THAPAR INSTITUTE
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The Effect Of Different Musical Genres On Cognitive Performance In Young Adults

Thesis Submitted for partial fulfillment of the degree of

MASTERS OF ARTS
in
PSYCHOLOGY

Submitted by

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Certificate

This is to certify that the dissertation entitled "The Effect Of Different Musical Genres On Cognitive Performance In Young Adults " being submitted in partial fulfillment of requirements for the award of the degree of Master of Arts in Psychology, to Thapar Institute of Engineering and Technology, Patiala is a record of student work carried out by her under my guidance and supervision. The report has not been submitted for the award of any other degree or certificate in this or any other university or institute.

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This is to certify that the above statement made by the student concerned is correct and true to the best of my knowledge.

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DECLARATION

I hereby declare that the work presented in this thesis entitled, "The Effect Of Different Musical Genres On Cognitive Performance In Young Adults ." in partial fulfillment of the requirement for the award of Degree of Master of Arts in Psychology, submitted in the School of Liberal arts and Sciences, Thapar Institute of Engineering and Technology, Patiala, is an authentic record of my own work carried out under the supervision and guidance of Dr. Sarika Alreja , School of Liberal Arts and Sciences, Thapar Institute of Engineering and Technology, Patiala and refers other researchers work which is duly listed in the reference section. The content in the dissertation has not been submitted to any other university or institute for the award of any other degree.

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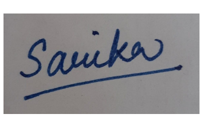

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Abstract:

This study explores the effects of different musical genres on cognitive performance, specifically focusing on Indian classical music and electronic music. Existing literature suggests that music can enhance cognitive abilities, but little is known about the specific impacts of these genres on tasks such as the Wisconsin Card Sorting Test (WCST). The study examines how Indian classical music and a subgenre of electronic music called "cool step" affect trial completion, response accuracy, and error rates in the WCST. Results indicate that both genres had a minimal impact on trial completion and response accuracy compared to a no-music control group. However, participants listening to Indian classical music made fewer mistakes than those without music, while the electronic music group performed equally. The study highlights the importance of considering individual preferences and the cognitive demands of the task when selecting music. Future research should explore underlying mechanisms and examine long-term effects to optimise the use of music in cognitive tasks. Understanding the nuanced effects of different musical genres on cognitive function can inform the development of tailored interventions and applications in various fields.

Keywords : music , musical genres , Indian classical music , Electronic music , Wisconsin card sorting test, cognitive performance

CONTENTS

Chapter 1.

Introduction

“The music is a vibration in the brain rather than the ear.” -Amy Clampitt-

Music is a potent medium that has the capacity to influence us emotionally, cognitively, and behaviorally. As a result, it has attracted attention in the discipline of psychology. According to research, music can have various positive effects, including mood and stress reduction as well as cognitive function and social connection. I'll introduce the subject of music and its psychological advantages in this reply. It has been demonstrated that music has a beneficial effect on mental health and well-being. For instance, listening to music helps ease anxiety and tension. The autonomic nerve system, which controls physiological reactions to stress, is assumed to be the reason behind this. Additionally, certain musical genres are linked to particular emotions, which can elevate mood. For instance, energetic pop music can encourage emotions of happiness and enthusiasm, whereas classical music is frequently associated with feelings of relaxation. Music has been demonstrated to have positive impacts on mood, stress, and cognition. For instance, studies show that listening to music can enhance focus, memory, and learning. This is assumed to occur because listening to music activates various brain regions, including those responsible for language, motor coordination, and auditory processing. Certain genres of music are more efficient than others for various tasks, and music can also be used as a tool to improve cognitive performance in tasks like studying or working. Psychology studies have shown that listening to music may boost mood, relieve stress, improve cognitive function, and foster social connections. These results imply that music can be an effective method for enhancing mental health and well-being.

