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Does Lyrical Music Affect Cognitive Performance?

Andrew Stone⁴

Many students listen to music while studying or doing homework, and many are looking for ways to maximize this time. Students at Lindenwood University in St. Charles, MO were asked to take two different basic math tests. One was taken with normal, lyrical songs playing in the background. The other was taken with the instrumental versions of these same songs playing in the background. I hypothesized that students would take longer to complete the test with the lyrical music in the background than with the instrumental music playing. The results showed no significant difference in the completion times between those taking the test with lyrical and instrumental music. This was mainly due to an incredibly small sample size.

Every college student tries to find ways to maximize their study time. Some use coffee, energy drinks, or more potent drugs to increase their energy and focus. While these may be effective in the short term, these solutions are not very productive for one's physical health and students can easily become dependent on these chemicals to be productive. Many have figured this out, so they find other ways to increase focus and energy while studying. In a world where music is everywhere, many students have turned to music to create a more productive study environment.

There are lots of studies that have shown music's effects on academic performance, memory, and physiological changes, one of which was looking at the relationship between certain types of music and test anxiety and performance. The researchers played music for undergraduate students 5 min before they were to take a math test that may or may not have affected their grade for the math course they were enrolled in. Some students heard calming music and others were played obnoxious music. They found that those students who listened to

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the calming music before the test experienced symptoms such as lower blood pressure and heart rate, as well as actually performing better on the test itself (Lilley, Oberle, & Thompson, 2014). Therefore, it seems that music had an effect on the students' bodily processes and academic performance.

The belief that listening to music while studying can increase learning is widely accepted (Jäncke, Brügger, Brummer, Scherrer, & Alahmadi, 2014). According to this study, they found no difference in the influence on learning of lyrical and instrumental music. However, Jancke et al. (2014) focused on learning new information instead of performing mathematical computations. A similar study was conducted to see if the style of background music affected mathematical computation, and no significant difference was found based on music style (Chen & Wen, 2015). However, this study only focused on whether the music was "favorable" to the listener or not; it did not take into account the presence or absence of lyrics.

Similarly, Etaugh and Ptasnik (1982) used music to see if it would impair or facilitate more productive studying. They began by having 20 college students study a passage in a silent room and 20 studying the same passage with music of their choice in the background. They then had 10 from each condition relax, while the other 10 were tasked with reading some unrelated material. After this all participants were given a five-question comprehension test regarding the original passage. The condition of silence and relaxation performed the best on the test, followed by the music and relaxation condition. The condition requiring the subjects to read unrelated material significantly impaired their memory (Etaugh & Ptasnik, 1982). Interestingly, they also asked subjects beforehand if they preferred to listen to music while studying. Those who preferred a silent study environment supported their claim by performing better in silence and worse with music, and the opposite could be said of those who prefer to study with music (Etaugh & Ptasnik, 1982).

One of the most relevant studies to the present study was conducted by Salamé and Baddeley (1989). They wanted to see what types of music would interfere with a participant's ability to remember a nine-digit sequence. They found that vocal or lyrical music was more disruptive than instrumental music, and both were more disruptive to memory than silence (Salamé & Baddeley, 1989). In a second experiment they replicated the first design, but this time the subjects received focus training before completing the trials. With more highly trained subjects, vocal or lyrical music disrupted memory far more than instrumental music, and there was no significant difference found between the instrumental music and silent conditions (Salamé & Baddeley, 1989).

The focus of the present study is on completing mathematical computations with lyrical and instrumental music playing in the background. I hypothesized that students would complete a basic math test faster and more accurately when listening to instrumental versions of songs than when they listen to the lyrical (original) versions because the words are a distraction. The songs played were exactly the same except for the presence or absence of lyrics, in order to limit the effects of differences in genre or song flow. This study will provide students who choose to listen to music while studying and doing homework a way to better maximize their time by customizing their playlist to include less lyrical music.

