MUSIC AND ITS EFFECT ON TYPING SPEED FOR CLERICAL WORKERS DURING POSTPRANDIAL SOMNOLENCE

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ABSTRACT

This research aims to examine the hypothetical assumption that music and its stimulative effect may increase typing speed for postprandial clerical workers. Past studies in postprandial somnolence generally focused on factors such as effects of food intake or biological clock on postprandial somnolence. However, there is a lack of research on the effect of music on typing speed for postprandial clerical workers. This study employed 50 clerical workers in two groups of twenty-five. They were exposed to three different environments; no music, slow music and fast music. The results and their answers in the questionnaire were recorded. 28 participants out of the 50 were then selected for further research as they displayed significant expression of postprandial sleepiness. The study also covered the possible disparity of effects on music exposure with or without headphones. Group 1 was exposed to music with the use of headphones whereas Group 2 was exposed to music without the use of headphones. Typing efficiency in the span of 120 seconds and questionnaire data were gathered and analysed with the use of SPANOVA, repeated measured ANOVA and Likert scale. The resulting outcome showed substantial influence of music, regardless of fast or slow paced, on the typing efficiency of the participants. Fast music induced more accuracy in the participants, however it is also of note that the participants who were exposed to fast music with the use of headphones scored better than the participants who were exposed to the same music without the use of headphones. An interesting observation remains, that participants who were exposed to slow music however, were able to type more words. This study proves that music helps to stimulate better performance and efficiency for postprandial clerical workers.

ABSTRAK

Kajian ini menguji hipotesis di mana muzik membawa kesan pada masa menaip semasa subjek dalam keadaan ‘postprandial somnolence.’ Sorotan literature menyumbangkan kajian lepas yang fokus terhadap pemakanan dan masa tidur dalam bidang ‘postprandial somnolence.’ Akan tetapi, terdapat kekurangan kajian terhadap potensi muzik dalam mempercepatkan kerja menaip di antara yang bekerja sebagai kerani. Kajian ini memberi tumpuan dalam perbezaan pendengaran muzik dengan dan tanpa headphones. Kajian dalam bidang psikologi dan muzik menunjukkan keadaan positif di mana muzik dapat memberi kesan yang baik dari segi psikologi, psikofizikal, terapi dan juga kesan ergogenic dalam golongan atlit. Kajian ini menguji 50 kerani (25 dalam kumpulan 1 dan 25 dalam kumpulan 2). Kajian ini juga mengambil kira satu kumpulan subjek dalam keadaan postprandial somnolence. Subjek kumpulan 1 mendengar muzik dengan headphones dan kumpulan 2 tidak menggunakan headphones. Markah menaip diambil kira dalam 120 saat. Data dianalisis dengan menggunakan SPANOVA, repeatd measured ANOVA dan likert scale. Keputusan menunjukkan pengaruh muzik yang hebat, tidak kira music yang cepat atau lambat. Perserta yang dipengaruhi oleh music cepat adalah lebih tepat, tetapi perserta yang memakai fon kepala mendapati markah yang lebih tinggi daripada peserta yang tidak memakai fon kepala dalam jenis music yang sama. Pemerhatian yang menarik menunjukkan perserta yang dipengaruhi oleh music lambat dapat menaip lebih banyak perkataan. Ujian ini membuktikan muzik boleh membantu dan meningkatkan performasi pekerja-pekerja pejabat yang selepas makan.

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CHAPTER 1 INTRODUCTION

1.1 Introduction

The purpose of this research is to investigate and examine the effect of music on task performance among clerical workers. This study focuses on their typing speed in the condition of postprandial somnolence. This chapter will first define the state of postprandial somnolence, and then discuss the psychological effect of music, justification of research, problem statement, research objectives and research questions, limitation and organisation of study.

1.2 Background of Study

Postprandial somnolence, commonly known as postprandial sleepiness, is a condition of people experiencing drowsiness after their meal. This is due to the influence of digestive system on body functions during the day. In this condition, the above phenomenon was known as postprandial somnolence (p.116, as cited in Gu, 2011).

After a meal, the blood is redistributed from all organs to the digestive systems and this causes lacking of blood distribution to the brain, which leads to postprandial sleepiness. As endocrine hormones, melatonin and orexin are produced, the sleep centre is activated. Doing a task that requires mental activity results in constriction of the superior mesenteric artery instead of celiac artery. In addition, mental activity does not affect the postprandial blood flow in the internal organs. Stimulated by the vasoactive factors which are released from peripheral organs, the splanchnic blood flow passes by the neuronal system (Johnson, Ghishan, Kaunitz, Merchant, Said and Wood, 2012).

In general, postprandial somnolence refers to the post-meal slump that further leads to drowsiness. Researchers found an approach to resolve the problem. An officer who experienced sleepiness after lunch was exposed to birdsongs and other natural sounds to resist postprandial somnolence. This was an experiment executed at a primary school in Liverpool by the sonic branding company Condiment Junkie, Glyndwr University and Architects Nightingale Associates. They came out with a conclusion that birdsong was a random model of stimulant because it had no repeating rhythm or specific pattern. Birdsongs neither annoy nor calm people to sleep, as described by Russell Jones from Condiment Junkie (Winterman, 2013).

Modern office work is highly dependent on computers, and the monotonous task of word processing requires concentration. Typing on a keyboard can cause stress and mental fatigue (Jiang & Sengupta, 2011) hence, music has been employed to reduce office worker stress, maintain motivation and improve work efficiency for word processing tasks. Previous research has investigated the effects of background music on typing skill (Bramwell-Dicks, Petrie, & Edwards, 2016), typing accuracy (Borella, Carretti, Grassi, Nucci, & Sciore, 2014), distraction and concentration during typing (Bade, Bade, Hoerres, & Kremsreiter, 2012), typing force on the keyboard (Jiang & Sengupta, 2011), memory performance (Chie & Karthigeyan, 2009) and tension and alertness during typing (van der Zwaag, Westerink, & van den Broek, 2011).

Music is a common way to improve people's moods in daily life. However, people have different emotional pattern (Juslin & Laukka, 2004; Sloboda & O' Neill, 2001). Adjusting moods is a basic necessity in daily life and music listening plays a powerful role in this behaviour (Van Goethem & Sloboda, 2011).

Past studies have shown that human psychology can be affected by music. As a stimulant, music is able to calm people, or even make people recall their memories of past events. Similarly, it is also able to relieve strong emotions and serve as an emotion-healing therapy (DeNora, 2000; Juslin &Laukka, 2004).

The word “music” has been listed in the Oxford English Dictionary (OED) since the 13th century, proving that there has been a long history in the evolution of music. According to the third edition of International Dictionary, music can be divided into two models - instrumental and vocal music. Gradually, music has evolved into many genres such as jazz, rock, pop, classical music, traditional folk music, instrumental and soundtrack. The structure of music consists of various musical elements, including tune, rhythm, harmony, dynamic, speed and tonalities. There is a popular definition that describes music as a fine art that possesses organic sound movement but is incomplete in its meaning (Gao, 2007). Music is not only an aural art; it is also highly related with visual, tactile and sensory perception. Likewise, human’s reactions to music are expressed through these channels.

This study belongs to music psychology. As proposed by Wallaschek (1893), music psychology is an interdisciplinary subject that combines psychology, philosophy, neurology and musicology. Wallaschek explored music psychology from 1890 to 1895 during his studies in the British Museum in London. This shows the British contribution to music psychology even though Germany was considered as the main contributor of music psychology in the 19th century (Bujić, 1988). Later, neurology was discovered in England. British neurologists William Gower (1845-1915) and John Hughlings Jackson (1835-1911) studied the effect of music on brain damage (Graziano & Johnson, 2006).

1.2.1 Psychological Effect of Music on Behaviours

Music has both positive and negative influences. It is able to divert attention from medical pain, but it can distract attention in completing a task as well (Darrow, Johnson, Agnew, Fuller, Uchisaka 2006). Moreover, listeners' sensitivity to music is based on their culture and its tonality. The sensitivity is related to psychophysical variables and reflected in music tempo, rhythmic complexity, melodic complexity, pitch range and instrument timbre. Psychophysics is able to assist listeners in releasing their emotions when they listen to unfamiliar tonal music (Balkwill & Thompson, 1999).

Music is able to make people enjoy their life (Konechi, 1982). The extent of different music affects people's psychological states depending on the condition of listener, the music and the process of music listening (Morth & Hargreaves, 1997).

Music brings certain influence to people with special needs, such as people with congenital amusia. From an experiment that observed congenital amusics whose everyday lives were incorporated with music, it was revealed that music was able to make them achieve certain psychological states. This showed that music plays an important role in psychology. On the other hand, the same experiment also reported that listeners felt more negatively about imposed music.

Nevertheless, there was a developmental dissociation between music perception and music appreciation among the congenital amusics (Mcdonald & Stewart, 2008). Some congenital amusics were not able to recognise familiar tunes or to explain the difference between two tunes due to perceptual agnosia (Peretz, Champod & Hyde, 2003). Many studies have recorded the impaired music perception and its components in congenital amusia (Hyde & Peretz, 2004). Music has various stimulants towards the listeners. In spite of the inability to recognise pitches, there would be a vital intermediating effect during music listening, so the congenital amusics may still acquire expectancies on other musical senses, such as timbre or rhythm (Houron, 2006).

1.2.2 The Development of Psychophysics and Its Application

The psychophysical effects of music are reflected on two main aspects, which are psychological perspective and physical feeling. Examples of physical feeling are blood pressure and heart rate.

Psychophysics is a subject that falls between Psychology and Physics. It explores the connection between the outside world and the inner feelings of the body. Started 165 years ago, Psychophysics was first explored in the early 1800s by Ernst Heinrich Weber, who was a professor of anatomy and physiology (Boring, 1950). Psychophysics has been widely used for many purposes, such as improving decibel scale, affecting temperature and adjusting brightness (Stevens, 1956). The Borg Rating is used in psychophysics to measure a person's perceived exertion. In fact, the first application of Psychophysics happened in the United States Air Force. A student loaded ammunition cases into F-86H aircraft he operated during the maintenance activities. The concepts of Psychophysics discussed in the application did not have repetition rate, training or adaptability (Emanuel, Chaffee & Wing, 1956; Switzer, 1962).

1.2.3 Application of Music Effect on Ergogenic

Music helps enhance ergogenic performance, work efficiency and power (Edworthy & Waring, 2006). Ash (1913) stated that the production of energy is not only derived from the society, but also from individual's mental and physical strength. Besides, the environment is a crucial factor that generates diverse energy. Psychology theories show that some people are able to resist sleepiness with energy. According to the observations of French and British psychologists, it was discovered that stored human energy was only used at work due to its intrinsic characteristics. On the contrary, another way to produce energy was one derived from the nerve centre for the functioning of organs. Additionally, the capacity of children's energy is determined by their sustainability in an activity. Unlike the children's, the capacity of adults' energy is dependent on two traits – either attractive or boring (Ash, 1913). The following part explains the effects of music on Psychology, Psychophysics and ergogenic, which are highly related to sports activities and exercises.

1.2.4 Psychological Effect of Music on Sports

Listening to music has become a strategy that appears in the studies of sport psychology research (Gluch, 1993). Furthermore, music is able to drive impact on emotions (Gabrielsson & Lindström, 2001). Music can be a method to control the athletes' moods before they enter a competition (Saarikallio & Erkkilä, 2007). Before the competition, tennis players are given a period of 90 seconds for an introspection that could help them relieve stress (Baumeister, 1984). In addition, synchronous music makes athletes perform better when they keep their pace according to the music tempo, thus creating a positive ergogenic effect. Fast upbeat music is able to produce a motivating effect (Terry & Karageorghis, 2006). Similar studies also revealed that listening to music is able to bring a positive influence on improving their moods and to keep them motivated until the exercises end (Scherer, 2004; Thayer, Newman & McClain, 1994).

Although it was not allowed to play music in some major sports events, such as the Wimbledon Championships, it has been found by Karageorghis, Drew and Terry (1996) that athletes who did grip strength exercises performed better when they listened to stimulating music (tempo of 134 beats per minute). Moreover, music was also helpful in improving athlete's psychology for better moods (Crust & Clough, 2006).

1.2.5 Psychophysical Effect of Music and Ergogenic on Sport

Psychophysical performance is closely linked with the capacity of music. For example, suitable music tempo is good at maintaining heart rates during treadmill walking (Karageorghis, Jones & Low, 2006). Meanwhile, the same piece of music played in both fast and slow tempo has shown that music in fast tempo reduces neural responses to visual stimuli (Amezcua, Guevara & Ramos, 2005).

Karageorghis et al (1999) pointed that the psychophysical exertion is affected by music. The four controlling elements, which are rhythm reaction, musicality, cultural influence and association, form a framework of music inspiration. The most important factor is rhythm response; on the other hand, association is the least important one. As Karageorghis et al (2006) put forward, the features of motivational music are fast tempo (> 120 bpm), strong rhythm and ability to boost the listener's spirit.

Synchronous music is able to make athletes perform better when they exercise according to the music tempo, which leads to a positive ergogenic effect. Fast upbeat music generates a stimulating effect on the athletes; on the contrary, slow soft music calms people (Terry & Karageorghis, 2006).

Synchronous music, asynchronous music and pre-task music are the primary affecting factors in the sport activity. For instance, Brazilian football players listen to Latin American music – as the pre-task music – to stimulate their mental state when they are in the dressing room. While listening to the music, they step into the field following the beat of the drum-accompanied background music. Therefore, it demonstrates how the asynchronous music was employed in sports. They are also known as "The Samba Boys" because they adopt the samba rhythm and play it as a synchronous music (Elliott, Carr & Savage, 2004).

1.2.6 The Relationship between Music and Sports

According to related records, it has been revealed that music benefits athletes throughout their exercises. This standpoint has been confirmed for a long time. The functions of music include changing moods, recalling past memories, lifting spirits, improving work efficiency, relieving depression and increasing attention. These functions were proven when music was used in sports and exercises (Karageorghis & Terry, 1997).

In the sixth century B.C. in Greek, music was infused in many athletic competitions, such as the Pythian Games that took place in Delphi. Similarly, music was used to benefit people mentally and physically. Many historical records show that music was associated with sports as the sports theme tunes (McLeod, 2009).

Both musicians and athletes should relax their muscles before their performance. Tension would affect the smoothness of physical execution due to the responses to neural stimuli. Moreover, music and sports are closely related, whereas rhythm is the connection between them. For instance, basketball is played according to its rhythmic flow. Polyrhythms and syncopations are easier to generate distraction to the challengers and audience. Likewise, the capability of tempo and dynamic could also be the factors to affect the challengers. On the other hand, musicians often use their body to express the music beats, such as foot taping and head bobbing to stay on beat. Besides, there is a new approach in sports training, which is the rhythm training using jazz music and swing music, to help athletes perform better (p. 205-206, as cited in McLeod, 2009).

The relation between music and sports is obvious in boxing activity. Boxing has impacted the African American musical community. Joe Louis is the most well-known representative who is a swing music bandleader and a professional boxer at the same time. The heavyweight champion became a national hero in 1938. He had played at hotels and clubs with many musicians. Furthermore, as a patron of swing music, Louis was one of the judges for courier magazine. There has been footage of boxers having their training in James Brown and B.B. King’s concert. James Brown was an ex-boxer and he spent a lot of time practising his boxing footwork added with dancing elements for better physical ability. As time goes on, the African American community was affected by jazz boxing that created interaction between jazz music and other sports, such as basketball and baseball in the 1930s and 1940s (p. 211, as cited in McLeod, 2009).

1.2.7 The Development of Music Therapy

Throughout the development of music therapy, evidence has shown that listening to music can relieve painful feelings and reduce stress. When patients experience chronic pain, music is able to console them and serve as a companion to achieve mood improvement, relaxation and motivation. Moreover, music helps them to develop self-awareness to resist and release painful feelings from the body (Gold & Clare, 2013).

Anthropological studies showed a precisely long history of music. It has been found that organised sound was used in ritual and ceremony since prehistoric era. For example, music was used in church activities, praying to God, funerals and sports events. It has been perceived that music has unexplained effects in people's lives (Merriam, 1964). The effect of music and its therapeutic functions have been recorded in the history for a long time. In some communities, music plays an important role, such as treatments for illnesses and getting rid of evil spirits or demons. The music then was performed with drums, by chanting and singing (Boxberger, 1962).

From 5000 B.C. to 3500 B.C., music played a significant role in medical therapy, magic and religions in the Babylonian civilisation. It was recorded that doctors used music to cure heart disease in 5000 B.C. in Egypt (Feder & Feder, 1981).

According to an ancient Greek belief, music had a special power in thoughts, emotions and physical health. In 6000 B.C., Thales employed the strength of music to cure plague (Feder & Feder, 1981). Aristotle affirmed that music had catharsis values that could affect emotions and improve personality. Furthermore, Plato has described music as the cure for heart.

After the fall of the Roman Empire, Christianity became the main force in western civilisation. People's attitude has changed due to the effect of religion. It was reflected on how people behaved towards the disease. Since the rapid spread of Christianity in Europe, the society began to establish medical care for the patients. During the Renaissance period, music was not only used to treat depression, despair and madness, but also used as preventive drugs by doctors. In addition, music served as a powerful tool to build healthy emotions and helpful behaviours (Boxberger, 1962).

During the Baroque period, music was related to medical science based on the four theories of liquids. Kircher (1602-1680) put forward a new standpoint of the application of music. He believed that the relationship between personality characteristics and types of music was connected. For instance, depressed individuals preferred sad music while cheerful individuals preferred dance music because of how music stimulated the blood (Carapetyan, 1948). In the late 18th century, although European doctors recommended music to be used in treatments for diseases, the medical treatment principles gradually changed. The status of music therapy became lowered and music was only used in few cases by doctors who acquired the multidisciplinary concepts. According to Unkefer (1968), the development of music therapy was highly related to the development of activity therapy for the therapeutic effects of music. In the 20th century, based on the initiated goals and purposes, music therapy was possibly used from the scientific aspects of medicine (Boxberger, 1963).

The function of music and its therapeutic effects were used in early history. The term “music therapy” as an independent discipline was first established in the United States. (AMTA) The American Music Therapy Association was created in 1971. Since then, music therapy has held the dominant positions in its development across the world.

As Heller (1987) proposed, people’s mental state could affect their health and music could affect people’s emotions. There were practices in music therapy in Europe and they were done mainly from the French philosopher Descartes’s point of view (Heller, 1987). Application of music therapy in educational institutions began in the 19th century. In 1840, a deaf student completed his difficult piano lessons in Hartford, Connecticut in the United States. In 1848, Turner and Bartlett reported a publication about music for deaf on an annual deaf conference in America (Darrow & Heller, 1985).

In late 1899, James L. Corning, a neuropathist, contributed different innovation on development of music therapy. He was the first person who used music therapy to cure mental disorder. He presented music (vibration) and visuals to the patients before they went to bed for an emotional therapy. He believed that people’s thought would enter the stationary state in their sleep, so music vibration would enter the subconscious mind. At the same time, suitable music could benefit patients. For example, classical music was proven to help people to keep the visuals in mind and leave the bad feelings when they woke up. Corning’s statement was essential in music therapy because he was the first person who tried recording systematic music in the process of treatment to cure psychosis with music therapy (Davis, 1987).

Music therapy has been developed into a training course for music therapists and it was applied in the hospitals in early 20th century (Boxberger, 1963). There were three renowned female practitioners, including Eva Augusta Vescelius (1900-1917), Isa Maud Ilsen (1905-1930), and Harriet Ayer Seymour (1915-1944), who formed a team to promote the music therapy and training (Davis, 1993).

In the development of music therapy, Eva Augusta Vescelius was the most significant practitioner. At the same time, she has influenced many individuals to practise music therapy in the early twentieth century (Boxberger, 1963). Also a trained singer, Vescelius was interested in mental therapy that used music as a healing method and she performed it in hospitals and asylums occasionally. She initiated music therapy experiments at home with her personal music theory and succeeded. Then, she applied her therapeutic theories to the patients in hospitals and mental institutions (Davis, Gfeller & Thaut, 1992). Vescelius initiated the National Therapeutic Society in New York in 1903, and she was considered the first to publish a music therapy journal, *Music and Health*, in 1913.

In 1919, Columbia University was the first university in New York City that provided music therapy courses to prepare musicians to work in the hospitals. Margaret Anderton, who was a pianist, practised music therapy among Canadian soldiers during World War I. Meanwhile, she taught music psychology and physical reactions in a practical way by employing music to cure patients with neuropsychiatric problems and orthopaedic injuries (Davis, Gfeller & Thaut, 1992; Taylor, 1981; Weldin &Eagle, 1991).

Next, Isa Maud Ilsen was a musician, nurse and hospital director. She was considered as an important pioneer in promoting music therapy in the hospital of the United States. She worked as a music therapy teacher with Anderton at Columbia University in 1919. In 1926, she established country music association in the hospital and she had been working for the hospital for 20 years. During World War I, she was the music director in the Red Cross Hospital. Ilsen believed that music could relieve pain of patients who suffer from diseases. Her experience has helped her to establish the theory of music therapy. Moreover, she believed that rhythmic is important in curing patients, but she proposed that certain types of music were not suitable for the treatment, such as jazz music (Ilsen, 1926). In this period, Ilsen and other musicians and doctors have considered classical music as the basic frame structure to cure all kinds of diseases with music therapy. For example, she used Schubert's music to cure fearful insomnia and she believed that Brahms's Waltz and March of souse were suitable for terminal care. In the therapeutic process, music was chosen according to patients' preference. Different ethnic music and instrumental music have been included in the therapy too (Literary Digest, 1919, p.26).

Likewise, Harriet Ayer Seymour worked as a music therapist during World War I. In 1941, she established national fund for music therapy. From 1941 to 1944, she has trained more than 500 students who were major in music therapy. In the 1920s, Esther Gatewood proposed to implement music in the surgical arena, especially during anesthesia. She believed that the usage of music has to be in the patients' favour in the beginning. In the 1940s, Ira Altshuler developed and improved Gatewood's theory (Taylor, 1981). In 1925, Dr. Burdick reported that music was not only used in operating theatre, but also used to reduce patients' discomfort and help them to enter sleeping state in the ward. From the treatment, it was found that 95% of the patients had benefited from music therapy (Burdick, 1916). The initial music therapy college training programmes were founded in 1940s. Certain representative universities and colleges developed programs in music therapy, such as Michigan State University, University of Kansas, Chicago Musical College, College of the Pacific and Alverno College. The students received professional training in the music therapy courses and most of them worked as music therapist in the treatment for mental health after their graduation (Boxberger, 1962).

Meanwhile, (NAMT) the National Association for Music Therapy was established in 1950. In the mid-1960s, music therapists also treated adults and children who had mental disorders. In the 1990s, music therapy was expanded to treat general populations, elderly care institutions and prisoners. The last few years of the 20th century, music therapists' work was continuously increased. A large number of music therapists employed music to improve diseases, such as Rett syndrome and HIV; and to treat substance dependent patients. Music was also used in terminal care (Gao, 2007). So far, the application of music is influenced by the local background. For example, the selection of music depends on the local culture and popular trends of music according to the studies done in different countries.

1.3 Significance of Research

Research about the effects of music on psychology has developed in many ways. There are case studies that have used music stimuli to help overcome psychological obstacles, reduce depression and improve productivity. Effects of music could bring positive influence on people's behaviour (Taylor & Paperte, 1958). According to some results in research on the effects of background music upon consumer behaviour, results showed that music had a positive influence on the customers' mood when they were shopping, thus making them spend more in the store (p. 286, as cited in Milliman, 1986).

However, not much research has examined music and its stimulating effects on typing speed among clerical workers in the condition of postprandial somnolence. According to the Psychology and Physiology theories, human body's internal clock is able to control how the development of time and space is perceived. It could also generate quantity and quality in the life entity. Thus, it causes most people who have just had lunch to feel tired and experience postprandial sleepiness from 12:30pm to 2:00pm. The internal clock is related to physical, sensitive and intellectual health (Wang, 2012). Relevant data about music stimuli could be refreshing and invigorating. The result of this study is significant as it could benefit clerical workers in effectively reacting to postprandial somnolence. Therefore, the investigation of this research is necessary and the results will contribute to the society.

1.4 Problem Statement

This research began with a problem statement whether music can produce an effect in improving productivity, or otherwise. Therefore, the study came with a hypothetical assumption: whether music has any influence on task performance (typing) upon countering postprandial sleepiness. The research is also to explore the effect between fast and slow music, and whether a condition where the subjects listen to music with or without headphones may increase typing speed. The research subjects are clerical workers and the variable tested is typing speed.

There is a lack of research that explored intervention of music in this particular area although an early study examined intervention of birdsong at a primary school (Winterman, 2013). Similarly, music could be an intervention in a computer-programming task (Fujigaki, 1993). Thus, it is essential to research on how music could affect clerical workers' task performance.

1.5 Research Objectives

This study proposed research objectives in aim that it may be beneficial to the society. Fast and slow music are tested in their effect in improving task performance and also in the condition during postprandial sleepiness after lunch. The following are research objectives of this study:

1. To examine the effect of the selected music as a stimulant on task performance (typing speed) in postprandial sleepiness.
2. To compare the results between Group 1 (listening to music using headphones) and Group 2 (listening to music without using headphones).

1.6 Research Questions and Null Hypothesis

This research is done based on the following question:

Q1: Is there a significant difference in the number of typed characters when clerical workers are given a music treatment before typing?

H_o: There is no significant difference in the number of typed characters after clerical workers listen to the selected music.

H_a: There is a significant difference in the number of typed characters after clerical workers listen to the selected music.

Q2: If null hypothesis is rejected, what are the differences in the number of typed characters between Group 1 (with headphone) and Group 2 (without headphone)?

1.7 The Experiment

The research employed an experiment in testing the effectiveness of music in typing speed. The research participants are 50 clerical workers who work full-time in various companies. The independent variable is the two types of popular music, which are slow music (Music A - "Jurassic World Sonata") and fast music (Music B – theme from motion picture "Mission Impossible"). The dependent variable is the participants' typing scores in three music conditions.

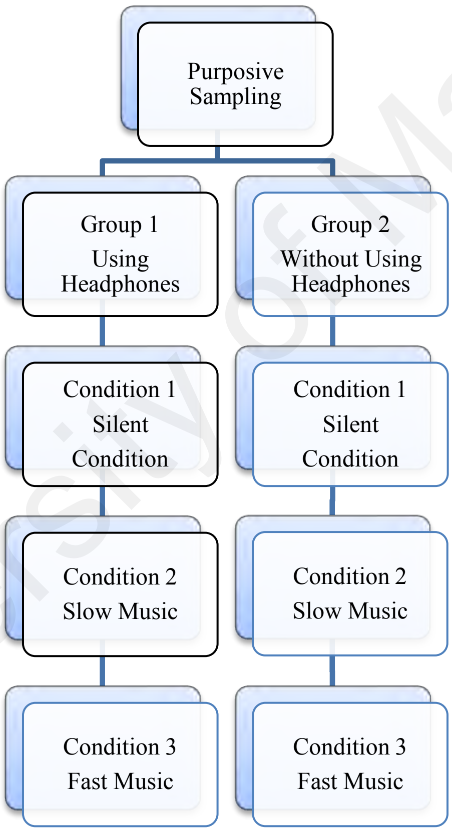

Figure 1.1: Research Design

According to the conceptual framework illustrated in Figure 1.1, the subjects are given several pages of text to type in 2 minutes. The text consists of 200 to 300 words printed at the font size of 12, and each character typed contributes as 1 point. The points scored by each subject are the dependent variable to verify if effects of music are different in the conditions of listening to music using headphones and without using headphones. After the scores of silent condition have been collected, the subjects in Group 1 were given Music A (slow music) and Music B (fast music) respectively by listening with headphones, while Group 2 listens to the music without using headphones.

This experiment investigates the relation between the independent and the dependent variables in Group 1 and Group 2. In addition, it also finds out if there is a continuous effect throughout the three tests.

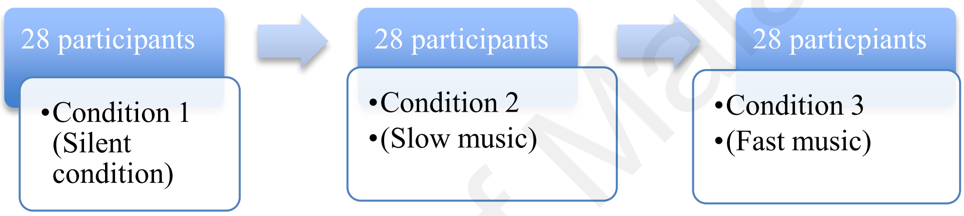

Figure 1.2: Research Procedure

In addition, 28 participants identified in postprandial sleepiness are also tested. The research participants are 28 clerical workers who are selected from University of Malaya and other companies. Two types of popular music have been selected as the independent variable. The dependent variable is the participants' typing scores in three conditions. According to Figure 1.2, the participants were given some pages of text to type in 2 minutes. The text contains 200 to 300 alphanumeric words printed at the font size of 12, and each character typed contributes as 1 point. After the scores of silent condition have been collected, the participants were exposed to slow music and fast music intervention.

This experiment explores if there is a relationship between the selected music and the participants' typing score. Moreover, it also finds out if there is a continuous effect throughout the three tests.

1.8 Limitation of Study

This research focuses on music and its stimulating effect on typing speed among clerical workers in the condition of postprandial somnolence. The participants are volunteers recruited from a few companies including University of Malaysia, Maybank, Fungates Superflow Foundation and so forth. The two types of music selected in the experiment include music with slow and fast tempo. Discussion focuses on the results after comparing the two groups and two types of selected music in the experiment.

In terms of physiological differences, only females who are not in their menstrual periods at the time of the experiment will be chosen to participate in the experiment.

In addition, due to the limited timeline of a Master's Dissertation, only two types of music will be tested: slow and fast popularly known music are used in the experiment as familiarity with the music is a crucial factor that delivers a more positive result. The selection criteria were based on past literature. For example, researchers Fassbender et al. (2012) referred that background music applied in computer animated history lesson that exposed memory was affected by music, such as it worked on remembering higher number of facts and recalling facts. Thus, background music is beneficial for the participants in this study. The well-known "Jurassic Park Theme" and "Theme from Mission: Impossible" are selected. Both pieces of music were extracted from two well-known movies. These two pieces of music are suitable because of the popularity and the music structure.

1.9 Organisation of Study

This study involves five chapters. The first chapter is the introduction to the report that provides the background information. In the second chapter is the literature review and includes past studies for reference. The third chapter explains the methodology. The fourth chapter discusses the results and the fifth chapter is the conclusion of the study.

The first chapter is an introduction to the study. There is an overview of effects and functions of music on different areas. The chapter also includes the justification of research, problem statement, research objectives, research questions and limitations of the study.

Next, the second chapter includes effects of music in the past literature. Critical opinions from scholars and the previous research done in relevant area will be reviewed in order to specify wide-ranging standpoint to the study. The third chapter is the methodology that primarily conducts the procedure of experiment and the pilot test. Chapter Four demonstrates the results of the study. There is also a discussion and analysis of the results. Finally, Chapter Five presents a conclusion for the whole study.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

Music has evolved enormously over the last century. The period between early 1940s and early 1990s was a particularly revolutionary period, with significant research on the subject of music theory. Studies on the progression of music theory were especially popular in the late 1980s (Hallam, Cross & Thaut, 2016), while the 1950s and 1960s saw the rise of studies in transcultural ethnomusicology. Music has always been widely used in various aspects of human life, such as hypnosis aiding in babies' sleep, dance, religious worship, wedding ceremonies, funerals, etc (Merriam, 1964).

Experimental psychology plays a big role in music psychology, involving aspects such as physiology, physics, genetics, anthropology, aesthetics and other relevant theories that explore people's interpretation and behaviour towards music. Music psychology includes studies on physical reactions towards sound, musical memory, musical imagination, musical skills and performance skills. It is shown that music psychological theory is closely linked with music aesthetics theory and constitutes a part of musicology. Stumpf (1848-1936) was one of the founders in music psychology. In 1883, Stumpf published a paper on music psychology, strengthening the psychological standpoint proposed by Helmho, at the same time combining the studies of physics and physiology in the paper. His research, focusing on the effects of musical consonance and dissonance on emotions earned him a spot as one of the main figures in music psychology.

The very first study that touched on the subject of music psychology revealed the growing influence of perceptual psychology. Hodges (1980) provided a detailed research in music psychology in the form of a handbook (Hargreaves, 1986).

The term "Psychomusicology" was derived from the psychology of music, or music psychology. It explains the musical context in aspects such as sensory, structural and expressive dimensions (Williams, Carlsen & Dowling, 1981). Music acts as a stimulus to both musicians and non-musicians. It affects people in various ways in terms of behavioural and emotional patterns. However, when people are gathered in the same space, they may present similar emotions and physical responses during music listening (Storr, 2015).

The following sections provide past studies that examined the effects of music in several areas, including behavioural, emotional, physiological, psychological and educational aspects. Furthermore, the effects of music therapy, postprandial somnolence and the ergogenic effects of caffeine-enhanced performance are also reviewed in the chapter.

2.2 Effects of Music on Behaviour

Early research states that music has positive effects on human behaviour (Taylor & Paperte, 1958). Many aspects of human behaviour have been studied as it provides valuable insights on whether music has an effect on human behaviour (Ellis & Brighouse, 1952). According to Freymann (1948), music influences elaborate effects in humans. In 1955, Jeffrey stated that contingent music has successfully changed children’s behaviour (p. 105, as cited in Standley, 1996). Some other studies also looked into the congruence between music and movement in sports, such as Loo and Loo (2012) and Loo and Loo (2013) in rhythmic gymnastics. In a more recent study, Loo and Loo (2014) mentioned ‘audio capture’, where visually perceived movement might be different such as in momentum, due to the effect of music used in accompanying rhythmic gymnastics. In two other studies, Loo and Loo (2013) and Loo and Loo (2015) found that perception over *Taichi* movement might also be affected when different music was played.

2.2.1 Effects of Music on Typing Behaviour

In a study by Salame and Baddeley (1989), it was mentioned that memory performance is highly affected by vocal music in a sequential recollection of visually displayed sentence. Waters et al (1985) discovered that voices in loud volume are destructive to reading performance. It also studied the effects of music on working memory as it is a main factor in influencing writing span and fluency. The background music has been proven to disrupt writing and working memory. The experiment included both musicians and non-musicians and there were differences in the writing fluency between the musicians and the non-musicians when exposed to background music (Bever & Chiarello, 1974). In Ransdell and Gilroy's (2001) study, they found out that listening to music intensely damaged the fluency and efficiency during word-processed writing. Participants who wrote better essays either received musical training or had high working memory span and those with high working memory span wrote more fluently while listening to music in word-processed writing.

2.2.2 Effects of Music on Eating Behaviour

Roballey et al (1985) examined how eating speed was affected by music. There were three variables in the experiment; fast-tempo, slow-tempo music and without background music, while the eating speed was observed. The results showed that fast-tempo music increases the number of bites per minute of the participants. However, there was no difference in total time of the meal.

Human's emotions, reactions, physiology and behaviour are affected by a variety of music. Milliman's (1982) research mentioned that human behaviour is also affected by music tempo. Fast-tempo music is able to improve efficiency whereas slow-tempo music has an opposite effect. Besides that, he also researched the effects of music tempo on eating behaviour. However, his hypothesis on eating speed decreasing with exposure to slow-tempo music was invalid.

Based on Milliman (1986) in his study on food serving in a restaurant, results showed that music tempo affected the consumer behaviour. When slow-tempo music was played, although patrons ate the same amount of food, they stayed longer and tended to consume alcoholic drinks and beverages compared to when fast-tempo music was played. This shows that soothing background music creates a relaxing environment for patrons and also lowered inhibitions.

2.2.3 Effects of Music on Shopping Behaviour

According to Smith and Morris (1976), stimulative music and sedative music work in contrasting ways when affecting the people's emotions. Stimulative music increases emotions and enlarges the pupils while sedative music decreases emotions and pupil size (Slaughter, 1957).

People are affected by music tempo during shopping in terms of purchasing behaviour and movement speed in a grocery store. Slow-tempo music leads to greater traffic flow and sales volume when compared to fast-tempo music. However, the study failed to reveal the customers' awareness of music genre played (Milliman, 1982).

Meanwhile, Mehrabian (1980) & Russell (1974)'s theory generated a similar standpoint that shopping behavior is influenced by the shopper's environment. Mehrabian and other environmental psychologists studied that people's feelings and emotions affect their behaviours (Donovan & Rossiter, 1982). Research found that music had a positive influence on customer's emotions when they were shopping, thus making them spend more in the store (p. 286, as cited in Milliman, 1986). In Smith and Curnow's (1966) experiment conducted in two outsized supermarkets, consumers were exposed to music ranging from loud to soft in eight counter-balanced assemblies. The results revealed that consumers spent longer time in the stores when the music was soft (p. 286, as cited in Milliman, 1986). Another study found greater traffic flow and sales volume in a medium-sized supermarket when the background music played was in slow tempo. In conclusion, slow-paced music is more suitable to be played in the stores to encourage sales (p.287, as cited in Milliman, 1986).

2.2.4 Effects of Music on Suicidal Behaviour

Many studies found that human emotions and behaviours are affected by music (Diserens, 1926; Schoen. 1927; Seashore, 1938; Trotter, 1924). The main factor inducing suicidal behaviour is the emotional state of an individual and this is heavily affected by the music exposed to the individual (Asmus 1985).

According to Stack and Gundlach's (1992) study, country music and suicide rates are closely linked. This is due to the lyrics and messages conveyed in country music which directly nurture the emotions to commit suicide. The most common factors of suicidal behaviour are alcohol abuse, marital conflict, and work stress. Furthermore, weapon accessibility also plays a part in encouraging suicidal behaviour. The study found that suicide rates were highly influenced by the time being exposed to country music, increasing the rates in 49 major U.S. cities (*Ibid.*).

2.3 Effects of Music on Emotions

Human history in early stage revealed that the music is closely related to psychology and society. In many studies, influence of music has been examined in social aspects (Freymann, 1948). In early Chinese history, music plays an important role in people's daily life. There is a relation between music and human emotions, which is proven by scholars that music and positive emotions are relevant and equivalent (Brindley, 2006). The relation between music and emotions has become an emphasis in recent research in psychology and neuroscience. Music acts as a powerful variable in reinforcing emotions and influencing relationships (Baraldi, 2009). According to Baraldi (2009), emotions bring huge influence on musical performance. It affects the interaction between musicians and the audience. The researcher also observed that people cry when music was played in emotional events, such as in weddings and funeral rituals (p.258, Baraldi, 2009).

Two experiments have been done to examine how emotions are affected by exciting and calming music. The subjects were patients from the hospital and they were either depressed or schizophrenics. The Galvanic Skin Response (GSR) device was used to measure the emotional response. GSR values were positive when the subjects were exposed to exciting music. There was a decrease in electrical skin resistance; however, the emotional excitement increased. On the other hand, GSR values were negative when calming music was played. That showed an increase in electrical skin resistance and a decrease in emotional excitement (p. 891, as cited in Zimny & Weidenfeller, 1962).

Bishop et al (2007) pointed that listening to music was a helpful approach for elite athletes as music can alter their emotional state and affect their visuals and emotions as well as auditory imagery. However, the findings in a study showed that listening to relaxing music increase the endocrine stress reaction. However, the results showed no significant difference between an intervention of relaxing music and rippling sound of water in reducing in terms of cognitive and emotional stressor (Thoma, Marca, Brönnimann, Finkel, Ehlert & Nater, 2013).

2.4 Effects of Music on Physiology, Psychology and Education

Music has significant positive effects on pulse, respiration, blood pressure and muscle fatigue as described by Schlichting et al (1970). It serves as a catalyst in promoting people's health. Moreover, music can consciously and unconsciously improve physiological and psychological performance based on its variety of musical structure - tempo, range, level and instrumentation (Meyer 1956).

Vaughn (2000) demonstrated that there was a relationship between music and Mathematics. Music helped people to understand Mathematics in some facets, such as geometry and proportional reasoning. Otherwise, background music could help enhance performance on language learning tasks, such as Mandarin Chinese (Kang & Williamson, 2014).

Scholars Jäncke and Sandmann (2010) explored that there was no significant influence of background music on verbal learning performance, neither an improving nor a harmful effect. However, background music could help people advance performance on language learning tasks. Especially, it worked on people who were learning Mandarin Chinese (Kang & Williamson, 2014).

Researchers found that keyboard training might help pre-schoolers to complete spatial-temporal tasks – such as solving puzzles – faster and more accurately. Psychologists believed that music could form a stimulating effect on children which could help develop children's working and learning capacity (Rauscher, Shaw, Levine, Wright, Dennis, & Newcomb, 1997).

Stress can be specifically damaging to children as it could lead to health problems. However, music and arts are able to help children deal with the stress. Depression and asthma are recognised as being health problems with high-stress levels. Akinbami (2010) through the Prevention Centers and Disease Control revealed that asthma has caused 14.7 million school non-attendances in 2002. In Chicago, 50% of the youth suffered depression of different levels and 10% of them suffered from other emotional illnesses associated to stress in the urban environment (Van Landeghem, 2003). In addition, stress also significantly affects people's attention, memory, planning and behaviour control (Shonkoff & Phillips, 2000).

Cortisol is helpful in insulating the mind from negative memories. However, cortisol should be kept in balance or learning function would stop and be compromised. According to Vincent (1990), high cortisol levels impair hippocampal neurons and impact learning and memory. Short-term stress was linked to the high cortisol level in the hippocampus which would impede people's ability to identify parts of a memorable event (Gazzaniga, 1989).

However, stress could be relieved with arts and music education as they produce endorphin. Endorphin help obstruct the effects of cortisol so that people's ability to concentrate will not be affected. Meanwhile, endorphin can also help control personal stress and improve people's study potentials (Sprenger, 1998). Used in most children's hospital, music and arts education programmes are able to improve children's well-being, enhance their learning ability and reduce negative social behaviours (Teplin *et al*., 2002). Instrumental music also helps students concentrate better on their work and to resolve common stress in urban environments (Walker & Tillman, 2002).

Kirkpatrick (1943) reported that music could affect people's concentration. According to a research conducted by Freeburne and Fleischer (p. 427, as cited in Schlichting et al, 1970), it was found that concentration was influenced by presence of background music. When the subjects listened to music in an architectural drafting room, it was easier for them to work compared to listening to no music. In the experiment, different types of music were selected as the background music including instrumental music, vocal music, familiar music and unfamiliar music. Based on the research, it was discovered that short-period frequency of music is beneficial and fulfilling to people (Gatewood, 1921).

Baker (1937) conducted an experiment on the influence of background music on two groups of students when they did arithmetic. One of the groups performed better than the other. The students with background music performed better and considered music to be beneficial. In another example, Schlichting et al (1970) carried out an experiment to prove effects of background music on students' performance. There was a series of 12 lectures and a one-hour examination completed with background music in the experiment. They found that students enjoyed the classes with background music more and their performance improved as a result of that. Similarly, background music was also beneficial for the lecturer as he was more willing to present lectures.

2.5 Effects of Background Music on Task Performance

It has been challenging to measure performance in the psychological aspect. Performance equals to task accomplishment, goal achievement, results and outputs. Music brings positive effects on task performance (Isen, 1999; Thompson et al., 2001). In music listening, 'peak' experiences on emotional responses are revealed, such as thrills, shivers, laughter and tears. These emotional responses were affected by the musical structures. The most obvious expression is the physical reaction of tears aroused at the end of a piece of music (Sloboda, 1991).

Music reduces anxiety and prevents depression. Without music, stress increases during the preparation of a task. Meanwhile, music inhibits anxiety, systolic blood pressure and increased heart rate (Knight and Rickard, 2001). This has been proven in a computer programming task. Fujigaki (1993) found that 42 percent of all design errors were derived from the programmers' stress level. Based on their experience, the computer system developers found that listening to music lowered their anxiety level (Lesiuk, 2005). Similarly, music is beneficial in work efficiency (Fox, 1971; Kirkpatrick, 1943; Wokoun, 1969). Listening to music from radio increases work efficiency as explored by Oldham (Lesiuk, 2005).