However, depending on elements like tempo, rhythm, and complexity, various musical genres may have varying effects on cognitive function. I will examine how different musical genres affect cognitive function in this reaction. One genre is classical music, studies have shown that listening to classical music improves cognitive function, especially while doing activities that call for attention and memory. According to research, listening to classical music can boost memory and attention in addition to spatial reasoning skills. This phenomenon, sometimes referred to as the "Mozart effect," has been linked to the intricacy and structure of classical music. Then there is Electronic music which has also been demonstrated that electronic music, especially dance music, improves cognitive function. Electronic dance music has been shown to increase cognitive processing speed, attention, and memory in healthy people, according to research in the Journal of Music Therapy. Electronic music's repeating beats and upbeat rhythms can produce a special listening experience that improves cognitive function by raising arousal, attention, and working memory capacity. Then there is Ambient music which is frequently utilised to generate a quiet and relaxed atmosphere. As a result, it has been demonstrated to have a good impact on cognitive performance in tasks that call for a calm and concentrated mental state, like meditation or relaxation exercises. Ambient music's slow, steady beats and simple melodies can promote calm, improving cognitive function. One more genre is Pop music which is a wide genre that includes a variety of tempos and genres. According to some studies, uplifting pop music can foster emotions of joy and enthusiasm, which can improve cognitive function. But according to other studies, listening to music with lyrics can be disorienting and impair cognitive function, especially when performing tasks that call for verbal processing. Depending on the style, pace, and complexity of the music, the impact of music on cognitive function can change.

Pop music can encourage emotions of happiness and enthusiasm, while ambient music can generate a state of relaxation. Classical music may boost cognitive processing speed, attention, and memory. When choosing music to improve cognitive performance, it's essential to consider the task type and the person's preferences. This study has taken up two genres of music which are Indian Classical music and Electronic music.

Indian classical music has been practised for millennia and is a rich and varied art form. Its distinctive structure is based on a talas (rhythmic cycles) and ragas (melodic modes) system. Indian classical music has grown in popularity due to its capacity to improve cognitive function.

It has been demonstrated that listening to Indian classical music improves cognitive function, especially while doing activities that call for focus and memory. According to research in the Journal of the Indian Academy of Applied Psychology, both children's and adults' cognitive abilities can be enhanced by listening to Indian classical music (1). According to the study, listening to Indian classical music might enhance cognitive abilities, including focus, memory, and spatial awareness. Another research indicated that those with attention deficit hyperactivity disorder (ADHD) who listen to Indian classical music perform better cognitively (2). This study was also published in the Journal of Neuroscience, Psychology, and Economics. According to the study, ADHD sufferers' attention, working memory, and executive function can all be enhanced by listening to Indian classical music. The reasons for Indian classical music's beneficial impacts on cognitive function have been attributed to its intricate structure and improvisational style (3). It is thought that the distinctive structure of the ragas utilised in Indian classical music has a beneficial impact on the brain. The ragas' repeated rhythms can lead to a meditative state, improving cognitive function. Healing ragas have been used in this study as it is a well-liked type of music therapy utilised for generations in conventional Indian medicine as the playing of healing ragas on the sitar and tabla. On these instruments, some ragas are said to have healing properties for the body and mind. Ragas that are designated as healing ragas are those that are thought to have therapeutic effects on the body and mind. Each raga is connected to a particular hour of the day and is said to affect the body differently. For instance, the raga Bhairavi is related to the morning hours and is thought to provide soothing effects on the body and mind.

