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Short Term Memory Experiment

Abstract

Short term memory is ones ability to retain a small amount of information and it stores the memory for a short period of time. Background music has been known to impact short term memory but it is unclear whether it impacts memory positively or negatively. The test studied the impact of background pop music on the remembrance of a sequence of shapes. The test was completed by 15 Roland Park Country School female high school students. It was asked that they remember an increasing sequence of shapes while various pop songs played in the background for 10 seconds. After performing the test, it was concluded that pop music has a positive effect on short term memory. When background music was playing, students remembered more shapes.

Introduction

The Merriam Webster Dictionary defines short term memory as “memory that involves recall of information for a relatively short time (as a few seconds).” Mastin (2010) defines it as, “The brains post-it note.” He continues to state that, “it holds a small amount of information (typically around 7 items or even less) in mind in an active, readily-available state for a short period of time (typically from 10 to 15 seconds, or sometimes up to a minute).” To study the definitions of short term memory, a scientist conducted research on “The Effects of Music (Song) on Short Term Memory Recall”, which studied whether or not music has an effect on short term memory. This study was completed on 15 females and 15 males at the College of Wooster in Wooster, Ohio. During the test the subject was shown a tray of 10 items. The subject had to memorize the 10 items while classical music was playing in the background. No clear conclusions were drawn yet but the scientists expected that students would have an easier time remembering the object while music was playing in the background.

In another study, Leman (2000) analyzed the impact of “western” noise on short term memory. Western music refers to popular music. Leman’s “test subjects” were other papers written by scientists. There was no procedure because Leman synthesized other reports, so the conclusion was drawn that “western” music impacts short term memory, but it was unclear whether the music had a good or bad impact on memory. The conclusion was drawn by taking all the statistics from what was read, and combining them. Another article, “Auditory Short Term Memory, Listening Comprehension, and the Input Hypothesis,” studied the relationship short term memory skills has to listening and auditory comprehension. It was concluded that auditory helps comprehension. The conclusion was drawn by reading a paper titled “Call 1979” and analyzing it. The “...Input Hypothesis” test is just like this experiment, but using comprehension instead of memorization. The scientists tried to find a connection between auditory and comprehension.

Based off of other experiments, this study uses western/popular music as an auditory distractor. The chosen songs played in the background, while an increasing sequence of shapes showed on the screen for 10 seconds. After choosing all the variables for the experiment, the final research question was, “Does pop music affect the short term memory of an increasing sequence of random shapes?”

Methods

In this experiment, scratch was used to develop and run a program that tested whether loud pop music (level 10 on laptop with headphones) affected the short term memory of fifteen different Roland Park upper school female students. They were tested in a quiet hallway. The experiment tested memory by using a series of two, four, six, eight, and ten shapes(see Image 1).The shapes were shown on the screen for ten seconds one time with music and another time without music(see Image 2). Then the test subject had to record the shapes that they remembered after the ten seconds were up. The subjects had a paper that had a space for them to draw 2, 4, 6, 8, and 10 shapes shown. They would draw all the shapes that they remembered. Before they completed the experiment, a questionnaire was made to find out information about the people tested . The first question was, what’s your name and grade? Another question that was asked was if they listen to music when they study and if they find music distracting while studying. The people who said they listen to music while studying results were compared to the people who said that they do not listen to music while studying results. The same test was given again, but with music. They had the same thing on the back of the paper for the trial with music. They used headphones when they listened to music and the songs that played. The songs that played were different pop songs. The songs played were the following: “Baby” by Justin Bieber, “Shake It Off” by Taylor Swift, “Animals” by Maroon 5, “All About That Base” by Meghan Trainor, and “Rather Be” by Clean Bandit ft. Jess Glynne. The way that they were graded was if they drew the correct shape in its correct place. For example if one person wrote down three shapes correct for the six shape series they would have received a 3/6.

