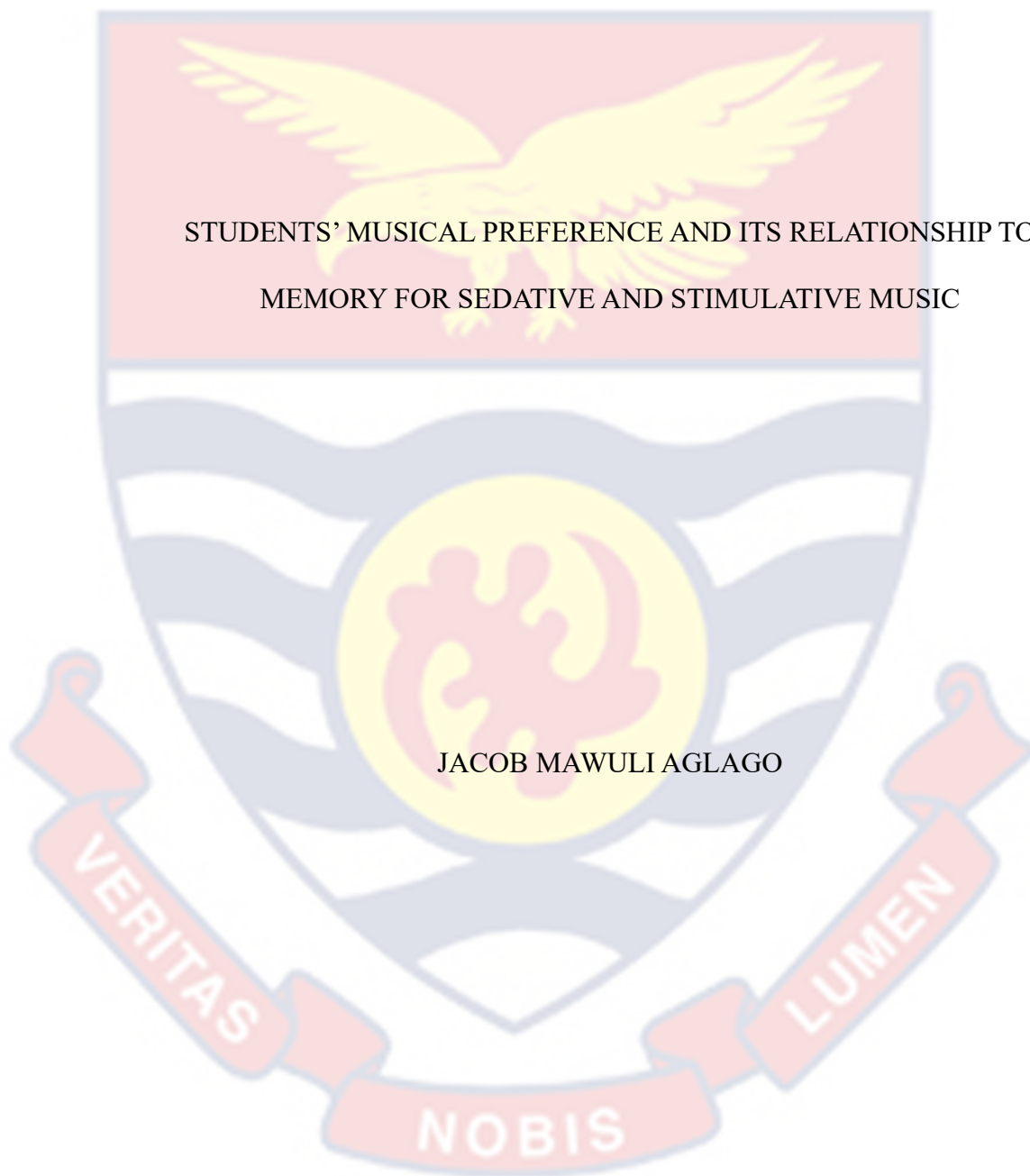


UNIVERSITY OF CAPE COAST

STUDENTS' MUSICAL PREFERENCE AND ITS RELATIONSHIP TO
MEMORY FOR SEDATIVE AND STIMULATIVE MUSIC

JACOB MAWULI AGLAGO



2023



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The background of the page features a large, faint watermark of the University of Cape Coast crest. The crest is a shield with a red top section containing a yellow eagle with spread wings. Below the eagle is a white section with blue wavy lines. The center of the shield is a yellow circle containing a red stylized human figure. A red ribbon banner wraps around the bottom and sides of the shield, with the Latin motto 'VERITAS LIBERABIT VOS' written in white capital letters. The word 'NOBIS' is written in white capital letters on a red oval at the very bottom of the crest.

STUDENTS' MUSICAL PREFERENCE AND ITS RELATIONSHIP TO
MEMORY FOR SEDATIVE AND STIMULATIVE MUSIC

BY

JACOB MAWULI AGLAGO

Thesis submitted to the Department of Music and Dance of the Faculty of
Arts, University of Cape Coast, in partial fulfillment of the requirements for
the award of Doctor of Philosophy degree in Music Education.

NOVEMBER, 2023

DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original work and that no part of it has been presented for another degree in this University or elsewhere.

Candidate's Name: Jacob Mawuli Aglago

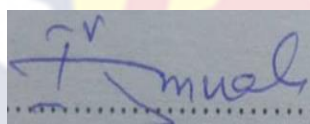
Signature Date.....

Supervisor's Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

Principal Supervisor's Name: Prof. Isaac Richard Amuah

Signature

 Date 7/11/23

Co-Supervisor's Name: Dr. Maria Witek

Signature.....



.....Date.....07.11.2023.....

ABSTRACT

The concept of preference for music is one that is deeply connected to memory for music inter alia. People's preference for music vary from person to person, and this may in effect have some influence or effect on their memory for that music stimulus as they engaged with music on daily basis. With the employing and use of the quantitative method (Field's model of 2009) in this study, the researcher used a sample size of one hundred students in a basic school to investigate the relationship between preference for music and memory for sedative and stimulative music. The statistical tools used were Inferential and descriptive (the Chi square, the Cohen's d test, the independent and the one sample t test) were used to test the hypotheses of the significant difference between the two variables (preference and memory). The study suggests that there was a link between music preference and memory, indicating a statistically significant difference between students' preference for the two-music stimulus. Again, there was some discrepancy in memory for music between students who prefer sedative music and those who prefer stimulative music. Finally, those who preferred sedative music demonstrated a notable advantage in memory retention when compared to their counterparts who preferred stimulative music.

KEY WORDS

Memory

Music listening

Preference

Relationship

Short term memory

Long term memory

Sedative music

Stimulative music



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DEDICATION

To Professor Isaac Amuah, Dr. Maria Witek, my dear wife, children, brothers
and sisters and finally to friends and choristers.



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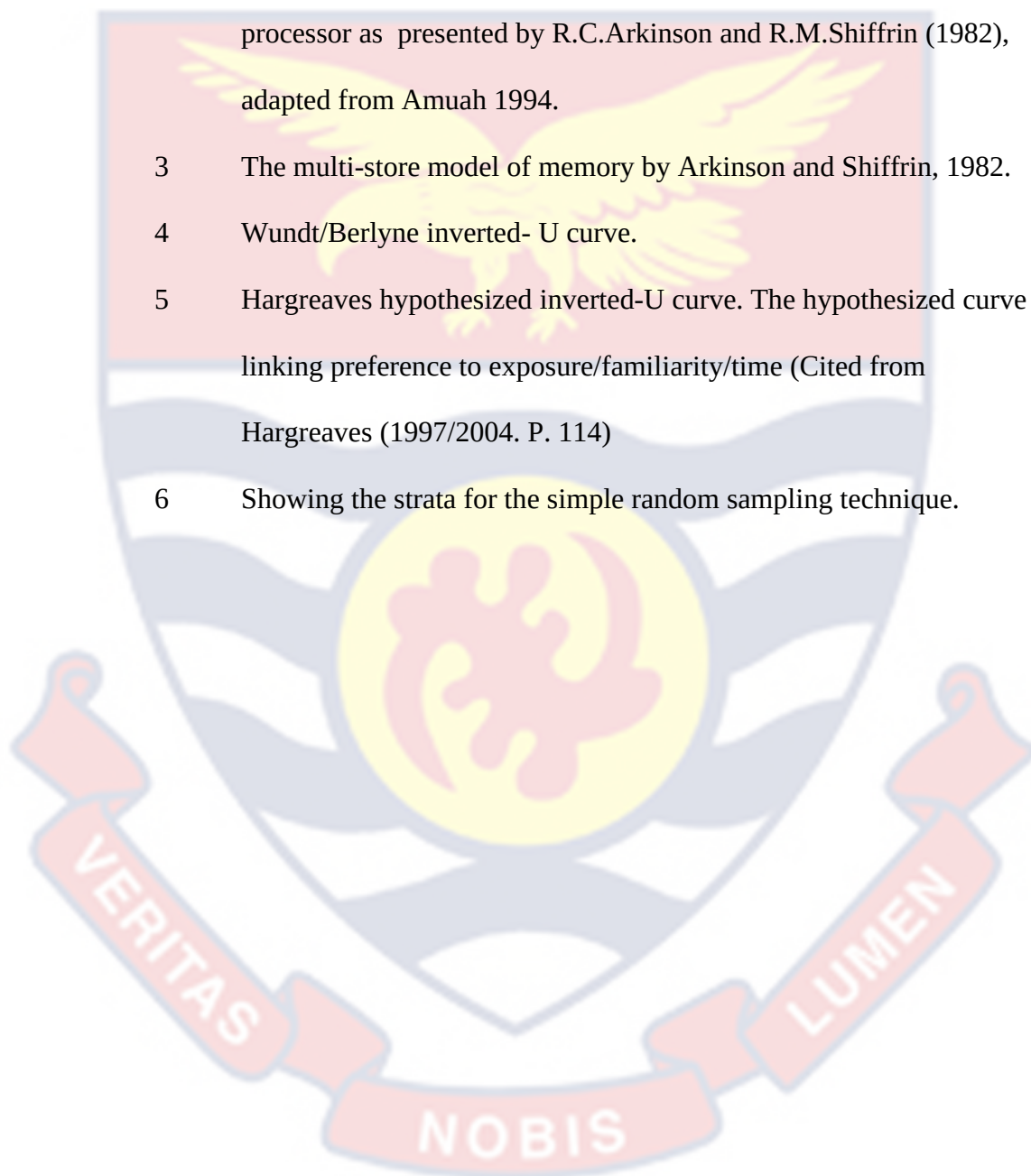
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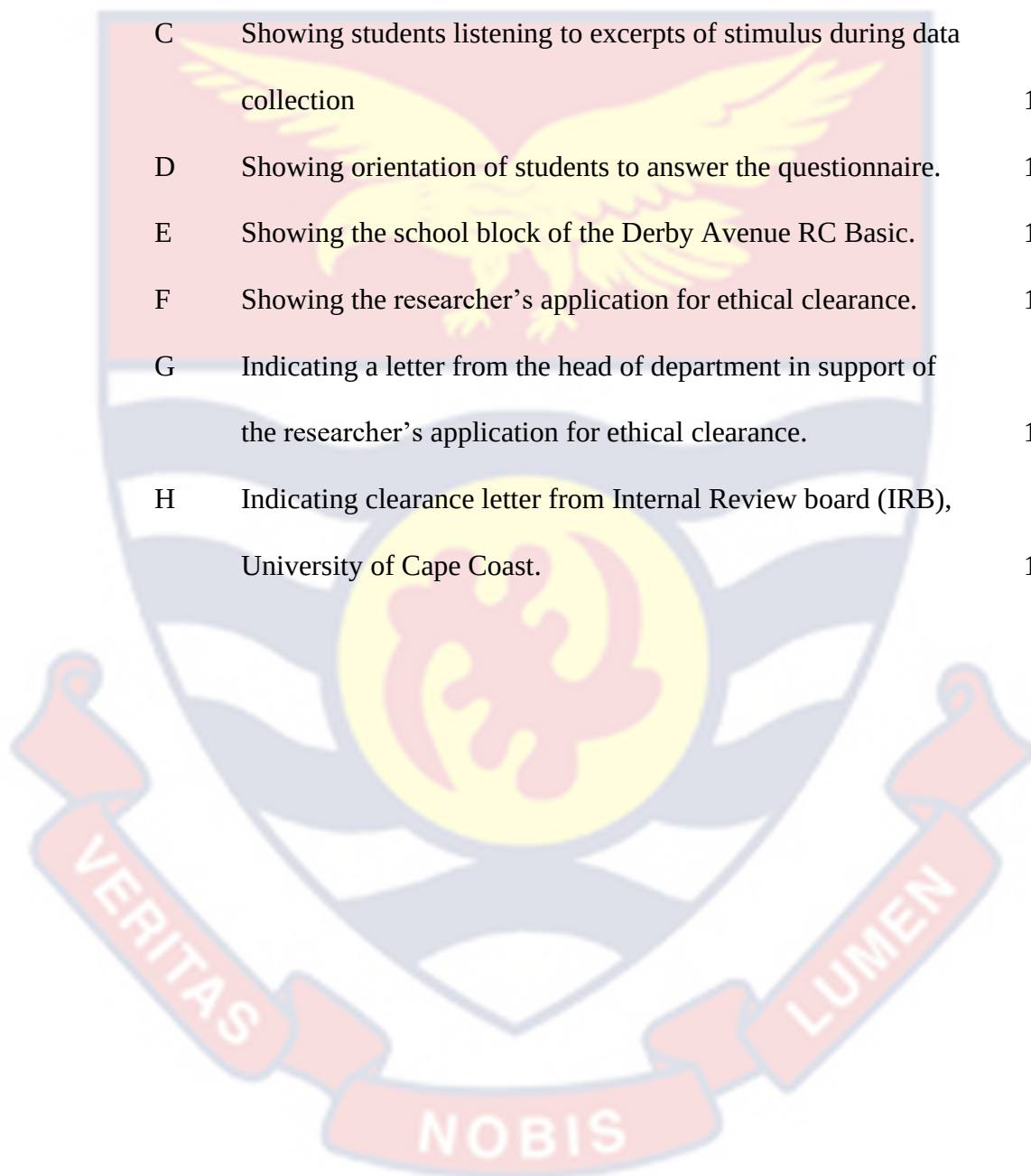
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CHAPTER ONE

Introduction

The concept of memory has been a focal point in numerous philosophical, psychological, and intellectual discussions, among others. There seems to be a consensus and unanimous acknowledgment that intelligence and the ability to recall memories are indeed integral to the development of every individual. Memory, according to scholars is one important influential and authoritative tools the individual has in the mind that enables them to learn, recall, and use what was learnt to solve problems; the amount of it the individual has it, the faster they will learn, use it, and the greater will be their chances of success in solving difficult problems (Derville, 1990).

Researchers have indicated that, those who possess high level of memory and recall have the potential to solve complex problems which those who are less endowed would be unable to solve. The importance of memory and recall in achievement in any endeavour cannot be underestimated; and this explains the great amount of research that has been carried out by many researchers, and still being carried out, on various topics in this area. Memory for music refers to the cognitive processes involved in encoding, storing, and retrieving musical information (Jäncke, 2019). Researchers have also described memory as being involving the ability to remember and recognize melodies, rhythms, harmonies, and other musical elements (Brower, 1993).

Studies in memory for music falls under cognitive psychology which is a branch of psychology that emerged as a reaction against behaviorism. It focuses on the study of mental processes such as thinking, perception,

memory, attention, language, problem-solving, and decision-making. It is a study area that seeks to understand how people acquire, process, store, and retrieve information and how these mental processes influence behaviour, and also seek to emphasise the importance of mental processes in understanding human behaviour and experiences. The focus of the current study is on storage and retrieval of information acquired through listening to two types of music of the Ghanaian music.

Researchers have indicated that memory for music is categorised into different types which includes, short-term and long-term memory (Talamini et, al., 2017). In the context of music, short-term memory allows the listener to retain and recall a musical phrase or melody immediately after hearing it. In most cases, within a brief period usually in 30 seconds or less (Berz, 1995). Long-term memory on the other hand refers to the storage of information over an extended period, potentially for a lifetime. In the case of music, long-term memory involves the retention of songs, compositions, lyrics, and other musical knowledge that an individual has learnt or experienced over a long period of time (Talamini et, al., 2017). Scholars have indicated that a long-term memory, has two subcategories, procedural memory, and semantic memory.

Recall, in the context of memory for music, refers to the ability to retrieve stored musical experiences into conscious awareness (Snyder, 2000). This phenomenon of recall through conscious awareness is an exercise which allows musicians to reproduce basic rudimental concepts of music such as melodies, rhythms, and harmonies accurately, remember lyrics, and perform music from memory without relying on external sources such as music sheet,

or other sources of musical materials. However, the capacity to remember and recall music can vary among individuals, based on certain factors such as attention, practice, and emotional connections to the music, which as a matter of fact can influence memory performance (Ericsson & Charness, 1994). This study discussed the cultural context of which a piece of music played and heard as one of the factors that may have some influence on memory and recall

The cultural context of which a piece of music is played can play an important role in its impact on individuals memory ability in relation to a particular type of music (Sixsmith & Gibson, 2007). For instance, music played at a funeral of a close relation or family member will always be remembered anytime it is played or listened to as a result of the music being link to that event. This type of music can be one of sedative or stimulative music in the Ghanaian context. By focusing specifically on Ghanaian sedative and stimulative music genres, this study seeks to relate itself to understanding how preference for these musical styles relates to students' memory for sedative and stimulative music as the stimulus for the study.

This study envisages that, the findings would inform educational practices, curriculum development, or interventions that employ specific types of music to enhance students' cognitive functions (memory and preference) within the Ghanaian basic school's system specifically in measuring the cognitive abilities of pupils in relation to memory and recall.

Background to the study

Although the relationship between music and memory has been extensively studied, limited attention has been given to how individual differences in musical preferences influence memory and recall. Research in

Ghana has largely overlooked this area, highlighting the need to address this gap, particularly within this part of the world. Each individual has their own unique musical taste and the kind of music that the individual may prefer. In Ghana for instance, the commonest musical types or group that individual can choose from include gospel music, “bonga” highlife, reggae music, Azonto music and many more. The choice of these stimulus may greatly influence their emotional, psychological, social, behaviour, and cognitive responses to music. The current study focused on the relationship between memory recall for music and music preference in relation to engaging with calming and invigorating music in basic schools in Ghana with the Derby Avenue basic school as a case study.

Understanding the relationship between students' musical preference and memory for sedative and stimulative music is important in educational contexts. Students often engage in various learning activities that require efficient memory encoding, retention, and retrieval (Driscoll & Burner 2005). By exploring the role of musical preference in memory processes, educators and researchers can gain some insight into creating optimal auditory environments that ease learning and improve memory performance.

Individuals have unique musical preferences influenced by various factors such as personal experiences, cultural background, period of exposure to music, religion, and social influences (Radocy 2012). Some students may have a preference for calming and relaxing music (sedative music), while others may gravitate towards energetic and stimulating music (stimulative music). The student may however like both music but will choose one in one circumstance, and the other in another. For example, if the student wants to

relax, they may prefer sedative music. If they want to feel energised, they might prefer stimulative music. Researchers have noted that, different types of music, such as sedative and stimulative music, can elicit contrasting emotional and physiological responses in individuals such as happiness and sadness, calmness and energetic characteristics (Lingham & Theorell, 2009).

Research suggests that emotional arousal, induced by music, can enhance memory consolidation and retrieval (Lane et. al., 2015). Sedative music for instance may promote relaxation and focus, creating a situation favourable for encoding and consolidation of information (Foster, 2020). On the other hand, stimulative music may upsurge arousal and attention, possibly facilitating memory encoding and retrieval of more engaging or thrilling content (Mado et. al., 2015).

Exploring the relationship between students' musical preference and memory for sedative and stimulative music can afford valued insights into individual differences in cognitive processing and memory performance. By understanding how music preferences influence memory and recall, educators can design learning activities in an environment that harness the power of music to improve students' learning experiences and improve their overall academic performance. Understanding the influence of students' musical preference on memory for sedative and stimulative music is particularly relevant in educational contexts and for music education because students frequently engage in various learning activities, such as studying, reading, and problem-solving, which require efficient memory processes, and therefore, creating an optimal auditory environment that matches students' musical

preferences which may enhance their engagement, focus, and memory recall performance if it is well managed.

Musical engagement and experience by students at all educational system tiers form one of the major activities in the classroom, lecture halls and theatres. Music teaching and learning focuses on the enhancement of students' skills, development, appreciation, aesthetics, and knowledge (Gullatt, 2008). Music scholars as well as educators have conducted empirical investigations and research that deals with memory and musical preference on various subtopics. Even though studies have been done extensively, much have not been seen in the Ghanaian landscape where typical Ghanaian music has been used to investigate students' memory for music. Through empirical research and careful investigation, this study aims to contribute to the existing body of knowledge on the influence of musical preference on memory processes. The findings may have practical implications for educators, psychologists, and researchers seeking to enhance memory performance in their students, and also to music education and provide a deeper understanding of the intricate relationship between music preference, memory and recall. By investigating this relationship, the study will shed light on the potential benefits of tailoring auditory environments to individual preferences. The outcomes of this investigation may contribute to the development of effective strategies for optimising memory performance in educational settings and provide insights into the intersection of music, cognition, and personalised learning experiences.

Statement of the problem

The connection between students' musical preferences and cognitive ability in relation to memory for sedative and stimulative music remains largely unexplored, particularly in Ghana's basic schools within the context of educational research. A reasonable number of previous studies have been conducted on the impact of music on memory and cognition. Limited attention has been given to individual differences in musical taste and its influence on memory processes and recall. This study focuses on exploring how students' musical preferences interact with sedative and stimulative music to influence memory recall. Gaining insights into this interaction can help improve learning environments and enhance short-term memory and recall performance.

Researchers have sufficiently established a connection between music and emotion (West, 2009; Nortz, 2002; Reimer, 2009; Sloboda, 1992, 1999, 2001). Other studies have been conducted in the area of music memory and perception which indicates that music evokes autobiographical memories in the individual who do listen to music (Janata, Tomic & Rakowski 2007). However, it is increasingly evident that empirical studies in the field of memory and recall in relation to music preference in the Ghanaian context have not gained much ground. Many of the studies that border on music and memory recall are short of empirical validation; they seem to stem from logical speculations and personal intuitions (Otchere 2014). Other studies focus on, for example, the speed of our mental soundtracks which has to do with tracking the tempo of involuntary musical imagery in everyday life, for

memory and cognition (Jakubowski, Farrugia, Halpern, Sankarpandi & Stewart, 2015).

Other studies which are similar to the area I investigated are studies on musical preference and personality/lifestyle. For instance, in one of the studies of Rentfrow and Gosling (2003), they also observe a “fascinating pattern of links between music preferences and personality, self-views, and cognitive ability.” This observation supports the unanimity of deductions made by many scholars who were involved in research on musical preference and personality (North & Hargreaves, 2008; Dalrymple, 2009; Pearson & Dollinger, 2003; Delsing, Ter Bogt, Engels, & Meeus, 2008).

In conclusion, the need to carry out a study on music and memory recall based on music preference is even more pressing in Ghana especially in our basic schools. Ghana as a country and especially in the area of research has ignored this part of research, contributing little or no information on the area (preference and memory for music). It should be noted that, most related subjects on ‘music and memory’ or ‘music and autobiographical memory retrieval’ studies have not received adequate attention in Ghanaian music education discourse. In terms of scope, the closest studies by Ghanaian music educators include that of Amuah and Sracoo (2001) who selected two hundred and seventy basic school pupils and investigated the differences among the pupils’ abilities to perceive the expressive qualities of music. They concluded that there is a significant difference between lower and upper primary pupils in their abilities to perceive dynamic qualities of music. Otchere (2014), also investigated music and emotion, a study of the relationship between musical

preference and emotional intelligence. These two research studies did not address the relationship between preference for sedative and stimulative music and memory for music creating the lacuna between the previous studies and the current study. The gap identified in this study is contextual, a gap that indicate that, research is limited or missing in specific settings or environments. This may involve factors like geographical location, culture, socio-economic background, or historical context. The author of this current research decided to fill the gap.

Purpose of the study

The purpose of this study was to examine the relationship between students' musical preferences and memory for sedative and stimulative music.

Objective of the study

The study sought to address the following research objectives;

1. To investigate the difference between students' preference for sedative and stimulative music.
2. To examine the difference in memory for music between students who prefer sedative music and stimulative music.
3. To compare students who prefer stimulative music and those who prefer sedative music on their memory for stimulative music.
4. To compare students who prefer stimulative music and those who prefer sedative music on their memory for sedative music.

The research questions

The following research questions were considered to guide the study:

1. What significant difference exist between students' preference for sedative music, and stimulative music?

2. What is the difference in memory for music between students who prefer sedative music and stimulative music?
3. What is the difference between students who prefer stimulative music and those who prefer sedative music in their memory for stimulative music?
4. What is the difference between students who prefer stimulative music and those who prefer sedative music in their memory for sedative music?

The hypotheses

The following research hypotheses were tested:

Research Hypothesis 1

H₀: There is no difference between students' preference for sedative and stimulative music.

H₁: There is difference between students' preference for stimulative and sedative music.

Research Hypothesis 2

H₀: There is no difference in memory for music between students who prefer sedative music and stimulative music.

H₁: There is a difference in memory for music between students who prefer sedative music and stimulative music.

Research Hypothesis 3

H₀: There is no difference between students who preferred stimulative music and those who preferred sedative music on memory for stimulative music

H₁: There is a difference between students who preferred stimulative music and those who preferred sedative music on memory for stimulative music

Research Hypothesis 4

H₀: There is no difference between students who preferred stimulative music and those who prefer sedative music on memory for sedative music.

H₁: There is a difference between students who prefer stimulative music and those who preferred sedative music on memory for sedative music.

Significance of the study

The significance of this study is to bring to the awareness of educational practitioners and professionals in the teaching service, the impact and influence of students listening abilities of two different types of music and its relation to memory and recall. This particular study holds great importance as it contributes to the limited body of empirical research on the subjects of music and memory, specifically concerning sedative and stimulative music.

It will help music educators and practitioners to choose appropriate songs for enhancing the memory for music in students. Music accompanies many aspects of daily life, and affects us whether we are aware of it or not (West 2009, "p.284). West specifically suggests that "sounds that are unwanted and disturbing can impact our well-being in various ways" (p. 286). Regardless of the underlying philosophy guiding the study of music in any educational institution, the crucial aspect of education is instilling commendable values and attaining favorable results (Otchere 2014). It is the responsibility of music educators and professionals to conduct research that explores the impacts of various sounds, especially music, on aspects of our lives that can enhance memory and recall.

Furthermore, the study will help psychotherapists, parents, teachers, psychologists, guardians, and other people in managerial positions who would

want to improve their intellect in terms of memory and recall for and that of their counselees (Otchere 2014). In addition, it will encourage children, staff and students to do purposeful listening to the preferred music within specified music dimensions (Otchere 2014); Therefore, the importance of this study cannot be overstated. People engage in different kinds of music every day for the instantaneous fulfilment based on their preferences, without the least idea of what that music can do to them over time. The results from this study may help initiate a fruitful memory recall discourse in that direction as well.

Finally, the researcher believes that, the result emerging from the study will serve as vital information hub for music educators and practitioners who will absorb into their teaching methods and experiences the lessons learnt from the study. The study, though basic research, will serve as a base for future researchers interested in studying memory for music abilities of Ghanaian students.

In conclusion, the overall significance of the study lies in its potential to inform educational practices about how to enhance the memory of students. It is hoped that, the outcome of the study will deepen our understanding of the intricate relationship between students' musical preference, memory, recall, and learning processes.

The delimitation of the study

This study focuses on the influence of sedative and stimulative music on short-term memory recall among junior high school students in Ghana. It specifically examines the effect of music preference on memory encoding and retrieval during academic tasks. The research is limited to a sample size of 200 students from four schools in the Greater Accra region.

The study does not explore the impact of background noise, other genres of music, or long-term memory effects. These aspects were excluded due to time constraints and the need to maintain a manageable research focus. Additionally, participants outside the basic school level were not considered to ensure uniformity in the cognitive development stage.