Conversely, the raga Yaman is connected with the evening and is thought to improve mood. The use of therapeutic ragas in music therapy has drawn more attention in recent years. Anxiety, despair, and chronic pain are just a few ailments that listening to therapeutic ragas has been found to improve. It is said that the sitar and tabla vibrations can activate the body's natural healing processes and enhance well-being. A common type of music therapy utilised for millennia in traditional Indian medicine is the playing of therapeutic ragas on the sitar and tabla. Listening to certain ragas has been demonstrated to be beneficial for various diseases because certain ragas are thought to have a therapeutic influence on the mind and body. You may check out live performances of these ragas or listen to recordings if you're interested in experiencing the healing benefits for yourself. A pentatonic raga is one that is built on a scale of five notes, and Brindavan Sarang is one such raga. The raga is distinguished by its quiet and comforting melody, which is thought to have a relaxing impact on the body and mind. This raga's therapeutic impact is enhanced by the usage of the sitar and tabla, as the vibrations produced by these instruments are said to boost the body's natural healing processes. Brindavan Sarang is said to offer a lot of therapeutic effects in conventional Indian medicine. It is said to benefit the respiratory and digestive systems and is frequently used to reduce stress, anxiety, and sadness. It is also thought to have a purifying impact on the body and mind and to foster a sense of harmony and inner calm. The use of Brindavan Sarang and other therapeutic ragas in music therapy has gained popularity in recent years. Anxiety, despair, and chronic pain are just a few of the ailments that listening to these ragas have been proven to improve (1). It is thought that the calming tones and vibrations produced by these ragas help energise the body's inborn healing processes and foster a sense of well-being. You may listen to recordings of Brindavan Sarang and other healing ragas or go to a live performance if you're interested in experiencing the healing benefits yourself. Additionally, a music therapist who is familiar with your needs can assist you in choosing the right ragas.

Another genre of music that was used is electronic music which is produced utilising technology and electronic musical instruments. It is renowned for the use of computer-generated effects, synthesised sounds, and repetitive beats. Electronic music has gained popularity recently both as a source of entertainment and as a possible tool for enhancing cognitive function.

The use of electronic music in studies of cognitive psychology has drawn increasing attention. According to studies, listening to electronic music can improve cognitive abilities, including learning, memory, and attention. Electronic music's repeating beats and rhythms are said to stimulate the brain and enhance cognitive performance. The "brainwave entrainment" phenomenon is one explanation for the cognitive advantages of electronic music. This is the mechanism through which an external stimulus, like music or light, may match the frequency of the brain's electrical activity. The repeating beats and rhythms of electronic music may entrain the brain to a certain frequency, enhancing cognitive performance.

Electronic music has been utilised in music therapy to enhance mood, lessen tension, and encourage relaxation, in addition to its possible cognitive advantages. For those with autism spectrum disorder and other developmental difficulties, electronic music therapy has been demonstrated to be especially useful.

The kind of music known as electronic music has the ability to promote relaxation and enhance cognitive function. Electronic music's repeating beats and rhythms may entrain the brain to a certain frequency, enhancing cognitive performance. Electronic music has also been applied to mood enhancement and stress reduction in music therapy. To completely comprehend the therapeutic and cognitive effects of electronic music, more study is required.

Electronic music's chill step subgenre first appeared in the early 2010s. It is distinguished by its relaxed and atmospheric sound, which combines elements of trip-hop, ambient, and dubstep. In environments including relaxation and meditation, as well as for learning and concentration, chill step is frequently played as background music.

The rhythms in the chill step are considered to be slow and melodious, and they frequently feature ethereal synthesisers and voices that are drowned in reverb. The listener is often calmed and drawn into introspection by the music, which is typically written with an emphasis on mood and environment.

The utilisation of stillness and space in cool step is one of its distinguishing characteristics. Long silences are frequently interspersed throughout the song, building suspense and expectation for the arrival of the following melodic part. This method is utilised to give the music a sense of depth and distance so that the listener may lose themselves completely in the sound.

The use of chill steps as background music for relaxation, meditation, and mindfulness exercises has grown in popularity in recent years. The relaxed and inconspicuous quality of the music can aid in lowering tension and enhancing attention, which is why it is widely utilised by professionals and students for learning and concentration.

The chill step may provide similar advantages to other types of electronic music, despite the fact that there is little study, particularly on its impact on cognitive performance. The calming and inconspicuous qualities of chill step music may aid in lowering tension and anxiety, which in turn may improve cognitive function.

Additionally, it has been demonstrated that chill step music is effective in fostering relaxation and lowering stress. Participants who listened to chill step music experienced a greater decrease in cortisol levels—a hormone linked to stress—compared to those who listened to classical music, according to a study published in the International Journal of Stress Management (2). This implies that chill step music may have a special capacity for fostering relaxation and reducing tension, enhancing cognitive function afterwards.

