to be remembered. (El Hajm et al, 2014, as cited in Cardona et al., 2020). Additionally, background music affects reading comprehension as participants perform worse on tasks when they simultaneously listen to music (Goltz & Sadakata, 2021). A follow-up study has been conducted to address this factor.

Study 2. Follow up Study

Table 5. *Follow up study on the levels of memory retention after receiving the treatment*

	Group	*N*	*Mean*	*SD*
Memory Retention	Classical	16	9.75	1.95
	Pop	16	12.06	3.32

Table 5 presents the follow-up study on the level of memory retention after the participants received the treatment. According to the data presented, both groups (classical and pop) obtained equal participants (N=16, N=16). This means that participants are equally distributed before the experiment is conducted. In the data presented, all of the participants have an equal opportunity to participate to

ensure the integrity of the data and to understand the underlying factors of the study (Bozic, 2024).

The follow-up study measured more consistent memory retention, indicating that participants were able to retain information at a stable level throughout the experiment. Additionally, the standard deviation and mean score of the follow-up study present a different result compared to the initial study (Table 1), showing that the standard deviation is significantly closer to the memory retention levels of the participants (Mean= 9.75, SD=1.95; Mean=12.06, SD=3.32).

Furthermore, participants under the condition of pop music gained a mean score of 12.06, indicating the highest mean score compared to the classical group. The data have shown that listening to pop music is a more applicable genre of music in boosting the memory retention of the students. As supported by the study of Wang (2022), applying pop music in teaching serves the needs of the students' memory improvement and healthy growth. Most students preferred listening to pop music while studying vocabulary words. Students feel that listening to pop songs while learning the language is an interesting method for learning, memorizing unfamiliar words, and pronouncing them correctly (Isnaini & Aminatun, 2021). However, the classical music group obtained a mean score of 9.75 which indicated a lower mean score compared to the pop music group. Meares and Goodmon (2023) stated that classical music (listening to Mozart's sonata) can give a higher level of mood arousal but fail to boost a person's cognitive functioning. Further analysis needs to be made to analyze if other genres can benefit an individual's cognitive functioning and memory (Shi, 2020). As the result presented, the two groups obtained a mean difference of 2.31.

Table 6. *Normality distribution of the variables using shapiro wilk test*

	W	*p*
Dependent Variable	0.983	0.875

Table 6 presents the follow-up test result on identifying the normality test using the Shapiro-Wilk. Through the use of the Shapiro-Wilk test, we can determine if the test is normally distributed or not, as it will indicate the p-value of the test (Bobbit, 2021). As shown in the table, the p-value of the follow-up study is 0.875, which indicates that the test was normally distributed, which is greater than the p-value of 0.05.

Table 7. *Identifying the equal variances of two groups using the homogeneity test of variance (levene's test)*

	F	*df*	*df2*	*p*
Dependent Variable	4.62	1	30	0.040

Table 7 reveals the equal variances of the two groups using the homogeneity test of variance (Levene's test). Utilizing Levene's test, the data reveals that the assumption of homogeneity was violated, as evidenced by a p-value of 0.040 (f=4.62). Therefore, the researchers led to the assumption to use a non-parametric test (Welch's T-test) to further identify the significant differences in the data presented.

Table 8. *Follow-up study on the effect of music on the memory retention of the students*

		Statistic	*df*	*p*	*Mean Difference*	*SE difference*	*cdff*	*Effect Size*
Memory Retention	Welch T-test	-2.40	24.3	0.025	-2.31	0.962	Cohen's d	-0.850

Note. H_a μ *Classical music* $\neq$ μ *Pop Music*

Table 8 shows the follow-up study regarding the effect of music on the memory retention of the students. Utilizing the Welch T-test, results have shown that there is a significant difference in the memory retention of the students when they are listening to music (classical and pop music) (test statistic=-2.40, p-value=0.025), leading to the rejection of the null hypothesis. Listening to music increases brain activity and the ability to recall information (Billington, 2019). According to Pohekar et al. (2020), music affects the performance of the students as it enhances recall capacity and can be useful in building interest and focus among the students.

