Examining the Effects of Music on Memory Game Performance

Stats 101B, Group 1
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Music Is Widely Listened To

Americans stream **75 minutes** of music per day on average

Spotify
Youtube Music
Apple Music
Amazon Music

On average, **20.7** hours a week are spent listening to music

people listen to

700

music genres

Why did we choose to study music?

1.  We are curious about music's impact on our ability to retain information, especially with regards to different genres

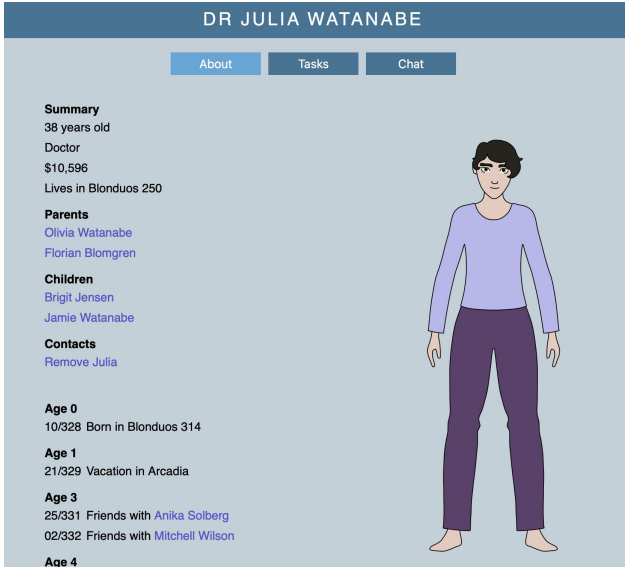
2.  We wanted to build on existing research on the effects of music, such as studies that suggest possible negative implications on focus and cognitive ability

3.  We all love listening to music and are curious about music's impact on our studying habits as students!

Data Collection Process

The Islands consists of

- Virtual human subject called Islanders
- Three islands - Ironbard, Providence, and Bonne Santé
- Twenty-seven villages



Data Collection Process - Randomization

01 Stage 1

Each of the 27 villages was assigned a number

- A random number generator was used to select the village

02 Stage 2

Within each village, Birth Records were used identify Islanders within the target block, age

- A random number generator was used to select the Islander

* Once selected, Islanders were asked to for consent to participate in the study. If the Islander did not consent, the process was repeated.

Design of Experiment

Treatment	Block				
	Age 10-19	Age 20-29	Age 30-39	Age 40-49	Age 50-59
Control					
Classical					
Heavy Metal					

Response Variable: Time of completion of Memory Game (in seconds)

Treatments: Type of music

- Control (no music)
- Classical Music
- Heavy Metal Music

Nuisance Factor: Age

- 10-19
- 20-29
- 30-39
- 40-49
- 50-59

Power Calculations

A pilot study was conducted with 45 participants to determine the required sample size to obtain statistically significant results.

```
          k = 3
          n = 18.67981
          f = 0.4266369
  sig.level = 0.05
      power = 0.8
```

A minimum sample size of 57 is required.
We chose to a sample size of 75, for a higher power.

Results and Interpretation - ANOVA

R Code:

```
m1 <- aov(time~ factor(age) + treatment)
summary(m1)
```

ANOVA:

	Df	Sum Sq	Mean Sq	F value	Pr(>F)	
factor(age)	4	1460	365.1	1.240	0.302268	
treatment	2	5404	2702.1	9.178	0.000296	***
Residuals	68	20020	294.4			

The p-value of 0.000296 < 0.05, thus there is a statistically significant difference in the in the performance on the Memory Game.

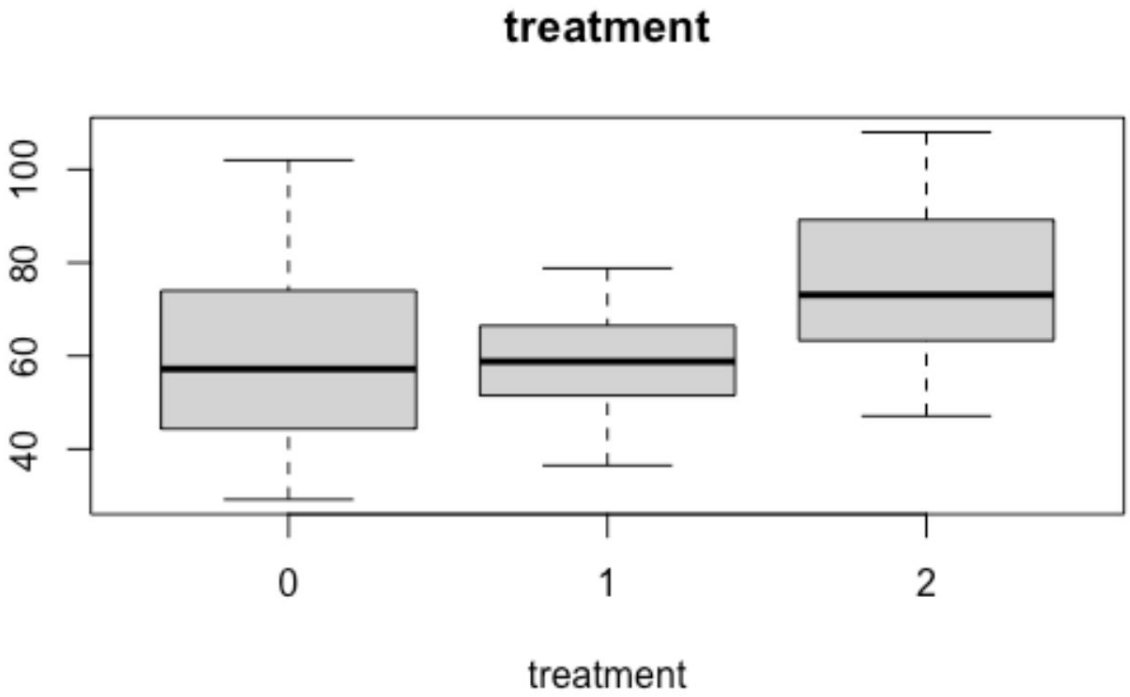
Results and Interpretation - Tukey's HSD

```
  Tukey multiple comparisons of means
    95% family-wise confidence level

Fit: aov(formula = time ~ factor(age) + treatment, data = df)

$treatment
                          diff        lwr      upr     p adj
Classical-Control        0.788 -10.840419 12.41642 0.9855736
Heavy metal-Control     18.388   6.759581 30.01642 0.0009324
Heavy metal-Classical 17.600   5.971581 29.22842 0.0015775
```