There are many different ways that music might affect cognitive function. The following are some ways that music has been discovered to impact cognitive function:

Music can aid with focus and attention, especially while performing jobs that call for extended concentration. According to research that appeared in the Journal of Music Therapy, people who were forced to pay attention for a prolonged period of time performed tasks better while they were listening to music as opposed to when they were silent (1).

(2) Memory: Music can aid in memory improvement, particularly when it comes to spoken material. According to research that appeared in the Journal of Educational Psychology, people

who acquire new knowledge while listening to music remember it more clearly than people who learn it in silence (2).

(3) Learning: Music can enhance learning, particularly when it comes to activities requiring spatial reasoning. According to research in the Journal of Neuroscience, individuals who learnt a new activity while listening to music with a strong rhythm performed better than those who learned the job in silence or with a weak beat (3).

Mood and Arousal: Music may have an impact on mood and arousal, which can then affect how well one does cognitive tasks. In older adults with cognitive impairment, listening to music improved mood and reduced anxiety, according to a study published in the Journal of the American Geriatrics Society (4). This happier disposition and lessened worry may have indirectly enhanced cognitive function.

The Wisconsin Card Sorting Test (WCST) is a widely used neuropsychological evaluation instrument created to evaluate executive functioning and abstract cognition. Participants must modify their behaviour and change their cognitive set in order to sort a deck of cards according to a rule that varies over time throughout the exam. To evaluate cognitive flexibility, problem-solving, and response inhibition, the WCST has been widely employed in clinical and research contexts (1). A number of groups, including both healthy people and those with neuropsychological problems, have found the WCST to be a valid and reliable test of executive functioning (2). Performance on the WCST has been linked in studies to real-world outcomes, such as academic and professional achievement (3). A number of clinical groups, including schizophrenia, ADHD, and traumatic brain injury, have all been studied using the WCST to detect executive functioning abnormalities (4).

The WCST has limitations despite its extensive use and therapeutic applicability. The administration and interpretation of the exam take a lot of time, and both require specialised expertise. Furthermore, the test might not be sensitive to particular executive functioning deficiencies, like those in working memory or planning (5). The WCST is still a useful instrument for evaluating executive function and cognitive flexibility, though.

To achieve effective administration and scoring, the WCST administration requires specialised training and oversight. The WCST uses a number of different scoring systems, including the first scoring system created by Grant and Berg and more contemporary computerised scoring methods.

The WCST has several clinical uses, including the evaluation of cognitive function in research investigations and the assessment of cognitive deficits in a range of neurological and psychiatric diseases. The WCST has also been used to assess how executive function and cognitive flexibility are affected by ageing, stress, and cognitive training.

Overall, the WCST is a useful instrument for evaluating executive function and cognitive flexibility, and it has helped us understand these cognitive processes in different populations. Its reliability and validity as a tool for cognitive evaluation are attested to by the fact that it is often used in research and clinical settings. In those with neurological or psychiatric problems such as ADHD, schizophrenia, traumatic brain injury, and dementia, it is frequently used to assess cognitive flexibility and problem-solving skills. The test has been applied in a wide range of research projects to examine different executive functioning-related cognitive, psychological, and neurological processes.

The ability to transition between various mental processes, methods, or rules in an adaptable manner in response to shifting task requirements or environmental demands is known as cognitive flexibility. Cognitive flexibility is a key component of human cognition. It entails the ability to adapt one's ideas and behaviours to fit novel or unexpected circumstances and to react effectively to various inputs. For routine tasks that call for the integration of several cognitive processes, such as problem-solving, decision-making, and learning, cognitive flexibility is essential. According to research, a network of brain areas, including the prefrontal cortex, anterior cingulate cortex, and basal ganglia, supports cognitive flexibility. Numerous variables, including genetics, environment, experience, and ageing, are considered to have an impact on the growth and maintenance of cognitive flexibility. Numerous cognitive exercises and neuropsychological tests, like the Wisconsin Card Sorting Test (WCST), the Trail Making Test, and the Stroop Test, can be used to measure cognitive flexibility. These assessments are often used in clinical and research settings to assess cognitive flexibility impairments in a variety of groups, including those with neurological or psychiatric problems. Typically, participants must switch between several rules, stimuli, or reactions throughout these assessments.