Many scholars have confirmed that task performance and work efficiency are affected by music. However, researchers Cassidy and MacDonald (2007) put forward that introverts complete better than extraverts on five mental tasks, including immediate recall in memory, recalling a list of items, expressing in numbers, recalling acquired information, and a Stroop test (that underwent four circumstances by negative sound affect, positive sound affect, daily noise and silent condition). Negative effect and noise was not advantageous for subjects in the experiment.

The concept that music and its rhythm have a stimulating effect on the facet of motor behaviour has been proven in the beginning of the 20th century. The correlating research investigated the effect of music on exercise performance. The results indicated that music helps reduce fatigue, improve motor coordination and increase relaxation (Szabo, Small & Leigh, 1999).

Based on Williams's (2002) statement about effects of music on performance, results, output and behaviours, many researchers tried to examine the influence of background music on musicians' and non-musicians' task performance. For instance, there was a study that examined 36 expert musicians and 36 non-musicians on language comprehensive task and visuospatial search task. In the experiment, the subjects were examined in a silent condition and then exposed to piano music that played both correct and incorrect notes. The results revealed that the musicians' performance on language comprehension task while being exposed to music was unsatisfactory. However, the subjects' task performance was good in the silent condition compared to when music was played (Patston & Tippett, 2011). Similarly, another research shows that there were no differences between subjects listening to popular music and in silent condition in a memorization task (Sandberg & Harmon, 2003).

Past studies examined the effects of sensory deprivation and music on perceived exertion. Rating of perceived exertion (RPE) is an individual's subjective valuation of work during exercise and it could be improved by music. Music has been used to reduce the sensation of pain in dental procedures (Corah, Gale, Pace, & Seyrek, 1981) and electric shock (Lavine, Buchsbaum, & Poncy, 1976). Music helps eliminate discomfort and negative emotions during exercise. Conversely, visual and auditory deprivation would increase discomfort.

2.6 Effects of Music on Physiology

Earhart (1928) pointed that there is a connection between rhythm and physiology. For example, the characteristics of instrument music are dignity, rest and joy, thus making instrumental music an appropriate stimulus to arouse certain effects in physiology.

According to Wagner (1975), music stimulates the alpha rhythm production in the temporal lobe. The analysis of electroencephalograms resulted that musicians have more alpha rhythm contents compared to non-musicians. Meanwhile, the encephalography also showed that alpha brainwave responds to tempos and pulses. However, different music characteristics have different effects on cortical reaction.

Regardless of genre, variety and tempo of music, music is certainly related to physiological responses (Mursell, 1937). The similar opinion made by Roballey et al (1985) is that human's emotions, reactions and behaviours are affected by the variety of music. Music is related with perceptual, symbolic and personal processes, particularly emotional and physiological, that explains how music influences and adjusts human behaviour (Taylor & Paper, 1958).

Landreth, J. E. and Landreth, H. F. (1974) examined heart rates on 22 students when they were listening to the first movement of Beethoven's fifth symphony in a college-level music appreciation class. The results showed elevated heart rate among the subjects when they were listening to the intense part of music. On the other hand, the transient state of music displayed lowered heart rate. In the test, the excerpt of music that consisted of rhythm and intensive dynamic has led to elevated heart rate. This study proved that music tempo could significantly affect heart rates.

Music appreciation has a mutual effect on physical, emotional and intellectual as examined by Machlis (1955). The affected degree is based on some factors, such as sensual reaction to rhythmic energy, imaginary associations transmitted by music, as well as music aesthetics performance.

Development of children's musical intelligence helps increase their specified perception on musical sound. It is presented in their pictures, such as invented symbols for music.

Moreover, music training could improve children's perception. Music training comprises children's motor system in the kinesthetic responses (Lewis, 1988; Morrongiello & Roes, 1990). Music and arts are able to rebuild children and youths' emotions and physical lives (NGA, 2002).

Ellis and Brighouse (1952) investigated the effects of music on two behaviours, which are respiration and cardiac activity. They proposed that the respiratory activity is an important way to cure tuberculosis patient whereas cardiac activity is a valuable treatment for heart diseases. Early researchers also indicated that respiration and heart rates are affected by music, but inadequate statistical treatment cases made explanation harder. According to Gilliland and Moor's (1924) study, after playing popular music, jazz music and classical records for 25 times, it was found that jazz music increased heart rate the most, especially on the repeated part (p. 39, as cited in Ellis & Brighouse, 1952). Furthermore, it was discovered that music affects systolic and diastolic blood pressure as well as pulse rate as tested on electrocardiograms (Hyde, 1927). Additionally, blood pressure, pulse rate and mental imagery are affected by music whereas different behaviours are affected by the varieties of music (Washco, 1933). Foster and Gamble's (1906) study also reported a similar standpoint that emotions are influenced by different types of music and closely linked to diverse respiration.

According to Dainow (1977), listening to music affects the physical reactions, such as the motor responses to music. Meanwhile, the miscellaneous responses on parameters involve breathing process, heart rate, galvanic skin resistance and muscle tightness. Moreover, Farnsworth (1969) stated that bodily procedures are significantly affected by music. Next, Dainow (1977) also mentioned the study done by Dogiel, a Russian doctor, about effects of music on physiological responses, which stated that blood circulation and blood pressure are affected by musical tone, pitch and loudness. Musical tones increased the frequency of heartbeat; breathing changed depending on the music played (p.183, as cited in Gardner, 1944). Many experiments that employed music in maladies treatments have also been conducted, proving that music has great effects in curing most ailments and mental cases.

Effects of music have been applied to human's mind and body. As a high value therapeutic method, music is used in the treatment of diseases since the ancient time. The physical effects of music presented on listener's emotions are stimulative. According to Courtier (1897), music composition expresses human's emotions and stimulates physical reactions, such as increased pulse and breathing.

Bordeaux mentioned that Guibaud used plethysmograph to explore effects of music in terms of breathing, circulation sounds, scales, melodies and musical phrases. They discovered that the dissonances produced more obvious reaction whereas the minor scale produced more stressful feelings. When the music has been changed from minor to major scale, vaso-constriction was alleviated and breathing changed more regularly compared to the results of minor scale (p.17, as cited in Savill, 1958).

In 1903, Xavier Verdier mentioned that ancient Greece engaged music to cure diseases of the mind and body and music has been a significant treatment. Meanwhile, he discovered that the variety of music and musical instruments is beneficial for individual patients, such as flute, violin and piano. These musical instruments are better than loud powerful instruments in the contemporary age. On the other hand, Vincent and Thompson employed sudden noises, melody and rhythm during a blood pressure test in the experiment. The result revealed that blood pressure is influenced by the content of music.

Emotions affect pulse and breathing, while pulse and breathing are stimulated by music. Music leads to an accelerated pulse and respiration. Helga Eng has proven that mental activity – such as pleasure, displeasure, depression and excitement – and physical reaction are influenced by music. Pleasant music leads to increased pulse rate and breathing rate (p. 20, as cited in Savill, 1958).

2.7 Effects of Music on Music Therapy

Researchers found that music has positive effects on behaviour. This makes music an important element in therapy (Taylor & Paperte, 1958). As a therapeutic means, music has been popular in related studies and its effects on behaviour have widely been examined (Mitchell & Zanker, 1948; Podolsky, 1939; Schullian & Schoen, 1948; Soibelman, 1948; Wall, 1940). Music plays a significant role in the treatment of diseases (Ellis & Brighouse, 1952).

According to Lind (2007), his study explored that commercial music has been conceptualised in the present Western hospital. The study examined the position of music in the market and the results showed that music has brought positive experience for individuals. The article also explored a natural notion, which is the healing effects of music applied to the medical industry, and it has benefited the hospital wards and private homes. New Age music, relaxation music and healing music have been used as medicine in hospitals, such as the implementation of MusiCure in Denmark. MusiCure is a “specially designed sound and music environment” as described by Eje (2003). Vescelius (1918) stated that music therapists exposed the patients to harmonious rhythmic vibration and achieved satisfactory therapeutic results, thus proving music is effective as an approach in music therapy. In more recent research, clinicians adopted music listening as adjuvant therapy to overcome patients with chronic pain (Linnemann, Kappert, Fischer, Doerr, Strahler & Nater, 2015). According to Koelsch (2014), music treatment can give positive effect to psychiatric and neurological disorders.

2.7.1 Music Therapy Effects on Psychology and Physiology

Music improves work efficiency, reduces stress and minimises pain. Music effects on physical performance and sensory have been mentioned by Farnsworth (1965) and Winckel (2014). Their concept enlightened Peretti and Swenson, who later discovered that music is essential in the treatment for mental illnesses, especially anxiety. Moreover, they also found that sensory and motor tasks are greatly affected by music (Peretti & Swenson, 1974).

Music has multiple properties, such as peaceful, soothing, prohibitive and depressant, so it can be used in the treatment to cure patients with mental illnesses. The similar statements described by Jones and Schlotter (1957) and Dickinson (1958) confirmed that music is important in the therapy for both children and adults. Music and art therapy are useful and widely applied in children's hospitals (Teplin et al. 2002).

Furthermore, past studies showed that music is able to cure ailments. According to Gardner (1944), Petrie mentioned that human body was affected by music in Kahûm. Next, around 2500 B.C., the Egyptian medical papyrus also found that music has its effects on human body, proving that music is beneficial to human. In addition, Maritinus said that his songs made his fever disappear. Aesculapius assumed that sound made by horn might recover people with hearing loss. Plutarch stated that lyre is able to stop the plague in Lacedaemonia. Sound made by Phrygian pipe can relieve sciatica symptoms. A book published in England, which is named "Magis Universalis Naturae et Artis", recorded bars of music as a treatment to cure people bitten by a tarantula. Dr. Bekhnisky, who is a Russian doctor, mentioned that Chopin's waltzes assisted in curing sleeplessness. Dr. Ewing Hunter showed that music was advantageous for people who suffer from pain and sleeplessness. Likewise, Dr. Herbert Dixon verified Hunter's opinion that soothing music can relieve the condition of insomnia patients and people who have night terrors. Gardner (1944) reported that music is effective in curing ailments. In the experiment, patients joined the group to sing or play the musical instrument. It showed that gathering in a group to sing Beethoven's "The Heavens Resound" was able to make patients release their emotions (p.181-183, as cited in Gardner, 1944).

Friedlander (1954) examined the patients in music therapy and found that music brings an impact on emotions and ego sensual experience. Besides, it serves as an approach in psychotherapy. For example, Racker (1955) stated that musical sound created delusions in a schizophrenic patient and made him identify himself as a persecutor. This indicates that the same piece of music may bring different impacts on different people. Furthermore, Racker (1953) mentioned that many therapists have similar findings that patients became active and enthusiastic throughout the treatment (p. 255, as cited in Taylor & Paperte, 1958).

Music is used as medicine in the modern medical practice (Kneutgen 1970). Pontvik (1948) put forward that Bach's music is the most ideal medicine due to the natural attunement in his music. Other researchers (Schullian and Schoen 1948; Kohler 1971; Willms 1975) reported that classical and romantic concert repertory was the standard music to use in music therapy. Schwabe (1969) reported that light music and folk songs were helpful in treating neurotic, psychotic and psychosomatic disorders.

Past studies have examined the therapeutic music influences on the autonomic nervous system (ANS) dysfunction. The perspective that neurovascular integration was influenced by the central and autonomic nervous systems are based on experiments and therapeutic literature related to effects of music. Music is also closely related to physiology, emotions and cognitive health (Ellis & Thayer 2010). There are two major branches in the ANS, including the sympathetic branch for energy mobilisation and the parasympathetic branch for vegetative and restorative functions. The ANS links the central nervous system with the major peripheral organs and organ system, such as brain and spinal cord; heart and blood vessels; pupil dilator and ciliary muscles. There are many studies that reviewed the music influences on the ANS activities and dysfunction. Additionally, past literature also discussed the effects of music on the physiological activities, such as heart rate, blood pressure and electrodermal activity. There are two aspects of the physiological activity. The first one is to explore the psychological conditions and the second one refers to the limited conditions, such as practical on barometers of physiological states.

Some studies examined that decreasing heart rate, respiration rate and blood pressure are possible by playing sedative music, which comprises slow tempo, legato phrasing and minimal dynamic. Music has its effects on behaviours, emotions and physiological conditions both consciously and unconsciously. Additionally, the musical elements, such as beat, tempo and pitch, bring impacts on neurophysiology, psychophysiology, emotions and behaviours (Ellis & Thayer, 2010).

2.8 The Effects of Postprandial Somnolence

Previous studies found that there could be postprandial sleepy feelings in human body and mind, which are called postprandial somnolence (Smith, Ralph & McNeil, 1991; Wells & Read, 1996; Wells, Read & Craig, 1995). According to Lloyd et al (1994), the digestion of fat and carbohydrates in food is the main factor that causes people to feel sleepy. However, studies using the Multiple Sleep Latency Test (MSLT) argued that the standpoints above could not be confirmed in objective measures (Mavjee, 1992; McNair, Lorr & Dropplemen, 1971). For instance, an experiment examined the effects of a midmorning meal on sleep latency 20 minutes and 1-1.5 hours after the meal. The meal included a hamburger, French fries and ginger ale (4,067 KJ, 43% energy fat, 44% energy CHO). The data collection exposed that there is no significant distinction in sleep latency before and after the meal. The experiment gained negative results due to the insufficient intervals between naps. Moreover, coffee intake was not allowed in that research. Relevant studies also showed that biological time and food intake could influence the sleep lethargy. Nevertheless, the interaction between the two factors was not fully completed (Carskadon & Dement, 1987). Some studies have shown that a high-fat low-carbohydrate lunch could induce more sleepiness than low fat high-carbohydrate could. In addition, the sleepiness levels are affected by the amount of fat and carbohydrates in the meals, which could not be examined using MSLT. In a recent study, MSLT and Akerstedt electroencephalograph sleepiness test have been applied to examine the ingestion of different amount of fat and carbohydrates in the meals. The results showed that the food ingestion was an essential factor that could increase sleepiness based on the measurement using electrophysiological techniques (Wells, Read, Idzikowski & Jones, 1998).

2.9 Conclusion

The reviews above reveal that effects of music are significant to human in behavioural, emotional, psychological, physiological, psychophysical and medical aspects. However, there is not any research on music and its stimulative effect in improving task performance in post-food individuals. Past literature provides useful information for the research design and helps to identify the gap with the present study.

Many scholars discussed the effects of music in their research. Most of them focus on the effects of music on shopping and eating behaviour, psychology (such as how music could reduce stress), education, emotions and mental state, task performance, work efficiency and physical performance. Even daily diet is a reason that affects the ergogenic performance. Furthermore, music has evident influences on physiology, such as respiration rate, heart rate and blood pressure. Music has been widely used in therapy to cure the physical and mental health issues.

In addition, researchers also found that birds' sound could affect the postprandial sleepiness (Denise, 2013). This is closely related to the topic of this paper. As effects of music on computer task performance have been examined, this paper will discuss music and its stimulative effects on typing speed among clerical workers in postprandial somnolence, which has not been studied before. It will provide more information about effects of music in a new area. It will also contribute to the society, such as the clerical workers and individuals who would like to resist postprandial sleepiness effectively.

CHAPTER 3 METHODOLOGY

3.1 Introduction

This research aims to identify the effects of music on typing speed among clerical workers in postprandial somnolence. Quantitative methods were employed in this research. Secondary resources, experiment, questionnaires, and analysis based on figures were carried out. Punch and Oancea (2014) described quantitative study with characteristics of plenty of measurable objects and numbers. In this study, an experiment was carried out to determine the typing efficiency of participants with and without music exposure. The data collected was analysed using SPSS software. The research design includes participant details, procedure of experiment and the selection of music.

3.2 Secondary Resources

Secondary resources are the materials which are relative to the research topic that were collected and used in the studies (Stewart & Kamins, 1993). Secondary resources can be gathered from published papers or books (Solberg, 2000). All information needed as a reference for this research is gathered at this stage. Books, journals and articles related to the research are important as they provide additional information to the researcher. Apart from that, online sources are very useful when the researcher could not obtain sufficient information or data from published books and journals, as they are more readily available.

3.3 Subject/sample/participants

The participants were 50 clerical workers of both genders aged from 21 to 56. The participants were separated into two groups of twenty-five. Data from 28 of the 50 participants were further analysed as they displayed significant show of postprandial fatigue.

The participants completed a written demographic survey with a signed consent letter before the experiment. This is to ensure the subjects will not be affected by other factors throughout the experiment such as being under the influence of medication or other health issues. The participants consented by signing the acknowledgement on the form.

In terms of food intake, all participants should ensure they have consumed a proper meal during lunchtime. The meal should include a main source of carbohydrates such as rice, bread or noodles, and the quantity of food should be as usual. Food and beverages were not allowed to be consumed directly before the experiment. Any substance that contains caffeine, chocolate, cocoa beans, cola nuts, coffee and tea was not allowed. In this study, the researcher prepared a meal for the subjects, however, in the exception of Muslim participant, they prepared halal food by their own following the instruction given by the researcher.

3.4 Selection of Music

Participants were not allowed to select music based on their personal preference because it would have led to inconsistent music selection, thus affecting the results of this experiment.

The definition of popular music changes according to space and time. ‘Popular’ can be defined as a culture that will be known inevitably without specific propagation (Hall 1978). Based on the perspective of psychology and sociology, the community shares the same feeling such as pleasure, love, romance, sex, and desire through popular music. However, in other perspective, popular music is always related to the publicity of media

(Barbazon 2012). Hamm (2006) agrees that the meaning of popular music resulted from the influence of mass media social environment. He regards popular music the same as other music genre, more attention should be imposed to the cultural level of the music rather than technical level. Furthermore, Hamm thinks that popular music is never independent in any field of music as it always interacts with other form of music for instance the classical music. The point of treating popular music as a low standard of culture is untenable (Hamm cited in Hall 1978).

Two types of music were used in the experiment; fast-paced and slow-paced music. "Mission Impossible" was selected as the fast-paced music whereas "Jurassic World Sonata" was selected as the slow-paced music. Past literature showed fast-paced and slow-paced music were selected as experimental music while familiarity is an important factor in an experiment (Pereira, Teixeira, Figueiredo, Xavier, Castro, & Brattico, 2011). Thus, these two songs were selected due to their popularity among people of all ages apart from the suitable musical structure for this experiment.

"Theme from Mission: Impossible" song is the soundtrack from the movie "Mission: Impossible". There are 5 arrangements of the same song, all ranging from 2 to 5 minutes. To accommodate the experiment time frame, a version of "Theme from Mission: Impossible" with a length of 2'26" was selected. The music was extracted from 1'36" towards the end and edited by repeating the same piece to achieve the exact 2-minute length. The edited song was played in the second post-test.

The song "Theme from Mission: Impossible" is a fast-paced music with a 4/5 time signature. The main rhythm pattern comprises of two quavers and two minims; another rhythm pattern consists of two crotchets with the second one divided into two quavers. The two rhythm patterns overlap to create a tensed atmosphere to the listeners.

“Jurassic World Sonata” played by The Piano Guys, which is a music group well known for their music rearrangement of popular songs, is 4’41” long. The music was extracted from 0’15” to 2’15” for an exact 2-minute length to be played in the first post-test. The song was downloaded from YouTube.

“Jurassic Park Theme” is played with piano and cello. The observation is done according to the fifteen-second interval, such as 0’15” - 0’30” and 0’45” - 1’00”. At 0’15”, there is water sounds in the music. Chords and melody are played with piano too. At 0’19”, cello is played starting from a simple note and they dynamics change from soft to loud gradually. Until 0’41”, the first note changes to the second note. At 0’42”, cello produces the vibrato. Then, the same main melody played in the beginning was played with cello. From 0’53” to 0’54”, cello plays the high pitch. At 1’11”, the note changes to fifth higher playing the same melody accompanied by piano. At 1’22”, piano plays the main melody and cello turns to play the harmony. From 1’39”, cello plays the lower range of notes and the sound becomes deep and loud. At 1’55”, cello plays the main melody in lower range of notes. Next, the song repeats the theme melody.

Past literature showed human behaviors were stimulated by music. The music consists of many elements, such as tonality, melody, rhythm, sound volume, and pitch and so forth. The specified illumination on timing of songs could be a hint for readers who understood the content well. Meanwhile, to reminder the duration of experiment was two minutes. The research hypothesis was that participants’ typing speed and efficiency post-food would be highly affected by exposure to different paced music.

3.5 Procedure

Typing speed is measured using WPM, which stands for Words Per Minute (Tech, 2014). It is a calculation of speed and accuracy of the words typed in minutes. In general, a novice can type around 10 wpm; skilful typist can type 30-60 wpm; professional typist whose job is closely related to mass typing can achieve above 60 wpm. In terms of keystroke, it is assumed that fast typists achieve 125 ms per keystroke while slow typists achieve 750 ms per keystroke. The keystroke is one of the factors that would affect typists, for example, many users hit the “n” key at 221 ms on average and they hit the space bar key at 155 ms (p. 64, as cited in Ritter, Baxter & Churchill, 2014). As Teresia Ostrach (2012), the president of Five Star Staffing Inc., Indicated, half of the general population lacks finger dexterity to type more than 50 wpm. The median typing speed is 38 wpm and the average typing speed is 40 wpm. The typing test website, RankMyTyping.com, examines a person’s typing speed based on online typing tests. Based on the results on RankMyTyping.com, high ranks are taken by secretaries (74 wpm) and the low ranks are taken by average 13-year-old users (23 wpm).

Information of words per minute enables the participants’ typing speed to be measured and calculated. In this study, the final results will be measured based on the letters typed because calculating the words typed might be inaccurate. The provided texts are in English and Malay, and the amount of words differs in the two languages

3.5.1 The 50 Participants in the Experiment

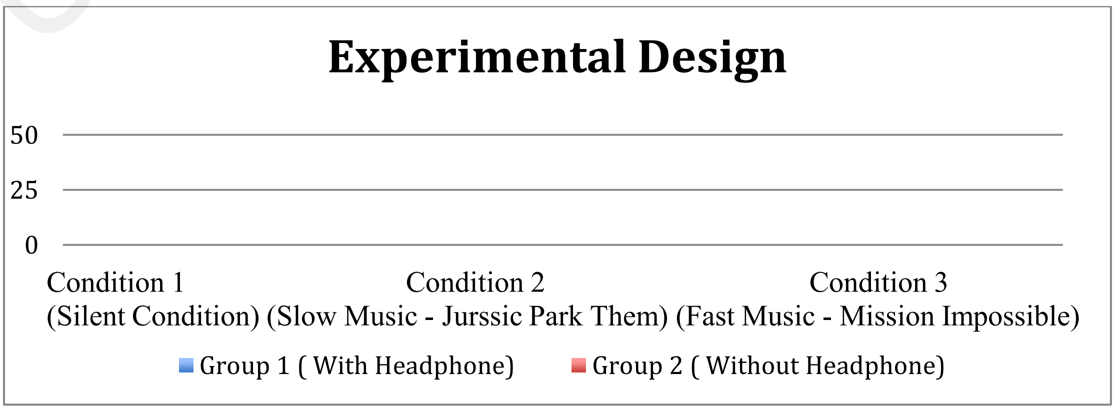

Figure 3.1: Experimental Design

Via a purposive sampling approach, the participants were 50 clerical workers who work full-time in various companies that were employed in this experiment. Purposive sampling was selected in recruiting subjects who stated problems of postprandial somnolence after a meal. Two kinds of popular music were chosen as the independent variable. The subjects were separated into two groups of twenty-five. The participants' typing score in three music conditions was the dependent variable in the experiment. Based on Figure 3.1, subjects were given several pages of text to type and they were required to type as much as they could in two minutes. Each text consisted of 200 to 300 thousand alphanumeric characters at font 12 printed on A4 paper. Each typed character accumulated as 1 point. After the typing score of pre-test was collected, participants went through another typing test with music exposure where typing score was gathered again as a post-test. Music was played via headphones for Group 1 while no headphones was used for the participants in Group 2. This experiment studied the relationship between the independent and dependent variables in both Group 1 and Group 2.

A choice of English or Malay (the national language) text was specified so that the subjects could choose the language that is most familiar to them. The content was chosen from local dailies. The texts prepared were "Ranking Chong Wei: Ramalan Frost Tepat" (Text 1) and "Secret Venice" (Text 2). They were obtained online and enclosed in Appendix A.

3.5.2 Participants in Postprandial Sleepiness

Out of the 50 participants in the first experiment, 28 participants were found to display sleepiness and their data was further analysed. These participants were clerical workers who work full-time in various companies. Two kinds of popular music were chosen as the independent variable. The participants' typing score in three conditions which silent condition, slow music and fast music that became the dependent variable in the experiment. Based on Figure 3.2, participants were given some pages of text to type and they were required to type as much as they could in two minutes. Each text contained 200 to 300 thousand alphanumeric characters at font 12 printed on A4 paper. Each typed character contributed as 1 point. After the typing score of pre-test was collected, participants went through another typing test with music intervention where typing score was gathered again as a post-test. This subsequent experiment examined the relationship between the music intervention and the typing score.

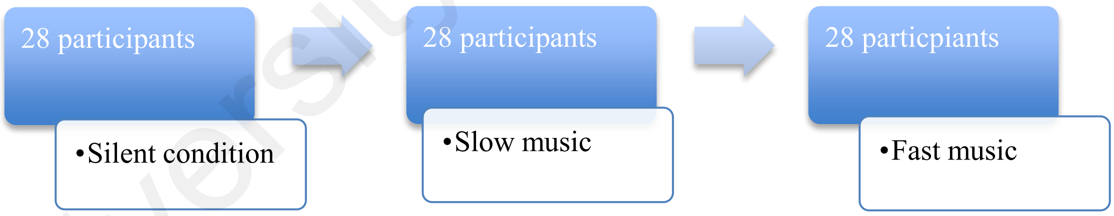

Figure 3.2: Experimental Procedure

3.5.3 Sessions

Each participant went through two sessions: pre- and post-tests.

1) In the first stage, participants' typing score was recorded in a silent condition.

2) In the second stage, a music intervention was added where a slow music was played in the background. Group 1 attended to the slow music using headphones whereas Group 2 listened to the music without using headphones. The participants' typing score was gathered.

3) In the third stage, fast music was played in the background. Group 1 listened to the fast music using headphones and Group 2 listened without using headphones. Then, the participants' typing score was gathered.

The experiment was done from 12:30pm to 3:30pm to accommodate the participants' lunch time and to examine their typing score in postprandial somnolence. In the first stage, subjects were specified 2 minutes to type their selection of text in a silent condition. In the second stage, participants were given 2 minutes to type the text as well, only with slow music being played in the background throughout the test. Next, in the third stage, participants were given 2 minutes in the typing test with fast music being played in the background. Typing speed, facial expression and body movement were recorded in all 3 stages. After that, the data was entered to SPSS and results were analysed.

The participants experienced each session once only. After the sessions, they were required to fill in a questionnaire. Contacting the participants was not allowed after the experiment to protect their privacy.

3.6 Analysis

Analysis is essential to explain any kind of situation (Moore, 2003). Analysis is an approach that breaks a compound subject or splits a text into smaller parts to better understand it. After the experiment, subjects were required to fill in a questionnaire which included the Likert Scale. The Likert scale is based on a points system, basing strongly disagree as 1, disagree as 2, neutral as 3, agree as 4, and strongly agree as 5. Based on the typing score, observation and questionnaires, the similarities and differences between the two groups of participants were presented in the analysis.

3.7 Equipment

A MacBook Pro has been used to type in the experiment and search for information for the study. Meanwhile, the SPSS software was installed in the laptop for analysis.

Figure 3.3: MacBook Pro (Picture taken from http://image.baidu.com/)

Next, this is the headphone used by the participants of Group 1 in the experiment.

Figure 3.4: Sony MDR-S70AP/S40 (Picture taken from http://image.baidu.com/)

3.8 Pilot Test

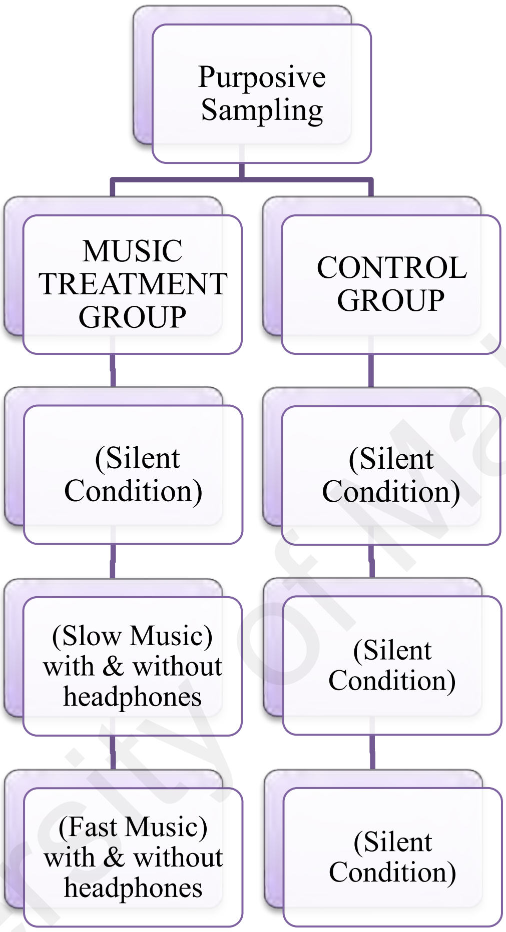

Figure 3.5: Pilot Design

There were six participants in the pilot test and they were identified as Participant A, B, C, D, E and F. Participant A, B, C and D belonged to the Music Treatment Group; Participant E and F belonged to the Control Group. According to Figure 3.5, the participants went through silent condition, slow music and fast music accordingly. The two types of popular music, which are slow music "Jurassic World Sonata" and fast music "Mission Impossible", were chosen as the independent variable. The participants' typing score in three conditions became the dependent variable in the experiment.

Participants were given several pages of text to type. They were required to type as much as they could in two minutes. Each text consisted of 200 to 300 thousands alphanumeric characters at font 12 printed on A4 size paper. Each typed character contributed as 1 point. The typing score achieved by each participant was the dependent variable to examine the effects of selected music on task performance when participants listened to music using and without using headphones.

After the typing score of silent condition was collected, participants in the Music Treatment Group were exposed to slow and fast music with and without the use of headphones. On the other hand, participants in the Control Group completed Post-test 1 and 2 in the silent condition. This experiment studied the relationship between the independent and dependent variables in both Music Treatment Group and Control Group.The following section records the data collected based on observation and questionnaire.

3.8.1 Data Collected Based on Observation

Participants' typing speed, facial expression and body movements throughout the tests have been observed. They were recorded according to the timing of observation, which was at every fifteen-second interval. In term of past literature that indicated human behaviors were affected by psychological and physiological factors all participants were observed and a combination with the respond of the questionnaires were analysed.

3.8.1.1 Silent Condition

Table 3.1: Participants A on Silent Condition

Timing	(Typing Speed)	(Facial Expression)	(Body Movement)

00’’-15’’	40characters	Tension	Regular Typing
15’’-30’’	42characters	Tension	Typing Fast
30’’-45’’	36characters	Normal	Regular Typing

Table 3.1, continued

45’’-60’’	31 characters	Tension	Regular Typing
60’’-75’’	35characters	Normal	Typing Slow
75’’-90’’	32characters	Relaxation	Typing Fast (Lean Forward)
90’’-105’’	24characters	Relaxation	Typing Fast (Lean Forward)
105’’-120’’	27characters	Normal	Regular Typing

Table 3.1 showed that Participant A typed 150 characters in the first minute and 119 characters in the second minute on silent condition. The participant was seen to be in tension in the typing process. From 75” to 105”, she leaned forward while typing and the typing speed became fast.

Table 3.2: Participant B on Silent Condition

Timing	(Typing Speed)	(Facial Expression)	(Body Movement)
00’’-15’’	23characters	Relaxation	Typing Slow
15’’-30’’	17characters	Relaxation	Typing Slow
30’’-45’’	30characters	Normal	Typing Slow
45’’-60’’	30characters	Normal	Regular Typing
60’’-75’’	23characters	Normal	Typing Slow
75’’-90’’	30characters	Relaxation	Typing Slow
90’’-105’’	30characters	Normal	Typing Fast
105’’-120’’	32characters	Normal	Typing Fast

According to Table 3.2, it was observed that Participant B typed 100 characters in the first minute and 115 characters in the second minute on silent condition. He was constantly relaxed while typing. Gradually, his typing speed became faster than the beginning of the test. His body movement changed based on his typing speed.

Table 3.3: Participant C on Silent Condition

Timing	(Typing Speed)	(Facial Expression)	(Body Movement)
00’’-15’’	34characters	Tension	Typing Fast
15’’-30’’	48characters	Tension	Typing Fast
30’’-45’’	39characters	Relaxation	Regular Typing
45’’-60’’	42characters	Tension	Regular Typing
60’’-75’’	31characters	Normal	Typing Slow
75’’-90’’	42characters	Tension	Typing Fast (Lean Forward)
90’’-105’’	39characters	Relaxation	Typing Fast (Lean Forward)
105’’-120’’	65characters	Tension	Typing Fast

The results in Table 3.3 showed that Participant C typed 163 characters in the first minute and 177 characters in the second minute. Her typing speed became faster gradually from 00” to 60”. With a slightly slow typing speed from 60” to 75”, her typing speed improved from 75” onwards. Once she leaned forward while typing, she appeared to be tensed and her typing speed increased to 65 characters by the end of the test.

Table 3.4: Participant D on Silent Condition

Timing	(Typing Speed)	(Facial Expression)	(Body Movement)
00’’-15’’	36characters	Normal	Regular Typing
15’’-30’’	34characters	Tension	Typing Fast
30’’-45’’	37characters	Normal	Regular Typing
45’’-60’’	39characters	Normal	Regular Typing
60’’-75’’	8characters	Relaxation	Typing Slow
75’’-90’’	34characters	Normal	Typing Fast (Lean Forward)
90’’-105’’	18characters	Normal	Typing Fast (Lean Forward)
105’’-120’’	47characters	Normal	Typing Fast

Next, Table 3.4 presented that Participant D typed 146 characters in the first minute and 107 characters in the second minute. His facial expression showed tension from 15” to 30”. When he leaned forward while typing from 75” to 90”, he did not look tensed and his typing speed increased.

Table 3.5: Participant E on Silent Condition

Timing	(Typing Speed)	(Facial Expression)	(Body Movement)
00’’-15’’	44characters	Relaxation	Regular Typing
15’’-30’’	48characters	Tension	Leaned Forward
30’’-45’’	43characters	Tension	Regular Typing
45’’-60’’	48characters	Normal	Regular Typing
60’’-75’’	35characters	Normal	Typing Slow
75’’-90’’	40characters	Tension	Regular Typing
90’’-105’’	39characters	Normal	Regular Typing
105’’-120’’	49characters	Normal	Regular Typing

Table 3.5 showed that Participant E typed 183 characters in the first minute and 163 characters in the second minute. From observation, it was found that she typed faster when she was tensed, as seen from 15” to 45”.

Table 3.6: Participant F on Silent Condition

Timin	(Typing Speed)	(Facial Expression)	(Body Movement)
00’’-15’’	28characters	Relaxation	Regular Typing
15’’-30’’	38characters	Tension	Leaned Forward
30’’-45’’	33characters	Normal	Regular Typing
45’’-60’’	29characters	Normal	Regular Typing
60’’-75’’	33characters	Tension	Regular Typing
75’’-90’’	34characters	Normal	Regular Typing
90’’-105’’	40characters	Tension	Leaned Forward
105’’-120’’	36characters	Normal	Leaned Forward

Table 3.6 indicated that Participant F typed 128 characters in the first minute and 143 characters in the second minute. From 15” to 30”, she leaned forward when she was in tension. Then, she was seen to type faster.

3.8.1.2 Slow Music

In slow condition, the participants of Music Treatment Group first listened to music using headphones while typing; then, they listened to music without using headphones in the typing process. Slow music “Jurassic World Sonata” was played in the background in this post-test. On the other hand, for the Control Group, participants’ typing speed was tested in a silent condition.

Table 3.7: Participant A with Slow Music

Timing		Typing Speed	Facial Expression	Body Movement
00’’-15’’	Without headphones	32 characters	Normal	Regular Typing
	With headphone	38 characters	Normal	Regular Typing
15’’-30’’	Without headphones	34 characters	Relaxation	Regular Typing
	With headphone	33 characters	Normal	Regular Typing
30’’-45’’	Without headphones	27 characters	Normal	Regular Typing
	With headphone	29 characters	Relaxation	Regular Typing
45’’-60’’	Without headphones	32 characters	Normal	Regular Typing
	With headphone	21 characters	Relaxation	Regular Typing
60’’-75’’	Without headphones	36 characters	Relaxation	Regular Typing
	With headphone	36 characters	Relaxation	Regular Typing
75’’-90’’	Without headphones	26 characters	Sleepiness	Regular Typing
	With headphone	26 characters	Relaxation	Regular Typing
90’’-105’’	Without headphones	17 characters	Sleepiness	Regular Typing
	With headphone	31 characters	Relaxation	Regular Typing
105’’-120’’	Without headphones	17 characters	Sleepiness	Regular Typing
	With headphone	27 characters	Normal	Regular Typing

Table 3.7 showed that Participant A typed 125 characters in the first minute and 96 characters in the second minute when she was exposed to music without using headphones. When she used headphones, she typed 121 characters in the first minute and 120 characters in the second minute.

When comparing music played with and without the use of headphones, there was no significant difference in the first minute. However, Participant A's typing speed was faster while she listened to music using headphones in the second minute. As shown in the results, music volume produced with and without headphones was able to affect the typing speed. However, due to insufficient time of the test, observation in body movement was not available. It was proven that listening to music using headphones benefits people in sleepy condition.

Table 3.8: Participant B with Slow Music

Timing		Typing Speed	Facial Expression	Body Movement
00''-15''	Without headphones	17 characters	Relaxation	Regular Typing
	With headphone	37 characters	Relaxation	Regular Typing
15''-30''	Without headphones	34 characters	Relaxation	Regular Typing
	With headphone	30 characters	Relaxation	Regular Typing
30''-45''	Without headphones	18 characters	Relaxation	Regular Typing
	With headphone	24 characters	Relaxation	Regular Typing
45''-60''	Without headphones	29 characters	Relaxation	Regular Typing
	With headphone	26 characters	Relaxation	Regular Typing
60''-75''	Without headphones	31 characters	Relaxation	Regular Typing
	With headphone	23 characters	Relaxation	Regular Typing

According to Table 3.8, while listening to music without using headphones, Participant B typed 98 characters in the first minute; while listening to music using headphones, he typed 117 characters in the first minute. This showed that his typing speed was faster when he listened to music with headphones. From 00" to 15", the difference of typing speed was 20 characters between listening with and without the use of headphones. Participant B has been relaxed all the time and he sometimes leaned forward while typing.

Table 3.9: Participant C with Slow Music

Timing		Typing	Facial	Body Movement

		Speed	Expression	
00’’-15’’	Without headphones	44 characters	Relaxation	Regular Typing
	With headphone	50 characters	Tension	Regular Typing
15’’-30’’	Without headphones	20 characters	Relaxation	Lean Forward
	With headphone	28 characters	Tension	Regular Typing
Table 3.9, continued				
30’’-45’’	Without headphones	52 characters	Tension	Regular Typing
	With headphone	36 characters	Normal	Regular Typing
45’’-60’’	Without headphones	43 characters	Tension	Regular Typing
	With headphone	30 characters	Relaxation	Lean Back
60’’-75’’	Without headphones	49 characters	Tension	Regular Typing
	With headphone	43 characters	Tension	Regular Typing
75’’-90’’	Without headphones	21 characters	Normal	Regular Typing
	With headphone	40 characters	Normal	Regular Typing
90’’-105’’	Without headphones	42 characters	Relaxation	Regular Typing
	With headphone	35 characters	Normal	Regular Typing
105’’-120’’	Without headphones	---	---	---
	With headphone	40 characters	Relaxation	Regular Typing

Table 3.9 showed that Participant C typed 163 characters when she listened to music without headphones in the first minute; and typed 115 characters in the second minute. From 105” to 120”, she stopped typing and no results could be recorded. Meanwhile, when she listened to music with headphones, she typed 146 characters in the first minute and 161 characters in the second minute. The result displayed that her typing speed was better when she listened to music without headphones. The results of the second minute could not be compared due to loss of information. Results also showed that the music volume affected her typing speed.

Table 3.10: Participant D with Slow Music

Timing		Typing Speed	Facial Expression	Body Movement
00’’-15’’	Without headphones	38 characters	Relaxation	Regular Typing
	With headphone	17 characters	Sleepiness	Regular Typing
15’’-30’’	Without headphones	35 characters	Tension	Leaned Forward
	With headphone	50 characters	Sleepiness	Regular Typing
30’’-45’’	Without headphones	30 characters	Tension	Regular Typing
	With headphone	35 characters	Normal	Leaned Forward
45’’-60’’	Without headphones	34 characters	Normal	Regular Typing

	With headphone	35 characters	Normal	Regular Typing
60’’-75’’	Without headphones	44 characters	Relaxation	Typing Fast
	With headphone	20 characters	Normal	Regular Typing
75’’-90’’	Without headphones	37 characters	Relaxation	Regular Typing
	With headphone	30 characters	Normal	Leaned Forward
Table 3.10, continued				
90’’-105’’	Without headphones	34 characters	Relaxation	Regular Typing
	With headphone	50 characters	Normal	Regular Typing
105’’-120’’	Without headphones	32 characters	Normal	Regular Typing
	With headphone	20 characters	Sleepiness	Regular Typing

Table 3.10 showed that Participant D typed 137 characters in the first minute and 147 characters in the second minute when he was exposed to music without the use of headphones. With headphones, he typed 137 characters in the first minute and 120 characters in the second minute. His typing speed was not stable when he listened to music with headphones. Sleepiness was the reason that his typing speed was not consistent. Furthermore, his typing speed was affected by music volume too because listening to music with and without headphones was different.

Table 3.11: Participant E on Silent Condition

Timing	Typing Speed	Facial Expression	Body Movement
00’’-15’’	26 characters	Normal	Regular Typing
15’’-30’’	33 characters	Normal	Regular Typing
30’’-45’’	28 characters	Normal	Regular Typing
45’’-60’’	33 characters	Normal	Regular Typing
60’’-75’’	36 characters	Normal	Regular Typing
75’’-90’’	34 characters	Normal	Regular Typing
90’’-105’’	37 characters	Normal	Regular Typing
105’’-120’’	30 characters	Normal	Regular Typing

Table 3.11 displayed the results of Participant E’s Post-test 1 which was done in a silent condition. She typed 120 characters in the first minute and 137 characters in the second minute. No significant facial expression and body movement have been observed.

Table 3.12: Participant F on Silent Condition

Timing	Post-test 1 Typing Speed	Post-test 1 Facial Expression	Post-test 1 Body Movement
00''-15''	26 characters	Normal	Regular Typing
15''-30''	47 characters	Normal	Regular Typing
30''-45''	36 characters	Normal	Regular Typing
45''-60''	37 characters	Normal	Regular Typing
60''-75''	31 characters	Normal	Regular Typing
75''-90''	36 characters	Normal	Regular Typing
90''-105''	25 characters	Normal	Regular Typing
105''-120''	40 characters	Normal	Regular Typing

Table 3.12 showed the results of Participant F's Post-test 1 which was done in a silent condition. She typed 146 characters in the first minute and 142 characters in the second minute. There was no difference in her facial expression and body movement too.

3.8.1.3 Fast Music

In fast condition, the participants of Music Treatment Group first listened to fast music using headphones while typing; secondly, they listened to music without using headphones when they typed. Fast music "Mission Impossible" was played in the background in the test. On the other hand, for the Control Group, participants' typing speed was tested in a silent condition again.