By narrowing the scope, the study provides focused insights into the relationship between music and short-term memory in a critical educational context.

Limitations of the study

The content and limitations of this study provide a framework for the discussion on students' musical preference and its relationship to memory for sedative and stimulative music. Being aware of these foreseen limitations in the study can help researchers and readers interpret the findings accurately and identify areas for future research and improvement.

For this study, the limitations hinge on the following paradigm; Generalizability: The outcomes of the study was limited to the specific sample of students and may not have been applicable to broader populations or different cultural contexts. To generalise this study has to be done with decorum.

Self-Report Bias: The assessment of musical preference relies on self-report measures, which are subject to individual interpretation and potential biases. All the music stimulus were selected by the researcher, and therefore may not have been a true representative of the choice of the student's preferred music. Students may have different interpretations or perceptions of musical genres, impacting the accuracy of their reported preferences.

Influence of Other Factors: While the study focuses on musical preference and memory ability, it is important to acknowledge that memory performance can be influenced by various factors such as attention, motivation, and prior knowledge in music. Controlling for and accounting for these variables is challenging due to the complex nature of the population and the selected stimulus.

Ethical Considerations: All ethical considerations such as protecting the privacy of students, and comfortability during the data collection session may not be of the highest standard required for a perfect study.

Complex Nature of Music and Memory: Music and memory processes are multifaceted and influenced by numerous cognitive and emotional factors. Capturing the entire complexity of these interactions within the scope of a single study is challenging.

A population of hundred students may be considered as a small sample size for the study, however, scholars propose that a sampled size of at least 30 can be used for experimental research (Hertzog, 2008; Osborne & Costello, 2004). It is believed that since the sample size is larger than 30, the results of the study will produce a reliable information on students' memory and musical preference on the two types of music (Marino, Hogue, Ray & Kirschner, 2008; Wisz, Hijmans, Peterson, Graham, Guisan & NCEAS, 2008). The researcher believes therefore that, the size of hundred respondents (N =100) observed in the study was significant enough for a statistical inference.

Key terms

The key words and terms used in the study include the following and are explain as;

1. *Music Stimulus*

This is described as an element of music or an event that elicits a distinct functional response in an organism or tissue.

2. *Music listening*

Listening is to appreciate and give one's self the necessary attention to sound, and therefore, music listening is an active or passive process of giving attention to the sound component of music. It involves complex affective, cognitive, and behavioural processes.

3. *Memory*

Memory for music refers to the cognitive processes involved in encoding, storing, and retrieving musical information. It involves the ability to remember and recognize melodies, rhythms, harmonies, and other musical elements.

4. *Cognitive psychology*

Cognitive psychology, as a field within psychology, concentrates on the examination of mental processes like cognition, perception, memory, attention, language, problem-solving, and decision-making.

5. *Music preference*

Refers to an immediate and specific choice of music within a set of possibilities.

6. *Recall*

Recall, in the context of memory for music, refers to the ability to retrieve stored musical information and bring it back into conscious awareness. It allows musicians to reproduce melodies, rhythms, and harmonies accurately, remember lyrics, and perform music from memory without relying on external sources such as music sheet.

7. *Short-term memory*

This is a type of memory that holds information for a brief period, usually up to 30 seconds. In the context of music, short-term memory allows you to retain and recall a musical phrase or melody immediately after hearing it.

8. *Long-term memory*

Long-term memory refers to the storage of information over an extended period, potentially for a lifetime. In the case of music, long-term memory involves the retention of songs, compositions, lyrics, and other musical knowledge that have been learnt or experienced.

9. *Stimulative music*

Music that invigorates or arouses listeners with a strong and have an energising component with a tempo ranging between 80 – 120 beats per minute and above.

10. *Sedative music*

Music that soothes, calms, or tranquilizes behaviour with a tempo ranging between 60 – 80 beats per minute and below.

Memory for music

Many have come to believe that an important aspect of the cognitive processes involved in musical sensitivity is memory for music (Stokes, 1990; Kauffman, 1986). Several scholars have various views in relation to memory and music, among them are several cognitive psychologists in music who believe that the ability to perceive the expressive qualities of music hinges on one's memory capacity (Dowling & Bartlett, 1981). Other scholars also believe that, music can have a significant impact on memory recall, and people who prefer stimulative or sedative music may experience enhanced memory

recall (Janata et. al.,2007). Scholars have noted that, people who engaged in listening to either of the music exhibit certain characteristics under certain conditions, resulting to a positive effect (Mitterschiffthaler et. al., 2007). A study of memory for music may also offer opportunities for music professionals an understanding of the role it plays in the development of musical intellect and recall and of musical experience when one engages in listening to two genres of music.

Reimer (1989), identified two aspects of musical experience, perception and feelingful/ reaction to the expressive abilities for music. Researchers in the field of cognitive psychology of music have posited that music is the bedrock of musical perception (Dowling & Bartlett, 1981). This finding indicates that, the ability to perceive the expressive qualities of music, among other things, is dependent on one's ability to recall past musical events (Sloboda 1985). This goes to emphasise the point that, the processes involved in the memory for music may deepen our understanding of the processes involved in musical perception and preference. The development of students' ability to remember music may then be an appropriate goal for those interested in developing students' understanding of and sensitivity to music, and this has been stressed by Thomas (1970) in his report on the Manhattasville music curriculum project that, memory is the *sine qua non* of music learning and the enhancement of students' musical skill.

There are various ways through which the study of memory and music have been approached, however, the most notable perspective among the list are: (1) the cognitive processes involved in memory for music, or (2) the factors influencing the development of memory for music. However, over

the years, the former has dominated the writing in this field (Kauffman & Carlsen 1989; Dowling, 1973; Dowling & Fujitani, 1971; Deutsch, 1972, 1970; Orttman, 1926). It has been observed that, researchers in this area of study have designed and/or tested models, which are information-based processing theories, to clarify the cognitive structures that are involved in memory for music and recall.

Studies was conducted, which focused on attention and the factors that influence memory and music (Mitchell, 1985; Freeman, 1974; Moore, 1973). In one study, Moore (1973) indicated that environmental factors, such as parents' musical preference, availability of audio at home, and family musical interaction play an important role in the enhancement of a student's ability to recall music. In addition, studies indicated that, personal factors such as musical preference and time spent in active listening to music have been found to predict students' memory for music (Freeman, 1974). The identification of these environmental and personal factors which are associated with memory for music, and an insight about how they influence the development of memory for music, will give the music education profession the impetus to develop appropriate pedagogical strategies for the enhancement of students' memory for music.

Another study conducted by Belfi, Karlan and Tranel (2016) revealed that music is a powerful trigger for the retrieval of autobiographical memories. The participants reported a significant number of memories associated with the songs they listened to, and these memories were often described as vivid and emotionally charged. The study found that the emotional content of the music played a significant role in the autobiographical memory retrieval

process. Songs that elicited strong emotional responses were more likely to evoke vivid and detailed memories. The study highlights the close relationship between music and autobiographical memory, indicating that listening to music can trigger a torrent of memories from one's personal past. These findings contribute to our understanding of the mechanisms underlying the emotional and mnemonic impact of music on our lives. It should however be noted that, there can be some errors that can occur in the minds of the listener that may be temporal or permanent which can hinder memory recall and preference of music in the individual which scholars described as cognitive failure. This study discussed this phenomenon.

Cognitive failure

Cognitive failure is one aspect of human memory which has attracted attention by cognitive psychologists over the years. Research suggests that cognitive failures are a normal and common part of human experience, occurring in people of all ages. It's important to note that while occasional cognitive failures are normal, persistent or severe lapses in cognitive functioning could potentially be indicative of underlying issues that might require attention.

Cognitive failure, in the context of cognitive psychology, denotes a temporary lapse in cognitive processes that can lead to errors, or failures in everyday activities (Carrigan & Barkus 2016). Cognitive failure involves a variety a temporary lapse in cognitive processes that can lead to errors, or failures in everyday activities (Carrigan & Barkus 2016). The fundamental causes of cognitive failure can be fatigue, stress, distractions, information overload, inadequate attentional resources, or simply, being preoccupied with

other thoughts or concerns (Groes 2017). This phenomenon is a common trait in students and for that matter in our educational system. In music education lessons, it could lead to inability to recognize tonality, rhythm, and recall of music stimulus that was played for identification or recall.

Cognitive error as defined by Martin is that which may occur during the performance of a task that is normally well within the ability of the person carrying it out (Martin & Jones 1984, p.96). The positive relationship between cognitive failures and academic achievement has been demonstrated by both cognitive and educational psychologists (Harris, 1984). Wilhite (1990) observed and supported the findings of Martin that, measures of cognitive failures accounted for a considerable proportion of the variance in students' academic achievement measures. Anderson (1990) on the other hand also asserts that, there is a relationship between cognitive failures and memory for verbal and auditory events.

Having the understanding cognitive failures as educators and music professional can help us know when and where a particular type of music especially during our practical lessons and using music as our starter in our lessons in our basic schools in particular.

Musical preference

Preferences are matters of individual taste for a particular phenomenon and preference for music type is not an exception. In any choice of sensory experience, people vary in their preferences. It should be noted that personal preferences are not consistent, and are deeply rooted on individual biological needs, enculturation, and lived experiences (Radocy & Boyle 2012). Phelps, (2014) referred to musical preference as an immediate and specific

choice within a set of possibilities. This means that, individuals make choices only if there are other alternatives, hence the choosing becomes limited to the subject.

Some variables that can affect musical preferences among the others include personality, emotional intelligence, mood regulation, identity and cognitive function (Rentfrow et. al., 2011, Greasley, & Lamont, 2016, Otchere, 2014). These traits affect the kind of music a person prefers, which confirms the statement that the type of music that an individual prefers listening to affects their lives and indicate who they are. Chamorro et.al., (2010), in support of this posited that, individual musical choices reflected clinical personality assessments which is dependent on aesthetic values and individual needs for sensual pleasure.

Considering certain theories and models that serve as the basis for explaining music preference, Zajonc (1968) indicated that preference for music can be linked with exposure and some experiences or a foreknowledge an individual may have in music. Theories that further explain preference for music according to researchers can be attributed to scholars like Hargreave, Tversky and Kahneman. (Hargreave's hypothesized U-curve; 2001), and anchor and adjustment heuristic theory (Tversky & Kahneman, 1974). All these theories clearly indicated that, music preference is the product of exposure or adequate familiarity to a musical stimulus. In simple terms, we can conclude that, even though an individual may develop preference for a particular type of music for which that individual may be oblivious of, exposure to that music may give high confident rating for that music. It therefore presupposes that, any consideration for a preference for a particular

kind of music must be considered according to the prevailing music available and should be within the environment of the participant (Otchere & Florian, 2016). This study however is not based on previous exposure of the respondents, or respondents' own choice of music or stimuli since all the stimulus played were chosen by the researcher, in order to avoid bias.

Students' preference for music and its effects on learning

Students' preference for music varies from student to student (Reynolds, 2000). However, its effect on the learning process gives almost the same result and is likely to contribute students' learning process. In selecting music stimulus for music activities in the learning process, it is important to note that, students' input into the selection is very important. This is because, it can help to get to students to know about the type of music they find as motivating or enjoyable. This can help create a more inclusive and engaging classroom environment, highlighting the importance of involving students in the decision-making process regarding the music used in the classroom (Simmons, Graham, & Thomas, 2015). It is important to note that, while student input is valuable, teachers should maintain the final say in the music choices to ensure they align with the lesson objectives and classroom goals. Balancing student preferences with educational outcomes is key to a successful implementation of the learning process leading to achieving the required result. (Vrieling, Stijnen, & Bastiaens, 2018).

Factors affecting music preferences

The dialogue between preferred music and music listening is a longstanding area that has been covered by researchers in various studies. Under normal circumstance, any individual who decides to listen to a piece of

music, holding other factors constant, will chose music of his choice in order to get the satisfaction anticipated. Extant literature is replete with a number of factors that have bearing on the music preferences of people (Otchere, 2016). Most common are peculiar characteristics of music, (Russel. 1997; Otchere, 2013), socioeconomic status (Zillman & Gan, 1997), age (Dunn, 2010; O'Neill, 2000), gender (Russell. 1997; Otchere, 2013), and ethnic factors (Denisoff & Levine, 1972), to mention a few. Below is a figure illustrating the various factors that influence music preferences.

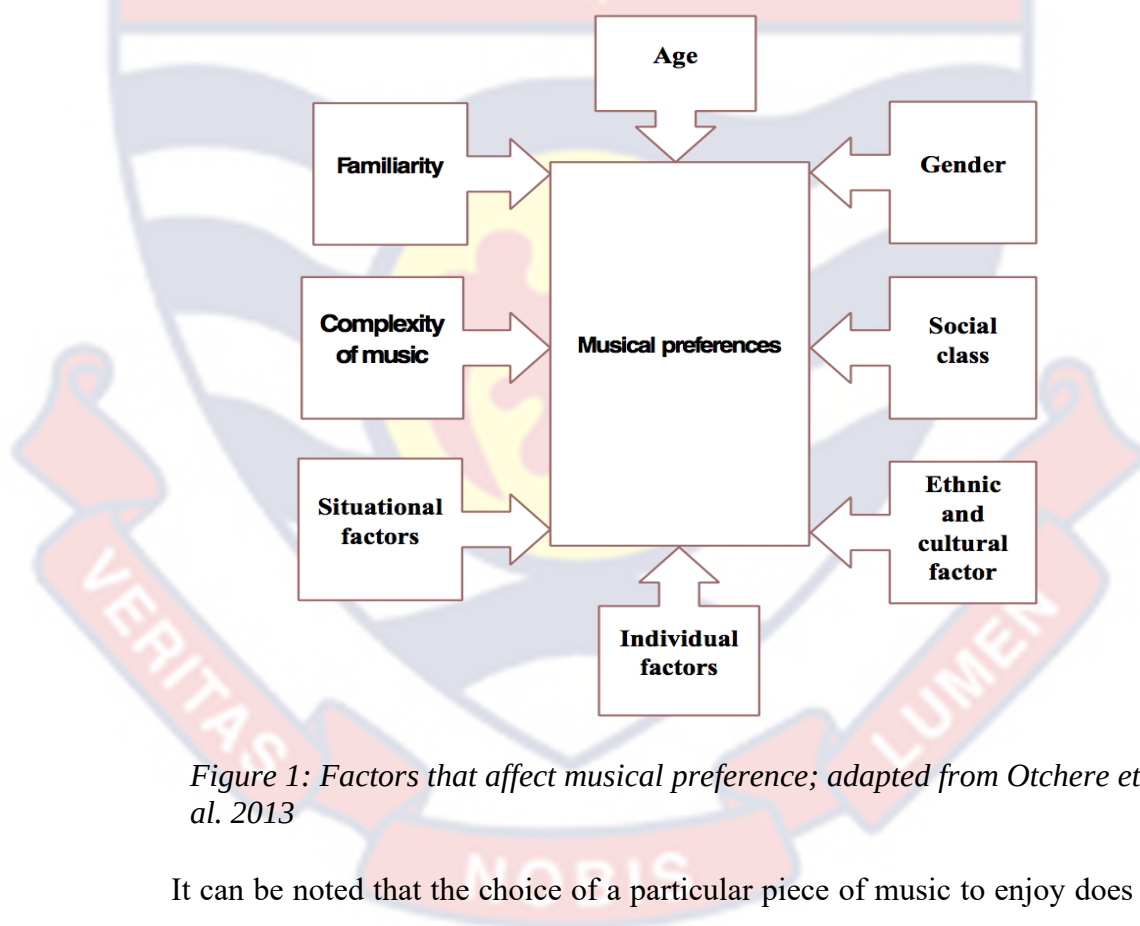


Figure 1: Factors that affect musical preference; adapted from Otchere et. al. 2013

It can be noted that the choice of a particular piece of music to enjoy does not come as a result of chance, but rather a deliberate choice that has been thought of and agreed on based on a person's innermost feeling and conviction.

Scholars, for example (Otchere et. al., 2016) did a study (though not based on Ghanaian context) which indicated that, younger people especially those below the ages of 25 are more receptive to new and emerging musical trends. They tend to have more preference for different genres than those of the older categories. This, therefore indicate that, adults have their choice of music more consolidated and well defined than the youngsters. The study concluded that, age can also be a decider for the choice of music, more especially, based on rhythmic dimension of the music (energetic or calmness) of the piece of music, and also based on past experience and exposure. We can conclude that both sedative and stimulative music are likely to influence the music preferences of young adults, as well as upper primary and junior high school pupils in Ghana, who constitute the study sample.

Music listening

Music is part of life. In Africa, and for that matter in Ghana, music can be described as an activity that the majority of the population engages in on a daily basis no matter where the Ghanaian finds themselves. In Ghana, music has become a pervasive element in daily life, seamlessly integrated into various settings such as homes, public transportation, commercial establishments, and workplaces, shaping an essential aspect of individuals' everyday experiences (Carl & Kutsidzo, 2016). This is because it has deep roots in the Ghanaian culture throughout history (Flolu & Amuah, 2003).

Engaging with music, whether by listening, enjoying, or playing, can evoke feelings of pleasure, sadness, comfort, and profound emotions that may lead to life-altering experiences (Castle & Phillips, 2003). According to scholars, listening to music elicits a certain behaviour such as calmness or

setting the person into an energetic mood during and after engaging in the listening activity (Radocy & Boyle, 2012). Furthermore, researchers like Wunu and Dzakey (2020), in their study on brain responses to music performance and listening in Ghanaian participants, have found that during engagement with music, the brain functions as a responsive machinery that performs various functions and activities.

As a result, some musicologists, anthropologists, psychologists, neuroscientists and philosophers have propounded a number of theories concerning the origin and purpose of music (Fitch, 2006; Peretz, 2006; Levitin, 2007; Schäfer & Sedlmeier, 2010). One of these theories that were eloquently illustrated is by Panksepp and Bernatzky (2002, p. 139) who referred to music as a means of social and emotional communication and therefore postulated that:

In social beings like us, whose predecessors dwelled in tree-dwelling habitats where sound served as a highly efficient method for orchestrating unified group activities, strengthening social connections, resolving conflicts, and establishing enduring structures of submission and dominance, there may have been a significant advantage in the ability to convey nuanced emotion through the melodic quality (prosody) of produced sounds.

In the above argument, it has been suggested that listening to music can be active and/or passive.

Active listening has been described by Burstein (2009) as a focused behaviour during a listening activity. In other words, it can be described as a

purposeful and deliberate action engaged in by an individual. In this engagement, the individual pays attention to the sound being presented and internalises the music in wholistic term (sound and lyrics) for a feelingful reaction to take place. In this active listening, cognisant concentration is given to the music and its elements through the combination of perceptual and cognitive skills, thoughtful, and internalising the music, leading to feelingful reaction and the engagement of memory leading to recall. Some scholars have also noted that active listening to music makes one a good musician, a way of developing better musical skills and experience (Pitts, 2016; Goto, Yoshii, Fujihara, Mauch & Nakano, 2011).

Scrine and McFerran (2018) on the other hand observed that passive listening is an automatic behaviour between the ear and the brain. This implies that the listener may not pay full attention to the music that is being played, however, there is a constant signal between the sound that is being produced and the brain, which may not result in internalisation and eliciting of an affective emotion (although it certainly still can). Given the advantages of active listening over passive listening, this study focused its investigation on active listening, using sedative and stimulative music as stimuli.

Sedative and Stimulative music

Sloboda et al., (2009) have identified that there are five functions that music plays in an individual's life when they are engaged in a listening activity or when choosing a particular music to listen to. Firstly, to reduce boredom and as a way to maintain arousal and interest. In this case, the individual will often choose a distracting form of music. Secondly, an energising type of music is chosen as a means to arousal leading to giving

attention to tasks. Thirdly, one can choose a kind of music for entertainment and fourthly for relaxation. Finally, an individual will choose a piece of music due to its meaning enhancement, and adding significance to a task or activity for example, scholars have identified that, individuals who have preference for sedative music may have a heightened sensitivity to, and engagement with, the musical characteristics that define sedative music, leading to improved memory recall (Hallam, 2015). While sedative music again, can facilitate enhanced cognitive processing and, consequently, improved memory retention for musical details (Scherer & Zentner, 2001), stimulative music on the other hand often arouses and sustains attention (Simons et. al., 2003). Some scholars have argued that, music that resonates with the listener emotionally can enhance memory recall by creating a stronger association with the content being remembered. For example, people who prefer such music may have higher levels of alertness and focus, which can benefit memory recall. Preferences for music on the other hand are often influenced by personal and emotional connections to specific songs or genres (Greasley, Lamont & Sloboda, 2013) as referenced by Radocy and Boyle (2012), stated that all music exists on a continuum between highly stimulating, invigorating and soothing, sedating. McMullen (1982) also suggested that energy and structure in music are experienced as forms of activation or arousal. They also suggested that these activations may involve a heightened state of arousal, either psychological, physiological or behavioural. These suggestions and findings indicate that the choice of listening to a particular type of music might depend on several factors, not just general stylistic preference but also for desired mental and physical motivations.

Music that stimulates or arouses listeners with a strong and energising component (stimulative music), and music that soothes, calms, or tranquilizes behaviour (sedative music), are two main types of music identified in this study that individuals can choose to listen to, depending on their preferences. Nevertheless, individuals exhibit varied responses to stimulative and sedative music, which influence their music preferences. Although these differences have been widely studied, little attention has been given to substantiating their effects within the Ghanaian context through research.

A comprehensive review on the physiological response to music indicate that stimulative and sedative music elicit different effects (Hodges, 2010). Typically, stimulating music has a tendency to elevate physiological rates, for instance, heart rate, while on the other hand, sedative music generally induces calming or relaxing effects, such as reducing muscle tension. A study conducted at the University of Kansas by students of Gaston (1951/52, 1968b, pp. 18-19) as quoted by Taylor (1973), revealed that there were significant differences in responding to stimulative and sedative music in terms of heart rate, blood pressure, self-reported rating arousal. Studies of postural response revealed that subjects sat more erect when listening to stimulative music than when listening to sedative music. Furthermore, clinical observation of sedative music's effects on patients in a hospital ward revealed an observable sedative effect for the ward as a whole compared to stimulative music Radocy & Boyle (2012). They again conducted another study on 145 university students' verbal descriptions of excerpts of stimulative and sedative music, which revealed differential response to the two types of music. The study shows that the mean difference in rating for memory for the two types of

music for each pair of stimuli was highly significant. Data from their study support the theory that, affective response to music is related to the activation and energising characteristics of the musical stimulus. Mood response, which seems to reflect a disposition to action, apparently is intertwined somehow with response to stimulative and sedative music. Hodges (2009, p. 126) noted that physiological responses to music are natural phenomenon but observed that only in few situations such as in Western classical music concerts that there is an attempt to control these responses. Scholars however cautioned that, the social context and the milieu in which the music is played and heard is an important contributing factor to such responses. There is therefore the need for more research investigating factors influencing differential response to stimulative and sedative music in different cultural contexts. It is for this reason the present study is conducted using basic students. It intends to delve into the effect on memory and recall when students listen to sedative and stimulative music in the Ghanaian context (using Ghanaian idioms or stimulus).

Operationalization of sedative and stimulative music

One important element that demonstrate a sedative or stimulative music is the tempo of the music, that is tempo per minute (measured in beats per minute, or BPM). It plays a crucial role in differentiating between sedative and stimulative music because it directly influences the listener's physiological and psychological state.

Sedative Music (Slow Tempo) is measured in the ranges of 60-80 beats per minutes (60-80 BPM) or lower. Its effect is tempo that mimic the natural

resting heart rate, encouraging relaxation and calmness. This type of music can lower stress, reduce blood pressure, and even aid in sleep or meditation.

Stimulative Music (Fast Tempo) on the other hand is measured around 80-120 beats per minute (80-120 BPM) or higher. It has a faster tempo that increases arousal and energy, often aligning with or exceeding the heart rate during physical activity. This type of music can boost alertness, motivation, and even physical performance (Bernardi et al., 2006).

Difference between sedative and stimulative music

Other elements worth mentioning that can conveniently be used to differentiate between sedative and stimulative music, beyond rhythm complexity and beats per minute (BPM), other critical elements include; (1) melody and harmony with sedative music having smooth, flowing, and repetitive melodies with consonant harmonies (pleasant sound). Often uses simple chord progressions. Stimulative is often characterised by energetic, dynamic, and diverse melodies with dissonant or unexpected harmonic shifts. (2) dynamics (volume levels) of the music. Sedative music are usually soft, stable, and consistent dynamics with gradual changes, while Stimulative music are loud, varied, and sudden dynamic changes. (3) Timbre (tone quality) of which sedative music has a warm, smooth, and rounded tones with stimulative music having a bright, sharp, and intense tones. (4) Frequency spectrum, where sedative music is dominance of mid-range and low frequencies whiles stimulative music hasve a wide frequency range, often emphasizing treble and bass. (5) Emotional tone of sedative music is calm, peaceful, nostalgic, or meditative. On the other hand, stimulative music has an exciting, tense, joyful, or aggressive emotional tone.

Organization of the thesis

The following structure served as the organisation of the thesis: This study was conducted according to the laid down structure of the University of Cape Coast's guidelines for thesis writing. Chapter one introduced the background and overview of the study. It also provided the statement of the problem, the purpose of the study, the objectives of the study was listed, and the research questions and hypothesis for testing were also set out. The significance of the study was also looked at, and the delimitation of the study were stated. Terms were also defined, and finally, the organisation of the study was stated.

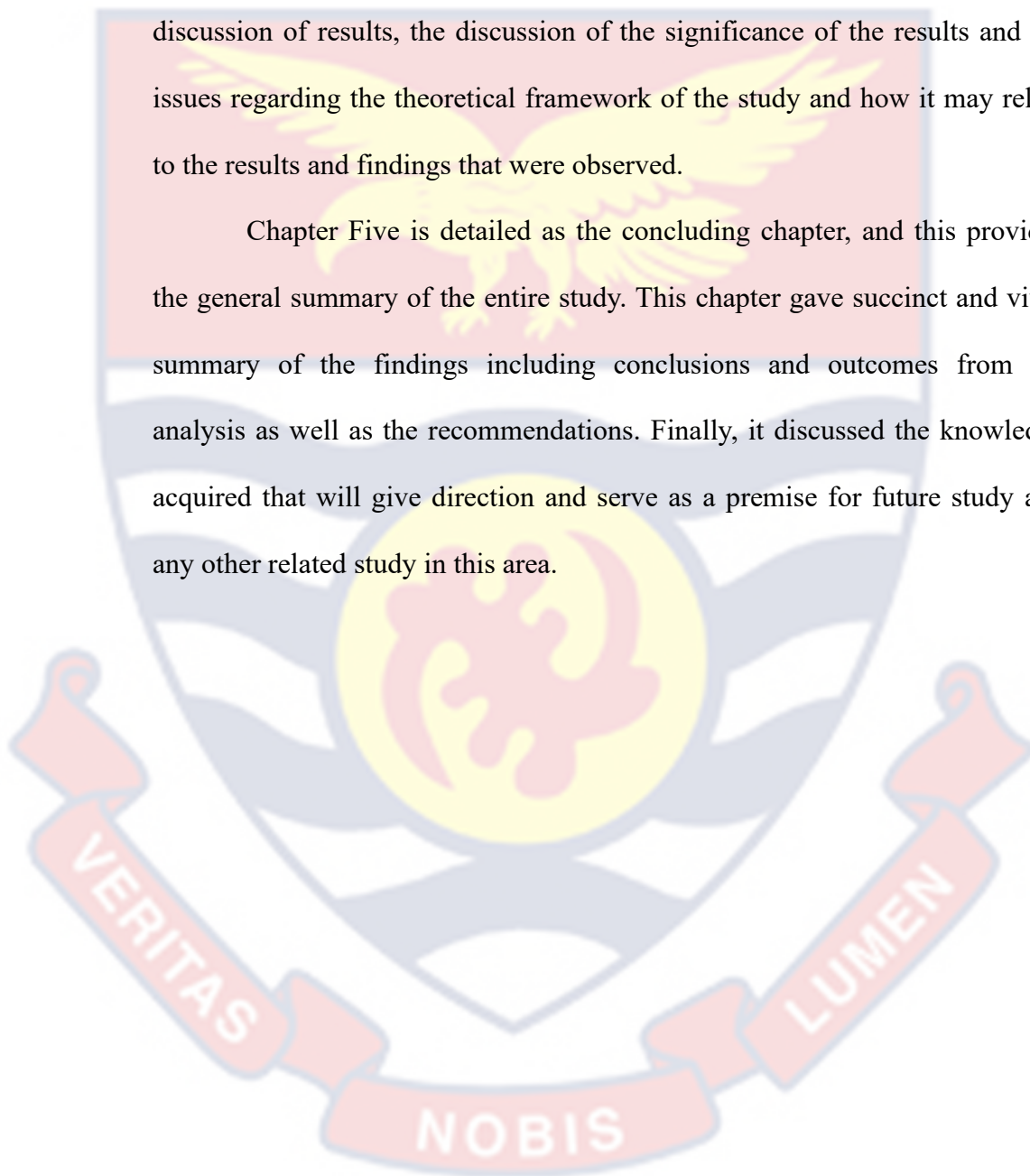
Chapter Two presents the review of related literature for the study. Some of the phenomenon and or materials that were discussed are the theoretical framework of the study, brief history of the development of music education in Ghana, the case of music and dance education in Ghana, music education and its pedagogical practices in Ghana, the case of music and dance education and reforms in Ghana, effect of music experiences on the growing child, musical preference of the listener, music cognition and memory, the influence of music on memory, musical preference and its psychological factors, music and cognitive functioning, the role of emotional response in memory, memory for music and musical understanding, short-term memory for music, issues in memory, concluding comments, music preference, factors affecting musical preference, theoretical foundation of musical preference, and other subtopics relevant to the study.

