

# The Effects of Different Types of Music on Cognitive Abilities

**Laurel Harmon, Kristen Troester  
Taryn Pickwick, Giovanna Pelosi**  
Western Connecticut State University

A variety of research has been conducted on the effects of different types of music on cognitive abilities. Many of these studies are based upon the Mozart Effect, which claims that listening to classical music has an advantage over other types of music on learning. This study consists of two experiments which tested 54 college students ages 18-50. In Experiment 1, we hypothesized that participants exposed to Mozart would score significantly higher on a listening comprehension test than those exposed to rock music or silence. In Experiment 2, we hypothesized that listening to rock music would result in lower reading comprehension test scores than classical music or non-music groups. An ANOVA test indicated that the results for both experiments were non-significant.

The relationship between music and learning has been an area of interest for researchers for many years. Some studies have shown that music can enhance cognitive abilities (Hall, 1952), and others have shown that it can interfere with complex cognitive processes but not simple processes (Fogelson, 1973). In 2004, researchers conducted a study that presented the effect of Mozart's music on learning. The effect demonstrated that there may be an important relationship between certain types of music (e.g. classical) and learning (Jackson & Tluaka, 2004). One study involving college students showed a correlation between how awake they felt and their preference for music or silence. Results indicated a positive effect while listening to Mozart (Jones, West, & Estell, 2006). This effect has become known as the Mozart Effect, which proposes that listening to Mozart can increase spatial abilities. The proposed increase in the construction of alpha waves may result in positive learning ability. Other studies on the Mozart Effect, however, have produced inconsistent results, often showing no significant increase in cognitive abilities. Although the results have been ambiguous, the relationship between music and learning still remains of interest to many researchers, especially to educators and others involved in the teaching profession.

The upsurge in the technology of music playing devices has made a phenomenon out of listening to music while participating in daily activities. Music is a common part of our everyday

routine. It is played in the car, stores and supermarkets, professional and medical offices and more. It has also been found that many students study and do homework while listening to music. A study done by Hallam (2002) showed that elementary school students who listened to mood-calming music while completing mathematical problems were able to complete more problems and solve a higher percentage of them correctly than the group who listened to no music at all. Bowman (2007) also came across this in a similar study looking at whether Mozart music enhanced receiving ability; namely, listening comprehension. He tested whether students learned more in the classroom by listening to Mozart music before class started. Many other studies have shown that easy listening, such as classical or instrumental soundtracks can promote cognitive performance (Wilson, 2006). However, such studies fail to include groups exposed to mainstream popular music. The present paper describes two experiments based on the Mozart Effect. Experiment 1 examined whether classical music had any benefits over pop music with regard to intellectual listening capacity. The hypothesis was that the subjects listening to Mozart right before a listening comprehension task would have significantly higher test scores than those in the control group (white noise) and the group listening to Billy Joel. Experiment 2, in contrast, examined how different types of background music affect a complex cognitive process such as reading comprehension. Based on previous research, the hypothesis was that listening to mainstream rock music while studying would serve as a larger distracter to the participant, therefore producing significantly lower test scores than both the classical and non-music groups.

---

Correspondence concerning this article should be addressed to Laurel Harmon, Department of Psychology, Western Connecticut State University, 181 White Street, Danbury, CT 06810. Email: Harmon002@student.wcsu.edu. This research was conducted under the supervision of Robin Flanagan, Ph.D.

## Experiment 1

### Method

*Participants.* A convenience sample of 27 undergraduate students enrolled at a public northeastern university psychology class was used. Participants were given a sheet to answer questions about their gender, age, and other demographic information. The demographics revealed the following information about participants: There were three males and 24 females, aged 18 to 34. As students arrived at the research room, they were randomly assigned to one of the three experimental or control groups. Participants were required to sign an informed consent before participating in the experiment.