Method

Participants

Participants were recruited through a Facebook post containing a brief description of the study and a link to sign up. These participants were not compensated in any way for their efforts. All participants in this study were Lindenwood students between the ages of 18 and 21. There were 3 male participants and 2 female participants. Participants also reported class standing and major, which came out with 2 freshmen and 3 juniors, 4 Business majors and 1 Psychology

major. None reported any hearing difficulties, and all reported 4 or 5 when asked to rate their comfort level with basic mathematical computations on a scale from 1-5. They were also asked how often they listen to music while studying and 2 marked “Occasionally,” 2 marked “Usually,” and 1 marked “Never.”

Materials and Procedure

The study was conducted at Lindenwood University in St. Charles, MO in a variety of locations, including quiet dorm rooms and quiet classrooms in Harmon Hall. Participants were given two copies of the Informed Consent form upon arrival (see Appendix A). Once this was read and signed, they were given a short demographic survey regarding things like age, gender, and grade level (see Appendix B). This survey also contained a question asking if the participant had any form of hearing impairments.

After the demographic survey was completed and collected, I verbally explained the directions to the participants thoroughly. They were tasked with completing two separate basic math tests, each containing 30 questions of equal difficulty (see Appendices C and D). They were informed that there would be music playing in the background. During one test, a Lyrical (with words) playlist of five songs was played, including “Viva La Vida” (Coldplay, 2008), “Centuries” (Fall Out Boy, 2014), “Renegades” (X Ambassadors, 2015), “7 Years” (Lukas Graham, 2015), and “Closer” (The Chainsmokers, 2016). During the other test, an Instrumental playlist of these same five songs was played, including “Viva La Vida” (Dallas String Quartet, 2010), “Centuries” (Brooklyn Duo, 2014), “Renegades” (Simply Three, 2015), “7 Years” (Brooklyn Duo, 2016), and “Closer” (Brooklyn Duo, 2016). To view this song list and get audio links, see Appendix E.

The order of the two tests, as well as the order the playlists, were counterbalanced in an attempt to eliminate any order effects. Both playlists were associated equally with both tests to

eliminate the relative difficulty of either test influencing the results. After both tests were completed, I verbally debriefed each participant, explaining the purpose of the study and the hypothesis. During this time, the participants were provided with a feedback letter thanking them for participating and encouraging them to contact me with any future questions or concerns (see Appendix F). Each test was measured for completion time and entered into a data sheet once the participant exited the study.

Results

I hypothesized that students would complete the math tests faster while listening to the instrumental music than the lyrical music. The independent variable of this study was the type of music played, featuring two levels: Lyrical and Instrumental. The dependent variable was the time taken to complete the test, measured in seconds. A related samples *t*-test was conducted to compare the mean completion time of the tests with instrumental music and the tests with lyrical music. There was not a significant difference between the mean times of completion for the instrumental ($M=175$, $SD=46.61$) and lyrical tests ($M=165.2$, $SD=17.88$); $t(4) = -.445$, $p=.679$).

Discussion

Considering my hypothesis of faster completion times for the Instrumental playlist, the data above do not support such a claim. In fact, the Lyrical playlist tests were completed faster on average than the Instrumental playlist tests was. These findings are in direct contrast to those of Salamé and Baddeley (1989). However, the difference was nowhere near statistically significant. This is due to a number of factors, the most influential of which being the small sample size. If a larger sample could have been tested, the results could have been drastically different and have some actual significance. Not to mention that order effects such as the practice effect and fatigue effect may have been at play. These were counterbalanced for as much as

possible, but with only 5 participants it was difficult to fully counterbalance these to avoid any extra variance.

This study is important because it can show students who listen to music while studying what type of music will maximize their cognitive abilities. This study proved somewhat relevant in that regard, because 80% of participants reported listening to music while studying “occasionally” at the very least. Future researchers could first replicate this study with a larger sample size, then expand to include middle school and high school aged students. It would be interesting to see if the results would differ with younger students. I would also recommend looking at other dependent variables such as their actual scores on the tests and a post-test rating of how distracting or helpful they found the music.