Chapter Three outlines the methods adopted for the study. The main terms for consideration in this chapter would be the research design and its relevance to the study, the sampling procedures, the population size and the

data collection and analysis process. Finally, the data collection tools and its setups was also discussed.

Chapter Four detailed the statistical analysis and results from the data. Core points that were considered here include; hypotheses testing and discussion of results, the discussion of the significance of the results and the issues regarding the theoretical framework of the study and how it may relate to the results and findings that were observed.

Chapter Five is detailed as the concluding chapter, and this provides the general summary of the entire study. This chapter gave succinct and vivid summary of the findings including conclusions and outcomes from the analysis as well as the recommendations. Finally, it discussed the knowledge acquired that will give direction and serve as a premise for future study and any other related study in this area.



CHAPTER TWO

LITERATURE REVIEW

Introduction

This chapter presents a review of extant literature in the field of the study. The literature reviewed includes materials on music education, music preference, and music and memory. The exercise was undertaken with the view to lodging the current study in the pool of existing literature and as well examine the extent to which the literature assists with the solution of the problem under investigation. The review covered the following topics: theoretical framework/theoretical bases of memory ability; music education; music education in Ghana in historical perspective; the case of music and dance education and reforms in Ghana; music education and its pedagogical practices and orientations in Ghana; contributions of music to general education; effect of musical experiences and cognitive benefit on the growing child; models of cognitive or memory or recall; theoretical foundation of musical preference; musical preference of the listener; music cognition and memory; memory for musical excerpts; the influence of music on memory; musical preference and its psychological factors; factors affecting musical preference; theoretical foundation of musical preference; memory and musical stimuli; memory for music and musical understanding; short-term memory for music; issues in memory: concluding comment.

The theoretical framework of the study

There are many theoretical models that have been developed and designed to explain the structure of memory and the purposes of its module parts. Most of these models have been designed within the framework of

information processing theories (Eysneck 1977). The most detailed information-processing theories of human memory for music which has been adopted for this study is *the Modal Model theory* by (Atkinson & Shiffrin, 1982). This theory aided in the data collection process by collecting data on students' memory and preference scores.

The Modal Model of Memory, which is also known as the Atkinson-Shiffrin model, is a widely accepted cognitive theory in research that describes the processes involved in human memory. It has served as a foundational framework for understanding memory processes and has been widely used in memory study (Amuah, 1994). The components of the Modal Model consist of three main memory stores and processes that connects them, and they are the sensory, short-term, and long-term memories (Atkinson & Shiffrin, 1982). Sensory memory is the initial stage of memory processing, where sensory information from the environment (such as visual, auditory, or tactile stimuli) is briefly held for a very short period of time. It allows the individual to retain a sensory experience for a fraction of a second before it either decays or is transferred to the next memory level which is the store (the working memory). Short-Term Memory (STM) is the unit where information that are deemed important or attended to from the sensory memory is transferred to short-term memory for a process. The STM has limited capacity and duration, typically holding information for about 15-30 seconds without rehearsal. This is the section where conscious thought and active processing of information, such as making decisions or solving problems occur. The last unit is the Long-Term Memory (LTM). In this unit, all information that are rehearsed or processed further in short-term memory are transferred to long-term memory. The LTM

has a much larger capacity and can store information for extended period of time. It is thought to be systematised in a semantic or meaningful way, allowing for easier retrieval (Amuah 1994).

In summary, information in the environment is captured by the sense modalities, stored in the sensory store and from there passed through the short-term memory into the long-term memory. While in the short-term memory, the information may be released as a response to an external stimulus, this is indicated in the diagram below, signifying the direction of flow of information across the memory subsystems;

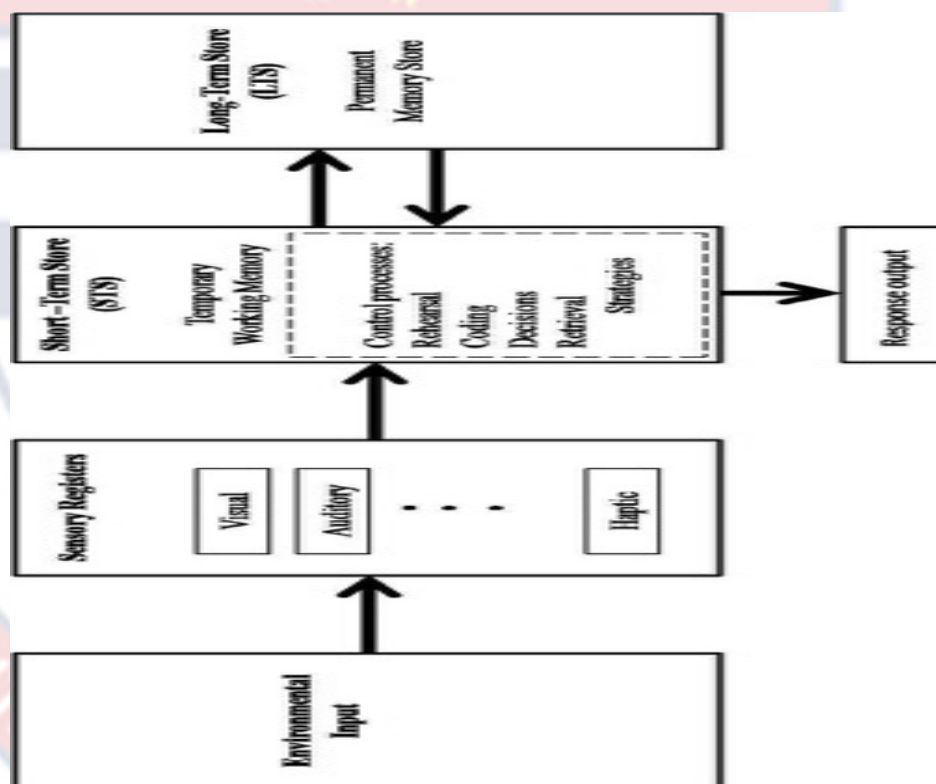


Figure 2: A theoretical description of information flow through human processor as presented by R.C.Arkinson and R.M.Shiffrin (1982), adapted from Amuah 1994.

Arkinson and Shiffrin (1982) outline how information is guided through the memory structure by control processes. The control processes facilitate the flow of information through the memory system through various

strategies. The strategies that are used are attention, encoding, rehearsal and retrieval (However, the most important and frequently used strategies are encoding and rehearsal, organisation, clustering, categorisation and chunking), See figure 3 below.

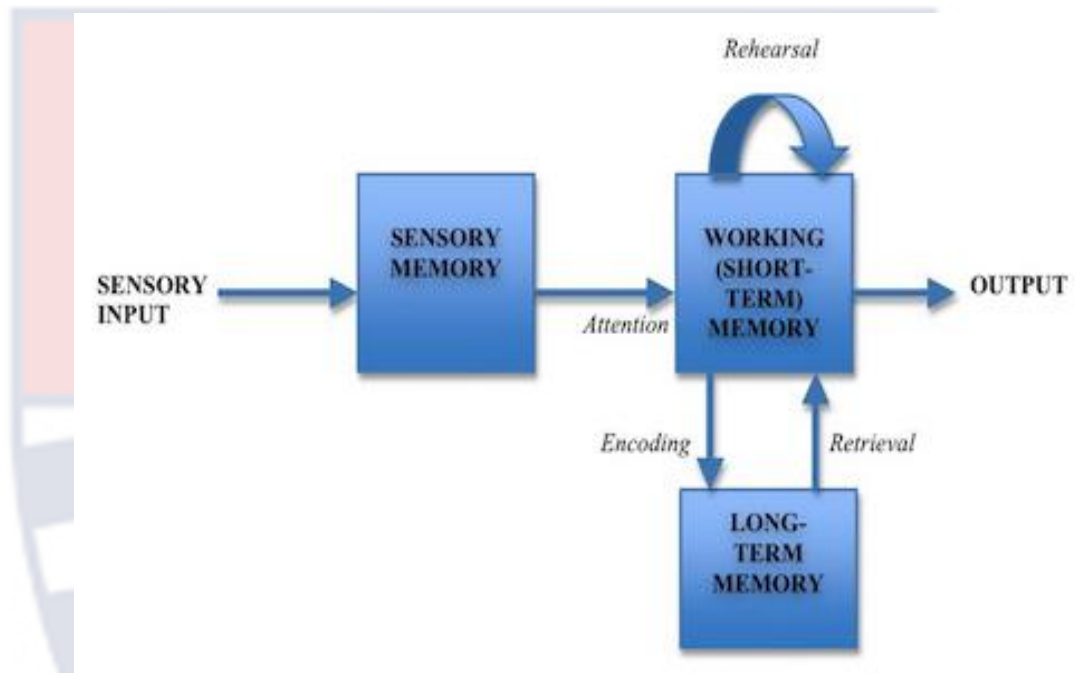


Figure 3 The multi-store model of memory by Atkinson and Shiffrin, 1968.

Coding

Memory coding has been described by Zechmeister and Nyberg as the way an external event is represented in memory (Zechmeister, 1982). The concept of coding has been used extensively by researchers in the field of memory to explain representations of information in human memory. Atkinson and Shiffrin (1982) also identify coding as one of the memory activities occurring in the short-term memory. Other scholars also support the findings that, when subjects are presented with information sets for retention, they reduce the amount of the information by recoding subsets of more than one item into a single higher order datum. For effective coding, the to-be-

remembered items need some form of organisational structure. Organisation in memory refers to the arrangement of the to-be-remembered items into higher-order units. According to Kintsch (1977), items are not encoded independently, ignoring their context, but are organised with respect to the other to-be-remembered items and what is already known; this structure is then used to guide retrieval. One major factor in the process of encoding in the short term that hinders coding is chunk (Miller, 1956). He states, “what forms a chunk in short term memory is largely determined by principles of perceptual grouping and organisation”. Scholars have indicated that, the existing literature on the development of encoding strategies is abounding with studies that indicate a relationship between practice and the development of chunking strategies (Chase & Ericsson, 1982; Ericsson, Chase, & Floon, 1980; Chase & Ericsson, 1978, 1979). Chase and Ericsson (1978) conducted a study that revealed a remarkable improvement in a subject's memory span. After several months of practice on a digit memory task, the subject's memory capacity expanded from 7 to 79 digits. A further investigation into the causes of the variability in this subject's memory capacity indicated that, the subject had developed better strategies of encoding the digits under study. This study is consistent with Schwartz and Reisberg (1991), who claim that practice increases strategies in chunking.

Chunking as a phenomenon plays an important role in the encoding of musical events (Dowling 1971 p. 37). Dowling conducted a study where he used the short-term recognition paradigm to study “effects of rhythmic grouping on chunking and memory for non-verbal materials”. In this study;

subjects were presented with a sequence of 20 tones grouped rhythmically into four phrases of five tones each. Two seconds after this presentation they heard a five-tone test sequence and were asked to decide whether or not the test sequence was contained in the 20-tone sequence melody. Two types of 5-tone test sequence were presented “within” and “across” trials. In case of the former, the test sequence was of the same rhythmic grouping as any of the 5-note phrases included in that 20-tone sequence. The rhythmic grouping of the latter cuts across phrase boundaries, corresponding to last three notes of one phrase and the first notes of the next phrase. The results of the study indicated that the “within” items were easier to recognize than the “across” items. On the basis of this finding, Dowling concluded that “rhythmic grouping of input determines subjective chunking and memory storage, facilitating the recognition of test items chunked in the same way as list item,” (Dowling 1971 p. 37)

The above narrative matches this study, where students will be asked to listen to two different 1-minute-long stimuli of music, and later excerpts will be played from one of the two stimuli or a previously unheard stimulus for student for about 30 seconds to identify whether the excerpt was part of the music they heard previously or not.

In summary, the paradigmatic multistage model of memory, which is the Modal Model, designates subsystems encompasses sensory, short-term, and long-term memories as units of store. The control process receives the information which is guided through this hierarchy, such as rehearsal and coding (the most frequently used control processes). It has been observed that control processes could be enhanced by factors like experience and practice. The primary focus in the field of music has been the structure of memory for music, and the control processes involving the retention of musical events. Even though studies have been conducted on factors influencing control processes adopted by researchers in colleges and schools, to remember musical events, no such study seems to have been done among basic schools in Ghana among the Ghanaian students. The home environment has been one of the variables identified as having influence on students' short-term memory for music (Mitchell, 1985; Moore, 1973). This proposition is based on the theoretical assumption that, students or participants prior knowledge of music, or the music stimuli used for the investigation can influences the retention and retrieval or recall of excerpts of a stimuli (Moussard, et. al., 2012).

Rehearsal

Scholars, for example (Anderson, 1990; Craik & Lockhart, 1972; Arkinson & Shiffrin, 1968; Miller, 1956) argue that, rehearsal can substantially assist information retention in any individual who rigorously engages in it regularly. Zechmeister and Nyberg succinctly define rehearsal as “the mental activity associated with repeating an item” (1982, p. 55). The influence of rehearsal on memory has been verified by researchers studying the effect of serial position on verbal and visual memory. Scholars (Page and

Norris, 1998; Seiler and Engelkamp, 2003) posited that, the serial position curve, particularly the primacy effect, is as a result of rehearsal. Demonstrating this relationship, Rundus (1971) presented subjects with a list of words of similar characteristics and asked them to recall as many of the words as possible.

In the experiment, participants were asked to articulate their mental processes (this articulation was mainly a rehearsal of the to-be-remembered items which contains list of words). During the process, a tape recording of the subjects' verbalization was recorded and later the number of items that was rehearsed was also counted accordingly. The outcomes showed that, there was a positive relationship between the number of times an item was repeated and the likelihood that the item would be remembered. The present study adopts a similar approach of recording and playing stimuli, with excerpts presented for students to listen to and observe the recall patterns associated with sedative and stimulative music. Unlike previous studies that focused on verbalization, this research emphasizes memory recall specifically for musical stimuli.

Research have identified two types of rehearsal strategies: *maintenance rehearsal* and *elaborative rehearsal*. In the first type rehearsal, which is the maintenance rehearsal, Craik and Lockhart (1972), described it as the process of retaining information in memory by repeating the to-be remembered material (the music stimuli in this current study) over and over again. This has also been supported by others (Glenberg & Adams, 1978; Glenberg, Smith & Green, 1977; Atkinson & Shiffrin, 1968). These scholars have also found out that, increasing the amount of maintenance rehearsal leads to increased performance in recognition memory texts or recall. They

observed in their experiment that, the probability of correctly recognising a distracter word increased from 65 to 67 and to 74, as rehearsal time increased from two to six, and to eight seconds respectively. On the other hand, the elaborative, or type II rehearsal, according to Craik and Watkins (1973), involves steps that serve to establish items in permanent memory. The to-be-remembered items, and how the items are related to each other, or other things in the surrounding are the steps that serve to establish the items. Craik et al., (1975) considered the elaborative rehearsal as a major assumption in the *levels-of processing* theory, thus processing of information from the short memory through to the long memory.

In summary, the elaborative rehearsal is not relevant to this study because this study deals with short term memory rather than long term storage. Instead, the maintenance rehearsal strategies are more central to the study. The literature reviewed indicates that regular rehearsal on a particular stimulus can influence its recall. This indicate that, if students are allowed to listen to the stimuli for a longer period, the result may affect their choice of the type of music in relation to sedative and stimulative music.

Arkinson and Shiffrin's Modal Model Theory connects to this study through the idea that memory performance is influenced by the processing and encoding of sensory information. Stimulative music, being more engaging, may captures students' attention more effectively, facilitating the encoding and retrieval processes described in the theory.

The second theory that was considered for this study was *the mere exposure theory* by Zajonc (1968). The theory is a psychological concept that suggests that people tend to develop a preference for things that they are

exposed to repeatedly. This theory posits that familiarity breeds liking or preference, even without a conscious awareness of the exposure. Key elements of the theory indicate repeated exposure leading to preference for a particular stimulus. Zajonc demonstrated through experiments that participants were more likely to express a favourable attitude toward unfamiliar stimuli (such as shapes, words, or images) after being repeatedly exposed to them. This effect can occur even if the initial exposure is neutral or ambiguous. In addition, the mere exposure effect operates without conscious awareness (automatic processing). People may not realize that they are forming positive attitudes due to exposure. Furthermore, he argued that there is an emotional association, thus, the repeated exposure to stimuli can evoke a positive emotional response, even if the initial impression of the object or experience was neutral. There is however a limitation to the theory which indicate that overexposure can lead to boredom or dislike if the stimulus becomes repetitive or annoying. Not all, the effect works best when initial exposure is neutral or slightly positive; exposure to negative stimuli may reinforce negative feelings. The theory seems to suggest clearly that “Cognitive psychology, as a subdivision of psychology, centers on investigating mental processes such as cognition, perception, memory, attention, language, problem-solving, and decision-making”. (Hargreaves, 1997/2004). Individuals will never like what he or she is oblivious of in a natural sense. This means that, any other factor that affects musical preference are secondary and may come to play only when the individual is adequately familiar with the music or the stimulus in question. This phenomenon of acquaintance and fondness is what is explained in the *mere exposure theory* (Zajonc, 1968; Miller, 1956).

Zajonc's research on this theory involved not only music but a variety of stimuli, including shapes, images, words, and even nonsense words. He found that participants consistently rated stimuli they had been exposed to more positively than stimuli they had not been exposed to. Familiarity breeds liking more than contempt. This has been demonstrated in many research works, for example, Averbach (1963) found when he used a tachistoscope to present subjects with displays of black dots on a white background. He randomly mixed the number of dots from one trial to another and also meticulously controlled the length of the display. After each visual presentation, subjects were asked to estimate the number of dots they saw. The observation made by Averbach was that, the exposure time affected subjects' span of apprehension; the shorter the duration of exposure to the research stimulus, the fewer the number of dots that were estimated by the respondents. Apart from the above observation, the accuracy of the subjects' estimates fell off rapidly as the number of dots in the display increased in number. The Mere Exposure Model theory by supported the assumption that music preferences could be shaped by familiarity and that these preferences might influence memory performance. It also indicated that memory performance is not solely dependent on music type but also could be on individual difference preferences. This aligns with the Modal Model theory by Arkinson and Shiffrin which emphasised on personalized processing mechanisms and the Mere Exposure Model's insight into the role of familiarity.

The Zero novelty

Several studies have been done where the “*mere exposure theory*” has been adopted, tried and verified in research on musical preference” (Berlyne, 1971). Based on this theory, Berlyne (based on original suggestions by Wundt – cited in Hargreaves, 1997/2004), proposed the *inverted-U function* relating familiarity to liking (see Figure 4 below);

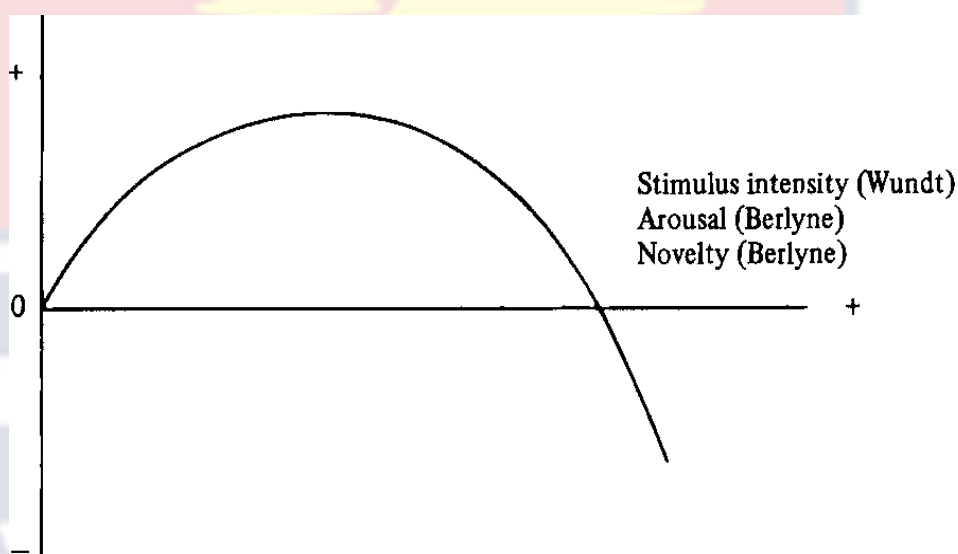


Figure 4: Wundt/Berlyne inverted- U curve.

The model illustrates that a person’s level of enjoyment is very low when the person is less exposed to a stimulus. Preference however increases as the stimulus becomes more familiar, preference however begin to decrease if the stimulus is over exposed to the extent that, it carries no new information for the perceiver or the respondent leading to boredom.

Hargreaves (1997), considering the zero novelty of Wundt and Berlyn, also proposed a different adaptation of the *inverted-U* model. In the inverted U model, Hargreaves included a reverse of the abscissa which in effect seems to make more sense in terms of zero familiarity, that is, of no acquaintance to a stimulus, than zero novelty... (p.111).

This new curve suggests that, liking for entirely novel stimuli is firstly negative: people primarily dislike novel objects. But as the objects become more familiar, they begin to have some liking for it and therefore becomes increasingly positive, reaching a zenith at some optimum familiarity level, and further increases in familiarity give rise to a decline in liking, which ultimately becomes negative at very high levels of familiarity (Hargreaves, 1997. p.111), (see figure 5 below);

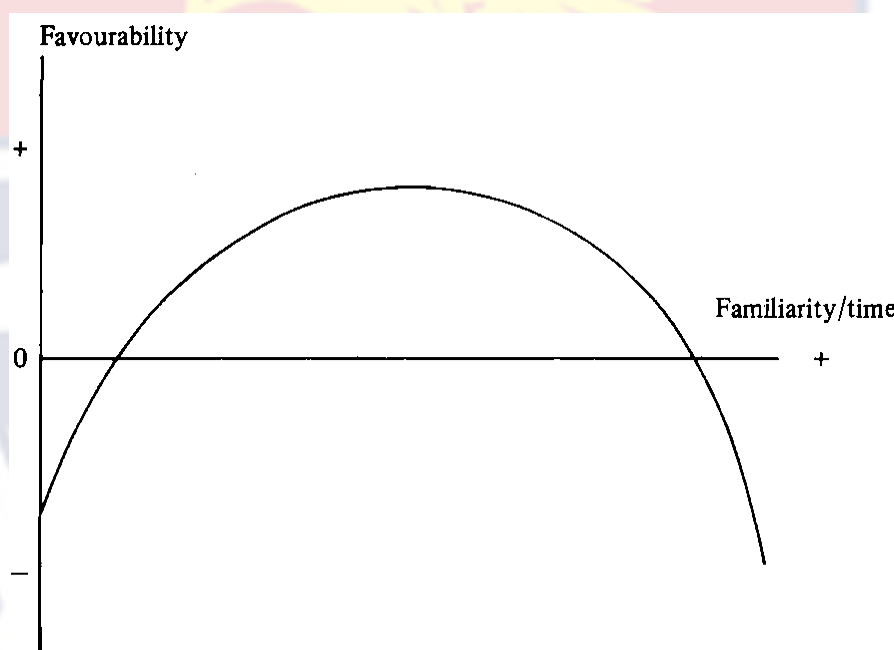


Figure 5 Hargreaves hypothesized inverted-U curve. The hypothesized curve linking preference to exposure/familiarity/time (Cited from Hargreaves (1997/2004. P. 114)

In summary, this theory of Zajonc (1968) of the mere exposure theory, a concept that suggests that, people tend to develop a preference for things that they are exposed to repeatedly and that familiarity breeds liking or preference, even without a conscious awareness of the exposure, have some connection with the Modal Model of Memory theory by Atkinson-Shiffrin

model (1982). They posited that rehearsal can substantially assist information retention in any individual who rigorously engages in it regularly (Anderson, 1990; Craik and Lockhart, 1972; Arkinson and Shiffrin, 1968; Miller, 1956). These two theories confirm that regular rehearsal or continuous engagement of a participant with a particular stimulus will definitely affect its remembrance and or recall in a test. These theories seem to suggest clearly that novelty, or unfamiliarity, is an important potential source of musical dislikes (Hargreaves, 1997/2004), and that, an individual will never like what he or she is oblivious of in a natural sense, the more exposure the participant has with the stimulus, the more they tend to develop a positive attitude or preference toward it. However, preference begin to decreases if the stimulus is over exposed to the extent that, it carries no new information for the perceiver or the respondent. The question here, however is, is it that liking and memory occur in parallel as familiarity/rehearsal increases, or are they actually affecting each other in some way? Do we like music that we are better at remembering? Or do we remember music that we like? We can conclude, based on the review of the literature that, liking and memory may occur in parallel as rehearsal increases. Also, we may be seen remembering music that we like better. In conclusion, the two theories are therefore in line with this study as stated earlier under the two theories and therefore very appropriate as the main theoretical frameworks for the study.

Over exposure of stimulus

Overexposure to either sedative or stimulative music may lead participants to feel bored, irritated, or desensitized, (saturation and boredom). This emotional response could negatively impact their memory performance.

In addition, repeated exposure to a specific type of music may diminish the cognitive arousal effect leading to habituation. For stimulative music, this may reduce its energizing impact, while sedative music may no longer produce calming effects as intended. Memory interference as a factor show that an excessive exposure to a particular stimulus can cause cognitive overload or confusion, which may impair recall and recognition performance. Preference shifts (reverse effects) as a result of overexposure could potentially reverse initial preferences. For example, participants who initially enjoyed sedative music might develop a preference for stimulative music and vice versa. Finally, novelty effect, which may initially enhance engagement and memory retention, would decline with overexposure.

It should be noted that understanding these concepts is relevant to the study in the sense that it emphasises the importance of carefully controlling the duration and frequency of music exposure during the listening session to avoid the negative effects of overexposure. Overexposure might help differentiate between temporary effects on memory versus long-term habituation effects though.

The multi-store model of memory by Arkinson and Shiffrin connects to this theory through the idea that memory performance is influenced by the processing and encoding of sensory information. Stimulative music, being more engaging, likely captures students' attention more effectively, facilitating the encoding and retrieval processes described in the Modal Model. Sedative music, on the other hand, may reduce cognitive load, enabling deeper encoding for certain types of memory tasks. These theories connection with the study is observed in the framework for hypothesis development. Kalsen's

Modal Model provided a basis for hypothesizing how different types of music (stimulative and sedative) might influence memory performance through attention, encoding, and storage mechanisms. The Mere Exposure Model supported the assumption that music preferences could be shaped by familiarity and that these preferences might influence memory performance.