Image 1: Instructions for taking test



Image 2: A Sequence of 6 Shapes



Results

Graph 1: This graph shows the r2 values for each number of shapes

Table 1: This table shows the P-values for each number of shapes

|  |  |
| --- | --- |
| **Number of Shapes** | **P-Value** |
| 2 | 1 |
| 4 | .596 |
| 6 | .923 |
| 8 | .375 |
| 10 | .737 |

The distractor did have an impact. The r2 value that was generated by Fathom where the data was inputted was 0.7492 with the distractor and 0.5051 without the distractor. If the r2 value is higher than .5 and less than 1, then the points are highly correlated with the line of best fits, so the distractor did have an impact. The closer the r2 value to 1, the more it correlates to the line of best fit. When the points are highly correlated than there are no outliers to dramatically change the averages, so they can be closest to 100% accuracy. The r2 value was higher than .5, so the distractor did have an impact. The P-values were generated by the data being inputted into TI-84 calculators. If the P-value was smaller than 0.05 than it would show the distractor did have an impact.

Discussion

From the data, it was concluded that the music had a positive effect on the student’s short term memory who was tested. It was positive because the averages correct were mostly higher for when music was played. The average correct for 2 shapes for without a distractor is 2 and with a distractor is 2. For 4 shapes, the average correct without a distractor is 3.533 and with a distractor is 3.333. For 6 shapes, the average correct without a distractor is 2.933 and with a distractor is 3. For 8 shapes, the average correct without a distractor is 2.733 and with a distractor is 3.4. For 10 shapes, the average correct without a distractor is 4.533 and with a distractor is 4.333.The equation on the graph shows this because the equation for average correct without a distractor was y=0.4733x + 1.7933 and the equation for average correct with a distractor was y = 0.4266x + 1.8666. This shows that the average correct line with a distractor is steeper. There was a very small difference of the average number correct for when there was and wasn’t a distractor. There was more correct when there was a distractor. Pop music does have an effect on female high school students. In the future to test short term memory, it would be better to use a different sequence of shapes for the with music than with the no music because this may have affected our results. This may have contributed to why music had a positive effect on memory rather than negative, like we expected. The p value is found by doing a t test. For the sequence of 2 shapes the p value is one because the results for music and no music were the same. This shows that for 2 shapes, music did not affect the brain. For a sequence of 4 shapes, the p value is .559. Since this is above 0.5, this shows that there was not much impact. For a sequence of 6 shapes the p value is .92. This is very close to 1 and means that the music barely had any impact on memory. For a sequence of 8 shapes the p value is .375, and since it is under 0.5, it shows that the music had an impact. For a sequence of 10 shapes, the p value is .77, which means music barely had an impact as well.

Bibliography

Call, M. E. (1985). Auditory Short Term Memory, Listening Comprehension, and the Input Hypothesis. *Tesol Quarterly*, *19*, 765. http://dx.doi.org/10.2307/3586675

The Effects of Music (Song) on Short-Term Memory Recall. (2012). *Music and Speech Perception*. Retrieved from http://musicandspeech.voices.wooster.edu/title-the-effects-of-music-song-on-short-term-memory-recall/

Gustavson, A., Hanneken, K., Moldysz, A., & Simon, B. (2014). The effects of Music on Short Term Memory and physiological Arousal. *University of Wisconsin-Madison*, 1-8. Retrieved from http://jass.neuro.wisc.edu/2013/01/602%207%20Final%20Paper.pdf

Leman, M. (2000). An Auditory Model of the Role of Short-Term Memory in Probe-Tone Ratings. *An Interdisciplinary Journal*, 481. Retrieved from http://www.jstor.org/discover/10.2307/40285830?sid=21105574678613&uid=2&uid=70&uid=4&uid=2129&uid=3739256

Leutwyler, K. (2001). Exploring the Musical Brain. *Scientific American*. Retrieved from http://www.scientificamerican.com/article/exploring-the-musical-bra/

New Findings Reported from Catholic University Describe Advances in Algorithms. (2012). *Mental Health Weekly Digest*, *126*, 1. Retrieved from http://www.highbeam.com/doc/1G1-284109545.html

Schellenberg, S., & Moore, R. S. (1985). The effect of tonal-rhythmic context on short term memory of rhythmic and melodic sequences. *Jstor*, 207-217. Retrieved from <http://www.jstor.org/stable/40317957?seq=1#page_scan_tab_contents>

Short-term memory. In *Merriam Webster*. Retrieved from <http://www.merriam-webster.com/medical/short-term%20memory>