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Faculty of Cognitive Sciences and Human Development

A COMPARISON OF SLEEPING PATTERNS WITH BRAINWAVES OF MUSIC PREFERENCE BASED ON GENDER AMONG UNDERGRADUATE STUDENTS IN UNIVERSITI MALAYSIA SARAWAK (UNIMAS)

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A COMPARISON OF SLEEPING PATTERNS WITH BRAINWAVES OF MUSIC PREFERENCE BASED ON GENDER AMONG UNDERGRADUATE STUDENTS IN UNIVERSITI MALAYSIA SARAWAK (UNIMAS)

ISABEL A/P PARAMASIVAM

This project is submitted on partial fulfillment of the requirements for a
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The project entitled 'A Comparison of Sleeping Patterns with Brainwaves of Music Preference based on Gender among Undergraduate students in Universiti Malaysia Sarawak (UNIMAS) was prepared by Isabel A/P Paramasivam and submitted to the Faculty of Cognitive Sciences and Human Development in partial fulfillment of the requirements for a Bachelor of Science with Honours (Cognitive Science).

Received for examination by:

(A.P. DR NORSIAH BINTI FAUZAN)

Date:

Grade

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ABSTRACT

The brainwaves pattern of male and female vary to a certain extend especially in terms of musical preferences and sleeping patterns. This research aims to compare the sleeping patterns between male and female respondents from both musical and non-musical background in relation to the brainwave patterns based on their musical preferences using quantitative electroencephalogram (qEEG). EEG brain signals were captured from 4 male and 4 female respondents of Universiti Malaysia Sarawak (UNIMAS) based on the music listening tasks administered. The data collected were then filtered and later classified into four frequency bands. It was observed that, in average Delta wave is the highest brainwave present at the frontal cortex in all respondents during the music listening tasks. On the other hand, comparing frequency bands to that of gender, female undergraduates had higher Beta wave as compared to males. Moreover, the most prominent sleeping pattern was identified among the 8 respondents as well. This research highlights that most undergraduates in UNIMAS are of *Evening Type* sleeping pattern with music preferences towards *Upbeat and Conventional* factor (e.g. country, gospel, oldies, pop, religious and soundtracks).

Keywords: qEEG, musical and non-musical background, sleeping patterns, musical preferences, gender.

ABSTRAK

Corak gelombang otak di antara lelaki dan wanita adalah berbeza kepada sesetengah peringkat khususnya dalam persoalan kegemaran muzikal dan corak tidur. Penyelidikan ini bertujuan untuk membandingkan corak tidur di antara responden-responden lelaki dan wanita dari kedua-dua latar belakang sama ada muzikal atau bukan muzikal berkaitan dengan corak gelombang otak berdasarkan kegemaran muzikal menggunakan elektroensefalogram kuantitatif (qEEG). Isyarat-isyarat otak EEG telah diperoleh dari empat orang responden lelaki dan empat orang responden wanita daripada Universiti Malaysia Sarawak (UNIMAS) berdasarkan tugasan mendengar lagu yang telah diberikan. Semua data dikumpul, ditapis dan kemudian digolongkan kepada empat jalur frekuensi. Telah diperhatikan bahawa, dalam purata gelombang Delta adalah paling tinggi yang hadir pada korteks hadapan dalam semua responden-responden semasa tugasan mendengar lagu dijalankan. Sebaliknya, membandingkan jalur frekuensi dengan jantina, responden-responden wanita mempunyai gelombang Beta yang lebih tinggi jika dibandingkan dengan responden-responden lelaki. Tambahan pula, corak tidur yang paling ketara telah dikenal pasti dalam kalangan lapan responden tersebut. Penyelidikan ini menonjolkan bahawa kebanyakan mahasiswa di UNIMAS mempunyai corak tidur '*Evening Type'* dengan kegemaran muzik berarahkan faktor '*Upbeat and Conventional* (e.g. country, gospel, oldies, pop, religious and soundtracks)'.