Table 3.13: Participant A with Fast Music

Timing		Typing Speed	Facial Expression	Body Movement
00''-15''	With headphones	22 characters	Relaxation	Regular Typing
	Without headphone	35 characters	Normal	Regular Typing
15''-30''	With headphones	20 characters	Relaxation	Leaned Forward
	Without headphone	27 characters	Normal	Regular Typing
30''-45''	With headphones	36 characters	Tension	Typing Fast
	Without headphone	36 characters	Normal	Regular Typing

45’’-60’’	With headphones	45 characters	Normal	Regular Typing
	Without headphone	35 characters	Normal	Regular Typing
Table 3.13, continued				
60’’-75’’	With headphones	39 characters	Normal	Regular Typing
	Without headphone	45 characters	Normal	Regular Typing
75’’-90’’	With headphones	20 characters	Relaxation	Regular Typing
	Without headphone	25 characters	Normal	Leaned Forward
90’’-105’’	With headphones	20 characters	Relaxation	Regular Typing
	Without headphone	39 characters	Normal	Regular Typing
105’’-120’’	With headphones	20 characters	Relaxation	Regular Typing
	Without headphone	20 characters	Normal	Regular Typing

According to Table 3.13, while listening to music with headphones, Participant A typed 123 characters in the first minute and 99 characters in the second minute. When listening to music without using headphones, she typed 133 characters in the first minute and 129 characters in the second minute. The results indicated that her typing speed was better when she listened to music without headphones.

Whereas, the participant mentioned that listening to music with headphones helped her to concentrate better in the typing process after the test. Moreover, music played at loud volume could increase her typing performance. This phenomenon appeared in the second minute.

Table 3.14: Participant B with Fast Music

Timing		Post-test 2 Typing Speed	Post-test 2 Facial Expression	Post-test 2 Body Movement
00’’-15’’	With headphones	33 characters	Relaxation	Regular Typing
	Without headphone	20 characters	Relaxation	Regular Typing
15’’-30’’	With headphones	28 characters	Relaxation	Regular Typing
	Without headphone	36 characters	Relaxation	Regular Typing
30’’-45’’	With headphones	27 characters	Relaxation	Regular Typing
	Without headphone	44 characters	Relaxation	Regular Typing
45’’-60’’	With headphones	24 characters	Relaxation	Regular Typing
	Without headphone	32 characters	Relaxation	Regular Typing
60’’-75’’	With headphones	24 characters	Relaxation	Regular Typing

	Without headphone	30 characters	Relaxation	Regular Typing

In Post-test 2, Participant B did not complete the test because he accidentally dropped the paper of the printed text on the floor, causing the test to end by 75”. From Table 3.14, it was seen that he typed 136 words throughout the 75-second test when music was played with the use of headphones. He typed 168 characters throughout the test when he listened to music without using headphones. Based on the results, Participant B was discovered to type faster when he listened to music without the use of headphones.

Table 3.15: Participant C with Fast Music

Timing		Post-test 2 Typing Speed	Post-test 2 Facial Expression	Post-test 2 Body Movement
00’’-15’’	With headphones	41 characters	Normal	Regular Typing
	Without headphone	45 characters	Normal	Regular Typing
15’’-30’’	With headphones	46 characters	Tension	Regular Typing
	Without headphone	43 characters	Normal	Regular Typing
30’’-45’’	With headphones	35 characters	Tension	Regular Typing
	Without headphone	50 characters	Normal	Regular Typing
45’’-60’’	With headphones	51 characters	Tension	Regular Typing
	Without headphone	54 characters	Normal	Regular Typing
60’’-75’’	With headphones	52 characters	Normal	Regular Typing
	Without headphone	40 characters	Normal	Regular Typing
75’’-90’’	With headphones	44 characters	Normal	Regular Typing
	Without headphone	29 characters	Normal	Regular Typing
90’’-105’’	With headphones	52 characters	Tension	Regular Typing
	Without headphone	---	---	---

Participant C did not complete the 2-minute test as well. Only typing speed from 00” to 105” was recorded. Table 3.15 showed that Participant C typed 133 characters when she listened to music with headphones; and she managed to type 192 characters when she listened to music without headphones in the first minute. However, in the following thirty seconds, she was found to type 96 characters when she listened to music with headphones and 69 characters when she listened to music without headphones. It was proven that listening to music with headphones benefited Participant C in her typing performance.

Table 3.16: Participant D with Fast Music

Timing		Typing Speed	Facial Expression	Body Movement
00''-15''	With headphones	45 characters	Sleepiness	Regular Typing
	Without headphone	30 characters	Sleepiness	Regular Typing
15''-30''	With headphones	5 characters	Sleepiness	Regular Typing
	Without headphone	31 characters	Sleepiness	Regular Typing
30''-45''	With headphones	44 characters	Sleepiness	Regular Typing
	Without headphone	40 characters	Sleepiness	Regular Typing
45''-60''	With headphones	39 characters	Sleepiness	Regular Typing
	Without headphone	35 characters	Sleepiness	Regular Typing
60''-75''	With headphones	36 characters	Sleepiness	Regular Typing
	Without headphone	29 characters	Sleepiness	Regular Typing
75''-90''	With headphones	45 characters	Sleepiness	Regular Typing
	Without headphone	38 characters	Sleepiness	Regular Typing
90''-105''	With headphones	54 characters	Sleepiness	Regular Typing
	Without headphone	41 characters	Sleepiness	Regular Typing
105''-120''	With headphones	---	---	----
	Without headphone	32 characters	Sleepiness	Regular Typing

From Table 3.16, Participant D typed 133 characters in the first minute and 135 characters in the second minute while listening to music with headphones. Next, when he was exposed to music without headphones, he managed to type 146 characters in the first minute and 140 characters in the second minute. Based on the observation, he seemed sleepy in the typing process. It was also discovered that listening to music with headphones made him type more efficiently. However, his typing speed was better when he listened to music without headphones from 15" to 30".

Table 3.17: Participant E on Silent Condition

Timing	(Typing Speed)	(Facial Expression)	(Body Movement)
00''-15''	20characters	Tension	Regular Typing
15''-30''	41characters	Tension	Leaned Forward

30''-45''	31characters	Tension	Regular Typing
45''-60''	18characters	Relaxation	Regular Typing
60''-75''	26characters	Relaxation	Regular Typing
75''-90''	32characters	Relaxation	Regular Typing
90''-105''	33characters	Relaxation	Regular Typing
105''-120''	33characters	Relaxation	Regular Typing

Table 3.17, continued

In Post-test 2, Participant E completed her typing test in the silent condition. Table 3.17 showed that she typed 110 characters in the first minute and 124 characters in the second minute. Throughout the test, she seemed to be more relaxed from 45" onwards.

Table 3.18: Participant F on Silent Condition

Timing	Typing Speed	Facial Expression	Body Movement
00''-15''	21 characters	Normal	Typing Fast
15''-30''	38 characters	Normal	Typing Fast
30''-45''	29 characters	Normal	Typing Fast
45''-60''	33 characters	Normal	Typing Fast
60''-75''	42 characters	Normal	Typing Fast
75''-90''	30 characters	Relaxation	Typing Fast
90''-105''	47 characters	Relaxation	Typing Fast
105''-120''	28 characters	Relaxation	Typing Fast

According to Table 3.18, in the silent condition, Participant F managed to type 121 characters in the first minute and 147 characters in the second minute. She was only tensed from 30" to 45". However, her body movement showed that she has been typing fast throughout the test.

3.8.2 The Overall Results of Three Conditions

In this section, the overall results of three conditions which silent condition, slow music and fast music will be listed in a table for every participant. This is to view and compare the results more thoroughly.

Table 3.19: Participant A's Overall Results

Silent Condition		150 characters per minute in the first minute
		119 characters in the second minute
Slow Music	With headphone	121 characters in the first minute
	Without headphone	125 characters per minute in the first minute
	With headphones	120 characters in the second minute
	Without headphones	96 characters in the second minute
Fast Music	With headphones	123 characters in the first minute
	Without headphones	133 characters in the first minute
	With headphones	99 characters in the second minute
	Without headphones	129 characters in the second minute

Table 3.19 showed that Participant A had good results in the first minute on the silent condition. Listening to fast music benefited her typing performance regardless listening to music with or without headphones. In the second minute, the results showed that slow music was more beneficial for the participant in her typing performance.

Table 3.20: Participant B's Overall Results

Silent Condition		100 characters in the first minute
		115 characters in the second minute
Slow Music	With headphone	117 characters in the first minute
	Without headphone	98 characters in the first minute
Fast Music	With headphones	112 characters in the first minute
	Without	130 characters in the first minute

	headphones	

Table 3.20 showed that Participant B did well when he listened to fast music in the test. Fast music increased his work efficiency when music was played without headphones throughout the test. Nevertheless, the overall results were incomplete due to unforeseen circumstances in the second minute of the post-tests.

Table 3.21: Participant C's Overall Results

Silent Condition		163 characters in the first minute
		177 characters in the second minute
Slow music	With headphone	144 characters in the first minute
	Without headphone	159 characters in the first minute
	With headphones	158 characters in the second minute
	Without headphones	112 characters in the second minute
Fast music	With headphones	173 characters in the first minute
	Without headphones	192 characters in the first minute

Table 3.21 showed that Participant C was greatly affected by fast music. Fast music made her type more efficiently when she listened to music without headphones in the first minute. Listening to fast music without headphones increased her task performance. Nevertheless, the overall results were incomplete due to unforeseen circumstances in the second minute of the post-tests.

Table 3.22: Participant D's Overall Results

Silent Condition		146 characters in the first minute
		127 characters in the second minute
Slow Music	With headphone	137 characters in the first minute
	Without headphone	137 characters per minute in the first minute
	With	120 characters in the second minute

	headphones	
	Without headphones	147 characters in the second minute
Fast Music	With headphones	133 characters in the first minute
	Without headphones	146 characters in the first minute
	With headphones	135 characters in the second minute
Table 3.22, continued		
	Without headphones	140 characters in the second minute

Table 3.22 indicated that Participant D performed well in the second minute of the test when fast music was played via headphones. Based on the observation, the participant was found to experience sleepiness when he was typing.

Table 3.23: Participant E's Overall Results

Silent Condition	183 characters in the first minute
	163 characters in the second minute
Silent Condition	120 characters in the first minute
	130 characters in the second minute
Silent Condition	110 characters in the first minute

Participant E's typing speed was tested in the silent condition in all three tests. According to Table 3.23, his typing performance decreased hugely. Based on the observation, it was found that she has been in postprandial sleepiness in the post-tests.

Table 3.24: Participant F's Overall Results

Silent Condition	128 characters in the first minute
	143 characters in the second minute
Silent Condition	146 characters in the first minute
	142 characters in the second minute
Silent Condition	121 characters in the first minute
	147 characters in the second minute

Table 3.24 displayed that there were no difference in Participant F's results in these three conditions. On the silent condition, she did well in the second minute.

In conclusion, it was found that participants' typing speed decreased from the silent condition, and with slow music. Fast music was discovered to be more beneficial for the participants compared to slow music and silent condition in the typing process.

3.8.3 Data Collected from Questionnaires for Pilot Study

The section includes the results of questionnaire in diagrams. In addition, the results were analysed by the SPSS software.

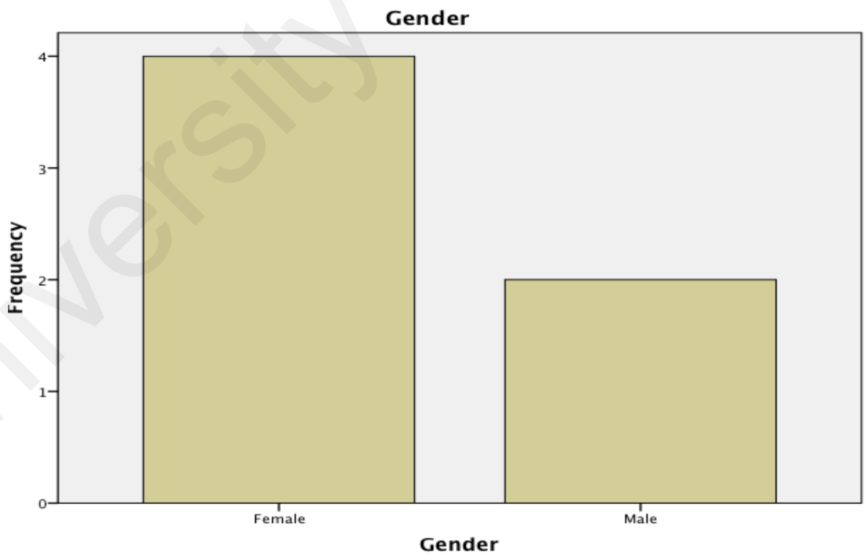

Figure 3.6: Analysis of Questionnaires (Gender)

From Figure 3.6, there were four female participants and two male participants in this pilot test.

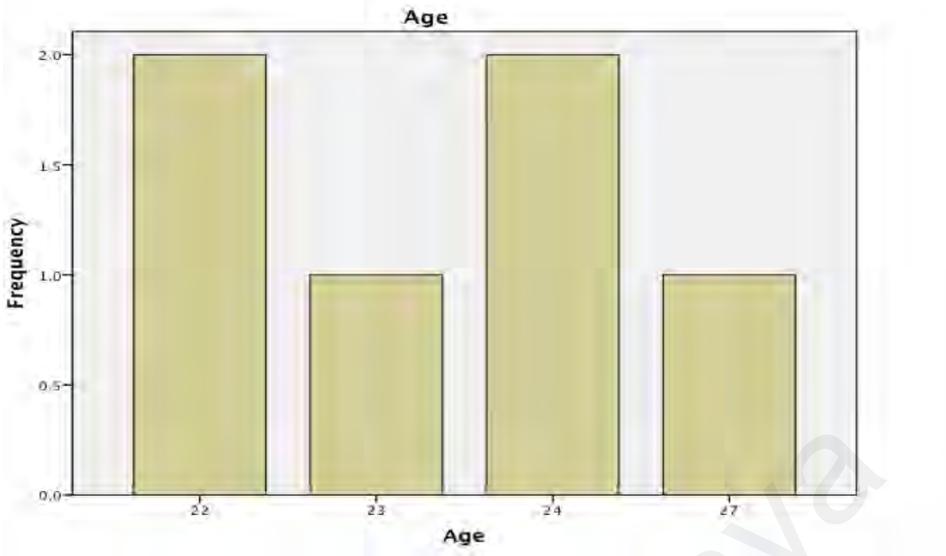

Figure 3.7: Analysis of Questionnaires (Age)

Figure 3.7 showed the age group of the participants. Their age ranges from 22 to 27.

Figure 3.8: Analysis Questionnaires (Experience)

Among the participants, four of them have typing experience of 1 to 5 years. The other participant has experience of 11 to 15 years. There was another participant who has experience of above 16 years.

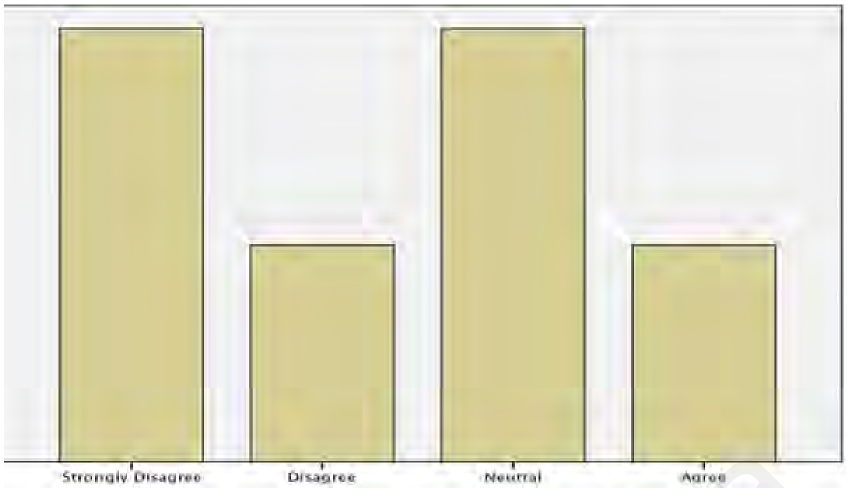

Figure 3.9: Responses to the question “Are you feeling sleepy after you have taken your lunch in pre-test?”

Figure 3.9 showed the participants’ responses to the question “Are you feeling sleepy after you have taken your lunch in pre-test”. Three participants disagreed with the question, meaning that they did not feel sleepy in the pre-test. The other one agreed that he/she experienced sleepiness throughout the test. However, two participants remained neutral in the question. The results indicated that participants were in postprandial somnolence in the test.

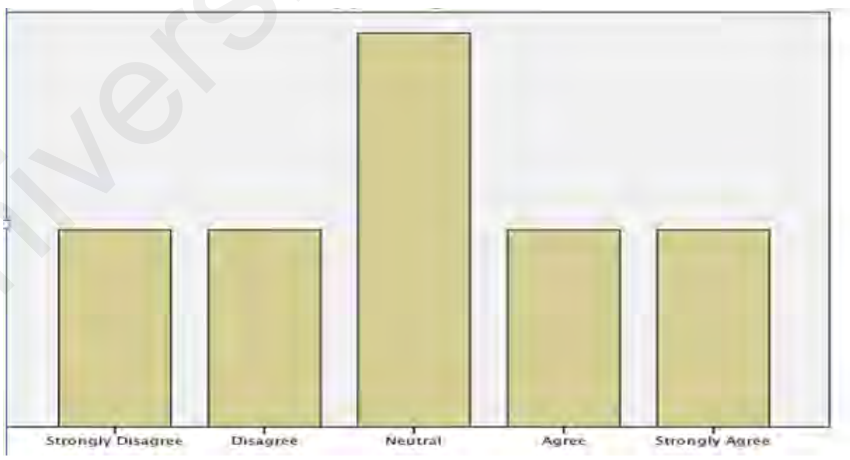

Figure 3.10: Responses to the question “Do you feel sleepy during the pre-test?”

Among the responses to the question “Do you feel sleepy during the pre-test”, Figure 3.10 showed that two participants selected “neutral”. A participant strongly disagreed and another participant disagreed with the question. The two remaining participants agreed that they felt sleepy during the pre-test. The results indicated that participants experienced postprandial sleepiness during the pre-test.

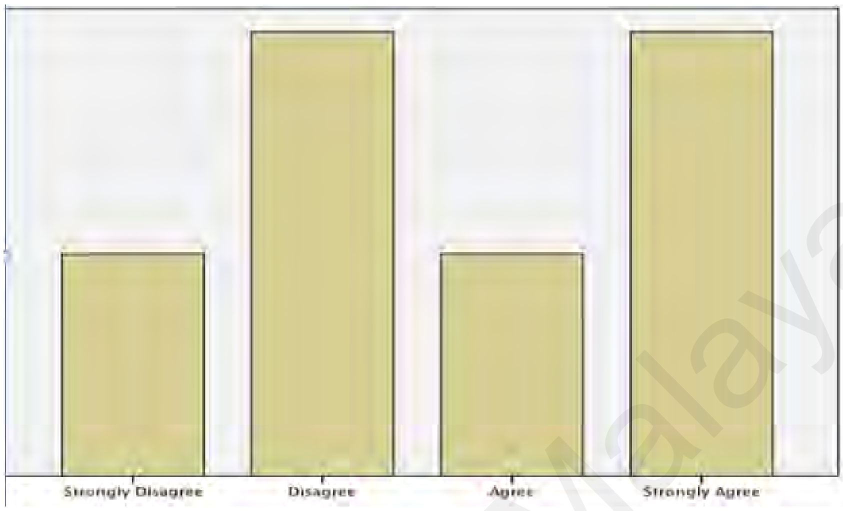

Figure 3.11: Responses to the question "Do you feel sleepy after the pre-test?"

From Figure 3.11, half of the participants agreed that they felt sleepy after the pre-test. On the contrary, the remaining three participants disagreed that they experienced postprandial somnolence after the pre-test.

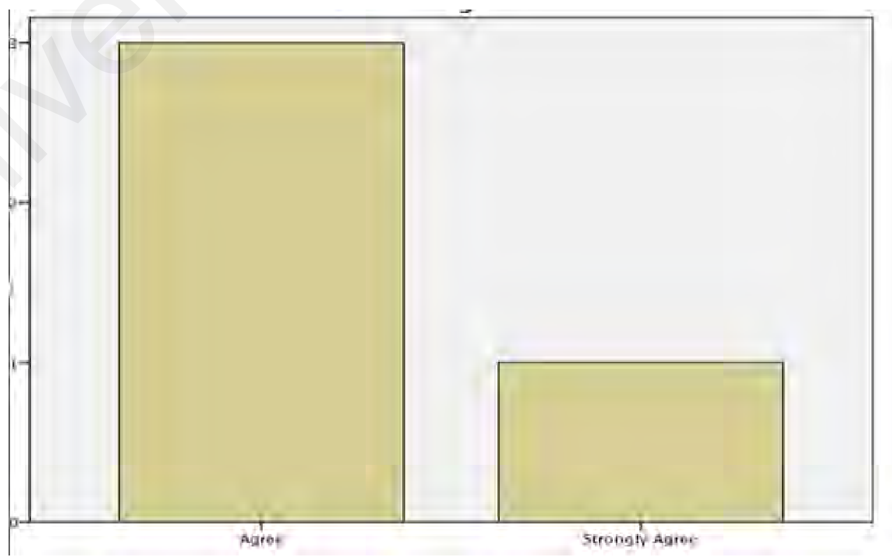

Figure 3.12: Responses to the question "Music helps me to feel more energetic in the process of typing in post-test."

For the question "Music helps me to feel more energetic in the process of typing in the post-test", only four participants were required to respond because the other two participants were only test in silent condition. From Figure 3.12, among the four participants, three of them agreed that music helped them feel more energetic in the process of typing. The remaining participant selected "strongly agree".

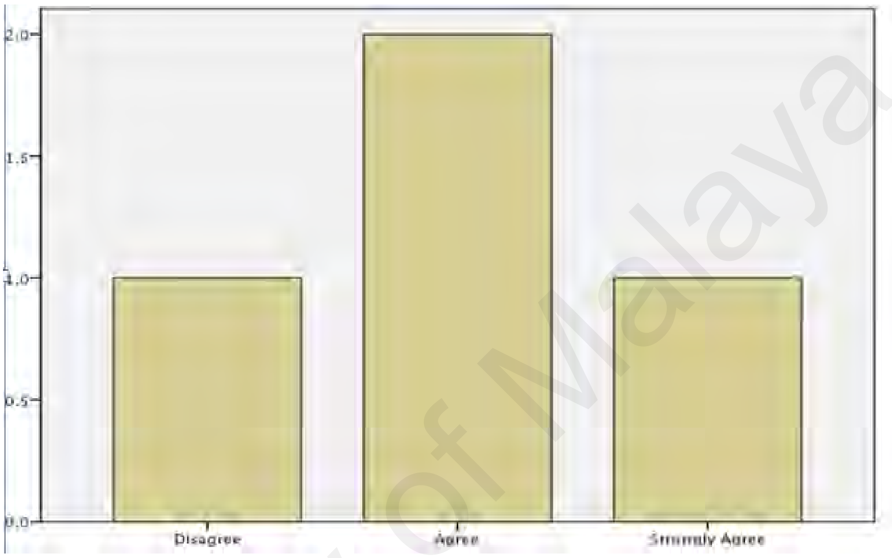

Figure 3.13: Responses to the question "Fast music compared to slow music helps to deliver better concentration in the process of typing in post-test."

Only four participants were required to answer this question. As seen in Figure 3.13, a participant strongly agreed that fast music helps to deliver better concentration in the process of typing. Another two participants also agreed with it. However, the remaining participant disagreed with the statement.

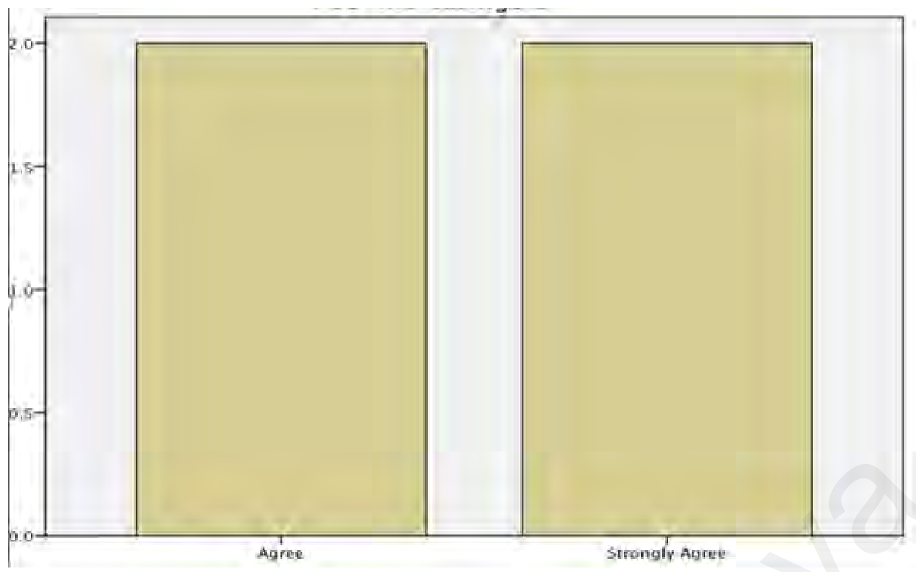

Figure 3.14: Responses to the question "Fast music compared to slow music can help in increasing typing speed in the post-test."

Only the participants of the Music Treatment Group were required to respond to this question. Figure 3.14 showed that all of them agreed that fast music can help increase their typing speed in the post-test. Particularly, two of them selected "agree" and another two selected "strongly agree".

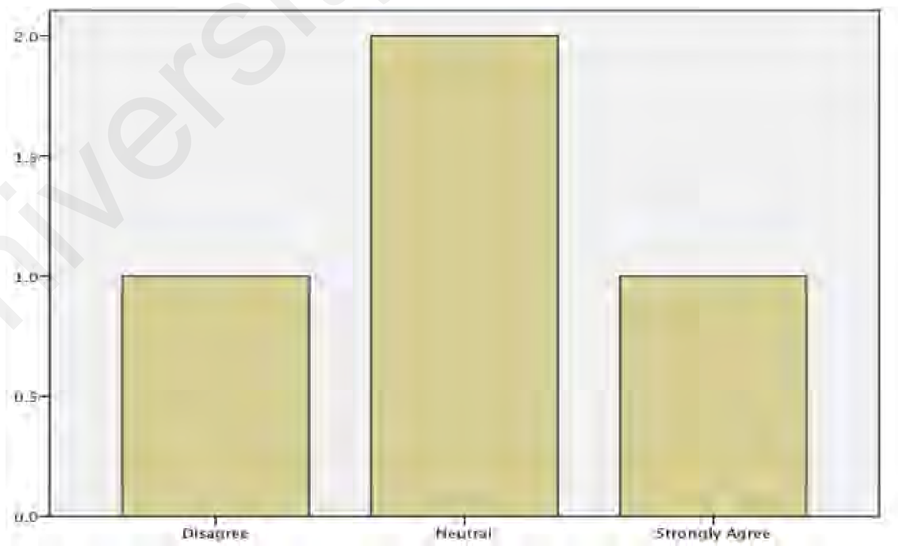

Figure 3.15: Responses to the question "Slow music compared to fast music helps to deliver better concentration in the process of typing in the post-test."

This question was only prepared for the participants in the Music Treatment Group. According to Figure 3.15, a participant strongly agreed that slow music provided better concentration than fast music did in the process of typing in the post-test. Two participants remained neutral in this question. Nevertheless, a participant disagreed with the statement.

Figure 3.16: Responses to the question “Slow music compared to fast music can help in increasing typing speed in the post-test.”

Similarly, there were only four respondents to this question. Figure 3.16 showed that none of the participants agreed that slow music could help increase typing speed in the post-test. However, three participants selected “disagree” and the other one remained neutral in the question.

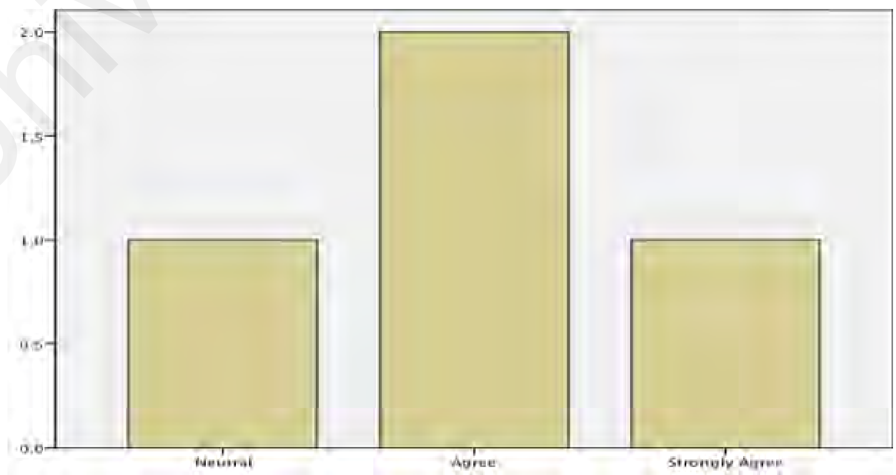

Figure 3.17: Responses to the question “Slow music makes me relax when I am typing in post-test.”

There were four responses to this question as well. From Figure 3.17, the results showed that three participants agreed that slow music relaxed them when they were typing in the post-test. Nevertheless, a participant selected "neutral" in the question.

Figure 3.18: Responses to the question "I feel different with the presence of music during typing in post-test."

From Figure 3.18, all four participants agreed that they felt different with the presence of music during typing in the post-test.

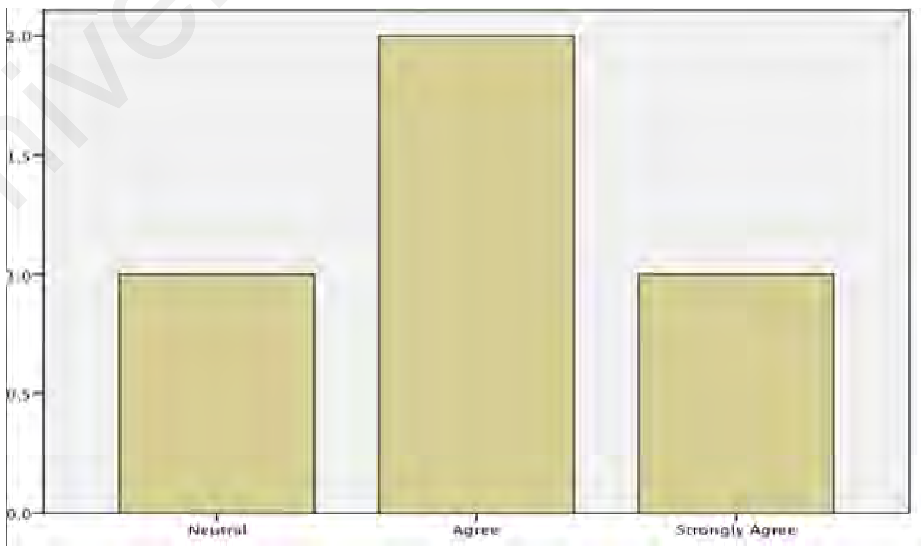

Figure 3.19: Responses to the question "Listening to music with headphones helps me to increase my typing speed in post-test."

Among the four responses, two participants agreed that listening to music with headphones helped increase their typing speed in the post-test. Meanwhile, a participant strongly agreed with it. The remaining participant remained neutral.

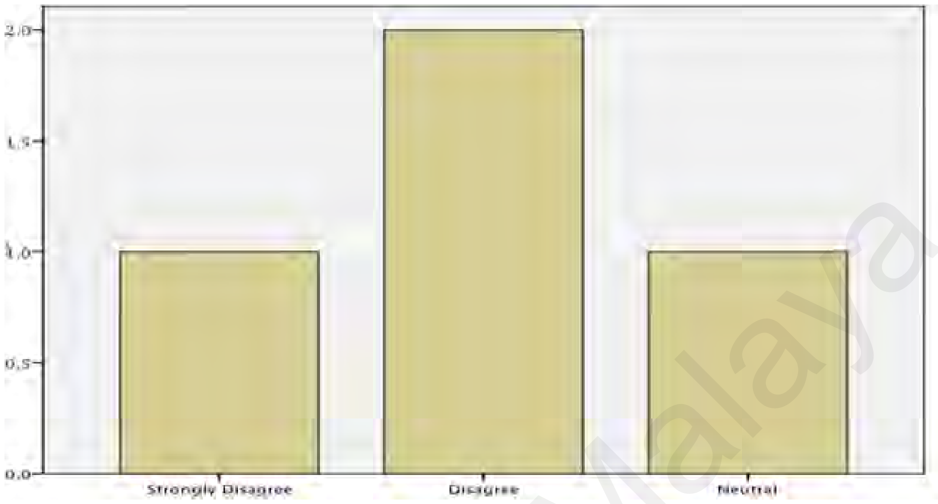

Figure 3.20: Responses to the question "Listening to music without headphones helps me to increase my typing speed."

Figure 3.20 showed that none of the participants selected "agree" to the question "Listening to music without headphones helps me to increase my typing speed". Among the four responses, three disagreed with the question and one remained neutral.

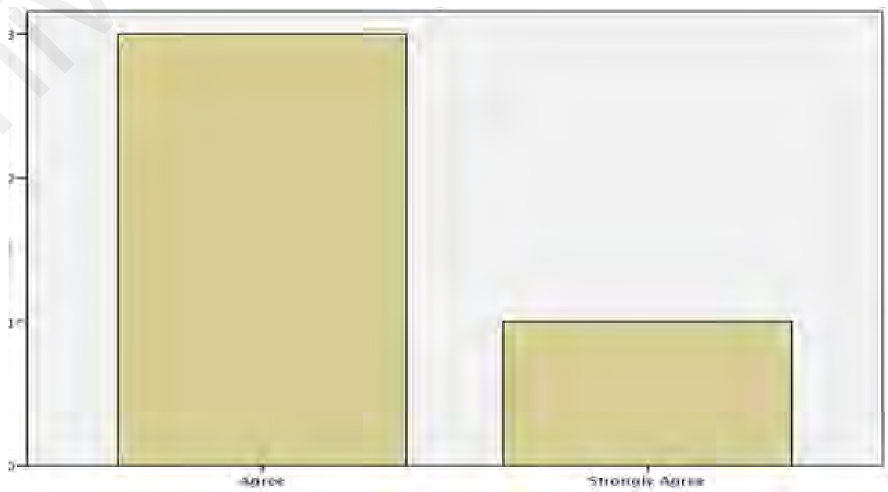

Figure 3.21: Responses to the question "Listening to music with headphones improves concentration during typing."

According to Figure 3.21, all participants agreed that listening to music with headphones improved their concentration when they were typing. Particularly, one of them expressed that he/she strongly agreed with the statement.

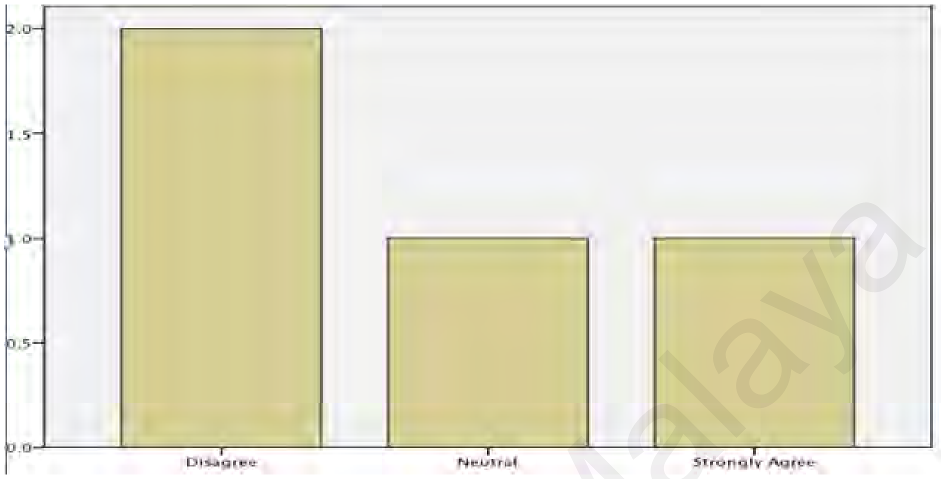

Figure 3.22: Responses to the question "Listening to music without headphones improves concentration during typing."

Figure 3.22 showed that two participants disagreed that listening to music without headphones improved concentration during typing. One of the participants remained neutral. The other participant strongly agreed with it.

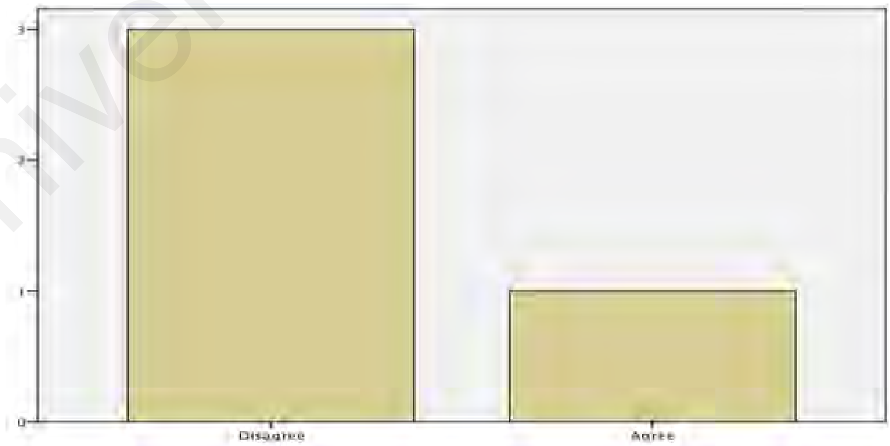

Figure 3.23: Responses to the question "Listening to loud music with headphones, compared to small volume helps to concentrate during the process of typing."

From Figure 3.23, three participants disagreed that listening to loud music with headphones helped them concentrate in the typing process. This indicated that only one participant agreed that loud music helped increase concentration in the typing test.

Figure 3.24: Responses to the question "Listening to loud music without headphones, compared to small volume helps to concentrate during the process of typing."

Figure 3.24 presented that all participants disagreed with this statement. They felt that listening to loud music without headphones did not help them concentrate while typing.

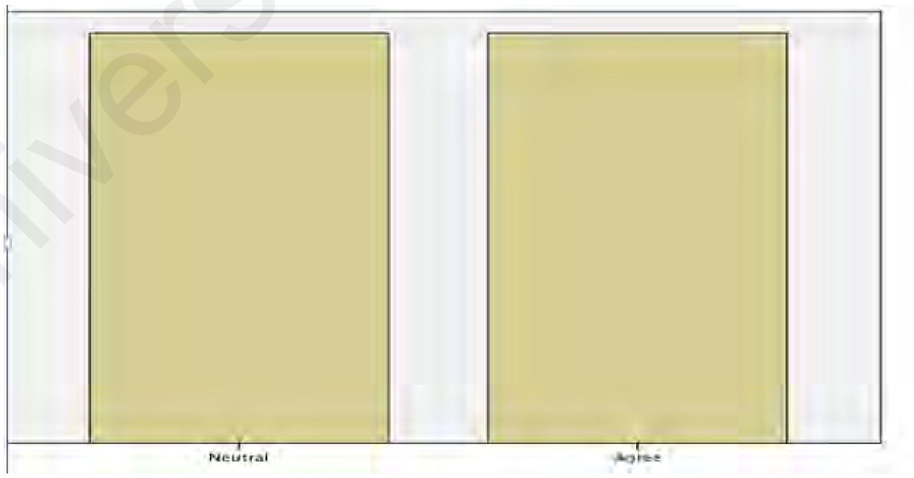

Figure 3.25: Responses to the question "Fast music makes me nervous when I am typing."

From Figure 3.25, two participants selected "neutral" in this question. Another two participants agreed that fast music made them nervous when they were typing.

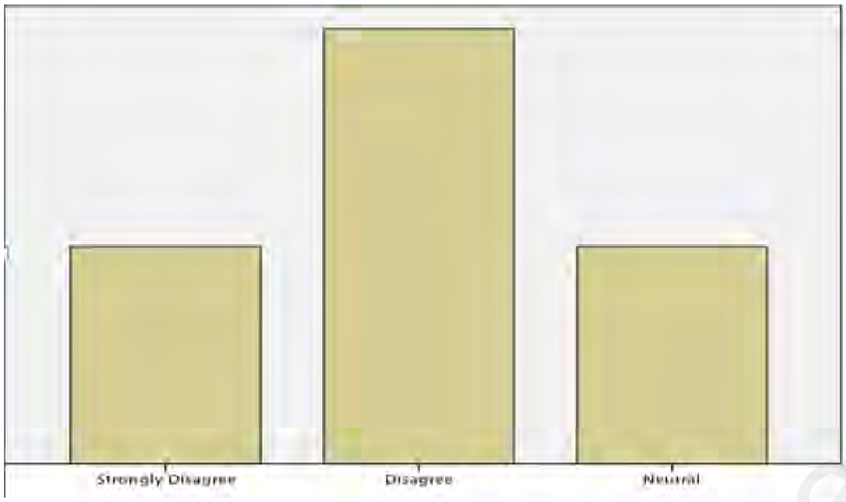

Figure 3.26: Responses to the question “Listening to music decreases my concentration during typing compared to my usual working environment in post-test.”

According to Figure 3.26, three participants disagreed that listening to music decreases their concentration while typing compared to their usual working environment. Nevertheless, a participant selected “neutral” in the question.

Figure 3.27: Responses to the question “I feel relax typing with the presence of music.”

Last but not least, based on Figure 3.27, two participants agreed that they felt relaxed when they typed with the exposure of music. The other two participants remained neutral.

3.9 Conclusion

Collected based on observation and questionnaires, the data has proven several important points about effects of music on typing performance. First of all, music is able to help people feel more energetic when they are typing. Secondly, fast-paced music helps deliver better concentration in the typing process compared to slow-paced music. Besides, compared to slow music, fast music is able to increase typing speed. Furthermore, listening to music with headphones could increase typing speed and improve concentration while typing.

The results of this pilot test have proven all hypotheses to be true. Besides, all assumptions made before the pilot test are useful in the actual experiment. Nevertheless, there are some flaws in the structure of the test to further validate the standpoint of this study. Some comparisons of results are not convincing due to incomplete recorded information. This requires amendment and improvement for the actual experiment. Thus, the researcher adopted changes in improving the test design.

CHAPTER 4 DATA ANALYSIS & DISCUSSION

4.1 Introduction

This chapter presents and analyses the collected data. Data is collected from questionnaires and observation which are conducted under quantitative method. The experiment examines the effects of selected music on work performance (typing speed) among clerical workers in postprandial somnolence. The data collection provides sufficient materials for analysis. Then, the data was analysed using SPANOVA, ANOVA and Likert Scale that results displayed on descriptive statistic, multivariate Tests, and estimated marginal means. In the meantime, comparison of results between Group 1 and Group 2 in terms of the condition of background music.

This chapter is presented in the following sequence:

1. Data Collected from Questionnaires
2. Data Collected Based on Observation
3. Data Analysis of Questionnaires
4. Data Analysis of Observation
5. Data Analysis of Sleepy Participants
6. Comparison of Using Headphones and Without Headphones on Two Conditions
7. Reliability Statistics
8. Discussion on Results

4.2 Data Collected from Questionnaires

The participants were required to complete two forms before and after the experiment. The first form is a demographic survey form. Participants were required to sign on the written consent before the experiment to ensure the validity of experiment results. After the experiment, the participants were required to complete the questionnaires as this is the easiest way to achieve standard results (Appendix A).

4.3 Data Collected Based on Observation

Throughout the two-minute test, participants were observed when they were typing. Each 15-second interval was recorded. The observation mainly focused on the participants' facial expression; a typing score was recorded to measure the typing speed in every 15 seconds. A diagram that showed the characters typed in the first minute, in the second minute and in total in all environments has been enclosed in the Appendix.

4.4 Data Analysis of Questionnaires

There were 50 participants divided into two groups in this experiment. All participants went through three environments, including a silent environment, slow music background and fast music background, in the experiment. 25 participants in Group 1 were exposed to music with the use of headphones; the other 25 participants in Group 2 were exposed to music without the use of headphones.

The section analysed the 150 samples (3 tests per participant) recorded. The results of the questionnaires were compared based on group and gender in order to examine the participants' postprandial sleepiness. Effects of music were examined using Statistical software SPSS. The data of questionnaires was analysed by the repeated measurements SPANOVA and ANOVA, as well as the Likert Scale, which are the methods in the SPSS software.

4.4.1 Data Analysis Using SPANOVA

Although there are 15 separate items in the questionnaires, the first 3 items are applicable for both pre-test and post-test, thus making 18 items in total for analysis.

