The Effect of Music on Memory Tasks

Abstract

The purpose of this study was to examine the effects of listening to music on the ability to retain information. In this study, 30 undergraduate students went through two different conditions: listening to music with lyrics (SICKO MODE by Travis Scott) and without lyrics (Jinsang by Midnight) while memorizing a random sequence of 15 letters (in order) for only 30 seconds. Each participant was randomly assigned which condition and which sequence of letters were given first, and had to verbally repeat back what they memorized. The results were evaluated based on the average number of letters the subjects memorized and these averages were compared between the two conditions. We are 95% confident that the difference in the long run mean number of letters in a sequence that a subject can memorize while listening to Midnight vs. SICKO MODE lies in the interval (0.386, 4.041).

Background and significance

Many students listen to music while studying, but many of these students don't seem too concerned with the effects that music might have on their ability to retain the information that they are studying. In an experiment performed by Downs, [1] twenty-one undergraduate students were used and tested the effects of music on studying by having the subjects memorize a list of words when listening to karaoke music and lyrical music. It was found that there was a positive effect in retaining information when the students were listening to karaoke music compared to lyrical music. Similar to this, there is some research that claims that music with lyrics can negatively impact your ability to remember what you are studying [2]. However, a study by Dodge, yielded only a moderate statistical significance between music vs. no music but there was no overall effect when the conditions were broken down into pop music and classical music [3]. Because of the various results found in different studies testing the effect of music on studying, our research question was: Can information be retained more efficiently when listening to music with lyrics or without lyrics?

This experiment tests these hypotheses: our null hypothesis states that there will be no difference between the long run mean number of letters a subject can memorize in the sequence while listening to SICKO MODE (lyrical) as opposed to Midnight (non-lyrical), or H0: μ diff = 0 . Our alternative hypothesis states that there will be a positive difference in the long run mean number of letters a subject can memorize in the sequence while listening to Midnight as opposed to SICKO MODE, or HA: μ diff > 0 .

Method

Participants
Thirty undergraduate students volunteered to participate in the study. They were randomly approached in the largest dining hall, library, and residential halls.

Experimental Design
The explanatory variable was the type of music that was played for the subject (lyrical or non-lyrical), which was the categorical variable. The response variable was the number of letters the subject was able to remember in order, and this was the quantitative response variable.

Procedure
We created two sets of fifteen random letters (kawghzoywfdeujq & qlxdignetkelsaw) and gave our participants only thirty seconds to try and memorize the set of letters while they were listening to the non-lyrical song (Jinsang by Midnight) or the lyrical song (SICKO MODE by Travis Scott). Also, each participant was randomly assigned which condition and which sequence of letters were given first. Once the thirty seconds were up, the set of letters would be taken back and the subject would try to repeat as far into the sequence as they could in order. After they finished their first condition and sequence, the same steps were used for their second condition. In the end, we were left with two responses for each subject, how many letters of the sequence they were able to memorize while listening to SICKO MODE (lyrical), and how many

letters of the second sequence they were able to memorize while listening to Midnight (non-lyrical).
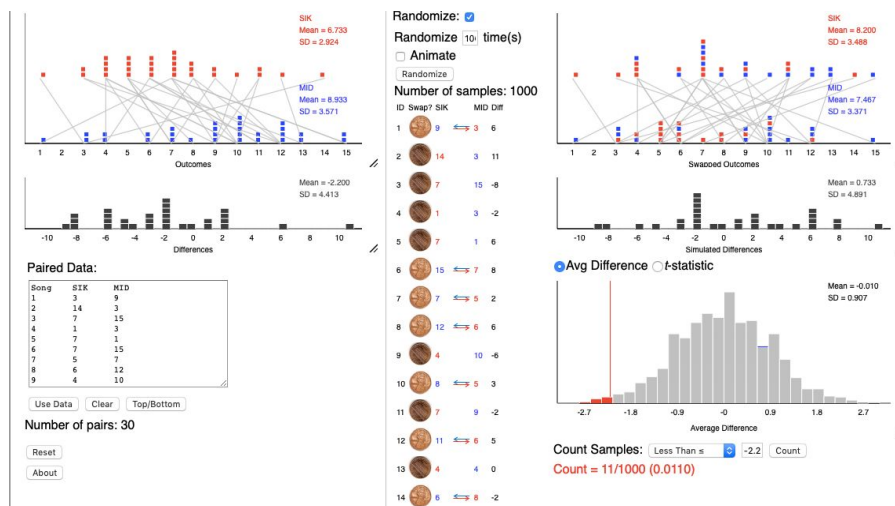
Data Analysis

The data were input into excel where the difference between the average number of letters memorized in sequence in each condition (lyrical and non-lyrical) was computed. After these values were obtained, we used the Matched Pair Analysis to run a paired, one-sided simulation-based test to compare the differences in the averages from each condition.