*Materials.* The participants in the music groups listened via earphones to CD's played on laptops through Windows Media Player™. The two separate CD's contained either the Mozart sonata *Eine Kleine Nachtmusik Serenata Notturna Lodron – Night Music No.1 Allegro*, or *All My Life* by Billy Joel. The participants in the silence group wore silence-enhancing headphones to ensure a quiet environment conducive to meditation. An excerpt on President F.D. Roosevelt (Appendix B) was read to the participants, and a test sheet on that excerpt was given after the reading (Appendix C).

*Procedure.* The room's supervisor followed a predetermined script welcoming students to the study and explaining the procedures. Upon arrival, the participants were given the consent form and a research participation credit sheet if needed. The participants were then welcomed to participate in the study. Next, they were given a demographics sheet to fill out (Appendix A). After the students signed the consent forms, part 1 began. The students were not told if they were in the experimental or control group. Each of the students was exposed to a different condition that lasted for ten minutes. Group 2 received the experimental treatment. This consisted of exposure to an orchestra recording of slow-tempo Mozart alpha-wave music, which was meant to assist with attentiveness and construction of alpha wave patterns. Group 1 listened to rock and roll music, which consisted of a song by the rock musician, Billy Joel. Group 3 was given silence-enhancing headphones and was told to sit in silence, clear their thoughts, and meditate. This was intended to produce relaxation and heightened alpha wave movement.

After the ten minute treatments, the study entered into part 2. The headphones were removed and all groups were read aloud a document which contained a factual excerpt about Franklin Roosevelt. Students were not allowed to take notes. Next, in part 3, participants answered a set of four multiple-choice questions, based on what they had heard. These questions included the terms and order of presidency, President F. D. Roosevelt's aide and the role he played after World War II. The test scores were analyzed by the percentage of correct answers.

To control extraneous variables such as distraction while test taking, we asked our participants to stay seated after they finished their question sheet. Once everyone had completed the sheet, they

turned it over. Once everyone was finished, the experimenter collected the sheet from each participant and told the participants they were free to leave.

### Results

A one-way between subjects ANOVA test was used to determine whether listening to Mozart produced significantly higher test score percentages than the other groups. The groups included the rock music group ( $M = 50.00$ ,  $SD = 21.651$ ), Mozart ( $M = 66.667$ ,  $SD = 17.678$ ), and silence ( $M = 50.00$ ,  $SD = 25.00$ ). It was determined at the 0.05 alpha level that there was no significant difference in test scores between these groups,  $F(2,24) = 1.778$ ,  $p > 0.05$ .

### Discussion

Subjects listening to Mozart directly before a listening comprehension task were hypothesized to have significantly higher test scores than those in the control group (white noise and meditation) and the group listening to Billy Joel. In experiment 1, experimenters discovered that there was insufficient evidence to support the hypothesis. This would have substantiated the positive effect that Mozart music had on learning. However, based on the findings, as there was no significant difference in test scores between groups, it was determined that it was necessary to conduct further studies in this area of research. A greater number of participants may have increased the power of the analyses. Experiment 2 investigated a related concern: the relationship between music and distraction. Rather than hypothesizing that Mozart's music causes an increase in learning, the study was conducted to determine whether music would cause a disruption in the learning process.

## Experiment 2

### Method

*Participants.* The participants consisted of a convenience sample of 27 public northeastern university students. The participants were between the ages of 18 and 50.

*Materials.* The participants were given a one page unpublished manuscript to read (Appendix D). The excerpt was recorded by an undergraduate student, and should have been written at an appropriate reading level expected of the sample of college students. During the time participants read, classical music was played via earphones for Group 1 and rock music was played via earphones for Group 2. Silence-enhancing headphones were worn by the participants in Group 3. All participants were seated at laptops and the music groups listened to CDs played through Windows Media Player™. The classical music pieces used were *Little Fugue in G Minor* by Sebastian Bach, *7th Symphony* by Mozart, and *5th Symphony* by Beethoven. The rock music songs were chosen off the

Billboard Top 100 and included *Bleed It Out* by Linkin Park, *Thanks for the Memories* by Fall Out Boy, *The Pretender* by Foo Fighters and *Wake-Up Call* by Maroon Five. Both sets of music played for around ten minutes. The tempo of both groups of music was semi-fast paced to avoid the possibility of having difference in tempo as a confounding variable in the analysis.