Among the 18 items, the first 6 items consisted by Item 1 (Pre-test and Post-test), Item 2 (Pre-test and Post-test) and Item 3 (Pre-test and Post-test) were analysed using SPANOVA. The pre-test was done in a silent environment without any music background. Then, post-tests were done with music background, including slow music and fast music.

4.4.1.1 Contrastive Analysis of Item 1 Based on Group

In the questionnaire, Item 1 asked whether the participants feel sleepy after they have taken their lunch. The responses of Item 1 in pre-test and post-test have been compared based on the group of the participants. Results were analysed using SPANOVA. Table 4.1 and 4.2 depicted the results of analysis.

Table 4.1: Contrastive Analysis of Item 1 Based on Groups (Descriptive Statistics)

	Group	Mean	Std. Deviation	N
Sleepy feeling Pre-test	1=with headphones	3.5600	1.00333	25
	2=without headphones	3.2800	1.20830	25
	Total	3.4200	1.10823	50
Sleepy feeling Post-test	1=with headphones	3.4400	1.12101	
	2=without headphones	3.0800	1.15181	25
	Total	3.2600	1.13946	50

Table 4.2: Contrastive Analysis of Item 1 Based on Groups (Multivariate Analysis)

Effect		Value	F	Hypothesis df	Error df	Sig.
Factor1	Pillai's Trace	.034	1.677[b]	1.000	48.000	.202
	Wilks' Lambda	.966	1.677[b]	1.000	48.000	.202
	Hotelling's Trace	.035	1.677[b]	1.000	48.000	.202
	Roy's Largest Root	.035	1.677[b]	1.000	48.000	.202
Factor1 *group	Pillai's Trace	.002	.105[b]	1.000	48.000	.748
	Wilks' Lambda	.998	.105[b]	1.000	48.000	.748
	Hotelling's Trace	.002	.105[b]	1.000	48.000	.748
	Roy's Largest Root	.002	.105[b]	1.000	48.000	.748

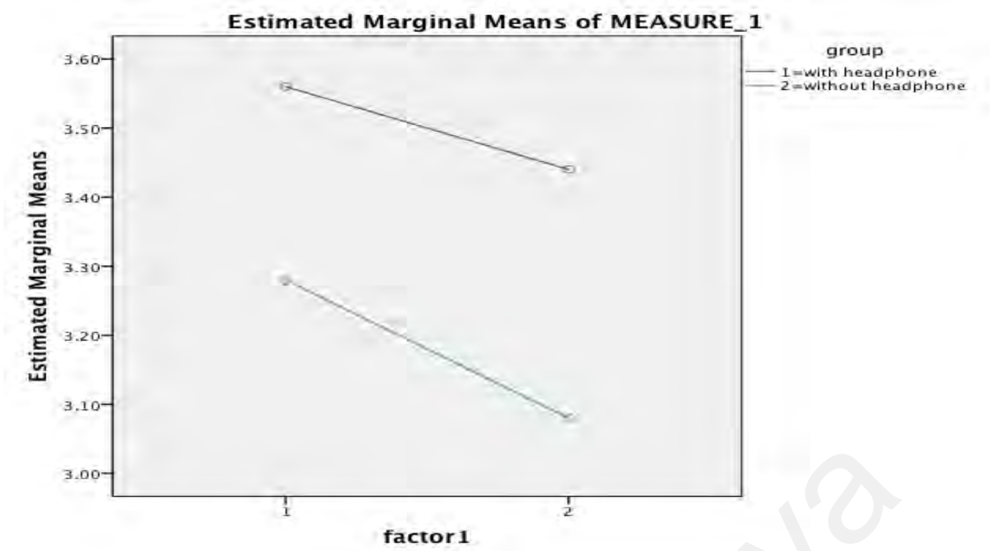

Figure 4.1: Contrastive Analysis of Item 1 Based on Group (Line Graph)

The results showed that there was no significant distinction of sleepy feelings in the pre-test and the pro-test [F (1, 48) = 1.677; p > 0.05]. According to Table 4.1 and 4.2, the mean score of pre-test (3.4200) outperformed post-test (3.2600). It means that music was able to reduce the participants' sleepiness. Without the use of headphones, the effects of music were much better than using headphones. However, there was no interaction effect of music on Group 1 and Group 2 [F (1, 48) = .105; p > 0.05].

Figure 4.1 showed that the sleepy feeling score in pre-test was higher than the score in post-test for both groups. It means participants felt sleepier in the pre-test compared to post-test. However, the almost parallel line graphs representing the two groups (1= with headphones; 2= without headphones) indicated that the results of two groups were similar, suggesting that participants in both groups felt sleepy in both tests.

4.4.1.2 Contrastive Analysis of Item 1 Based on Gender

Item 1 that aims to examine the participants' sleepy feelings in pre-test and post-test after their lunch. Its responses in pre-test and post-test have been compared based on the participants' gender. Results were analysed using SPANOVA. Table 4.3 and Table 4.4 depicted the results of analysis.

Table 4.3: Contrastive Analysis of Item 1 Based on Gender (Descriptive Statistics)

	Gender	Mean	Std. Deviation	N
Sleepy feeling pretest	Male	4.1538	.68874	13
	Female	3.1622	1.11837	37
	Total	3.4200	1.10823	50
Sleepy feeling posttest	Male	4.0769	.64051	13
	Female	2.9730	1.14228	37
	Total	3.2600	1.13946	50

Table 4.4 Contrastive Analysis of Item 1 Based on Gender (Multivariate Analysis)

Effect		Value	F	Hypothesis df	Error df	Sig.
factor1	Pillai's Trace	.018	.893[b]	1.000	48.000	.349
	Wilks' Lambda	.982	.893[b]	1.000	48.000	.349
	Hotelling's Trace	.019	.893[b]	1.000	48.000	.349
	Roy's Largest Root	.019	.893[b]	1.000	48.000	.349
Factor1* group	Pillai's Trace	.003	.159[b]	1.000	48.000	.692
	Wilks' Lambda	.997	.159[b]	1.000	48.000	.692
	Hotelling's Trace	.003	.159[b]	1.000	48.000	.692
	Roy's Largest Root	.003	.159[b]	1.000	48.000	.692

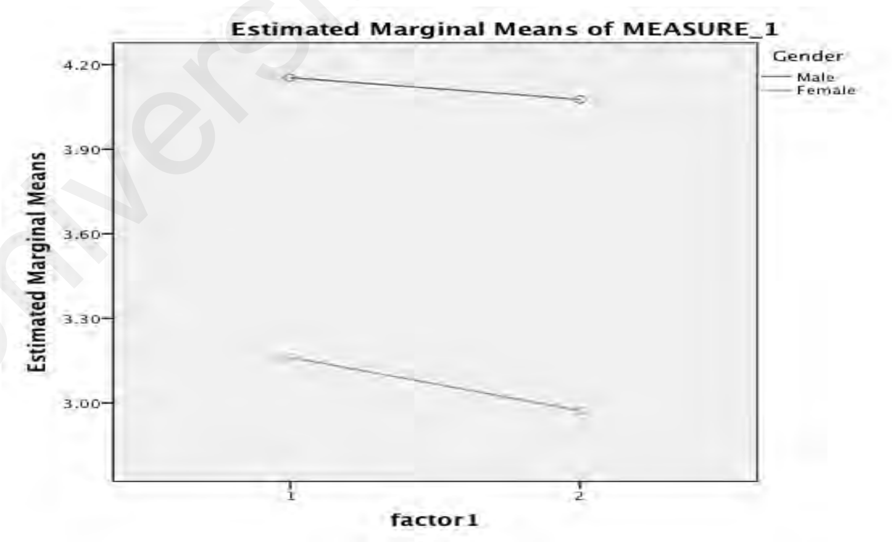

Figure 4.2: Contrastive Analysis of Item 1 Based on Gender (Line Graph)

The results in Table 4.3 and 4.4 indicated that the mean score of sleepiness for male participants in pre-test (4.1538) outperformed the mean score in post-test (4.0769). The results of female participants obviously displayed that pre-test

(3.1622) exceeded post-test (2.9730). Based on the results, music was able to reduce the participants' sleepy feelings throughout the test. Likewise, compared to male participants, female participants were less likely to appear tired. This could be seen from Table 4.4.

However, there was no significant interaction effect of sleepiness between pre-test and pro-test [F (1, 48) = .893; p > 0.05]. Similarly, there was no significant difference between the two genders [F (1, 48) = .159; p > 0.05].

The profile plot in Figure 4.2 showed the sleepy feeling score of the pre-test was higher than the score of post-test in terms of gender. Nevertheless, the almost parallel line graphs representing two genders (1= Male; 2= Female) suggested that there was no difference between the two genders in terms of sleepiness.

4.4.1.3 Contrastive Analysis of Item 2 Based on Group

Item 2 aims to find out whether the participants feel sleepy during the test. The responses of this item in pre-test and post-test have been compared. Then, the results were analysed using SPANOVA. Table 4.5 and Table 4.6 depicted the results of analysis

Table 4.5: Contrastive Analysis of Item 2 Based on Groups (Descriptive Statistics)

	Group	Mean	Std. Deviation	N
Feel sleepy during pretest	1=with headphones	2.2000	1.11803	25
	2=without headphones	2.2400	.96954	25
	Total	2.2200	1.03589	50
feel sleepy during posttest	1=with headphones	1.9600	.93452	25
	2=without headphones	2.0400	.93452	25
	Total	2.0000	.92582	50

Table 4.6: Contrastive Analysis of Item 2 Based on Groups (Multivariate Analysis)

Effect		Value	F	Hypothesis df	Error df	Sig.
Factor1	Pillai's Trace	.090	4.730[b]	1.000	48.000	.035

Table 4.6, continued

	Wilks' Lambda	.910	4.730b	1.000	48.000	.035
	Hotelling's Trace	.099	4.730b	1.000	48.000	.035
	Roy's Largest Root	.099	4.730b	1.000	48.000	.035
Factor1* group	Pillai's Trace	.001	.039b	1.000	48.000	.844
	Wilks' Lambda	.999	.039b	1.000	48.000	.844
	Hotelling's Trace	.001	.039b	1.000	48.000	.844
	Roy's Largest Root	.001	.039b	1.000	48.000	.844

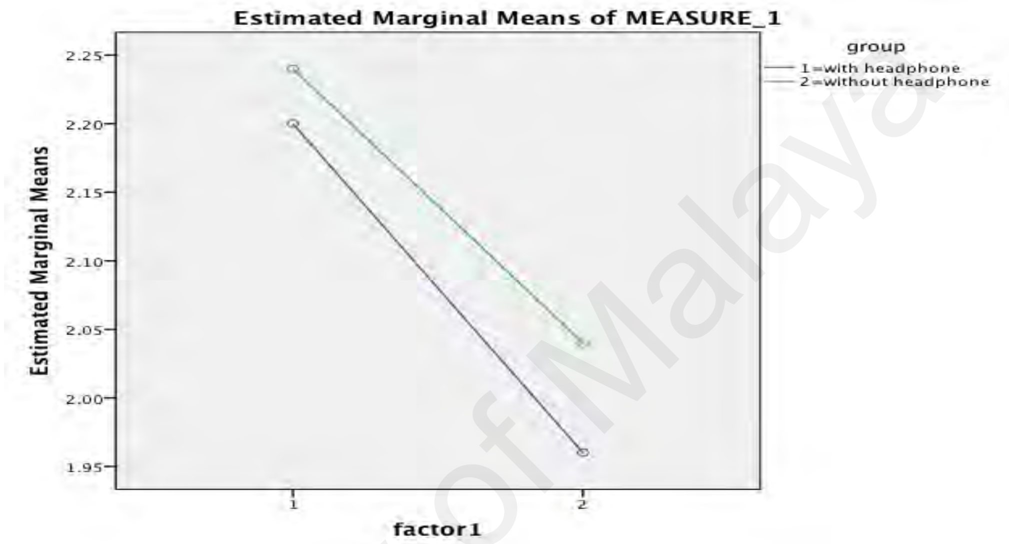

Figure 4.3: Contrastive Analysis of Item 2 Based on Group (Line Graph)

Results in Table 4.5 and 4.6 displayed that the mean score in the pre-test (2.2200) outperformed the post-test (2.0000). It proved that music could reduce the participants' sleepy feelings during the test. Being exposed to music with the use of headphones brought more refreshing effects to the participants compared to when music was played without the use of headphones.

According to Table 4.5 and 4.6, there was a significant interaction effect on the participants in the pre-test and the post-test [F (1, 48) = 4.730; p < 0.05]. However, there was no significant difference between the two groups [F (1, 48) = 0.039; p < 0.05].

On the contrary, the profile plot in Figure 4.3 showed that the sleepy feeling score in the pre-test was higher than the post-test for both groups. However, the almost parallel line graphs indicating the two groups (1= with headphones; 2= without headphones) showed that the results of two groups were similar; in the post-test, participants in both groups did not feel as sleepy as it was in the pre-test.

4.4.1.4 Contrastive Analysis of Item 2 Based on Gender

Item 2 asked the participants whether they feel sleepy during the pre-test and the post-test. Responses to the item were compared based on gender. Next, the results were analysed using SPANOVA. Table 4.7 and Table 4.8 depicted the results of analysis.

Table 4.7: Contrastive Analysis of Item 2 Based on Gender (Descriptive Statistics)

	Gender	Mean	Std. Deviation	N
Feel sleepy during pretest	Male	2.3846	1.44559	13
	Female	2.1622	.86646	37
	Total	2.2200	1.03589	50
Feel sleepy during posttest	Male	2.0000	1.15470	13
	Female	2.0000	.84984	37
	Total	2.0000	.92582	50

Table 4.8: Contrastive Analysis of Item 2 Based on Gender (Multivariate Analysis)

Effect		Value	F	Hypothesis df	Error df	Sig.
Factor1	Pillai's Trace	.107	5.727b	1.000	48.000	.021
	Wilks' Lambda	.893	5.727b	1.000	48.000	.021
	Hotelling's Trace	.119	5.727b	1.000	48.000	.021
	Roy's Largest Root	.119	5.727b	1.000	48.000	.021
Factor1 *group	Pillai's Trace	.019	.948b	1.000	48.000	.335
	Wilks' Lambda	.981	.948b	1.000	48.000	.335
	Hotelling's Trace	.020	.948b	1.000	48.000	.335
	Roy's Largest Root	.020	.948b	1.000	48.000	.335

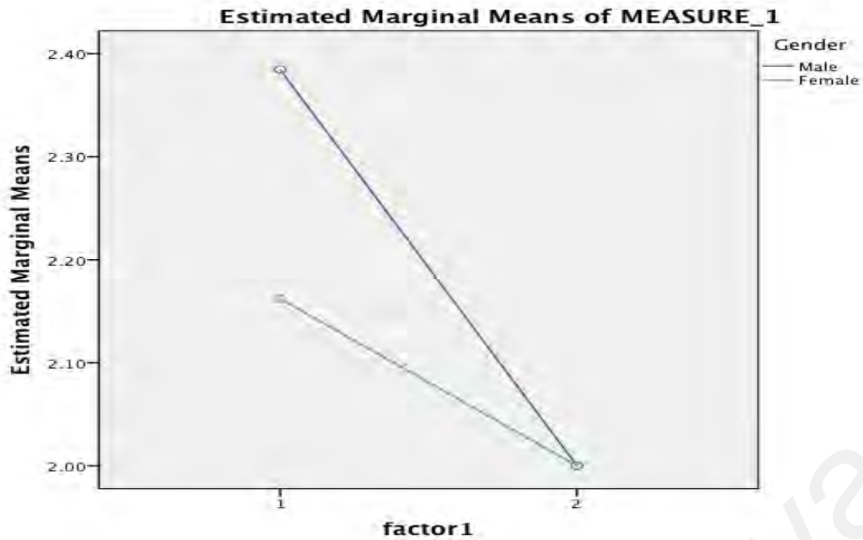

Figure 4.4: Contrastive Analysis of Item 2 Based on Gender (Line Graph)

According to Table 4.7 and 4.8, it was shown that the mean score for male participants in pre-test (2.3846) outperformed the score in post-test (2.0000). Furthermore, the mean score for female participants in pre-test (2.1622) outperformed post-test (2.0000) as well. This proved that music can reduce the participants' sleepy feelings during the test.

However, there was a significant interaction effect between the pre-test and the post-test [F (1, 48) = 5.727; p < 0.05]. There was no significant effect on the gender [F (1, 48) = .948; p > 0.05].

Based on the line graphs in Figure 4.4, male participants felt much sleepier than female participants in the typing process. However, when male typed with presence of music, they did not feel sleepy. The sleepy feelings of male and female participants were in the same level.

4.4.1.5 Contrastive Analysis of Item 3 Based on Group

Then, Item 3 in the questionnaires asked whether the participants feel sleepy after the pre-test and the post-test respectively. Responses to the item have been compared in terms of group and the results were analysed using SPANOVA. Table 4.9 and Table 4.10 depicted the results of analysis.

Table 4.9: Contrastive Analysis of Item 3 Based on Groups (Descriptive Statistics)

	Group	Mean	Std. Deviation	N
Feel sleepy after pretest	1=with headphones	2.1600	1.24766	25
	2=without headphones	2.0400	.97809	25
	Total	2.1000	1.11117	50
Feel sleepy after posttest	1=with headphones	2.1200	1.16619	25
	2=without headphones	2.1200	1.01325	25
	Total	2.1200	1.08119	50

Table 4.10: Contrastive Analysis of Item 3 Based on Groups (Multivariate Analysis)

Effect		Value	F	Hypothesis df	Error df	Sig.
Factor1	Pillai's Trace	.001	.042^b	1.000	48.000	.838
	Wilks' Lambda	.999	.042^b	1.000	48.000	.838
	Hotelling's Trace	.001	.042^b	1.000	48.000	.838
	Roy's Largest Root	.001	.042^b	1.000	48.000	.838
Factor1 *group	Pillai's Trace	.008	.379^b	1.000	48.000	.541
	Wilks' Lambda	.992	.379^b	1.000	48.000	.541
	Hotelling's Trace	.008	.379^b	1.000	48.000	.541
	Roy's Largest Root	.008	.379^b	1.000	48.000	.541

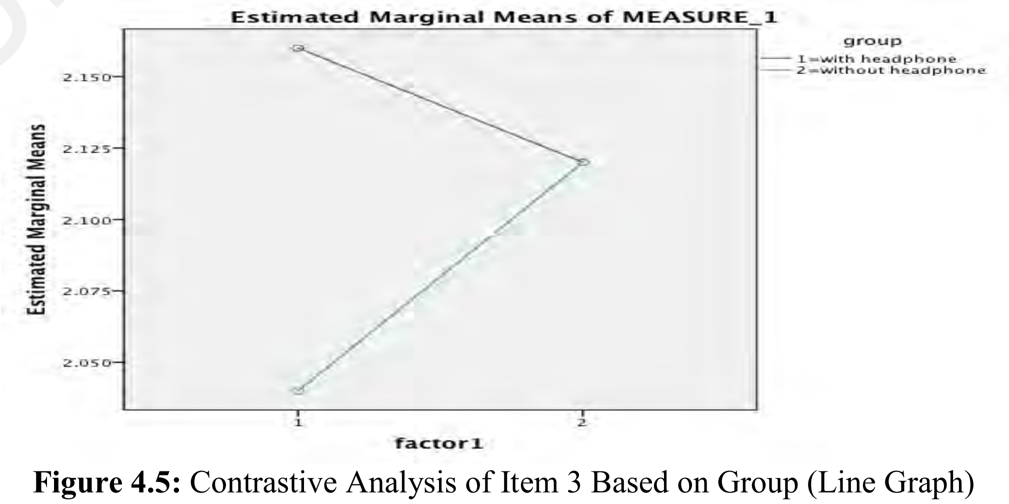

Figure 4.5: Contrastive Analysis of Item 3 Based on Group (Line Graph)

The results in Table 4.9 showed the mean score of Group 1 (2.1000) and Group 2 (2.1200). There was no significant difference whether participants listened to music with or without headphones.

Table 4.10 revealed that there was no significant difference in the pre-test and the post-test [F (1, 48) = .042; p > 0.05]. Moreover, there were no significant effects between the two groups [F (1, 48) = .379; p > 0.05].

The profile plot in Figure 4.5 showed that the score of participants in Group 1 was higher than the score gained by Group 2 in the pre-test. However, the line graphs representing the two groups (1= with headphones; 2= without headphones) were in opposite direction. This indicated that participants who listened to music without using headphones were not as sleepy as the participants who used headphones.

4.4.1.6 Contrastive Analysis of Item 3 Based on Gender

The last item to analyse using SPANOVA is Item 3, which is analysed based on gender. Item 3 aims to check the participants' sleepy feelings after the test. The results were analysed using SPANOVA. Table 4.11 and Table 4.12 depicted the results of analysis.

Table 4.11: Contrastive Analysis of Item 3 Based on Gender (Descriptive Statistics)

	Gender	Mean	Std. Deviation	N
Feel sleepy after pretest	Male	2.2308	1.58923	13
	Female	2.0541	.91122	37
	Total	2.1000	1.11117	50
Feel sleepy after posttest	Male	2.0769	1.38212	13
	Female	2.1351	.97645	37
	Total	2.1200	1.08119	50

Table 4.12: Contrastive Analysis of Item 3 Based on Gender (Multivariate Analysis)

Effect		Value	F	Hypothesis df	Error df	Sig.
Factor1	Pillai's Trace	.002	.109[b]	1.000	48.000	.743
	Wilks' Lambda	.998	.109[b]	1.000	48.000	.743
	Hotelling's Trace	.002	.109[b]	1.000	48.000	.743
	Roy's Largest Root	.002	.109[b]	1.000	48.000	.743
Factor1* group	Pillai's Trace	.023	1.135[b]	1.000	48.000	.292
	Wilks' Lambda	.997	1.135[b]	1.000	48.000	.292
	Hotelling's Trace	.024	1.135[b]	1.000	48.000	.292
	Roy's Largest Root	.024	1.135[b]	1.000	48.000	.292

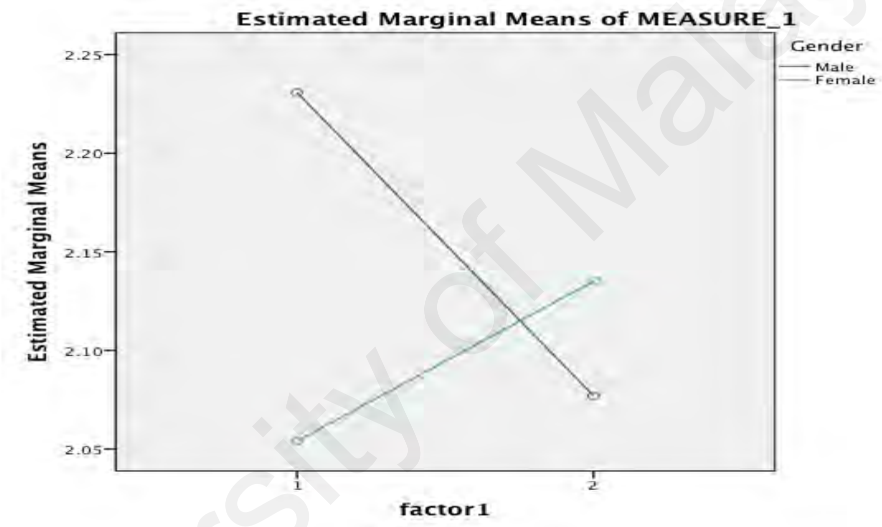

Figure 4.6: Contrastive Analysis of Item 3 Based on Gender (Line Graph)

According to Table 4.11, the mean score of male in pre-test (2.2308) outperformed the score in post-test (2.0769). Contrarily, the mean score of female in post-test (2.1351) outperformed the score in pre-test (2.0541). In the silent condition, male participants (2.2308) were much sleepier than female participants (2.0541). In contrast, female participants (2.1351) were much sleepier than male participants (2.0769) when there was music intervention in the post-test. This represented that male could perform better with music played in the background, but female could not.

Comparing the item in pre-test and post-test, there was no significant interaction effect [F (1, 48) = .109; p >0.05]. In addition, there was no significant difference in the sleepiness between male and female [F (1, 48) = 1.135; p > .292].

The profile plot in Figure 4.6 showed that there was no significant effect between male and female. Although the line graphs of male participants' sleepiness intersected the line graphs of female, which was at the point between 2.10 and 2.15, the software has not clearly shown the 0.05 differences. Thus, there was no significant difference in terms of gender that could be displayed in the results.

4.4.2 Data Analysis using ANOVA

On the other hand, the remaining 12 items, which include Item 4, Item 5.1, Item 5.2, Item 6.1, Item 6.2, Item 6.3, Item 7, Item 8, Item 9, Item 10, Item 11 and Item 12, were analysed using ANOVA. All items were examined based on two facets – group and gender. In terms of group, Group 1 was exposed to music with the use of headphones and Group 2 without the use of headphones. In terms of gender, comparison was made on male and female.

4.4.2.1 Contrastive Analysis of Item 4 Based on Group and Gender

Item 4 asked whether music helps the participants to feel more energetic in the process of typing. The results were analysed based on group and gender using ANOVA. Table 4.13 and Table 4.14 depicted the results of analysis.

Table 4.13: Contrastive Analysis of Item 4 Based on Groups (Descriptive Analysis)

	N	Mean	Std. Deviation	Std. Error	95%Confidence Interval for Mean		Minim	Max
					Lower Bound	Upper Bound		
1=with headphones	25	3.4400	.96090	.19218	3.0434	3.8366	2.00	5.00
2=without headphones	25	4.0400	.61101	.12220	3.7878	4.2922	3.00	5.00
Total	50	3.7400	.85261	.12058	3.4977	3.9823	2.00	5.00

Table 4.14: Contrastive Analysis of Item 4 Based on Groups (ANOVA)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.500	1	4.500	6.941	.011
Within Groups	31.120	48	.648		
Total	35.620	49			

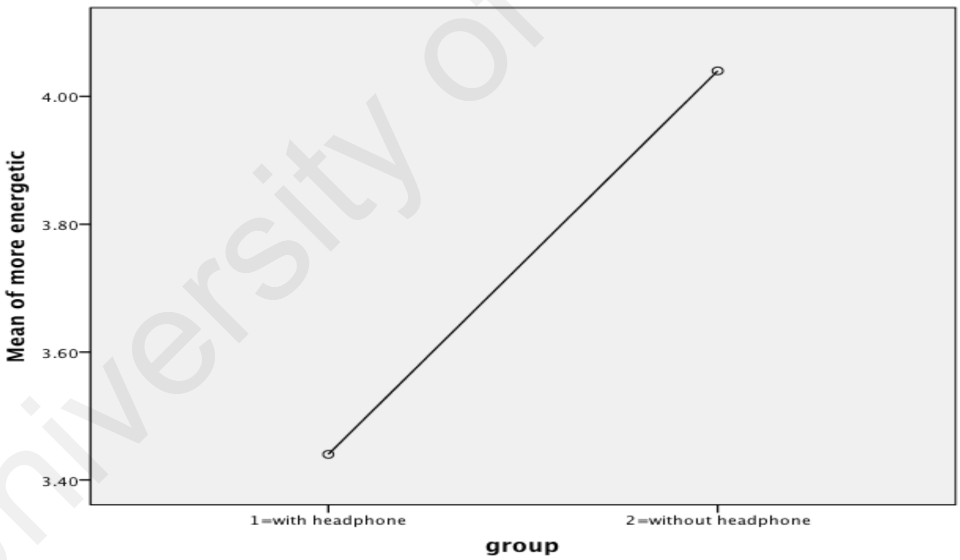

Figure 4.7: Contrastive Analysis of Item 4 Based on Group (Line Graph)

Results in Table 4.13 showed that the mean score of Group 2 (4.0400) outperformed the mean score of Group 1 (3.4400). There was a significant difference between the two groups. Meanwhile, Figure 4.7 indicated that the participants who listened to music without using headphones were more energetic than those with headphones during the test. Table 4.14 represented that there was a significant interaction difference between the two groups [$F (1, 48) = 6.941$, $p< 0.05$]. Therefore, the hypothesis of this item has been confirmed.

Table 4.15: Contrastive Analysis of Item 4 Based on Gender (Descriptive Analysis)

	N	Mean	Std. Deviation	Std. Error	95%Confidence Interval for Mean		Minim	Max
					Lower Bound	Upper Bound		
Male	13	4.0000	.70711	.19612	3.5727	4.4273	3.00	5.00
Female	37	3.6486	.88870	.14610	3.3523	3.9450	2.00	5.00
Total	50	3.7400	.85261	.12058	3.4977	3.9823	2.00	5.00

Table 4.16: Contrastive Analysis of Item 4 Based on Gender (ANOVA)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.188	1	1.188	1.656	.204
Within Groups	34.432	48	.717		
Total	35.620	49			

Figure 4.8: Contrastive Analysis of Item 4 Based on Gender (Line Graph)

From Table 4.15, the mean score of male participants (4.0000) outperformed female's (3.6486). This suggested that compared to female, male felt more energetic. Table 4.16 showed that there was no significant interaction difference between male and female [$F (1, 48) = 1.656$, $p> 0.05$]. Furthermore, the line graphs in Figure 4.8 reflected that music served as a tool to make male participants stay more energetic than female during the test.

4.4.2.2 Contrastive Analysis of Item 5.1 Based on Group and Gender

In Item 5.1, participants were asked to compare fast music and slow music in terms of concentration in the process of typing. The results were then analysed using ANOVA. Table 4.17 and Table 4.18 depicted the results of analysis.

Table 4.17: Contrastive Analysis of Item 5.1 Based on Groups (Descriptive Analysis)

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minim	Max
					Lower Bound	Upper Bound		
1=with headphones	25	3.0000	1.38444	.27689	2.4285	3.5715	1.00	5.00
2=without headphones	25	2.5200	1.29486	.25897	1.9855	3.0545	1.00	5.00
Total	50	2.7600	1.34862	.19072	2.3767	3.1433	1.00	5.00

Table 4.18: Contrastive Analysis of Item 5.1 Based on Groups (ANOVA)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.880	1	2.880	1.603	.212
Within Groups	86.240	48	1.797		
Total	89.120	49			

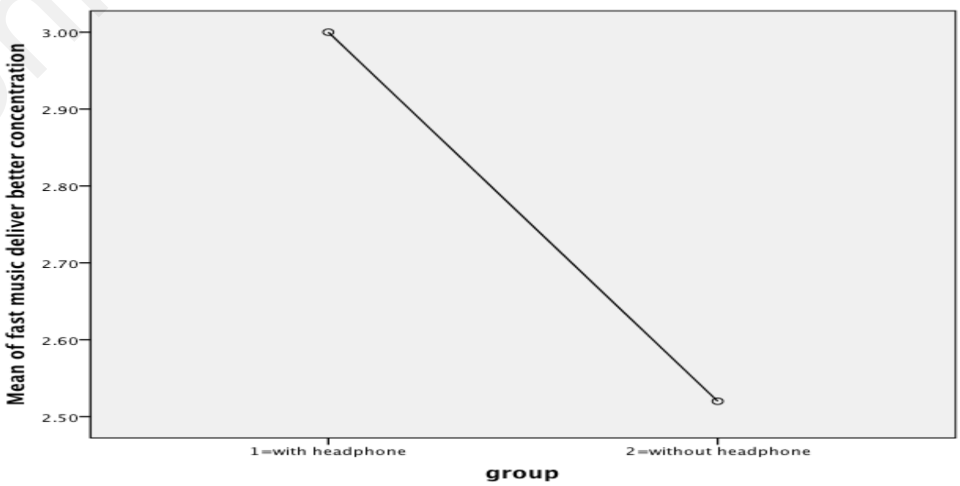

Figure 4.9: Contrastive Analysis of Item 5.1 Based on Group (Line Graph)

From Figure 4.9 and Table 4.17, results showed that the mean score of Group 1 (3.0000) outperformed Group 2 (2.5200). This indicated that compared to slow music, fast music made Group 1 (using headphones) concentrate more than Group 2 (without using headphones). There was no significant difference between Group 1 and Group 2 [F (1, 48) = 1.603, p> 0.05] as displayed in Table 4.18.

Table 4.19: Contrastive Analysis of Item 5.1 Based on Gender (Descriptive Analysis)

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minim	Max
					Lower Bound	Upper Bound		
Male	13	3.4615	1.50640	.41780	2.5512	4.3718	1.00	5.00
Female	37	2.5135	1.21613	.19993	2.1080	2.9190	1.00	5.00
Total	50	2.7600	1.34862	.19072	2.3767	3.1433	1.00	5.00

Table 4.20: Contrastive Analysis of Item 5.1 Based on Gender (ANOVA)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	8.646	1	8.646	5.157	.028
Within Groups	80.474	48	1.677		
Total	89.120	49			

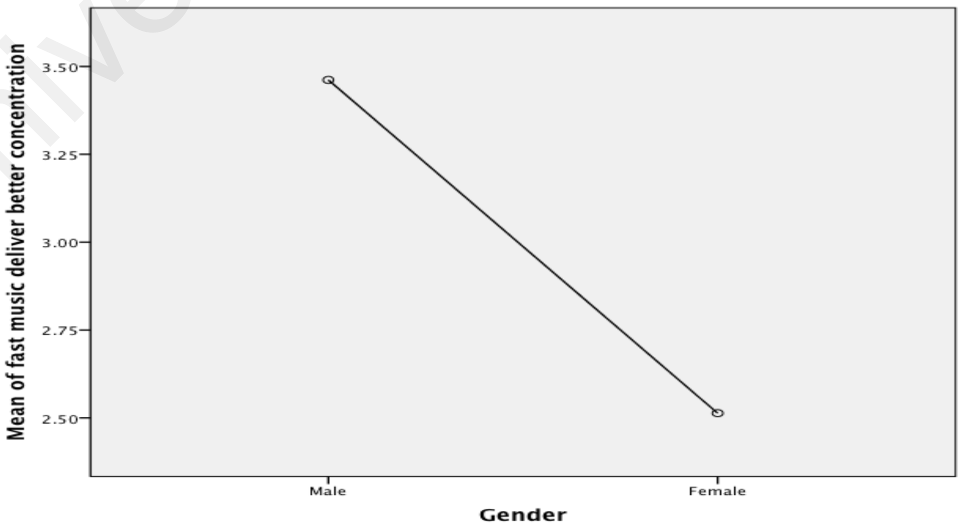

Figure 4.10: Contrastive Analysis of Item 5.1 Based on Gender (Line Graph)

In Table 4.19 showed that the mean score of male (3.4615) outperformed female's (2.5135). Combining it with Figure 4.10, compared to slow music, fast music was able to provide better concentration for male participant. Besides, Table 4.20 proved that there was significant interaction difference between male and female [F (1, 48) = 5.157, $p < 0.05$]. Therefore, the hypothesis of this item has been established.

4.4.2.3 Contrastive Analysis of Item 5.2 Based on Group and Gender

Next, Item 5.2 aims to check whether the participants feel fast music or slow music can help increase their typing speed. The results were analysed using ANOVA. Table 4.21 and Table 4.22 depicted the results of analysis.

Table 4.21: Contrastive Analysis of Item 5.2 Based on Groups (Descriptive Analysis)

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minim	Max
					Lower Bound	Upper Bound		
1=with headphones	25	3.0800	1.44106	.28821	2.4852	3.6748	1.00	5.00
2=without headphones	25	3.2800	1.13725	.22745	2.8106	3.7494	1.00	5.00
Total	50	3.1800	1.28873	.18225	2.8137	3.5463	1.00	5.00

Table 4.22: Contrastive Analysis of Item 5.2 Based on Groups (ANOVA)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.500	1	.500	.297	.588
Within Groups	80.880	48	1.685		
Total	81.380	49			

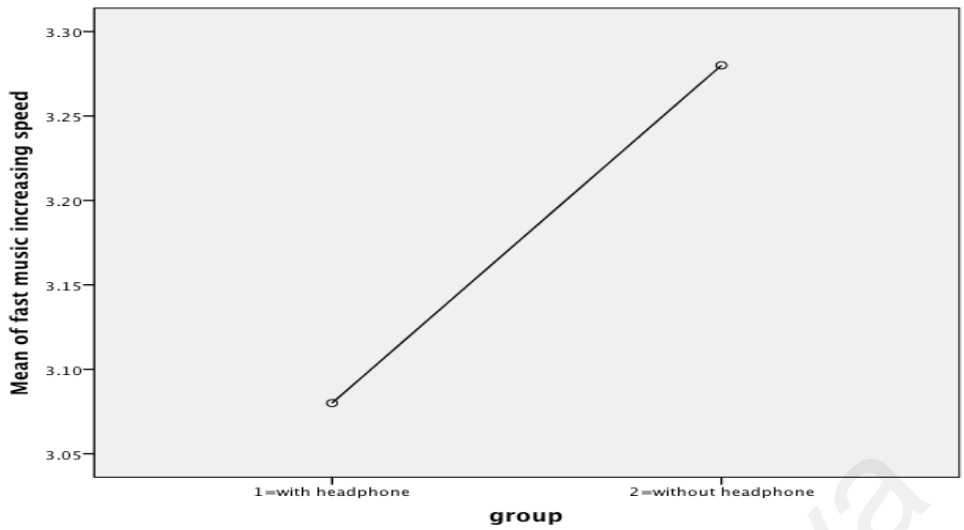

Figure 4.11: Contrastive Analysis of Item 5.2 Based on Group (Line Graph)

The results in Table 4.21 indicated that Group 2 (3.2800) outperformed Group 1 (3.0800). It represented that compared to slow music, fast music was able to increase the typing speed of participants who listened to music without using headphones. However, Table 4.22 showed that there was no significant interaction difference between the two groups [F (1, 48) = .297, P > 0.05]. The line graphs in Figure 4.11 conveyed the same standpoint with Table 4.21, which line graphs of Group 2 were higher than Group 1. It means that participants without headphones felt that compared to slow music, fast music helped increase their typing speed.

Table 4.23: Contrastive Analysis of Item 5.2 Based on Gender (Descriptive Analysis)

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minim	Max
					Lower Bound	Upper Bound		
Male	13	3.6154	1.44559	.40094	2.7418	4.4889	1.00	5.00
Female	37	3.0270	1.21304	.19942	2.6226	3.4315	1.00	5.00
Total	50	3.1800	1.28873	.18225	2.8137	3.5463	1.00	5.00

Table 4.24: Contrastive Analysis of Item 5.2 Based on Gender

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.330	1	3.330	2.048	.159
Within Groups	78.050	48	1.626		
Total	81.380	49			

Figure 4.12: Contrastive Analysis of Item 5.2 Based on Gender (Line Graph)

From Table 4.23, it was found that the mean score of male (3.6154) outperformed the mean score of female (3.0270). There was a minor difference between male and female. Likewise, Figure 4.12 showed the same results with Table 4.23. However, results in Table 4.24 showed that there was no significant interaction difference in terms of gender [F (1, 48) = 2.048, p > 0.05].

4.4.2.4 Contrastive Analysis of Item 6.1 Based on Group and Gender

Next, Item 6.1 aims to check whether slow music helps to deliver better concentration in the process of typing compared to fast music. The results were analysed using ANOVA. Table 4.25 and Table 4.26 depicted the results of analysis.

Table 4.25: Contrastive Analysis of Item 6.1 Based on Groups (Descriptive Analysis)

	N	Mean	Std. Deviation	Std. Error	95% Confidence interval for Mean		Minim	Max
					Lower Bound	Upper Bound		
1=with headphones	25	3.4400	1.15758	.23152	2.9622	3.9178	1.00	5.00
2=without headphones	25	3.9200	.90921	.18184	3.5447	4.2953	2.00	5.00
Total	50	3.6800	1.05830	.14967	3.3792	3.9808	1.00	5.00

Table 4.26: Contrastive Analysis of Item 6.1 Based on Groups (ANOVA)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.880	1	2.880	2.658	.110
Within Groups	52.000	48	1.083		
Total	54.880	49			

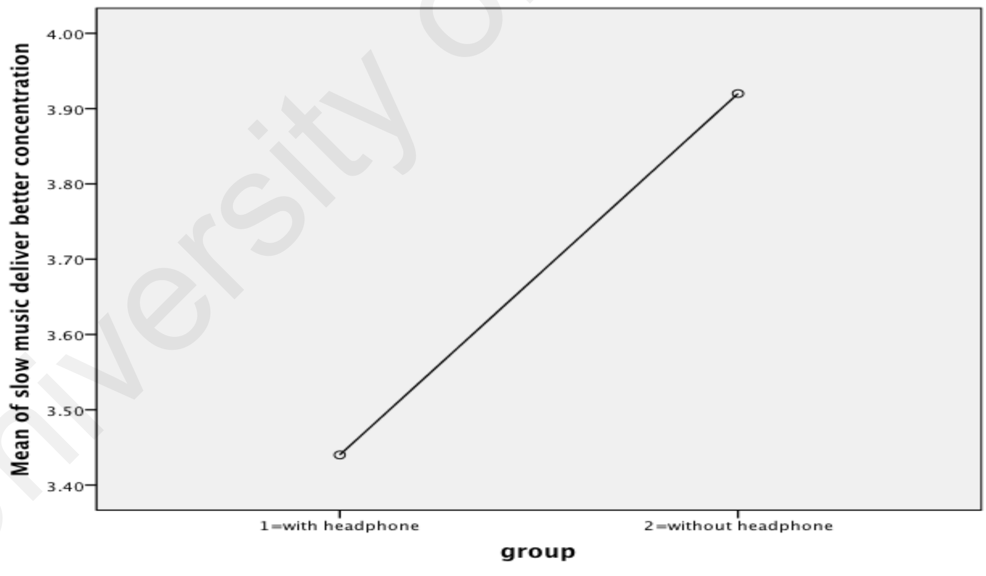

Figure 4.13: Contrastive Analysis of Item 6.1 Based on Group (Line Graph)

Based on the results in Table 4.25, the mean score of Group 2 (3.9200) outperformed Group 1 (3.4400). There was a minor difference between Group 1 and Group 2. Figure 4.13 showed that Group 2 (without headphones) was higher than Group 1 (with headphones). It represented that compared to fast music, slow music delivered better concentration to Group 2 (without headphones).

However, the results in Table 4.26 showed that there was no significant interaction difference in both groups [F (1, 48) =2.658, p > 0.05]. Table 4.27 and Table 4.28 depicted the results of analysis.

Table 4.27: Contrastive Analysis of Item 6.1 Based on Gender (Descriptive Analysis)

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minim	Max
					Lower Bound	Upper Bound		
Male	13	3.6154	1.32530	.36757	2.8145	4.4163	1.00	5.00
Female	37	3.7027	.96796	.15913	3.3800	4.0254	2.00	5.00
Total	50	3.6800	1.05830	.14967	3.3792	3.9808	1.00	5.00

Table 4.28: Contrastive Analysis of Item 6.1 Based on Gender (ANOVA)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.073	1	.073	.064	.801
Within Groups	54.807	48	1.142		
Total	54.880	49			

Figure 4.14: Contrastive Analysis of Item 6.1 Based on Gender (Line Graph)

The results in Table 4.27 showed that the mean score of female (3.7027) outperformed male's (3.6154). Figure 4.14 revealed line graphs of female were higher than male. It showed that compared to fast music, slow music provided better concentration for female. Based on the results in Table 4.28, it was shown that there was no significant interaction difference between male and female [F (1, 48) = .064, p> 0.05].

4.4.2.5 Contrastive Analysis of Item 6.2 Based on Group and Gender

For Item 6.2, it asked whether slow music can help in increasing typing speed compared to fast music. The results were analysed using ANOVA. Table 4.29 and Table 4.30 depicted the results of analysis.

