The Effect Of Music On The Performance Of A Task

Word Count: 1498 words

Abstract

The aim of this investigation is to investigate the effect of music upon the performance of a task.

30 participants completed different anagrams under each of the 3 conditions: fast, slow and no music.

A two-tailed Wilcoxon test was used, as a significance level of p=0.05. This revealed that the slow music & no music; and the fast music & slow music had significant results between them. However, between the fast music & no music conditions, there was no significance.

The data collected shows that slower music provides the highest level of performance, with the average score being 8.1 out of 15. Faster music gives an average performance, with no music providing the lowest level of performance. Individual differences and extraneous variables need to be accounted for, however, before firm conclusions can be drawn.

Background

Many studies have taken place with an aim to find out more about how music affects humans.

Turner et al (1997) concluded that the amplitude of the melody is important for the task to be performed quicker. Also lowering the amplitude gave slower response times to unexpected visual effects.

Similarly, **Wallace (1994)** concluded that a simple repetitive melody was enough to increase people's memory. It has been argued, however, that memory is not controlled by music alone, and many other reasons may affect memory, such as a person's I.Q.

The above two studies originated from **Mayfield and Moss (1989)**, which found that slower tempo music made people more relaxed, thus providing a slower pace of work.

It is from **Mayfield** that this investigated is based upon and taken a step further, to see the effects of having no music whilst participants perform the anagram task.

A two-tailed Wilcoxon Test was used at a significance level of $p=0.05$. This was used due to the repeated measures design used. It is easy to compare the differences of the mean scores for the conditions.

A laboratory experiment was used as this means there is a high level of control of confounding and extraneous variables. All participants will be in the same room, therefore limiting the chances of any extraneous variables occurring.

A repeated measures design will also be used with 10 participants, each completing all 3 conditions. This style of design means that any possible traits will occur across all conditions e.g. I.Q. level or ability to complete anagrams. This means the results will not be due to the participant variables.

Conditions

The **Independent Variable** has three levels: fast music, slow music and no music

The **Dependant Variable** is the number of anagrams correctly solved

Hypothesis

There will be a significant difference between the scores participants obtain on the anagram test, depending upon the type of music played (or no music being played).

Null Hypothesis

There will be no significant difference between the scores participants obtain on the anagram test, depending upon the type of music played (or no music being played).

Method

Design:
A laboratory experiment was used with a repeated measures design. This is used to control as many possible participant variables as possible. There were 3 conditions – fast music, slow music and no music.

Participants:
There were 10 participants in the study, selected via an opportunity sample. Each participant completed the three sets of anagrams. The age range of the participants was varied from 16 – 19, as this will limit the possibility of age affecting the results. However, generalisation of the results may be affected.

Procedures:
3 sheets of anagrams were created – one sheet for each condition. Each sheet had 15 anagrams, containing everyday words. Each sheet also had equal numbers of word lengths (between 4 and 10 letters).

Participants were given a sheet and a set of printed standardised instructions, which were also read out. They follow in the appendix. Once this had been done, the participants were asked to turn over the anagram sheet and start. The music was also started at this point. Once the 3 minutes was over, the papers were taken in and the next ones were given out. Participants were told when to start the second and third sets of anagrams.

Controls:
Controls used included use of the same location, a 3-minute time limit, the experimenter reading out the standardised instructions (as well as being printed on the instruction sheet). Also, the same dB (decibel) level was used for all music.

Measurement:
Measurement of the Dependant Variable (*D*.V) was the number of correct answers within the 3 minutes. The Independent Variable (I.V) was the condition – either fast, slow or no music. The reason for measuring the *D*.V in this way was because it enables easy-to-use, quantitative data – answers are simply right or wrong. The data will be analysed using the Wilcoxon test, as this works best with repeated measures in comparing the conditions.

Ethics:
There are no real ethical considerations, however all participants were given a brief overview as to what the study was looking into before they started the tests. The six ethics that needed to be considered were: debriefing, deception, protection from harm, consent, withdrawal and distress/embarrassment.