For successful interventions and therapies for cognitive deficiencies and diseases, it is crucial to comprehend the neurological bases and mechanisms driving cognitive flexibility. In the past several years, cognitive flexibility has drawn more and more attention from academic disciplines, including neuroscience, psychology, and education in an effort to better understand human cognition and foster optimal cognitive functioning.

The capacity to do mental activities that call for attention, memory, problem-solving, decision-making, and other cognitive functions is referred to as cognitive performance. Age, gender, genetics, education, experience, and other factors all play a role in this intricate architecture.

In many facets of our life, such as academic and professional achievement, interpersonal relationships, and general well-being, cognitive functioning is crucial. For instance, those who do better cognitively are more likely to succeed in both academic and professional environments and to have better long-term results. Additionally, cognitive function is a predictor of effective ageing and a lower incidence of dementia and cognitive decline.

Cognitive performance is assessed using a variety of techniques, such as computerised cognitive evaluations, experimental activities, and standardised neuropsychological testing. These tests give a complete picture of a person's cognitive ability by evaluating several different cognitive domains, including attention, memory, processing speed, and executive functioning.

Various therapies, including cognitive training, physical activity, and lifestyle changes, can improve cognitive function. Promoting healthy cognitive functioning over a lifetime requires an understanding of the variables that affect cognitive performance and the mechanisms behind cognitive improvement.

Overall, cognitive functioning is a crucial component of human cognition that has an impact on many areas of our life. There are substantial ramifications for education, career training, and public health from research on cognitive performance. In recent years, there has been a lot of interest in studies on how music affects cognitive function. Attention, memory, and executive functioning are just a few of the cognitive functions that music has been proven to improve.

The WCST is frequently used as a diagnostic test in clinical psychology to evaluate cognitive impairment in people with a variety of neurological and psychiatric illnesses, including traumatic brain injury, schizophrenia, ADHD, and an autism spectrum disorder.

According to research, there are gender disparities in how well people do on the Wisconsin Card Sorting Test (WCST). For instance, several research has revealed that men often outperform women on the WCST, especially on specific metrics like perseverative mistakes and categories filled. The structure and function of the male and female brains differ from one another, which may be the cause of this gender disparity. In the prefrontal cortex, which is involved in executive processes like those assessed by the WCST, studies have shown that males typically have greater quantities of grey matter. It is crucial to note that not all studies have discovered gender differences in WCST performance, and even when they have, the size of such differences might change based on a variety of variables like age, educational attainment, and cultural background. As a result, it is inappropriate to draw broad conclusions regarding gender differences in WCST performance without taking the study's particular context and sample size into account.

Chapter 2
2.1 Literature Review

The study conducted by Feizpour, Parkington, and Mansouri (2018) examined the interaction between sex, music, and executive control of behaviour using the Wisconsin Card Sorting Test (WCST). The findings revealed sex differences in WCST performance, with males displaying shorter response times in correct responses compared to females. The presence of background music had adverse effects on accuracy, decreasing the percentage of correct responses in incongruent trials. Additionally, the effects of music on response time were sex-dependent, with females showing increased speed of target selection and males experiencing a decrease. Error slowing, the phenomenon where errors took longer than correct responses, was intensified in males when listening to music. These results shed light on the complex relationship between sex, music, and cognitive function, emphasising the need to consider both the adverse and beneficial effects, as well as sex differences when using music in the rehabilitation of neuropsychological disorders.

The study conducted by Sirisumthum, Thanasetkorn, Chutabhakdikul, and Chumchua (2015) aimed to investigate the relationship between music training and executive function in young adults. Participants from Music and Non-Music Programs were assessed using the Wisconsin Card Sorting Test (WCST). Results showed that young adults in the Music Program group had higher scores on two WCST sub-scores (Total Correct and Conceptual Level Response) compared to the Non-Music Program group. These findings supported previous research on the positive impact of music training on cognitive executive function. However, there were some differences in specific sub-scores that did not align with previous findings. Overall, the study provided evidence that music training can enhance executive function in young adults.

