Faculty of Cognitive Sciences and Human Development

THE EFFECT OF DIFFERENT TYPES OF MUSIC ON WORKING MEMORY PERFORMANCE AMONG UNIVERSITY STUDENTS

Izwan bin Jamani

Bachelor of Psychology (Honours)

2022

UNIVERSITI MALAYSIA SAWARAK

Grade: _____

Please tick (√)
Final Year Project Report ☑
Masters ☐
PhD ☐

DECLARATION OF ORIGINAL WORK

This declaration is made on the 4th day of July 2021.

Student's Declaration:

I Izwan bin Jamani (69912)**,** Faculty of Cognitive Sciences and Human Development hereby declare that the work entitled, "**The Effect of Different Types of Music on Working Memory Performance Among University Students"** is my original work. I have not copied from any other students' work or from any other sources except where due   reference or acknowledgement is made explicitly in the text, nor has any part been written for me by another person.

18 July 2022
_____
Date submitted

Izwan bin Jamani (69912)
_____
Name of the student (Matric No.)

Supervisor's Declaration:

I _____MOHAMAD AZHARI BIN ABU BAKAR_____**(SUPERVISOR'S NAME)**_____ hereby certifies that the work entitled, _____**(FYP TITLE)**_____ was prepared by the above named student, and was submitted to the "FACULTY" as a ***** partial/full   fulfillment for the conferment of **BACHELOR OF PSYCHOLOGY(HONOURS),** and the aforementioned work, to the best of my knowledge, is the said student's work

___(SUPERVISOR'S SIGNATURE)_____
Received for examination by: Date: __22/7/22__
___(SUPERVISOR'S NAME)____

MOHAMAD AZHARI BIN ABU BAKAR

I declare this Project/Thesis is classified as (Please tick (√)):

☐ **CONFIDENTIAL** (Contains confidential information under the Official Secret Act 1972)*****
☐ **RESTRICTED** (Contains restricted information as specified by the organisation where research was done)*****
☑ **OPEN ACCESS**

Validation of Project/Thesis

I therefore duly affirmed with free consent and willingness declared that this said Project/Thesis shall be placed officially in the PeTARY with the abide interest and rights as follows:

- This Project/Thesis is the sole legal property of Universiti Malaysia Sarawak (UNIMAS).
- The PeTARY has the lawful right to make copies for the purpose of academic and research only and not for other purpose.
- The PeTARY has the lawful right to digitise the content to for the Local Content Database.
- The PeTARY has the lawful right to make copies of the Project/Thesis for academic exchange between Higher Learning Institute.
- No dispute or any claim shall arise from the student itself neither third party on this Project/Thesis once it becomes sole property of UNIMAS.
- This Project/Thesis or any material, data and information related to it shall not be distributed, published or disclosed to any party by the student except with UNIMAS permission.

Student's signature   18 July 2022   Supervisor's signature: _____
                              (DATE)   (DATE) 22/7/22

Current Address:
No 6, Lorong Wangsa Siaga 5, Taman Wangsa Melawati, 53300, Kuala Lumpur.

Notes: ***** If the Project/Thesis is **CONFIDENTIAL** or **RESTRICTED**, please attach together as annexure a letter from the organisation with the period and reasons of confidentiality and restriction.

[The instrument was duly prepared by the PeTARY]

THE EFFECTS OF DIFFERENT TYPES OF MUSIC ON WORKING MEMORY PERFORMANCE AMONG UNIVERSITY STUDENTS

IZWAN BIN JAMANI

This project is submitted
in partial fulfilment of the requirements for a
Bachelor of Psychology with Honours

Faculty of Cognitive Sciences and Human Development
UNIVERSITI MALAYSIA SARAWAK
(2022)

The project entitled **'THE EFFECTS OF DIFFERENT TYPES OF MUSIC ON WORKING MEMORY PERFORMANCE AMONG UNIVERSITY STUDENTS'** was prepared by [**IZWAN BIN JAMANI -69912**] and submitted to the Faculty of Cognitive Sciences and Human Development in partial fulfillment of the requirements for a Bachelor of Psychology with Honours

Received for examination by:

MOHAMAD AZHARI BIN ABU BAKAR

_____

(Name of Supervisor)

Date:

Gred
A

ACKNOWLEDGEMENT

I would first and foremost like to express my earnest gratitude to my project supervisor, En Mohamad Azhari bin Abu Bakar for your putting your time and effort to guide me through consultations either online or face-to-face. I am truly grateful for the knowledge that you have passed down to me throughout the preparation of my final year project. Thank you for putting your trust in me, and for giving me time and encouragement to finish my final year project as I am one of the slowest students you have. Without your guidance and support, I would not be able to successfully complete this thesis as precise as it is today.