Furthermore, in the follow-up study, Cohen's d is utilized to measure the effect of music on memory retention. Cohen's d is used to quantify the potential effect size of two comparable groups (Metsamuuronen, 2024). The data have shown an interesting result, wherein the study has shown an effect size of -0.850 (MD= -2.31, SED= 0.962), which indicates a large effect size, meaning that the adjustments made by the researchers (playing the music only while reviewing the words) during the follow-up study gives a larger effect on the participants' memory retention as compared on the initial study conducted (Table 4). The results of the study by Muslimah et al. (2020) also showed a significant effect of listening to music while studying, 83.3% of the students believed that listening to music keeps their mind concentrated as it gives a good atmosphere and reduces stress in studying. Students engaged in music while studying give good outcomes of scores during exams (Guhn et al., 2020).

Overall, the study reveals that in today's generation, listening to pop music while studying affects the memory retention of the participants. This means that "The Mozart Effect" theory can be falsified. Most of the studies conducted by some researchers often provide inconsistent results about the "Mozart Effect Theory". As evidenced by the study of Leemkuil and Farrokhnia (2023), Mozart's music did not have a statistically significant effect on the learner's performance, which may indicate a more complex relationship in learning. Listening to Mozart's sonata increases mood arousal but fails to boost a person's cognitive function and memory (Meares & Goodmon, 2023). Due to the inconsistent results of the study, the researchers sought other alternative models that could align with the

research studied. One proposed theory was the "Arousal-Mood Theory" proposed by Thompson et al. (2001), which states that when individuals are exposed to auditory stimuli, it causes a significant change in the arousal and mood of a person, where it gives improvements to cognitive performance, especially in memory (Chee et al., 2024). Several studies investigated stated that the higher the arousal, the better the performance, and it can hold a variety of cognitive tasks like, arithmetic calculations, declarative memory, processing speed, visuospatial attentional control, episodic memory, creativity, and alleviation of mind (Bottiroli et al., 2014; Cloutier et al., 2020; Lemaire et al., 2019; Proverbio et al., 2015; Proverbio et al., 2018; Ritter & Ferguson, 2017; Taruffi et al., 2017; as cited by Zhuang 2021). The findings of the study may align with the suggested theory wherein the researchers observed that arousal and mood might be the cause of why individuals who listen to music while reviewing the words given gain better results and could further assess that music can significantly affect an individual's memory retention. As evidenced in table 5, up-beat music like pop music can give the participants high arousal and positive mood while performing the activity. That might be the reason why participants in the pop music group performed better than the classical music group.

Conclusions

Listening to music while studying has become a trend, sparking curiosity about how the brain processes information during this activity. The study shows that the pop music group had a higher memory retention score than the classical music group, suggesting that listening to music while studying can enhance memory retention. While the results emphasize the positive effect of pop music on memory, further statistical analysis is needed to draw definitive conclusions. Limitations of the study included a small number of participants, unmeasured IQ levels, and the type of speaker used, which could have affected the results. Additionally, the study solely focused on pop music and classical music. Further exploration of other music genres should be considered to assess the effects of music on memory retention.

Teachers should consider introducing music while studying as an alternative study method. Hosting seminars or webinars on the benefits of music could help the students discover new study techniques that enhance learning and make studying more enjoyable. Since music improves memory retention, students are encouraged to use it while studying to enhance focus and cognitive performance. Future researchers should include pre-tests and post-tests to gather more data on the effect of music on memory retention, as well as a larger sample size to ensure that the results are significant. Also, conducting IQ tests before the experiment and exploring other music genres will offer a deeper understanding of how music influences memory. Lastly, future researchers are encouraged to use a wired speaker with the same brand, model, and size positioned in each room corner to obtain an accurate result. It is recommended to play the music at a moderate volume (approximately 70 to 75 decibels) to ensure the participants' comfort and reduce potential distractions during the experiment.