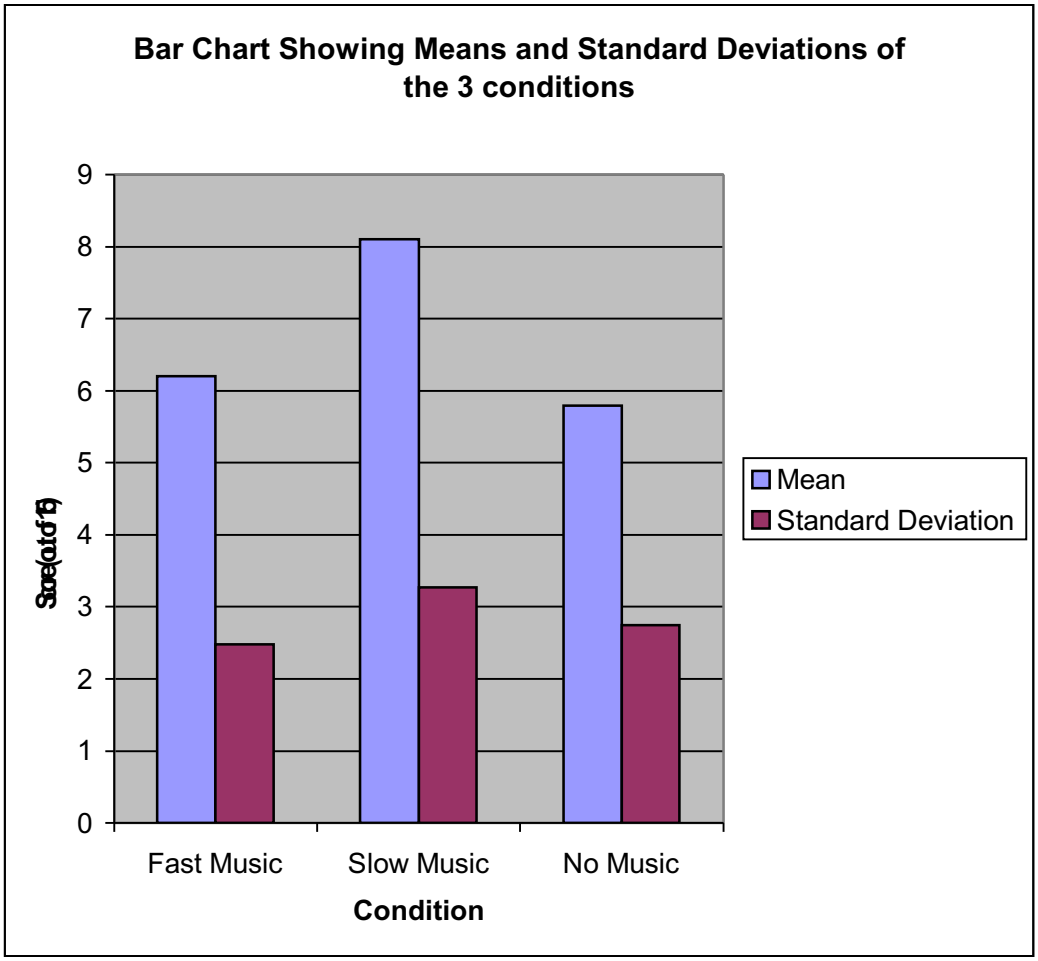
	Mean	Standard Deviation
Set 1 (fast music)	6.2	2.482
Set 2 (slow music)	8.1	3.270
Set 3 (no music)	5.8	2.750

Standard Deviation:

Using $s = \frac{(x - \bar{x})^2}{n}$

Why use the mean & standard deviation:
The mean provides an average for each of the three conditions. The same can be applied for the standard deviation, and this means that all ten results are taken into account, and can be analysed easily. However, some clarity on the results will be lost via using averages.

Bar Chart:



What the results show:
Scores in the slow music condition were generally higher – the means of the fast and slow music were 6.2 and 8.1 out of 15 respectively. This is also shown via the standard deviation, with scores of 2.482 and 3.270 for the fast and slow conditions.

The no music condition had results, which were slightly lower than that of the fast music condition. The mean score in the no music condition was 5.8, compared to 6.2 for the fast music condition.

Test One:
For a two-tailed hypothesis where p <= 0.05, the value of *W* must be equal or less than 8.
Result: *W* = 3 – results between slow music and no music are significant.