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7 Years [MP3]. (2016). Brooklyn Duo.

Appendix A

Informed Consent Form

LINDENWOOD

Research Study Consent Form

How Lyrical Music Affects Cognitive Performance

You are asked to participate in a research study being conducted by Andrew Stone, under the guidance of Dr. Michiko Nohara-LeClair at Lindenwood University. Being in a research study is voluntary, and you are free to stop at any time. Before you choose to participate, you are free to discuss this research study with family, friends, or a physician. Do not feel like you must join this study until all of your questions or concerns are answered. If you decide to participate, you will be asked to sign this form.

Why is this research being conducted?

I am doing this study to determine if certain types of music have a significant effect on cognitive performance while studying. I will be asking about 20 other people to answer these questions.

What am I being asked to do?

You will be given two basic addition and subtraction tests, each 30 questions in length. There will be music playing in the background as you take these tests. You may take your time and skip around as much as you like, just be sure to eventually answer all 30 questions.

How long will I be in this study?

This study will last between 15 and 30 minutes.

What are the risks of this study?

- Privacy and Confidentiality

I will not be collecting any information that will identify you.

What are the benefits of this study?

You may learn how to best maximize your study time with a certain type of music. I also hope what I learn may benefit other people in the future.

What if I do not choose to participate in this research?

It is always your choice to participate in this study. You may withdraw at any time. You may choose not to answer any questions or perform tasks that make you uncomfortable. If you decide to withdraw, you will not receive any penalty or loss of benefits. If you would like to withdraw from a study, please let me know immediately.

What if new information becomes available about the study?

During the course of this study, I may find information that could be important to you and your decision to participate in this research. I will notify you as soon as possible if such information becomes available.

How will you keep my information private?

I will do everything I can to protect your privacy. I do not intend to include information that could identify you in any publication or presentation. Any information we collect will be stored by the researcher in a secure location. The only people who will be able to see your data are: myself, qualified staff of Lindenwood University, representatives of state or federal agencies.

How can I withdraw from this study?

Notify me immediately if you would like to withdraw from this research study.

Who can I contact with questions or concerns?

If you have any questions about your rights as a participant in this research or concerns about the study, or if you feel under any pressure to enroll or to continue to participate in this study, you may contact the Lindenwood University Institutional Review Board Director, Michael Leary, at (636) 949-4730 or mleary@lindenwood.edu. You can contact the researcher, Andrew Stone, directly at (636) 357-1226 or aks334@lindenwood.edu. You may also contact Dr. Michiko Nohara-LeClair at (636) 949-4371 or mnohara-leclair@lindenwood.edu.

I have read this consent form and have been given the opportunity to ask questions. I will also be given a copy of this consent form for my records. I verify that I am at least 18 years old. I consent to my participation in the research described above.

Participant's Signature

Date

Participant's Printed Name

Signature of Principal Investigator or Designee

Date

Investigator or Designee Printed Name

Appendix B
Demographic Questionnaire

Please do not put any identifiable information on this questionnaire.
Please feel free to skip any questions you do not feel comfortable addressing.

1.) Are you... (circle one) MALE FEMALE Other

2.) How old are you? _____ years

3.) What is/are your major(s)? List all that apply.

4.) Which of the following best describes you? (Circle one)

FRESHMAN SOPHOMORE JUNIOR SENIOR Other

5.) Do you have any difficulty hearing? (Circle one) YES NO

6.) Please rate your comfort level in completing simple math problems involving addition and subtraction? (1=Not at all comfortable...5=Completely comfortable) (Circle one)

1 2 3 4 5

7.) How often do you listen to music while studying or doing homework? (Circle one)

ALL THE TIME USUALLY OCCASIONALLY NEVER

Appendix C

Math Test 1

(You may complete the problems in order or skip around as much as you like.)