Kata Kunci: qEEG, latar belakang muzikal dan bukan muzikal, corak tidur, kegemaran muzikal, jantina.

CHAPTER ONE

INTRODUCTION

Music is known as a universal cross-cultural language, found in every human culture in this world. The common use of music in current society is purely for pleasure and enjoyment, another use is the music's ability itself in inducing physical movement and dance. Moreover, most individuals particularly adolescents use music for mood regulation, reducing loneliness and as a means of defining social identity by listening to music that peers listen to in order to mold personal musical tastes and preferences (Langmeyer, Guglor-Rudan, and Tarnai, 2012).

From the perspective of Neuroscience, listening to music is one of the most complex things a person can do. Many parts of the brain have to work together in order to comprehend even the simplest tune. Music is one of the few activities that involve the use of the whole brain. It is intrinsic to all cultures and has surprising benefits not only for learning language, improving memory and focusing attention, but also for physical coordination and development. However, not all types of music have favorable effects. Music can be distracting if it's too loud or too jarring, or if it competes to get the person's attention (Harmat, Takacs and Bodizs, 2008).

Music is sometimes given a quick classification as a 'right-brained' activity in which the act of processing music is centered on the right hemisphere of the brain. Brain imaging studies have shown that 'happy' music caused the production of the chemical dopamine that had stimulated the reward centers of the brain, which is the same chemical released when eating great food. Some of the higher brain functions can be enhanced by the power of music such as reading and literacy skills, spatial-temporal reasoning, mathematical abilities and emotional abilities. A person can learn well just by listening to music or playing an instrument.

Each individual demonstrates different preferences towards music. Certain music is able to eliminate fatigue symptoms caused by monotonous work in order to uplift the mood and provide extra energy. However, listening to too much of pop and hard music can make a person more jittery than energized. Thus, it is vital to find out the suitable and most preferable type of music to listen to.

The most relaxing music to listen to would be classical music that has been known some time to beat people who are suffering from insomnia. Listening to relaxing music especially before bedtime can make a restful night by reducing sympathetic nervous system activity, decreases anxiety, blood pressure, heart and respiratory rate which produces positive impact on sleep through muscle relaxation (McCraty, Barrios-Choplin, Atkinson and Tomasino, 1998).

Differentiating music genre can sometimes be difficult as certain music can have the possible mixture of more than one genre resulting in a very large list. However, all of these music genres which consist of 13 musical style such as Classical music, Rock music, Blues, Jazz, Electronic, Folk, Country, R&B, Hip hop, Ska & Reggae, Latino music, World Music and New Age have been categorized into *Mellow/relaxing, Urban/danceable, Sophisticated/aesthetic, Intense/aggressive* and *Campestral/sincere* based on the 5 factor MUSIC model created by (Rentfrow, Goldberg, and Levitin, 2011).

Background of Study

The purpose of this study is to compare the brainwave pattern of subjects from musical and non-musical background based on gender. The intention is to gather details to compare the different brainwave pattern between male and female respondents and to discover the ultimate music preference that is suitable for most undergraduates. Besides that, this research aims to find out the prominent sleeping pattern as well.

Problem Statement

Most previous researches have been carried out investigating the different types of music and in the field of sleep quality respectively. These researches were carried out before bedtime and the tasks involved listening to 45 minute length of music. Hence, once the most preferred music style has been identified, the answer to the problem will be much clearer to see if there exist a relationship between students sleep pattern and music preference.

Research Questions

1) What is the difference between brainwave pattern of subjects from musical and non-musical background based on gender?
2) What is the ultimate music preference that is suitable for most undergraduate students to listen to?
3) What is the prominent sleeping pattern for the majority of undergraduates?