Next, I would like to express my appreciation to my family especially my mother. Thank you so much for always calling and checking up on me and to always tell me to take it slow on one step at a time. Without your lifelong investment in raising me, I would not be where I am today.

Other than that, I would like to express my gratitude to my research participants. Thank you so much for arranging your time out of your schedules to participate in my research experiment.

Lastly, I would like to thank my good friends, Kelly, Sobhana, Iffah, Nicole, Harmiza, Rania, and Gina for their unending support throughout my final year project. I cannot thank you all enough for always finding time to help me with my thesis and to spend time with me while cheering me up through my hard times. Because of all of you, my time in university has truly been exciting and fun. It is a one-of-a-kind-experience, and I will never forget.

Table of Contents

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

This study aimed to investigate the difference in different types of music on students' working memory performance based on total number of correct recalls and total time taken. Forty undergraduates from University Malaysia Sarawak (UNIMAS) had participated in this study. This study employed a quantitative research method through quasi experimental design. A Mann-Whitney U test and Independent Samples T-test were adopted to test the hypotheses of the study. The findings showed that there is a significance in the difference between different types of music on students' working memory performance based on both total number of correct recalls and total time taken. Findings in the study showed that the Instrumental Music group had performed better compared to the Lyrical Music group in both total number of correct recalls and total time taken. This study also discussed the implications of the findings as a reference for further future researchers.

Keywords: music, working memory performance, different types of music

ABSTRAK

Kajian ini bertujuan untuk menyiasat perbezaan jenis muzik yang berbeza terhadap prestasi ingatan kerja pelajar berdasarkan jumlah ingatan tepat dan jumlah masa yang diambil. Seramai 40 pelajar dari Universiti Malaysia Sarawak (UNIMAS) telah mengambil bahagian dalam kajian ini. Kajian ini menggunakan kaedah kajian kuantitatif melalui reka bentuk kuasi eksperimen. Ujian *Mann-Whitney U test* dan ujian *Independent Samples T-test* telah diterima pakai untuk menguji hipotesis kajian. Hasil kajian menunjukkan bahawa terdapat perbezaan antara jenis muzik yang berbeza terhadap prestasi ingatan kerja pelajar berdasarkan kedua-dua jumlah ingatan tepat dan jumlah masa yang diambil. Dapatan kajian juga menunjukkan kumpulan Muzik Instrumental menunjukkan prestasi yang lebih baik berbanding kumpulan Muzik Lirik dalam kedua-dua jumlah ingatan tepat dan jumlah masa yang diambil. Kajian ini turut membincangkan implikasi dapatan kajian sebagai rujukan kepada penyelidik seterusnya.

Kata kunci: muzik, ingatan tepat, jenis muzik yang berbeza

CHAPTER ONE

INTRODUCTION

1.0 Introduction

This chapter explains the introduction to this study, which includes the background of the study, the problem statement, research objectives, research questions, research hypotheses, conceptual framework, the significance of this study, and the definition of terms.

1.1 Background of Study

Sounds can be found all around us, from the chirping of birds, the waveform of the seas, to even the wind's blows. To many people, sounds are nothing more than what they are known for, while to others, some sounds can be arranged and put together into something more significant, something much more meaningful. These arrangements of sounds are what we call music. Music is an art concerns itself with the mix of vocal or instrumental sounds to produce a form of beauty or to express one's emotions, which is usually conducted according to cultural standards of rhythm, melody, and, in most Western music, harmony (Epperson, 2021). Compared to the past few decades, music has become much more available to the public (Lehmann and Seufert, 2017). This gives us the possibility to choose an array of endless types of music with the help of online applications and our smartphones as well as computers. Music has gained a lot of attention to be used in learning as a background music over the last decade due to the advancement in technology (Schwartz et al., 2017).

It is quite known that music has been around for as long as we all can remember. Killin (2017) claimed in his study that the oldest known musical instrument to have ever appear in the archaeological record was from 40 000 years ago. Even so, he argued that musical instruments had appeared far earlier than that. What is fascinating about this is the fact that music had been a part of our lives since thousands of years ago and possibly even further before that. According to Galindo (2003), art and music are considered as basic human functions. Zatorre and Peretz, however argued that musical activities have presented itself on earth, with its ancient roots extending all the way back to 250,000 years and possibly more. People have always found music to be significant in their lives, whether listening to is for enjoyment, the emotional responses, performing, or creating. Psychologists have even found the significance in music and how it can be used to treat others or even influence their performance to a certain degree.

