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## The Power of Music

**Michelle Bella, Tijana Redzepovic, and Kandice Schroeder**

*Music can influence one's mood and alter one's concentration, either in a positive way or a negative way. Such as classical music tends to soothe and focus one's mood where as techno seems to excite and distract one's mood. The main objective of this experiment is to determine whether one's memory is more efficient and improves when presented with classical music rather than techno while studying a list of words. In this study, 30 participants performed a series of memory test while listening to classical, techno and no music at all. Although, music did not seem to affect performance on the memory test, sex did seem to play a role in the outcome of the memory tests.*

History has shown that music has played an important role in people's behaviors and how they perform on certain tasks. A recent study measuring the effect of music on simple tasks revealed that background music has a significant effect on the subject's performance (Hallam, Price, & Katsarou, 2002). While calming music seemed to increase the subject's level of performance, aggressive and disruptive music appeared to do the opposite, decreasing the subject's level of performance and even lowering their altruistic behavior level. Surprisingly, this study proved that music more likely affects arousal and mood rather than cognition when studying mental ability on simple tasks (Hallam, Price, & Katsarou, 2002).

Another study investigated whether subject-preferred music had a significant effect on cognitive tasks (Hirokawa, 2004). This study, which involved three different conditions, the first being subject-preferred music followed by relaxation instruction and ending with silence control, focused on the effects different conditions had on memory tests and energy levels. Results

showed that subject-preferred music increased the subject's energy level, unlike the other two conditions that decreased energy level and increased calmness and tiredness levels (Hirokawa, 2004). While all three conditions seemed to lower subject's tension levels, results indicated that there was no significant difference among scores on the memory test. This study revealed that subject-preferred music seems to increase energy levels, therefore, increased energy levels can lead to an increase in test performance. Contrary to music, silence tends to have the opposite effect on subjects by increasing their calmness and tiredness, therefore decreasing their overall performance on tests (Hirokawa, 2004).

A third study, compared the effect of different types of music on vocabulary and comprehension skills (Dawson, 2003). Subjects were tested in four different conditions, including Mozart, Yanni, Pink Floyd, and silence, while performing simple cognitive tasks. The results revealed the famous Mozart Effect which revealed that out of the four conditions, subject's performance levels improved while listening to Mozart music.

Similar to these three studies, the purpose of our study is to see if music enhances memory and comprehension skills. This finding could be helpful in improving the study habits and memory in students at Lindenwood University. We propose that subjects' performance level will increase while listening to classical music or no music, when compared to other music types such as techno. We hypothesize that techno will in fact decrease the subject's level of performance while taking a memory test.

## Method

### *Participants*

A total of 30 participants, 16 women and 14 men were students recruited from the Lindenwood University Human Subject Pool (HSP). The subjects were all above the age of 18,

undergraduate students at Lindenwood University and included both men and women students. For participating in the experiment, the HSP students were rewarded extra credit points from their professors. The subjects were recruited by a signup sheet outside the HSP office on the fourth floor of Young Hall and the professors of the HSP classes gave notice of the extra credit opportunities to their students. The HSP consisted of students from the introduction course of the Social Science Classes.

### *Materials*

The experiment was conducted in room 105 in Young Hall. The room was small, no bigger than approximately 10 ft. x 12 ft., with plain white walls except a few posted notices that warned experimenters not to throw liquids into the trash cans. There were two tables in the room. One table was used to prepare each session of the experiment and the other table was used for subjects to fill out paperwork and for conducting the experiment. Two chairs were also used during the experiment. One chair was used for the participant each session and the second chair was used for the experimenter to sit in. The room was brightly lit with one overhead fixture and no window was present in the room. For the experiment, a piece of Beethoven classical music was used as well as a piece of Benny Benassi Techno music. The participants would be listening to the music coming from an apple 6GB ipod, with apple head phones. Three lists of words, containing 50 random words were presented to participants to memorize (see Appendix A). A consent form was given to participants to sign to get their permission for participating in the experiment. A datasheet was used to assign numbers to participants and to keep participants information organized. A feedback letter was given to participants after the experiment process to debrief and make experimenters' information available to receive feedback of the results of the study if they were interested. A receipt was given to participants upon completion of

experiment. A pen was used for signing the consent forms. Participants were given a survey regarding their music preference, their own memory rating, their major, and their gender, refer to Appendix B. A watch was used to make sure each session began and finished on time, as well as timing the participants as they completed each task.