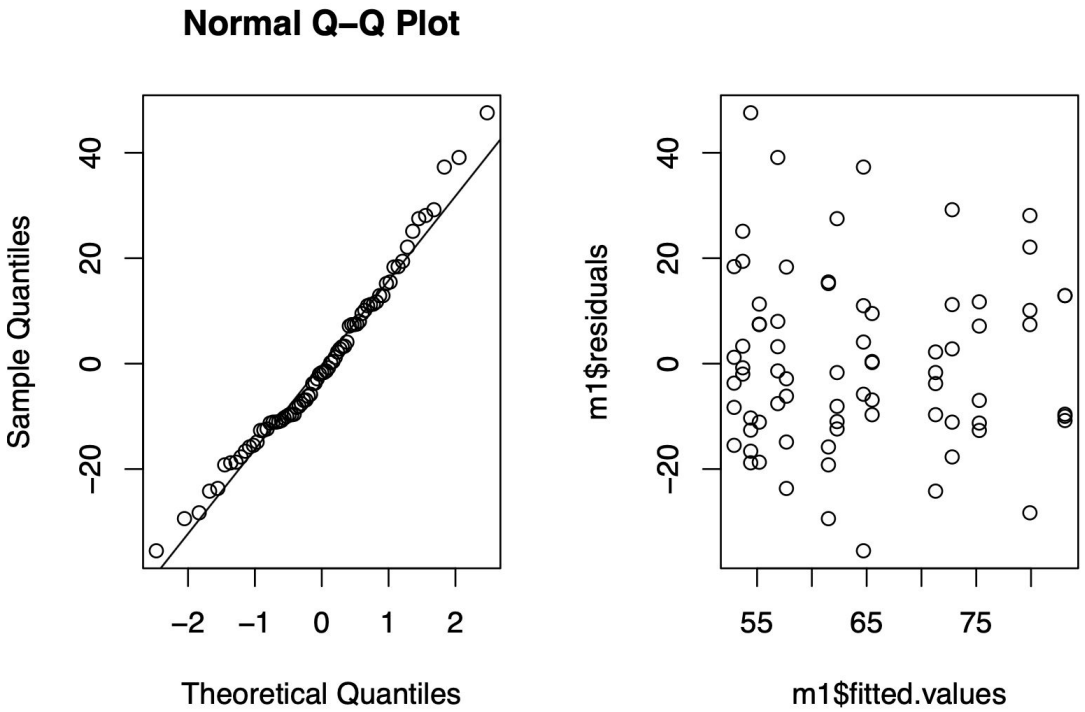
Classical music had no measurable effect compared to Control. Heavy metal-Control and Heavy metal-Classical differ in the time of completion for the Memory Game, thus Heavy metal is significantly increases completion time.

Results and Interpretation - Boxplot

Key:
0 - Control
1 - Classical
2 - Heavy Metal



Results and Interpretation - Model Adequacy



The assumption of normality and constant variance hold.

Discussion

Summarized Results

- The type of music plays a significant role in the participants' memory performance
- The treatment variable was found to be statistically significant **(p = 0.0159)**
- Participants in the **Heavy Metal** group performed **significantly worse** compared to both the Control group and the Classical music group

Results in the Real World

ARTICLE
An experimental study on the effect of background music on memory recall among medical students
Prabhu, P ; Nair, Reshmi ; Lau, Luh ; Chong, Ju ; Sia, Zhi ; Aithal, P; Wolters Kluwer - Medknow Publications

- This study found that students who completed memory tasks without listening to music **scored higher** than those who listened to music
- This effect was **apparent** especially in genres like **rock**.

Limitations

- A limitation of the study is the **insignificant blocking factor (p = 0.302268)**
- Blocking by age **did not significantly** contribute to explaining the variation in the response time