Objective of Study

Main Objective

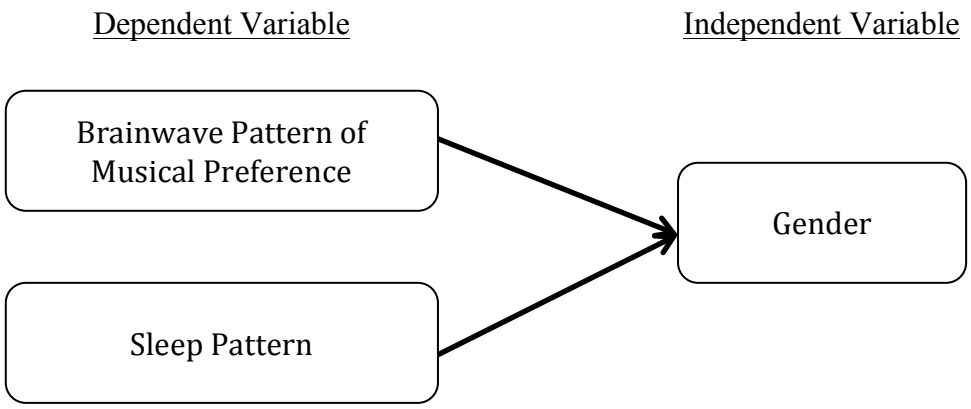
The goal of this study is to compare the brainwave pattern of subjects from musical and non-musical background based on gender.

Specific Objective

I. To discover the ultimate music preference that is suitable for most undergraduate students.

II. To find out the prominent sleeping pattern for most undergraduate students.

Theoretical / Conceptual Framework



Definition of Terms

Musical Preference

It is the structure of a musical composition. According to the Encyclopedia of Britannica, the term is regularly used in two senses: to denote a standard type or genre and to denote the procedures in a specific work.

Sleep pattern

It is the habitual pattern in sleep, 8 hours straight, 24-hour period or daytime nap (Psychology Dictionary.org).

Contribution of Study

To provide findings by doing a research to discover the ultimate music preference and the most prominent sleeping pattern by comparing the brainwave pattern of subject from musical and non-musical background between male and female respondents.

Limitation of Study

1) The analyses in this research are not controlled by age.

2) The personality traits of the respondents are not taken into consideration.

3) This research was carried out within the population of undergraduates in UNIMAS.

CHAPTER TWO

LITERATURE REVIEW

A brief literature review was carried out on the topic **on the comparison of sleeping patterns with brainwaves of music preference based on gender.**

The first investigation of individual differences in music preferences was conducted by Cattell and Anderson (1953). The study aimed to develop a method for assessing dimensions of unconscious personality traits. Cattell and his colleagues developed a music-preference test consisting of 120 classical and jazz music excerpts, to which respondents reported their degree of liking for each of the excerpts (Cattell & Anderson, 1953; Cattell& Saunders, 1954). These investigators attempted to interpret 12 factors, which they explained in terms of unconscious personality traits. For example, musical excerpts with fast tempos defined one factor, labeled surgency, and excerpts characterized by melancholy and slow tempos defined another factor, labeled sensitivity. Cattell's music-preference measure never gained interest, but his results were among the first to suggest a latent structure to music preferences.

It was not until some 50 years later that research on individual differences in music preferences resurfaced. However, Cattell and his colleagues assumed that music preferences reflected unconscious motives, urges, and desires. The contemporary view is that music preferences are manifestations of explicit psychological traits, possibly in interaction with specific situational experiences, needs, or constraints (Cattell & Anderson, 1953; Cattell & Saunders, 1954). More specifically, current research on music preferences draws from interactionism theories (e.g., Buss, 1987; Swann, Rentfrow, & Guinn, 2002) by hypothesizing that people seek musical environments that reinforce and reflect their personalities, attitudes, and emotions.