A 10 question multiple choice test was given to assess reading comprehension for all groups (Appendix E). The types of questions asked were varied in order to assess full comprehension of the article.

*Procedure.* The participants were randomly assigned to one of three groups, nine people per group. Group 1 listened to classical music, Group 2 listened to popular rock music and Group 3 did not listen to any music.

When each participant entered the classroom we introduced ourselves as experimenters conducting a study for our Experimental Psychology course. We then informed them that their participation in the study would require them to read a one-page excerpt from a book review and subsequently answer 10 multiple choice questions about it. We then told the participants that they would have approximately 7-10 minutes to read and study the excerpt and then it would be taken away before we administered the test. This should be an adequate amount of time for reading the material while listening to the length of music required for the study. The participants in the music groups were told where to be seated and to press play on their laptops and begin reading the excerpt. The participants in the silence group were told to put the headphones on and begin to read as well.

After about seven to ten minutes, we told the groups to press the "stop" key on their laptops and remove their headphones. We then collected the excerpts from the participants and passed out the reading comprehension tests. Each participant received the same test. The test scores were analyzed by the percentage of questions answered correctly.

The participants were told to complete the questions, turn the test over and stay seated until dismissed. They were asked to do this in order to eliminate any other distractions that may be caused by the bustle of people getting up and walking around. When everyone was done with the test they were thanked for their time and for completing the experiment.

## Results

A one-way between subjects ANOVA was used to determine whether listening to rock music while studying produces lower test score percentages than listening to classical music or no music at all. The results showed no significant differences between the test scores of the classical music group ( $M = 65.56$ ,  $SD = 15.9$ ), the rock music group ( $M = 65.56$ ,  $SD = 10.14$ ), or silence group ( $M = 72.22$ ,  $SD = 15.63$ );  $F(2, 24) = .667$ ,  $p > .05$ .

## Discussion

Our hypothesis for Experiment 2 was that the participants who listened to rock music while reading the excerpt would have

significantly lower scores than the other two groups (classical and silence) on the comprehension test. We predicted these results because we thought that the rock music would be more distracting for complex cognitive activities, and based on previous findings, classical music may improve cognitive abilities. We classified the rock music as more distracting due to the presence of lyrics, the popularity of the songs, and the general use of louder instruments (i.e. electric guitar, drums, etc.). The results found in this experiment did not support our hypothesis.

One limitation may be an insufficient number of participants. A second limitation was that there was no manipulation check on this distraction, and therefore we are not certain that the rock music was in fact more distracting. We accept the null hypothesis stating that no significant differences existed between the test scores of the participants that can be attributed to the type of distracter the participants were exposed to.

The results of both Experiment 1 and 2 do not support Hall's study which stated that music enhances cognitive abilities (1952). Based on our findings in Experiment 2, the two music groups obtained the same average on their test scores and were not different than the average obtained by the silence group. Therefore, the data in Experiment 2 is inconsistent with Hall's findings and relates more to Fogelson's findings in 1973. Fogelson's results showed that listening to music can interfere with complex cognitive processes but not simple cognitive processes. Since we consider reading comprehension to be a complex process, our results correspond to Fogelson's findings because our music groups did obtain slightly (not significantly) lower scores than the group who studied in silence without any distraction.

The results for Experiment 1 were different than what we found in Experiment 2. In Experiment 1 we tested the Mozart Effect, which states that listening to Mozart creates alpha brain waves that produce enhanced performance in cognitive activities. Experiment 1 is closely related to Bowman's (2007) study, which showed that Mozart music increased "receiving ability" (listening comprehension). Similar to Bowman's experiment, Experiment 1 had students exposed to their conditions before their comprehension task. On the other hand, Experiment 2 measured learning distraction by exposing the participants to their conditions during their task.