The study conducted by Thoma et al. (2013) aimed to investigate the effects of listening to relaxing music prior to a stressor on physiological and psychological stress responses. The authors reviewed existing literature and found that their findings contradicted some previous studies. They observed higher cortisol levels in participants who listened to music compared to those who listened to the sound of rippling water. However, there was a trend towards faster recovery in salivary alpha-amylase activity and heart rate variability in the music group. The study did not find significant differences in stress perception or anxiety between the music group and control groups. The authors emphasised the need for further research to understand the contextual and temporal factors that influence the effects of music on stress responses. They also acknowledged limitations in their study, such as the use of researcher-selected music stimuli and a limited sample. Overall, more research is needed to fully understand the potential health implications and effectiveness of using music as a stress management tool.

In their study, Thompson, Schellenberg, and Husain (2001) examined the Mozart effect, which suggests that listening to Mozart's music enhances spatial abilities. The researchers sought to determine whether this effect is due to differences in arousal and mood between conditions. Participants took a spatial abilities test after either listening to music or sitting in silence. The music included a Mozart sonata (pleasant and energetic) or an Albinoni adagio (slow and sad). The researchers also measured enjoyment, arousal, and mood. The results showed that performance on the spatial task was better for participants who heard Mozart compared to those in the silence condition. Additionally, the two music selections elicited different responses in enjoyment, arousal, and mood. Importantly, when the statistical analysis controlled for these differences, the Mozart effect disappeared. These findings strongly suggest that the Mozart effect is an artefact of arousal and mood rather than a direct influence of the music itself.

In a single-blind, randomised, and controlled trial, Särkämö et al. (2008) and group investigated the effects of music listening on cognitive recovery and mood after stroke. Sixty stroke patients were assigned to a music group, a language group, or a control group. The music and language groups listened daily to self-selected music or audiobooks, while the control group received no listening material. Results showed that the music group had greater improvements in verbal memory and focused attention compared to the other groups. They also experienced less depression and confusion. This study provides evidence that music listening in the early post-stroke phase enhances cognitive recovery and improves mood.

Patel and Joshi (2020) conducted a study to investigate the impact of Indian classical music on sustained attention (51) The study involved a sample of 60 participants, who were divided into two groups: an experimental group exposed to Indian classical music and a control group exposed to no music. The participants' sustained attention was assessed using a standardized psychological test. The results of the study indicated a significant improvement in sustained attention among participants who listened to Indian classical music compared to the control group. The experimental group exhibited higher attention scores and reduced mental fatigue, suggesting that Indian classical music positively influenced sustained attention abilities.

Chapter 3

RESEARCH GAP

3.1 RESEARCH GAP

Many research studies have been done on Indian classical music and it's effect on cognitive performance but the difference between Indian classical music and electronic music has also not been done before . It was observed that the relationship between electronic music and its effect on cognitive performance has not been studied. Also, the effect of these two music genres on WCST is also not found in the existing literature studies.

3.2 Objectives of Study

1) To study the effects of different musical genres on cognitive task performance in young adults

3.3 Hypothesis

H_1: There will be no significant difference in cognitive task performance between Indian classical music and without music

$H_{2:}$ There will be no significant difference in cognitive task performance between Indian classical music and chill step.

H_3: There will be no significant difference in cognitive task performance between electronic music and without music

Chapter 4. Methodology

4.1 Sample

A sample comprising 90 young adults between 18-25 years of age was taken. The sample consisted of both genders. Three groups were taken among which one of each group had 30 participants, with 15 females and 15 males each. Convenient sampling was used.

4.2 Design

This study employed a between-subject design The independent variable was the type of music genre, with two levels: Indian classical music and chill step music. The dependent variables included measures of cognitive performance.

4.3 Tools used

Indian classical music

The musical instrument will be "Healing Ragas - Sitar Tabla - Brindavan Sarang - Classical Instrumental Fusion" by B. Sivaramakrishna Rao. During the course of the study, participants were listening to this music on the laptop while performing the WCST. To guarantee that all participants receive the same amount of exposure, the music was played at the designated volume level.