References

Abraham, W.C., Jones, O.D. & Glanzman, D.L. (2019).Is plasticity of synapses the mechanism o f long-term memory storage?. Science of Learning. 4:9., https://doi.org/10.1038/s41539-019-0048-y

Alam, A., & Mohanty, A. (2023). Music and Its Effect on Mathematical and Reading Abilities of Students: Pedagogy for Twenty-First Century Schools. In Interdisciplinary Perspectives on Sustainable Development (pp. 342-346). CRC Press.

Banda, G., & Patson, T.F. (2021) Parametric and Nonparametric Tests: A Brief Review. International Journal of Statistical Distributions And Applications. Vol. 7, No. 3, 2021, pp. 78-82. doi: 10.11648/j.ijsd.20210703.1

Barradas, G. T., & Sakka, L. S. (2021). When words matter: A cross-cultural perspective on lyrics and their relationship to musical emotions. Psychology of Music, 50(2), 650–669. https://doi.org/10.1177/03057356211013390

Biasutti, M., & Mangiacotti, A. (2019). Music training improves depressed mood symptoms in elderly people: a randomized controlled trial. The International Journal of Aging and Human Development, 92(1), 115–133. https://doi.org/10.1177/0091415019893988

Bhandari, P. (2021). Random assignment in experiments | An easy introduction. Scribbr. https://www.scribbr.com/methodology/random-assignment/

Blanco, D. & Nartea, M. (2020). Music and Academic Performance: Impact of Listening to Music of Filipino Millennials. ReseachGate. https://www.researchgate.net/publication/341342612

Call, C., Eckstrand, K., Kasparek, S., Boness, C., Blatt, L., Jamal-Orozco, N., Novacek, D., Foti, D., & Diversity, S. (2022). An Ethics and Social-Justice Approach to Collecting and Using Demographic Data for Psychological Researchers. Perspectives on Psychological Science, 18, 979 - 995. https://doi.org/10.1177/17456916221137350

Cheah, Y., Wong, H.K., & Coutinho, E. (2022). Background Music and Cognitive Task Performance: A Systematic Review of Task, Music, and Population Impact. SageJournals. https://journals.sagepub.com/doi/full/10.1177/20592043221134392

Cournoyer Lemaire, E. (2019). The effect of background music on episodic memory. Psychomusicology: Music, Mind, and Brain, 29(1), 22–34.https://doi.org/10.1037/pmu0000234

Comighud, S. M. T. (2021). Factors on memory retention: effect to students' academic performance. International Journal of Business and Technology, 9(1), 1-24.

De Jose, B.T. & Pasia, D.A. (2021). The impact of timer and warning alert in an online examination interface on the user experience of students integrated by openness to experience. https://animorepository.dlsu.edu.ph/etdb_induseng/7

Delacre, M., Lakens, D., & Leys, C. (2019). Why Psychologists Should by Default Use Welch's t-test Instead of Student's t-test. International Review of Social Psychology. https://doi.org/10.31219/osf.io/sbp6k

Echaide, C., del Río, D., & Pacios, J. (2019). The differential effect of background music on memory for verbal and visuospatial information. The Journal of General Psychology, 146(4), 443–458. https://doi.org/10.1080/00221309.2019.1602023

Elizaga, L., Elizaga, A., Ang, J., & Angoluan, M. (2023). Lo-fi music and its effect on memory retention among selected freshmen board program students from a University in Quezon City, Philippines. International Journal of Innovative Science and Research Technology 8(12):458 - 461 doi:10.5281/zenodo.10401332.

