

## Psychology Unit 3 – Coursework An investigation into the Mozart Effect

### Introduction

#### Background research

Modern technology is increasing at an amazing rate, everyone is trying to keep up and have cutting edge equipment. This is very much important in school systems as well as other areas of life. With technology now being such a dominant factor in classrooms, teachers are doing all they can to incorporate technology into their teaching. This includes playing music during tests. Teachers may see this as a way to relax students and reduce anxiety, thus helping their test performance.

There is research however, that states to achieve maximal scores on a test, studying should be done with the same cues present as during testing. For example, if the student listened to Mozart's 5<sup>th</sup> concerto whilst studying, he may recall the facts better during the exam if the same piece of music is played. According to the encoding specificity principle of memory, (Thompson & Tulving, 1970) the most effective retrieval cues at the time of recall are cues that contain information that was processed at the time the "to be remembered material" was studied. Therefore, for the music to help the student during testing, it should be played during studying also. This brings up the issue of whether or not studying with music effects test performance. Many students feel that studying with music helps.

Frances H. Rauscher discovered that performance on spatial reasoning tests improved after the participants listened to Mozart as opposed to a relaxation tape or silence. He first demonstrated the correlation between music and learning in an experiment in 1993. His experiments indicated that a 10-minute dose of Mozart could temporarily boost intelligence. Groups of students were given intelligence tests after listening to silence, relaxation tapes, or Mozart's Sonata for Two Pianos in D Major. He found that after silence, the average IQ score was 110, and after the relaxation tape, scores rose a point. After listening to Mozart, however, the scores jumped to 119. Even students who did not like the music still had an increased score on the IQ test. Rauscher hypothesized that listening to complex, non-repetitive music, like Mozart, may stimulate the relevant parts of the brain into thinking.

McFarland and Kennison (1987) however assume through their studies that the right hemisphere of the brain processes music. They found that participants require greater effort to successfully learn a task with the presence of music. Therefore, according to their study, music does more harm than good when studying. McFarland and Hanna (1990) found that music inhibited initial learning in a spatial task. Again showing that playing music while studying is more damaging than helpful on test performances.

Research seems to show that music during studying inhibits learning. Is this true even if there is music present during testing?

#### Rationale

This experiment will show if there is a relationship between music present during studying and test scores. It will also exhibit if there is a correlation between studying with environmental cues and having the same cues present during recall. It will show how the encoding specificity principle relates to music being present during studying. The experiment is neither damaging nor demoralizing to the participants; therefore it is sound on ethical and humanitarian grounds. If the experiment does show music to have a beneficial effect on learning, it would be well worth the time and effort spent in carrying it out and the benefits to the education

world would be notable. Equally if it does not, the conclusions will still be important in showing that music does not aid learning and perhaps students could be better advised against listening to music whilst learning due to more factual evidence.

### Aims

1. To discover whether classical music can exhibit a beneficial effect on the brains ability to commit information to memory and therefore produce a higher than normal level of recall.
2. To discover whether classical music can have a detrimental effect on the processes of learning and recall of information.

### Hypotheses

#### 1) Experimental

Participants who are tested on a list of 20 basic, 4-6 letter words (e.g. shop) will have higher recall levels of those words when classical music is played during the learning period.

#### Null

Participants recall abilities are not affected by the playing of music, any differences that do occur are due to unforeseen variables coming into play.

### Method

#### Method and design

For this experiment independent groups design will be used. Therefore one group will be the 'control' group whilst the other is the 'experimental' group. The advantage of this will of course be that there are no order effects, the groups will not know what the condition being investigated is. Prior knowledge of the participants is also irrelevant and will not affect the results making this design preferable. On the other hand the different groups are different people and therefore some quantity of reliability is lost through the chance of one group having brilliant memories whilst the other has poor ones. Therefore I will be using 15 participants in each experiment to try and rule out any differences due the individual's characteristics.

#### Variables

##### Independent variable

The independent variable for this experiment will be the ability of 1 group to recall the 15 words with classical music played in the background and the other group without music.

##### Dependant variable

This will be the number of words recalled by each respective group.

### Participants

The participants will all be members of King's college school 6<sup>th</sup> form; therefore all will be male and aged between 16 and 17 and 15 will be used in each group. The method of sampling used will be opportunity sampling as it is the most readily available one and others like random sampling would be unethical as to make it random a list of names would have to be used, violating students' privacy.

### Apparatus

15 sheets of the 15 chosen words to be learned

15 pens

15 sheets of blank a4 paper

### Procedure

- 1) The participants will be given a brief introduction to the experiment, "You have been asked to take part in an experiment into the ability of the brain to learn and recall words."
- 2) The lists of words will be handed out to each participant face down to allow no cheating which would affect the results.
- 3) The participants will be told to turn over the sheets and learn as many of the words as possible.
- 4) They will be given 1 minute to learn them (during this time classical music will be played) and then asked to turn the sheets back over.
- 5) The word lists will be collected and the blank sheets handed out.
- 6) The participants will now have 2 minutes to write down as many words as they can recall from the list.
- 7) After 2 minutes they will be stopped and the sheets collected.
- 8) The participants will be debriefed, "you have been part of an experiment to show the Mozart effect, which is the effect of classical music on learning ability. It has been shown in the past that classical music can temporarily boost brain activity and increase learning ability."