However, not all studies of music-preference structure have obtained similar findings. For example, George, Stickle, Rachid and Wopnford (2007) studied individual differences in preferences for 30 music genres in sample of Canadian adults. Their analyses revealed nine music-preference factors, labeled *rebellious* (grunge, heavy metal, punk, alternative, classic rock), *classical* (piano choral, classical instrumental, opera/ballet, Disney/Broadway), *rhythmic & intense* (hip-hop & rap, pop, R&B, reggae), *easy listening* (country, 20th century popular, soft rock, disco folk/ethnic, swing), *fringe* (new age, electronic, ambient, techno), *contemporary Christian* (soft contemporary Christian, hard contemporary Christian), *jazz & blues* (blues, jazz) and *traditional Christian* (hymns & southern gospel, gospel).

Even though the results are not identical, there does appear to be a considerable degree of convergence across these studies. Indeed, in every sample, three factors emerged that were very similar: One factor was defined mainly by classical and jazz music, another factor was defined largely by rock and heavy metal music, and the third factor was defined by rap and hip-hop music. There was also a factor comprising mainly country music that emerged in all the samples in which singer–songwriter or storytelling music was included (i.e., six of seven samples). In half the studies, there was a factor composed mostly of new age and electronic styles of music. Thus, there appear to be at least four or perhaps five robust music preference factors.

However, early research measured music preferences by using audio stimuli (e.g. IPAT Music Preference Test; Cattell & Anderson, 1953). In recent research, measuring music preferences by using rated music genres has become a common method used. Each individual might have a different understanding of these genres. Individual's ratings of genres may be biased given that genres causes stereotypes that are associated with traits (Rentfrow, Goldberg, & Levitin, 2011). In a study carried out by Rentfrow et al., (2011) in which

individuals demonstrate manifestly different preferences in music, and yet relatively little is known about the underlying structure of those preferences.

Using this approach in three independent studies, Rentfrow and colleagues (2011) found five underlying factors in music preferences such as Mellow/*relaxing*, Urban/*danceable*, Sophisticated/*aesthetic*, Intense/*aggressive* and Campestral/*sincere* which makes up the abbreviation as MUSIC model. However, all of these music genres such as Classical music, Rock music, Blues, Jazz, Electronic, Folk, Country, R&B, Hip hop, Reggae, Latino music, World Music and New Age have been categorized based on the MUSIC model (Rentfrow et al., 2011). It is through this study that the MUSIC model was created to measure the music preferences among individuals from then onwards.

This research concluded on suggestions how colleges and university officials can alter procedures to minimize students' sleep disturbances and reduce the deleterious effects of sleep problems on academic performance. However, the limitation of this study is the singular geographic location of the university in the rural southern may lead to difficulties in generalizing the results to other regions.

Two studies on sleep quality, sleep habits and classroom performance in middle school students both found that feeling rested and ease of getting started in the morning were associated with school motivation, performance, and student self image. On the other hand, variables more reflective of sleep habits (such as time in bed or sleep latency) were not associated with these school factors (Meijer, 2000).

In another study of European adolescents, Hofman and Steenhof (1997) surveyed about 600 Dutch high school students. The survey queried sleep habits, sleep quality, and school performance, and the following sleep variables were derived: weekday bedtime, rise time, weekend bedtime, rise time, sleep lag (difference) between weekday and weekend bedtimes and rise times), time of peak alertness, sleep quality, and total time in bed. It is

unclear how school performance was operationalized in this report. Using a multiple regression analysis, these investigators found an association of better school performance with more time in bed, better sleep quality and a shorted sleep lag. They pointed out that better school performance was also related to reduce reported drug use (e.g. alcohol, caffeine, nicotine).