Memory for musical excerpts

Emotional resonance and familiarity with a particular music genre can enhance memory retention for elements within that genre if an excerpt is played (Madison et. al., 2011). Memory for musical excerpt refers to the cognitive process by which individuals remember and recall specific pieces or excerpts of music. Just as we have memory for words, events, or images, it is in the same vein that musical excerpts are also subject to memory processes. In most cases of research in the field of memory for music, researchers have always been more concentrated on melodies, and tone melodies identification as the research stimuli. A few researchers have used songs in this area of studies, and those who did, used common tunes and songs, short tunes, and melodic fragments as their stimuli to study subject's long-term memory for music (Kallam & Massaro, 1979; Dowling, 1978; Dowling & Hollombe, 1977; White, 1960).

White (1960) as one of the earliest researchers in this field conducted a study using familiar tunes as the research stimuli for investigation of the effect of melodic transformations on the ability to recognize well-known tunes. He adopted the recognition paradigm, and therefore constructed twenty-four- tone melodies from the first 24 notes of each of 10 familiar melodies. The subjects were tasked after hearing each excerpt to select from

the list of the ten musical stimuli and decide on which of the music they like most, and to record their decisions by marking the appropriate space in the answer sheet that was provided to them. 120 student-subjects were observed in the study.

The conclusions that were made from the study was that the dependency on interval relations in identifying familiar tunes are very high, and that subjects depend heavily on interval relations while performing recognition tasks. This finding has been supported by Dowling and his colleagues (1971) in their studies in area of interval relationships and melodic recognition. White's findings are important but may lack certain fundamental requirements of investigation in the sense that, factors that may influence the study were not considered in the investigation, making his conclusion geared toward explanations of factors affecting the ability to recognize familiar tunes. It leaves the issue of development of memory for music unexplored. In addition, no explanation has been provided for the ability to recognize unfamiliar pieces or excerpts of pieces. The need for an understanding of the mental processes involved in recollecting unfamiliar musical events is as great for those involved in identifying familiar tunes. This study has endeavored to review some of these factors that are likely to affect respondent's memory for recall and cognition.

Memory and environmental and educational factors

Even though much attention has been focused on the study of the relationships between environmental factors and musical achievement, and musical aptitude for music, very little research has been reported on the effect of environmental factors on memory for music and recall especially in the

context of sedative and stimulative music in Ghana. Records indicate that, the commonest of the criterion variables used in studies relating to music achievement and ability have been measured with instruments purporting to have measured memory for music as reported by Shutter-Dyson and Gabriel (1981). In addition, it has been argued that memory pervades almost all cognitive processes and underscores mental aptitudes, including musical ability (Sternberg, 2018; Huang, 2023; Mbise, 1989). Mbise (1989, p. 47) observed in his study that memory encompasses a broad set of abilities that develop as children mature into adulthood. He further concluded that the development and functioning of children's memory at different ages are shaped by its impact on and interactions with various activities people engage in.

This study incorporates a comprehensive literature review on musical ability, focusing on criterion variables that claim to assess memory for music. This is juxtaposed with the current investigation of memory responses to both sedative and stimulative music. The researcher posits that exploring literature on the influence of environmental factors—such as educational experiences and home conditions—on musical ability and aptitude will provide deeper insights into how these factors shape and foster memory development in individuals.

In a study conducted by Freeman (1974), which involves seventy-two music and non-music students between the ages of 7 and 11, she found that, most of the factors which generated and sustained students' interest in instrumental music playing also facilitated the development of their memory for music. However, before the study, information about subjects' environmental

background (mainly home background) was obtained with a questionnaire. In the study, she administered the memory subtest of Wing's Standardized Test of Musical Intelligence, among other measures. The results revealed that, there is a correlation with environmental factors ranging from parents' socio-economic status, to the availability of musical instruments and materials in the home and memory. The results again indicated that subjects' musical abilities correlated positively with "strong home opportunity" (p. 7). The strong home in this sense according to Freeman denotes homes where there were musical facilities and opportunity for the student to learn them, and are in addition, attending educationally stimulating schools with an environment which provided incentives, materials and encouragement in the appropriate field of interest" (p.8).

In her conclusions, she posited that, positive parental attitudes toward subjects' school work were an important factor of their children's level of performance in music. Freeman's observation concerning the relationship between memory for music and home environmental factors, coupled with her findings on the difference between music students and non-music students in their ability to remember music, is relevant to the current study since this study has considered this as one of the factors that may affect students' memory and recall of sedative and stimulative music after listening to an excerpt. In addition, the ages of the children used in the study represents the same as in the current study, (ages ranging from ten to fifteen years) including the contrived melodies that were used as the stimuli, and therefore remains a relevant material to be reviewed for this study.

Musical ability and the home environment

The range of skills and capacities that individuals possess for understanding, creating, performing, and appreciating music is what scholars describe as musical ability (Hallam & Prince, 2003). It includes skills such as pitch perception, rhythm perception, melodic memory, tonal memory, musical creativity, musical analysis, aural skills, and many more skills. Research has shown that, musical abilities can be influenced by a combination of genetics, exposure to music at an early age, training, practice, and individual interests (McPherson & Hallam, 2009). People with strong musical abilities might become skilled musicians, composers, conductors, music teachers, or simply enjoy a deeper appreciation of music as listeners as compared to people without skilled musical abilities. It's important to note that musical abilities can be developed and improved over time through education, practice, and exposure to different musical styles and experiences (McPherson, Davidson & Evans 2006).

In an investigation, Politimou et. al., (2019) investigated one hundred and one subjects who participated in a study. They took the “Pitch and Rhythmic Response Test” to study the conditions which generated musical ability (pitch and rhythmic response) by correlating specific environmental factors, particularly in the home, and children’s musical responses. The research she conducted included six subtests: maintenance of steady beat, identification of rhythmic patterns, identification of tonal patterns (a recognition memory test), singing of familiar songs, and reproduction of tonal patterns (memory recall test). The results of the study indicated that a child’s pitch and rhythmic responses correlated with the combined environmental

variables, mostly from the home stemming from experiences such as: (1) showing and hearing musical instruments played in the home; (2) showing interest in and attending concerts, (3) parental contribution to the child's early musical training and (4) making music together as a family.

From the study, the results again indicated that, young children living in an environment which provided the opportunity for exposure to music and enhances music making both vocal and instruments, and where they are encouraged, motivated and rewarded in their musical attempts, demonstrated higher levels of musical development than those children who have few of these advantages. This study has considered this review very relevant in the sense that, one of the objectives and questions has considered environmental and educational (engagement and experiences with music) as a factor that is likely to affect memory and recall.

In another study, Shelton (1965) investigated factors in the preschool home musical environment which influence the musical response of first-grade children. The study was conducted by putting the children into two groups which was based on their ability to sing in tune, discriminate pitches and melodic directions, respond to rhythms by bodily movements, play rhythmic instruments and respond to contrasting tempos and moods while listening to music. In the first group of 18 musical students, 3 came from musical homes, 11 from average homes and 4 from unmusical homes. The second group of the 12 unmusical students, 1 child came from a musical home and 11 children came from unmusical homes. In conclusion, Shelton realised that, there was a significant relationship found between home environment factors and students' musical ability based on their engagement with music.

Shelton observed seemingly that, the following factors accounted for the variance:

1. Frequent opportunities for the child to hear singing in the home.
Frequent opportunities to sing with other members of the family, especially the mother, and older children.
2. Frequent opportunities to hear records played in the home for the child to listened to, and
3. Ability of the mother and father to sing and to learn new songs in the presence of the child.

This study is of the view that reviewing literature on students' environment is necessary in the sense that it can serve as a conduit to confounding that may lead to the various variations in the results realised on preference for music and the recall abilities of the students in the study even though it was not part of the objectives of the study. In addition, the review on students' environment and musical background will provide valuable insights into how external factors, such as educational exposure and familiar musical experiences, shape students' musical preferences and memory development. By understanding these environmental influences, the researcher can better interpret the relationship between students' preferences for sedative or stimulative music and their memory performance, leading to more informed conclusions and recommendations. Again, the review establishes a foundation for examining how students' backgrounds affect their responses to different types of music. It helps frame the hypothesis that environmental exposure and musical upbringing might influence memory retention when exposed to sedative or stimulative music. This connection allows the researcher to contextualize

findings within broader social and educational dynamics, ultimately enhancing the study's relevance and depth.

Importance of literature review on environment as a factor to musical preferences.

The literature on memory in relation to environmental and educational factors, musical ability, and home environment even though are not answering any of the research questions, the researcher is of the view that they can contribute positively to the study in several ways. For instance, on review of musical ability, studies often show that individuals with musical training exhibit better memory and cognitive abilities due to enhanced auditory processing skills. This can help the researcher control for potential confounding variables such as pre-existing musical expertise. The home environment influences exposure to different types of music, potentially shaping preferences for sedative versus stimulative music. This background can contextualize findings on individual differences in memory responses. Reviewing literature on musical ability may explain why some students may show stronger preferences or varying effects for sedative or stimulative music on memory. Finally, homes with enriched environments (musically or cognitively stimulating) often promote better memory development, which can be examined as a moderating variable.

The overall contributions of these literature as factors will (1) lead to holistic framework for analysis providing a broader understanding of how multiple influences intersect in shaping memory outcomes, helping to refine the design and variable control. (2) improved study validity in formulating hypotheses, developing research questions, and interpreting findings by

identifying and mitigating confounding factors, and (3) contextual understanding by providing a nuance approach to how individual differences and external factors may explain variations in responses to sedative and stimulative music.

Summary on issues in memory

The role of music in education and how it affects memory and learning outcomes is a subject of ongoing research and debate. Music plays various roles in education, and its impact on memory and learning outcomes can be both positive and significant (Keehl & Melcer, 2019).

Several studies have been done leading to a plethora of research on memory particularly in the arenas of verbal and visual memory. This extensive body of work has given rise to various theoretical models aimed at explaining the complex nature of human memory and its diverse functions. In most cases, the models developed tried to distinguish between two features of memory: structure and controlled processes as posited by Artkinson and Shiffrin (1968). The structure of memory as a unit is made up of sensory, short-term and long-term storages. Sensory and short-term stores are said to have relatively fixed capacity, while long term storage is relatively unlimited and has a bigger capacity. Recall and its opposite forgetfulness are the sides of a coin in the storage modes and are purported to have different rates for each of the storage modes. It has been observed that various types of strategies are adopted to complete the cycles of encoding, storage and retrieval of information from memory which is guided through the memory structure by control processes. The control processes that include verbal rehearsal, clustering and

categorization have been recognised as strategies often used by individuals and researchers as memory aids.

One important factor this study has identified in the literature reviewed on memory in general is the lack of attention being given to issues concerning “nature” and “nurture” with respect to the development of memory structure and control processes. The nurturing of subjects in relation to memory and recall is key to encoding and retrieval of information or stimuli in the case of this study, and should be a considerable issue to be focused on by researchers.

Research pertaining to the development of mnemonics such as verbal rehearsal, clustering, categorisation, semantic elaboration and meta memorial skills has been the focus of many researchers but some of these important factors have been relegated to the background in these studies.

Two important factors that have been considered in this study as factors that affect memory were the environmental and educational factors that seem to have the highest effect on memory and recall. It was observed from the literature that, though extensive research has been done on the relationship between environmental factors and academic achievements, only a few studies have been conducted on the environmental issues on memory. In academic achievement, memory has been identified as an important factor. Perhaps this has contributed to the limited amount of research on the effect of environment on memory and or recall, since researchers in the field of memory study may consider it as part of achievement.

It should be noted that, even though the literature reviewed for the study on memory were studies done in the 80s, and may look outdated for

current time, they are materials that are relevant and have highly contributed and offer an immense support for the current study. All the models and the theories are in line with the current studies, and therefore the researcher has decided to review them in support of the study.

Music Education

Music making, listening, and its enjoyment in Ghana, especially in the twenty first century continue to make its impact on our society both in the sociocultural and economic sense. It is inescapable in all aspect of life (political events, family festivals, religious rituals, theatrical spectacles) and therefore can be described as a phenomenon we are born with, live with and will die with.

Music education is a discipline linked to the instruction and acquisition of musical knowledge. (Barrett 2014, Colwell & Richardson, 2002). It is a domain within the field of music where scholars, researchers, and educators undergo training for professions in music instruction and research, as well as music conservatory directors. To be abreast with time and developments in music education, music educators and professionals need some form of education and orientation in psychology or cognitive science to equip themselves with some knowledge on mental reasoning and neurological information of the young, and adult musical involvement and learning (Charcot, 2013; Heath, & Wolf, 2012; Ravitch, 2010; Swanwick, 2002). This development will help music educators in the choice of appropriate methods and techniques in the delivery of music lessons.

Music teachers teach music theory, harmony and instruments such as piano and voice. Music teachers who teach children, especially those in early grades might need to be knowledgeable in early childhood learning and development

(National Research Council, 2012; Morrow, 2001). They might also need to be abreast with psychological, cognitive and neurological knowledge of children's musical participation and learning (Haskell, 2000).

Music education in Ghana in Historical perspective

Music contains eight core perceptual attributes that can be individually manipulated and, though often analysed separately, they must be merged to make up the experience of music (Shan, 2012). These attributes are loudness, pitch, meter, tempo, timbre, contour, rhythm, and spatial location. Every known human culture in the world has been found to have some element of music inborn traits that elicit responses when being experienced or participated in (Sloboda & Juslin, 2001). In our daily activities especially in our small and large communities, music plays a major role in life activities.

Historically, in Ghana, music education has been linked to the establishment of formal school system by the Catholic, Wesleyan, Basal and Bremen, A.M.E Zion and the Anglican missionaries. The phenomenon that led to the introduction of music education in Ghana during the colonial period was comparable to that of Nigeria (Emielu, 2011). The influence of Western music on contemporary Ghanaian music could be attributed to the musical legacies left behind in over four hundred years of Christian and Islamic worships, schooling and colonial rule (Collins, 2005). A typical example is how church music was infused into our culture to re-create the recent musical hybrids. Such has the gospel highlife, borga highlife, and the azonto music. According to Mereku (2014), the era of colonisation contributed significantly to the musical forms experienced in recent times in Ghana that cut across political, cultural, and religious dimensions.

The era of music education in Ghana from the time of our colonial masters saw most music scholars trained from the then grammar high schools, colleges and teacher training institutions. Local anthems, danceable highlife idioms, *ebibindwom*, *borborbor* or *kpanlogo*; were learnt and sang in schools, churches and social gatherings. Ghanaian musicians relied on Western musical skills to write anthems and church hymn books for Methodist, Catholic Presbyterian and Anglican Church worships (Hind, 2020). These early pioneers of music writers became translators of vernacular hymnbooks including Catholic, *asorndwombukuu*, *Twi Ndwom*, *Lala* and *Hadzigbale*. The exposure given to the pioneers ensured that Ghanaians were educated to sing and read music in their dialects (Coe, 2005).

The influence of church activities also led to the formation of choral groups in churches where choristers were taught to sing and read solfage or staff notation at rehearsals. Organists and brass band groups and choirs were given auditory and musical training to enable them sing in churches (Collins, 2005). Through the auditory and musical training, diverse opportunities were created for many Ghanaians to learn different forms of songs including gospel, highlife and hip-life styles of music, some of which has seen tremendous changes and innovations.

It is indicated that, during the colonial administration by the British government, music in Ghana was non-centralised and informal. Its existence during that era was to satisfy the needs of the missionaries with the attempt to spread their missionary activities. The contributions of scholars in Ghana like Flolu and Amuah (2003) have received a tremendous attention in this area of writing on music education in Ghana. These scholars, Flolu and Amuah

(2003), also confirm and supported earlier writers that, music education at that time was meant to meet the needs that arose for both teachers and workers of the church, thus, to be able to sing hymns and participate fully in the activities of the missionaries in propagating their missionary values and in expanding the churches. To achieve this aim was the birth of a school curriculum that included the study of music. These developments generated some interest in some Ghanaians in learning music and taking it as a profession. As many Ghanaians began taking keen interest in music education where concerns as to how music education could promote Ghanaian cultural heritage were raised. Series of efforts were made by the colonial masters to address the concerns. For example, Kwami (1994) described how W.E.F. Ward, a former history and music teacher at Achimota College, helped Ephraim Amu to develop traditional African music in the College. Another significant effort made by Robert Ashong Kwami and Philip Gbeho also led to the growth of the first-generation music scholars such as J.H. Kwamena Nketia, Komla Amoaku, N. Z. Nayo, Atta Annan Mensah, and Nessio Fiagbedzi. These scholars were the first Ghanaians to promote indigenous musical culture in the social, political, economic and religious life of the contemporary Ghanaian.

One of the fundamental aims of music education espoused by the colonial masters was to train men and women who could teach mostly Christian hymns to new converts and the church (Adeogun, 2007). These developments gave birth to the formation of choirs in the various congregations which aimed at learning the hymns and lead the congregations in singing them during church services. The same was replicated in the mission schools where pupils and students were made to learn hymns as a

form of singing in the schools, a phenomenon that would instill the Christian values and believe in these students. Later, instruments like the piano, organ, and the harmonium were introduced to augment the singing. Rudiments of music were also introduced to train the individuals in acquiring skills in teaching and learning the imported instruments. These activities were organized at the blind side of the educational curriculum since the teaching and learning of music was left in the hands of the individual teacher's initiatives, thus the teaching of music varied from school to school. The syllabuses that were used however were based on England's Royal School of Music in Britain as a guide to training teachers in training colleges. This training that was given to the Ghanaian teachers led to Dr. Ephraim Amu becoming the first Ghanaian head teacher of the three-year teacher education program at Achimota in 1949. All exams conducted under the headship of Dr. Amu were based on the syllabuses of the Association Board of the Royal Schools of Music (ABRSM) in Britain. The first music syllabus that was published officially for use in schools was in 1959 which served in ministry of music education as a manual in training students and pupils till 1999 when there was a new review of the syllabus (Flolu, 1993).

The case of Music and dance Education and reforms in Ghana

Music education in Ghana has a longstanding gloomy history one which contains an ostentatious issue that make it a difficult task if one wants to describe it. This is as a result of the various reforms that have taken place as governments change hands. The system looks more denser as the country travels through the path of education may be as a result of the absence of a national policy on education and for that matter music education. Flolu (1993)

viewing music education in the context of the 21st Century described the situation as being absurd system.

Acquah and Mensah, (2021) quoted Amuah and Flolu and opine that, music education in Ghana could not see the goal it was supposed to accomplish as a way of educating its citizens and to attain its value and reason for which it was intended. It was in that same sense that Otchere, Amuah and Numekevor (2016) suggest that there is the need to evaluate the entire music program since the program seems not to realize its true function. Again, they are of the view that the creative arts, notable among them which is music is best suited for the training of the affective domain of human, as such should be given the highest precedence in the school curriculum at all levels of education in Ghana, conversely; this big dream has been short lived to the extent that music is now a non-examinable subject in the school curriculum.

„The introduction of creative arts as a new subject, particularly in our elementary schools in Ghana, aims to encompass a wide range of artistic disciplines. This includes visual arts, covering activities like drawing, weaving, modeling, casting, carving, painting, and sewing, as well as performing arts, as demonstrated in music, dance, and drama, all integrated into one curriculum (CRDD, 2007). The Curriculum Research and Development Division (CRDD) of the Ministry of Education in Ghana highlights that this integration is intended to underscore aspects such as "national creativity, development of emotional, material, spiritual, and intellectual life," as well as to foster the growth of imagination and self-expression through various art forms (CRDD, 2007; Flolu & Amoah, 2007).“

The world today is changing rapidly due to the advancement of information and technology and therefore for music to follow suit and achieve its purpose, music education should employ and fully integrate into this new phenomenon. Base on this argument, Nyamful (2016) report that music education in Ghana should therefore not be left behind in the technological era in which education finds itself.

In the current situation of music education in Ghana, the teaching and learning of music especially in the pre-tertiary levels of education have not been given the needed attention in the school curriculum (Adjepong, 2018). In another twist, Adjepong (2018) noted that most music teachers lack the requisite knowledge and skills necessary to infuse into the training of students to have the right experiences required. Obeng and Senyah (2018) suggests that most of the music instructors who teach the subject in the basic schools are not professional music trained teachers, a factor that can contribute to poor interpretation of the music syllabus.

Music education and its pedagogical practices and orientations in Ghana

Music teaching in Ghana has been bedeviled with a lot of problems. In recent time, it has shifted from practical based music learning to theoretical orientation where students are taken through series and myriad of music theories. Much attention has been given to the teaching in the cognitive and psychomotor domains leaving out the affective domain which reflects the response of the brain, and the emotional knowledge of children (Otchere, et. al, 2016). One very important value of music education which is the education of the affective domain of human through the experiences of feelingful effect

and reaction has also been absent in the pedagogical approaches music educators employ in their teaching strategies (Otchere, et. al, 2016).

A single causative agent of this unfortunate development perhaps, is the lack of specialized or professional teachers for the teaching and learning of music and an effective implementation of the music curriculum at the basic school levels in Ghana (Otchere, Amuah & Numekevor, 2016).

The current upsurge of a new curriculum (the common core program, CCP) that has been introduced by the Ghana education service, has worsen the plight of the subject since music was considered as part of other creative arts subject and not as a major subject on its own. Teachers of the creative arts and design subject in most cases do not teach the music aspect of the common core program due to lack of knowledge or absence of orientation in the subject area of music.

In conclusion, the problem issuing from pedagogical mismanagement and practices can only be curbed when music teachers acquire quality training to enhance effective music teaching in the classroom. The acquisition of skills in the use of stimulative and sedative music, music preference, and its application in enhancing the memory and recall of students in our basic schools and colleges could also be a vivacious portion of learning enhancement and pedagogy since the teacher will know the type of music that the student needs to help him or her in terms of memory and recall, especially in the area of music and dance courses.

Contributions of music to general education

The role played by music and its contribution to general education especially in educating the growing child is inportant and cannot be

overlooked. Music educators and other researchers in music education have found that learning music facilitates and accelerate the learning of other subjects and enhances skills that children inevitably use in other areas of education (Črnčec, 2006). Musical performance that involves children moving to music, listening, and singing has significant benefit to children as they progress in formal education and especially as they move forward in climbing the educational ladder (Boyd, 1989).

Nketia (1997) also supported this idea of the effect of music education as he stressed that, the quest to knowing the importance of the African's music is a means by which the African can realise their potential in the space of culture. According to him, the exposure of the African child to the musical traditions of diverse African cultures, would enable music education to contribute to the developmental processes of music education. This can create a framework that allows different groups to see themselves in national and pan African levels as one people with one common culture.

Conversely, Gallahue and Ozmun, (2014) noted that children can develop performance skills quite rapidly when they are in their motor and perceptual stages. At these stages, the effective use of instruments and other sound sources provides children with creative abilities and insight into music and its appreciation. As performance or motor skills are developed in practice, Manford (1996) suggested that children should be given the opportunity to play musical instruments such as maracas, drum, bells, triangles, and cymbals. In Manford's view, "early experience in instrumental music fosters rhythm sensitivity, insight into musical structure and complements the other musical activities such as singing and listening.

Recently, studies by neuroscientists have strongly backed, with empirical evidence, the idea that music is beneficial to education by enhancing the overall development of children in psychomotor, cognitive, and affective domains (Campayo–Muñoz et al., 2017). Engaging in music not only contributes to students' academic performance but also fosters self-discipline, efficiency, emotional control, and brings about societal benefits as well. The benefits of music are visible in diverse ways including the following: (1) Musical activities such as in performance (Hyde et al. 2009); (2) Students' have improved ability to develop vocabulary and reading skills (Tsang and Conrad, 2011); (3) Students' musical experience are raised in their IQ levels (Schellenberg, as cited in Hyde et al., 2009); (4) Music alleviates learning disabilities, such as dyslexia (Huotilainen & Kujala, 2021). (5) Music activities and engagement by students and learners help improve attention, memory, and recall (Posner & Patoine, 2009). (6) Music is a less expensive and simple method of early screening in children for reading disabilities (Zuk et al. 2013). (7) In addition to participating in musical activities like dancing, singing, or listening, playing musical instruments supports intellectual development and enhances confidence, self-esteem, resilience in overcoming challenges, self-discipline, and provides a channel for self-expression in students, particularly in children (Hallam, 2010). (8) finally, learners who partake in high-quality music programmes usually scores higher marks in reading and spelling tests than students who do not engage or participate in quality music programmes (Hille et al. 2011). In recount, the reviewed literature is relevant since it discusses the efficacy of the use of music in the development of the child. We can conclude from the discussion that, musical

activities of any individual contributes to a holistic development of the human being from childhood through to life and to the day of exit from this world.

Effect of musical experiences and cognitive benefit on the growing child

Research on children's composing processes, as indicated by Gutierrez and Rogoff (2003), highlights that music making significantly improves cognitive skills. The conceptual elements of music, identified as tools for co-constructing a musical whole during group interaction, underscore the significance of critical thinking in the context of children's compositions and creative music making (Kerchner & Abril, 2009). A focus on children's creativity in improvisation makes us understand how music assists children to actively co-construct semiotic resources to communicate. It also enhances children's identity and self-understanding, listening and performance skills (Harrop-Allin, 2010). It is however revealed that planning is needed for creative music invention to support children to validate their prior experiences, competencies, dispositions, and music identities (Barrett, 2007).

Several educational psychologists and neuroscientists have affirmed that early interaction with music of a child has an enormous effect on the child's life and cognitive development (McPherson & Davidson, 2002). One of the most recent works is the one by Emily Gersema (2016) of the Brain and Creativity Institute, University of South Carolina (USC) which established that, children's brains develop faster with exposure to musical experience.

While learning music, distinct networks of neurons are triggered based on whether an individual is listening or actively performing music (Altenmüller, 2001). This process activates specific regions of the brain associated with memory, motor control, timing, and language (Demarin et al., 2016). It,

therefore, makes sense that, music has the ability to generate emotions and memories; it actually activates these sections of the brain. Music stimulates and exercises the entire brain. Arts and Music enhances cognitive growth, human development, emotional and psychomotor pathways (Zull, 2005). The effects of musical experience on memory development are of equal importance for understanding the important role of music in behaviour and cognitive processes. There is therefore, the need to start training the child from childhood through to adulthood, especially in our educational system, if we want a holistic human development in our society.

In summary, it has been revealed in the literature that, early engagement of children to music is of great importance. Children exposure to music at a tender age is crucial to the development of the child cognitively and in totality. This course is relevant because children's engagement with music stimulates the child cognitively and psychologically and enhances the child's memory. Certain parts of the brain are activated when it is engaged with musical experiences, improving on the child's memory and recall, and this helps children to improve their cognitive domain. It also improves the verbal memory of children especially for those who have a longer period of engagement, making these categories of children better than those who have not had any musical experience, or have had less engagement with it. Musical training of children therefore becomes very important in total development of the child, and therefore, should be encouraged in our schools especially at the thier chilhood.

These findings by researchers in neuroscience and music indicate the important role music plays in the entire human development and especially in

the developing child. It is therefore conclusive that music education should not be limited to the secondary and tertiary levels in our educational system, but should also be extended to basic schools so as to achieve these important experiences. Ghana as a developing country needs to meet this call to exonerate music in its educational system so that the growing child would go through these experiences for a holistic and all-embracing development.

The relevance of literature review on music education and other subtopics in this study offers a comprehensive understanding of the broader context in which music education exists, particularly in Ghana. Exploring the historical perspectives, pedagogical practices, and educational reforms in respect to music in Ghana provides insight into the evolution and current state of music education in the country. By examining how music and dance are integrated into education and their cognitive benefits for children, the researcher gained a strong foundation for analysing how these elements influence students' memory responses to sedative and stimulative music. Furthermore, reviewing the contribution of music to general education highlights the developmental advantages of musical exposure, helping to position the research within a framework of educational and cognitive development. These reviews directly connect to the study by establishing the context for understanding how music education and exposure shape students' musical preferences and memory abilities. An Insights into pedagogical practices and reforms in Ghana's music education system offer clues to the types of musical experiences students are likely to have encountered, which may influence their cognitive responses to sedative and stimulative music. Additionally, the examination of cognitive benefits and developmental effects

underscores the potential relationship between musical exposure and memory formation, supporting the research hypothesis and guiding the interpretation of results.