## Controls

### Extraneous variables

Time of day – the time of day may affect the learning ability of some participants but to avoid this problem, both groups will take the test between 10 am and 11 pm

Mood – Whether the participants are in a good or bad mood may affect their ability to learn the words.

State of alertness – whether each participant has slept well the last night or is ill may affect their learning ability.

Individual ability – the intelligence may vary between participants but as they all come from the same private school and year group there will probably be little difference.

Time of day can be controlled, as can individual ability to some stage but not totally. Mood and state of alertness are beyond control.

### Ethical considerations

As no ones privacy was invaded and the experiment does not give the participants their scores, there is no reason for any hurt to come of this experiment, therefore there are no real ethical considerations needed to be taken into account besides a debriefing.

## Results

Word number/ position	Number of words recalled in condition 1 - Control	Number of words recalled in condition 2 – Classical music
1	14	15
2	11	13
3	14	11
4	10	10
5	6	9
6	5	7
7	7	4
8	2	5
9	3	3
10	4	4
11	3	2
12	3	4
13	4	5
14	2	5
15	5	6
16	7	6
17	9	8
18	11	12
19	11	11
20	14	13

### Commentary on graphical display of results

The graph shows that there is a basic trend of a serial position curve which both the control group and experimental group follow. Both condition 1 and 2 had roughly the same results as the graph shows.

### Relationship to the hypothesis

The experimental hypothesis states, “Participants who are tested on a list of 20 basic, 4-6 letter words (e.g. shop) will have higher recall levels of those words when classical music is played during the learning period.”

The results did not support the hypothesis as can be seen in the graph above, the presence of classical music (condition 2) gives similar results to the control group (condition 1). Results from condition 1 and 2 both illustrate the serial position curve, which highlights much better recall at the beginning and ends of a list. So the null hypothesis is correct, classical music does not aid the brain to learn words better

## Discussion

### Validity

Validity refers to the trueness of an experiment and how well it can be generalised. The variables were operationalised by giving them a standard in which they can all be measured against.

Ecological validity is how true and similar a study is to real life. This study does not have very good ecological validity, as it is very uncommon for people to have to remember a set of words.

Construct validity is the comparison of test scores with the expected results. As seen from the graph, this does not demonstrate a similar trend to that of the expected results.

### Suggestions for improving validity

An improvement for the ecological validity of the study is to recall a sentence or paragraph of words rather than a list of words. It is common for people to remember a sentence of words possibly for an exam or a presentation speech rather than short words.

### Reliability

Reliability is a measure of how dependable or consistent a study is. It does not define its accuracy, as an inaccurate study can still be reliable. A reliable study would achieve very similar results if repeated. This study might not achieve the same results because several factors, for example the individual's ability can change the results. There is however no real way to improve this beyond using participants of the same class, age and sex, so it must remain as an extraneous variable. If a different wordlist was used, then it could produce completely different results, as some words may be easier for some subjects to remember than others possibly due to the familiarity of them. There is no way of identifying how easy/hard a word is to remember due to its subjectivity. Sampling can also change a study's reliability as all subjects have the liberty to choose whether they make a real effort to learn the words in the study or not so this could affect results. Controls and apparatus can be kept fixed with relative ease and standardised procedures and instructions can easily be reused to ensure maximum reliability.

### Improving reliability

It would be important to match age, gender, ethnicity and intelligence. Using people of similar intelligence might give a more reliable result. However this method would be very time consuming as all participants would have to be tested before the experiment as well to find this intelligence level and it would not always be effective. Another improvement that can be made is to have a larger sample of participants in each condition. It will increase reliability significantly and give more scope of the target population. Having a larger sample would mean more participants, which would help improve accuracy.

### Implications of the study

As seen from the graph, results of this study are not what was expected and are totally different to Rauscher 's (1993). Unlike his experiments into spatial ability, which were largely positive, it appears from these results that classical music does not have any effect on learning. Neither positively nor negatively, so it may help in spatial reasoning, but not the learning process. The results do however agree well with McFarland and Kennison (1987) who affirmed that music of any kind interferes with the learning process. McFarland and Hanna (1990) also found that music inhibited initial learning in a spatial task. Again showing that playing music while studying is more damaging than helpful on test performances.

### Generalisation of findings

It is possible to generalise for the target population. The target population 16 and 17 year olds from King's college school Wimbledon. There were 15 participants in each group from a total year group of approximately 140 students, which means 21% of the target population was tested. However, ethnicities of samples are completely random hence its range can be vast or very limited. The participants, depending on who was in each class can be widely varied and include every ethnicity from our school, or be entirely English. It is completely random. It is probably possible to generalise beyond the target population to an extent. Therefore, it can be concluded that it can be generalised beyond the target population to all 16 - 17 year olds in Kings College School.

### Application to everyday life

The results show that the findings do not agree with the majority of Rauscher's work. Applying this to everyday life would make little difference to learning since it does not affect it. However it is useful that students will know that it has no effect on their learning according to this experiment. It is a pity that the affects of music on spatial tasks do not transfer to learning tasks but perhaps the experiment would have different results in a different culture of circumstance, or maybe in students own homes music has a different affect on their learning due to the environment.

Appendices

- Word list for condition 1 and 2 :

1. Glove
2. Lead
3. Keys
4. Cup
5. Room
6. Coke
7. Snow
8. Tape
9. Pants
10. Beak
11. Lock
12. Rain
13. Meat
14. Nail
15. Town
16. School
17. Gun
18. Ball
19. Film
20. Badge



Alex Harlock