A study conducted by (Jesperson, 2012) highlights the effect of relaxation music listening on sleep quality in traumatized refugees. Traumatized refugees often suffer from severe sleep problems, with serious consequences in physiological and psychological areas of functioning. Recent research suggests that music may be a viable intervention to improve sleep quality. This study used a two-group pretest/posttest design with repeated measures taken for sleep quality. Dependent variables included sleep quality measured by the Pittsburgh Sleep Quality Index, trauma symptoms as measured by the PTSD-8 and well-being measured by the "How Do You Feel?" questionnaire designed specifically for refugees. Fifteen traumatized refugees with sleep problems participated in the study. The intervention group received the music listening condition (relaxing music played at night through a music player nested in an ergonomic pillow); the control group received only the ergonomic pillow (Jesperson, 2012).

Statistical comparisons showed a significant improvement of sleep quality in the music group, but not in the control group. A significant increase in well-being was found only in the intervention group, but there were no changes in trauma symptoms in either of the groups. Hence, these results support the use of relaxation music listening at bedtime to improve sleep quality in traumatized refugees.

Recent studies show that relaxing classical music is an effective intervention to reduce sleep problems. The question arises, if such an intervention might have side effects on people who are not faced with sleep difficulties at first instance. A study by Koeniga, Jarczokc,

Wartha, Harmatb, Hessea, Jespersend, Thayere and Hilleckea (2013) investigates the effects of a music listening intervention on sleep quality in young participants with normal sleep. They hypothesized that listening to relaxing classical music has an effect (either positive or negative) on the sleep quality of normal sleepers. To test this hypothesis they conducted a randomized control trial (RCT).

Together with previous findings, this research concluded that no adverse or side effects accompany the previously reported benefits of this music listening intervention. Further studies are needed to investigate the impact of music characteristics, musical preferences of participants and possible side effects of the intervention in different populations.

Overview of Present Research

Past researches on differences in music preferences focuses mainly on genres but genres are limited in several ways. Hence, a more reliable assessment of music preferences was created based on the five factor of MUSIC Model (Rentfrow et al., 2011). Clearly, student sleep habits and patterns and their effect on student adjustment, academic performance and health are underrepresented in the literature. Such studies have consistently demonstrated that large proportions of students suffer from some form of sleep difficulties, yet the full impact of these sleep difficulties is currently unknown (Buboltz et al., 2001). Thus, the goal of this research is to broaden the understanding on whether different music styles have an impact on the sleep patterns among undergraduate students.

CHAPTER THREE

METHOD

Research Design

A quantitative method was used to compare the brainwave pattern of music preference and the sleeping pattern between male and females. Quantitative electroencephalograph (qEEG) was used to record the brainwaves of the subjects for the research while listening to the music and tasks given by the researcher.

Selection of Subjects

In this study, 8 respondents of undergraduates were chosen between 22 to 24 years of age with a mix of gender and races. 4 male and 4 female respondents of which 2 of them have musical training background and the other 2 have no musical training background respectively for each gender were chosen to participate voluntarily in this research. These respondents were chosen from the Faculty of Cognitive Sciences & Human Development of University Malaysia Sarawak.

Material or Instruments Used

Short Test on Music Preference (STOMP)

This instrument is the first comprehensive measure of music preferences that consist of a 23-item measure based on a Likert-scale ranging from one to seven; 1 indicated *strongly dislike*, 4 indicated *neither like* nor *dislike*, and 7 indicated *strongly like* which consist of questionnaire to determine the respondent's preferred music style. After completing the questionnaire, the participants had to rate the following four sound clips including several short excerpts of pieces of music using the same type of response scale. The four sound files

were composed as suggested by Rentfrow (2003) and therefore reflect the four dimensions of the STOMP:

– *Reflective & Complex:* "Ride" (Nick Drake), "Fantasy and Fugue in C minor, BWV906" (composed by Johann Sebastian Bach, performed by Glenn Gould), "Stella by Starlight" (Herbie Hancock), "40 Days and 40 Nights" (Muddy Waters), "Time Out" (Dave Brubeck Quartet).