Chapter summary

This chapter presented extant literature in the area of the study. The literature that was reviewed includes materials on music education, music preference, and music and memory. The study was undertaken with the view to lodging the current study in the pool of existing literature and as well examine the extent to which the literature assists with the solution of the problem under investigation. Various subtopical areas were discussed with its related references.

The theoretical framework of the study concerns information processing theory of human memory for music, the Modal Model theory which was designed by Waugh and Norman (1965), and modified by Arkinson and Shiffrin (Murdock, 1982). The components of the Modal Model consist of three main memory stores and processes that connects them, and they are the sensory, short-term, and long-term memories (Schwartz & Reisberg, 1991). Information is guided through the memory structure by control processes which facilitate the flow of information through the memory system through various strategies which includes attention, encoding, rehearsal and retrieval.

The second theory that was considered for this study was the mere exposure theory by Zajonc (1968). The theory is a psychological concept that suggests that people tend to develop a preference for things that they are exposed to repeatedly. This theory posits that familiarity breeds liking or preference, even without a conscious awareness of the exposure. The zero

novelty, which form part of the mere exposure theory which was developed by Hargreaves, 1997/2004) was considered in the study. It proposed the inverted-U function relating familiarity to liking and over exposure leads to boredom.

By combining these two theories, the researcher can explore both the psychological basis for students' musical preferences and the cognitive mechanisms underlying memory retention. For preference formation, the Mere Exposure theory helps explain why students might gravitate toward specific genres or styles of music based on their previous listening experiences. On the other hand, the Modal Model theory provides insights into how exposure to sedative or stimulative music affects sensory, short-term, and long-term memory processes during learning or information retention tasks. Together, these frameworks enable the researcher to examine not only how repeated exposure to specific types of music influences students' preferences but also how these preferences relate to memory performance in different musical environments. This integrated approach offers a more holistic understanding of the cognitive and affective dimensions of music and memory.

Memory for musical excerpts was delved into in this chapter. The discussion suggests that, emotional resonance and familiarity with a particular music genre can enhance memory retention for elements within that genre if an excerpt is played (Madison, Gouyon et. al., 2011). The concept suggests that, memory for musical excerpt refers to the cognitive process by which individuals remember and recall specific pieces or excerpts of music. The chapter also reviewed literature on memory and environmental and educational factors and concluded that, the effects of environmental factors such as education and conditions in the home, on musical ability and aptitude

may enhance our understanding of how environmental factors affect the development of memory in the individuals. Musical ability and the home environment were also discussed, it includes the range of skills and capacities that individuals possess for understanding, creating, performing, and appreciating music is what scholars describe as musical ability (Hallam, & Prince, 2003). The chapter also discussed that, the structure of memory as a unit, is made up of sensory, short-term and long-term storages.

Music education as a concept in the context of the Ghanaian educational system was rigorously delve into in this chapter. The chapter discussed and viewed music education is a field of study associated with the teaching and learning of music (Barrett 2014, Colwell, and Richardson, 2002). The literature revealed that, the involvement in music is considered a fundamental component of human culture and behavior (Harvey, 2018). It also indicated that, music making, listening, and its enjoyment in Ghana, especially in the twenty first century is being reborn in our current generation and making a lot of impact on our society both in the sociocultural and economic sense. A brief history of music education in Ghana was also discussed. Missionaries and church's role in establishing education and for that matter music education in Ghana was not left out in the literature. The various educational reforms in Ghana's educational system were also discussed. Music education and its pedagogical practices and orientations in Ghana was rigorously discussed.

The contribution of music to education in general as revealed in the literature was that, learning music facilitates and accelerate the learning of other subjects and enhances skills that children inevitably use in other areas of

education (Črnčec, 2006). In addition, musical activities of any individual contribute to a holistic development of the human being from childhood through to life and to the day of exit from this world. However, early engagement of children to music is of great importance. It is therefore very important to note that, Ghana as a developing country needs to meet this call to exonerate music in its educational system so that the growing child would go through these experiences for a holistic and all-embracing development.

The link of literature review to the study topic, the purpose of the study, the objectives of the study and the research questions can be summed up as below;

The study investigated the relationship between students' musical preferences (sedative or stimulative) and memory for those types of music. The literature reviewed on music education, its historical evolution in Ghana, pedagogical practices, and cognitive benefits of musical experiences provides essential context for understanding the role of music in shaping students' preferences and cognitive development. By analysing how Ghanaian educational reforms and music pedagogy have influenced students' exposure to different genres, the literature aligns with the study's focus on musical preferences and memory.

The purpose of the study is to explore the relationship between students' musical preferences and their memory for sedative and stimulative music. The literature reviews on the cognitive benefits of musical experiences and the influence of music on learning and development supports this purpose. Understanding how exposure to music through educational environments affects cognitive functions such as memory helps justify the

study's intent to examine memory recall in relation to music preference. The reviewed literature on music education reforms and teaching practices in Ghana further contextualizes the relevance of the study by highlighting how educational structures may have shaped students' familiarity and preferences for sedative or stimulative music.

The literature on music education, historical perspectives, and the integration of music and dance offers insight into the factors influencing students' exposure to different types of music, which can shape their preferences. In addition, the literature on the cognitive benefits of musical experiences suggests that repeated exposure to different musical types can affect cognitive processes, including memory. This supports the examination of memory performance differences based on students' music preferences. Furthermore, the reviewed literature highlights the role of musical exposure in shaping cognitive responses, implying that preferences may influence memory recall for specific types of music. Also, the literature on pedagogical practices and cognitive benefits of music underscores the potential link between familiarity with a specific genre (sedative or stimulative) and memory recall, supporting this objective.

In conclusion, the literature reviewed provides a strong theoretical and contextual foundation for the study by highlighting the role of educational and environmental factors in shaping musical preferences and cognitive abilities. It supports the investigation of how exposure to and preference for sedative and stimulative music relate to memory performance, thus aligning with the study's topic, purpose, and objectives.

CHAPTER THREE

METHODOLOGY

Introduction

This thesis is about how students' preference for a particular music stimulus enhances or affects their memory and recall if excerpt of the music is played. The research discussed the general procedures that were followed and or designed, to be followed in the entire study which included the description of the gamut of major activities in the whole research process. Data collected was analysed in line with the research questions.

Specifically, the chapter presents and described the methods adopted for carrying out the study, the collection and analysis of data. It addresses the research approaches such as research design, statistical design, population, research instrument which was used for data collection, sampling and sampling techniques, data setup and computation. Other things which were also considered in this chapter include how the analyses of the data were conducted. Data collected for the study was carefully managed to be clean and accurate for analyses because inaccurate data collection procedures can impact the results of a study and lead to false results. Data collection instruments were clearly defined, the derivation techniques used, models used to measure memory, activities of the researcher before and during the field for data collection. Finally, it took a look at steps taken by the researcher to authenticate the information from the respondents, in addition to discussion on controls and unit of analysis.

The mode of enquiry

The adopted mode of enquiry for this study is purely quantitative. It is a research mode of enquiry that focuses on the objective measurement of statistical, mathematical or gathering numerical data which can be generalised across groups of people or to explain visible behaviour (Babbie, 2010; Muijs, 2010). Scholars acknowledged that the mode of enquiry is an overall plan for collecting data in order to tackle the objectives of a study. It is therefore expected that understanding the adopted mode would help in the examination and the analytical development of data that was collected empirically. Therefore, the researcher decided to use music listening to probe pupils' musical preference, and also find out their memory recall for music stimuli (sedative and stimulative music) during and after the listening session.

The result obtained was statistically analysed as proposed in the hypotheses of this study. Inferential observation was employed for the collection and analysis of the data.

This mode was adopted as a result of the numerical nature of the data that was collected for the study, obtained from pupils' musical preference responses and memory recall. According to Llinas, (2014), it is a suitable method that can be used to capture pupils' musical behaviour and responses to a given music stimulus.

Research Design

A research design is a method, model, or pattern for conducting research. It is a set of ideas, beliefs, or understandings within which theories and practices can function. There are, indeed, many different types of research designs; each with its own specific structure and practice. The choice of a

particular design by a researcher depends on, but not limited to: the nature of the research problem, the intended research questions that the researcher seeks to answer, the purpose of the study, what the result of the study will be used for, the time-frame involved in the study (Neuman, 2003), the level to which subjects in the study are either or not manipulated, and the degree of discourse or generalisability of the findings (McMillan & Schumacher, 2001). Sarantakos (2005), however, couches these factors that influence the choice of a research design a little differently. He writes,

..... research designs differ according to the nature, requirement, and purpose of the study. He added that, the type of population, the structure of the research, the number of researchers and research assistants, and the philosophical affiliation of the researcher, among other features... (p. 106).

The quote above makes it clear that the selection of a research design for a specific study should be supported by a thoughtful consideration of various factors. Consequently, employing the dimensions outlined as a sort of checklist, the research design for the present study is thoroughly examined. By purpose and categorisation, this study falls within the description of applied research. Holding other qualities constant, applied research aim at seeking to determine empirical relationships and analytical generalisations within a given field of study. It uses general discourse related to a given field of study, adds to research-based knowledge in a given area, and advances research and methodology in a given field (McMillan & Schumacher, 2001). The given field in this current study is Cognitive Psychology in Music Education. The

main terminologies used in this study bear on memory recall and musical preference. The study aimed at determining the possible relationship that exists between students' memory recall for the two types of music, (sedative and stimulative), and their preference for these two types of music in order to make analytical inferences for research and practice.

Neuman (2003), recognised three types of research for the purpose of research, and these are: descriptive, exploratory and explanatory. The current study falls under the experimental research category. In experimental research, the researcher aims at finding out the possibility of occurrence of a variable, or the possibility of a relationship among specified variables; based on hypothesis, informed haunches or educational guesses. Categorising an experimental study in accordance of the objectives of a study, Kumar (2005) notes that, this kind of study is carried out when a researcher wants to explore areas about which the individual has little or no knowledge of or about (p. 10). As already stated in chapter one of this study, practically nothing (or at most very little) is known (even though not empirically proven) about the relationship that exist between musical preference and memory recall in participants listening to sedative and stimulative music especially using the Ghanaian music. The subject is relatively unexplored and remain novelty, and this forms the foundation for the investigation.

Non experimental designs

The research is non experimental research, therefore in the process of selecting a suitable research design for the study, other available research designs such as the randomised experimental design, quasi-experimental design, natural experimental design, and correlational study design among

others were studied. The researcher reviewed these designs, because according to Shadish, Cook and Campbell (2002), these are the modern designs for experimental research.

Researchers (eg. Squire, *et al.*, 2008), identified an experimental design as a design that simplifies the multitude and analysis that facilitates the generation, and analysis of supporting, refuting, or validating a hypothesis (Philippe, Poustka, Chiodin, Hoff, Dessimoz, Tomiczek, & Kuhl, 2019; Callen, 2015). Scholars have explicated that experiments offers insights into what result occurs or could respond to when a particular factor is deployed or a stimulus is applied (Squire, Berg, Bloom, du Lac, Ghosh, and Spitzer, 2008).

Shadish, Cook and Campbell (2002) also discussed and describe experimental research design as a test under controlled condition that is meant to demonstrate a known truth and that it examines the validity of a hypothesis, and also to determine the efficacy of something unproven (Shadish, Cook and Campbell, 2002). This stands to indicate that we know nothing or less about the relationship between preference and memory in Ghanaian students.

Another design reviewed for this study was the randomised experimental design, also referred to as true experimental design. Scholars explained randomised experimental design as a research design that goes through a process of randomly selecting subjects to treatments (Everitt & Skrondal, 2010). A review of the randomized experimental design in relation to this study, the researcher has noted that randomised experimental design could not provide a suitable condition for adoption. The lack of compatibility stems from the fact that this study does not involve respondents being

randomised into treatment groups, therefore it cannot be appropriate for adoption.

Furthermore, the characteristics of the natural experimental design was studied by the researcher to see its appropriateness for the study. Scholars described the natural experiment as an empirical study in which individual or units are assigned to experiment with a control condition that are determined by nature or factors outside the control of the investigator (Leatherman & DiNardo, 2008). Other scholars view this design as a potentially manipulable (Shadish, Cook and Campbell, 2002). However, the nature of the natural experiment and its design also obviously seems not suitable enough for adaptation as the research design for this study due to its potential manipulatable characteristics.

Before I conclude on the choice of the appropriate experimental design, the correlational design was also reviewed. A correlational study or design is a type of research method used in the field of social sciences and other disciplines to examine the relationship between two or more variables (Mohajan, 2020). It aims to determine if there is a statistical association or correlation between these variables without manipulating them directly. Correlation refers to the degree to which changes in one variable are related to changes in another variable (Pereplechikova & Kazdin, 2005). If this design is employed in this study, it would have aimed at exploring the relationship between musical preference and memory recall without manipulating any variables. Data can be collected on pupils' musical preferences and their memory recall abilities, then analyse the correlation between the two factors. This design is relatively straightforward and can provide valuable insights into

potential associations between musical preference and memory recall. It is however not appropriate because the music stimulus used for the study was manipulated between stimulative and sedative music.

Finally, the researcher reviewed the Quasi-experimental research design which is similar to experimental research in that there is manipulation of an independent variable and has adopted it as the design that guides this study. A quasi-experimental study simply means participants are not randomly assigned to treatments (Gafen, 2002; Shadish, Cook & Campbell, 2002), and in this study, the respondents were not randomly assigned to treatments, hence the researcher deemed it the most appropriate for the study. In brief, a quasi-experimental design is a research methodology employed to assess the impact of an intervention or treatment in situations where random assignment of participants to groups is not feasible. Unlike true experimental designs, quasi-experiments do not involve the random allocation of subjects to treatment and control groups. Instead, participants are assigned based on pre-existing characteristics or conditions. Key features of this design as applied in the current study include the absence of randomization, the implementation of a treatment or intervention, and the measurement of its effects, typically in relation to a comparison or control group that has not been randomly selected.

In this study, the objective is to examine how students with differing pre-existing musical preferences, specifically, sedative versus stimulative music, vary in their memory performance when exposed to both types of music. Since musical preferences are inherently established and cannot be randomly assigned, the use of a true experimental design is impractical. Participants are therefore naturally grouped according to their musical

preferences. This makes the quasi-experimental approach particularly appropriate, as it facilitates a comparison between naturally formed or occurring groups and enables the researcher to study cause-and-effect relationships without altering or manipulating students' inherent preferences.

Moreover, this design ensures that ethical and practical constraints are respected while still allowing for meaningful analysis of differences in memory outcomes across groups.

In this design, though the independent variable is operated, respondents are not randomly and specifically allotted to conditions or instructions of a particular conditions. This is because the independent variable is manipulated before the dependent variable is measured. In quasi-experimental research, the problem of directionality is eliminated. But because participants are not randomly assigned making it likely that there are other differences between conditions, quasi-experimental research does not totally eliminate the problem of confounding variables.

Data analysis tools

The data that was obtained from the study was analysed using the Chi Square, the Cohen's d test, and the independent t test.

Chi-squared (χ^2) hypothesis testing, also known as the chi-squared test or χ^2 test, is a statistical method used to assess the independence or association between two categorical variables in a contingency table. It is commonly used in research to examine relationships between two categorical data and test whether observed frequencies differ significantly from expected frequencies under the assumption of independence. The chi-squared test can be applied in various fields, including social sciences, biology, and quality control. The

researcher has found that, the chi-squared hypothesis testing is a valuable tool for analysing relationships and associations between two categorical variables in research. It helps researchers assess whether observed differences are statistically significant or if they could have occurred by chance.

Null Hypothesis (H_0): The null hypothesis in a chi-squared test states that there is no significant connection or bond between the two categorical variables. In other words, the two variables are independent. The alternative hypothesis on the other hand (H_1) suggests that there is association or relationship between the two categorical variables. It implies that they are not independent. The Critical Value or P-value is based on the degrees of freedom and the chosen significance level (alpha), which can be found from a chi-squared distribution table or use a statistical instrument or software to find the value of p (p-value), which is associated with the test statistic.

According to scholars, in making decisions in chi square test, if the calculated χ^2 statistic is greater than the critical value, or if the p-value is less than alpha, (alpha = 0.05), you reject the null hypothesis in favour of the alternative hypothesis. This shows a significant relationship between the two variables. The conclusion for this analysis is that, if you reject the null hypothesis, you conclude that there is a statistically significant relationship between the two categorical variables. Researchers says on the other hand, if you fail to reject the null hypothesis, you conclude that there is insufficient evidence to suggest a significant relationship.

The independent t-test, also known as a two-sample t-test or Student's t-test for independent samples, is a statistical hypothesis test used to determine whether there is a statistically significant difference between the means of the

two independent or separate groups or samples under discussion. It's used when you have two separate groups, and you want to compare the means of a particular variable between these groups to determine if there is evidence of a significant difference. In this study, the two groups are the stimulative and the sedative music groups.

For the hypothesis of the independent t test, the null hypothesis (H_0), is the default assumption that there is no significant difference between the means of the two groups. It usually states that the population means are equal ($H_0: \mu_1 = \mu_2$), where μ_1 and μ_2 are the means of the first and second groups, respectively. The alternative hypothesis (H_1) is the statement that, there is a significant difference between the means of the two groups.

The test statistic for an independent t-test is calculated as follows:

$t = (\bar{x}_1 - \bar{x}_2) / \sqrt{(s_1^2/n_1) + (s_2^2/n_2)}$; where $\bar{x}_1$ and $\bar{x}_2$ are the means of the first and second groups, respectively, s_1 and s_2 are the standard of deviations of the first and second groups, respectively and n_1 and n_2 are the sample sizes of the first and second groups, respectively. The determination of the critical value or the P-value is based on the chosen significance level (alpha, typically 0.05), you can find the critical t-value from a t-table or use statistical software. Alternatively, you can calculate the p-value associated with the test statistic. The decision rule is based on the calculated t-statistic. If it falls in the critical region (beyond the critical value), you reject the null hypothesis in favour of the alternative hypothesis, and if the p-value is less than alpha (typically 0.05), you reject the null hypothesis.

Conclusions are drawn if you reject the null hypothesis, you then conclude that there is a statistically significant difference between the means

of the two groups. However, you fail to reject the null hypothesis, you conclude that there is insufficient evidence to suggest a significant difference. In summary, the independent t-test is a fundamental statistical test for comparing means between two independent groups, and it is widely applied in various research disciplines to assess differences and make informed decisions.

According to researchers, to make a decision on the calculated t value, if the calculated, t-statistic falls in the critical region (beyond the critical value), you reject the null hypothesis in favour of the alternative hypothesis, however, if the p-value is less than alpha (typically 0.05), you reject the null hypothesis. Conclusions are then drawn based on the t value either to reject the null hypothesis or fail to reject the null. According to scholars, if you reject the null hypothesis, you conclude that there is a statistically significant difference between the sample mean and the population mean. However, if you fail to reject the null hypothesis, you conclude that there is insufficient evidence to suggest a significant difference.

Study area

This study is conducted at Derby avenue Roman Catholic basic school located at the heart of Accra in the greater Accra region of Ghana. It is a mixed school comprising the Kindergarten department, the Primary department and the Junior High department. This school was deemed appropriate for the study even though it was selected through a multifaceted sampling technique, as a result of the the mixed nature of various ethnic groups of the students. For positionality, the school is located in an area of Accra which serves as the business hub of city hence contains variety of people located in the area. This

is to help the students in listening to the variety of music stimulus that has been selected for the study. This the researcher is of the view that reflexivity wise of the study is satisfied due to the complex nature of the ethnic groups.

Population

For this study, the Derby Avenue RC Basic School pupils comprising the upper primary and the Junior high departments were used as the population. The ages of these students range from 10 to 15 years, (thus basic four to nine students). The school has a total population of one the school is represented in table 1 below;

Table 1 Frequency Distribution Table for the Population

Department	Frequency	Percent	Valid Percent
Primary School	735	72.1	72.1
Junior High School	285	27.9	27.9
Total	1020	100.0	100.0

Table 1: showing the total population of Derby Avenue basic school.

Table 1 indicate the frequency distribution of the total population of the school in the 2023 academic year which was adopted for the study. The table shows that the primary department has the highest population compared to the Junior high department. Both departments (upper primary and the Junior high) were investigated for the study.

Table 2 Frequency Distribution of Gender of the Primary School Pupils

Frequency	Per cent	Valid Percent
Boys	495	67.3
Girls	240	32.7
Total	735	100

Table 2 shows a frequency distribution for the total population for the primary school.

Table 3 The Frequency Distribution of Gender of the JHS Population

Frequency	Per cent	Valid Percent
Boys	184	64.6
Girls	101	35.4
Total	285	100

Table 3 shows a frequency distribution for the total population of the JHS.

Gender in general was not a key variable of interest in the study. However, it was presented to indicate a balance between male and female in the selection of my sample size so as to avoid gender bias. It will also help the reader to know that the population under consideration is a mixed sex population, so that the result will not be thought of tilting towards a single sex

Sampling Technique/procedure

Sampling methods and techniques are the various tools that are used to select a sample from within a general population. Scholars indicate that proper sampling methods are important for eliminating bias in the selection process. Common methods of sampling include simple random sampling, systematic sampling, stratified sampling, matched random, and panel sampling among others. This study has adopted a multifaceted sampling technique for

participants selection, the cluster sampling, the stratified sampling, and the simple random sampling, are the techniques used for the study.

The cluster sampling technique which is a probability sampling method is a sampling method in which researchers and statisticians divide a large population into a number of clusters or sampling units. Each of these selected units would have similar demographic characteristics as the overall population. This method is useful for taking large samples of disparate clusters, and this method was used since the schools in the circuit were far from each other, and therefore was used to select the particular school where the study was conducted (Derby Avenue Basic) among the ten other schools that were in the same circuit of the Accra Metro education districts, the Urssher Circuit 13.

The population for the study was divided into discrete units called strata based on shared characteristics and behaviour. Stratified random sampling according to scholars refers to a sampling procedure in which a population is divided into discrete units called strata based on common characteristics for equal chance of respondents.

After the random selection was done to select the classes (clusters), thus from basics 1-9, the following classes (clusters) were obtained: basics 9, 8, 4, 7, and 6. This was followed by a random sampling of 20 students from the various classes (stratum), to select the main sample size of one hundred respondents through simple random sampling for the study using the snowballing technique. Below are the clusters (strata), that were used for the sample size.

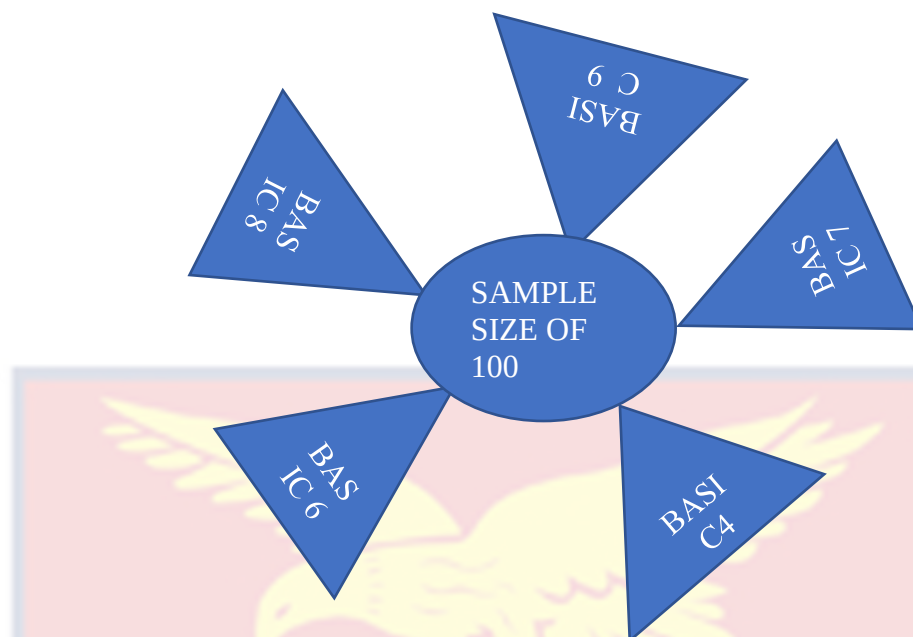


Figure 6 showing the strata for the simple random sampling technique.

Determination of Sample Size

The sample size for this study was determined using the ‘sample size calculator’, and the sampling size distribution table, based on the size of a particular population. The researcher used the sampling size determination table adopted from Krejcie and Morgan. Chuan & Penyelidikan, (2006) discussed the authentication of Krejcie and Morgan sampling size determination table for use when collecting data in a specific population. This sampling size table is said to be designed based on a confidence level of 95%.

Chuan and Penyelidikan, (2006) recommend that, in situations where a researcher cannot have access to an entire statistical population, a sampling size determination table, such as that of Krejcie and Morgan can be employed.

Table 4 Krejcie and Morgan (1970) Sample Size Determination Table

N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	346
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	1000	278	4500	354
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	191	1200	291	6000	361
45	40	170	118	400	196	1300	297	7000	364
50	44	180	123	420	201	1400	302	8000	367
55	48	190	127	440	205	1500	306	9000	368
60	52	200	132	460	210	1600	310	10000	370
65	56	210	136	480	214	1700	313	15000	375
70	59	220	140	500	217	1800	317	20000	377
75	63	230	144	550	226	1900	320	30000	379
80	66	240	148	600	234	2000	322	40000	380
85	70	250	152	650	242	2200	327	50000	381
90	73	260	155	700	248	2400	331	75000	382
95	76	270	159	750	254	2600	335	100000	384
<i>Note: N is Population Size; S is Sample Size</i>						<i>Source: Krejcie & Morgan, 1970</i>			

In the Krejcie and Morgan Sample Size Determination Table as displayed, *N* stands for population size, while *S* stands for Sample size.

The table was used to find or calculate the number of sample size from the total number of 1020 students in the Derby Avenue basic school. From the table, a population of 1020 will give a sample size of 284 students/respondents.

Sampling

In this study, a sample size of 100 respondents was used as stated earlier. From table 2 and 3, the total number of boys in the school is 679 representing 67%, and 341 girls representing 33%. In the selection of the sample size therefore depends on these percentages (67 boys and 33 girls) to give equal chance for both boys and girls in the school. Random sampling method was designed for the selection and employed to select the sample size. The choice of 100 students meets the requirement by scholars in a basic and

inferential studies if all other assumptions are met. According to scholars, a sample size of at least 30 is good for inferential statistics (Field, 2009; Kelley & Maxwell, 2003) if all assumptions are met. Scholars therefore recommend that a sample size of 30 and above is adequate to achieve an exact enough mean and deviation estimation (Suresh & Chandrashekara, 2012; Hertzog, Kramer, Wilson & Lindenberg, 2008). Glenberg and Andrzejewski (2008) believe that a small sample from random sampling that is accurately guided is better than a big but biased one. A sampled size of 100 was therefore reliable for an accurate result for this study.

Field's quantitative approach model adopted for the Study

Field's quantitative model in scientific research refers to a structured approach to analyzing data quantitatively, typically in the context of behavioral sciences or psychology. The theory was reviewed to serve as a guide to the chosen theory that guides the study and also to suit the purpose of the study. The theory suggest that any variable intended to be measured should be derived from the collected data which would then be used to test the proposed theory.

It is a theory that the researcher thinks will help approach the investigation appropriately, thus to help the researcher follow a systematic and a well-structured and scientific study. This study lend itself to quantitative method as a result of the data that has been generated.

The Field's theory follows the following steps, setting of research questions, generating of theory, generating of hypotheses, collecting of data to test the theory, data analysis.

Research scholars report that diverse research approaches or method and different analyses and analytical tools have their strength and weaknesses (Plonsky, 2013; Moher, Liberati, Tetzlaff, & Altman, 2010; Scollon, Prieto, & Diener, 2009; Grant, & Booth, 2009; Wolf, 1986). As a result, it is important that a researchers choose a research method that fits the purpose of the study.