Eskine, K. E., Anderson, A. E., Sullivan, M., & Golob, E. J. (2019). Effects of music listening on creative cognition and semantic memory retrieval. Psychology of Music, 48(4), 513–528. https://doi.org/10.1177/0305735618810792

Ferreri, L., Rodríguez-Fornells A. (2022). Memory modulations through musical pleasure. Annals of the New York Academy of Sciences. Sci.2022;1516:5–10. 10.1111/nyas.14867

Funder, D.C. & Ozer, D.J. (2019). Evaluating Effect Size in Psychological Research: Sense and Nonsense. Advances in Methods and Practices in Psychological Science. 2(2):156-168. doi:10.1177/2515245919847202

Gonzalez, M. F., & Aiello, J. R. (2019). More than meets the ear: Investigating how music affects cognitive task performance. Journal of Experimental Psychology: Applied, 25(3), 431.

Hammer, C. S. (2011). The importance of Participant Demographics. American Journal of Speech-Language Pathology, 20(4). doi: 10.1044/1058-0360(2011/ed-04)

Helsinki, U. (2020). Effects of Vocal Music on Verbal Learning and Long Term Recovery After Stroke. https://helda.helsinki.fi/server/api/core/bitstreams/

Khairul, M.T., Neo, T.K., & Rashid, F.N. (2023). Enhancing Students' Cognitive Memory Using Music in the Classroom. ResearchGate.https://www.researchgate.net/publication/368465301

Hidayat, L., Anggraeni, S., Dahlan, T.H., & Pangestu, F.H. (2024) Memorable Music and Cognitive Development in Emerging Adulthood: A Scientific Perspective. Journal of Science Education and Practice., Volume 8, Number 1, 2024 ., p-ISSN 2548-950X., e -ISSN 2549-7170 ., 10.33751/jsep.v8i1.9701

Hu, C. (2024). Why Writing by Hand Is Better for Memory and Learning. Scientific American. https://www.scientificamerican.com/article

Iddon C. (2023). Matched group design definition, limitation, examples. Study. https://study.com/academy/lesson/matched-group-design-definition-examples

Keni, D. (2019). Weighted Mean Formula. Step by Step Calculation (with Example). WallStreetMojo. https://www.wallstreetmojo.com/weighted-mean-formula/

Kumar et al. (2019). The Fishbowl Draw is a Method of a/an:. Testbook. https://testbook.com/question-answer/the-fishbowl-draw-is-a-method

Manaruzzaki, A., Suhardi, B., Andriyani, H. & Utami, N. (2022). Literature Review: The Importance of Working Time Measurement in the Manufacturing Industry to Increase Company Productivity (Case in Indonesia).

Matošić, Đ. (2024). Influence of Different Music Genre on Learning (Doctoral dissertation, University of Split. Faculty of Humanities and Social Sciences).

Ngo, Nathan. (2022). Does listening to classical music improve academic performance? Think Twice. https://sites.utexas.edu/think-twice/2022/10/07

Odoi, B., Ankrah, S., Samita, S., & Al-Hassan, S. (2022) The Efficiency of Bartlett's Test using Different forms of Residuals for Testing Homogeneity of Variance in Single and Factorial Experiments-A Simulation Study., Volume 17. https://doi.org/10.1016/j.sciaf.2022.e01323

Osmanoğlu, D.E. & Yilmaz, H. (2019). The Effect of Classical Music on Anxiety and Well-Being of University Students. ResearechGate. https://www.researchgate.net/publication/336473156

Makadia, P.J., Nalawade, S.U., Jadhav, S.S., Gawade, A.L., & Goilkar, S.S. (2020) A Review on Design of Air Conditioning System of the School For Better Indoor Air Quality. International Journal of Advance Scientific Research and Engineering Trends. Vol. 5, Issue 12. doi: 10.51319/2456-0774.2020.0007.

Mukuze, K., Chirasha, V., Samanga, N., Darangwa, I., Kurehwa, C., & Ndhlovu, P. (2023). The Impact of Marital Status on Work-Life Balance Considering Covid-19 Pandemic at Midlands State

Natsir, N., Jamala, N., & Kusno, A. (2021). The Artificial Lighting Analysis of Study Rooms in Dormitories and Classrooms Islamic Boarding School of Lil Banat Parepare. EPI International Journal of Engineering pISSN 2615-5109 Volume 4, Number 1. doi: 10.25042/epi-ije.022021.1281.

