

The Effect of Music on Puzzle Cube Solving

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Literature Review

Some studies have investigated music's effect on cognitive ability and concentration:

“Many students listen to music while they study at home. They seem to have learned from their experience that music increases their level of concentration. There has not been, however, much work on evaluating if music could be used to control the level of concentration” (The Effect of Music on the Level of Mental Concentration and its Temporal Change)

“We concluded **classical and jazz background music improve concentration and reading comprehension** in young adult women, with no significant differences in both types of background music.” (The Effect of Classical and Jazz Background-Music on Concentration and Reading Comprehension in Young Adult Women)

“The experimental results confirm that “Sonata for Two Pianos in D major, K.448” can make distinct changes in the α and θ waves, and it also proves that listening to this kind of music can help people to relax the mind and help sleep well. In the β wave, we observed that the **subjects inability to concentrate** , **when exposed to frequencies contained in the heavy metal music** . However, once exposed to the sound frequencies of classical music the subjects measurement of mental performance drastically improved.” (The influence of different kinds of music on brainwave signals)

Research Question

How does listening to different genres of music (classical music, heavy-metal music, or no music) affect the cognitive ability of individuals, as measured by the time taken to solve a puzzle cube?

This study could provide insights into how different types of auditory stimuli affect cognitive performance.

Findings may be applicable in educational settings or environments where cognitive tasks are performed, suggesting whether certain types of music might enhance or impair cognitive abilities.

Design

We chose a 3x3 Latin-Square design, blocking for gender and controlling age group and testing 3 different sequences of control (no music), classical, and heavy-metal.

Sequence A: Control → Classical → Heavy Metal

Sequence B: Classical → Heavy Metal → Control

Sequence C: Heavy Metal → Control → Classical

A	B	C
B	C	A
C	A	B

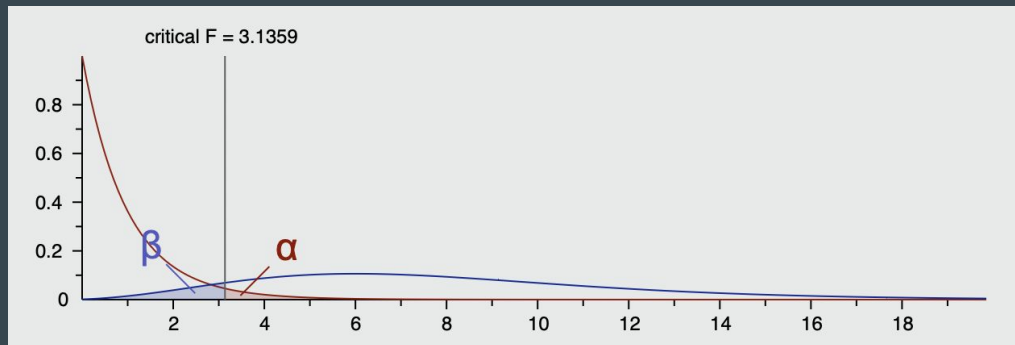
Sampling Methods/Characteristics

How we sampled:

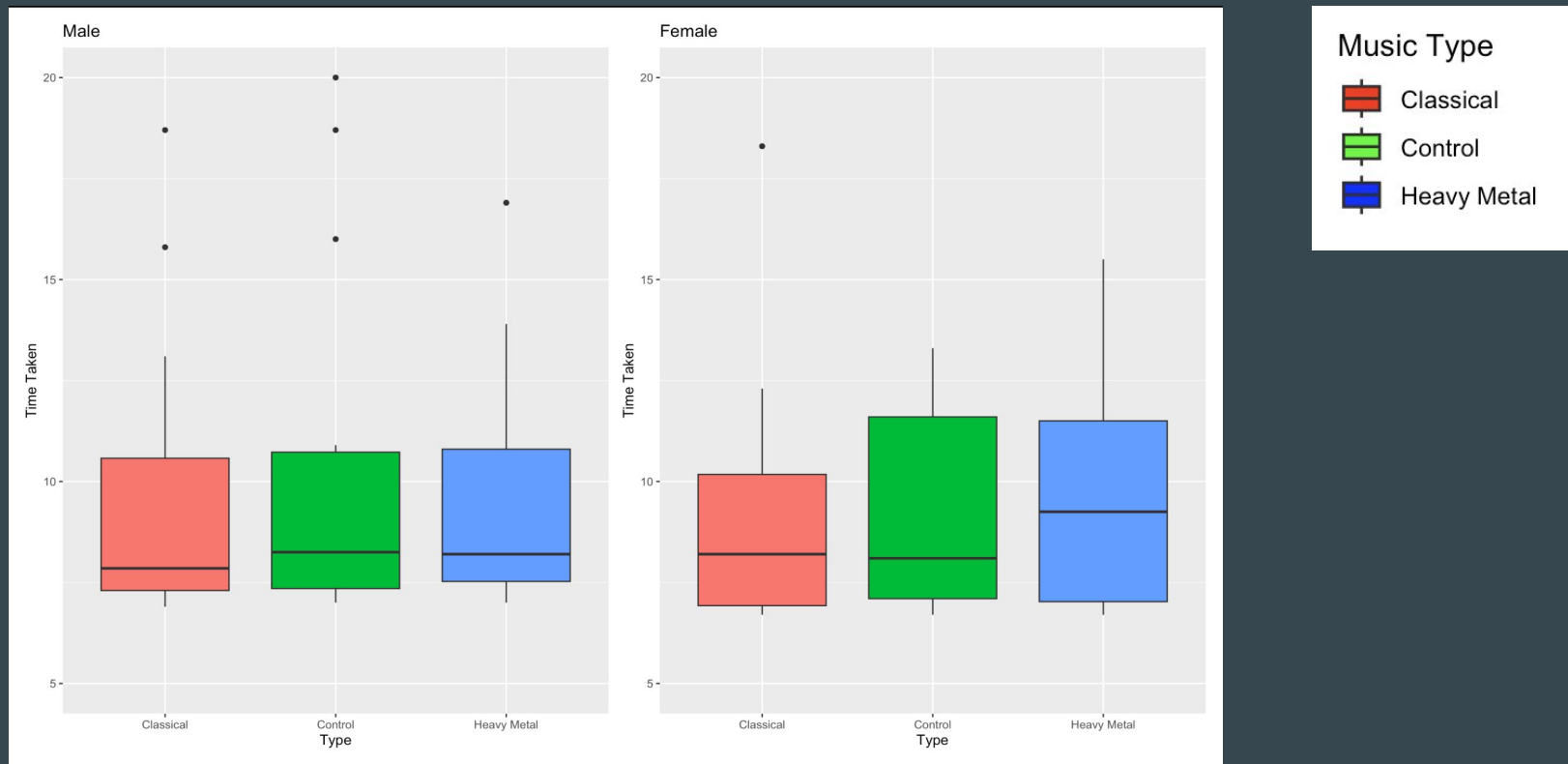
- Age Group: 18-24
- “Randomly” select island, city, house
 - Re-selected when we had too many males/females

G-Power Sample Size Calculation:

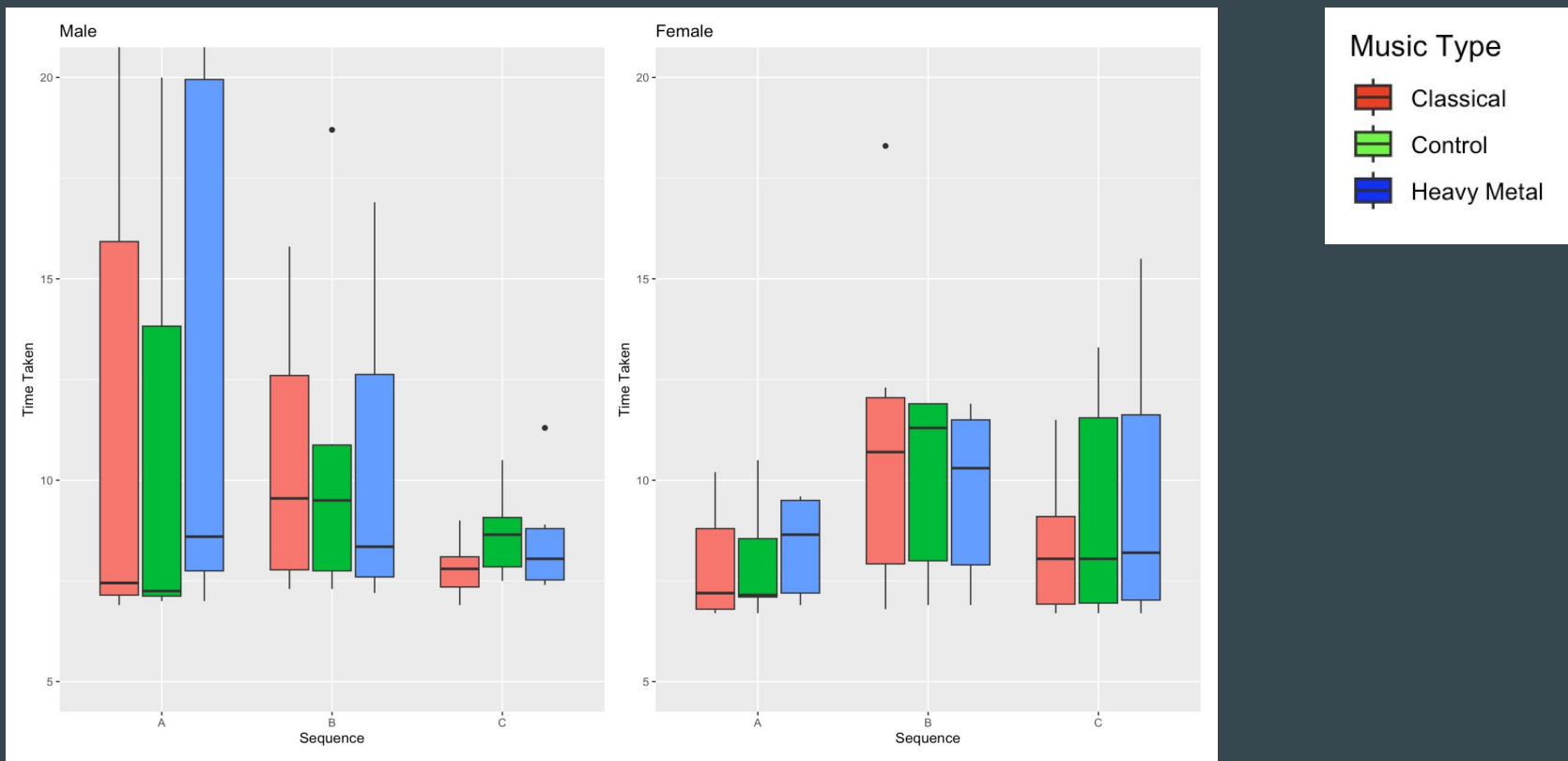
- Power: 0.9
- Alpha of 0.05
- Effect Size of 0.25
- Total sample size of 36
 - $n = 12$ for each treatment group
 - 6 males, 6 females