Table 4.29: Contrastive Analysis of Item 6.2 Based on Groups (Descriptive Analysis)

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minim	Max
					Lower Bound	Upper Bound		
1=with headphones	25	3.4400	1.12101	.22420	2.9773	3.9027	1.00	5.00
2=without headphones	25	3.2000	1.08012	.21602	2.7541	3.6459	1.00	5.00
Total	50	3.3200	1.09619	.15502	3.0085	3.6315	1.00	5.00

Table 4.30: Contrastive Analysis of Item 6.2 Based on Groups (ANOVA)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.720	1	.720	.594	.445
Within Groups	58.160	48	1.212		
Total	58.880	49			

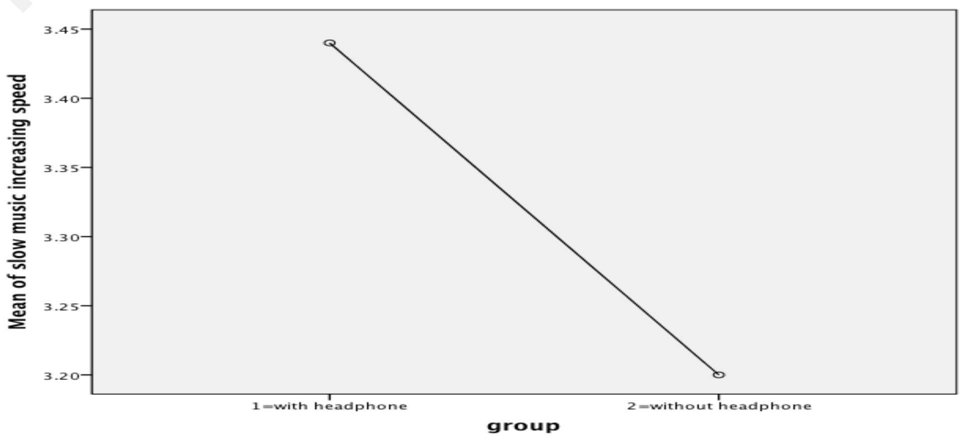

Figure 4.15: Contrastive Analysis of Item 6.2 Based on Group (Line Graph)

The results of Table 4.29 indicated that the mean score of Group 1 (3.4400) outperformed Group 2 (3.2000). The line graphs in Figure 4.15 showed that Group 1 (with headphones) was higher than Group 2 (without headphones). As described above, compared to fast music, slow music managed to help participants who used headphones (Group 1) to increase their typing speed. However, there was no significant difference effect as shown by Table 4.30. Table 4.31 and Table 4.32 depicted the results of analysis.

Table 4.31: Contrastive Analysis of Item 6.2 Based on Gender (Descriptive Analysis)

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minim	Max
					Lower Bound	Upper Bound		
Male	13	3.3077	1.31559	.36488	2.5127	4.1027	1.00	5.00
Female	37	3.3243	1.02886	.16914	2.9813	3.6674	2.00	5.00
Total	50	3.3200	1.09619	.15502	3.0085	3.6315	1.00	5.00

Table 4.32: Contrastive Analysis of Item 6.2 Based on Gender (ANOVA)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.003	1	.003	.002	.963
Within Groups	58.877	48	1.227		
Total	58.880	49			

Figure 4.16: Contrastive Analysis of Item 6.2 Based on Gender (Line Graph)

According to the mean score shown in Table 4.31, there was a minor difference between female and male. Female participants' mean score (3.3243) outperformed male's (3.3077). Similarly, the line graphs in Figure 4.16 indicated that female's was higher than male's. Compared to fast music, female felt that slow music was able to help increase their typing speed. Results in Table 4.32 showed that there was no significant interaction difference effect [F (1, 48) =. 002, P > 0.05].

4.4.2.6 Contrastive Analysis of Item 6.3 Based on Group and Gender

Item 6.3 asked the participants whether slow music makes them feel relaxed when they were typing. The results were analysed using ANOVA. Table 4.33 and Table 4.34 depicted the results of analysis.

Table 4.33: Contrastive Analysis of Item 6.3 Based on Groups (Descriptive Analysis)

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minim	Max
					Lower Bound	Upper Bound		
1=with headphones	25	3.8000	1.00000	.20000	3.3872	4.2128	2.00	5.00
1=without headphones	25	4.4800	.58595	.11719	4.2381	4.7219	3.00	5.00
Total	50	4.1400	.88086	.12457	3.8897	4.3903	2.00	5.00

Table 4.34: Contrastive Analysis of Item 6.3 Based on Groups (ANOVA)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5.780	1	5.780	8.605	.005
Within Groups	32.240	48	.672		
Total	38.020	49			

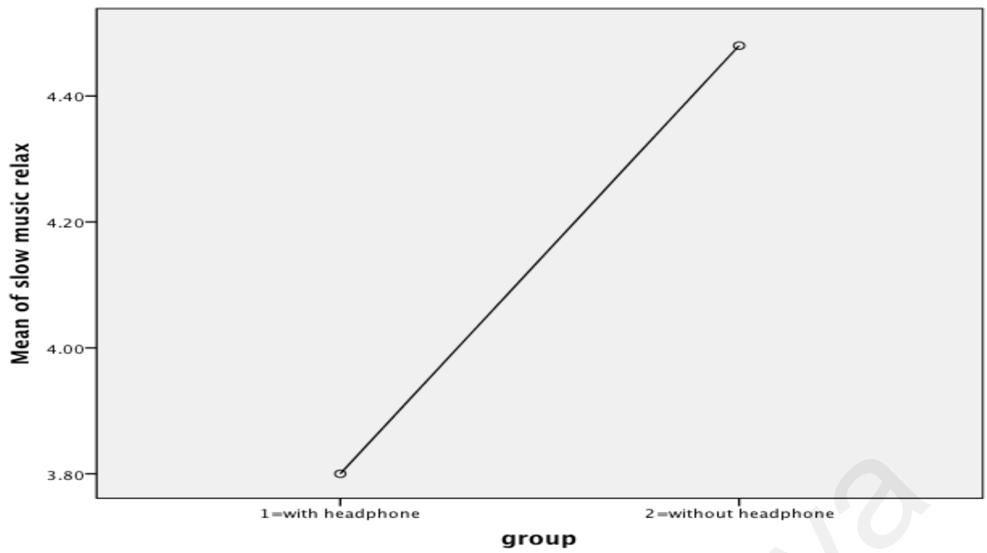

Figure 4.17: Contrastive Analysis of Item 6.3 Based on Group (Line Graph)

Based on the results in Table 4.33, Group 2 (4.4800) outperformed group 1 (3.8000). From the line graphs in Figure 4.17, it was also reflected that Group 1 (with headphones) was lower than Group 2 (without headphones). As described above, compared to Group 1, Group 2 (without headphones) generally felt that slow music made them feel relaxed during the process of typing. On the other hand, Table 4.34 showed that there was a significant difference between the two groups [F (1, 48) =8.605, P< 0.05]. Therefore, the hypothesis of this item has been established. Table 4.35 and Table 4.36 depicted the results of analysis.

Table 4.35: Contrastive Analysis of Item 6.3 Based on Gender (Descriptive Analysis)

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minim	Max
					Lower Bound	Upper Bound		
Male	13	4.4615	.87706	.24325	3.9315	4.9915	2.00	5.00
Female	37	4.0270	.86559	.14230	3.7384	4.3156	2.00	5.00
Total	50	4.1400	.88086	.12457	3.8897	4.3903	2.00	5.00

Table 4.36: Contrastive Analysis of Item 6.3 Based on Gender (ANOVA)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.816	1	1.816	2.408	.127
Within Groups	36.204	48	.754		
Total	38.020	49			

Figure 4.18: Contrastive Analysis of Item 6.3 Based on Gender (Line Graph)

From Table 4.35, it was found that the mean score of male (4.4615) outperformed female (4.0270). Meanwhile, the line graphs in Figure 4.18 showed that male's was higher than female's. The hypothesis assumed that slow music made male participants feel more relaxed than female participants. In Table 4.36, the results indicated that there was no significant interaction difference between male and female [$F(1, 48) = 2.408$, $P > 0.05$]. Therefore, comparing male and female did not satisfy the hypothesis.

4.4.2.7 Contrastive Analysis of Item 7 Based on Group and Gender

Item 7 aims to find out whether participants felt different with the presence of music while they were typing. The results were analysed using ANOVA.

Table 4.37: Contrastive Analysis of Item 7 Based on Groups (Descriptive Analysis)

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minim	Max
					Lower Bound	Upper Bound		
1=with headphones	25	3.8800	.72572	.14514	3.5804	4.1796	2.00	5.00
2=without headphones	25	4.3600	.56862	.11372	4.1253	4.5947	3.00	5.00
Total	50	4.1200	.68928	.09748	3.9241	4.3159	2.00	5.00

Table 4.38: Contrastive Analysis of Item 7 Based on Groups (ANOVA)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.880	1	2.880	6.776	.012
Within Groups	20.400	48	.425		
Total	23.280	49			

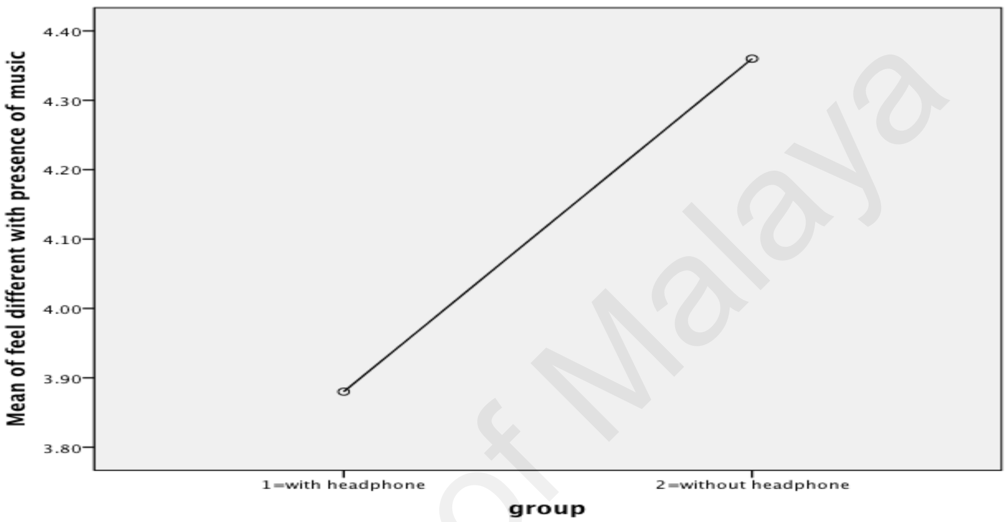

Figure 4.19: Contrastive Analysis of Item 7 Based on Group (Line Graph)

According to Table 4.37, the mean score indicated that Group 2 (4.3600) outperformed Group 1 (3.8800). Likewise, the line graphs in Figure 4.19 showed that Group 2 (without headphones) was higher than Group 1 (with headphones). During the process of typing, it was more suitable for participants to be exposed to music without the use of headphones. The results in Table 4.38 indicated that there was a significant difference between Group 1 and Group 2 [F (1, 48) = 6.776, $p < 0.05$]. Therefore, the hypothesis of this item has been confirmed. Table 4.39 and Table 4.40 depicted the results of analysis.

Table 4.39: Contrastive Analysis of Item 7 Based on Gender (Descriptive Analysis**)**

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minim	Max
					Lower Bound	Upper Bound		
Male	13	4.3077	.63043	.17485	3.9267	4.6887	3.00	5.00
Female	37	4.0541	.70498	.11590	3.8190	4.2891	2.00	5.00
Total	50	4.1200	.68928	.09748	3.9241	4.3159	2.00	5.00

Table 4.40: Contrastive Analysis of Item 7 Based on Gender (ANOVA)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.619	1	.619	1.311	.258
Within Groups	22.661	48	.472		
Total	23.280	49			

Figure 4.20: Contrastive Analysis of Item 7 Based on Gender (Line Graph)

Based on the results in Table 4.39, the mean score showed that there was a minor difference that male (4.3077) outperformed female (4.0541). Figure 4.20 showed the same results with Table 4.39, stating that male's feeling was higher than male's. It represented that male felt much different with the presence of music in the typing process. However, the results in Table 4.40 showed that there was no significant interaction difference between male and female.

4.4.2.8 Contrastive Analysis of Item 8 Based on Group and Gender

Item 8 is to examine whether listening to music helps the participants to increase their typing speed. The results were analysed using ANOVA. Table 4.41 and Table 4.42 depicted the results of analysis.

Table 4.41: Contrastive Analysis of Item 8 Based on Groups (Descriptive Analysis)

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minim	Max
					Lower Bound	Upper Bound		
1=with headphones	25	3.4400	.82057	.16411	3.1013	3.7787	2.00	5.00
2=without headphones	25	3.8000	1.04083	.20817	3.3704	4.2296	2.00	5.00
Total	50	3.6200	.94524	.13368	3.3514	3.8886	2.00	5.00

Table 4.42: Contrastive Analysis of Item 8 Based on Groups (ANOVA)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.620	1	1.620	1.844	.181
Within Groups	42.160	48	.878		
Total	43.780	49			

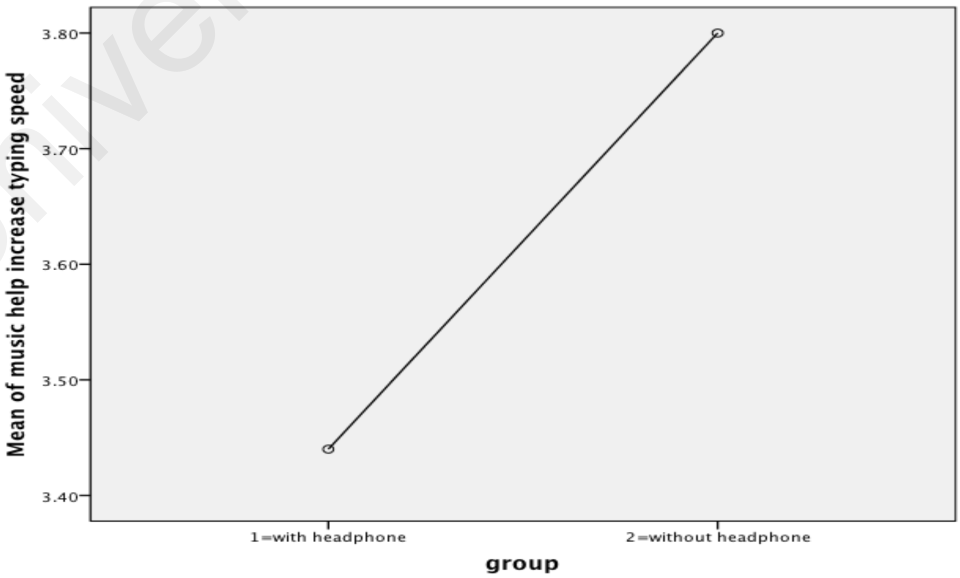

Figure 4.21: Contrastive Analysis of Item 8 Based on Group (Line Graph)

From Table 4.41, it was found that the mean score of Group 2 (3.8000) outperformed Group 1 (3.4400). Figure 4.21 showed the same standpoint with Table 4.42. It showed that listening to music helped participants to increase their typing speed, especially for Group 2 who was exposed to music without the use of headphones. However, the results in Table 4.42 showed that there was no significant interaction difference between Group 1 and Group 2 [F (1, 48) = 1.844, P > 0.05]. Table 4.43 and Table 4.44 depicted the results of analysis.

Table 4.43: Contrastive Analysis of Item 8 Based on Gender (Descriptive Analysis)

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minim	Max
					Lower Bound	Upper Bound		
Male	13	3.5385	.87706	.24325	3.0085	4.0685	2.00	5.00
Female	37	3.6486	.97799	.16078	3.3226	3.9747	2.00	5.00
Total	50	3.6200	.94524	.13368	3.3514	3.8886	2.00	5.00

Table 4.44: Contrastive Analysis of Item 8 Based on Gender (ANOVA)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.117	1	.117	.128	.722
Within Groups	43.663	48	.910		
Total	43.780	49			

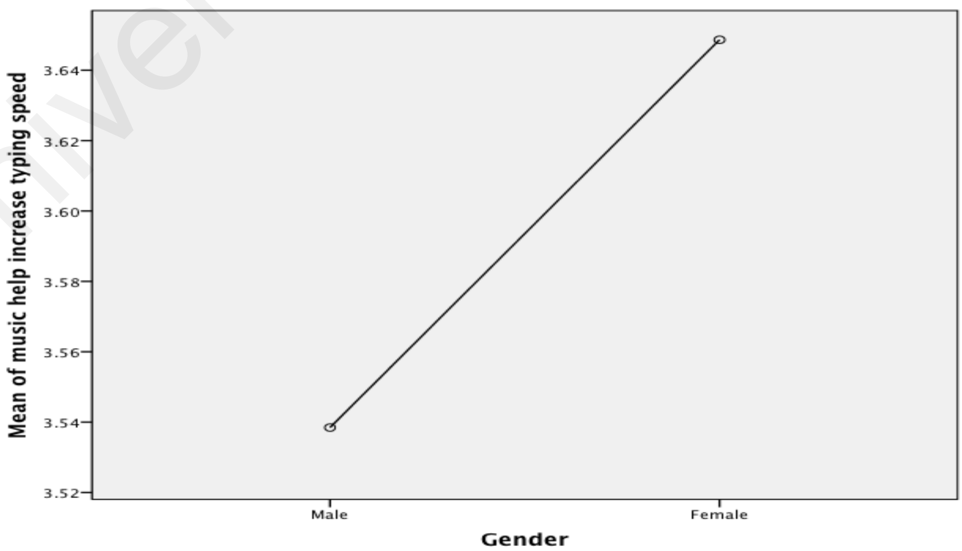

Figure 4.22: Contrastive Analysis of Item 8 Based on Group (Line Graph)

In terms of gender, the mean score in Table 4.43 showed that female (3.6486) outperformed male (3.5385). Similarly, Figure 4.22 showed that female's is higher than male's. Compared to male, female agreed that music helped them increase their typing speed during the test. However, there was no significant interaction difference between male and female [F (1, 48) = .128, p> 0.05] as displayed in Table 4.44.

4.4.2.9 Contrastive Analysis of Item 9 Based on Group and Gender

In addition, Item 9 asked the participants whether listening to music helps improve their concentration during typing. The results were analysed using ANOVA. Table 4.45 and Table 4.46 depicted the results of analysis.

Table 4.45: Contrastive Analysis of Item 9 Based on Groups (Descriptive Analysis)

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval from Mean		Minim	Max
					Lower Bound	Upper Bound		
1=with headphones	25	3.3200	.94516	.18903	2.9299	3.7101	1.00	5.00
2=without headphones	25	3.8400	.98658	.19732	3.4328	4.2472	2.00	5.00
Total	50	3.5800	.99160	.14023	3.2982	3.8618	1.00	5.00

Table 4.46: Contrastive Analysis of Item 9 Based on Groups (ANOVA)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.380	1	3.380	3.621	.063
Within Groups	44.800	48	.933		
Total	48.180	49			

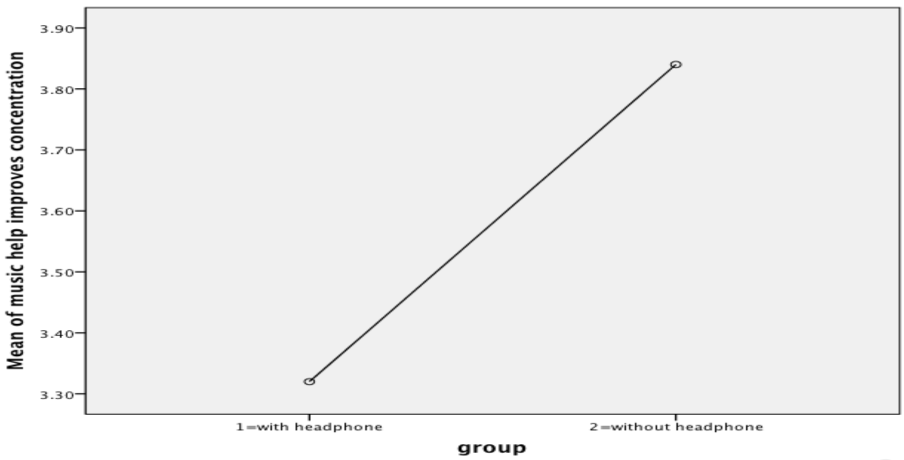

Figure 4.23: Contrastive Analysis of Item 9 Based on Group (Line Graph)

According to Table 4.45, the mean score indicated that Group 2 (3.8400) outperformed Group 1 (3.3200). The line graphs in Figure 4.23 showed that Group 2 (without headphones) was higher than Group 1 (with headphones). This suggested that the participants in Group 2 agreed that listening to music helped improve their concentration while they were typing. However, Table 4.46 shows that there was no significant difference between two groups [F (1, 48) = 3.621, p > 0.063]. Table 4.47 and Table 4.48 depicted the results of analysis.

Table 4.47: Contrastive Analysis of Item 9 Based on Gender (Descriptive Analysis)

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minim	Max
					Lower Bound	Upper Bound		
Male	13	3.6154	1.04391	.28953	2.9846	4.2462	1.00	5.00
Female	37	3.5676	.98715	.16229	3.2384	3.8967	2.00	5.00
Total	50	3.5800	.99160	.14023	3.2982	3.8618	1.00	5.00

Table 4.48: Contrastive Analysis of Item 9 Based on Gender (ANOVA)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.022	1	.022	.022	.883
Within Groups	48.158	48	1.003		
Total	48.180	49			

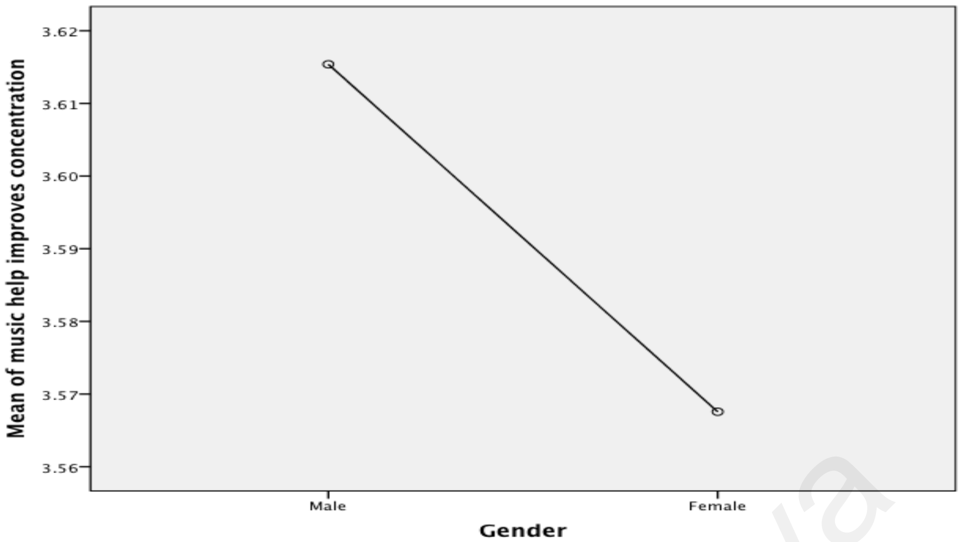

Figure 4.24: Contrastive Analysis of Item 9 Based on Group (Line Graph)

Based on the results in Table 4.47, the mean score showed that male (3.6154) outperformed female (3.5676). Similarly, Figure 4.24 presented that male's was higher than female's. Additionally, Table 4.48 indicated that there was no significant difference between male and female [$F (1, 48) = 0.022$, $P > 0.05$]. It indicated that there was no difference between male and female in agreeing that listening to music helped improve concentration during typing.

4.4.2.10 Contrastive Analysis of Item 10 Based on Group and Gender

Item 10 aims to determine whether listening to music decreases the participants' concentration during typing compared to their usual working environment. The results were analysed using ANOVA.

Table 4.49: Contrastive Analysis of Item 10 Based on Groups (Descriptive Analysis)

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minim	Max
					Lower Bound	Upper Bound		
1=with headphones	25	3.2000	.81650	.16330	2.8630	3.5370	2.00	5.00
2=without headphones	25	2.4000	1.224747	.24495	1.8945	2.9055	1.00	5.00
Total	50	2.8000	1.10657	.15649	2.4855	3.1145	1.00	5.00

Table 4.50: Contrastive Analysis of Item 10 Based on Groups (ANOVA)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	8.000	1	8.000	7.385	.009
Within Groups	52.000	48	1.083		
Total	60.000	49			

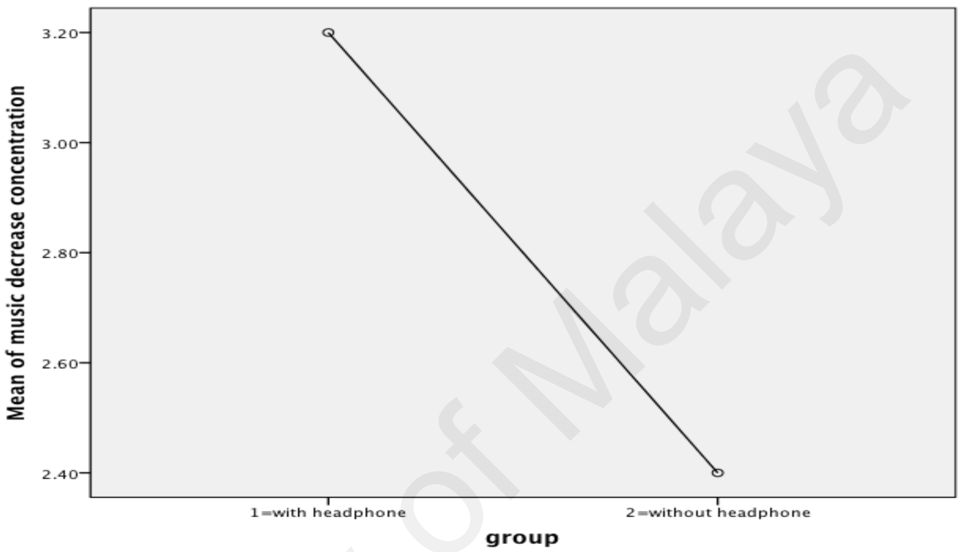

Figure 4.25: Contrastive Analysis of Item 10 Based on Group (Line Graph)

The results in Table 4.49 displayed that the mean score of Group 1 (3.2000) outperformed Group 2 (2.4000). The above results indicated that there was a significant difference between the two groups. Meanwhile, Figure 4.25 showed that Group 1 (with headphones) was higher than Group 2 (without headphones). Similarly, the results in Table 4.50 showed that there was a significant difference between Group 1 and Group 2 [F (1, 48) = 7.385, $p < 0.05$]. It expressed that Group 1 (with headphones) agreed that listening to music decreased their concentration while they were typing compared to their usual working environment. Table 4.51 and Table 4.52 depicted the results of analysis.

Table 4.51: Contrastive Analysis of Item 10 Based on Gender (Descriptive Analysis)

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minim	Max
					Lower Bound	Upper Bound		
Male	13	2.6154	.96077	.26647	2.0348	3.1960	1.00	4.00
Female	17	2.8649	1.15859	.19047	2.4786	3.2512	1.00	5.00
Total	50	2.8000	1.10657	.15649	2.4855	3.1145	1.00	5.00

Table 4.52: Contrastive Analysis of Item 10 Based on Gender (ANOVA)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.599	1	.599	.484	.490
Within Groups	59.401	48	1.238		
Total	60.000	49			

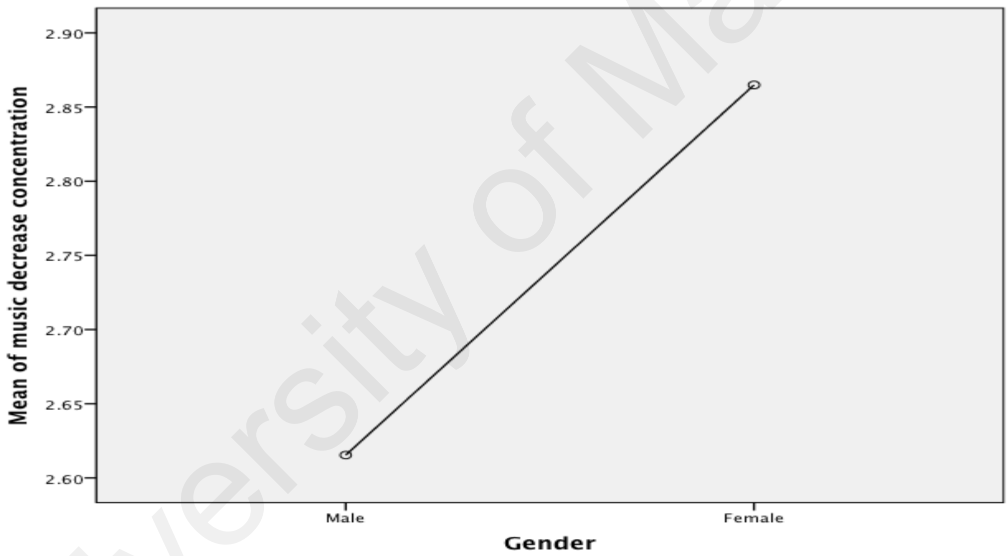

Figure 4.26: Contrastive Analysis of Item 10 Based on Gender (Line Graph)

According to Table 4.51, the mean score showed that female (2.8649) outperformed male (2.6154). In terms of gender, the line graphs in Figure 26 indicated that female's was higher than male's. However, the results in Table 4.52 showed that there was no significant interaction difference [F (1, 48) =. 484, P > 0.05] between male and female.

4.4.2.11 Contrastive Analysis of Item 11 Based on Group and Gender

Item 11 is to investigate whether fast music makes the participants nervous when they are typing. The results were analysed using ANOVA. Table 4.53 and Table 4.54 depicted the results of analysis.

Table 4.53: Contrastive Analysis of Item 11 Based on Groups (Descriptive Analysis)

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minim	Max
					Lower Bound	Upper Bound		
1=with headphones	25	3.6000	1.25831	.25166	3.0806	4.1194	1.00	5.00
2=without headphones	25	3.8000	1.32288	.26458	3.2539	4.3461	1.00	5.00
Total	50	3.7000	1.28174	.18127	3.3357	4.0643	1.00	5.00

Table 4.54: Contrastive Analysis of Item 11 Based on Groups (ANOVA)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.500	1	.500	.300	.586
Within Groups	80.000	48	1.667		
Total	80.500	49			

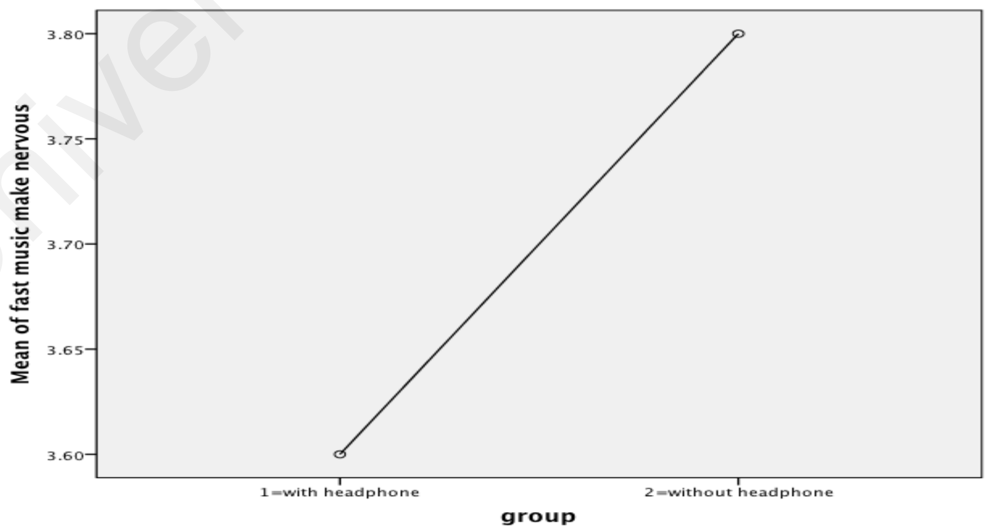

Figure 4.27: Contrastive Analysis of Item 11 Based on Group (Line Graph)

There was a minor difference between Group 1 and Group 2. According to Table 4.53, the mean score of Group 2 (3.8000) exceeded Group 1 (3.6000). Figure 4.27 showed the same result that Group 2 (without headphones) was higher than Group 1 (with headphones). As described above, the results were inconsistent with the results in Table 4.54, indicating that there was no significant difference interaction between the two groups [F (1, 48) = .300, p > .0.05]. Table 4.55 and Table 4.56 depicted the results of analysis.

Table 4.55: Contrastive Analysis of Item 11 Based on Gender (Descriptive Analysis)

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minim	Max
					Lower Bound	Upper Bound		
Male	13	3.8462	1.28103	.35529	3.0720	4.6203	1.00	5.00
Female	37	3.6486	1.29564	.21300	3.2167	4.0806	1.00	5.00
Total	50	3.7000	1.28174	.18127	3.3357	4.0643	1.00	5.00

Table 4.56: Contrastive Analysis of Item 11 Based on Gender (ANOVA)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.375	1	.375	.225	.638
Within Groups	80.125	48	1.669		
Total	80.500	49			

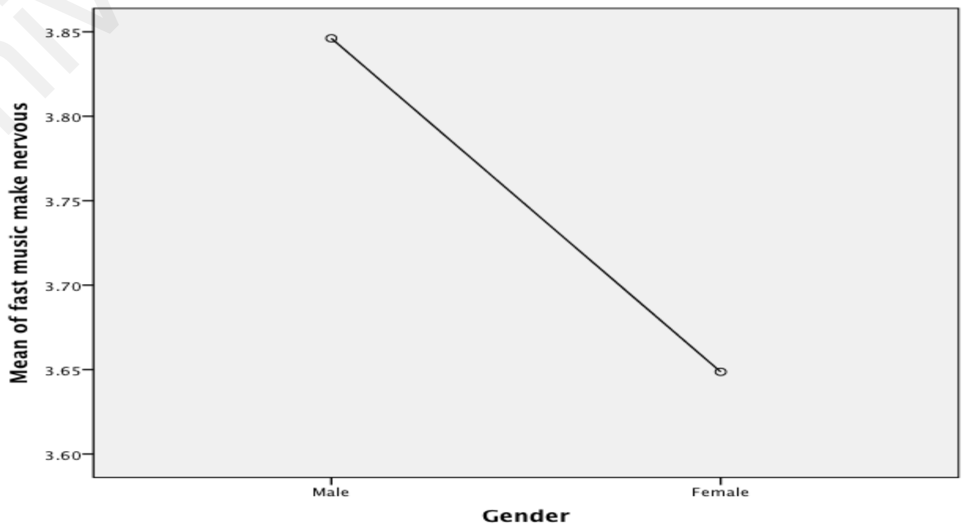

Figure 4.28: Contrastive Analysis of Item 11 Based on Gender (Line Graph)

From Table 4.55, it was obtained that the mean score of male (3.8462) surpassed female (3.6486). The line graphs in Figure 4.28 also showed that male's was higher than female's. The results in Table 4.56 indicated that there was no significant interaction difference in terms of gender [F (1, 48) = .225, P > 0.05]. It represents that there was no difference between male and female.

4.4.2.12 Contrastive Analysis of Item 12 Based on Group and Gender

Item 12 aims to examine whether the participants feel relaxed when they are typing with the presence of music. The results were analysed using ANOVA. Table 4.57 and Table 4.58 depicted the results of analysis.

Table 4.57: Contrastive Analysis of Item 12 Based on Groups (Descriptive Analysis**)**

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minim	Max
					Lower Bound	Upper Bound		
1=with headphones	25	3.7600	.87939	.17588	3.3970	4.1230	2.00	5.00
2=without headphones	25	3.7200	.73711	.14742	3.4157	4.0243	3.00	5.00
Total	50	3.7400	.80331	.11361	3.5117	3.9683	2.00	5.00

Table 4.58: Contrastive Analysis of Item 12 Based on Groups (ANOVA)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.020	1	.020	.030	.862
Within Groups	31.600	48	.658		
Total	31.620	49			

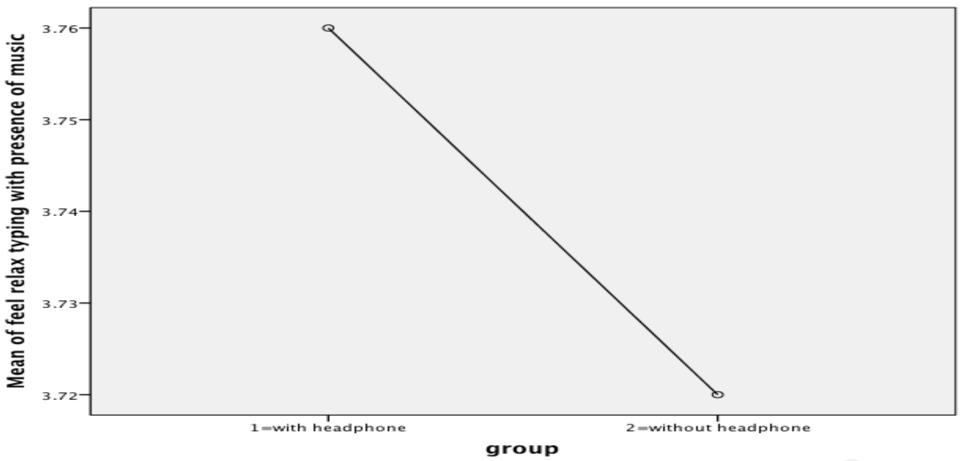

Figure 4.29: Contrastive Analysis of Item 12 Based on Group (Line Graph)

There was a minor difference between Group 1 and Group 2. The results in Table 4.57 showed that the mean score of Group 1 (3.7600) outperformed Group 2 (3.7200). The same standpoint was also displayed in Figure 4.29 showing that Group 1 (with headphones) was higher than Group 2 (without headphones). However, Table 4.58 suggested that there was no significant interaction difference between the two groups [F (1, 48) = .030, P > 0.05]. Table 4.59 and Table 4.60 depicted the results of analysis.

Table 4.59: Contrastive Analysis of Item 12 Based on Gender (Descriptive Analysis)

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minim	Max
					Lower Bound	Upper Bound		
Male	13	4.2308	.72501	.20108	3.7926	4.6689	3.00	5.00
Female	37	3.5676	.76524	.12580	3.3124	3.8227	2.00	5.00
Total	50	3.7400	.80331	.11361	3.5117	3.9683	2.00	5.00

Table 4.60: Contrastive Analysis of Item 12 Based on Gender (ANOVA)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.231	1	4.231	7.415	.009
Within Groups	27.389	48	.571		
Total	31.620	49			

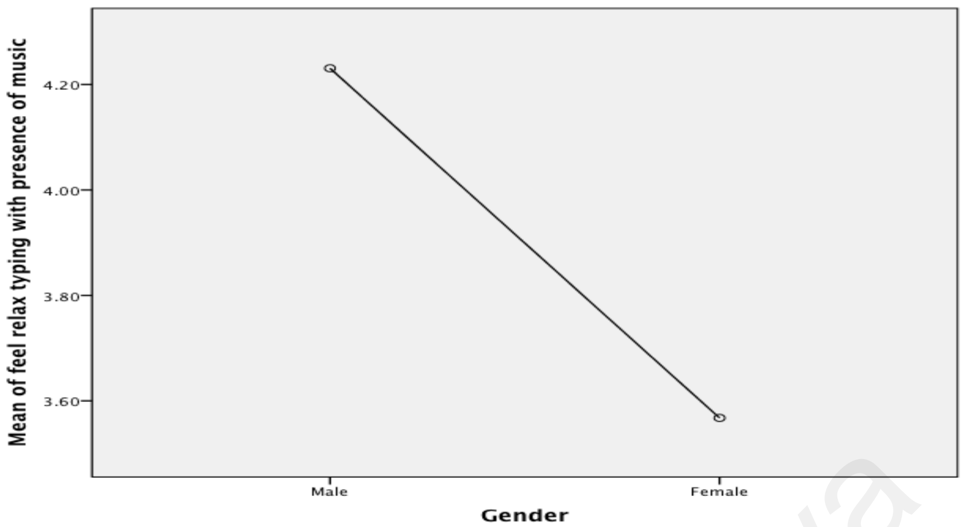

Figure 4.30: Contrastive Analysis of Item 12 Based on Gender (Line Graph)

In terms of gender, Table 4.59 showed results that the mean score of male (4.2308) exceeded female (3.5676). Meanwhile, the line graphs in Figure 4.30 indicated that male's was higher than female's. However, Table 4.60 presented that there was a significant difference between male and female [F (1, 48) = 7.415, P < 0.05]. It suggested that male participants were more relaxed than female participants while typing with the presence of music.

4.4.3 Data Analysis Using Likert Scale

The questionnaires results were analysed using Likert Scale. All 18 items in the questionnaires will be analysed and explained. There are five choices ranging from 1 to 5, representing strongly disagree, disagree, neutral, agree and strongly agree respectively.

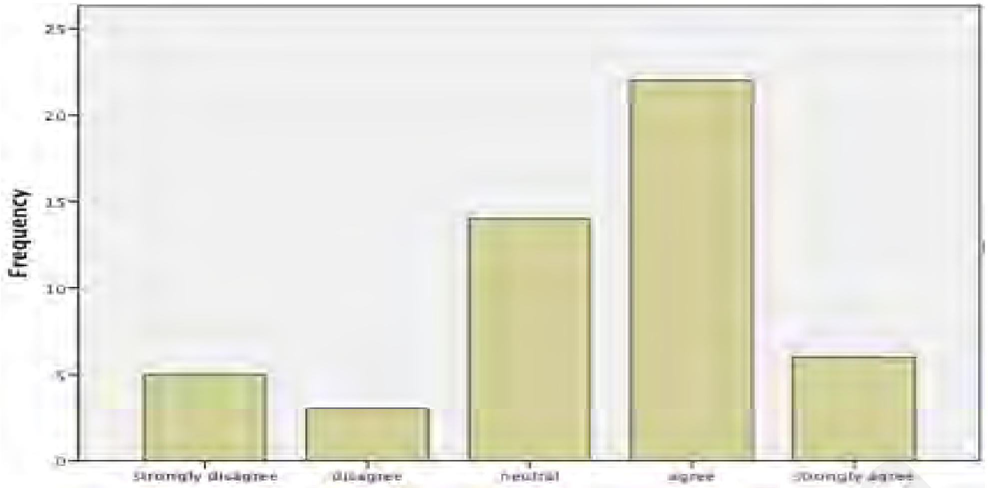

Figure 4.31: Analysis Using Likert Scale on Question-Are you feeling sleepy after you have taken your lunch in pre-test?

When being asked whether they were feeling sleepy in pre-test after lunch, the responses were presented in Figure 4.31. Results showed that most participants agreed with the question. Particularly, 22 participants chose “agree” and 6 participants chose “strongly agree”. Next, 14 participants selected “neutral”. Another 5 participants strongly disagreed with it and the remaining three disagreed with it. Therefore, there were 28 participants who were feeling sleepy in the silent condition (pre-test) after their lunch.

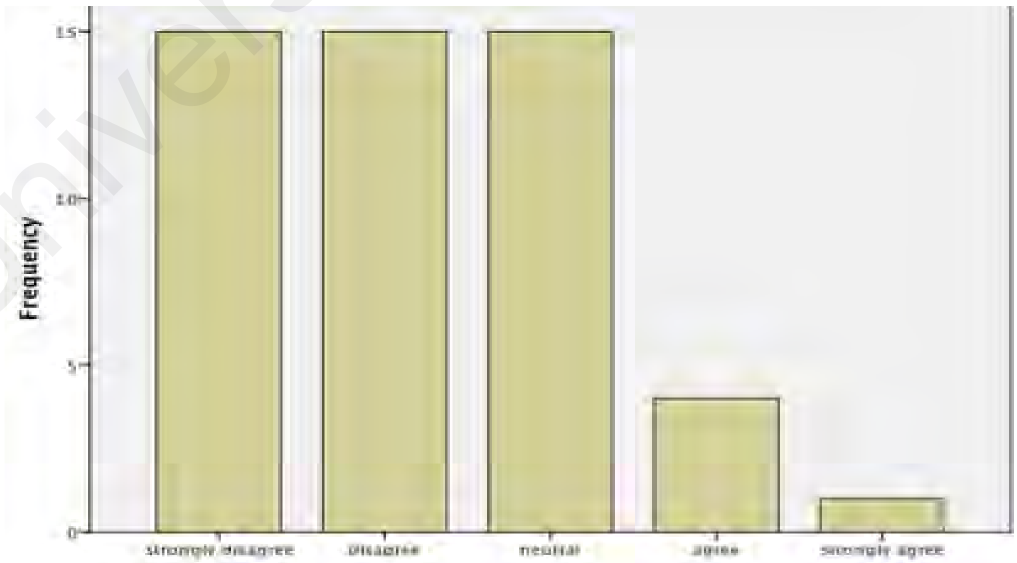

Figure 4.32: Analysis Using Likert Scale on Question- -Do you feel sleepy during the test in pre-test?