There are many benefits when one listens to music. Graff-Radford (2021) suggests that people who listen to or sing songs can give themselves emotional and behavioral benefits if they are struggling with Alzheimer's disease and other types of dementia. Musical memories will often be preserved in Alzheimer's disease because key brain areas linked to musical memory are relatively undamaged by the disease.

Working memory is the small amount of information that can be held in our minds and used executing various cognitive tasks, which is in contrast with long-term memory, the vast amount of information saved in a person's life (Cowan, 2014). This concept is a commonly used term in Psychology due to it being correlated to intelligence, information processing, executive functions, comprehension, problem solving, and learning. In 1690, John Locke managed to distinguish between contemplation, or to hold an idea in our minds, and memory or the power to recall the idea after it has disappeared from the mind. This statement shows

one of the foundations to studying the working memory and how it gradually grew to be bigger research that has been improved over the years. One of the biggest studies towards working memory is the association of music with memory performance.

Much research has been done to prove that music has its effects towards memory. There are also theories like the Mozart Effect, a popular scientific theory where if someone were to listen to any of Mozart's compositions, they will find a significant increase in spatial intelligence (Jenkins, 2001). In 1993, Francis Rauscher et al. (1993) had claimed that after listening to Mozart's sonata, K448, for 10 minutes, his participants had shown significantly better spatial reasoning skills. These results however proved to be controversial as no other researchers were able to reproduce the same findings using Mozart's compositions.

Many other researchers have made studies based on music and memory, but there have been mixed results in their findings. A study by Musliu et al. (2017) showed that music had negatively affected short-term memory. A study by Schäfer et al. (2013) stated in his findings that music offers a valued companionship, helps in providing a comfortable level of activation, and also a positive mood. In a study by Yim et al. (2003), the benefits of music training on verbal memory can be demonstrated in individuals with shorter durations of music training which less than 6 years. There was also a study that found how music can have a positive effect on the adult's working memory performance. However, this study was only limited to a specific type of music, which was Vivaldi's 'Four Season" (Mammarella et al., 2007).

In a study by Kumar et al. (2016) on 200 students, it was found that 60 percent of the participants, which are 120 students admitted to listening to music while studying whereas the remaining 40 percent which counted to 80 students were not involved in such practices. In their study, they used three genres of music which were instrumental, soft, and pop music with each having varying results. It was found that higher percentage of scores would be obtained when soft music was played in the background. It was also found that those who have a habit of listening to various types of music while studying would not score well without music.

Fennel et al. (2021) in their study tried to test whether music can show similar interference to sentence processing, which is contrary to non-interference like visuospatial stimuli. They had found that musical stimuli produce similar working memory interference such as linguistic stimuli, although visuospatial stimuli did not. This finding suggested that music and language may rely on identical working memory resources that are different from visuospatial skills. In order to investigate whether musical training can improve verbal working memory or not, a comparison was done on musicians and non-musicians. They concluded that musicians were able to perform more accurately for working memory tasks, specifically for verbal and musical working memory stimuli, which supports the relationship between musicianship and greater verbal working memory capacity.

1.2 Problem Statement

The main issue when researching about the effects of music towards working memory performance is that there most past studies have varying results, even to an extent where there are no significant effects on music towards memory (Romie and Gwee, 2019; Lehmann and Seufert, 2017). The inconsistency in these many studies has led to confusion on how music is portrayed in the research community. These inconsistencies will be further explained in Chapter Two of this study, which is the Review of Literature.

One example can be taken from a study by Musliu et al. (2017), who researched the influence of music towards memory by conducting an experiment where participants must memorize a set of nonsense syllables while under the influence of music. In their study, the researchers did not mention the size of the sample in their study. This means that we cannot confirm the precision of the study as the possibility of a small sample may yield inaccurate results. In terms of methodology, it will only draw a weak and unreliable conclusion towards a study such as theirs. Musliu's study seems to have never had any other adaptations by other researchers. This means that it has yet to be replicated.

As a self-made experiment, it can be assumed that the tests in. Musliu's research was only run once, signifying that there is a low the precision in this research is far from perfect and there are no other studies out there that have replicated it since. It also means that there is much room for improvement in the study.