Comparison Across Music Genre

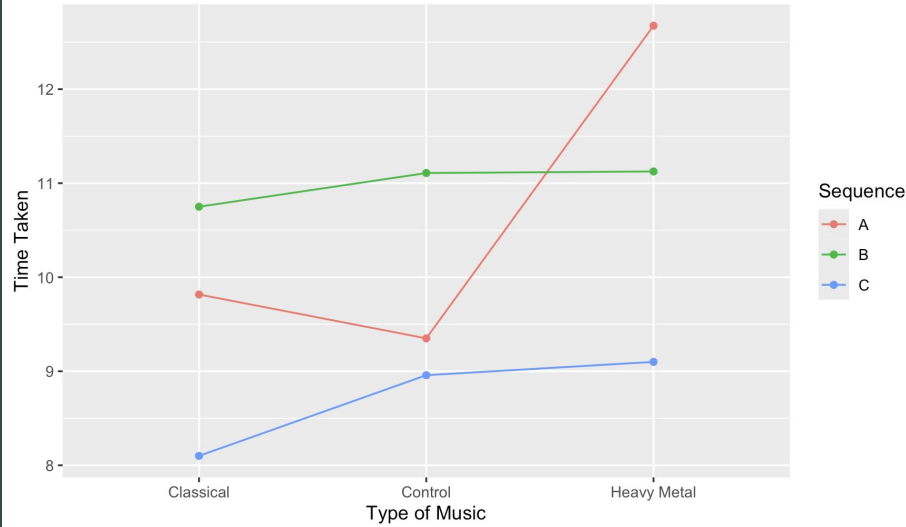


Comparison across treatment groups

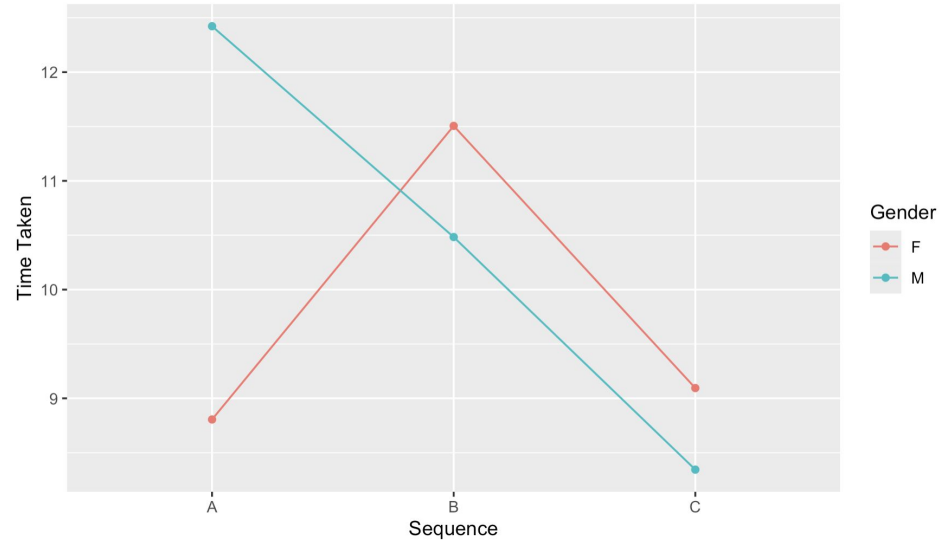


Interaction plots

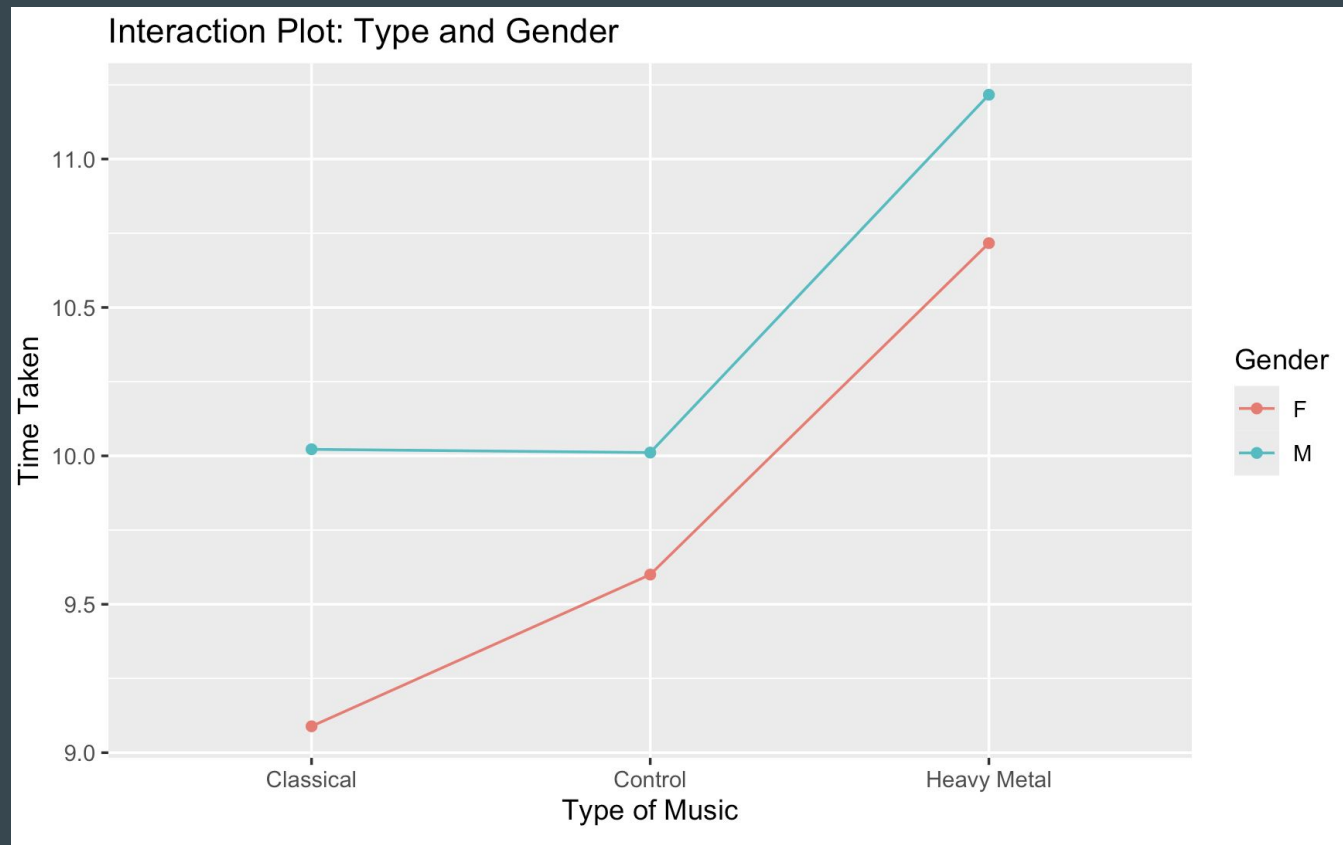
Interaction Plot: Type and Sequence



Interaction Plot: Gender and Sequence



Interaction plot

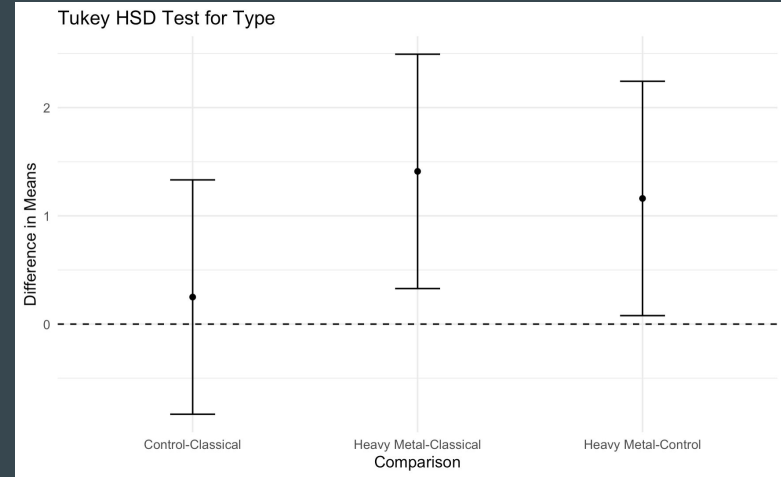


ANOVA Results

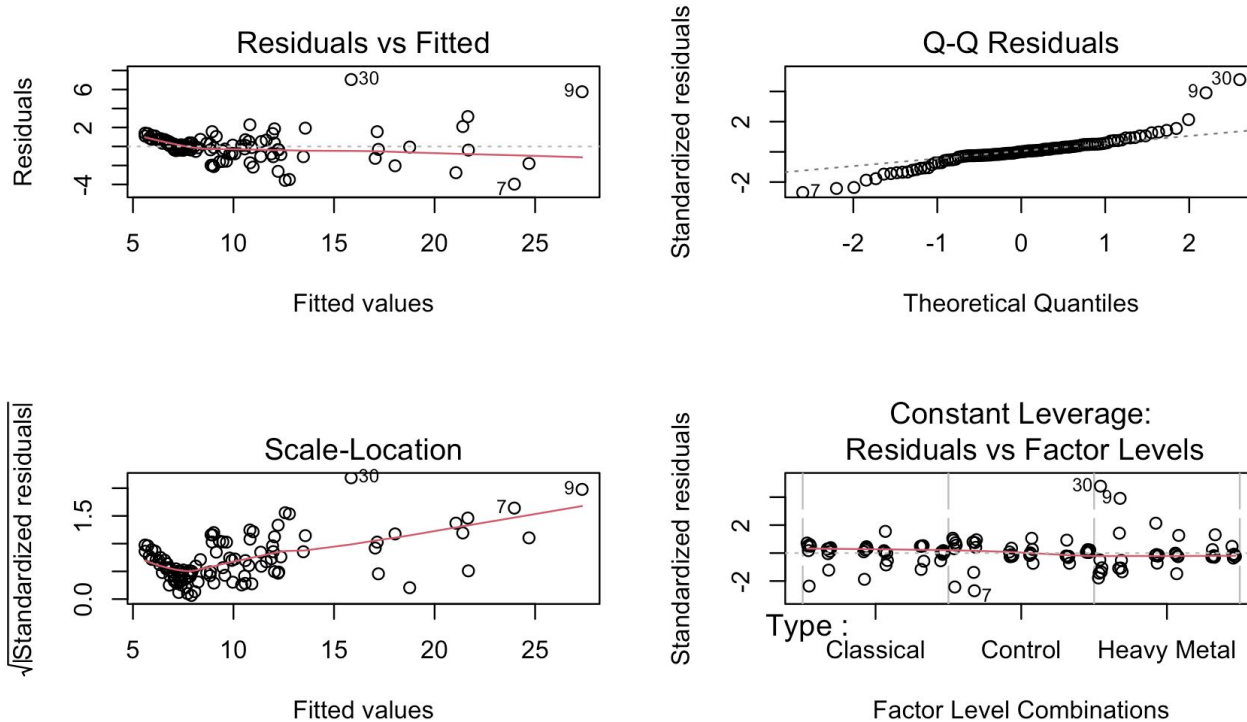
Factor	df	SS	MS	F-value	Pr(>F)
Type	2	40.8	20.41	5.571	0.00588
Sequence	2	106.9	53.46	14.591	6.01E-06
Gender	1	10.2	10.21	2.786	0.09999
Subject	32	1943.4	60.73	16.577	< 2e-16
Type:Sequence	4	45.1	11.26	3.074	0.02222
Type:Gender	2	1.4	0.7	0.192	0.82597
Residuals	64	234.5	3.66		

Tukey HSD

	diff	lwr	upr	p adj
Control - Classical	0.250000	-0.83250599	1.332506	0.8447310
Heavy Metal - Classical	1.411111	0.32860512	12.493617	0.0073750
Heavy Metal - Control	1.161111	0.07860512	2.243617	0.0327464