1. $19 + 25 =$
2. $94 - 24 =$
3. $53 + 43 =$
4. $50 - 12 =$
5. $39 + 53 =$
6. $84 - 23 =$
7. $76 + 13 =$
8. $42 - 31 =$
9. $49 + 23 =$
10. $35 - 32 =$
11. $79 + 22 =$
12. $85 - 43 =$
13. $47 + 53 =$
14. $65 - 30 =$
15. $25 + 63 =$
16. $49 - 43 =$
17. $22 + 33 =$
18. $89 - 54 =$
19. $55 + 39 =$
20. $60 - 28 =$
21. $49 + 51 =$
22. $91 - 18 =$
23. $68 + 23 =$
24. $82 - 69 =$
25. $74 + 18 =$
26. $65 - 49 =$
27. $83 + 10 =$
28. $22 - 13 =$
29. $80 + 19 =$
30. $55 - 28 =$

Appendix D

Math Test 2

(You may complete the problems in order or skip around as much as you like.)

1. $17 + 61 =$
2. $92 - 23 =$
3. $23 + 33 =$
4. $54 - 14 =$
5. $35 + 53 =$
6. $86 - 69 =$
7. $77 + 17 =$
8. $89 - 18 =$
9. $83 + 11 =$
10. $95 - 38 =$
11. $59 + 17 =$
12. $85 - 36 =$
13. $30 + 29 =$
14. $78 - 20 =$
15. $29 + 57 =$
16. $95 - 89 =$
17. $39 + 59 =$
18. $84 - 27 =$
19. $66 + 26 =$
20. $70 - 18 =$
21. $17 + 62 =$
22. $84 - 29 =$
23. $66 + 32 =$
24. $39 - 22 =$
25. $63 + 27 =$
26. $74 - 58 =$
27. $74 + 10 =$
28. $75 - 34 =$
29. $73 + 11 =$
30. $88 - 64 =$

Appendix E

Song Lists

Lyrical Song List (with Links through Apple Music)

- “Viva La Vida” (Coldplay) <https://itun.es/us/sMc7cb?i=1122773680>
- “Centuries” (Fall Out Boy) <https://itun.es/us/sCnJ4?i=948754235>
- “Renegades” (X Ambassadors) <https://itun.es/us/L2o86?i=988868008>
- “7 Years” (Lukas Graham) <https://itun.es/us/O73Dab?i=1081573445>
- “Closer” (Chainsmokers) <https://itun.es/us/2t3Xfb?i=1170699703>

Instrumental Song List (with Audio Links through Apple Music)

- “Viva La Vida” (Coldplay) <https://itun.es/us/YCM9K?i=620128228>
- “Centuries” (Fall Out Boy) <https://itun.es/us/-wvD4?i=947213932>
- “Renegades” (X Ambassadors) <https://itun.es/us/HNPzab?i=1080465993>
- “7 Years” (Lukas Graham) <https://itun.es/us/FH6Zbb?i=1104128459>
- “Closer” (Chainsmokers) <https://itun.es/us/jb-efb?i=1158930638>

Appendix F
Feedback Letter

Thank you for participating in this study. The present study was conducted in order to determine whether the type of music one listens to while studying or completing homework affects their cognitive performance. I hypothesized that the test taken with the instrumental versions of songs playing in the background would be completed faster and more accurately than the tests taken with the lyrical (original) versions of the same songs playing in the background, because the lyrics are a distraction from the task at hand (the math test). Please note that I am not interested in your individual results; rather, I am only interested in the overall findings based on aggregate data. No identifying information about you will be associated with any of the findings, nor will it be possible for me to trace your responses on an individual basis. If you are interested in obtaining the final results of this study based on aggregate data, or if you have any questions or concerns regarding any portion of this study, please do not hesitate to contact me now or in the future. My contact information is included at the bottom of this letter. Thank you again for your valuable contribution to this study.

Sincerely,

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