The results we obtained from Experiments 1 and 2 failed to clarify the effects of music on learning. It is still unclear whether listening to Mozart increases cognitive abilities. To further this research, it would most likely be beneficial to test participants after a series of long term exposures to Mozart. The use of before and after testing for both experiments would possibly reveal a more distinguished attribution of the test scores to the type of music listened to. In both experiments it was unknown how the individual participant would usually perform on comprehension tests. Although random assignment was utilized, it is possible that assignment was nevertheless biased. Thus, it is difficult to directly link their scores to their conditions. By using before and after testing, the individual participant's normal level of comprehension could be determined prior to the exposure of the conditions. Therefore any change in the participant's test average can most likely be attributed to the condition.

During these experiments we encountered some limitations that may have impacted our results. The most inhibiting factor was probably the sample size for our experiments. Most psychological research requires a sample size of at least 30 participants in order for the results to be substantial. In both experiments, we had a total 27 participants in each. If our sample size was larger, our results may have been different. Also, with a larger sample size, we could generalize our findings to the population much more accurately. The use of a convenience sample prohibits us from stating that our sample was random and again reduces our ability to generalize the results. A more diverse sample of participants is necessary to truly determine the ultimate findings on this research topic.

## References

- Bowman, B. (2007). Does listening to Mozart affect listening ability? *International Journal of Listening*, 21, 124-139.
- Fogelson, S. (1973). Music as a distracter on reading-test performance of eighth grade students. *Perceptual and Motor Skills*, 36, 1265-1266.
- Hall, J. (1952) The effect of background music on the reading comprehension of 278 eighth and ninth grade students. *Journal of Educational Research*, 45, 451-458.
- Hallam, S. The effects of background music on primary school pupils' task performance. *Educational Studies*, 28, 113-121.
- Jackson, C. (2004). Route-learning and the Mozart effect. *Psychology of Music*, 32(2), 213-220.
- Joel, B. (ca. 2007). *All my life*. New York: Columbia.
- Jones, M. (2006). The Mozart Effect: Arousal, preference, and spatial performance. *Psychology of Aesthetics, Creativity, and the Arts*, 5(1), 26-32.
- Mozart, W.A. (ca. 2001). *Eine kleine nachtmusik serenata notturna lodron-night music No.1 Allegro*. Amsterdam: Arts Music recording Rotterdam.
- Troester, K. (2007). A book review on a precious liquid: Drinking water and culture in the valley of Mexico. Unpublished manuscript.
- Wilson, M. (2006). *How students really learn: Instructional strategies that really work*. Lanham, Maryland: Rowman & Littlefield Education.
- Wikipedia. Franklin Delano Roosevelt. [Electronic version]. Retrieved October 13, 2007. "[http://en.wikipedia.org/wiki/Franklin\\_D.\\_Roosevelt](http://en.wikipedia.org/wiki/Franklin_D._Roosevelt)

## Appendix A

*Please answer the following questions by circling your choice:*

(Demographic question sheet)

1. Are you male or female?
2. What is your age group?
 

A. 18-22	B. 23-27	C. 28-33	D. 34 and above
----------	----------	----------	-----------------
3. What is your ethnic background?
 

A. African-American	B. Indian	C. Caucasian
D. Asian	E. Other	

## Appendix B

*Information/"Story" read to participants: either on power point slides or in Word. Doc Format.*

Franklin Delano Roosevelt (January 30, 1882 – April 12, 1945), often referred to by his initials FDR, was the thirty-second President of the United States. Elected to four terms in office, he served from 1933 to 1945, and is the only U.S. president to have served more than two terms. A central figure of the 20th century during a time of worldwide economic crisis and world war, he has consistently been ranked as one of the three greatest U.S. presidents in scholarly surveys.