The second question is "Do you feel sleepy during the test in pre-test". Figure 4.32 illustrated that 15 participants strongly disagreed and 15 disagreed that they felt sleepy in the pre-test. Another 15 participants remained neutral. Furthermore, 4 participants agreed and 1 strongly agreed that felt sleepy during the test. The results showed that most participants did not feel sleepy during the test in the silent condition in pre-test.

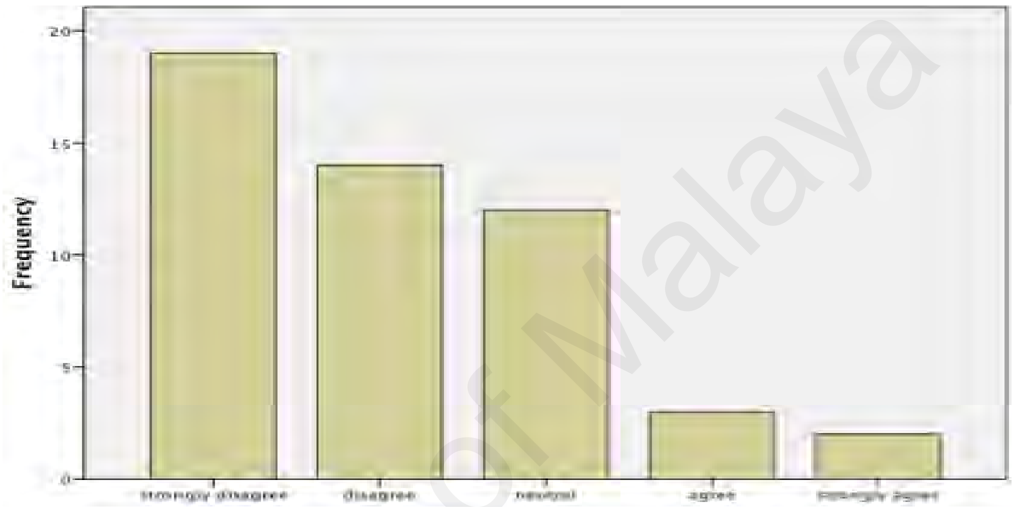

Figure 4.33: Analysis Using Likert Scale on Question--Do you feel sleepy after the test?

For the question asking whether the participants felt sleepy after the test, Figure 4.33 showed that 19 participants strongly disagreed with it whereas 14 participants chose "disagree". 12 participants remained neutral to the question. Then, 5 participants either agreed or strongly agreed that they felt sleepy after the test.

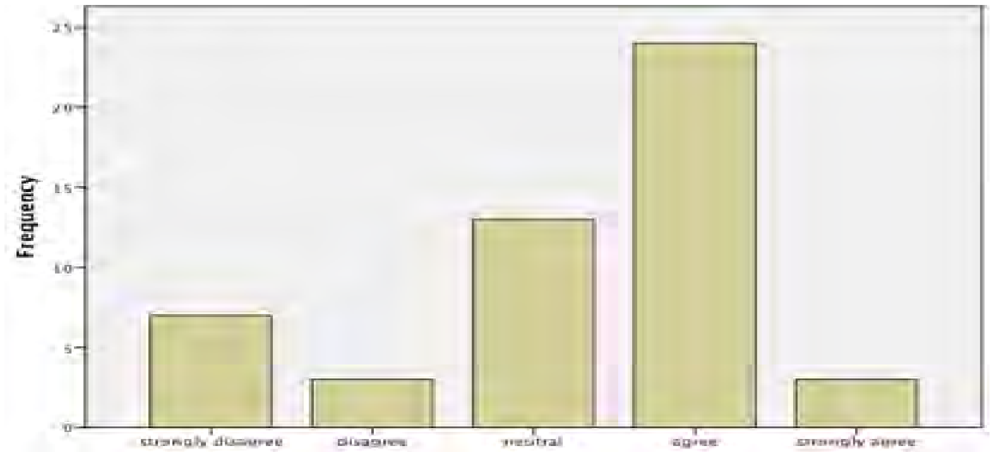

Figure 4.34: Analysis Using Likert Scale on Question- -Are you feeling sleepy after you have taken your lunch in post-test?

Figure 4.34 showed that 24 participants agreed and 3 strongly agreed that they experienced sleepy feelings in the post-test after their lunch. Next, 14 participants remained neutral. The remaining participants, which were 7 and 3, strongly disagreed and disagreed with the question respectively.

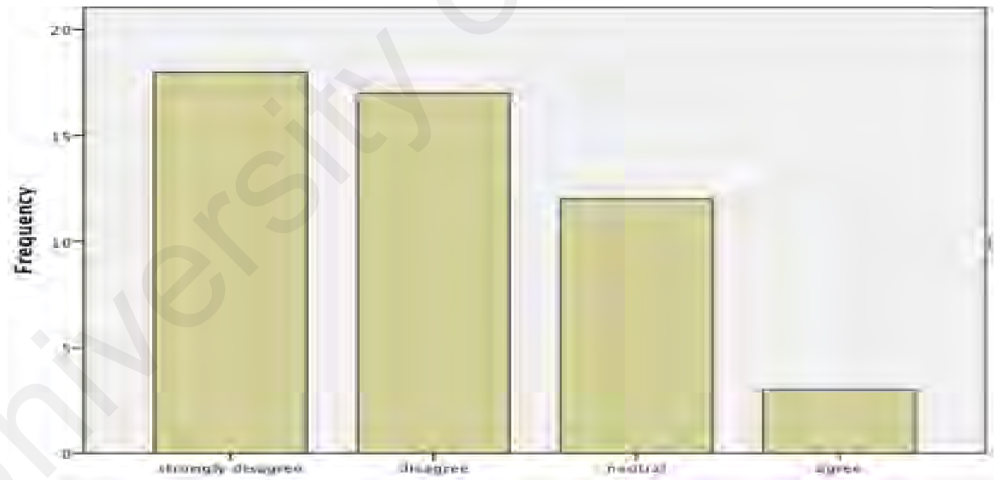

Figure 4.35: Analysis Using Likert Scale on Question- -Do you feel sleepy during the test in post-test?

Figure 4.35 illustrated that 35 participants did not feel sleepy during the post-test as they chose “strongly disagree” or “disagree”. 12 participants remained neutral whereas the remaining 3 participants agreed that felt sleepy in the post-test with music background.

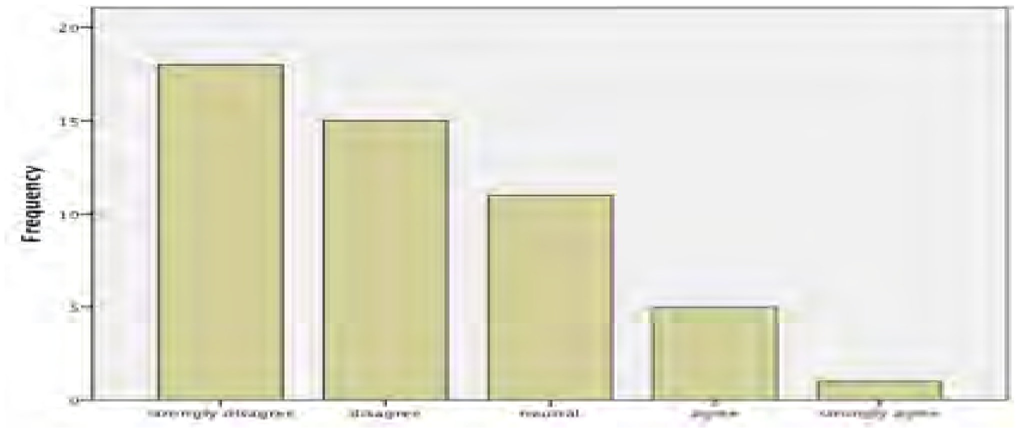

Figure 4.36: Analysis Using Likert Scale on Question- -Do you feel sleepy after the test in post-test?

Figure 4.36 presented that there were 18 participants who strongly disagreed that they felt sleepy in the test with music background. 15 participants disagreed with it too. Another 15 participants selected "neutral". However, 5 participants agreed that they felt sleepy in the post-test, and one participant strongly agreed with it.

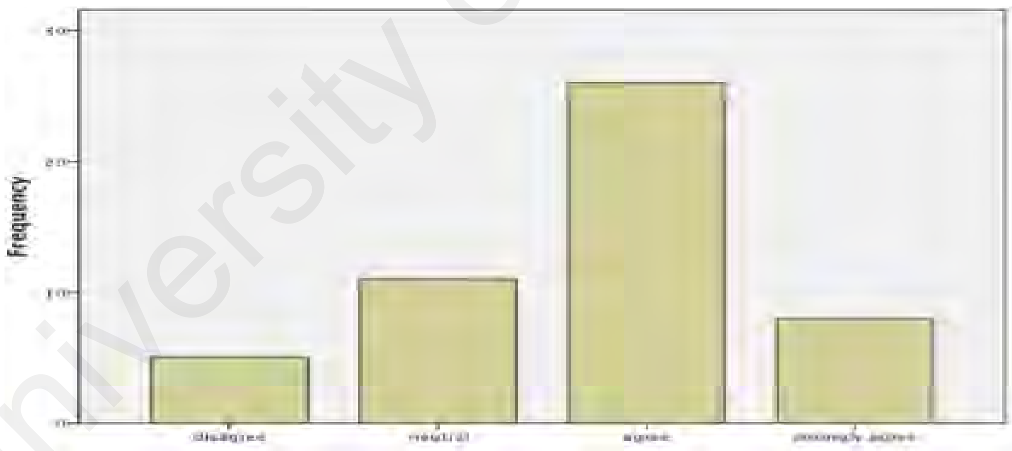

Figure 4.37: Analysis Using Likert Scale on Question--Music helps me to feel more energetic in the process of typing.

Figure 4.37 showed that 26 participants agreed that music helped them feel more energetic in the process of typing. On top of that, another 8 participants strongly agreed with the statement. Next, 11 participants remained neutral. Only 5 participants disagreed with it out of 50 participants. This suggests that the majority of the participants felt that music has its effects in making people more energetic in the process of typing.

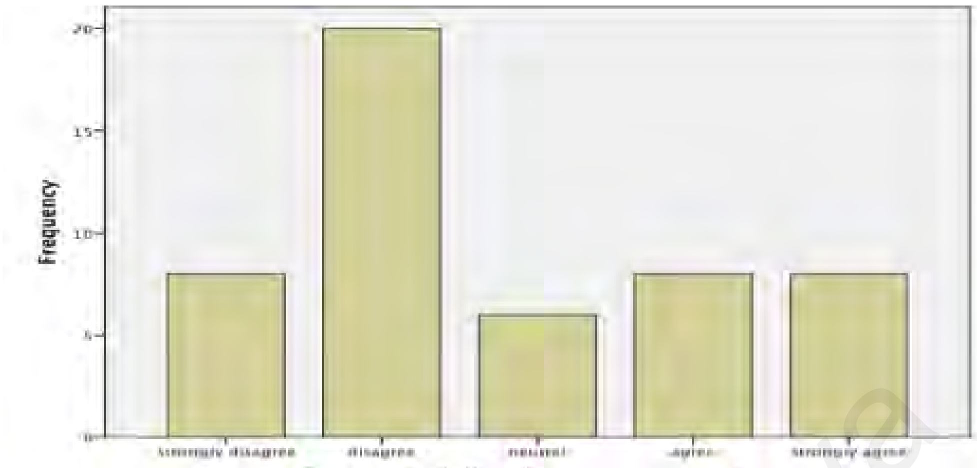

Figure 4.38: Analysis Using Likert Scale on Question--Fast music compared to slow music helps to deliver better concentration in the process of typing.

Figure 4.38 indicated that 20 participants disagreed that fast music compared to slow music helps them to deliver better concentration in the process of typing. On top of that, 8 participants strongly disagreed with that. The other 6 participants remained neutral to the statement. On the contrary, 8 participants agreed that fast music helped them concentrate better in the process of typing. Another 8 participants strongly agreed with it. Overall, most participants disagreed with the statement.

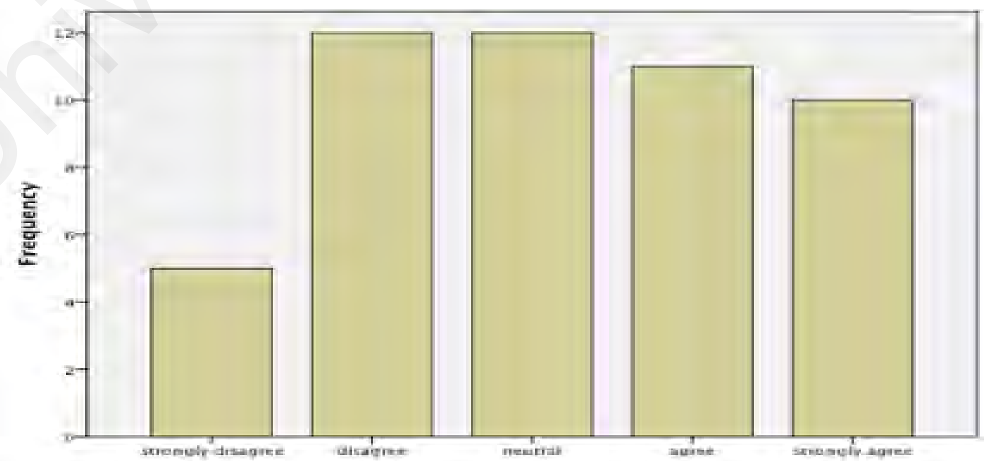

Figure 4.39: Analysis Using Likert Scale on Question--Fast music compared to slow music can help in increasing typing speed.

Figure 4.39 indicated that in total there was 17 participants who disagreed that fast music helped increase their typing speed, particularly 5 strongly disagreed and 12 disagreed. Another 12 participants remained neutral to the question. Nevertheless, 21 participants either agreed or strongly agreed with the question. Finally, comparing the number of participants who agreed and disagreed, a greater number of participants agreed with the standpoint that fast music helped increase their typing speed.

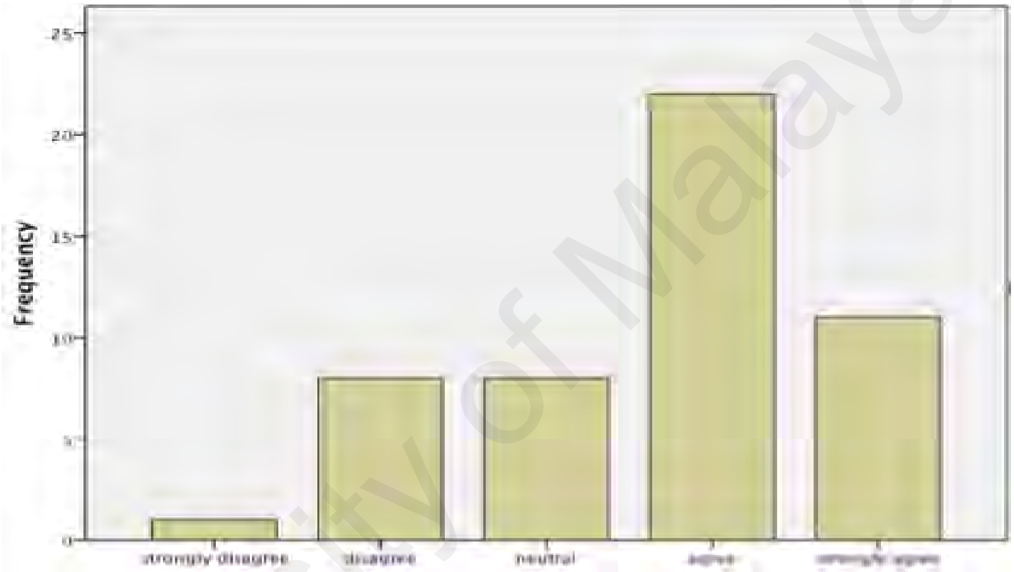

Figure 4.40: Analysis Using Likert Scale on Question- -Slow music compared to fast music helps to deliver better concentration in the process of typing.

Figure 4.40 illustrated that 22 participants agreed that slow music compared to fast music assisted them to deliver better concentration in the process of typing. Furthermore, another 11 participants strongly agreed with that. However, 8 participants chose the opposite and another participant even strongly disagreed with it. Based on the results, more than half of the participants felt that compared to fast music, slow music helped them concentrate better in the typing process.

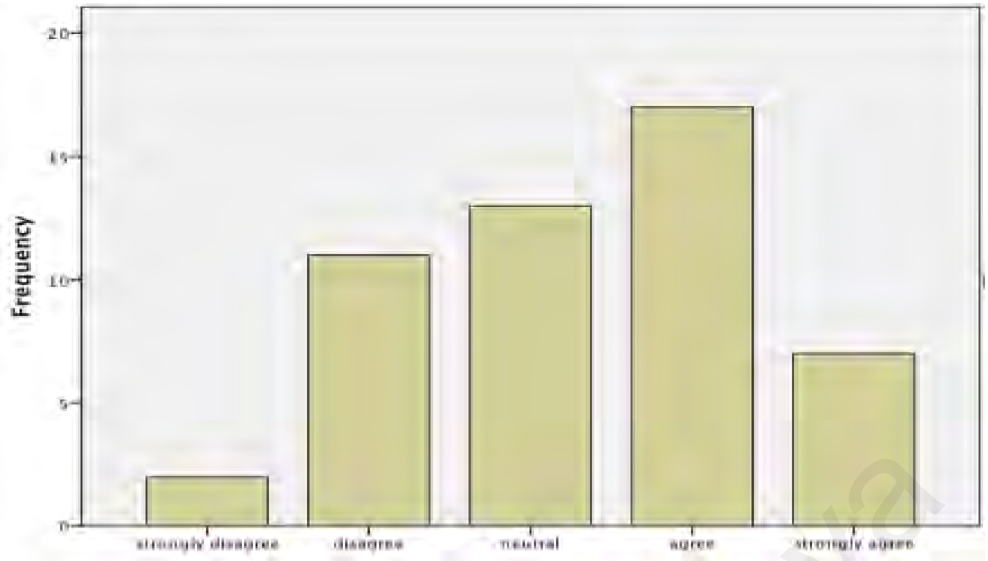

Figure 4.41: Analysis Using Likert Scale on Question--Slow music compared to fast music can help in increasing typing speed.

Figure 4.41 showed that 17 participants agreed that slow music compared to fast music could help in increasing their typing speed; there were 7 participants who strongly agreed. On the contrary, 11 participants disagreed and 2 participants strongly disagreed with it. However, 13 participants remained neutral to the statement. This suggested that slow music helped increase their typing speed in the test.

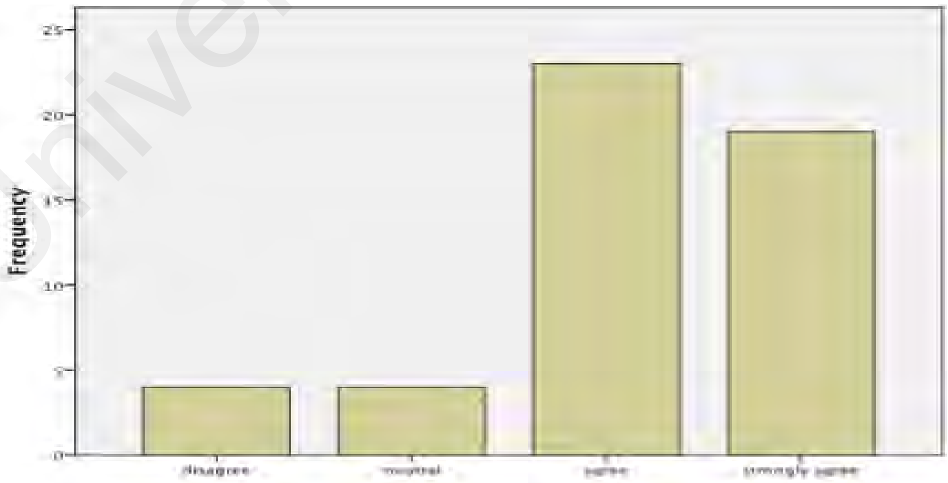

Figure 4.42: Analysis Using Likert Scale on Question- -Slow music makes me relax when I am typing.

Figure 4.42 indicated a high proportion of participants who agreed that slow music made them feel relaxed when they were typing. In total, there were 42 participants who identified that slow music made them feel relaxed in the typing process. Meanwhile, 4 participants remained neutral while another 4 participants disagreed with the statement.

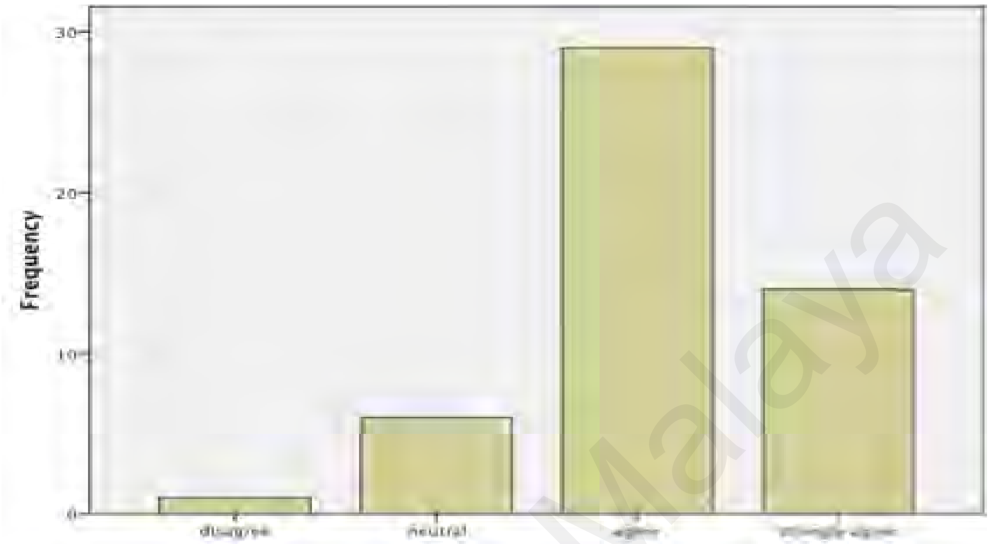

Figure 4.43: Analysis Using Likert Scale on Question- - I feel different with the presence of music during typing.

Figure 4.43 explained the results that 43 participants agreed that they felt different with the presence of music during typing. However, 6 participants remained neutral state. Only one participant did not feel different with presence of music during typing.

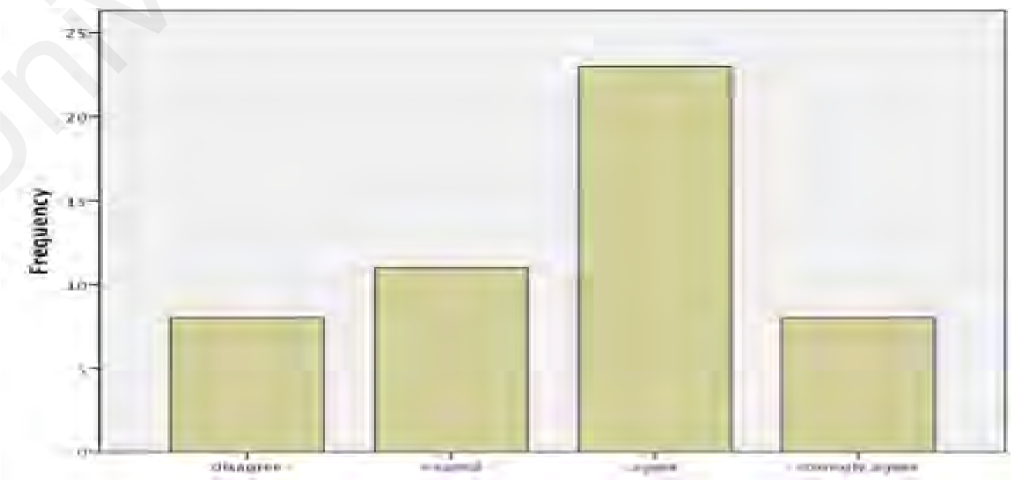

Figure 4.44: Analysis Using Likert Scale on Question- -Listening to music helps me to increase my typing speed.

Figure 4.44 showed that there were 31 participants who agreed with the standpoint – listening to music helped them increase their typing speed. However, 11 participants stayed neutral and another 8 participants disagreed with it. The results showed that music had a stimulating effect that could help increase the participants' typing speed.

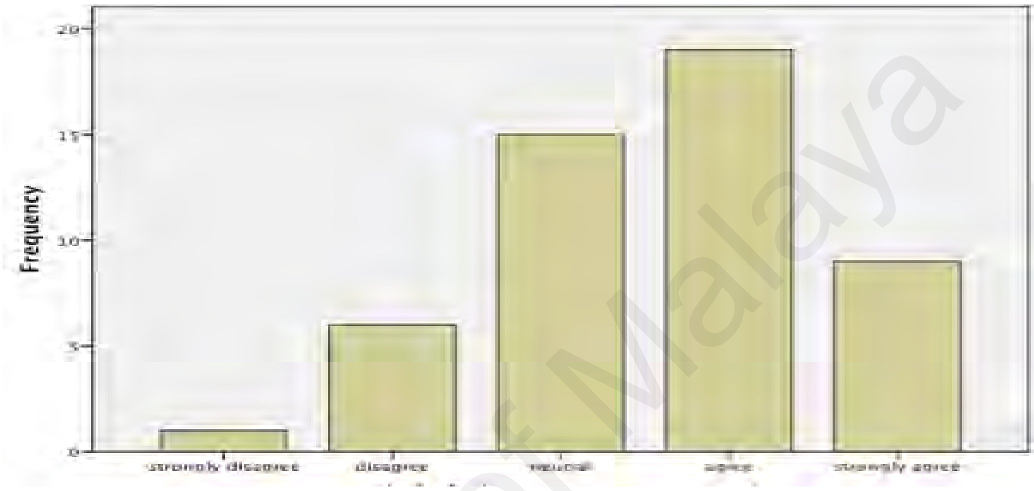

Figure 4.45: Analysis Using Likert Scale on Question--Listening to music help me improves concentration during typing.

Figure 4.45 explained that 28 participants agreed that listening to music helped them improve concentration during typing. 15 participants remained neutral to the statement. However, 7 participants did not think that listening to music helped them concentrate better in the test. In short, the hypothesis on listening to music helps people improve concentration in the process of typing may be established.

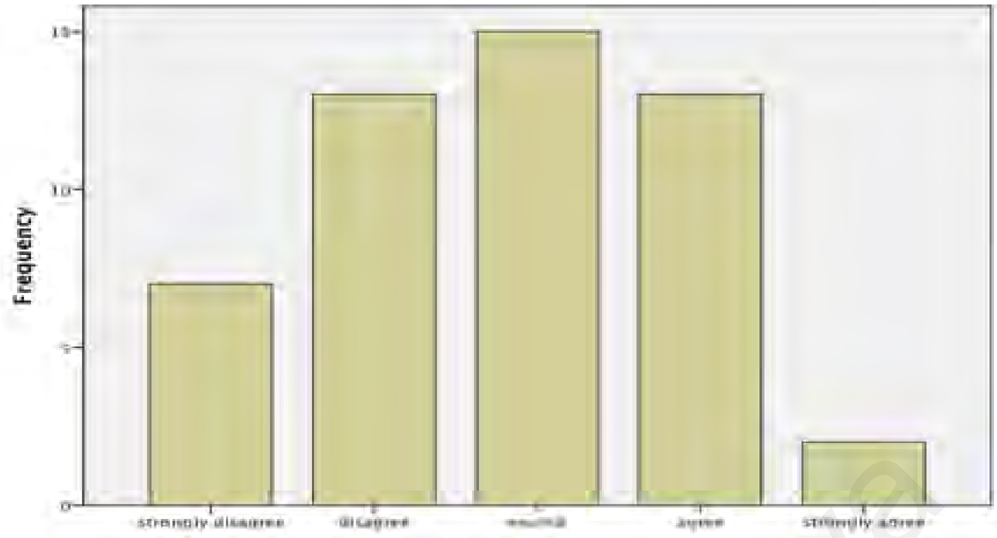

Figure 4.46: Analysis Using Likert Scale on Question- -Listening to music decrease my concentration during typing compared to my usual working environment.

Figure 4.46 showed that 7 participants strongly disagreed and 13 participants disagreed that listening to music decreased their concentration during typing compared to their usual working environment. On the other hand, 15 participants stayed neutral. Lastly, 13 participants agreed and 2 strongly agreed with it. Overall, participants who disagreed with the statement are far more than participants who agreed. This suggested that listening to music did not necessarily decrease the participants' concentration during typing.

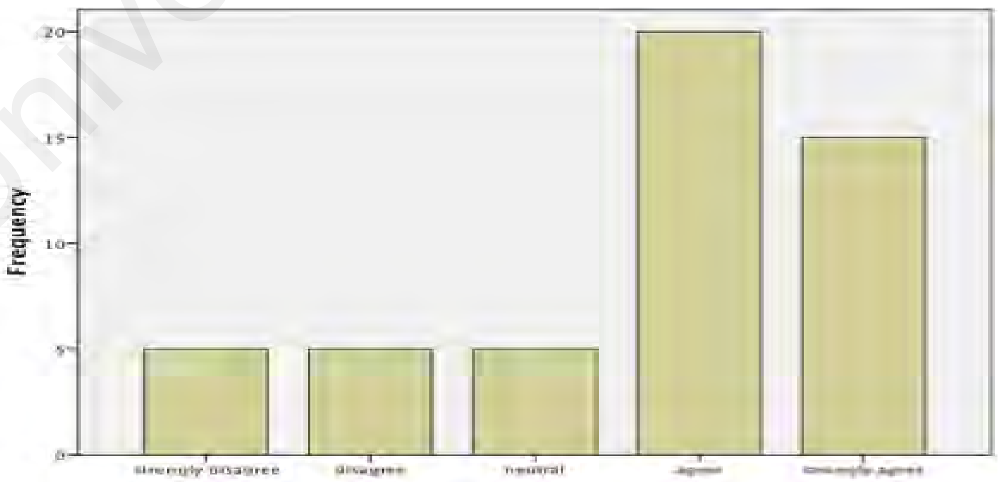

Figure 4.47: Analysis Using Likert Scale on Question--Fast music makes me nervous when I am typing.

Figure 4.47 illustrated that more than half of the participants agreed with the standpoint. They felt that fast music made them nervous when they were typing. 5 participants stayed neutral and another 10 participants disagreed with it.

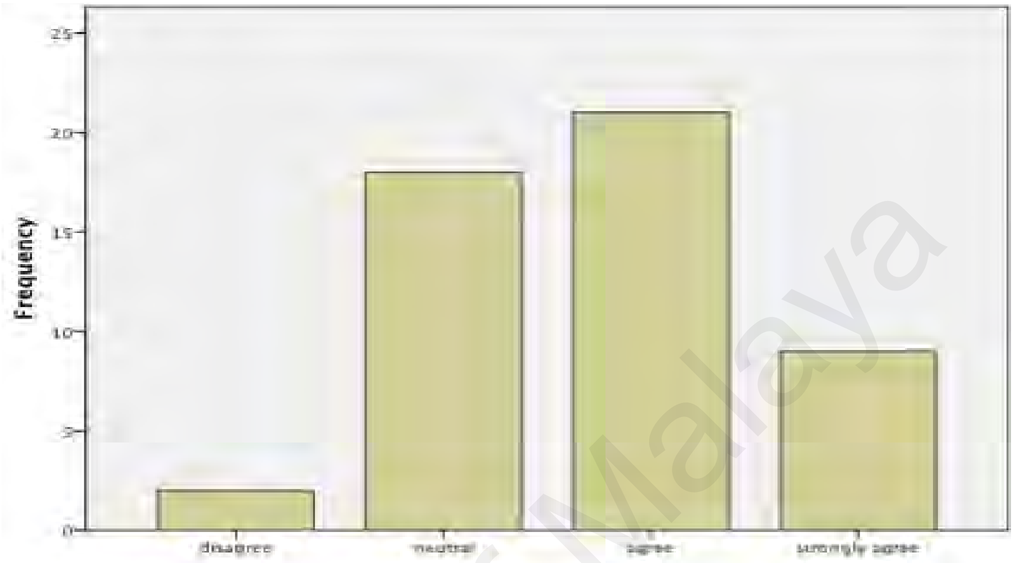

Figure 4.48: Analysis Using Likert Scale on Question-- I feel relax typing with the presence of music

Based on the bar chart in Figure 4.48, it was revealed that 30 participants felt relaxed while typing with the presence of music, particularly 21 participants agreed and 9 strongly agreed. Nevertheless, 18 participants remained neutral and 2 participants disagreed with the statement.

4.5 Data Analysis of Observation

This section analyses whether the typed characters in every 15-second interval in the 2-minute test are affected by the three conditions: silent condition (without music), slow music and fast music. Table 4.61 and Table 4.62 depicted the results of analysis.

Table 4.61: Data Analysis of Observation at each15-second in 2 minute (Between-Subjects Factors)

		Value Label	N
Type_Music	1.00	1=without music	50
	2.00	2=slow music	50
	3.00	3=fast music	50

Table 4.61 showed that there were 50 participants who went through three conditions, including silent condition (without music), slow music and fast music.

Table 4.62: Data Analysis of Observation at each 15-second in 2 minutes Descriptive Statistics

	Type of Music	Mean	Std. Deviation	N
Time00_15seconds_characters	1=without music	42.18	14.127	50
	2=slow music	46.06	16.382	50
	3=fast music	43.96	17.489	50
	Total	44.07	16.032	150
Time15_30seconds_characters	1=without music	40.56	14.193	50
	2=slow music	44.46	14.812	50
	3=fast music	47.42	16.021	50
	Total	44.15	15.190	150
Time30_45seconds_characters	1=without music	36.26	14.300	50
	2=slow music	40.06	14.006	50
	3=fast music	46.40	12.996	50
	Total	40.91	14.315	150
Time45_60seconds_characters	1=without music	37.78	13.434	50
	2=slow music	42.88	17.878	50
	3=fast music	47.06	17.103	50
	Total	42.57	16.588	150
Time60_75seconds_characters	1=without music	38.84	14.459	50
	2=slow music	39.18	14.513	50
	3=fast music	44.18	14.944	50

Table 4.62, continued

	Total	40.73	14.747	150
Time75_90seconds_characters	1=without music	37.52	15.867	50
	2=slow music	41.58	15.029	50
	3=fast music	42.24	16.826	50
	Total	40.45	15.955	150
Time90_105seconds_characters	1=without music	39.18	13.430	50
	2=slow music	41.74	15.842	50
	3=fast music	46.40	18.653	50
	Total	42.44	16.287	150
Time105_120seconds_characters	1=without music	40.66	15.874	50
	2=slow music	40.52	16.224	50
	3=fast music	43.72	16.386	50
	Total	41.63	16.122	150

Table 4.63: Data Analysis of Observation at each 15-second in 2 minutes (Multivariate Analysis)

Effect		Value	F	Hypothesis df	Error df	Sig.
Factor1	Pillai's Trace	.148	3.504[b]	7.000	141.000	.002
	Wilks' Lambda	.852	3.504[b]	7.000	141.000	.002
	Hotelling's Trace	.174	3.504[b]	7.000	141.000	.002
	Roy's Largest Root	.174	3.504[b]	7.000	141.000	.002
Factor1*group	Pillai's Trace	.168	1.857[b]	14.000	284.000	.031
	Wilks' Lambda	.838	1.862[b]	14.000	282.000	.030
	Hotelling's Trace	.187	1.867[b]	14.000	280.000	.230
	Roy's Largest Root	.138	2.798[b]	7.000	142.000	.009

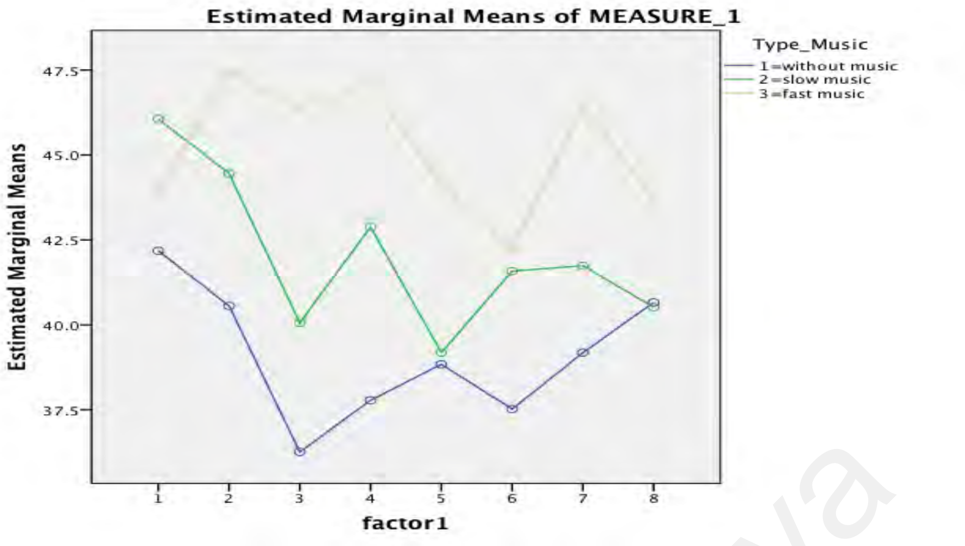

Figure 4.49: Analysis of Observation at each 15-second interval in 2 minutes

Table 4.62 explained the relationship in detail to help interpret the results in Figure 4.49. The mean score of time 00" to 15" showed that slow music (46.06) outperformed fast music (43.96) and condition without music (silent condition) (42.18). In these three conditions, slow music made participants type maximum number of characters. The mean score of time 15" to 30" showed that fast music (47.42) outperformed slow music (44.46) and condition without music (silent condition) (40.56). Based on the results above, it was found that fast music increased participants' maximum typed characters.

From 30" to 45", fast music (46.40) exceeded slow music (40.06) and condition without music (silent condition) (36.26). The results indicated that participants typed their maximum characters in the fast music condition. From 45" to 60", fast music (47.06) outperformed slow music (42.88) and condition without music (silent condition) (37.78). It suggested that minimum characters were typed under silent condition (without music) whereas fast music stimulates participants to type maximum characters. From 60" to 75", fast music (44.18) outperformed slow music (39.18) and condition without music (silent condition)

(38.84). The results represented that achieving maximum typed characters was highly influenced by fast music.

From 75” to 90”, fast music (42.24) surpassed slow music (41.58) and condition without music (silent condition) (37.52). According to the above results, fast music stimulated all participants to type their maximum characters. From 90” to 105”, once again, fast music (46.40) outperformed slow music (41.74) and condition without music (silent condition) (39.18). Similarly, fast music served as a tool to encourage participants to type more characters. From 105” to 120”, fast music (43.72) outperformed slow music (40.52) and condition without music (silent condition) (40.66). Participants were able to type maximum characters in the fast music condition.

As described above, the results discovered that fast music stimulated the participants to type their maximum characters compared to the other two environments: silence (without music) and slow music.

There results displayed in Table 4.63 are significant. The line graphs in Figure 4.49 clearly showed that participants were stimulated by both slow and fast music, especially participants who went through fast music were able to type maximum characters. Meanwhile, participants typed maximum characters in the fast music condition. However, compared to the silent environment (without music), slow music was the second environment that was able to make participants type more characters.

4.5.1 Analysis of Time 45_60 seconds

Every participant went through three environments: silence, slow music and fast music. Jurassic Park Theme played by The Piano Guys is used as the slow music. Mission Impossible Theme song is used as the fast music.

The Jurassic Park Theme song was extracted start from 15 seconds. In total, the time 45 seconds to 60 seconds is the peak part of the song that cello plays with piano in the highest volume. On the other hand, Mission Impossible was extracted from 1’35” to 2’25” with repeated cycle. Meanwhile, from 0’45” to 0’60” seconds is the beginning of this song that is most familiar to most participants by observation. The prior 4 seconds played with percussion and string instruments that make the bell sound have led listeners to feel more energetic. Followed by bass section and brass instrument, the music strengthens. Then, rhythm is the reason that the bass part makes participants move on faster. Table 4.64 and Table 4.65 depicted the results of analysis.

Table 4.64: Analysis of Time 45_60 seconds typing characters (Descriptive Analysis)

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Max
					Lower Bound	Upper Bound		
1=without music	50	37.78	13.434	1.900	33.96	41.60	16	70
2=slow music	50	42.88	17.878	2.528	37.80	47.96	12	83
3=fast music	50	47.06	17.103	2.419	42.20	51.92	21	102
Total	150	42.57	16.588	1.354	39.90	45.25	12	102

Table 4.65: Analysis of Time 45_60 seconds typing characters (ANOVA)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2160.013	2	1080.007	4.088	.019
Within Groups	38836.680	147	264.195		
Total	40996.693	149			

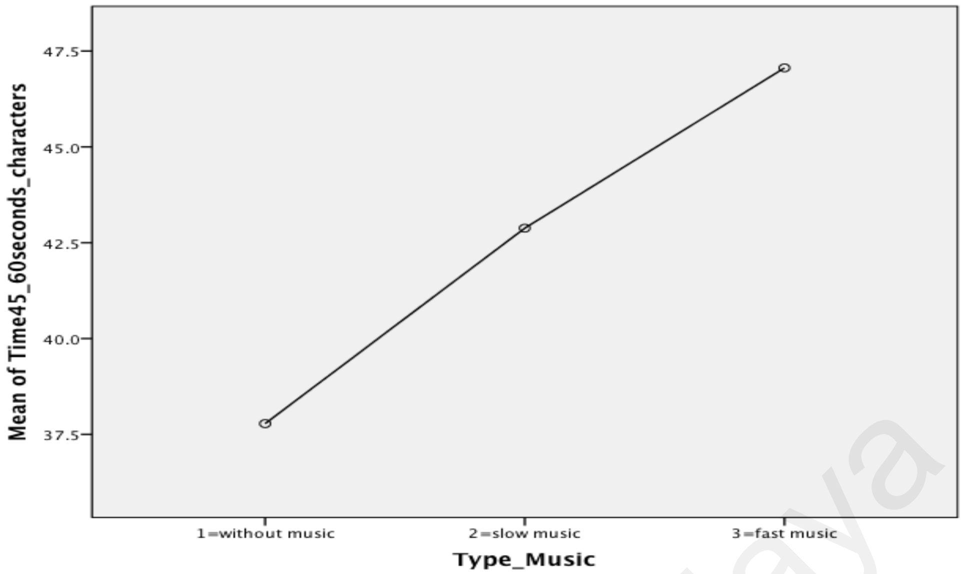

Figure 4.50: Analysis of Time 45_60 seconds

The mean score in Table 4.64 showed that fast music (47.06) outperformed slow music (42.88) and silent condition (without music). There was was significant interaction difference as showed in Table 4.65 [$p < 0.05$]. Figure 4.50 represented that fast music was higher than slow music and silent condition.

4.5.2 Analysis of Typing Characters in the First Minute

Table 4.66 and Table 4.67 depicted the results of analysis.