### *Procedure*

Before conducting a session, the experiment was set up by one of the three experimenters. When a participant arrived, he/she was greeted by the experimenters and given a seat in one of the chairs at the table in the middle of the room. The participants were asked to sign two consent forms and then given a survey asking several questions about their gender, major and music preference while studying. After filling out the survey, the participants were given a list of instructions to follow as the rest of the session was completed. Since this was a within-subject design, all participants were told that they would be presented with classical music, techno music and no music while memorizing three lists, a different list with each condition.

The experimenter was sitting at the same table as the participant. The same experimenter showed the ipod to the participants and instructed them to put on the headphones. The participants were asked to keep the headphones on during the course of the experiment until they were asked to take them off. The experimenter played a sample piece of classical music to ensure the volume was comfortable for the participants. A techno or classical piece of music was on the ipod ready to play when the time began. The experimenter explained to the participant that they would be given a list of 50 words to memorize while listening to music coming from the ipod for one minute. After this, the list would be taken away and they would be given a blank piece of paper to write down all the words they remembered from the list, and they would be given one

minute to do this as well. After these two minutes were up, the participant took 30 seconds rest period while the experimenter prepared the other piece of music for the participant. They were asked to repeat the same steps listening to either, classical or techno music, each participant listened to different music while studying different lists, this was repeated for each type of music and each list of words. The experimenter sitting at the table had a stop watch ready to ensure each task began and ended on time.

In every experiment there were two minutes while participants were not listening to any music while memorizing the words and in this case they were asked to take off the headphones. The sequence of music pieces and not listening to music at all was counterbalanced for order of presentation with six different combinations. Once the combinations reached the sixth participant it was started over again with the seventh participant starting at the first one. The experimenter collected the sheets each time the participant completed a two minute interval. Upon completion of the session, the subject were given a feed back letter, a receipt and a verbal "thank you." Data were put into a folder.

### Results

A one-way repeated measure analysis of variance (ANOVA) performed on participants' scores on memory tests revealed no main effect of the experimental condition,  $F(2, 28) = 2.449$ ,  $p > .05$ . However, the memory scores of participants while listening to classical music ( $M=10.13$ ,  $SD=3.21$ ) or no music ( $M=10.13$ ,  $SD=3.21$ ) were higher than scores while listening to classical music ( $M=8.93$ ,  $SD=2.92$ ), they did not significantly differ from one another.

The 30 participants consisted of 16 women and 14 men, since these measures were fairly equal another test was conducted to measure the sex difference in memory scores. A 2 (sex) X 3 (music) ANOVA was conducted to reveal the sex difference among memory scores while

listening to techno music, classical music or no music. The results revealed a statistically significant main effect of sex,  $F(1, 28) = 5.838, p < .05$ , the data reveals that females ( $M = 10.75$ ) did significantly better than males ( $M = 8.66$ ) on all the memory tests.

### Discussion

The predicted outcome of the study did not match the results found. It was predicted that participants would perform better on a memory test while listening to classical music rather than no music or techno music. There was a difference in the means of the test scores but not enough to prove significance. The average of the scores while listening to classical music was higher than the average while listening to techno music or no music, but after conducting a repeated measure one-way ANOVA, no significance was established.