Sovacool (2014) has observed that, methods used in the disciplines of social science remain underutilised due to lack of adequate and appropriate approaches of investigations. In furtherance, some scholars recommend that good research is supposed to follow a systematic and well-structured scientific model (Jensen, Goggins, Fahy, Grealis, Vadovics, Genus & Rau, 2018; Bennett *et al*, 2017; McKechnie & Pettigrew, 2002). It is on this background that the researcher has decided to discussed this study using the quantitative approach model by Field, 2009. It is interesting and most refreshing to note that, the nature of this research lends itself better to the quantitative method because of the statistical data that were generated of which the research questions are not exception. The figure 7 below illustrates Field's model for conducting quantitative research.

Quantitative method of research is noted to be an in-depth method that can support quality and rigorous research in social science disciplines (Sovacool, Aksen & Sorrell, 2018; Zainal, 2007; Amaratunga, Baldry, Sarshar, & Newton, 2002). The researcher has therefore decided to adapt Field's model for conducting quantitative research for investigation in this study.

This study provides that, the kind of data to be collected is the first most important aspect of research as illustrated in figure 3.4 above. This is very

important because scholars say the nature of data to be collected informs the development of the theoretical framework of a study (Varpio, et, al., 2020).

In this model, Field identified the variables as another vital aspect in the model of quantitative research approach. Variables, as described by statisticians are any characteristic or distinction that can be measured in an investigation, or an observed value that changes in data units in a population over time (Willenborg & De Waal, 2012). These identified variables usually prompted the development of the hypotheses for a study. Andy Field's quantitative model suggested that any variable intended to be measured should be derived from the collected data which would then be used to test the proposed theory. The measurement of variables in this study was enhanced by data computation and analyses. The measurement of variables also enhanced the hypotheses testing. Two variables (memory and preference) were identified, thus the variables from the data as the dependent variables, and the pre-existing variables in the participants are independent variable.

Rules and procedure for hypothesis Testing in Statistics

Glenberg and Andrzejewski (2008) have established the relationship for the hypothesis testing, and have said that, its processes and study was mainly fixated on the rules of assumptions which depends on its logical processes. Hypotheses are educational guesses that follows some logical processes that include: assumptions about the statistical procedures, generating of the hypothesis; that is the null and alternative hypothesis, sampling distribution of the test statistics, setting the significant level and the formulating of decision rule, random sampling and the computation of the test statistic, application of the decision rule, and finally, drawing of conclusion.

The interconnections that exist between these assumptions and statistical procedures according to scholars should be guided by fact that, one's confidence level must be high enough in terms of the characteristics of the various statistical procedures hence, these procedures have to do with the assumption of the population, data and sampling.

Two types of hypotheses are identified according to scholars that include the null and alternative hypothesis. The main difference that exists between these two are that, null hypothesis establishes a position that there is no relationship, nor difference between two phenomena. On the other hand, the alternative hypothesis states and takes a position that, there is a relationship or sameness between two phenomena (Banerjee, Chitnis, Jadhav, Bhawalkar & Chaudhury, 2009).

Procedure for data collection

Many researcher experts have emphasised the need for a careful planning at the data collection stage of an ex post facto research (Borg & Gall, 1989; Campbell & Stanley, 1969). Certain steps were taken to ensure that, a careful and systematic collection of data was carried out: (1) the construction and validation of measurement tools: (1) Students' Music Background Questionnaire (2) Questionnaire for students' preference for music, and (3) Questionnaire for memory for music.

Apart from the above, the researcher obtained permission from school authorities and parents to use students as subjects, and the administration of the questionnaire in two separate sessions.

Primary and secondary data collection procedures were the two sources and categories of data collection for this study. Primary data collection

as a category of data collection process of gathering data directly from sources other than collecting data from already existing research (Ajayi, 2017). Primary data can also be described as a data that has been collected from first-hand-experience and which has not yet been published (Denscombe, 2013). It is believed to be more authentic and reliable. For this study, the researcher's main primary source of data collection is the Derby Avenue basic school which formed the main population. Secondary data on the other hand are data from an existing literature, thus, they are data from sources that has already been published. They may be obtained from sources such as books, newspapers, biographies, data achieves, internet articles, database, among others (Saunders et.al., 2003). Bevan et. al., (2013) also explained that, in the event of accessing these data, there is no specific method because the data is ready for accessibility for all. In this study, therefore, the use of secondary data was reviewed to guide the study as well as to illuminate the understanding of the results.

For an effective data collection procedure for this study, the researcher subdivided the section into two stages: before the field (before data collection), and in the field (during data collection). The activities that went under each of the stages are described briefly below:

Questionnaire for data collection

The questionnaires that were used for data collection on students' memory for music and preference for music for sedative and stimulative music are found at appendix D.

Derivation of the Memory scores

The three main scoring techniques used in recognition memory research are “accuracy”, “latency”, and “confidence” (Murdock, 1982). The researcher in this current study has used the confidence rating, and it refers to subject’s assessment of the accuracy of his or her own responses. This procedure may be integrated with a “YES/NO” responses or given separately in the form of a Likert-type scale (Murdock, 1982). The efficacy of confidence rating in yielding reliable data has been demonstrated by researchers operating in the area of memory (Glanzer, 1982; Frank, Bransford, and Auble, 1982; Mandler and Boeck, 1974), states;

“Confidence ratings are useful secondary data to strengthen and elaborate a theoretical analysis” (Murdock, 1982 p. 67). Consistent with Glazer’s observation, Franks, Bransford, and Auble (1982) argue that the use of confidence ratings provides the experimenter with information that is not available from memory scores per se.

Table 5

Derivation of Confidence Rating Scores

As Used by Kauffman and Carlsen

-----confidence rating-----

---low--- -- --medium-- --high---

correct “yes/no” response +0.5 +1.5 +2.5

incorrect “yes/no” response – 0.5 - 1.5 - 2.5

Data collection on memory for music

Providing a correct answer with an accompanying high confidence level “earned” a subject (2.5 points). Table 3.5 above indicates that a correct response with a medium and low confidence rating resulted in the award of (1.5 points), and (0.5 points) respectively. An incorrect response with a high confidence rating resulted in a (-2.5 point), an incorrect response with a medium confidence rating result to (-1.5 points), and a low confidence of an incorrect answer yielded (-0.5 points). The sum of the points earned on all of the six responses correctly gives a on a high score yields (15 points), while an incorrect answer on a high confidence score yields (-15 points) for memory for music score.

Kauffman and Carlsen theory on memory score

Kauffman and Kalsen's Modal Model provided a basis for hypothesizing how different types of music (stimulative and sedative) might influence memory performance through attention, encoding, and storage mechanisms. It was used to derivate the data that was collected into figures.

Kauffman and Carlsen (1989) developed a recognition paradigm which several researchers have employed to investigate the effects of memory for music. This current study used this model to measure the memory score of respondents in this study. In this current study, 20 excerpts of sedative and stimulative comprising 10 each of sedative and stimulative pieces which were used in the listening session for which the scores were computed for preference for music and memory for music.

Each stimulus was played for one minute each at random, after which an excerpt of twenty seconds excerpt was played at random for respondents to

respond to by ticking a “YES” or “NO” on the respondents’ sheet. After making their choices, respondents were asked to rate their confidence in the answers given (“YES” or “NO” answer) on a three-point scale: “low confidence (guessing), moderate confidence (not guessing, but not positive), and high confidence (quite certain).

Data collection on preference for music

To indicate preference for either sedative or stimulative music, six excerpts from the list of sedative and stimulative music which was earlier mentioned, which respondents were not previewed to or know of were played at random. The songs were selected at random using the hat lottery random picking without replacement from the list of songs that were labelled. The stimulus was played and respondents were asked to respond on their preferences by selecting a yes or no response on their responds sheet. These responses were meant to answer hypotheses one which states; **H₀**: There is no difference between students’ preference for sedative and stimulative music, and the null, **H₁**: There is a difference between students’ preference for sedative and stimulative music. Respondents’ responses were then computed using the SPSS and the Chi square model for its analysis.

Stimulus material

The stimulus used in this study is of African and Ghanaian idiom. This was to elicit responses that reflect African effect and milieu, and can give a true representative of how Ghanaian students have preference for their own sedative and stimulative music and its effect or relationship on memory.

In this study, the music stimulus used was recorded. The idea behind the choice of a recorded music for the listening activity was to enable the

respondent to focus on the music and avoid being disrupted by the activity of performers if it were live performance. This will enable the respondent to totally engage in active listening and make choices of the stimuli preferred and also help in memory recall.

This method was also adopted because it was less expensive to use recorded music other than real performance of the music. Furthermore, it was easier to do data collection with the recorded music than it was a live performance.

To support the need of selecting stimulus materials, for example in a listening activity, Boyle and Radocy (1987) suggest that one must provide the bases for planning instructional activities for generating stimulus. This action helps in assessing a group's attitude towards a single object or event. It is important to note that in selecting music samples, it will be necessary to study and to establish some level of knowledge and confidence of participant's various behavioural responses towards the various sample, to be sure of selecting appropriate materials that is useful and will give a useful response and produce high confident level which will provide real attitudinal data for academic purposes and activities.

As part of the researcher's deliberate attempt to select the specific music stimuli, certain steps were taken; the researcher occasionally observes the respondents (the students) musical preferences through asking of some probing questions on the type of music they will like to listen to if they want to relax, or a song that will empower them to do a hard work like in sports. They were to choose songs in the African idiom and a song that is common in their communities. This exercise was carried out within a period of three month. It was possible within this period because the researcher is a teacher in the

school where the research is being conducted. The three-month period was used to see the repeated frequency of the choice of a particular music. Out of this prop, the researcher came up with a myriad of list of songs that comprised both sedative and stimulative music. After these selections, the researcher further subjected the selected songs to further authentication by a group of professional choirmasters at their annual conference of the Global Evangelical Church in Accra held on the 6th of August 2023. Sixty-five choirmasters were at the conference and took part in the final selection of ten each of sedative and stimulative songs.

The table below shows the list of the selected stimuli for the study;

Table 6

List of Sedative Music Used in the Study

<u>COLLECTIONS/COMPOSER</u>	<u>COMPOSITION</u>
Akwaboah	Hye Me Bo
Pau Adrah	Strings for prayers
Nii Kpakpo	Ga worship vol. 2
Collections	Strings for Worship
Collections	Ghana worship songs
Elder Mireku	Holy Ghost Worship
Joe Mettle	Ga Medley
Samuel Grippman	Praise songs
Rama Antwi	Ga Worship Medley
Mawuena Kissward	Twí worship song

Table 7

List of Stimulative Music Used in the Study

<u>COMPOSER/PERFORMER</u>	<u>COMPOSITION</u>
Abena Gyamfua	Akwankwaa Hiani
Super international Band	Aklowa
Daddy Lumba	Nea Woho Betorwo
Amakye Dede	Sansankroma
Mary Agyapong	Ade Dede
Adofo J.A	Nya asem hwe
K. Ansah	Yenkodi
Dr. Paa Bobo	Enye Mania
Antwi ne Antwi	Akwankwaa Hiani
Daasebre Gyamenah	Saa na etee

Before entering the field

The data collection process took place after my ethical clearance letter from the University of Cape Coast Institution Review Board (UCCIRB), was received. This letter serves as a permission and requirement from UCCIRB supporting the conduction and collection of data in the derby Avenue basic school.

Having clarified and set the research topic into perspective, the researcher ensured that the various instruments for the data collection were acquired and well organised, thus, the questionnaires, a laptop, and a sound speaker. A lab that can take about fifty-five students was arranged with the school authorities, and the questionnaires were printed out for use by the respondents. Consent letters were also sent to parents of the respondents to

allow their wards to participate in the exercise. The researcher also ensured that, all ethical issues including respect for subjects, not interfering with the responses of subjects, not making promises of rewards for participants, reporting any unusual cases, and ensuring the privacy and confidentiality of participants were to be strictly observed.

Another important condition that was carefully observed was the vulnerability of the respondents. Since the respondents were minors (basic school children), a comprehensive ethical procedure was highly observed and was very paramount to the study. Many protocols were strictly observed at this stage of the data collection process, including getting a convenient time for the exercise which will not interfere the normal studies of the respondents, and also will not delay them unnecessarily before getting home.

Data use, store and management

Data collected were used for the study after which it was stored on a computer which will be saved for a short while after the study. After the research was conducted, an effective data management was ensured to protect the integrity, security, and usability of collected data. The process starts with data cleaning and validation, where errors, inconsistencies, and missing information were corrected, and any transformations were documented. Accurate data analysis documentation was essentially ensured to maintain clear records of methods and tools used for reproducibility. Proper storage followed, with datasets securely saved in password-protected on encrypted systems, backed up in multiple secure locations to prevent data loss. Anonymisation of personally identifiable information (PII) was also critical before sharing or archiving data.

Ethical data sharing involves adhering to consent agreements and utilizing reputable repositories when necessary. Archiving securely for long-term access and organising metadata facilitates future reference. Sensitive data that no longer requires retention was securely destroyed. Throughout the process, ongoing compliance with data protection regulations, such as GDPR, and ethical standards remains essential.

Pilot testing

Before the actual data collection, the researcher undertook a pilot testing in students' preference for music and on memory for music. A pilot test has been defined as an initial investigation purposed to assess feasibility, time, and cost, among others to improve upon the study design preceding the conduct of a complete investigation (Kesler, Sheau, Koovakkattu & Reiss, 2011). In this study, the pilot testing was meant to support the verification of results which were computed and analysed from the data results. The Pilot testing was done on Mondy 21st August 2023, three clear weeks before the actual data collection on the 12th of September 2023.

The pilot study on students' musical preferences and memory recall that was conducted provided valuable insights into the feasibility of the research. It revealed practical challenges such as participant recruitment, task duration, and the overall effectiveness of the study timeline and methods. The feedback from the pilot helped the researcher to refine data collection tools by validating questionnaires, identifying ambiguities, and improving the clarity of memory recall questions. Additionally, observations on participant behaviour highlighted engagement levels, instances of fatigue, or environmental factors affecting music stimulus playback and task performance.

The pilot study also yielded important findings on data quality, such as preliminary recall trends for sedative versus stimulative music, unusual response patterns, and potential variability issues. Evaluating the effectiveness of study procedures, including randomisation and task sequencing, helped the researcher to minimize confounding factors. Ethical concerns emerged, prompting adjustments to privacy protocols and consent forms. Lastly, statistical insights guided sample size decisions and analysis techniques for the main study was considered, ensuring more reliable outcomes.

The field activity

The role of the researcher can best be described as a ‘vertical monolist’, and that has been addressed by Miles and Huberman (1994). The implication of this is that, the researcher is instrumental and fully involved in every aspect and stage of the research engaged in. This current study is not different as to the role of the researcher. In this study, pertaining field work, the researcher sought the necessary permissions, assembled the needed sampling frames and drew out the sample units.

Since the data collection processes were divided into two subgroups, the JHS children were the first group to have their session. This is because, they are older respondents than the primary session. This procedure was employed to help the researcher develop his research skills in the interaction with the older children before meeting the more vulnerable young ones in the primary school.

The students were given some orientation on how they were to complete questionnaire on their demographic history, [see appendix G]. After all these preliminaries, the researcher in person administered the

questionnaires to the respondents and supervised the response from the students.

The listening section commenced after the questionnaires were distributed to the participants to fill out or respond to the questionnaires, [see appendix F].

After participants had filled out the questionnaires, all the printed copies were collected, counted and arranged for further processing (coding, entry and analysis). Participants were given some refreshment as a gesture of appreciation for accepting to participate in the study.

Authentication

To verify the authenticity of the information provided by the respondents, a number of procedures were used in the study. The first thing the researcher did was to explain to the student what the respondents stood to gain if they honestly answered the questionnaire after establishing the necessary rapport. For example, the researcher made it clear to the students that their memory recall scores will be made known to them as one of the benefits in participating in the exercise. This was to motivate them and also ensure that the participants were as truthful and as scrupulous in answering the questions on the questionnaires sheet as possible as they engaged in the exercises.

In addition, the researcher believes that the instruments that were used in this study had very high validity and reliability high scores. The mode and nature of the instruments used in gathering the data also ensured that, the influence and interference of the researcher on respondents' response to the research questions were minimal and or was put to absolute check.

Finally, data entering on the information provided by the respondents were entered into the SPSS. This was to avoid providing wrong information or wrong data entering which may result in wrong output and feedback. Data entering was double checked by the researcher to help check for consistency and to match data on respondents' sheet to response on data collected.

Representation

According to research, three forms of representation which was also described as pitfalls were identified, these are: a) sampling non- representative informants b) generalizing from non-representative events or activities, and c) drawing inferences from non-representative processes (Miles and Huberman, 1994). Research suggests that, these pitfalls depend on representation in research, therefore, the researcher took a number of steps to ensure adequate representation in this study. To ensure that this rule is well observed, the researcher used a relatively large sample size (one hundred participants) who were selected randomly from the population. This was to meet the demands and be consistent with exploratory research which was also a requirement for making inferences, no matter how elusive the population might be. Researchers have observed that, large sample sizes are more likely to be representative of the population from which they are drawn (Glenberg, 1988/2010).

Finally, the researcher took into account, a number of meticulousness in making the necessary inferences. The procedures for testing the various hypothesis as guided by scholars (Glenberg, 1988; Sarantakos, 2005; Opoku, 2004). All the assumptions were carefully checked and fulfilled before the necessary corresponding analysis and inferences were finally made.

Data analysis procedure

Largely, the researcher analysed the data in two major stages. For the first stage, which can also be described as the preliminary analysis stage, the results of the individual variables (preference and memory) on the two stimuli were presented and discussed separately. This was done using statistical tools such as the Chi square, and the independent t test as summaries of the effect of the various variable exhibited by the respondents on one another.

The second stage (the main analysis stage) involved analytical procedures which were aimed at testing the preset hypotheses and answering the research questions. In all, there were four research hypotheses with its corresponding research objectives and questions. The first research question and its corresponding hypotheses was aimed at investigating the difference between students' preference for sedative and stimulative music. The Chi square was used for the analysis. Each research question was addressed after its corresponding hypothesis had been statistically tested, using the hypothesis testing steps prescribed by Glenberg (1988).

The second research question and its correspondent hypotheses were analysed using the independent t test. It sought to examine the significant difference in memory for music between students who prefer sedative music and stimulative music. Based on the outcomes of the hypotheses testing, the research question was addressed in terms of inductive analysis which was the evidence that was gathered from the data and output from the SPSS system. In addition, the deductive analysis (top-down relationships of the outcomes to the available literature and theoretical foundations addressed in chapter two) was also addressed. The researcher's personal interpretations were also stated.

The last four hypotheses were tested using the one sample size t test. They were aimed at addressing the research questions; are there any effect of preference for stimulative music on memory for music; are there any effect of preference for sedative music on memory for music; what is the effect of preference for sedative music on memory for sedative music; and also find out the effect of preference for stimulative music on memory for sedative music. Inferences and conclusions and presentations of the findings were made on each of the hypotheses. Computation was made for the two variables for the hypothesis that required testing by showing a relationship between the variables by computing Pearson's mean differences the two variables and comparing the resultant scores (p) to the critical values obtained at a .05 alpha level. This was to test if there were any statistically significant outcomes that could lead to the rejection of, or acceptance of the null hypothesis in each case.

In summary, the quantitative analytical tools were the sole tools used in this study. Even though the research hypotheses were mostly tested using various statistical tools and mode of enquiry, the research questions were also addressed descriptively.

Unit of analysis

The unit of analysis in research according to researchers refers to the specific entity or element that researchers are studying and collecting data about in their study (Vaismoradi, Turunen & Bondas, 2013). In effect, it is the primary focus of investigation and the level at which data is gathered, analysed, and interpreted. It should be noted that, the choice of unit of analysis

in any research is crucial because it is the focus, and it determines the scope and depth of the study's findings and conclusions.

Scholars have identified that, in various fields and research contexts, the unit of analysis can vary and may include the following; individuals, groups, events, texts, time periods, artifacts, and geographical areas. It is therefore important to note that, the unit of analysis should be carefully chosen to align with the research question, objectives, and methodology of the study. The selection of unit of analysis affects and dictates how data is collected, aggregated, and interpreted. Scholars has therefore suggested that, researchers must ensure that their findings and conclusions are valid and relevant to the level of analysis they have chosen. In the current study, the unit of analysis is the individual students' preference and memory for music. The researcher has therefore collected data on the musical preferences of individual students and their memory for sedative and stimulative music. Each student's preferences and memory performance has been treated as a separate data point for analysis.

Control and basic protocol

In a non-experimental design, control usually refers to holding constant the level of a particular variable, thus, the selection of subjects or conditions so their characteristics remain at a constant level or value (Spector, 1981).

Before the actual listening session are carried out, certain basic principles and protocols were observed, some of these controls include the following; a well-ventilated and noiseless laboratory that was suitable for listening. Scholars report that this kind of data collection was usually conducted in the laboratory

(De Vos, Kroesen, Emkes, & Debener, 2014); the duration for the listening session was constant for the two times that data was collected due to the size of the lab which cannot take more than fifty-five students; hence the sample was divided into two of fifty each session; the time for the data collection was also controlled, thus, the data was collected each time after 3:00 o'clock pm after school has closed. This was to control any extra noise that may affect the listening session; the researcher ensured that the conditions in the room where the data is being collected remains the same, thus, the sitting arrangement, and the positioning of the data collection instrument remains the same for each session; instruments/materials used for the collection of the data remains the same for the sessions and the respondents.

Chapter summary

The chapter opens up with the introduction of the various methods that were used in carrying out the study. It discussed the general procedures that were followed and or designed to be followed in the entire study which included the description of the gamut of major activities in the whole research process. The following were the content of the chapter that represents the procedures and methods that were used to collect and analysed the data for the study; the research approaches such as research design, statistical design, population, research instrument which was used for data collection, sampling and sampling techniques, data setup and computation. Other things which were also considered in this chapter include how the analyses of the data were conducted. It also included the role played by the researcher in the entire research process.

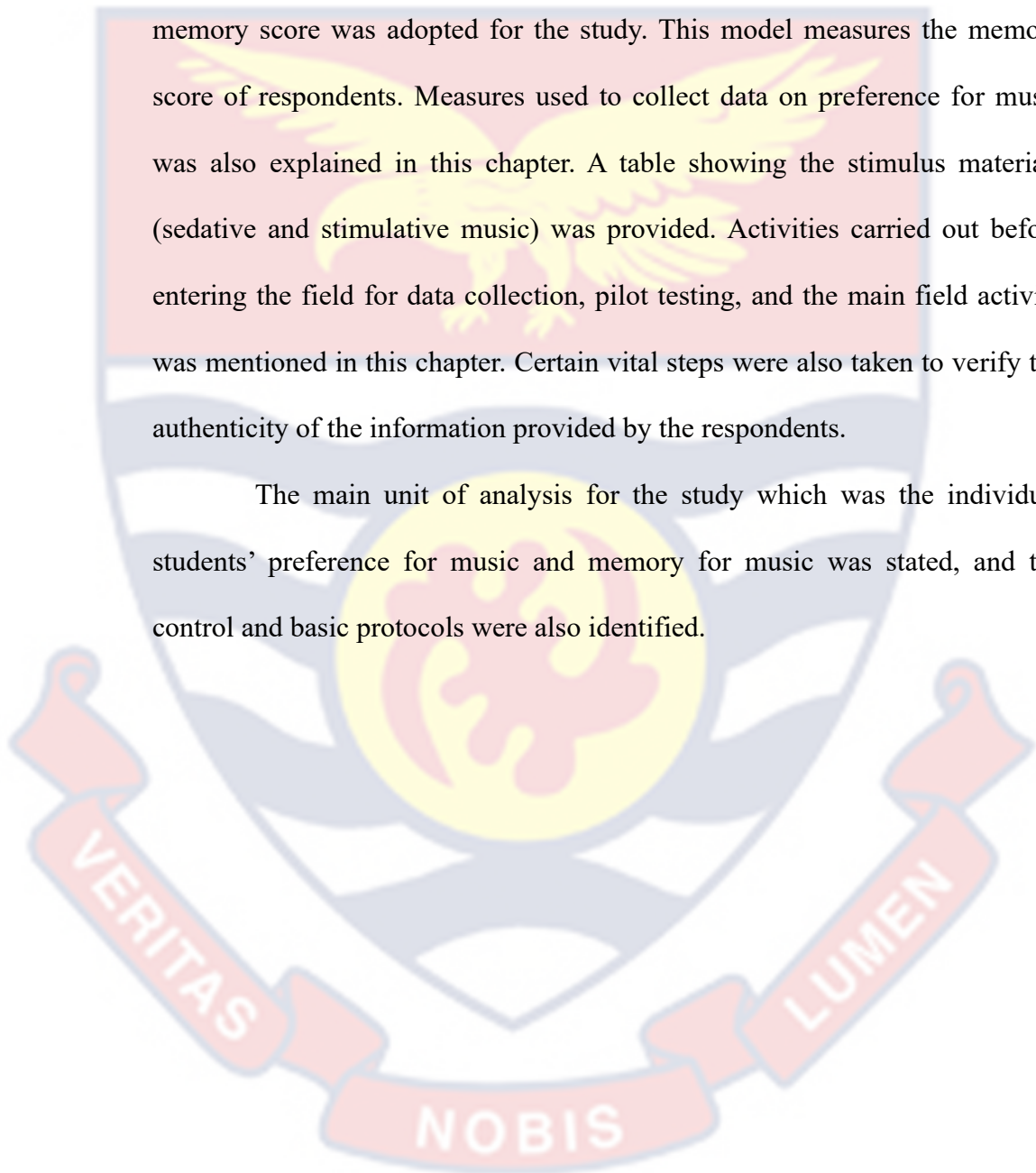
The mode of enquiry for the study was purely quantitative. This mode was adopted as a result of the numerical nature of the data that was collected for the study, obtained from pupils' musical preference responses and memory recall. The design of the study falls under non-experimental studies or research which aims at finding out the possibility of occurrence of a variable, or the possibility of a relationship among specified variables; based on hypothesis, informed hunches or educational guesses. Other experimental designs that have been reviewed in the study were the randomised experimental design, quasi-experimental design, natural experimental design, and correlational study design. In addition to the above-mentioned list of designs that have been reviewed, the ex post facto design which is non-experimental design was also reviewed and was chosen for the study.

The model that was adopted for the study was the Field's model for conducting quantitative research. The model provides that, the kind of data to be collected is the first most important aspect of research.

Data was analysed using the Chi square, the Cohen's d test, and the independent t - test. The area of study is the Derby Avenue Roman Catholic basic school located at the heart of Accra in the greater Accra region of Ghana with a population of 1020 students. The sampling technique used for the sampling were cluster sampling and simple random sampling. The rules and procedures for hypotheses testing in statistics were also stated as was established by Glenberg and Andrzejewski (2008). The main data collection instrument used in this study is questionnaires based on students' preference and memory recall which were processed using SPSS software.

The derivation technique of recognition research that were mentioned in the study and used was the “confidence rating”. The confidence rating that the researcher used was the accuracy, which refers to subject’s assessment of the accuracy of his or her own responses. Kauffman and Carlsen theory on memory score was adopted for the study. This model measures the memory score of respondents. Measures used to collect data on preference for music was also explained in this chapter. A table showing the stimulus materials (sedative and stimulative music) was provided. Activities carried out before entering the field for data collection, pilot testing, and the main field activity was mentioned in this chapter. Certain vital steps were also taken to verify the authenticity of the information provided by the respondents.

The main unit of analysis for the study which was the individual students’ preference for music and memory for music was stated, and the control and basic protocols were also identified.



CHAPTER FOUR

PRESENTATION, ANALYSIS AND DISCUSSION OF DATA

Introduction

Chapter Four presents the analyses of the data collected, and it then continues with two other sections covering the discussion of the results that emerged from the testing of the hypotheses generated for the study. The first section reports on the results emerging from the analysis of the data by the use of four statistical methods: the Chi square, the Cohen's d test, the independent t-test, and the one sample t-test. While the Cohen's d test was used to test the veracity and the effect size of the results, the Chi square was used to analyse the hypothesis one which is a categorical data for interpretation. The hypothesis one was meant to investigate if there is any difference between students' preference for sedative and stimulative music, and that was tested with the Chi square statistical tool. The independent sample t - test was used to test the hypotheses two to see if there is any significant difference in memory for music between students who prefer sedative music and stimulative music. The independent sample t - test was again employed to test for the hypotheses three and four; the effect of preference for stimulative music on memory for music, the effect of preference for sedative music on memory for music, effect of preference for sedative music on memory for sedative music, and the effect of preference for stimulative music on memory for stimulative music. This chapter concludes with a summary of the results obtained from the analysis in the study.