Table 4.66: Analysis of Typing Characters in the First Minute (Descriptive Analysis)

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minim	Max
					Lower Bound	Upper Bound		
1=without music	50	156.78	44.564	6.302	144.12	169.44	68	248
2=slow music	50	176.06	58.387	8.257	159.47	192.65	82	361
3=fast music	50	183.60	52.102	7.368	168.79	198.41	74	282
Total	150	172.15	52.871	4.317	163.62	180.68	68	361

Table 4.67 Analysis of Typing Characters in the First Minutes (ANOVA)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	19131.373	2	9565.687	3.539	.032

Table 4.67, continued

Within Groups	397371.400	147	2703.207		
Total	416502.773	149			

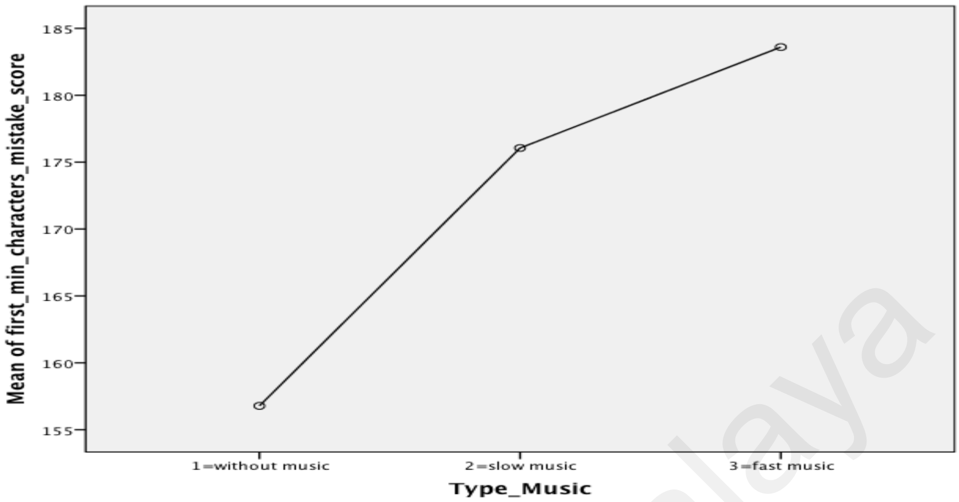

Figure 4.51: Analysis of Typing Characters in the First Minute

The mean score in Table 4.66 showed that fast music (183.60) outperformed slow music (1767.06) and silent environment (156.78). Table 4.67 indicated that there was a significant interaction difference among the three types of music [p< 0.05]. Figure 4.51 explained the relationships in detail to interpret the mean score in Table 4.66. The line graphs of fast music were higher compared to slow music and silent environment.

4.6 Data Analysis of Participants during Postprandial Somnolence

This section analyses 28 participants who experienced the sleepy feelings after lunch. Each participant went through three environments: silence (without music), slow music and fast music. The questionnaires and observation were examined and analysed.

4.6.1 Analysis of Questionnaires

In total, there were 18 items in the questionnaires. All 28 participants in postprandial sleepiness responded to them. This section follows the sequence of the analysis, which includes contrastive analysis of Item 1 in pre-test and post-test, contrastive analysis of Item 2 in pre-test and post-test, contrastive analysis of Item 3 in pre-test and post-test, were examined using SPNOVA. Next, all 18 items were analysed using Likert Scale. Table 4.68 and Table 4.69 depicted the results of analysis.

Table 4.68: Contrastive Analysis of Item 1 in Pre-test and Post-test of Sleepy Participants Descriptive Statistics

	Mean	Std. Deviation	N
Feeling sleepy after lunch pre1	4.2143	.41786	28
Feeling sleepy after lunch pos1	3.8929	.78595	28

Table 4.69: Contrastive Analysis of Item 1 in Pre-test and Post-test of Sleepy Participants (Multivariate Analysis)

Effect		Value	F	Hypothesis df	Error df	Sig.
Factor1	Pillai's Trace	.107	3.240[b]	1.000	27.000	.083
	Wilks' Lambda	.893	3.240[b]	1.000	27.000	.083
	Hotelling's Trace	.120	3.240[b]	1.000	27.000	.083
	Roy's Largest Root	.1200	3.240[b]	1.000	27.000	.083

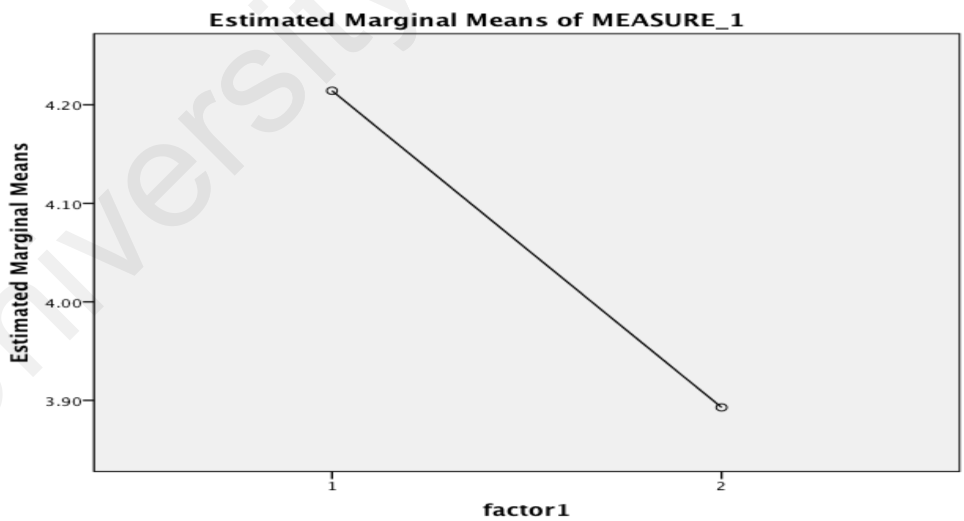

Figure 4.52: Contrastive Analysis of Item 1 in Pre-test and Post-test of Sleepy Participants

Table 4.68 showed that the results of pre-test1 (4.2143) outperformed post-test1 (3.8929). It showed that music was able to reduce the sleepy feelings in the post-test compared to pre-test without music background. However, Table 4.69 showed that there was no significant difference between the two tests [p> 0.05]. Correspondingly, Figure 4.52 showed that the line graph of pre-test was higher than post-test. It illustrated the same results in Table 4.68. Table 4.70 and Table 4.71 depicted the results of analysis.

Table 4.70: Contrastive Analysis of Item 2 in Pre-test and Post-test of Sleepy Participants Descriptive Statistics

	Mean	Std. Deviation	N
feel sleepy during test pre2	2.5357	1.10494	28
feel sleepy during test pos2	2.2143	.95674	28

Table 4.71: Contrastive Analysis of Item 2 in Pre-test and Post-test of Sleepy Participants (Multivariate Analysis)

Effect		Value	F	Hypothesis df	Error df	Sig.
Factor1	Pillai's Trace	.152	4.849[b]	1.000	27.000	.036
	Wilks' Lambda	.848	4.849[b]	1.000	27.000	.036
	Hotelling's Trace	.180	4.849[b]	1.000	27.000	.036
	Roy's Largest Root	.180	4.849[b]	1.000	27.000	.036

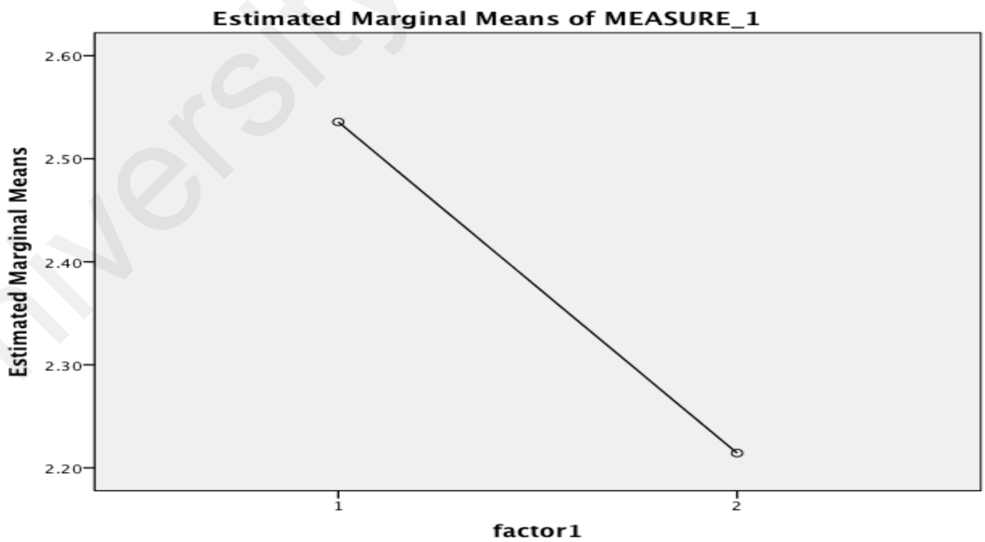

Figure 4.53: Contrastive Analysis of Item 2 in Pre-test and Post-test of Sleepy Participants

From Table 4.70, the mean score showed that Item 2 in the pre-test (2.5357) outperformed the post-test (2.2143). Meanwhile, there was a significant interaction difference as described in Table 4.71 [$p < 0.05$]. The line graphs in Figure 4.53 showed that pre-test was higher than post-test. It indicated the same results with Table 4.70. Table 4.72 and Table 4.73 depicted the results of analysis. Table 4.72 and Table 4.73 depicted the results of analysis.

Table 4.72: Contrastive Analysis of Item 3 in Pre-test and Post-test of Sleepy Participants (Descriptive Statistics)

	Mean	Std. Deviation	N
feel sleepy after test pre3	2.3214	1.21879	28
feel sleepy after test pos3	2.2143	1.10075	28

Table 4.73: Contrastive Analysis of Item 3 in Pre-test and Post-test of Sleepy Participants (Multivariate Analysis)

Effect		Value	F	Hypothesis df	Error df	Sig.
Factor1	Pillai's Trace	.046	1.299[b]	1.000	27.000	.264
	Wilks' Lambda	.954	1.299[b]	1.000	27.000	.264
	Hotelling's Trace	.048	1.299[b]	1.000	27.000	.264
	Roy's Largest Root	.048	1.299[b]	1.000	27.000	.264

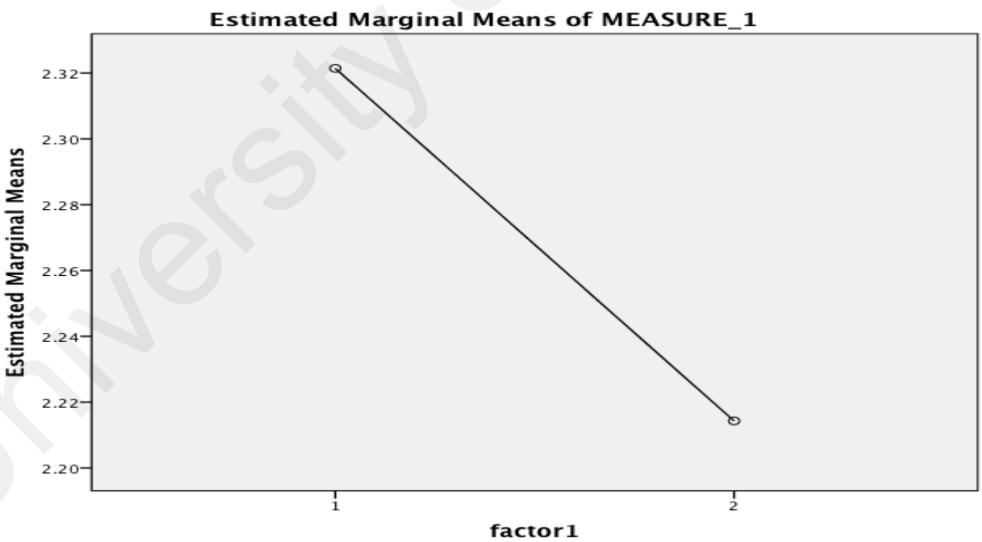

Figure 4.54: Contrastive Analysis of Item 3 in Pre-test and Post-test of Sleepy Participants

There was a minor difference as shown in Table 4.72. Item 3 in pre-test (2.3214) outperformed post-test (2.2143). It indicated that typing with music background helped participants to be more energetic. However, Table 4.73 showed that there was no significant difference between the two tests [p> 0.05]. Figure 4.54 showed the same results with Table 4.72.

Next, the following part analysed the data collected from the 18 questions in questionnaires done by the 28 participants who displayed postprandial sleepiness in the test. The results were analysed using Likert Scale.

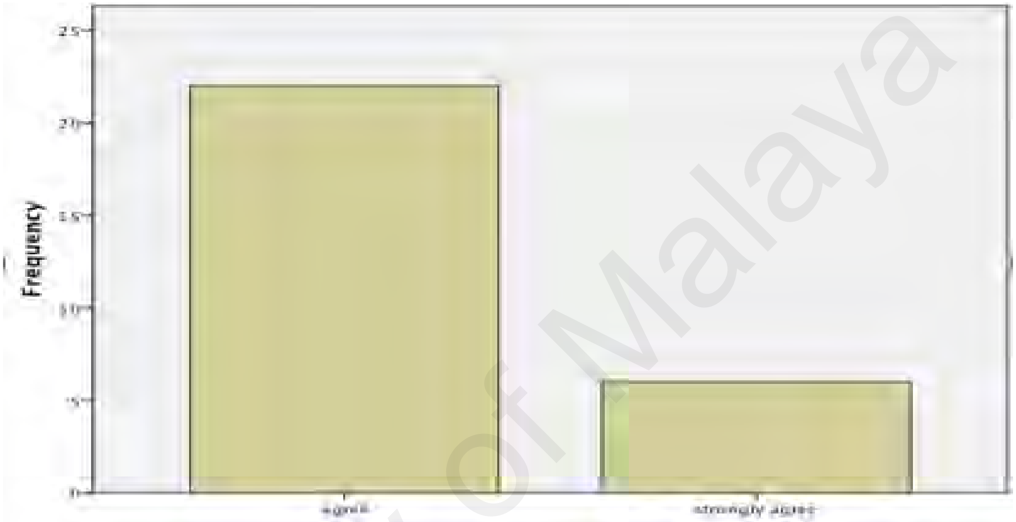

Figure 4.55: Responses to the Question "Are you feeling sleepy after you have taken your lunch in pre-test?" from Sleepy Participants

Results in Figure 4.55 showed that all sleepy participants agreed that they felt sleepy after lunch, particularly 22 participants selected "agree" and 6 selected "strongly agree".

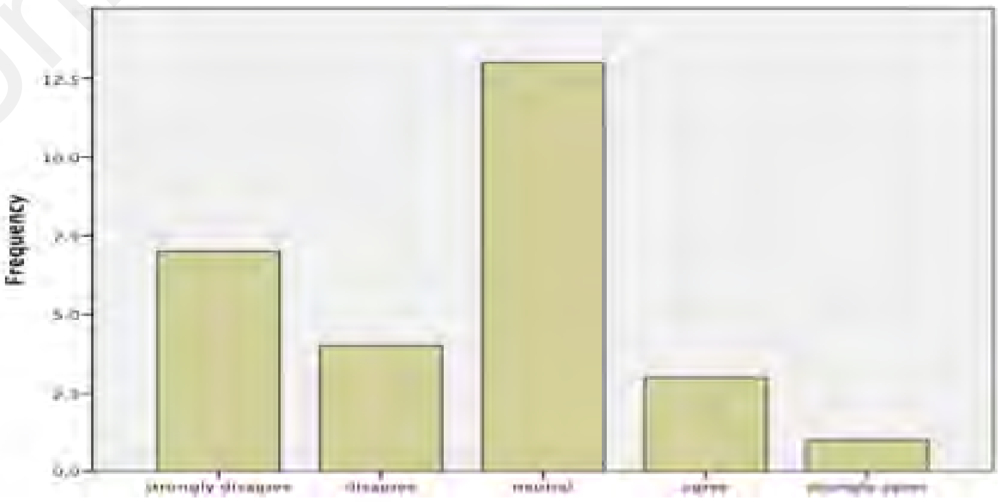

Figure 4.56: Responses to the Question "Do you feel sleepy during the test in pre-test?" from Sleepy Participants

Figure 4.56 illustrated in detail that there were 7 participants who strongly disagreed that they had sleepy feelings during the test. 4 participants disagreed too. However, 13 participants remained neutral. Meanwhile, 3 participants agreed that they experienced sleepiness during the pre-test and the remaining participant strongly agreed with that.

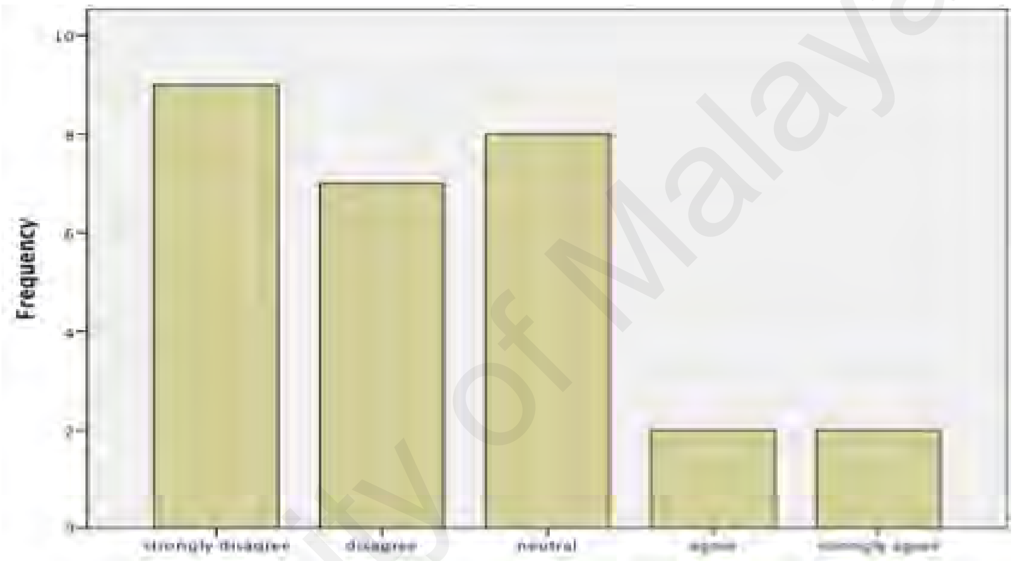

Figure 4.57: Responses to the Question "Do you feel sleepy after the test" from Sleepy Participants

Figure 4.57 indicated that 16 participants disagreed that they felt sleepy after the test. However, 4 participants agreed that they felt sleepy. The remaining 8 participants selected "neutral".

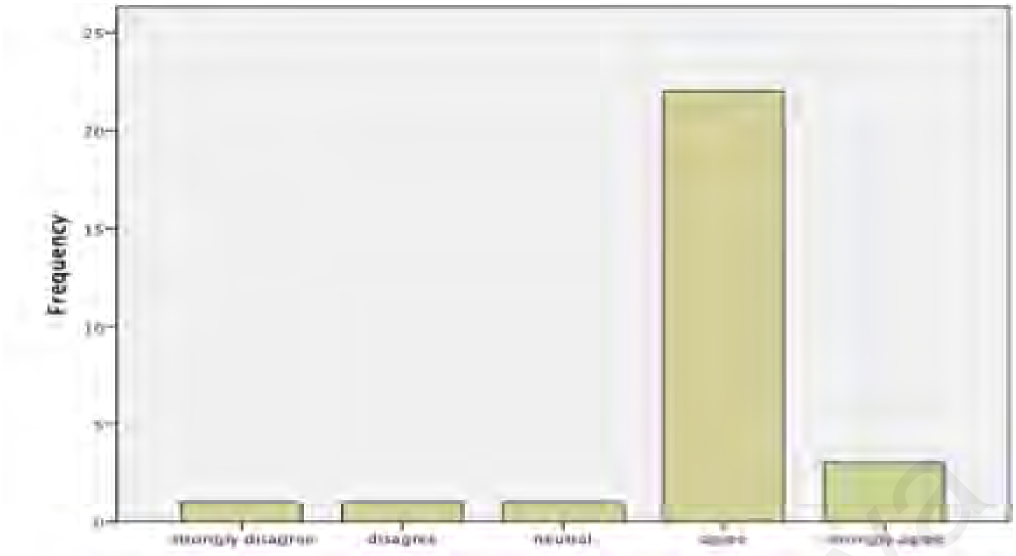

Figure 4.58: Responses to the Question “Are you feeling sleepy after you have taken your lunch in post-test?” from Sleepy Participants

From Figure 4.58, 25 participants agreed that they felt sleepy after lunch. Then, 2 participants did not feel sleepy after lunch. The only participant remained neutral to the question.

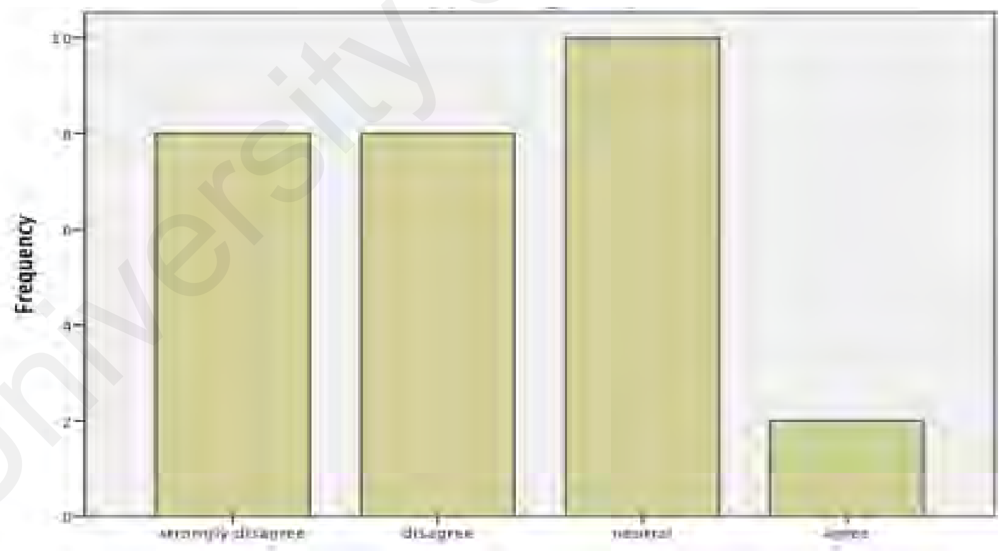

Figure 4.59: Responses to the Question “Do you feel sleepy during the test in post-test?” from Sleepy Participants

Figure 4.59 displayed that 16 participants did not feel sleepy during test. On the contrary, 2 participants felt sleepy during the test. Another 10 participants remained neutral.

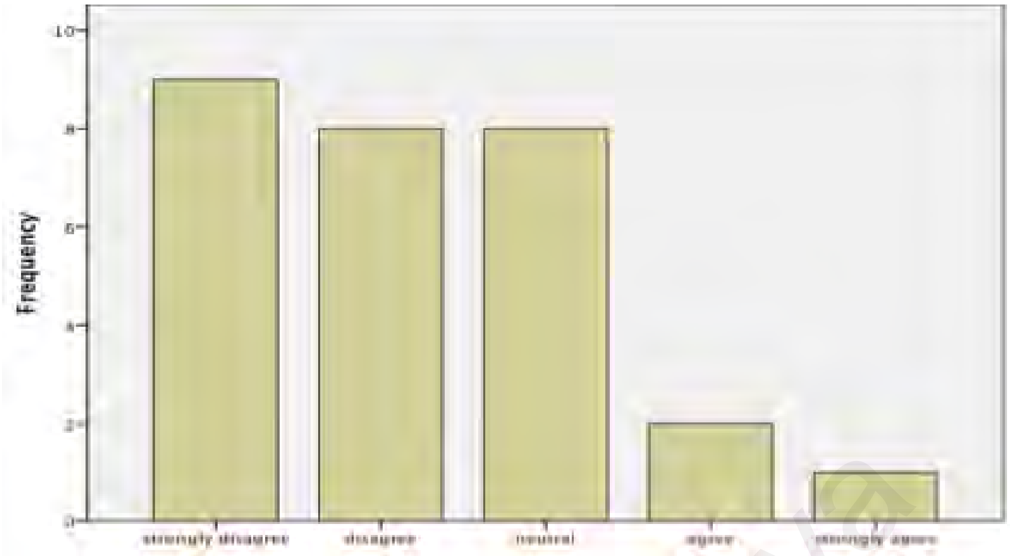

Figure 4.60: Responses to the Question "Do you feel sleepy after the test in post-test?" from Sleepy Participants

Figure 4.60 showed that 17 participants did not feel sleepy after test. However, 3 participants agreed that they felt sleepy after the post-test. There were 8 participants who remained neutral.

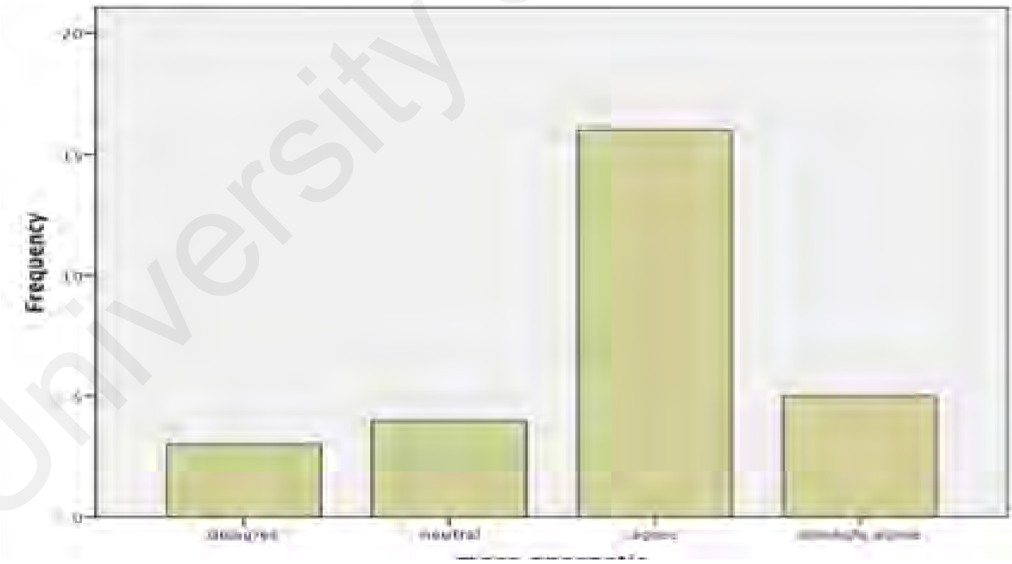

Figure 4.61: Responses to the Question "Music helps me to feel more energetic in the process of typing" from Sleepy Participants

Figure 4.61 showed that 21 participants agreed that music helped them feel more energetic in the process of typing. 4 participants stayed neutral to the question. However, there were 3 participants who disagreed with that.

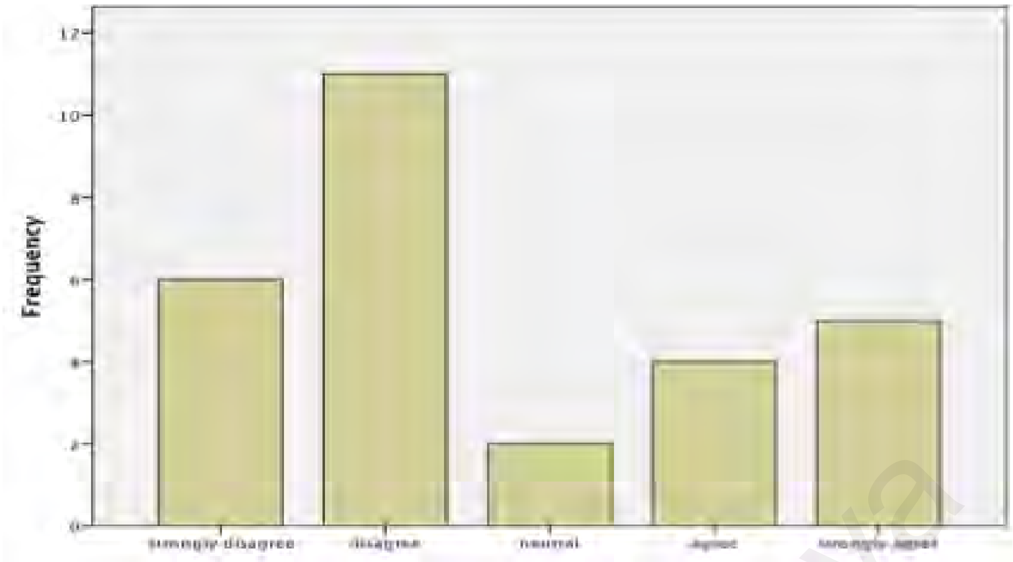

Figure 4.62: Responses to the Question "Fast music compared to slow music helps to deliver better concentration in the process of typing" from Sleepy Participants

Figure 4.62 illustrated that there were 17 participants who disagreed that fast music compared to slow music helped deliver better concentration in the process of typing. However, 9 participants agreed with the statement. Furthermore, there were 2 participants who remained neutral.

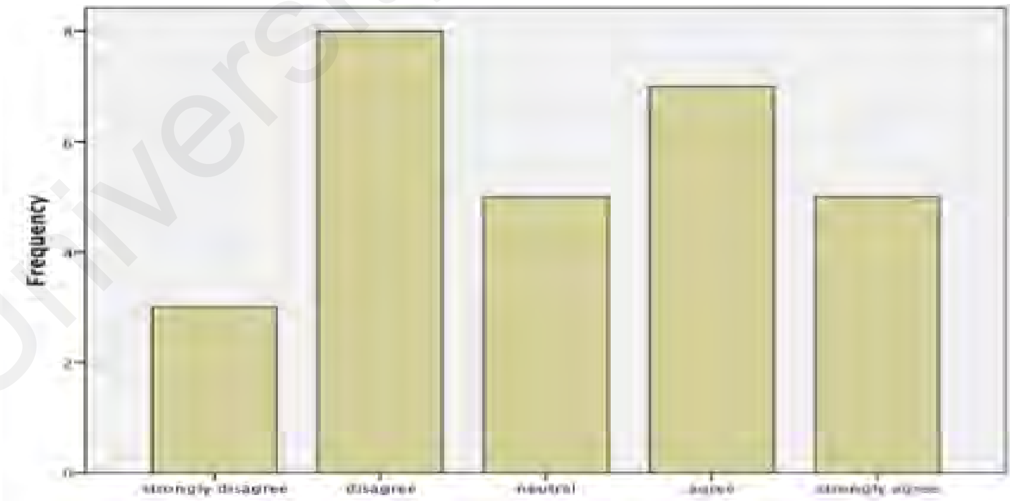

Figure 4.63: Responses to the Question " Fast music compared to slow music can help in increasing typing speed" from Sleepy Participants

Figure 4.63 displayed that 12 participants agreed that fast music could help increase their typing speed compared to slow music. 5 participants stayed neutral. On the other hand, there were 11 subjects who disagreed with the statement. They felt that fast music was not able to help increase their typing speed compared to slow music.

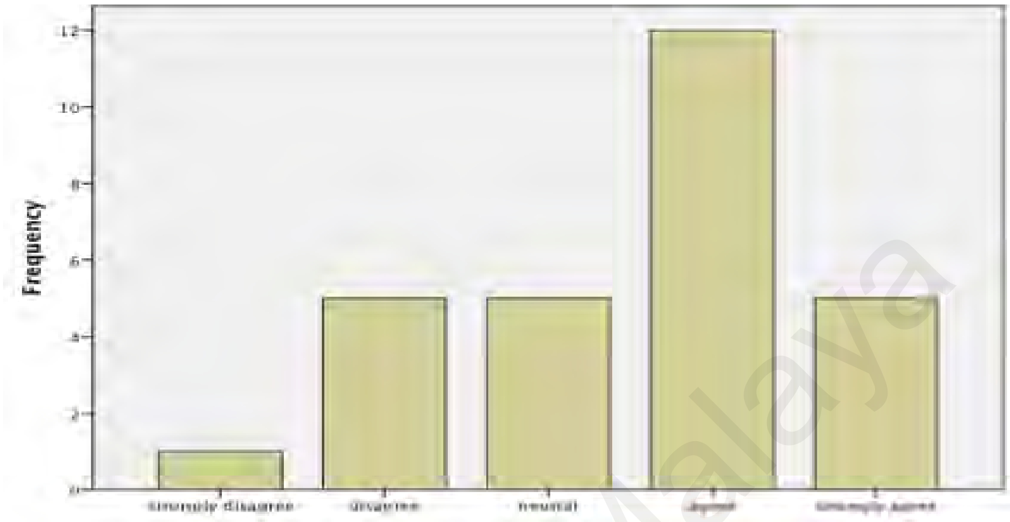

Figure 4.64: Responses to the Question " slow music compared to fast music helps to deliver better concentration in the process of typing" from Sleepy Participants

Figure 4.64 showed that 17 participants agreed that slow music helped deliver better concentration in the typing process compared to fast music. However, 6 participants did not agree with it. Lastly, 5 participants remained neutral.

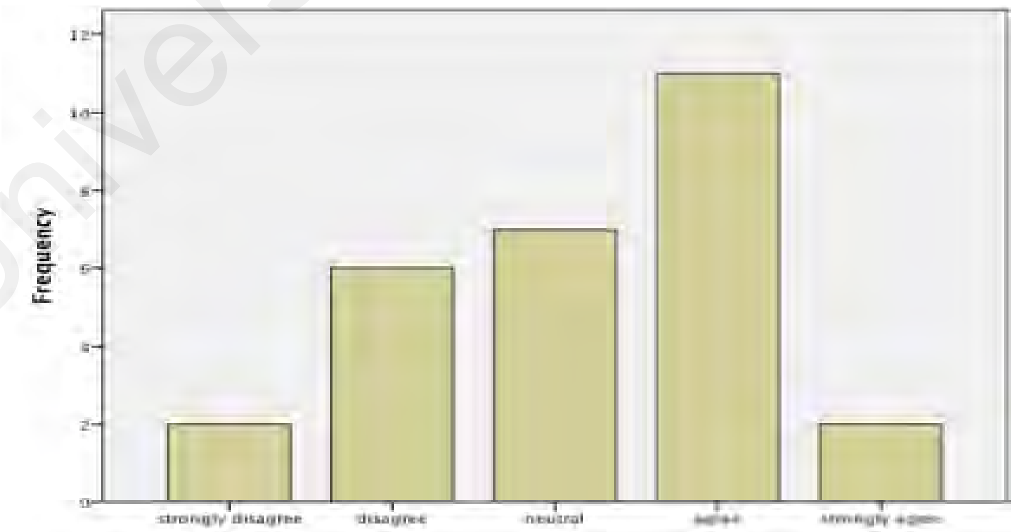

Figure 4.65: Responses to the Question "slow music compared to fast music can help to in increasing typing speed" from Sleepy Participants

Figure 4.65 showed that there were 13 participants who identified that slow music helped them in increasing typing speed compared to fast music. Nevertheless, 8 participants disagreed with this statement. Then, 7 participants selected “neutral” as their response.

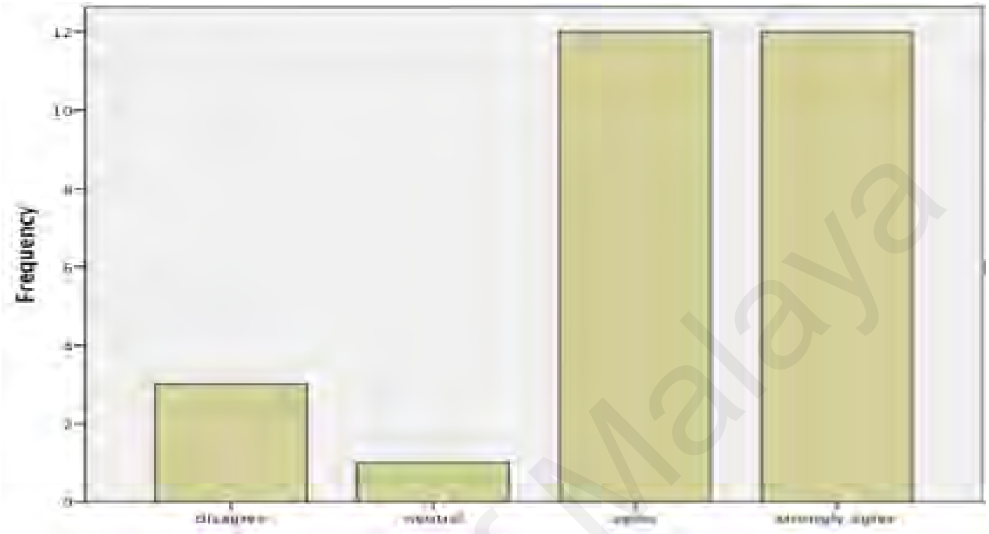

Figure 4.66: Responses to the Question “ slow music makes me relax when I am typing” from Sleepy Participants

Figure 4.66 showed that 24 participants felt that slow music made them feel relaxed during the test. On the other hand, 3 participants disagreed with it. The remaining participant selected “neutral”.

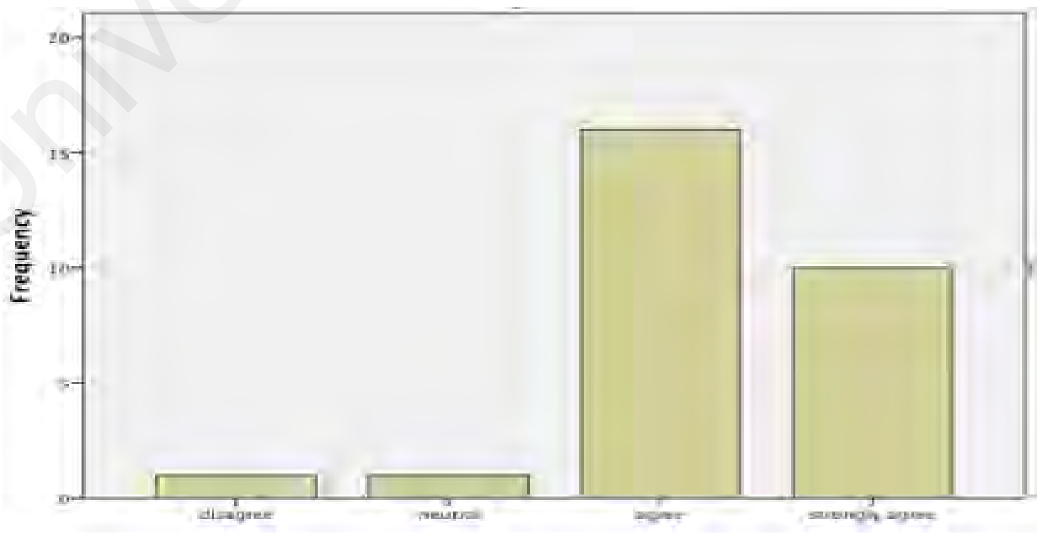

Figure 4.67: Responses to the Question “ I feel different with the presence of music during typing” from Sleepy Participants

Figure 4.67 displayed that there were 26 participants who identified that they felt different with the presence of music while typing. Only one participant disagreed with it. In addition, among all 28 participants in postprandial sleepiness, one participant remained neutral.

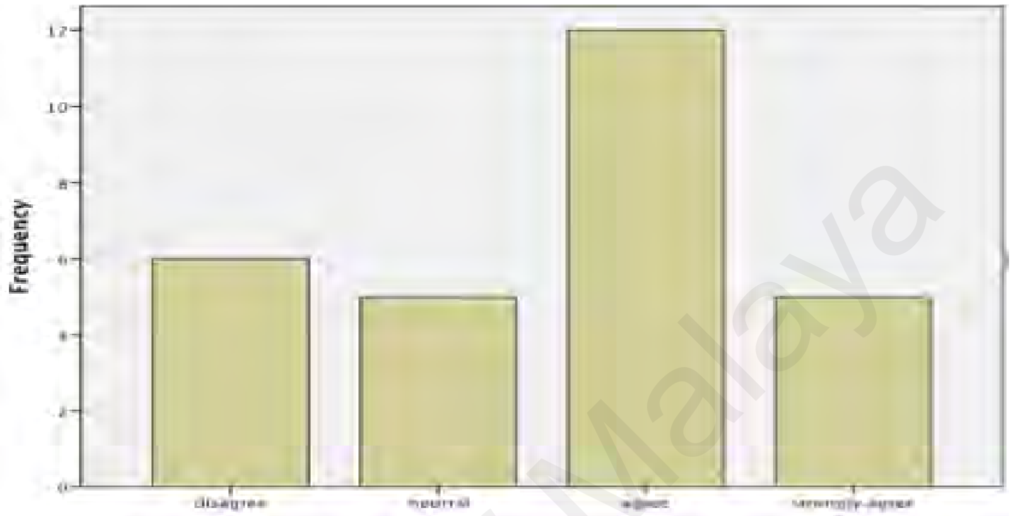

Figure 4.68: Responses to the Question "Listening to music help me to increase my typing speed" from Sleepy Participants

According to Figure 4.68, 17 participants felt that listening to music helped them to increase their typing speed. 5 participants stayed neutral. Moreover, 6 participants did not identify the standpoint.

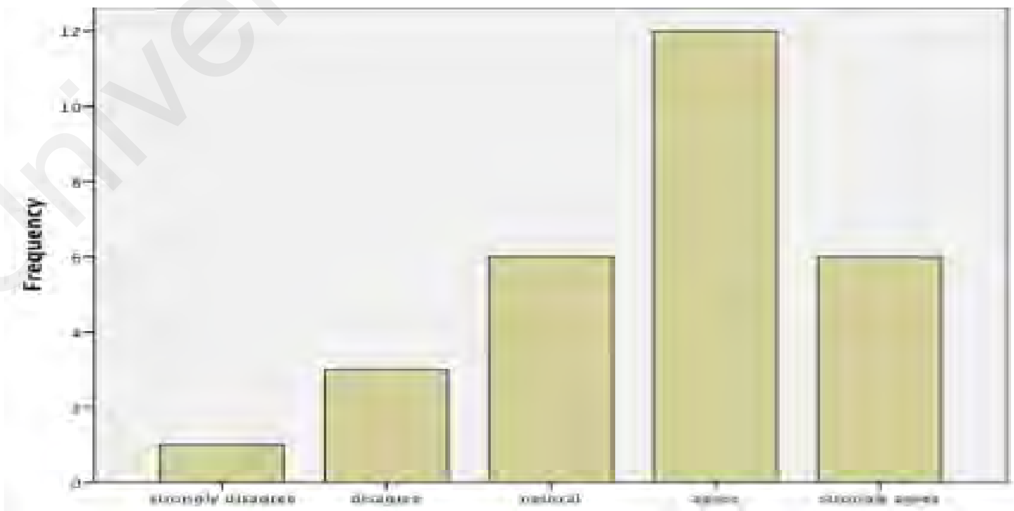

Figure 4.69: Responses to the Question "Listening to music help me improves concentration during typing" from Sleepy Participants

Figure 4.69 illustrated that 18 participants agreed that listening to music helped improve their concentration during typing. However, 4 participants disagreed with it. Another 6 participants stayed neutral.

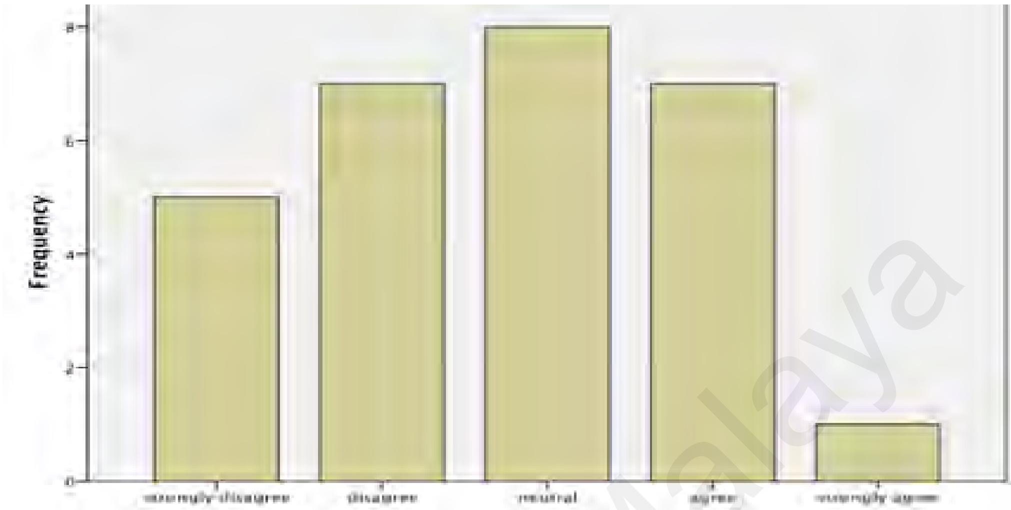

Figure 4.70: Responses to the Question " Listening to music decrease my concentration during typing compared to my usual working environment" from Sleepy Participants

Figure 4.70 showed that there were 8 participants who agreed that listening to music decreased their concentration during typing compared to their usual working environment. In contrast, 8 participants chose "neutral". The remaining 12 participants disagreed with it as they felt that listening to music increased their concentration in the typing test compared to their usual working environment.