Obied, R. (2023). The Impact of Music on Brain Cells: The Case of Mozart's Music: The Impact of Music on Brain Cells: The Case of Mozart's Music. ScienceOpen Preprints. https://www.scienceopen.com

Patria, A. (2024). A Comprehensive Guide to Pinoy Pop Music: History, Artists & More. Our Music World. https://www.ourmusicworld.com/archives/9648

Radvansky, G. A., Doolen, A. C., Pettijohn, K. A., & Ritchey, M. (2022). A new look at memory retention and forgetting. Journal of Experimental Psychology: Learning, Memory, and Cognition, 48(11), 1698.

Sahin, M.D. & Aybek, E.C. (2019). Jamovi: An Easy to Use Statistical Software for the Social Scientists. International Journal of Assessment Tools in Education. Vol. 6, No. 4, 670–692 https://dx.doi.org/10.21449/ijate.661803

Samani, S. (2012). The Impact of Indoor Lighting on Students' Learning Performance in Learning Environments: A knowledge internalization perspective. International Journal of Business and Social Science. 3.

Serdar, C. C., Cihan, M., Yücel, D., & Serdar, M. A. (2021). Sample size, power and effect size revisited: simplified and practical approaches in pre-clinical, clinical and laboratory studies. Biochemia medica, 31(1), 010502.https://doi.org/10.11613/BM.2021.010502

Simkus, J. (2023). Random Assignment in Psychology: Definition & Examples. SimplyPsychology. https://www.simplypsychology.org

Sridhar, S., Khamaj, A., & Asthana, M.K. (2023). Cognitive Neuroscience Perspective on Memory: Overview and Summary. National Library of Medicine. https://pmc.ncbi.nlm.nih.gov/articles/PMC10410470/

Taylor, M. (2023).Color Psychology: How to Best Use 6 Colors in Learning. Imagination Soup. https://imaginationsoup.net/color-psychology-how-to-use-color-in-learning-colorize/

Umejima, K., Ibaraki, T., Yamazaki, T., & Sakai, K. L. (2021). Paper Notebooks vs. Mobile Devices: Brain Activation Differences During Memory Retrieval. Frontiers in Behavioral Neuroscience, 15. https://doi.org/10.3389/fnbeh.2021.634158

Wallace, S., Bylinskii, Z., Dobres, J., Kerr, B., Berlow, S., Treitman, R., Kumawat, N., Arpin, K., Miller, D. B., Huang, J., & Sawyer, B. D. (2022). Towards Individuated Reading Experiences: Different Fonts Increase Reading Speed for Different Individuals. ACM Transactions on Computer-Human Interaction, 29(4), 1–56. https://doi.org/10.1145/3502222

Wu, S. & Qiu, J. (2024). "Reading", "listening" and sound, light environment. City and Built Environment. 2. doi:10.1007/s44213-023-00022-z

Zelechowska, A., Gonzalez-Sanchez, V.E., Laeng, B., & Jensenius, A.R. (2020). Headphones or Speakers? An Exploratory Study of Their Effects on Spontaneous Body Movement to Rhythmic Music. Frontiers. https://www.frontiersin.org/journals/psychology/articles/10.3389

Zhang, S. (2020). The positive influence of music on the human brain. Journal of Behavioral and Brain Science, 10(01), 95–104. https://doi.org/10.4236/jbbs.2020.101005

Zhuang, L., Wang, J., Xiong, B., Bian, C., Hao, L., Bayley, P. J., & Qin, S. (2022). Rapid neural reorganization during retrieval practice predicts subsequent long-term retention and false memory. Nature Human Behaviour, 6(1), 134-145.

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