Therefore, our hypothesis that while listening to classical music one will perform better on a memory test than while listening to techno or no music was not supported by our findings. This could be due to many different factors. Since a repeated measure design was performed, only 30 participants were tested. Perhaps a larger number of participants would have confirmed our hypothesis. It was also perceived that participants may have been affected by the floor effect; everyone did poorly on all three memory tests regardless of the present music in the background. This could be due to the fact that participants were recruited from the Lindenwood University Human Subject Pool; participant may have only been interested in receiving extra credit, not in performing well on the memory tests. It was noted that participants casually gave up listing remembered words after 15 seconds, saying “okay that’s all I remember” instead of focusing the whole 60 seconds they were given. The three memory lists presented to participants consisted of 50 random words only an average of 20% of words was recalled by participants.

It could be possible that too many words were presented but since participants were given 60 seconds to look at the lists 50 words seemed appropriate. On the contrary, participants may have felt overwhelmed and stressed by the amount of words presented. Also, since a repeated measures design was administered it is very likely that participants felt worried and hassled and experienced the fatigue effect. Participants did show signs of annoyance for example sigh or rolling of the eyes, at having to memorize three separate lists on three separate occasions. Another possible reason for not finding significance may be due to the words on the lists being too random, maybe if each list followed a theme, it would have been easier and less stressful for participants to recall words from each consecutive list.

Dawson (2003) conducted a study to compare the effect of different types of music on vocabulary and comprehension skills. Subjects were tested in four different conditions, including Mozart, Yanni, Pink Floyd, and silence, while performing simple cognitive tasks. The results revealed the famous Mozart Effect which revealed that out of the four conditions, subject's performance levels improved while listening to Mozart music (Dawson, 2003). Unfortunately this study did not match the results that we found which could be due to a number of factors. It was noticed that participants were visually distracted by the techno music, they bobbed their heads, tapped their pen or foot. Unfortunately, observation doesn't mean significance. Therefore, more research in this area is needed in order to see if music really does affect memory and learning.



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Appendix A

LIST 1

MOON	JACKET
HAIR	FAIRY
CUP	LOVE
STOVE	PARADISE
PICTURE	DUDE
SPRAY	SHARK
PURPLE	DUCK
CARD	HAT
LAMP	CLOTH
GRASS	LADY
MONSTER	TRAMP
CAT	BLOND
BROTHER	BOMB
RED	
JUICE	
CHAIR	
PANTS	
MIST	
MARRIAGE	
BEACH	
CHILD	
MOUSE	
SISTER	
WING	
ORANGE	
WATER	
DESK	

LIST 2

SCENE	JUMBO
SHAPE	NUTTY
SHOW	AWARD
TYPE	TRIM
VIEW	SWAN
VISUAL	PLAYGROUND
PICTURE	GOLD
METHOD	WHIP
TINT	LINK
VALUE	FOIL
PRICE	COAL
GALERY	SIDE
SPRING	
FLUSH	
PHONE	
SEED	
DROP	
NAP	
AIR	
DAMP	
PERSONAL	
AMUSED	
SEED	
WATER	
LIMB	
RABBIT	
STONE	
STOMP	

LIST 3

APPLY	DIVA
ARTIST	EXIT
ARTWORK	METAL
BEAUTIFUL	STONE
BORDER	ENGINE
BRUSH	ENJOY
DESIGN	ROAR
COPY	TICKET
DRAW	WITTY
FINE	HOST
MODEL	CREW
MEDIUM	LUCKY
WILLOW	ECHO
BEE	
VIOLET	
ASHES	
MISTLETOE	
TOOTH	
THIN	
EYE	
BAD	
OLD	
CURVED	
SCRATCH	
KNITTING	
SILVER	
TOUR	

Appendix B

Survey

1. What is your gender?

Female

Male

2. What is your major?

3. On a scale from 1-10, one being the weak and ten being strong, how would you rate your short term memory? Circle one.

1

2

3

4

5

6

7

8

9

10

4. What type of music do you prefer to listen to while studying?

Classical

Techno

No music

Other