Analysis of Data in Respect to Hypothesis One

The central aim of this hypothesis was to examine students' musical preferences, and their inclination toward either stimulative or sedative music. The researcher sought to know whether there was a significant difference in the percentage of students who preferred stimulative music compared to those who preferred sedative music.

Assumptions for Testing Hypothesis One

The hypotheses generated for the study were tested following the six steps of hypothesis testing proposed by Glenberg and Andrzejewski, (2008). According to scholars, in all inferential procedures, there is the need that the data being analysed meet certain requirements. These requirements are called assumptions (Glenberg & Andrzejewski, 2008).

The first step of Glenberg's proposal begins with these "assumptions". They noted that the following areas should be considered: assumptions about the population from which the sample is drawn, assumptions about the sample itself, and assumptions about the measurement scale employed in the data collection process (Glenberg and Andrzejewski, 2008). The population assumption states that the population from which the sample is drawn should be normally distributed or the sample size should be large. The sampling assumption should be obtained using the independent (within-sample) random sampling. Finally, the data assumption should be measured using interval or ratio scale. In this study, the population from which the sample size was taken from was normally distributed, over seven hundred students and a sample size of hundred students.

The second step was to generate the null and the alternative hypothesis and these are as follows:

H₀: There is no difference between students' preference for sedative and stimulative music.

H₁: There is difference between students' preference for stimulative and sedative music.

Step three of the hypothesis testing present the sampling distribution of the test statistic. A test statistic is a specific value computed from a sample (making it a statistic) that is used in deciding between the null and the alternative hypothesis. The formula for computing the test statistic for hypothesis one in this study is as follows in the below Table 8.

The Chi square was used to analyse the hypothesis, and the formular for Chi square is stated in the diagram below.

Table 8 Showing the formular for calculating the Chi Square

Formula for Chi square	but $f_e =$ (Column total) by (row total)/N	$df = (R-1) (C-1)$	where f_o is the observed relative frequency, f_e is the test statistic, N is the population, df =degree of freedom, R= row, and C = column
$\chi^2 = \sum \frac{(f_o - f_e)^2}{f_e}$			

The fourth step requires the setting of the significance level and the formulation of the decision rule. A significance level 0.05 ($\alpha = .05$) is appropriate for this study.

The decision rule is as follows: Reject H_0 if $\chi^2 \geq 3.84$ or Reject H_0 if p -value ≤ 0.05

In step five, the test statistic is computed as follows:

The table below shows the frequency distribution of preference for sedative and stimulative music.

Table 9 Preference for stimulative and sedative music

	Frequency	Percent	Valid Percent	Cumm. percent
Stimulative	62	62.00	62.00	62.00
Sedative	38	38.00	38.00	100.00
Total	100	100.00	100.00	

The descriptive statistics generated in response to the testing of hypothesis one is displayed in Table 9. It is worth mentioning that, hundred responses were made and hundred responses was received, and in this case, resulting to the same percentage and frequency. On that basis, in the face of the table 9 above, 62% of the respondents preferred stimulative music to 38% of respondents that preferred sedative music. The results of the Chi square analysis indicated that, a value of 104.84 ($\chi^2 = 104.84$) as against the rejection value in a (χ^2) of 3.84 which was set, hence the value of ($\chi^2 = 104.84$) is in the rejection region and therefore the null hypothesis is rejected OR as against the p-value of 0.05 which was set, the value 104.81 is in the rejection region and therefore the null hypothesis is rejected. see Table 10 below.

Table 10 Shows the result from the computed value of the Chi square.

f_o	f_e	$(f_o - f_e)$	$(f_o - f_e)^2$	$(f_o - f_e)^2 / N$
38	100	-62	3721	37.21
62	100	-38	1521	15.21
62	100	-38	1521	15.21
38	100	-62	3721	<u>37.21</u>
				104.84

Step six provides the decision and conclusion. Because the value of the test statistic (104.84) is in the rejection region, the null hypothesis is rejected. The researcher concluded that the relative frequency distributions of the preference for the two types of music differs. Judging from Table 10, the analysis revealed a significance difference in students' musical preferences. A higher percentage of the students preferred stimulative music (62%) compared to sedative music (38%).

Analysis of Data in Respect to Hypothesis Two

The pinnacle intention of this hypothesis was to explore whether students' musical preferences, explicitly their preference for sedative or stimulative music, exerted a discernible influence on their memory for music. The result from the analysis of data which was obtained was to examine whether there was any difference in memory for music between students who preferred sedative music and stimulative music. The hypothesis two was tested using the independent t-test model, also known as the two-sample t-test. It is a parametric test. According to Glenberg and Andrzejewski (2008), two (or more) random samples are independent when the scores included in one random sample are unrelated to the scores included in the other random sample. It is used for comparing two independent groups and determining whether the observed difference in means is statistically significant from each other or if it could have occurred by random chance.

Testing Hypothesis Two

Again, this hypothesis generated for the study was tested following the six steps of hypothesis testing propose by (Glenberg and Andrzejewski, 2008). According to scholars, in all inferential procedures, there is the need that the

data that was analysed met certain requirements. It has been stated in the introductory sections of the hypotheses testing that, these requirements are fully met for an accurate result to be obtained.

The first step for testing the hypothesis has been made in the earlier pages already as stated by (Glemberg and Andrzejewski, 2008). This study has satisfied these assumptions.

The second step is to generate the null and the alternative hypotheses and these are as follows:

H₀: There is no difference in memory for music between students who prefer sedative music and stimulative music, and the **H₁:** There is a difference in memory for music between students who prefer sedative music and stimulative music.

Step three of the hypothesis testing signifies the sampling distribution of the test statistic. A test statistic is a specific value computed from a sample (making it a statistic) that is used in deciding between the null and the alternative hypothesis.

The fourth step requires the setting of the significance level and the formulation of the decision rule. A significance level of 0.05, thus, ($\alpha = .05$) was appropriate for this study.

The decision rule is as follows: to reject the null hypothesis H_0 if p -value $\leq$ 0.05.

Step five deals with computing for the test statistic. The results of the test statistics are presented in Table 11 which shows the descriptive statistics for memory for music to summarise the data which was gathered to test the null hypothesis:

Table 11 Descriptive statistics for memory for music.

Preference	N	Mean	Std. Deviation	Std. Error Mean
Sedative	38	2.58	5.72	.929
Stimulative	62	7.40	4.18	.530

From the result presented in the Table 11 above, it is observed that the number of students that preferred sedative music is 38 compared to 62 for those who preferred stimulative music (representing 38% and 62% respectively). The mean of memory for music of students who preferred sedative music is $M = 2.58$, and for students who preferred stimulative music is $M = 7.40$. The standard deviation for both sedative and stimulative music are 5.78 and 4.18 respectively, resulting to a standard deviation of 0.93 for sedative music and 0.53 for stimulative music. It is noted that the mean difference between memory for sedative and stimulative music is $u = 4.82$.

In Table 12 below, the t value for the equal variance assumed is -4.86, and the not assumed equal variance is -4.51 with a $df = 98$. The p -value for both music stimulus is 0.001 with a mean difference of -4.82. Furthermore to the above, it is again noted that, the independent t - test report for the two memory scores of a p -value of < 0.001 . This is an indication that there is enough evidence to reject the null. The two memory score Means are significantly different.

Table 12 Inferential statistics for students' memory for sedative and stimulative music

Diff.	t	df	Sig. (2-tailed)	Mean diff	St. Err
Equal var. assumed	-4.86	98	.001	-4.82	.99
Equal var. not assumed	-4.51	61.16	.001	-4.82	1.07

The researcher further conducted and computed the Cohen's d test to determine the effect size of the difference. An Effect size is the degree to which the phenomenon is present in the population which estimates the degree to which the null hypothesis is false or rejected (Middel & Van Sonderen, 2002). A Cohen's d test for the independent t - test was therefore computed. The values of the effect size for rating are rated at 2, 5 and 8 to represent low, medium or moderate, and high respectively. The Cohen's d test is thus computed as:

$$\text{Cohen's } d = \frac{\text{Mean difference}}{\text{Standard deviation difference}}$$

$$\text{Therefore, the Cohen's } d = \frac{4.82}{1.55}$$

$$\text{Giving Cohen's } d = \underline{\underline{3.12}}$$

In summary, the computation from the Cohen's d test indicated that, there is a medium effect size (rating between 2 and 5). This implies that the magnitude of the significant difference that was computed for the two memory scores was moderate.

The sixth step as proposed by Galesburg et al. (2008) is the decision rule and conclusion. According to the decision rule, the null hypothesis should be rejected when the p-value was less than an alpha of 0.05. In this analysis,

the analysed data has generated enough evidence to reject the null hypothesis with $p = 0.001$. The researcher concluded that, the null hypothesis which states that, there is no significant difference in memory for music between students who prefer sedative music and those who preferred stimulative music is rejected. In effect, the alternate hypothesis which says that “there is a significant difference in memory for music between students who prefer sedative music and stimulative music prevails. The analysis revealed a significant difference in memory performance between the two groups. Students who preferred stimulative music demonstrated significantly higher memory scores. This outcome underscores that individual with preference for stimulative music exhibited superior memory retention for musical elements in contrast to their counterparts who favoured sedative music. This is an indication that, the recall memory of students who preferred sedative music and those who preferred stimulative music at any point in time are not the same, thus, they have different memory abilities.

Testing Hypothesis Three

The principal aim of hypothesis three was to compare students who prefer stimulative music and those who prefer sedative music on memory for stimulative music. This hypothesis is tested using the independent t-test, also known as the two-sample t-test. It is a statistical method used to determine if there is a significant difference between the means of two independent (unrelated) groups. It is particularly useful for comparing the means of two groups when the researcher wants to assess whether the observed differences are statistically significant or if they could have occurred by random chance. It is important to note that the independent t-test is a parametric test, which

implies that it assumes a normal distribution of data. According to scholars, the assumptions should include; (1) the groups being compared in a t-test study should be independent, meaning the data points in one group do not affect the data points in the other group, (2) the data within each group should be approximately normally distributed, (3) the variances of the two groups should be roughly equal (homogeneity of variances), (4) The data should be collected and sampled randomly, (5) determine the degrees of freedom for the t-distribution, which is based on the sample sizes of both groups, (6) look up for the critical t-value in a t-table or use a statistical software package to find the p-value associated with the calculated t-statistic. In this study, SPSS was the software used to find the p-value, (the p-value was set at 0.05), (7) compare the calculated t-statistic to the critical t-value or evaluate the p-value. If the t-statistic is greater than the critical t-value or the p-value is less than a chosen significance level (0.05), the researcher can conclude that there is a significant difference between the group means, therefore, the null hypothesis should be rejected.

Hypothesis three that was tested states that, **H₀**: There is no significant difference in memory for stimulative music between students who preferred stimulative music and those who preferred sedative music.

H₁: There is a significant difference in memory for stimulative music between students who prefer stimulative music and those who prefer sedative music on memory for stimulative music.

The decision rule is as follows: to reject the null hypothesis for the nondirectional alternative,

Reject H₀ if $t \geq t_{\alpha/2}$ or if $t \leq -t_{\alpha/2}$ or Reject H₀ if p-value $< \alpha$.

The descriptive statistics of the data obtained for testing hypothesis 3 is presented in Table 13

Table 13 Descriptive statistics for students who prefer stimulative music and those who prefer sedative music on memory for stimulative music.

	Preference	N	Mean	Std. Deviation	Std. Error
Stimulative Score	Stimulative	62	3.58	3.47	0.44
	Sedative	38	3.80	0.50	0.69

From the Table 13 above, it is observed that, there is a marginal difference in mean for memory for stimulative music between sedative and stimulative music, thus, the mean (M) for stimulative music was 3.58 compared to sedative music 3.80 for respondents who preferred sedative music, resulting in a mean difference of $u = 3.08$. The standard deviation for the two different music stimulus was 3.47 for stimulative music. The standard error mean was 0.44 and 0.69 for stimulative and sedative music respectively.

Table 14 Inferential statistics for students who prefer stimulative music and those who prefer sedative music on memory for stimulative music.

		t	df	Sig (2-tailed)	Mean difference	Std. Error Difference
Stimulative	Equ. Var. assume	3.94	98	0.001	3.08	0.78
	Equ. Var. not assume	3.75	66.48	0.001	3.08	0.82

The results of the test statistic are presented in Table 14. From the table, it could be observed that, $t = 3.94$, $df = 98$, $p = 0.001$, the mean difference $M = 3.08$, and the standard deviation $SD = 0.78$.

The summary of the result indicates that, the p -value was less than $\alpha = 0.05$, hence the null hypothesis was rejected.

This hypothesis seeks to assess whether an individual's preference for a specific type of stimulative music influences their ability to remember and recall elements of that music. The result of the study therefore indicates that there was a significant difference in memory for sedative music between students who preferred stimulative music and those who preferred sedative music. It can be concluded from the results that, personal musical preferences may affect memory, contributing to a deeper understanding of the relationship between music preference and memory processes in a stimulative music context. In addition, the study suggests that, a student's preference for either stimulative or sedative music can have a significant impact on their memory for music, particularly when recalling stimulative music.

For educational practitioners, knowledge in the choices for sedative or stimulative music will help to direct them on the choice of the type of stimulative or sedative music that a music teacher or professional can use in a lesson especially in music lesson or learning sessions which depend on memory recall and retention. Music educators should consider students' music preferences when designing learning environments. It is also important for educational professionals to take recognisance of individual differences in music preferences, encourage a more personalised approach to teaching and

learning, and allowing students to select music that suits their preferences and will aid their memory and concentration.

In spite of these findings and suggestions, further studies needed to be conducted to; (1) investigate whether the specific genre of stimulative or sedative music has a differential impact on memory. Some genres within each category may have more pronounced effects, (2) examine the long-term effects of music preference on memory, and find out how it does influence retention and recall over time, (3) explore the cognitive mechanisms behind these observed differences and to find out what aspects of stimulative or sedative music influence memory, and how does this occur, (4) investigate how individual differences, such as personality traits, cognitive styles, or musical background, interact with music preference and memory, and finally, (5) conduct other studies that will focus on practical applications in educational or professional settings, and delve into finding out how best music educators and professionals can leverage on these findings to enhance learning and performance of students especially music students.

Testing Hypothesis Four

Hypothesis four is also aimed at comparing students who prefer stimulative music and those who prefer sedative music on memory for sedative music. This hypothesis was also tested using the independent t-test, also known as two-sample t-test. This testing was established on all the principles protocols as stated in the hypothesis three.

The hypothesis four was H_0 : There is no significant difference between students who prefer stimulative music and those who prefer sedative music on memory for sedative music, and the alternative (H_1 ;) states that, there is a

significant difference between students who prefer stimulative music and those who prefer sedative music on memory for sedative music. This hypothesis was meant to answer the research question, “What is the difference between students who prefer stimulative music and those who prefer sedative music on memory for sedative music.”

The decision rule was set as follows: to reject the null hypothesis for the nondirectional alternative,

Reject H_0 if $t \geq t_{\alpha/2}$ or if $t \leq -t_{\alpha/2}$ or Reject H_0 if $p\text{-value} < \alpha$.

Table 15 Descriptive statistics for students who prefer stimulative music and those who prefer sedative music on memory for sedative music.

	Preference	N	Mean	Std. Deviation	Std. Error
Score	Stimulative	62	3.74	2.82	0.36
	Sedative	38	2.13	5.53	0.57

From the Table 15, it was observed that, there was a difference in mean value of memory for music between respondents who preferred sedative and those who preferred stimulative music. The mean (M) for respondents who preferred stimulative music was 3.74 compared to those who preferred sedative music of 2.13, resulting in a mean difference of 1.61. The standard deviation for stimulative music was 2.82 and sedative music having 5.53 standard deviation. The standard error mean was 0.358 and 0.57 for stimulative and sedative music respectively.

Table 16 Inferential statistics for students who preferred stimulative music and those who preferred sedative music on memory for sedative music.

		t	df	Sig (2-tail)	Mean Diff	Std. Error Diff.
Sedative Score	Equ. Varr. assume	2.52	98	0.01	1.61	0.64
	Equi. Varr. Not assume	2.38	65.551	0.02	1.61	0.68

The Table 16 presents reports on the results of the inferential statistic. The table shows a test statistic of $t = 2.52$, $df = 98$, $p = 0.01$, the mean difference $M = 1.61$, and the standard deviation $SD = 0.64$.

The result from Table 16 shows that the p-value is less than the $\alpha = 0.05$, indicating that the null hypothesis should be rejected, taking into consideration the decision rule. Therefore, the alternative hypothesis which states that there is a significant difference between students who preferred stimulative music and those who preferred sedative music on memory for sedative music is not rejected. It is important to note that, though, it appears that the stimulative preference group outperform the sedative one, also here on the sedative music recall.

The result from this hypothesis in the study provide a more nuanced and comprehensive understanding of the relationship between music preferences and memory, potentially leading to practical applications in education, such as in students lesson or personal learning, psychology, and cognitive science. However, there are certain areas that needs future research. Areas that can be covered through further studies may include the following; (1) to explore the underlying mechanisms that explain how and why music preferences affect

memory, probing into questions such as, does the preference for a particular type of music cause differences in memory, or are there other variables at play? (2) investigate whether the impact of music preferences on memory is specific to certain types of memory or cognitive domains. For instance, which of the memory terms does it affect, short-term memory, long-term memory, or working memory differently? Does it have distinct effects on verbal memory, visual memory, or procedural memory? Understanding these distinctions can provide a more comprehensive picture of the phenomenon. (3) the researcher can also focus on examining the role of individual differences. It is likely that not all students who prefer stimulative music may exhibit the same memory patterns, and the same goes for those who preferred sedative music. The study could delve into factors such as personality, cognitive styles, and background experiences that might moderate or mediate the relationship between music preference and memory.

Discussion of Results and Findings

The findings and discussion section of this study draws on the results from the findings, and the evaluation of the findings in the context of the extant literature. This section serves as a link between data results and findings, and the conclusions that are drawn from the data. The findings of the study in general have shown that students' preference and memory for music were related in most of the findings. In this instance, the relationship between preference for music and memory for music have reported significant differences.

Discussion of the Results and Findings with Respect to Hypothesis One

The testing of Hypothesis One, which aimed to discern the distinction in students' inclinations toward sedative and stimulative music, yielded compelling results. The finding sought to address the first research question: "What differences exist between students' preferences for sedative and stimulative music?", with its hypothesis stated as: "there is no difference between students' preference for sedative and stimulative music as its null hypothesis, and the alternative hypothesis as "there is difference between students' preference for stimulative and sedative music".

The results from this hypothesis testing indicated a significant disparity in students' musical preferences, with a higher percentage preferring stimulative music over sedative music. This finding contributes to our understanding of the prevalence of differences among students when it comes to musical preference.

Even though the choice of music for music educators and classroom teachers to support music teaching and learning can vary depending on the goals, age group, and level of students, as well as the specific curriculum and resources available, an understanding of the music type and stimulus that will yield a positive result in terms of what the teacher wants to achieve will support this teaching and learning endeavour. This can be stimulative or sedative type of music coming from folk and traditional music, contemporary and popular music, original student compositions and many more.

One very important observation made by the researcher was the potential influence of using local and traditional Ghanaian music as the stimulus for the study which may affect the results. In addition, the familiarity

students had with these musical types, coupled with the intricate rhythms in stimulative compositions, might have contributed to the substantial number of students preferring stimulative music. The demographic data from the study revealed that a majority of students engage with music regularly, whether at home, through various media channels, or during church services. This consistent exposure has equipped them with a discerning musical ear, influencing their preferences. It is however not very clear whether students were exposed to sedative or otherwise stimulative music. However, the data indicated preference for stimulative music more than sedative music, giving some indication of students turning to stimulative music more than sedative music.

The juxtaposition of these findings with established theories on music preference, such as Zajonc's (1968) proposition linking preference to exposure and prior experiences, lends additional support to the diverse ways in which students choose between stimulative and sedative music. It aligns with the idea that musical preference is a product of familiarity and exposure to specific stimuli, as outlined in the literature review. This familiarity, exposure which leads to preference as its product is in line with theories proposed by Hargreave, Tversky, and Kahneman (Hargreave's U-curve; 2001) and the anchor and adjustment heuristic theory (Tversky & Kahneman, 1974). Together, the findings (a disparity in students' musical preferences) contribute to a more nuanced understanding of how exposure, familiarity, and cultural context shape students' preferences for sedative and stimulative music. These variables in effect inform the study that, when basic students are made to listen to varieties of music or are made to have some lessons as a way of exposure to

music, it will make them make better choices for their own activities if they are provided with a myriad of music stimulus, for a better result to be achieved.

Although the large body of extant literature concerning preference for music has provided many insights into this important aspect of students' education, for example, choice of the type of music a class teacher will use as a starter for a lesson, (Simmons, Graham, & Thomas 2015; Vrieling, Stijnen & Bastiaens 2018) many questions remain unanswered. Further research is needed to build upon these findings by exploring the underlying reasons for these preferences and their potential effects on various aspects of student life and education in order to continue to offer the classroom teachers and music educators the best ways to enable students appreciate and listen more to music of their choice.

Discussion of the Results and Findings with Respect to Hypothesis Two

The study sought to answer the second research question, "What is the difference in memory for music between students who prefer sedative music and stimulative music, and also to address the research objective as follows: " To examine the significant difference in memory for music between students who prefer sedative music and stimulative music. The hypothesis that was tested was as follows: **H₀**: There is no significant difference in memory for music between students who prefer sedative music and stimulative music
H₁: There is a significant difference in memory for music between students who prefer sedative music and stimulative music.

The results and findings on students' memory for sedative and stimulative gave compelling evidence supporting the researcher's alternative

hypothesis that students' musical preferences, specifically their choice between sedative and stimulative music, can significantly influence their memory for music. The finding has addressed the research question and has concluded that there are differences in memory for music between students who preferred sedative music and stimulative music. However, it was observed that students who preferred stimulative music performed better in memory score than those who preferred sedative music. This finding supports the literature as proposed by Hodges (1980). Hodges states in his comprehensive review on the physiological response to music and indicated that stimulative and sedative music elicit different effects. The outcomes which provide that students' musical preferences, specifically their choice between sedative and stimulative music, can significantly influence their memory for music aligns with existing literature by Boyle (1982) who conducted a study on 145 university students' verbal descriptions of excerpts of stimulative and sedative music, which revealed differential response to the two types of music. The result from his study shows that, the mean difference in rating for memory for the two types of music for each pair of stimuli was significant. Result from the current study support the theory that, affective response to music is related to the activation and energising characteristics of the musical stimulus as stated in the literature (Imbir, & Gołab, 2017). The literature again stated that sedative music which is often characterised with soothing and calming qualities, may facilitate an enhanced cognitive processing and, as a consequence, improved memory retention. This finding is relevant in music education especially in our basic schools in Ghana in the sense that, it is an indication for educational practitioners that, the two musical genres when applied on students will not

yield the same result. Each musical stimulus should be carefully selected to give the desired result, hence educators especially music teachers should be careful in selecting their stimulus for their practical lessons.

The result indicated that students performed better in memory for music in stimulative music than in sedative music (7.40 to 2.58) with a mean difference of 4.82. The Cohen's *d* test also measured an effect size of $d = 3.12$ which represents a moderate effect. This mean that stimulative music has a bigger effect on memory compared to sedative music. In a practical educational perspective, the findings bear significance for music educators and instructional designers in the view that, it will help them tailored their educational materials in reference to the kind of music stimulus to be incorporated into their music practical activities that aligns with students' preferences, particularly in relation to memory. in the classroom for instance, educators can use stimulative music as a starter for a lesson that demand memory. This support the literature that, the role of music in education and how it affects memory and learning outcomes is a subject of ongoing research and debate. Music can play various roles in education, and its impact on memory and learning outcomes can be both positive and significant (Keehl & Melcer, 2019).

In summary, the finding from the study contributes to our understanding of the relationship between music preferences and memory processes and accentuates the possible advantages of bringing into line the educational approaches with students' musical predispositions.

Finally, Dowling and Bartlett (1981) as stated in the literature reviewed, also indicated that, a study of memory for music may also offer opportunities for

music professionals an understanding of the role it plays in the development of musical intellect and recall and of musical experience when one engages in listening to two genres of music. This study is related to Dowling and Barlett's findings in the area of giving lessons in music in the sense that, teachers will choose the kind of music genre that will stimulate students' urge and direct their interest toward the lesson in order to facilitate their memory and recall of the lesson later.

Discussion of the Results and Findings with Respect to Hypothesis Three

Hypothesis three was developed to compare students who prefer stimulative music and those who prefer sedative music on memory for stimulative music and to answer the research question as follows; what is the significant difference between students who prefer stimulative music and those who prefer sedative music on memory for stimulative music? The hypothesis tested was **H₀**: There is no significant difference between students who prefer stimulative music and those who prefer sedative music on memory for stimulative music.

H₁: There is a significant difference between students who prefer stimulative music and those who prefer sedative music on memory for stimulative music.

The findings of the current study provide empirical support for the hypothesis that there is a significant difference between students who prefer stimulative music and those who prefer sedative music on memory for stimulative music, and as indicated earlier, the group of students who preferred stimulative music performed better in memory for music.

This goes to confirm the literature that, stimulative music which is often characterized by its energetic and emotionally charged qualities, may contribute to increased cognitive processing and, consequently, improved memory retention (Garrido & Schubert, 2011).

The implications of the findings from the current study are important and noteworthy, particularly in the education settings. Students' preference can serve as a guide to instructional designers which should be considered when designing academic activities of especially music students, so that their programs will align with students' preferences for music to enhance memory retention when teaching music-related content. For example, students can be asked to select the kind of music that can be used as a starter, or a particular song that are their preference if a teacher wants to teach a new topic that demands cognitive abilities. Again, research in this area can deepen students' knowledge and refine practical applications for educators and psychologists alike.

Discussion of the Results and Findings with Respect to Hypothesis Four

The research question that was addressed which serve as the basis for hypothesis four was, "what is the difference between students who prefer stimulative music and those who prefer sedative music on memory for sedative music." The hypothesis four that was tested states that, H_0 : There is no significant difference between students who prefer stimulative music and those who prefer sedative music on memory for sedative music, and the alternative (H_1) states that, there is a significant difference between students who prefer stimulative music and those who prefer sedative music on memory for sedative music. The results and findings in the study in relation to this

hypothesis provide interesting evidence that supports the hypothesis that, there is a significant difference between students who preferred stimulative music and those who preferred sedative music on memory for sedative music. The result indicated that, the mean for students who preferred sedative music on memory for stimulative music had a mean of 3.58 compared to students who preferred stimulative music on preference for sedative music who had a mean of 3.74. this outcome shows that, those who preferred stimulative music has a higher memory for sedative music than those who preferred sedative music on preference for stimulative music. The result from this hypothesis provides a more nuanced and comprehensive understanding of the relationship between music preferences and memory.

Comparing the memory recall of stimulative music to sedative music, students who preferred sedative music had a lower score or mean value, indicating that, there was enough evidence to shows that, there is a significant difference between students who preferred stimulative music and those who preferred sedative music on memory for sedative music. The stimulative preference group performed better also on the sedative music recall. So, even for music that they prefer, the sedative preference group performed worse than the stimulative preference group.

This outcome aligns with existing literature which emphasised the potential role of emotional and cognitive arousal in memory processes (Simons et.al.,2003). These scholars opine that, stimulative music often arouses and sustains attention. People who prefer such music may have higher levels of alertness and focus, which can benefit memory recall. Preferences for music on the other hand are often influenced by personal and emotional

connections to specific songs or genres (Greasley, Lamont & Sloboda, 2013). Music that resonates with the listener emotionally can enhance memory recall by creating a stronger association with the content being remembered.