– *Intense & Rebellious:* "Bullet with Butterfly Wings" (Smashing Pumpkins) "Voodoo Child" (Jimi Hendrix), "Fight Song" (Marilyn Manson), "Angel of Death" (Slayer), "Money" (Pink Floyd), "Verse Chorus Verse" (Nirvana).

– *Upbeat & Conventional:* "Tell me that I'm Dreaming" (Backstreet Boys), "Come, Now is the Time to Worship" (WOW Worship), "Ready to Run" (Dixie Chicks), "I'm a Slave (4 U)" (Britney Spears).

– *Energetic & Rhythmic:* "It Takes Two" (Rob Base and DJ EZ Rock), "In-Flux" (DJ Shadow), "The Next Episode" (Dr. Dre featuring Nate Dogg and Snoop Dogg), "PickUp the Pieces" (Average White Band), "Roll it Up" (Crystal Method), "Everything is Everything" (Lauryn Hill).

How Music Dimensions differ in terms of general attributes?

1) *Reflective & Complex:* slower in tempo than other dimensions, use mostly acoustic instruments and very little singing.
2) *Intense & Rebellious:* faster in tempo, use mostly electrical instruments and have moderate amount of singing.
3) *Upbeat & Conventional:* moderate in tempo, use both acoustic and electrical instruments and have moderate amount of singing.
4) *Energetic & Rhythmic:* moderate in tempo, use electrical instruments and have moderate amount of singing.

Electroencephalography (EEG) Data Acquisitions

This research was performed at the Counseling Laboratory, Ground floor, Faculty of Cognitive Sciences and Human Development, Universiti Malaysia Sarawak (UNIMAS). The electroencephalography (EEG) consists of 19 electrode channels with conductive gel connected to the electrode scalp that is attached to the EEG machine, which transmits the brain signals to a computer as shown in *Figure 1*. The electrode channels are placed on the respondents scalp using the '10/20 International System' guideline. The impedance checker (shown in *Figure 2*) ensures proper connections exist between the electrodes and the scalp with the impedance of all electrodes maintained below 5 kΩ before the procedure begins. The figure below illustrates the EEG data acquisition procedure.

Figure 1. The EEG system.

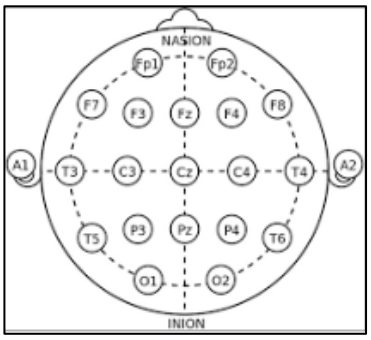


Figure 2. The impedance checker (left).

Sleep Habit Questionnaire

Sleep Habit Questionnaire is an 86-item that measures a person's pattern of sleep. This questionnaire measures a person's sleeping pattern and classifies it into one of the three main categories that are *Morning Type*, *Neither Type* or *Evening Type*. This questionnaire also consists of one week long sleep log that records the time a person went to bed, fell asleep and woke up. Through this instrument, data collected on demographic and behavioral information including sleep schedule regularity, daytime sleepiness and usual sleeping habits of a person could help to identify a person's sleeping pattern.

The scores from the questionnaire were added together and the sum was converted into a five point Morningness-Eveningness scale :

Types of Sleeping Pattern	**Score**
1) Definitely Morning Type	70 – 86
2) Moderately Morning Type	59 – 69
3) Neither Type	42 – 58
4) Moderately Evening Type	31 – 41
5) Definitely Evening Type	16 – 30

Research Design Procedure

The design procedure was divided into four section that includes Section A: Demographic Information, Section B: Short Test on Music Preferences (STOMP), Section C: qualitative electroencephalography (qEEG) and Section D: Sleep Habit Questionnaire.

Firstly, the Short Test on Music Preferences (STOMP) was used as a pre-test questionnaire on the respondents. Next, the EEG is setup on the respondents. The EEG instrument was used to measure the brainwave pattern or activity of the respondents and its