During the Great Depression of the 1930s, Roosevelt created the New Deal to provide relief for the unemployed, recovery of the economy, and reform of the economic and banking systems. Although recovery of the economy was incomplete until almost 1940, many programs initiated in the Roosevelt administration continue to have instrumental roles in the nation's commerce, such as the FDIC, TVA, and the SEC. One of his most important legacies is the Social Security system.

Roosevelt won four presidential elections in a row, causing a realignment that political scientists call the Fifth Party System. His aggressive use of an active federal government re-energized the Democratic Party, creating a New Deal Coalition which dominated American politics until the late 1960s. He and his wife, Eleanor Roosevelt, remain touchstones for modern American liberalism. Conservatives vehemently fought back, but Roosevelt usually prevailed until he tried to pack the Supreme Court in 1937. Thereafter, the new Conservative coalition successfully ended New Deal expansion; during the war it closed most relief programs like the WPA and Civilian Conservation Corps, arguing that unemployment had disappeared.



After 1938, Roosevelt championed re-armament and led the nation away from isolationism as the world headed into World War II. He provided extensive support to Winston Churchill and the British war effort before the attack on Pearl Harbor pulled the U.S. into the fighting. During the war, Roosevelt, working closely with his aide Harry Hopkins, provided decisive leadership against Nazi Germany and made the United States the principal arms supplier and financier of the Allies who later, along side the United States, defeated Germany, Italy and Japan. Roosevelt led the United States as it became the Arsenal of Democracy and put 16 million American men into uniform.

On the homefront his term saw the vast expansion of industry, the achievement of full employment, restoration of prosperity and new opportunities opened for African-Americans and women. Also with his term came new taxes that affected all income groups, price controls and rationing, and relocation camps for 120,000 Japanese and Japanese-Americans as well as thousands of Italian and German-Americans. As the Allies neared victory, Roosevelt played a critical role in shaping the post-war world, particularly through the Yalta Conference and the creation of the United Nations. Roosevelt's administration redefined liberalism for subsequent generations and realigned the Democratic Party based on his New Deal coalition of labor unions; farmers; ethnic, religious and racial minorities; intellectuals; [citation needed] the South; big city machines; and the poor and workers on relief.

Found at the following website:

[http://en.wikipedia.org/wiki/Franklin\\_D.\\_Roosevelt](http://en.wikipedia.org/wiki/Franklin_D._Roosevelt)

## Appendix C

### Instructions:

Please answer the questions below regarding the story you have just heard read aloud.

Thank you.

1. Which President, of the United States (U.S.), was Franklin D. Roosevelt?

A. 32nd                      B. 35th                      C. 42nd                      D. 50th

2. Which terms did F.D. Roosevelt serve as president of the U.S.?

A. 1930-1943    B. 1922-1945    C. 1935-1943    D. 1933-1945

3. During World War II, who was F.D. Roosevelt's aide that provided assistance against the German Nazi's?

A. Winston Churchill                      B. Harry Hopkins  
C. George Norris                              D. Robert Wagner

4. F.D. Roosevelt played this type of role in shaping the U.S. after the war:

A. "important role"                              B. "critical role"  
C. "No role"    D. "intellectual goal"

## Appendix D

*A Precious Liquid: Drinking Water and Culture in the Valley of Mexico* by Michael C. Ennis-McMillan is an ethnographic study on the influence of culture on water distribution practices in a town called La Purificacion located in the valley of Mexico. La Purificacion is a small community located in the foothills of the Valley of Mexico, relatively close to Mexico City. This region has a long history of water scarcity and this specific community stands out from the rest due to its traditional communal water distribution practices. The author/anthropologist did not initially intend to do research on the subject, however anyone who visits La Purificacion will see the tremendous impact of cultural traditions and practices and how the community views water as a precious resource. Research on the topic was gathered by participant observation as well as formal and informal interviews. The author also engaged in extensive archival research on the area and its local practices.