Results

The results of this study were that subjects remembered an average of 6.73 letters in the sequence when listening to SICKO MODE (lyrical) and 8.93 letters in the sequence when listening to Midnight (non-lyrical). This can be seen in Figure 1 down below. The simulation based data found that the $\bar{x}$Diff was 2.2 and the sDiff was 4.413. Using these numbers, we were able to calculate a z-statistic given by the formula sim z =[$\bar{x}$Diff - 0] / SD of the null distribution, and it gave us a z-statistic of 2.4255. We were able to use the applet to check the p-value using the null distribution and the p-value was 0.01. Using the $\bar{x}$Diff +/- 2[SD of the null distribution] formula, we calculated a 95% confidence interval for μ diff and this came out to be (0.386, 4.041). This can be seen in Figure 2 down below.
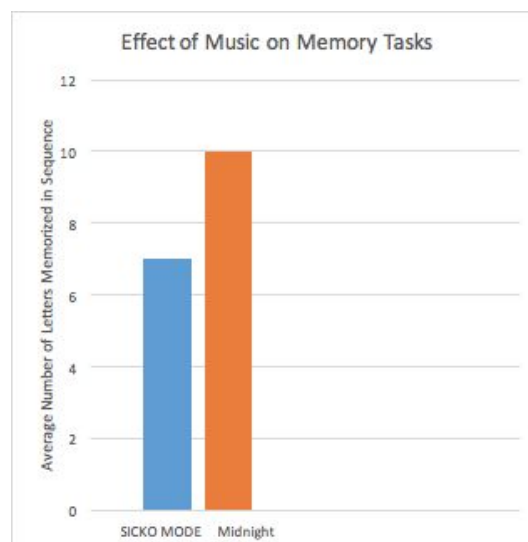
Figure 1. The differences between the average number of letters memorized in sequence between SICKO MODE (lyrical) and Midnight (non-lyrical). Average of 6.73 letters for SICKO MODE and 8.93 letters for Midnight.

Figure 2. Paired Data Analysis of Memorization in Two Conditions. The average differences of number of letters memorized in sequence within each subject were determined for SICKO MODE (lyrical) and Midnight (non-lyrical) and plotted as paired data. The mean difference was 2.2 with a standard deviation of 4.413.

Conclusion

There is strong evidence (z-statistic= 2.455 and p=0.01) to reject the null hypothesis that there is no difference between the long run mean number of letters a subject can memorize in the sequence while listening to SICKO MODE (lyrical) as opposed to Midnight (non-lyrical). We are 95% confident that the difference in the long run mean number of letters in a sequence that a subject can memorize while listening to Midnight vs. SICKO MODE lies in the interval (0.386, 4.041). Our confidence interval did not cover zero, which further signifies that there is a statistically significant difference between the number of letters in a sequence that can be memorized while listening to SICKO MODE vs Midnight.

Based on the analysis of the data and the design of the study, it is reasonable for us to generalize these findings to the entirety of our college since we selected our subjects at random. We can say that it is easier to memorize sequences of letters while listening to Midnight as opposed to SICKO MODE since the type of music was randomly assigned.

The study had several limitations and the main one being that we had a very small sample size. Some other issues include the fact that we only used two songs to test the differences between lyrical and non-lyrical music and that we only created two randomized sequences of letters. In the future, a better study could be made that would have tested a larger sample size, utilized a selection of lyrical songs and non-lyrical songs, and created a new sequence for each subject to further remove confounding variables of possible patterns within the sequences that made them easier to memorize.

References

[1] Downs, Trent. *The Effects of Music on Studying.*
    vault.hanover.edu/~altermattw/course/220/2015W/Downs.pdf.

[2] Alley, T. R., & Greene, M. E. (2008). The relative and perceived impact of irrelevant speech, vocal music and non-vocal music on working memory. *Current Psychology: A Journal For Diverse Perspectives on Diverse Psychological Issues*, 27 (4), 277-289. doi:10.1007/s12144-008-9040-z

[3] Dodge, Lara and Micheal Mensink. "Effects of Listening to Music While Studying in College Students." *Journal of Student Research-Music and Memory*, University of Wisconsin-Stout, pp. 203-215.

Data entered into Matched Paired Analysis:
    Numbers of letters memorized in correct order, for both types of music

Subject	Song SIK	MID
1	3	9
2	14	3
3	7	15
4	1	3
5	7	1
6	7	15
7	5	7
8	6	12
9	4	10
10	5	8
11	7	9
12	6	11
13	4	4
14	8	6
15	8	12
16	12	13
17	11	10
18	9	7
19	6	11
20	4	6
21	5	7
22	4	10
23	3	12
24	8	10
25	9	12
26	5	13
27	11	9
28	6	4
29	10	9
30	7	10