Test Two:
For a two-tailed hypothesis where p <= 0.05, the value of *W* must be equal or less than 8.
Result: *W* = 0 – results between fast music and slow music are significant.

Test Three:
For a two-tailed hypothesis where p <= 0.05, the value of *W* must be equal or less than 8.
Result: *W* = 19 – results between fast music and no music are **not** significant.

Statement of Significance:
The results prove the given hypothesis. However, it may be argued that there is not a significance difference in the results.

Discussion

What do the results mean:
Slow music increases performance & productivity. Having no music produces the lowest performance & productivity.

Hypothesis / rejection of *Null* Hypothesis:
The hypothesis can be retained, with the null hypothesis rejected. However, the results are not of great significant difference, therefore the hypothesis is not altogether accurate.

Method:
Many methodological factors may have affected the results. The **repeated measures design** meant that fatigue and practice effects would have occurred – the first condition would have meant low scores, as the participants may not have been used to anagrams. The second and third conditions would see practice effects increase scores, but especially in the last condition, fatigue would lead to a lowering of results. This could have been overcome via **counterbalancing** in order to provide more accurate results.

It was also realised that the **creation of anagrams** was slightly dubious – Appendix Three's anagram "heset" had multiple answers.

The **sample was opportunistic**, and therefore limits the generalisation of the results. 10 males, aged 16 to 19 were used in the experiment. All studied AS or A2 levels, which may lead the results to be concluded in light of their academic ability, as opposed to the music.

The **location** may have been unfamiliar to participants. This may have caused physiological arousal (as defined by **Yerkes and Dodson**), thus affected individual's performance within the task.

It is impossible to **control** the experiment 100%. For example, each individual's ability to complete anagrams may have affected the results (despite taking averages for the analysis). Individual's arousal levels, the heat of the room and other extraneous variables may all account for anomalous results. The pressure of the situation i.e. having the experimenter in the room may affect the results.

However, it must be argued that the I.Q level of each participant was matched across all three conditions, as all 10 participants completed all three of the anagram tasks. Therefore, the same I.Q levels remain across all of the conditions, thus increasing the validity and conclusions of the results.

There were no real **ethical issues** regarding the experiment, however all participants were asked to read and sign a consent form (included in the appendix) in order to make sure that they knew they could freely leave the experiment at any time etc. Also, all participants were debriefed at the end of the experiment, and the conclusions from this investigation were given to them at a later date.

Mayfield & Moss' study has told us that slower music meant a slower pace of work. However, this investigation challenges this theory, instead supporting the hypothesis outlined in this investigation.

One major modification that could be implemented would be the use of **counterbalancing**. This would increase the validity of the results. A **wider sample** could have been used, in order to increase the ability to generalise results.

More care should have been taken in checking and re-checking the anagrams before being tested upon the participants. The idea of running a test beforehand to check the validity of the anagrams may have been a good idea.

Future investigations could go on to isolate the various variables. It is very difficult to conclude that music affects performance. There are many other reasons as to why people may have performed well – some people can cope with stressful conditions; others just have a natural ability with particular tasks. By isolating various variables e.g. I.Q, and conducting experiments, a more specific reason (or reasons) can be given as to how music affects our performance, productivity and accuracy.

Instructions for Experiment

- In front of you there will be two sheets: this sheet of instructions and another sheet, turned face down. ONLY turn the latter sheet over when asked to do so by the experimenter.

- This experiment consists of three separate tests, which will be taken one after another.

- It is asked that you stay seated in between the three tests, as well as during the tests.

- Put the answer to each anagram in the spaces provided to the right of the anagram.

- You will have three minutes in which to complete each test, with a short break in between tests.

- Once the three minutes is completed, the experimenter will let you know will collect in your answers.

- Should you have any questions, do not hesitate to ask the experimenter before the first test.