This book demonstrates how anthropological perspectives can help to better understand global issues such as fresh water scarcity and quality. The author uses these perspectives and the example of La Purificacion to show how culture plays a vital role in how people and communities view these important issues. The author makes it very clear that in order to implement successful policies on water distribution, one must thoroughly understand the cultural traditions and views that a particular community may have on the subject. What makes La Purificacion so special and distinct is their social and communal perspectives on water distribution. The Los Purifiquenos (people of La Purificacion) view water as a vital and limited natural resource that must be shared equally throughout the community. They have withheld their traditional practices for many years, without letting capitalization and urbanization change their ways. Compared with other cultures, water is not viewed as a commodity. Water in this community is tied to social obligations and community participation. Those who fulfill these duties will be entitled to their fair share of water. Those who do not fulfill their civil duties are cut off. This bearing on social responsibility demonstrates the ideal that water should be a communal resource versus something that can be bought and sold.

In the fifteenth century, sparse communities located in the outskirts of the Valley of Mexico formed a territory called the Alcolua State. These people relied heavily on intensive agricultural practices. Extensive canal systems allowed water to be channeled up to the foothills where these communities, including La Purificacion were located. The rulers of these Aztec communities started the ideals that would withstand in the culture

for centuries later. Water rights were not individualized, they were shared and granted to communities as a whole. During the Spanish Conquest and Colonization, the indigenous peoples of the region were competing against the haciendas, large estates engaged in agricultural production, for rights to water. La Purificacion experienced times in this particular point in history when water was unequally distributed amongst the wealthy and the poor. This class distinction in water distribution can be observed in most other surrounding areas. Those with more money were able to obtain more water for irrigation and domestic purposes.

After Mexico declared its independence from Spain, the Los Purifiquenos were able to go back to their traditional practices of water distribution. Residents of the community were entitled to water if they contributed to the community by partaking in roles within the Water Committee, paying fees, and helping in community fiestas. A system of civil and religious obligations exist, and each community member must be an active member at some point or another. These obligations are known as cargos, which are a place of office that can be either civil or religious. Civil cargos involve participating in the Water Distribution Committee. Religious cargos are obligated to set up and execute certain fiestas. Cargos are elected from the community and one must fulfill this obligation or else they will face the threat of having their water supply cut off.

## Appendix E

- What is the name of the book in this passage?
  - A Precious Liquid: Drinking Water and Culture in the Valley of Mexico
  - A Precious Liquid
  - La Purificacion: Drinking Water and Culture in the Valley of Mexico
  - Los Purifiquenos
- Who is the author of this book?
  - Matthew C. Macmillan
  - Michael Dennis
  - C. Michaelson
  - Michael C. Ennis-McMillan
- How was the information collected for the book?
  - Participant observation
  - Formal/informal interviews
  - Archival research
  - All of the above
- What is the main theme of the passage?
  - Water scarcity is a global issue
  - Mexico has a rich culture
  - Culture plays a vital role in water distribution
  - Mexican agriculture
- What is the name of the town researched in this book?
  - Los Purifiquenos
  - La Purificacion
  - Mexico City
  - Alcoluah State
- Finish the quote: “compared with other cultures, water is not viewed as a(n) ....
  - Resource
  - Right
  - Commodity
  - Territory
- Which century was the Alcoluah State formed?
  - 15th
  - 16th
  - 19th
- What is an hacienda?
  - Canal
  - Foothill
  - Large agricultural estate
  - A wealthy Mexican person
- What happened after Mexico declared its independence from Spain?
  - Those with more money were able to obtain more water
  - The people of the town were able to go back to their traditional practices of water distribution
  - A fiesta was held
  - Water supply was cut off to the community.
- What is a cargo?
  - A place of office that can be either civil or religious
  - Restriction of trade
  - A type of fiesta
  - Packaged materials on a ship