B-A	0.3805556	-0.7019504	1.4630615	0.6775240
C-A	-1.8944444	-2.9769504	-0.8119385	0.0002466
C-B	-2.2750000	-3.3575060	-1.1924940	0.0000119
M-F	0.6148148	-0.1210779	1.350708	0.0999948



Residual plots and model assumptions



Conclusions + Further Research Questions

- Heavy metal music significantly increased solve times compared to classical music and no music
- The order in which participants experience the different types of music has a significant impact on their performance, with Sequence C (Heavy Metal → Control → Classical) being more favorable
- The effect of music type on solving times depends on the sequence in which the music is presented and varies between males and females, particularly for Heavy Metal music
- How do other genres of music (e.g., jazz, pop, electronic) affect cognitive performance and problem-solving skills?
- What are the long-term effects of listening to different types of music on cognitive performance?

References

- Mori F, Naghsh F and Tezuka T. (2014). The Effect of Music on the Level of Mental Concentration and its Temporal Change . In Proceedings of the 6th International Conference on Computer Supported Education - Volume 1: CSEDU, ISBN 978-989-758-020-8, pages 34-42. DOI: 10.5220/0004791100340042
- Pramono H, Gunadi JW, Adhika OA, Limyati Y, Gisela H, Dewi VC. The Effect of Classical and Jazz Background-Music on Concentration and Reading Comprehension in Young Adult Women. J. Med. Health [Internet]. 2019Aug.27 [cited 2024Jun.2];2(4). Available from: <https://journal.maranatha.edu/index.php/jmh/article/view/1826>
- S. K. Tai and Y. K. Lin, "The influence of different kinds of music on brainwave signals," 2018 IEEE International Conference on Advanced Manufacturing (ICAM), Yunlin, Taiwan, 2018, pp. 223-226, doi: 10.1109/AMCON.2018.8614971.