Chill Step

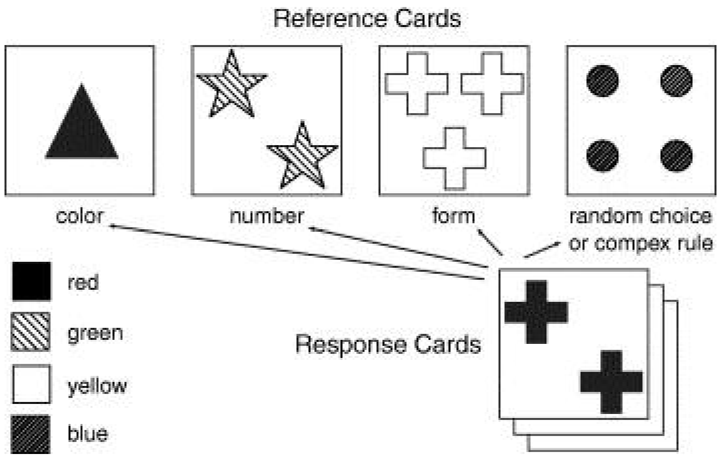
Another musical component was the chill step song "Rameses B - Memoirs (Liquid Memoirs Remix)". Throughout the course of the study, participants were taken to a controlled room and were made to listen to music while performing WCST. The volume was adjusted to ensure that each participant receives an equal amount of exposure.

Wisconsin Card Sorting Test (WCST)

WCST was developed by David A. Grant and Esta A. Berg in 1948. The Wisconsin Card Sorting Test (WCST) was used as a tool for evaluation to gauge problem-solving, executive function, and flexibility of thought. The WCST was conducted in accordance with standardised guidelines, which include completing either 6 sets or completing 128 trials whichever happens first. WCST performance will be monitored and examined in connection to their musical exposure. The interscorer reliability coefficients for the 11 WCST scores varied from .895 to 1.000, except for the learning-to-learn score (r=.658). WCST has adequate construct validity (Axelrod et al.,1992) Cronbach's alpha coefficient , used to measure reliability , was outstanding for the entire instrument (alpha =0.930) (Miranda et al.,2020)

4.4 Procedure

The study consisted of three groups which were Indian classical music , electronic music and the last group was without music , they were randomly selected. The subjects were informed that this is an educational study used for educational purposes only. Confidentiality was assured. The participant was made to sit comfortably and was introduced to WCST and was given the instructions. Later, the test was started and it was made sure that the test was conducted in a closed room without any distractions. After the experiment was completed , the scoring was done according to the WCST manual.


Reference Cards
color
number
form
random choice
or compex rule
red
green
yellow
blue
Response Cards

Chapter 5. Results

Table 5.1 Descriptive statistics

Descriptive Statistics

		N	Mean	Standard Deviation
correct	1.00	30	74.36	13.64
	2.00	30	72.56	9.65
	3.00	30	73.00	8.42
errors	1.00	30	44.00	20.68
	2.00	30	26.83	15.43
	3.00	30	26.93	16.68
Perseverative response	1.00	30	36.53	23.74
	2.00	30	25.16	24.62
	3.00	30	21.66	11.64
Perseverative error	1.00	30	28.03	18.23
	2.00	30	19.06	18.20
	3.00	30	15.86	8.93
non-perseverative error	1.00	30	18.60	10.54
	2.00	30	9.80	5.83
	3.00	30	11.20	8.88
Conceptual response	1.00	30	54.86	21.47
	2.00	30	61.80	14.06
	3.00	30	64.16	10.97
No of Categories	1.00	30	3.93	1.87
	2.00	30	5.36	1.42
	3.00	30	5.33	1.53
Failure to maintain set	1.00	30	2.26	4.65
	2.00	30	0.43	0.77
	3.00	30	0.93	1.25
Learning to learn	1.00	30	-2.11	7.03
	2.00	30	0.85	2.91
	3.00	30	3.57	8.19

In the table below, the descriptive statistics for various measures in the study are presented in the following paragraphs. For the "correct" category, the mean score of Group 1 is 74.37 and Standard Deviation is 13.65, the mean score of Group 2 is 72.57 and the standard deviation is 9.66, and the mean score of Group 3 is 73.00 standard deviation is 8.43. This measure represents the number of correct responses made by participants and all the groups performed almost similarly.