Sedative music is often characterized by its soothing and calming qualities, which may facilitate enhanced cognitive processing and, consequently, improved memory retention for musical details (Scherer & Zentner, 2001). The various characteristics of sedative music may lead to the result that people who prefer sedative music perform worse than those who prefer stimulative music on memory recall, even when the music to be recalled was sedative.

From a practical standpoint, these results have implications for educators and instructional designers.

In conclusion, the results and findings have demonstrated that, students' preference for sedative music has apparent and positive effect on their memory for music, and that, they perform better in memory recall. This finding contributes to our understanding of how individual musical preferences can influence memory processes and highlights its potential benefits to be derived for educators seeking to enhance memory retention for students in music-related contents and in education in general.

Summary of results and findings

It is important to note that, curriculum designers need to consider these findings when designing lessons and teaching strategies to leverage the effects of music preference on memory and create more effective and engaging learning experiences for students.

For preference for stimulative and sedative music in the study, it was observed that students showed preference for stimulative music over sedative music. This means that students tended to enjoy and chose music that is more energising and stimulating in nature. On the other hand, the effect of music preference on memory indicated that, a student's preference for either sedative or stimulative music had a discernible impact on their memory, as was seen in the memory recall score (mean) of the two stimuli that, students who preferred stimulative music are far better in memory retention than for those who preferred sedative music. In other words, the choice between sedative and stimulative music by a student will influence their ability to recall.

Another finding was on the effect of music preference on memory for specific musical types, thus, sedative and stimulative music. The study revealed that a student's preference for sedative or stimulative music had an effect on their memory specifically for sedative and stimulative music with a high preference and memory for stimulative music. This suggests that the impact of music preference on memory was not uniform but varied depending on whether the music was sedative or stimulative.

Furthermore, the study found that, there is a significant difference between students who prefer stimulative music and those who prefer sedative music on memory for stimulative music, with a better memory for stimulative music, and in addition, there is a significant difference between students who prefer stimulative music and those who prefer sedative music on memory for sedative music with a better memory for stimulative music.

Finally, memory impact by music type revealed that a student's preference for sedative or stimulative music influenced their memory

specifically for each type. This means that music preference had different effects on memory depending on whether the music was sedative or stimulative in nature.

Stimuli Differences in this Study and other Studies

It is probable that the kind of music adopted as the stimulus in this study have had some effect on the results and findings. In this study, the stimulus used are all Ghanaian music type. However, in all the studies conducted as recorded in literature, the stimuli applied were different from the one used in this study. Many researchers who conducted studies to investigate memory for music adopted jazz and classical music as stimuli in their investigations; examples of researchers who operated in the area of memory include (Glanzer, 1982; Frank, Bransford, and Auble, 1982; Mandler & Boeck, 1974). In addition, the Ghanaian scholar who did an intensive study into memory for music was Amuah, (1994), who investigated on “Memory for Music and its Relationship to Aspects of Musical Behaviour and Environmental and Personal Factors.” In his study, Amuah used classical and jazz music to test for memory for music memory. The current study is of the view that, using Ghanaian music is therefore a strength for the study, because it is more appropriate for the sample under study (Ghanaian students). Most Ghanaian music have the kind of energising traits that sort of presents heroism enforcing the stimulative nature of life. In addition, it offers the opportunity for generalisation about the effect of preference on music, with new evidence using Ghanaian music.

So far, it is difficult to trace any study that has adopted Ghanaian traditional sedative and stimulative music in similar study. It is likely that the

significant differences that were observed in means leading to the rejection of the null hypotheses in most cases of the study may be as a result of the Ghanaian music that was used, since they understood the lyrics and may be familiar with the music which are in their common language. Again, we can say as discussed earlier in the method of data collection that, during the process, the conditions of the room, and the orderly manner in which the listening session was conducted, there was no or little distractions which may influence the result even though participant may have been distracted by their own thoughts.

Limitations on the findings and results of the study

While the findings of the study on music preference and memory for stimulative and sedative music have revealed interesting and informative results, it is also important to acknowledge the limitations and potential areas of concern of the study.

In the first place, the population consisted of only one school from which the sample was drawn, limiting the generalizability of our findings to broader populations. The researcher is of the view that, regional differences in Ghana in terms of students' preference may yield some amount of difference in the result. Future research could incorporate more diverse and regional samples and employ objective measures of musical preferences to enhance the validity of these findings.

Secondly, the sample size of hundred students may not be enough for generalization for a larger population size even though in inferential studies a sample size of thirty is enough for generalisation. The researcher is of the view that, a future study will require a larger sample size other than the sample size

in this study. Other factors worth noticing that may have some limitations on the study include;

Causation verses Correlation: While the study identifies some connection between music preference and memory, thus preference and memory having effect on each other or showing a significant difference, it might not establish causation. Other variables could be at play, and more research would be needed to determine the causal relationship between these variables.

Situational Context: The study might not have considered the situational context. For instance, the effects of music on memory could vary depending on the specific learning environment, the cultural and religious background of the students, and student's exposure to music.

Memory type: The study focuses on short term memory; however, it is essential to also study other types of memory (e.g., short-term, long-term, working memory) and how music preference might affect each type differently. Memory in the long term might yield a different result compared to short or working memory.

Participant's age and background: The study's findings may not be universally applicable if it was conducted in older ages than ages of basic school students which ranges from eight to fifteen years (from upper primary). Different age groups and cultural backgrounds might have varying responses to music, and these factors were not considered in the study. Perhaps, older age group may tilt towards a calm and cool music which could be sedative music than stimulative music.

Summary of Chapter

Chapter four present the analysis of the data, presentation and discussion of the results. Four statistical methods were used to analyse the data; the Chi square, the Cohen's d test, the independent t-test, and the one sample t-test.

The various hypotheses were taken through the necessary assumptions for testing hypotheses as elaborated by Glenberg and Andrzejewski, (2008). The result from the first hypothesis indicated that majority of students preferred stimulative music to sedative music. Hypothesis two was to test for whether students' musical preferences explicitly their preference for sedative or stimulative music, exerted a discernible influence on their memory for music. It was tested using the independent t-test model, also known as the two-sample t-test. The result indicted that students performed better in memory for music in stimulative music than in sedative music (7.40 to 2.58) with a mean difference of 4.82. The Cohen's d test was used to measure the effect size and the result gave $d = 3.12$ which represents a moderate effect.

Hypothesis three aimed at comparing students who preferred stimulative music and those who preferred sedative music on memory for stimulative music. The result indicated that, the mean for students who preferred sedative music on memory for stimulative music had a mean of 3.58 compared to students who preferred stimulative music on preference for sedative music who had a mean of 3.74. This outcome shows that, those who preferred stimulative music has a higher memory for sedative music than those

who preferred sedative music on preference for stimulative music. Similar result was arrived at for hypothesis four.

The chapter also found that, memory impact by music type revealed that a student's preference for sedative or stimulative music influenced their memory specifically for each type. The study also acknowledges the effect of the stimuli differences as compared to other studies conducted in the same area. The researcher is of the view that, using Ghanaian music is therefore a strength for the study, because it's more appropriate for the sample (Ghanaian students). It also offers the opportunity for generalisation about the effect of preference on music, with new evidence using Ghanaian music.

Few limitations on the findings and the results of the study were also observed. The population used for the study consisted of only one school from which the sample was drawn, limiting the generalizability of our findings to broader populations. Again, the sample size of hundred students may not be enough for generalization for a larger population size even though in inferential studies a sample size of thirty is enough for generalisation. In addition, While the study identifies some connection between music preference and memory, thus preference and memory having effect on each other or showing a significant difference, it might not establish causation. Memory type used in the study was also considered and acknowledge that, different type of memory apart from the short-term memory that was used in the study may yield different results. Finally, the age group used in the study (ages 8 to 14) may account for these results, and that if different age group is used in further/future studies may give a different result.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

Research in preference and memory for music may be approached from the perspective of cognitive processes involved in the retention and retrieval of music, and also in the context of stimulative and sedative music. Though much research has been conducted with regard to cognitive processes involved in the encoding, storage, and retrieval of music, very little research has been done on using sedative and stimulative music to test for memory for music in the perspective of music preference. It is relevant to look at this in the context of the Ghanaian in the sense that it will enable music educators and professionals to select the right type of music stimulus when it comes to cognitive processes, preference and memory for music.

Music listening experience and its relation to memory for music has been addressed by scholars in the area of music education and psychology of music. Though very few empirical studies regarding the relationship between memory for music and listening behaviour have been undertaken, the importance of memory for music in the listening experience has been discussed and documented (Haack, 1992; Dowling & Harwood, 1986; Cuddy, 1982; Dowling, 1981).

Purpose of the Study

The primary purpose of this study was to examine the relationship between students' musical preferences and memory for sedative and stimulative music.

Objective of the study

The following were the objectives of the study:

1. To investigate the difference between students' preference for sedative and stimulative music.
2. To examine the difference in memory for music between students who prefer sedative music and stimulative music.
3. To compare students who prefer stimulative music and those who prefer sedative music in memory for stimulative music.
4. To compare students who prefer stimulative music and those who prefer sedative music in memory for sedative music.

The research questions

The following research questions served as a guide to the study:

1. What difference exist between students' preference for sedative music and stimulative music?
2. What is the difference in memory for music between students who prefer sedative music and stimulative music?
3. What is the significant difference between students who prefer stimulative music and those who prefer sedative music in memory for stimulative music?
4. What is the difference between students who prefer stimulative music and those who prefer sedative music in memory for sedative music?

Procedures

The procedures followed in researching the problem included: (1) the identification and use of an appropriate research design, (2) the selection of

variables and samples, and (3) the collection of data on the variables for the study for analysis.

The hypotheses

The following research hypotheses were tested:

Research Hypothesis 1

H₀: There is no difference between students' preference for sedative and stimulative music.

H₁: There is difference between students' preference for stimulative and sedative music.

Research Hypothesis 2

H₀: There is no significant difference in memory for music between students who prefer sedative music and stimulative music.

H₁: There is a significant difference in memory for music between students who prefer sedative music and stimulative music.

Research Hypothesis 3

H₀: There is no significant difference between students who prefer stimulative music and those who prefer sedative music in memory for stimulative music

H₁: There is a significant difference between students who prefer stimulative music and those who prefer sedative music in memory for stimulative music

Research Hypothesis 4

H₀: There is no difference between students who prefer stimulative music and those who prefer sedative music in memory for sedative music.

H₁: There is a difference between students who prefer stimulative music and those who prefer sedative music in memory for sedative music.

Design of the Study

The research design that was adopted for the study was the non-experimental design (ex post facto) that examines an independent variable (ex post facto design) that is present prior to the respondent.

The efficacy of the study in yielding useful results within the framework of nonrandom assignment has been addressed by many research scholars (Leutwyler & Meierhans, 2016; Williams-Brown, 2016; Campbell & Stanley, 2015; Montero & León, 2007).

Variables

The variables that were measured in this study were preference for music and memory for music. A variable as described by statisticians, is any characteristic or distinction that can be measured in an investigation, or an observed value that changes in data units in a population over time (Willenborg & De Waal, 2012; Mitnitski, Mogilner & Rockwood). These identified variables usually prompted the development of the hypotheses for a study. Andy Field's quantitative model (2009), suggested that any variable intended to be measured should be derived from the collected data which would then be used to test the proposed theory.

Sample

The sample size used in this study was 100 students from the Derby Avenue RC basic school in Accra, Ghana.

Data Collection

To ensure a careful and systematic collection of data, the following steps were taken: the design and validation of the questionnaire, a verification of the reliability and validity of the questionnaire through pilot testing,

obtaining permission from the internal review board to collect data for the study, and obtaining permission from the student's parents to involve their children in the study.

Research method employed for the study

Field's model of 2009 was the quantitative model that was adopted for this study as stated earlier in chapter three. The nature of this research lends itself to the quantitative approach because of the statistical data that were generated. This quantitative approach to research is noted to be an in-depth method that can support quality and rigorous research in social science disciplines (Sovacool, Axsen & Sorrell, 2018; Zainal, 2007; Amaratunga, Baldry, Sarshar, & Newton, 2002).

In this model, Field identified the variables as another vital aspect in the model of quantitative research approach. The measurement of variables in this study was enhanced by data computation and analyses, and the measurement of variables also enhanced the hypotheses testing.

Pilot Test. One pilot test was conducted to examine the reliability and validity of the questionnaires. In this study, the pilot testing was meant to support the verification of results which were computed and analysed from the data results. The Pilot testing was done on Monday 21st August 2023, three clear weeks before the actual data collection on the 12th and 13th of September 2023. A sample size of thirty was used for the pilot testing.

Field Work/activity

Students from the Derby Avenue basic school were involved in the study. Data collection occurred on the 12th and 13th of September, 2023. The administrative procedures for testing were straightforward. At the first meeting

with the subjects, the researcher briefly explain the entire process to students, and also, the academic background and stated the purpose of the study to the students. This was to make sure that the students knew what they were to do at a time so as to minimise error. After distributing the answer sheets, the recorded excerpts of the stimulus were played for students to listen to and also, answer the questions that were stated in the questionnaire. The entire exercise for listening session and responding to the questionnaires lasted 30 minutes; that is, 20 minutes for listening to the twenty excerpts and 30 seconds for listening to the excerpt that demands respond from the students. The subjects also completed the research questionnaires on providing such information on their background experience in music.

Analysis of Data

The data collected for the study were analysed with four statistical methods: the Chi square, the Cohen's d test, the independent t-test, and the one sample t-test. The Chi square was used to test and analyse the categorical data, and to test for students' preference for sedative and stimulative music. The Cohen's d test was used to test the veracity and the effect size of the results. The one sample t-test was used to test the hypothesis that seek to compare students who prefer stimulative music and those who prefer sedative music on memory for stimulative music.

The independent sample t - test was used to test if there was any significant difference between students who prefer stimulative music and those who prefer sedative music on memory for stimulative music, and also to test if there is a significant difference between students who prefer stimulative music and those who prefer sedative music on memory for stimulative music.

Summary of Major Findings of the Study

The major findings from this study highlight the interplay between music preference, and memory for music. The study suggests that there was a link between music preference, and memory. An examination of the varying abilities in memory for music and preference for music revealed that there were statistically significant differences between students' preference for sedative music and stimulative music.

In the independent t-test study, it was revealed that a student's preference for sedative or stimulative music had an effect on their memory specifically for sedative and stimulative music. The result indicted that students performed better in memory for music in stimulative music than in sedative music (7.40 to 2.58) with a mean difference of 4.82. The Cohen's d test was used to measure the effect size and the result gave $d = 3.12$ which represents a moderate effect. This suggests that the impact of music preference on memory was not uniform for students depending on the type of music the student preferred whether sedative or stimulative.

A step further into the use of the one sample t-test to investigate memory impact by music type revealed that a student's preference for sedative or stimulative music influenced their memory specifically for each type. The result indicated that, the mean for students who preferred sedative music on memory for stimulative music had a mean of 3.58 compared to students who preferred stimulative music on preference for sedative music who had a mean of 3.74. This outcome shows that, those who preferred stimulative music has a higher memory for sedative music than those who preferred sedative music on preference for stimulative music.

Finally, the findings from the independent t-test that compared students who prefer stimulative music and those who prefer sedative music on memory for stimulative music, and again compared students who prefer stimulative music and those who prefer sedative music on memory for sedative music indicated that, there was a significant difference between students who prefer stimulative music and those who prefer sedative music on memory for stimulative music. In addition, it was again found that, there was enough evidence to show that, there was a significant difference between students who preferred stimulative music and those who preferred sedative music on memory for sedative music.

Conclusions

It is necessary to acknowledge in the first place, the inherent difficulty in trying to measure the two variables in this study: preference for music and memory for music objectively. Getting an instrument that is cross-culturally viable in its theoretical and philosophical underpinnings, particularly for the measurement of musical preferences and its effects on memory is quite an intricate chore. In this vein, it is important to note that, the responses of the students (participants), upon which the findings were pitched, must be viewed with some level of carefulness.

Arkinson and Shiffrin's Modal Model Theory connects to this study through the idea that memory performance is influenced by the processing and encoding of sensory information. Stimulative music, being more engaging, captures students' attention more effectively, facilitating the encoding and retrieval processes described in the Modal Model theory.

In addition, the Mere Exposure Model theory by Jazonc supported the assumption that music preferences could be shaped by familiarity and that these preferences might influence memory performance.

The study reveals that memory performance is not solely dependent on music type but also on individual difference preferences. This aligns with the Modal Model theory by Arkinson and Shiffrin which emphasised on personalized processing mechanisms and the Mere Exposure Model's insight into the role of familiarity.

According to the familiarity theories that guided preference for music as stated in the literature (anchor and heuristic adjustment theories, mere exposure, and social judgment,), preferences for particular musical genres cannot be at the spare of the moment or developed unless the individuals are familiar with those particular musical genres. In this study, the researcher used music stimulus (sedative and stimulative music) that are not very familiar with the respondents in the sense that, the stimulus was selected by the researcher with the aim of not exposing students to music that are already familiar to them.

In conclusion, the findings point clearly to the possibilities of stronger relationships between preference and memory scores. Indeed, the data pointed to the fact that, there are identifiable differences in preference and memory of different people who preferred different musical stimulus. The design, the limitations, the findings and the recommendations for future research, together form a rich aggregate of information that can together act as a very fruitful step for further research.

Based on the above synopsis, the details of the following conclusions were reached and are presented in the following few paragraphs;

The researcher used music stimulus (sedative and stimulative music)” and “there was significant disparity in students' musical preferences, with a higher percentage favouring stimulative music over sedative music. These findings shed light on the potential influence of music on students' cognitive and emotional states, as well as their preferences in the context of sedative and stimulative music as was demonstrated in the findings in hypothesis one.

In addition, the study revealed a significant discrepancy in memory for music between students who prefer sedative music and those who prefer stimulative music. The results of this research provide captivating evidence of a significant difference in memory performance between students with preferences for sedative and stimulative music. The analysis revealed that students who preferred stimulative music demonstrated a notable advantage in memory retention when compared to their counterparts who preferred sedative music as a result of the high mean difference between students who preferred stimulative music to those who preferred sedative music as demonstrated in hypothesis one. This outcome underscores the powerful influence of music preferences on cognitive processes, in particular in memory.

This finding carries several important inferences. Firstly, it highlights the possible educational benefits of tailoring the auditory environment to an individual's music preferences. Educators, curriculum designers, and cognitive scientists may consider incorporating stimulative music in learning environments where memory consolidation is a priority. Conversely,

understanding the potential effects of sedative music on memory could lead to more effective strategies for minimising distractions in educational settings.

Furthermore, the study indicates that, there is a positive effect of students' preference for stimulative music on memory for music, and preference for sedative music also has an effect on students' memory ability for music. Finally, the study has again found that, students who prefer sedative music will have their memory also being influenced by sedative music, and students who preferred stimulative music will have their memories being influenced or have effect on stimulative music.

Implication for Research, Educators and other Professionals

The preference for stimulative and sedative music and its impact on memory for music have several implications for music educators and curriculum designers. In this study, a number of fascinating associations and effects have emerged and has several implications that calls for further research.

Among them are: (1) Music educators should acknowledge that students have different preferences when it comes to the stimulative or sedative nature of a piece of music, and the effects of the music. It is important and incumbent on curriculum designers to incorporate a variety of musical styles and genres into the curriculum for the different tastes and learning styles to cater for diverse musical experiences of students. (2) Future research should probe into the fact that, in recognizing and accommodating diverse musical preferences, music educator will have the understanding that, stimulative music for instance is likely to enhance alertness and motivation and therefore, educators can incorporate such music during activities that require higher energy and focus,

like practice sessions and rehearsals for performance, leveraging on stimulative music for mood and motivation (3) There is the need for further studies into understanding the theory that, music can enhance memory, and that, stimulative music can be used to aid memory retention if music educators can explore the use of mnemonic devices through music, helping students remember key concepts, musical terms, and compositions. This can be particularly beneficial for music theory and history classes. (4) In addition, by incorporating stimulative and sedative elements in compositions, curriculum designers can consider including opportunities for students to create and arrange music that elicits these stimulative and sedative responses. This will encourage creativity and allow students to explore how different musical elements can influence memory and recall.

Recognising that different students may have varying preferences for stimulative and sedative music, educators can allow for some level of personalization in the learning process. For instance, students may be given the flexibility to choose music that helps them concentrate while practicing.

In summary, understanding the implications of preference for stimulative music and its effects on memory can help music educators and curriculum designers create more engaging, effective, and inclusive learning experiences. By accommodating diverse preferences, leveraging music for memory enhancement, and promoting personalization and emotional well-being, educators can enhance the overall music education experience for their students. The current study focuses on preference for music and memory for music of students. There is therefore a need for an investigation into the relationships among memory for music and other factors such as experience in

music, environmental and personal factors involving the student's relationship with choral music, engagement in a band, and any other experiences of the students. By extension, other studies should examine the memory ability of music students in the universities in relation to sedative and stimulative music to throw light on their ability to remember musical excerpts.

Recommendations and suggestions for further research

This research has revealed some important findings in terms of students' preference for sedative and stimulative music in terms of preference for music and memory for music. In spite of these revealing result, further research is needed which could explore the underlying mechanisms of these relationship and its applications in various educational contexts.

First of all, researchers who would want to adopt and use sedative and or stimulative music as the stimulus in any future research especially in testing for memory and music preferences must ensure that they play songs that the respondents are familiar with. This will ensure that the participants have a good idea of the nature of the genres before indicating their preferences. Researchers should not take it for granted that participants know the differences between the genres; for example, between sedative and stimulative music.

The thematic analysis of the emergent data found a number of interesting patterns which the quantitative analysis provided to be statistically insignificant. It is believed that the use of a larger sample size that is more varied in their characteristics is highly recommended. This the researcher believe will produce results that may reach statistical significance and give much weight to the findings in their study. In a sense, the participants in this

study were one hundred, though it was an acceptable sample size in inferential studies, a larger sample size of about two hundred and over would yield a more compelling result and will represent a larger population, and therefore can be used for generalisation without any effect.

Future researchers may find it useful to do purposeful random sampling and try to incorporate people with different personality types such as sanguine, choleric, phlegmatic and melancholic. In addition, research however is needed which should endeavour to delve deeper into this phenomenon (sedative music and stimulative music in the context of music preference for music and memory for music), exploring its implications across diverse demographic groups instead of just one school as was the case in this study and musical genres to further enrich our knowledge in this field.

Last but not the least, the research opens avenues for further research into the relationship between music preferences, and memory for music across various demographic groups and music genres especially in Ghana and other parts of Africa using their indigenous music to test for these variables. Ghanaian music educators must pay more attention to research on these variables. So far, the findings in this study indicates that the area is very green and needs a lot of effort in research, so that together, these efforts will complement each other to produce a fruitful body of knowledge upon which musical practice in Ghana can be pitched. Such findings can help in formulating psychological principles that will guide music education practice in Ghana, and for that matter, the African continent.

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APPENDIXES

Appendix A Showing the questionnaires for data collection

A. STUDENT'S BACKGROUND (DEMOGRAPHY)

1. Do you belong to any singing group in your church or community?

1. YES

2. NO

2. Do you play any musical instrument?

1. YES

2. NO

3. Do you have any musical instrument in your house?

1. YES

2. NO

4. Have your parents been singing in your home?

1. YES

2. NO

5. Have you ever had any experience/lesson in music either in school or any other place before?

1. YES

2. NO

LISTENING TO EXCERPTS FOR SEDATIVE AND STIMULATIVE MUSIC SESSION

Listen to these excerpts of music and answer the following questions:

B. PREFERENCE FOR MUSIC

6. Do you like this music?

1. YES

2. NO

7. Do you like this music?

1. YES

2. NO

8. Do you like this music?

1. YES

2. NO

9. Do you like this music?

1. YES

2. NO

10. Do you like this music?

1. YES

2. NO

11. Do you like this music?

1. YES

2.NO

C. MEMORY FOR MUSIC

12. Did you hear this part of the music you have head in the list of songs you have listened to?

1.YES

2. NO

----low-----medium-----high-----

13. Did you hear this music in the list of songs you have listened to?

1.YES

2. NO

----low-----medium-----high-----

14. Did you hear this part of the music you have head in the list of songs you have listened to?

1.YES

2. NO

----low-----medium-----high-----

15. Did you hear this music in the list of songs you have listened to?

1.YES

2. NO

----low-----medium-----high-----

16. Did you hear this part of the music you have head in the list of songs you have listened to?

1.YES

2. NO

----low-----medium-----high-----

17. Did you hear this music in the list of songs you have listened to?

1.YES

2. NO

----low-----medium-----high-----

Appendix B Showing students readiness for data collection**Appendix C Showing students listening to excerpts of stimulus during data collection****Appendix D showing orientation of students to answer the questionnaire.**

Appendix E showing the school block of the Derby Avenue RC Basic.**Appendix F showing the researcher's application for ethical clearance.**

University of Cape Coast
Department of Music and Dance
11th July, 2022

The Chairman
Institution Review Board
University of Cape Coast

Dear Chairman,

REQUEST FOR ETHICAL CLEARANCE

I wish to apply for ethical clearance to enable me proceed to the next stage of my research project.

I successfully defended my PhD proposal with the topic "A comparative study of Brain response to Sedative and Stimulative music Listening: the case of Derby Avenue basic school."

This study will involve students of the Derby Avenue RC basic school in Accra.

I will be grateful if my permission could be granted.

Thank you.

Sincerely,

JACOB MAWULI AGLAGO

Appendix G indicating a letter from the head of department in support of the researcher's application for ethical clearance.

UNIVERSITY OF CAPE COAST
FACULTY OF ARTS
DEPARTMENT OF MUSIC AND DANCE

TELEPHONE: 03321-30947/Ext. 209
Direct: 03321-30947
TELEX: 2552, UCC, GH.
E-mail: music.dance@ucc.edu.gh



UNIVERSITY POST OFFICE
CAPE COAST, GHANA

14th March, 2023

The Chairman
Institutional Review Board
UCC

Dear Sir,

REQUEST FOR ETHICAL CLEARANCE

Mr. Jacob Mawuli Aglago is a third year PhD Music Education student in the Department of Music and Dance, University of Cape Coast. He has successfully defended his proposal entitled "*A comparative study of Brain Response to Sedative and Stimulative Music listening: The case Of Derby Avenue basic school.*"

The department will therefore be grateful if he is granted ethical clearance to enable him proceed to the next stage of his work which involves collection of data for his thesis.

Thank you.

Yours faithfully,

Dr. Eric Debrah Otchere

HEAD



**Appendix H Indicating clearance letter from Internal Review board
(IRB), University of Cape Coast.**

**UNIVERSITY OF CAPE COAST
INSTITUTIONAL REVIEW BOARD SECRETARIAT**

TEL: 0558093143 / 0508878309

E-MAIL: irb@ucc.edu.gh

OUR REF: IRB/C3/Vol.1/0127

YOUR REF:

OMB NO: 0990-0279

IORG #: IORG0011497



17TH MAY 2023

Mr Jacob Mawuli Aglago
Department of Music and Dance
University of Cape Coast

Dear Mr Aglago,

ETHICAL CLEARANCE – ID (UCCIRB/CHLS/2022/82)

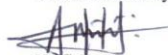
The University of Cape Coast Institutional Review Board (UCCIRB) has granted Provisional Approval for the implementation of your research on **A Comparative Study of Brain Response to Stimulative and Sedative Music Listening: The Case of Derby Avenue Basic School**. This approval is valid from 17th May 2023 to 16th May 2024. You may apply for a renewal subject to the submission of all the required documents that will be prescribed by the UCCIRB.

Please note that any modification to the project must be submitted to the UCCIRB for review and approval before its implementation. You are required to submit a periodic review of the protocol to the Board and a final full review to the UCCIRB on completion of the research. The UCCIRB may observe or cause to be observed procedures and records of the research during and after implementation.

You are also required to report all serious adverse events related to this study to the UCCIRB within seven days verbally and fourteen days in writing.

Always quote the protocol identification number in all future correspondence with us in relation to this protocol.

Yours faithfully,


Kofi F. Amuquandoh
Ag. Administrator

ADMINISTRATOR
INSTITUTIONAL REVIEW BOARD
UNIVERSITY OF CAPE COAST