A p p e n d i x T w o

Anagram Set One

sowhad -

konmey –

flufcitid –

wilrings -

noteaudic –

stainnoum –

sacslic –

nolcyba –

divoe –

pice –

rakcc –

tird –

kilm –

korf –

kalt –

Anagram Set Two

krow –

henop –

wolb –

perap –

tighl –

dinwow –

heset –

verco –

zigamane –

ningnigeb –

dicsedover –

dubliing –

cagedroune –

cadeox –

mipsle -

Anagram Set Three

tecpar –

repumoct –

osralnep –

moeh –

scae –

necres –

litfuubea –

equue –

xreim –

ioard –

koyrecr –

teolacohc –

teltob –

eprfoenamrc –

tecenmainna –

Anagram Answers

Fast Condition:
sowhad - shadow
konmey – monkey
flufcitid – difficult
wilrings - swirling
noteaudic – education
stainnoum – mountains
sacslic – classic
nolcyba – balcony
divoe – video
pice – epic
rakcc – crack
tird – dirt
kilm – milk
korf – fork
kalt – talk

Slow Condition:
krow – work
henop – phone
wolb – bowl
perap – paper
tighl – light
dinwow – window
heset – sheet
verco – cover
zigamane – magazine
ningnigeb – beginning
dicsedover – discovered
dubliing – building
cagedroune – encouraged
cadeox – coaxed
mipsle – simple

No Music Condition:
tecpar – carpet
repumoct – computer
osralnep – personal
moeh – home
scae – case
necres – screen
litfuubea – beautiful
equue – queue
xreimm – mixer
ioard – radio
koyrecr – rockery
teolacohc – chocolate
teltob – bottle
eprfoenamrc – performance
tecenmainna – maintenance

Consent Form

The experiment that you are about to take part in aims to investigate how music affects performance. There are three sets of anagrams that you will be asked to complete.

All results will remain anonymous, as no name is requested at any stage. Each individual will be told at the end as to their results.

Once the investigation has been completed, you will be fully debriefed on exactly what the investigation is looking into.

You have the right to ask any questions before the start of the test.

You can also leave the test at any time, without question.

In order to take part in the investigation, you must firstly consent to taking part.

If you agree with the above conditions, then please sign below. If you have any questions, do not hesitate to ask the experimenter.

Signed: _____

Appendix Seven

Results Table:

A – J are the participants

Set 1 are the anagram results from the **fast music condition**
Set 2 are the anagram results from the **slow music condition**
Set 3 are the anagram results from the **no music condition**

---/---	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**
Set 1	4	6	5	8	2	11	5	5	9	7
Set 2	7	7	5	10	3	13	6	6	13	11
Set 3	2	4	3	7	3	9	4	8	10	8

Appendix Eight

Wilcoxon Test Results

Slow Music & No Music

Subject	Cond A	Cond B	d (A – B)	rank d	rank +ve diff	rank –ve diff
1	7	2	5	10	10	
2	7	4	3	6	6	
3	5	3	2	3	3	
4	10	7	3	6	6	
5	3	3	0	1	1	
6	13	9	4	8.5	8.5	
7	6	4	2	3	3	
8	6	8	-2	3		3
9	13	10	3	6	6	
10	11	8	4	8.5	8.5	
totals					52	3

W = 3; at a significance level of p=0.05 and a two-tailed test, W must be equal or less than 8. Therefore, the results are significance.

Fast Music & Slow Music

Subject	Cond A	Cond B	d (A – B)	rank d	rank +ve diff	rank –ve diff
1	4	7	-3	9		9
2	6	7	-1	3.5		3.5
3	5	5	0	1		1
4	8	10	-2	7		7
5	2	3	-1	3.5		3.5
6	11	13	-2	7		7
7	5	6	-1	3.5		3.5
8	5	6	-1	3.5		3.5
9	9	13	-2	7		7
10	7	11	-4	10		10
totals					0	55

W = 0; at a significance level of p=0.05 and a two-tailed test, W must be equal or less than 8. Therefore, the results are significance.

Fast Music & No Music

Subject	Cond A	Cond B	d (A – B)	rank d	rank +ve diff	rank –ve diff
1	4	2	2	7.5	7.5	
2	6	4	2	7.5	7.5	
3	5	3	2	7.5	7.5	
4	8	7	1	3	3	
5	2	3	-1	3		3
6	11	9	2	7.5	7.5	
7	5	4	1	3	3	
8	5	8	-3	10		10
9	9	10	-1	3		3
10	7	8	-1	3		3
totals					36	19

W = 19; at a significance level of p=0.05 and a two-tailed test, W must be equal or less than 8. Therefore, the results are **not** significant.