Therefore, my goal in this study is to investigate the effects of different types of music towards working memory performance.

1.3 Research Objectives

1. To identify the differences between different types of music on students' working memory performance based on total number of correct recalls.

2. To identify the differences between different types of music on students' working memory performance based on total time taken.
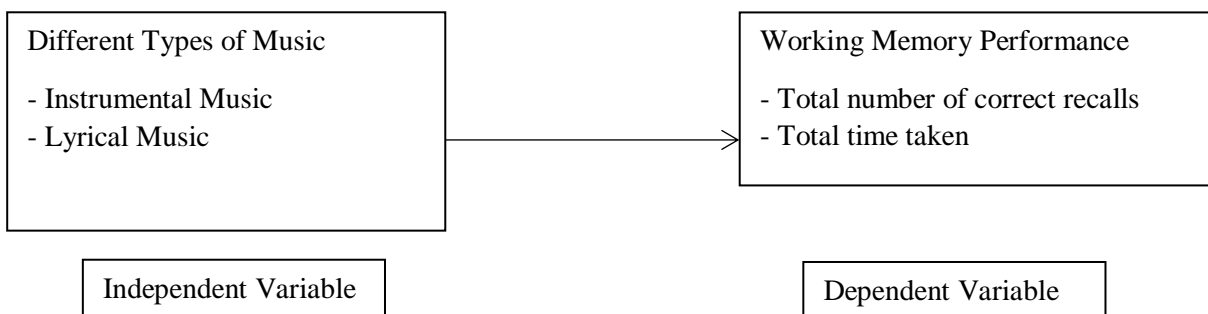
1.4 Research Questions

1. Is there any difference between different types of music on students' working memory performance based on total number of correct recalls?

2. Is there any difference between different types of music on students' working memory performance based on total time taken?

1.5 Research Hypotheses

H1. There are significant differences between different types of music on students' working memory performance based on total number of correct recalls.

H2. There are significant differences between different types of music on students' working memory performance based on total time taken.

1.6 Conceptual Framework

Different Types of Music - Instrumental Music - Lyrical Music	→	Working Memory Performance - Total number of correct recalls - Total time taken
Independent Variable		Dependent Variable

Figure 1.6 Conceptual Framework of the Study

1.7 Significance of Study

This study can prove to be significant as it can unravel the various possibilities music holds towards the human brain. Through this research, we will be able to understand the significant effects that different types of music can bring towards the human brain and how it can influence the working memory performance. This study was also done to prove to past researchers who have claimed that music can only negatively affect the working memory performance that music can also have positive effects towards the working memory performance.

1.8 Definition of Terms

1.8.1 Music

Conceptual Definition: Music is an art concerned with combining vocal or instrumental sounds for beauty of form or emotional expression, usually according to cultural standards of rhythm, melody, and, in most Western music, harmony (Epperson, 2021).

Operational Definition: Two types of music will be used for a memory recall test, which are instrumental music and lyrical music. Both music will be obtained from a website named Youtube and will be used during the experimentation period.

1.8.2 Working Memory

Conceptual Definition: Working memory is the retention of a small amount of information in a readily accessible form. It facilitates planning, comprehension, reasoning, and problem-solving (Cowan, 2014).

Operational Definition: Working memory in this study will be measured based on the total correct recalls and total time taken using the Reading Span Task by Loboda (2012). Participants will be tasked with two tasks, A and B which will be done simultaneously (dual

task). Task A focuses on retaining a series of letters in memory for later recall while task B

focuses on judging if English language sentences make sense.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter will focus on the variables of this study, which are music (independent variable) and working memory (dependent variable). This chapter will also elaborate on the theories regarding music and working memory, through past studies and correlate the relation between these two variables.

2.1 Theory of Music

According to Berz (1995), musicians who are well trained have improved recency effect for both visual and auditory when they were tasked with serial recall of notes. It was also noted that a differ between music and language was found when modality and recency effects are linked together. Another study of short-term memory in music by Pembrook (1987) where he tasked his participants to compare melodies with differing times and differing rehearsal strategies used between hearing. Results found that when too much stress is put to the storage of the short-term memory, it can cause interference and impaired performance, leading to retrieval problems (Pembrook, 1987).

Berz (1995) also proposed a new working memory model with musical information taken into account. This was done to understand how significant demands placed on working memory in activities related to music can affect the trade-off between storage and processing functions of the working memory. Pembrook (1986) states that "memory for an unfamiliar melody will not be accurate for melodies longer than 10 notes and suggests a melodic memory capacity of approximately 7-11 notes, depending on various factors." These studies laid the foundation of many other theories revolving around music and working memory.