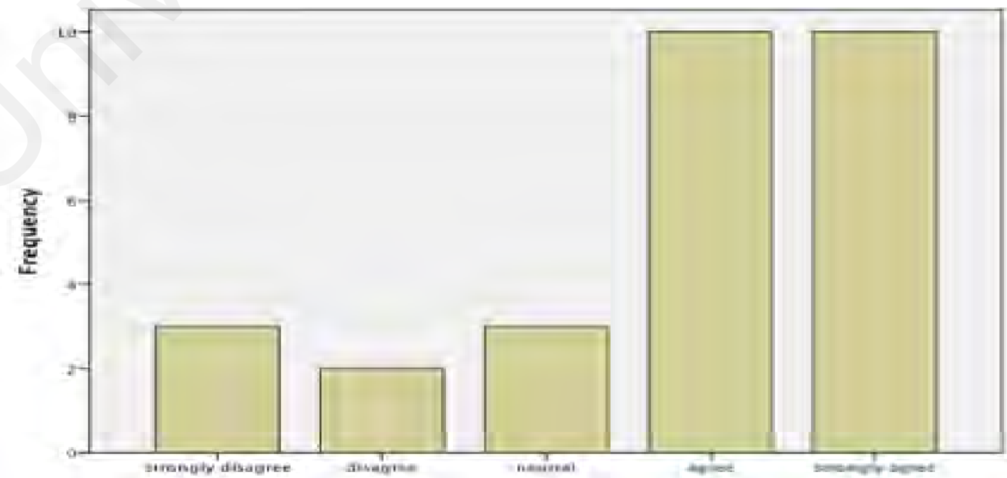

Figure 4.71: Responses to the Question " Fast music makes me nervous when I am typing" from Sleepy Participants

Figure 4.71 illustrated that there were 20 participants who agreed that fast music made them nervous when they were typing. 3 participants chose “neutral” as their responses. However, 5 participants disagreed with it.

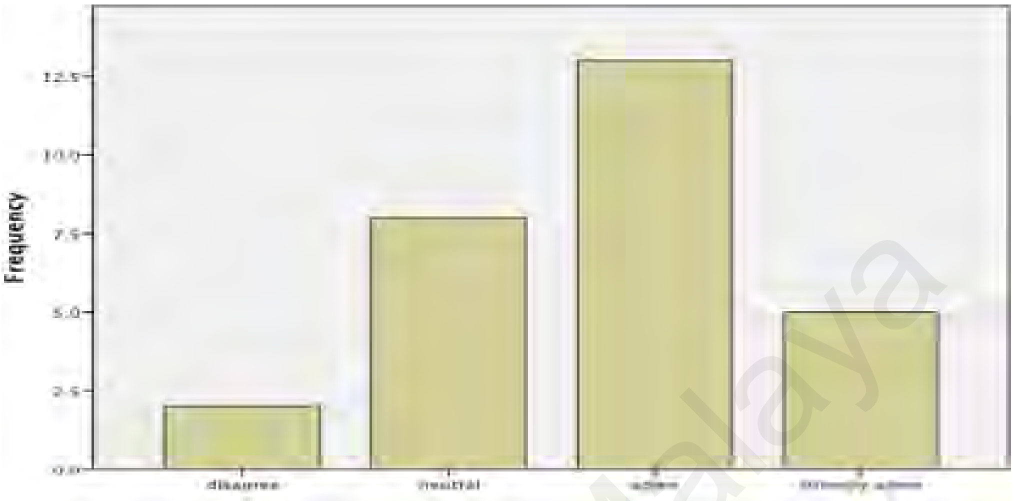

Figure 4.72: Responses to the Question “I feel relax typing with the presence of music” from Sleepy Participants

Figure 4.72 showed that 18 participants agreed that they felt relaxed while typing with the presence of music. 8 participants remained neutral. The remaining 10 participants disagreed with it.

4.6.2 Analysis of Observation

The observation section records the typing speed, facial expression and body movement of the 28 participants in postprandial sleepiness in every fifteen-second interval. The following part described the comparison on the 28 participants’ typing speed in three environments, including silence, slow music and fast music. Table 4.74 and Table 4.75 depicted the results of analysis.

Table 4.74: Results of the Observation in 2 Minutes (Descriptive Statistics)

	Type of music	Mean	Std. Deviation	N
Time00_15_characters	Silent condition/without music	42.6071	13.92929	28
	Slow music	42.6071	14.32258	28
	Fast music	43.5517	18.61564	29

Table 4.74, continued

	Total	42.9294	15.62110	85
Time15_30_characters	Silent condition/without music	39.3929	13.95851	28
	Slow music	42.4643	13.84967	28
	Fast music	45.3103	16.37747	29
	Total	42.4235	14.81985	85
Time30_45_characters	Silent condition/without music	35.5357	15.53129	28
	slow music	38.1071	11.76416	28
	Fast music	43.5172	12.42871	29
	Total	39.1059	13.59449	85
Time45_60_characters	Silent condition/without music	38.3571	11.22898	28
	Slow music	41.3214	17.16813	28
	Fast music	46.5517	13.73886	29
	Total	42.1294	14.48792	85
Time60_75_characters	Silent condition/without music	36.8929	13.20308	28
	Slow music	37.2143	16.24889	28
	Fast music	42.9655	13.17054	29
	Total	39.0706	14.37656	85
Time75_90_characters	Silent condition/without music	35.7500	17.06551	28
	Slow music	39.0714	13.84552	28
	Fast music	39.2759	13.89732	29
	Total	38.0471	14.90758	85
Time90_105_characters	Silent condition/without music	37.6429	12.73727	28
	Slow music	40.1786	14.76747	28
	Fast music	43.8276	15.78894	29
	Total	40.5882	14.55719	85
Time105_120_characters	Silent condition/without music	39.3214	15.89096	28
	Slow music	37.8929	14.47946	28
	Fast music	41.4828	16.02815	29
	Total	39.5882	15.37569	85

According to Table 4.74, the mean score of fast music (43.5517) outperformed slow music (42.6071) and silent condition (42.6071) from time 00 to 15 seconds. In the interval of 15 to 30 seconds, the record indicated that fast music (45.3103) outperformed slow music (42.4643) and silent condition (39.3929). Then, from 30 to 45 seconds, the result displayed that fast music (43.5172) exceeded slow music (38.1071) and silent condition (35.5357). Next, from 45 to 60 seconds, it revealed that fast music (46.5517) surpassed slow music (41.3214) and silent condition (38.3571).

Then, from 60 to 75 seconds, fast music (42.9655) outperformed slow music (37.2143) and silent condition (36.8929). From time 75 to 90 seconds, it was shown that fast music (39.2759) outperformed slow music (39.0714) and silent condition (35.7500). Besides, from 90 to 105 seconds, fast music (43.8276) surpassed slow music (40.1786) and silent condition (37.6429). From time 105 to 120 seconds, fast music (41.4828) exceeded silent condition (39.3214) and slow music (37.8929).

Table 4.75: Results of the Observation in 2 Minutes (Multivariate Analysis)

Effect		Value	F	Hypothesis df	Error df	Sig.
Factor1	Pillai's Trace	.211	2.905[b]	7.000	76.000	.010
	Wilks' Lambda	.789	2.905[b]	7.000	76.000	.010
	Hotelling's Trace	.268	2.905[b]	7.000	76.000	.010
	Roy's Largest Root	.268	2.905[b]	7.000	76.000	.010
Factor1* Type of music	Pillai's Trace	.154	.920	14.000	154.000	.539
	Wilks' Lambda	.850	.920[b]	14.000	152.000	.539
	Hotelling's Trace	.172	.919	14.000	150.000	.539
	Roy's Largest Root	.135	1.484[c]	7.000	77.000	.186

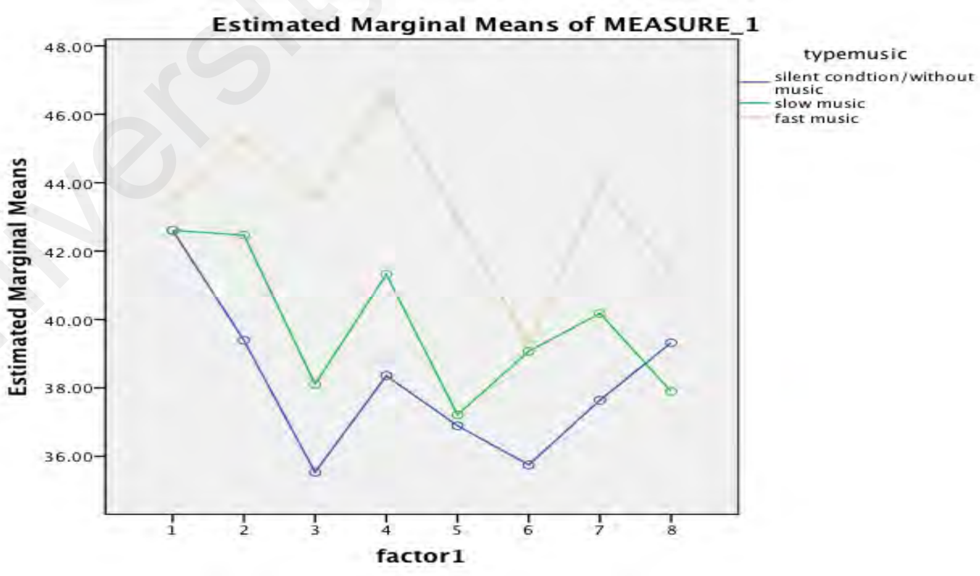

Figure 4.73: Analysis of Observation fro Sleepy Participants at each 15-second interval in 2 minutes

The line graphs in Figure 4.73 showed the relationships between background music and typing speed in detail to further interpret the results in Table 4.74. However, Table 4.75 showed that there was a significant difference in the typed characters [F (1, 76) = 2.905; p < 0.05]. However, there was no significant relation between the typed characters and the three environments [F (1, 152) = .920; p>0.05].

4.7 Comparison of Using Headphones and Without Headphones on Two Conditions

Table 4.76: Comparison of Using Headphones and Without Headphones on Two Conditions in Which Silent Condition and Slow Music (Descriptive Statistics) (Headphones & Slow Music)

	Group	Mean	Std. Deviation
Time00_15s	With headphones	46.72	15.981
	Without headphones	45.64	17.209
Time15_30s	With headphones	45.32	14.761
	Without headphones	43.72	15.001
Time30_45s	With headphones	37.40	9.042
	Without headphones	42.80	17.388
Time45_60s	With headphones	43.44	17.968
	Without headphones	42.44	18.134
Time60_75s	With headphones	37.32	14.798
	Without headphones	41.04	14.278
Time75_90s	With headphones	41.00	12.682
	Without headphones	42.44	17.650
Time90_105s	With headphones	41.08	16.487
	Without headphones	42.48	15.449
Time105_120s	With headphones	38.68	13.306
	Without headphones	42.60	18.899

Table 4.47, continued

Table 4.77: Comparison of Using Headphones and Without Headphones on Two Conditions in Which Silent Condition and Slow Music (Multivariate Analysis)

	Value	F	Hypothesis df	Error df	Sig.
Pillai's trace	.281	2.340[a]	7.000	42.000	.041
Wilks' lambda	.719	2.340[a]	7.000	42.000	.041
Hotelling's trace	.390	2.340[a]	7.000	42.000	.041
Roy's largest root	.390	2.340[a]	7.000	42.000	.041

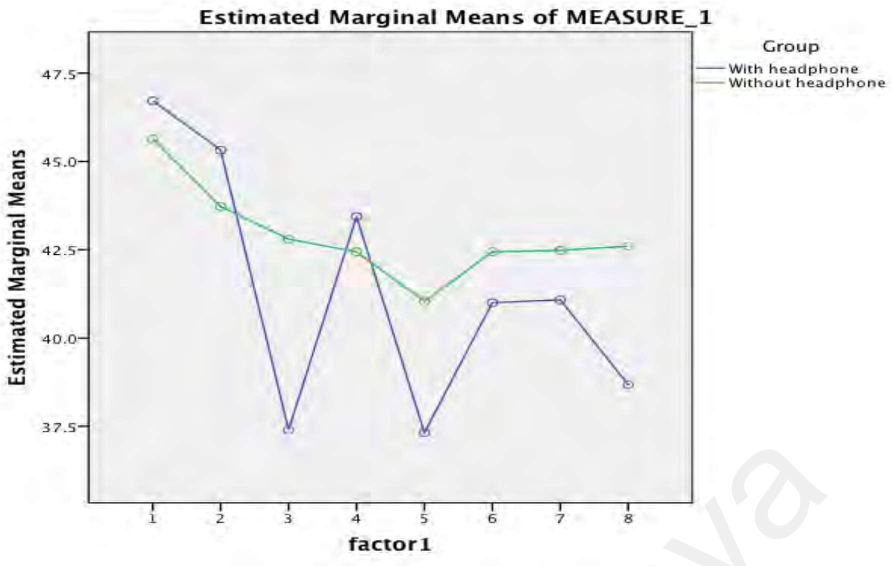

Figure 4.74: Comparison of Using Headphones and Without Headphones on Two Conditions in Which Silent and Slow music

This section uses the same approach to investigate the effect of fast music on typing speed for participants who were exposed to music with and without the use of headphones in the typing process.

In Table 76, mean score indicated that participants who typed and listened to music with headphones outperformed those without headphones from time 00 to 15 seconds (46.72 VS 45.64), Time 15 to 30 seconds (45.32 VS 43.72), and time 45 to 60 seconds (43.44 VS 42.44). In addition, participants who typed and listened to music without headphones outperformed those with headphones from time 30 to 45 seconds (37.40 VS 42.80), time 60 to 75 seconds (37.32 VS 41.04), time 75 to 90 seconds (41.00 VS 42.44), time 90 to 105 seconds (41.08 VS 42.48), and time 105 to 120 seconds (38.68 VS 42.60).

The results in table 77 showed that there was a significant interaction between two groups and fast music [(F, 42)= 2.340; P< 0.05]. The line graphs in Figure 74 presented the identical results appeared in Table 76 and Table 77. The results discovered that participants who listened to slow music without headphones could type better than the participants with headphones in the process of typing. Table 4.78 and Table 4.79 depicted the results of analysis.

Table 4.78: Comparison of Using Headphones and Without Headphones on Two Conditions in Which Silent Condition and Fast Music (Descriptive Statistics) (Headphones & Fast Music)

	Group	Mean	Std. Deviation
Time00_15s	With headphones	41.32	17.102
	Without headphones	46.60	17.819
Time15_30s	With headphones	47.60	12.790
	Without headphones	47.28	18.995
Time30_45s	With headphones	46.68	12.740
	Without headphones	46.16	13.524
Time45_60s	With headphones	45.44	12.767
	Without headphones	48.76	20.636
Time60_75s	With headphones	41.96	12.624
	Without headphones	46.40	16.921
Time75_90s	With headphones	43.24	15.912
	Without headphones	41.32	17.932
Time90_105s	With headphones	48.60	15.527
	Without headphones	44.24	21.423
Time105_120s	With headphones	43.92	15.945
	Without headphones	43.52	17.142

Table 4.79: Comparison of Using Headphones and Without Headphones on Two Conditions in Which Silent Condition and Fast Music (Multivariate Analysis)

	Value	F	Hypothesis df	Error df	Sig.
Pillai's trace	.287	2.412[a]	7.000	42.000	.036
Wilks' lambda	.713	2.412[a]	7.000	42.000	.036
Hotelling's trace	.402	2.412[a]	7.000	42.000	.036
Roy's largest root	.402	2.412[a]	7.000	42.000	.036

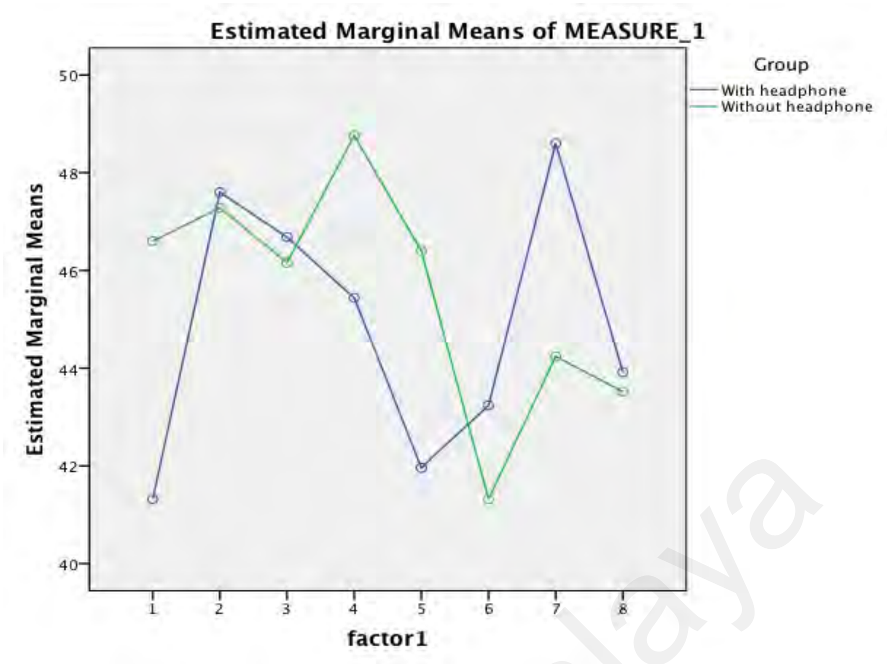

Figure 4.75: Comparison of Using Headphones and Without Headphones on Two Conditions in which silent and fast music

In Table 78, mean score indicated that participants who typed and listened to music with headphones outperformed those without headphones from time 15 to 30 seconds (47.60 VS 47.28), time 30 to 45 seconds (46.68 VS 46.16) and time 75 to 90 seconds (43.24 VS 41.32), time 90 to 105 seconds (48.60 VS 44.24) and time 105 to 120 seconds (43.92 VS 43.52). Furthermore, participants who typed and listened to music without headphones outperformed those with headphones from time 00 to 15 seconds (46.60 VS 41.32) and time 45 to 60 seconds (48.76 VS 45.44).

The result in table 79 showed that there was a significant interaction between two groups and fast music [(F, 42)= 2.412; P< 0.05]. The line graphs in Figure 74 presented the identical results appeared in Table 78 and Table 79. Through all results discovered that participants who listened fast music with headphones could type better than the participants who used without headphones in the process of typing.

As expected, music could stimulate clerical workers who were exposed to music in the typing process, such as providing more energy, delivering better concentration while typing and increasing typing speed.

For more accurate and thorough results, 50 participants have been gathered in the research and their typing speed have been recorded and analysed. Based on the questionnaires, slow music made participants feel relaxed whereas fast music made them feel nervous in the typing process. However, this study provides new findings in effects of music on task performance. Fast-paced and slow-paced music were able to influence clerical workers' typing speed compared to their usual typing speed. Meanwhile, the highest correctly typed characters were greatly affected by fast music. Based on the contrastive analysis of results, there was no difference on typing speed between female and male who were exposed to the background music while typing. Most participants felt nervous and some would prefer following the rhythm while typing.

4.8 Reliability Statistics

Table 4.80, Table 4.81 and Table 4.82 depicted the results of analysis.

Table 4.80: Cronbach's Alpha result for the 18 Items

Cronbach's Alpha	N of Items
.727	18

Table 4.81: Scale Statistics

Mean	Variance	Std. Deviation	N of Items
59.6429	63.646	7.97781	18

Table 4.82: Item-Total Statistics

	Cronbach's Alpha
Feeling sleepy after lunch pre	.733

Table 4.82, continued

Feel sleepy during test pre	.694
Feel sleepy after test pre	.693
Feeling sleepy after lunch post-test	.723
Feel sleepy during test post-test	.696
Feel sleepy after test post-test	.699
More energetic	.718
Fast music helps to deliver better concentration	.726
Fast music help in increasing speed	.702
Slow music helps to deliver better concentration	.733
Slow music help in increasing speed	.735
Slow music help make relax	.701
Feel different with presence of music	.713
Listening to music help increase typing speed	.708
Listening to music help improves concentration	.702
Listening to music decrease concentration	.773
Fast music makes nervous	.727
Feel relax with presence of music	.691

Table 4.80 indicated that Cronbach's Alpha is .727 in general. According to Chua (2013), Cronbach's Alpha in the range of .65 to .95 is reliable. In terms of each item, Table 4.82 showed that the results were in the range from .691 to .773, meaning the items were reliable.

4.9 Discussion on Results

This section discusses the data analysis of questionnaires and observation which were done using SPANOVA, ANOVA and Likert Scale.

4.9.1 Discussion on Data Analysis of Questionnaires

There are 18 questions in the questionnaires. All questions have been analysed in three facets, which are groups, genders and frequencies (without between-subjects factors).

Based on the results, there was a significant interaction difference on Item 4, Item 5.1, Item 6.3, Item 7, Item 10 and Item 12. There was no significant interaction difference on Item 1 in pre-test and post-test, Item 2 in pre-test and post-test, Item 3 in pre-test and post-test, Item 5.2, Item 6.1, Item 6.2, Item 8, Item 9 and Item 11. While the results displayed significant interaction difference, the hypothesis has been established. However, the results under condition with no significant interaction difference indicated that the hypothesis has not been proven.

4.9.2 Discussion on Contrastive Analysis Based on Group

In Item 4, there was a significant difference between Group 1 (with headphones) and Group 2 (without headphones). It proved that Group 2 was more energetic compared to Group 1 in the typing process.

In Item 6.3, there was a significant interaction difference between the two groups too. The results revealed that participants who listened to music without using headphones felt more relaxed with slow music played in the background when they were typing.

In Item 7, there was a significant difference between Group 1 (with headphones) and Group 2 (without headphones). Participants who listened to music without using headphones felt different with the presence of music during typing.

In Item 10, there was a significant interaction difference between Group 1 (with headphones) and Group 2 (without headphones). The results found that participants who were exposed to music with the use of headphones felt that listening to music decreased their concentration during typing compared to their usual working environment.

As described above, results showed the comparisons between Group 1 (with headphones) and Group 2 (without headphones). Listening to music without headphones was better and more suitable for clerical workers.

4.9.3 Discussion on Contrastive Analysis Based on Gender

In Item 5.1, there was a significant interaction difference between male and female. Compared to female participants, male participants agreed that fast music compared to slow music helped them stay focused in the process of typing.

In Item 12, there was a significant difference between male and female. Compared to female, male felt more relaxed when they typed with the presence of music.

Based on the above results, it was shown that male was better at perceiving music than female. However, the results showed that there was no significant difference in the music perception between male and female.

4.9.4 Discussion on Frequencies (without Between-Subjects Factors)

Music serves as a tool to stimulate clerical workers to resist lethargy when they listen to music while typing, generating more energy to improve clerical workers' work efficiency. Both fast and slow music have shown to affect clerical workers' task performance; for example, increasing typing speed. Nevertheless, fast music makes some participants feel nervous. For these participants, slow music could provide them with better concentration and keep them relaxed in the process of typing.

4.9.5 Discussion on Data Analysis of Observation

Based on the results gained from observation, it was discovered that both fast music and slow music have their effects to improve typing speed compared to silent condition without any music background. When exposed to fast music, typing speed will improve and maximum typed characters could be achieved.

Results have proven that fast music can increase typing speed much better than slow music. However, slow music could deliver better concentration to the participants.

4.9.6 Discussion on Data Analysis of Participants with Postprandial Sleepiness

Comparing Item 2 in pre-test and post-test, results show that background music could energies sleepy participants better compared to no music. There is a significant interaction between the two groups [$p < 0.05$] that proves the hypothesis. Moreover, among the 28 participants in postprandial sleepiness, 21 of them agree that music helps them to feel more energetic in the process of typing. More than half of the participants had the idea that fast music would not deliver better concentration in the process of typing compared to slow music. However, the questionnaires found that majority of the participants find listening to music helpful in improving their typing speed, especially fast music.

In addition, most participants think that slow music helps them to stay focused more easily compared to fast music. A little over half of the participants felt a difference when listening to music while typing.

By including the 28 participants in postprandial sleepiness in this section, it could be summarised that similar results have been found with the analysis of the 50 participants. Music stimulates and encourages clerical workers to stay focused and refreshed when they listen to music in the typing process, improving their work efficiency. Both types of music – fast and slow – are able to affect the clerical workers in positive ways.

4.9.7 Discussion on Comparison of Using Headphones and Without Headphones on Two Conditions

For more accurate and thorough results, 50 participants have been gathered in the research and their typing speed have been recorded and analysed. Based on the questionnaires, slow music made participants feel relaxed whereas fast music made them feel nervous in the typing process. However, this study provides new findings in effects of music on task performance. Fast-paced and slow-paced music were able to influence clerical workers' typing speed compared to their usual typing speed. Meanwhile, the highest correctly typed characters were greatly affected by fast music. Based on the contrastive analysis of results, there was no difference on typing speed between female and male who were exposed to the background music while typing. Most participants felt nervous and some would prefer following the rhythm while typing.

CHAPTER 5 CONCLUSION

5.1 Overview

This chapter provides a summary of the discussion based on the results. In order to fulfill the research objectives, an experimental designed study was carried out and data has been collected from 150 samples (3 tests per participant) of the experiment. Contrastive analysis of the data was completed and lastly, the effects of music on typing speed among clerical workers in postprandial somnolence were examined.

5.2 Summary of Findings

Prior to the experiment, past literature about effects of music has been reviewed to provide a background for the study. By reviewing the effects of music in everyday life, areas studied by previous scholars such as behaviour, emotions, physiology, psychology, task performance and medical treatment were included. The gap in the literature was defined where this research explores a new topic which has not been done before, which is to examine the effects of music on typing speed among clerical workers in postprandial somnolence. For more accurate and thorough results, 50 participants were gathered in the research and their typing speed have been recorded and analysed.

This research provides new findings in effects of music on task performance. Based on the results, fast-paced and slow-paced music are able to influence clerical workers' typing speed compared to their usual typing speed. The typing speed is also affected by the way music is exposed to the clerical workers. Music is played with and without the use of headphones. Based on the questionnaires, it has been found that listening to music using headphones was more effective in improving the typing efficiency. However, the contrastive analysis of results displayed that listening to fast music with the use of headphones increases the participants' typing speed compared to those listening without the use of headphones. On the other hand, listening to slow music without the use of headphones leads to better typing speed compared to listening to the same music without the use of headphones. Thus, this shows that music affects typing efficiency regardless the music tempo.

As described above, it has been proven that music brings an impact to the participants' typing speed. This conforms to the findings of Hunter *et al.* (2010), and Milliman (1986) but adding another scope in the task performance studied – typing speed. Hunter et al (2010) mentioned that some properties of music, such as music tempo and mode, could influence human perception and feeling. This experiment showed the similar results that fast-pace music and slow-pace music stimulated participants. Both types of music have their stimuli. As Milliman's (1986) mentioned soothing background music creates a relaxing environment that more certain showed by this experiment, all participants felt slow music make them more relax and comfortable during the process of typing. Nevertheless, in this experiment, the results obtained through observation also revealed that the typed characters have increased when there was presence of slow music compared to the silent condition. This standpoint is in fact opposite to what Hunter *et al.* (2010) had mentioned, that slow music would result in the listeners' internal contradiction. Thoma *et al* (2013) put forward that relaxing music can induce endocrine stress reaction, however, not able to remove stress at a cognitive level. Probably, this reasoned why slow music revealed better results in this study as the subjects' typing speed was increased.

The data collected in this study were analysed using SPANOVA, ANOVA and Likert Scale. Based on the results gathered, participants listening to music without headphones reported a few conditions in a survey such as feeling more energetic when fast music was played, feeling more relaxed when slow music was played, as well as concentrated better, with an overall response that listening to music without the use of headphones while working is better.

Based on the results gained from the participants' typing speed, music helps improve typing efficiency compared to environment without music. The outcome shows that fast music has a more significant outcome in increasing typing speed compared to slow music. On the contrary, slow music leads to better concentration among the participants compared to fast music. In addition, some participants reported that fast music might induce nervousness while typing. Otherwise, high pitch notes with slow music affected typing speed, and high pitch notes facilitated clerical worker typed more characters that discovered from the analysis results of typing speed.

Among the 28 participants who displayed postprandial sleepiness, a majority of the participants agree that music creates energetic mood in the typing process. However, more than half of the participants feel that fast music could not deliver better concentration in the typing process compared to slow music. Similarly, the participants agree that slow music helps them concentrate better while typing.

In short, music influences working performance, particularly in typing efficacy in this study, among the clerical workers. There is a limitation in this study as the scope of the study could include fewer variables for further studies. In addition, the graph in Chapter 4 shows that when music was played, the effect of slow and fast music on typing speed was recorded at a different time frame even though it was notated 15 seconds apart. This invites further studies looking into the temporal length of music and its effect on typing speed.

5.3 Suggestion for Future Research

Due to the limited timeline of a Master's dissertation, only two types of music tempo were tested in the study. Fast and slow popular music were selected for the experiment.

Therefore, for future research, the following areas may be looked into:

1) other genres of music could be included to explore the effects of music on task performance

2) participants' musical preference as a variable

3) music volume as a variable

4) duration of the music played and its effect

5) cultural background of participants as a factor

It is advised that further research on the effects of music employ a larger number of participants for more comprehensive results.

5.4 Conclusion

This study proves that music helps clerical workers to resist lethargy at work. When they listen to music during typing, they could lessen the symptoms of postprandial sleepiness. Interestingly, both fast-paced and slow-paced music could be used to improve task performance. It is believed that fast music is better than slow music for better performance.

In terms of how the music is played in the background, it is found that listening to music using headphones is more suitable for clerical workers who have the intention to improve typing speed. Fast music provided people highest correct characters. However, listening to slow music without headphones increases the typing speed.

Overall, the results and analysis in the study could be useful for clerical workers when they experience postprandial sleepiness at work. As music is a stimulus in improving task performance, if they would like to boost their work efficiency regardless of the time of the day, listening to music could be one of the options. Furthermore, these suggestions are also applicable to everyone from other working industries. Last but not least, all research hypotheses had been confirmed. In short, music has its influence on task performance upon countering postprandial sleepiness; and listening to fast music without using headphones is more suitable to enhance task performance in general.

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APPENDICES

APPENDIX. A

Text 1. Ranking Chong Wei: Ramalan Frost tepat

Jaguh badminton negara Datuk Lee Chong Wei berada di landasan tepat untuk layak beraksi di Sukan Olimpik 2016 di Rio de Janeiro, Brazil selepas menduduki ranking ketiga dunia, demikian menurut Persekutuan Badminton Dunia (BWF) hari ini.
Kedudukan Chong Wei dalam ranking dunia melonjak selepas pemain nombor satu Malaysia itu meraih tiga gelaran berturut-turut di Terbuka Perancis, China dan Hong Kong, baru-baru ini.
Chong Wei kembali beraksi pada kejohanan kompetitif Jun lepas, selepas menjalani penggantungan selama lapan bulan oleh BWF kerana kesalahan doping.
Berikutan itu, ranking beliau jatuh merudum daripada pemain nombor satu dunia kepada kedudukan ke-180.
Mengulas pencapaian itu, Pengarah Teknikal Persatuan Badminton Malaysia (BAM) Morten Frost Hansen berkata ranking Chong Wei naik mendadak daripada kedudukan ke-180 kepada ketiga dunia, dalam tempoh kurang enam bulan.
"Chong Wei menampilkan prestasi mengagumkan. Ia pencapaian hebat kerana beliau menjuarai tiga kejohanan berturut-turut.
"Kejayaannya baik untuk badminton negara. Jangkaan saya tepat...sejak hari pertama berada di sini, saya percaya Chong Wei mampu melakukannya," kata Frost di Kuala Lumpur hari ini.
Frost ditemui pemberita ketika menyaksikan Kejohanan Badminton Remaja Badan Amal dan Kebajikan Tenaga Isteri-Isteri Menteri dan Timbalan Menteri (Bakti) 2015 di Arena Sukan Sentosa di Kuala Lumpur hari ini.
Mengenai jurulatih perseorangan lelaki negara, Frost berkata pada masa ini, beliau tidak dapat mengumumkan senarai nama jurulatih berkenaan, namun mereka terdiri daripada jurulatih tempatan dan asing bagi membimbing pemain kebangsaan.
"Saya belum berbincang dengan Chong Wei mengenai jurulatih perseorangan... seperti yang saya katakan, terdapat pilihan dalam senarai jurulatih. Saya berharap dapat memilih jurulatih perseorangan menjelang akhir Disember ini," katanya.
- *Bernama*

Text 2. Kedah Dan Selangor Punyai Misi Tersendiri - Kapten Pasukan

SHAH ALAM, 11 Dis (Bernama) -- Barisan pemain Selangor tidak menghadapi sebarang tekanan tetapi sebaliknya teruja untuk melayan Kedah pada aksi final Piala Malaysia di Stadium Shah Alam di sini, malam esok.

Ketua pasukannya Shahrom Kalam berkata pasukannya tidak terasa tertekan kerana kekuatan pasukan itu tidak bergantung kepada mana-mana individu tetapi kemampuan pasukan secara menyeluruh.

"Semua pemain tahu peranan masing-masing. Kita juga tidak menghadapi sebarang tekanan sebaliknya teruja apabila layak ke final," katanya pada sidang media menjelang perlawanan final itu di sini hari ini.

Menurutnya biarpun tidak tertekan beraksi di laman sendiri, namun tidak memandang mudah pasukan Kedah kerana mereka memiliki barisan penyerang yang mampu merobek gawang lawan.

Justeru, bentang pertahanan Selangor mempunyai tugas berat untuk mengekang pergerakan barisan depan pasukan lawan, katanya.

Sementara itu, kapten Kedah, Khairul Helmi Johari berkata pasukan telah memperbaiki banyak kelemahan semasa latihan dengan memberi tumpuan kepada benteng pertahanan.

"Kami juga tidak boleh memberi ruang kepada Selangor untuk mencipta peluang melakukan jaringan,"katanya pada sidang media bersama itu.

Kedua-dua pasukan pernah bertemu pada aksi final edisi 2008 di Stadium Nasional, Bukit Jalil yang menyaksikan Kedah muncul juara menerusi kemenangan tipis 3-2.

Kali terakhir Selangor memenangi Piala Malaysia pada 10 tahun lepas, iaitu pada tahun 2005. Selangor juga mempunyai tugas berat untuk merealisasikan misi kali ke-33 untuk menjulang Piala Malaysia itu.

-- BERNAMA

Secret Venice

Hiding in the elegant shadows of the Italian city's Grand Canal palaces and music-see monuments are Venetians' most beloved hangouts.

By Alison Bing

18 July 2012

Hiding in the elegant shadows of Venice's **Grand Canal** palaces and must-see monuments are Venetians' most beloved hangouts. But from the major tourist thoroughfares, you may only glimpse the locals as they slip under archways into labyrinthine *calli* (backstreets) or hear their soft, assured footsteps gliding over Istrian stone footbridges.

- **Related article: Insider's guide to Venice**

To get to know Venice as Venetians do, follow their lead, like Alice following the white rabbit into Wonderland. You will not need to imbibe any magic potions – though every true Venetian adventure begins and ends with a glass of Prosecco -- just follow this guide for tips on where to go morning, noon and night.

Morning: Rialto

When tour guides refer to the Rialto they mean the **Rialto Bridge**, Antonio da Ponte's dazzling Renaissance span across the Grand Canal. But when Venetians refer to the Rialto, they are usually referring to the historic **Rialto Markets**, which date from Venice's founding circa 809 AD, when Venice was just a Byzantine backwater with fish and ambition to spare.

The current **Pescaria** (fish market) is a 19th-century incarnation of the original Venetian fish market that lasted at least 600 years, until constant pounding finally wore out the paving stones. Beneath the fish gargoyles that adorn the peaked roof, sustainable lagoon fishing standards are literally set in stone on a carved sign, and shameless bragging about Venetian *moeche* (soft-shell crab) and *moscardini* (baby octopus) still begins around 5 am Tuesday through Sunday.

By late morning, fishermen (who are often up before 3 am) are good and ready for their midday meal. Join them for a glass of Prosecco nearby, in one of the many backstreet *bacari*, hole-in-the wall pubs that have served Rialto market workers for hundreds of years. Pre-noon arrivals at **All'Arco**, **Pronto Pesce Pronto** and **Dai Zemei** get first pick of ultra-fresh *cicheti*, or Venetian tapas: delectable, market-inspired bites of lagoon seafood, cured meats, cheeses and creative salads.

While away the hours between markets and meals by shopping the artisan's studios alongside the Rialto bacari. Lagoon ripples are perfectly captured in marbled-paper handbags at **Cartè**; stationery imprinted with gondola images rolls hot off the antique press at **Veneziastampa**; and **Cartevenezia** illuminates handmade paper lanterns with an embossed lion of St Mark, Venice's patron saint.

Afternoon: Zattere

In the neighbourhood of Dorsoduro, the banks of the Grand Canal are lined with art museums, from Tiepolo's glorious baroque ceilings at **Ca' Rezzonico** to Maurizio Cattelan's cheeky horse's hind end apparently jumping through the brick walls at avant-garde **Punta della Dogana**. But duck around the corner to the **Giudecca** canal bank, known as the **Zattere**, and you will find sunset strollers and sun-tanning Venetians.

Along this sunny stretch is the **Magazzini del Sale**, the historic salt warehouses that were recently reinvented by Renzo Piano and the late, great Venetian expressionist painter Emilio Vedova as a public gallery, now hosting local talents alongside international artists like Anselm Keifer and Louise Bourgeois. Heading west along the Zattere past the Fondamenta degli Incurabili (Canalbank of the Incurables), you will pass local art students casually flirting in front of the ancient syphilis hospice that became Venice's **Accademia delle Belle Arti** (Academy of Fine Arts), recently graced with a dedication to the poet Joseph Brodsky. Along these canal banks, the Russian-born American Nobel Laureate wrote Watermark, his passionate ode to Venice – as the plaque says, "He loved and sang this place."

Turn off the Zattere to reach **Chiesa di San Sebastian**, the tiny parish church covered floor to ceiling with masterpieces painted over three decades by Paolo Veronese. Legend has it that the Renaissance master found refuge here after fleeing murder charges in his hometown of Verona in 1555, and lavished this church with gratitude. Over a bridge from San Sebastian is Calle Lunga San Barnaba, a narrow alleyway lined with some of Venice's most affordable pizzerias and *osterie* (a small local restaurant) specialising in meat dishes – a rarity in this lagoon city.

Evening: Ghetto

As Venetians know, even the highest tide must eventually ebb – as is also true with the influx of day-trippers during Venice's high season. Conventional wisdom among those who like to avoid the crowds is to visit anytime but during the June opening of Venice's **Art Biennale** (held in odd-numbered years), during the annual **Venice Film Festival** (September), and throughout the two-week masked bacchanal that is **Venetian Carnevale** (February). But in truth, to experience Venice like a Venetian, all you need to do is to stay overnight.

Less than one-third of all visitors to Venice stick around after sunset, missing out on romantic canalside dining and family-run guesthouses tucked away behind the Strada Nova pedestrian thoroughfare in the district of Cannaregio. This picturesque neighbourhood is home to Venice's loveliest brick Gothic church, the Tintoretto-adorned **Chiesa della Madonna dell'Orto**, as well as Venice's historic Ghetto.

The world's original Ghetto housed Venice's Jewish community from the 16th through 18th Centuries, with refugees from the Inquisition across Europe expanding the neighbourhood beyond its original island boundaries. Publishers in the Ghetto circulated the daring humanist philosophy that sparked Italy's Renaissance, and the Ghetto's learned doctors helped Venice develop the concept of quarantine that spared the city the worst ravages of the bubonic plague. The history-changing contributions of the Venetian Jewish community are now captured in the Ghetto inside Italy's first Jewish Museum, the **Museo Ebraico**.

Bridges to the Ghetto that were once officially closed at night are open for evening strollers to browse Ghetto bookstores, art galleries and antique shops – at least until cicheti arrive on the countertops of bars lining the Fondamenta degli Ormesini, the canalbank across from the Ghetto. Raise toasts with Venetians between acoustic music sets at **Al Timon**, but do not be late for reservations at nearby **Dalla Marisa**: lagoon seafood and local meats are bought fresh daily, and when they are gone, no one else will be seated. With the lively regular crowd of tugboat captains, celebrated architects and champion rowers, raise your glass to *la bea vita*, Venice's beautiful life.

The article **'Secret Venice'** was published in partnership with **Lonely Planet**.

Music and Effect on Typing Speed for Clerical Worker During

Postprandial Somnolence State

Name: Gender:

Age: Company:

Years of typing experience:

a) 1-5 years
b) 6-10 years
c) 11-15 years
d) Above 16 years

1-Strongly disagree; 2-Disagree; 3-Neutral; 4-Agree; 5-Strongly Agree

Post-test						Pre-test				
1	2	3	4	5	Item	1	2	3	4	5
					1) Are you feeling sleepy after you have taken your lunch?					
					2) Do you feel sleepy during the test?					
					3) Do you feel sleepy after the test?					
					4) Music helps me to feel more energetic in the process of typing.					
					5.1) Fast music compared to slow music helps to deliver better concentration in the process of typing.					
					5.2) Fast music compared to slow music can help in increasing typing speed.					
					6.1) Slow music compared to fast music helps to deliver better concentration in the process of typing.					

					6.2) Slow music compared to fast music can help in increasing typing speed.					
					6.3) Slow music makes me relax when I am typing.					
					7) I feel different with the presence of music during typing.					
					8)Listening to music with help me to increase my typing speed.					
					9) Listening to music help me to improves concentration during typing.					
					10) Listening to music decrease my concentration during typing compared to my usual working environment.					
					11) Fast music makes me nervous when I am typing.					
					12) I feel relax typing with the presence of music.					

Appendix. B

Participation in a Research Study

Research topic: **Music and its Effect on Typing**

Investigators:

Name: ______________________ **Dept:** __________ **Phone:** __________

Introduction

- We ask that you read this form and ask any questions that you may have before you participate in this study.

Purpose of Study

- The purpose of the study is to investigate the effect of music on typing during postprandial state.
- Ultimately, this research may be published as a journal article.

Description of the Study Procedures

- Test
- Music listening with and without headphone.
- Typing

Criteria of participants:

1. Participants must not be under any form of medication that may cause drowsiness.

2. Participants have not consumed any beverage that contains caffeine in the last 12 hours.

3. Participants have consumed a full meal during lunch that includes a main source of carbohydrate such as rice, bread or noodle and the quantity of food as usual.

4. Female participants are not in their menstrual period.

Benefits of Being in the Study

- Helping the researcher to generate outcome that may improve typing.

Confidentiality

- This study is anonymous. We will not be collecting or retaining any information about your identity.

1

Right to Refuse or Withdraw

- The decision to participate in this study is entirely up to you. You may refuse to take part in the study *at any time* without affecting your relationship with the investigators of this study. Additionally, you have the right to request that the interviewer not use any of the interview material.

Right to Ask Questions and Report Concerns

- You have the right to ask questions about this research study and to have those questions answered by me before, during or after the research.

2

FORM 3: CONSENT FORM

(ENGLISH)

To become a subject in the research, you or your legal guardian are advised to sign this Consent Form.

I herewith confirm that I have met the requirement of age and am capable of acting on behalf of myself /* as a legal guardian as follows:

1. I understand the nature and scope of the research being undertaken.
2. All my questions relating to this research and my participation therein have been answered to my satisfaction.
3. I voluntarily agree to take part in this research, to follow the study procedures and to provide all necessary information to the investigators as requested.
4. I may at any time choose to withdraw from this research without giving reasons.
5. I have received a copy of the Subjects Information Sheet and Consent Form.
6. Except for damages resulting from negligent or malicious conduct of the researcher(s), I hereby release and discharge University of Malaya and all participating researchers from all liability associated with, arising out of, or related to my participation and agree to hold them harmless from any harm or loss that may be incurred by me due to my participation in the research.
7. I have read and understood all the terms and conditions of my participation in the research.

I have read the statements above, understand the same, and voluntarily sign this form.
Dated :_____ day _____ month ______ year

Name **IC Number**

Signature **Date (/ /)**

Name & Researcher's Signature **Date (/ /)**

3"

"