2.2 Theory of Working Memory

According to Cowan (2014), working memory is the small amount of information that can be held in mind and used in the process of executing cognitive tasks. In psychology, this term is widely used, mainly to relate to intelligence, comprehension, problem solving, information processing, executive functions and the learning process in people ranging from infancy to old age (Cowan, 2014). The concept of working memory has been a relevant study for centuries on end due to the complex nature of memory itself.

Verbal working memory is commonly viewed as the temporary maintenance of verbal information (Schwering and MacDonald, 2020). According to Schwering and MacDonald (2020), some researchers distinguish verbal working memory as an immediate memory for processing of information from short-term memory a passive temporary store.

Working memory maintains information in an easily accessible state over brief periods of time (Eriksson et al., 2015). This feature is necessary for future goal-directed behaviour and allows us to act beyond the restrictions of the here and now. As such, working memory is taxed by numerous laboratory and everyday cognitive challenges.

Nelson Cowan (2016), in another study suggests that on the importance of parameters of information processing, researchers of human development seem to agree, mostly on topics regarding working memory, the control of attention, inhibition of prepotent schemes, and self-regulation, in the developmental maturation of cognition. Within this common framework, Cowan (2016) mentions that a special role in the cognitive development is played by working memory. Geary (2004) explains that working memory also permits characteristics of a new situation to be taken into consideration in order for an effective response be programmed up.

In this sense, working memory is key for fluid intelligence (Geary, 2004). This means that it is possible for the working memory aspect of the human mind to be trained in some way.

Alan Baddeley and his colleagues had developed the Working Memory Model in hopes to explain the behavioral findings in the memory literature (Buchsbaum, 2016). In their model, Baddeley and Hitch (1974) emphasized on rehearsal processes, which is the strategic mechanisms for the maintenance of items in memory. They had attempted to create a system that is able to simultaneously manipulate the contents inside our memory and update information for working memory in the service of task goals (Baddeley and Hitch, 1974).
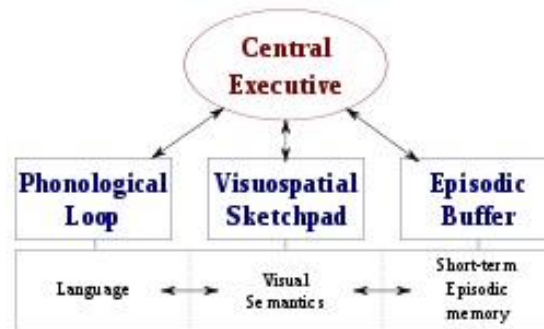
Figure 2.2: The Baddeley model of Working Memory

In this working memory model, there are three subcomponents involved which are the Phonological Loop, which is the working memory itself, the Visuospatial Sketchpad, which is the visual-spatial working memory, and the Episodic Buffer, which is the temporary storage system that modulates and integrates different sensory information. The central executive, acts as the "control center" that "oversees manipulation, recall, and processing of information (non-verbal or verbal) for meaningful functions such as decision-making, problem-solving or even manuscript writing" (Chai et al., 2018).

2.3 Effects of Music on Working Memory Performance

The results of multiple studies regarding the effect of music towards working memory performance are varied. Some find that there are no significant effects of music towards working memory (Romie and Gwee, 2019; Lehmann and Seufert, 2017), while other studies found that music affects memory both positively (Kumar et al., 2016; Ho et al., 2003) and negatively (Musliu et al., 2017; Evano, 2013).

In a study by Romie and Gwee (2019), they conducted a feasibility study to examine the effects of music towards attention and memory. They used an online software called Cambridge Neuropsychological Test Automated Battery (CANTAB) which conducts multiple cognitive tests. The tests they used to observe the variables were Paired Associates Learning (PAL) and Rapid Visual Information Processing (RVP) to observe the effects of music on memory and attention respectively. Based on their findings, it was found that there were no significant effects of both self-selected music and alpha brainwave music on attention and memory performance.

In the study by Lehmann and Seufert (2017), they investigated how background music influences learning with respect to three different theoretical approaches. In order to measure learning outcomes, they tested recall and comprehension. From the results of their study, they did not find a correlation between background music and arousal or mood on learning outcomes. In addition to it, there were no main effects of background music or working memory capacity, nor an interaction effect of these factors for recall performance. They concluded that background music did not affect arousal or mood of participants in their study.