In terms of "errors," the mean score of Group 1 is 44.00 and the standard deviation is 20.68, the mean score of Group 2 is 26.83 standard deviation is 15.44, and the mean score of Group 3 is 26.93 standard deviation is 16.69. This measure reflects the number of errors made by participants during the tasks and the results indicated that groups 2 and 3 performed almost similarly and groups 1 committed the most errors.

Regarding "perseverative response," the mean score of Group 1 is 36.53 standard deviation is 23.74, the mean score of Group 2 is 25.17 standard deviation is 24.62, and the mean score of Group 3 is 21.67 and the standard deviation is 11.64. This measure captures the tendency to respond in a perseverative manner and in Group 1 there are the most perseverative responses whereas in Group 3 there are the least.

In terms of "perseverative error," the mean score of Group 1 is 28.03 standard deviation is 18.23, the mean score of Group 2 is 19.07 and the standard deviation is 18.21, the mean score of Group 3 is 15.87 and the Standard Deviation is 8.93. This measure represents the number of perseverative errors made by participants and in this again, groups 2 and 3 almost performed similarly and group 1 got the most perseverative errors.

For "non-perseverative error," the mean score of Group 1 is 18.60 and the Standard Deviation is 10.54, the mean score of Group 2 is 9.80 and the Standard Deviation is 5.84, and the mean score of Group 3 is 11.20 and the Standard Deviation is 8.88. This measure reflects the number of errors made by participants that were not perseverative in nature and in this groups 2 and 3 shows similar performance and group 1 committed the most perseverative errors.

Regarding "conceptual response," the mean score of Group 1 is 54.87 and the Standard Deviation is 21.48, the mean score of Group 2 is 61.80 and the Standard Deviation is 14.06. The mean score of Group 3 is 64.17 and the Standard Deviation is 10.97. This measure captures the participant's ability to provide responses that are conceptually answered and we see that group 2 shows the most conceptual responses and group 1 shows the least conceptual responses.

The "number of categories" measure indicated that the mean score of Group 1 is 3.93 and the Standard Deviation is 1.87, the mean score of Group 2 is 5.37 and the Standard Deviation is 1.43 The mean score of Group 3 is 5.33 and the Standard Deviation is 1.54. This measure reflects the participants and the number of categories they completed and we see that the group 2 and 3 almost completed the same amount of categories and group 1 is the lowest.

For "failure to maintain set," the mean score of Group 1 is 2.27 and the Standard Deviation is 4.65, the mean score of Group 2 is 0.43 and the Standard Deviation is 0.77 The mean score of Group 3 is 0.93 and the Standard Deviation is 1.26). This measure captures the participants' tendency to struggle with maintaining a consistent cognitive set and we see that groups 2 and 3 did not have much problem in maintaining the set when compared to group 1.

The LTL (Learning to learn) measure was analysed for three groups in the study. The mean score of Group 1 is -2.12 with a standard deviation (SD) of 7.03. The mean score of Group 2 of LTL score is 0.86 and the Standard Deviation is 2.91, while the mean score of Group 3 is 3.57 and the Standard Deviation is 8.19. In this, we see that Group 3 shows the highest value and group 2 is second and Group 1 shows the lowest LTL.

Table 5.2 Anova

ANOVA						
		Sum of Squares	df	Mean Square	F.	Sig.
Correct	Between Groups	52.95	2	26.47	0.227	0.798
	Within Groups	10166.33	87	116.85		
	Total	10219.28	89			
errors	Between Groups	5859.75	2	2929.87	9.306	0.000*
	Within Groups	27392.03	87	314.85		
	Total	33251.78	89			
Perseverative response	Between Groups	3624.68	2	1812.34	4.164	0.019*
	Within Groups	37868.30	87	435.26		
	Total	41492.98	89			
Perseverative error	Between Groups	2386.68	2	1193.34	4.812	0.010*
	Within Groups	21574.30	87	247.98		
	Total	23960.98	89			
Nonperseverative error	Between Groups	1341.60	2	670.80	8.977	0.000*
	Within Groups	6500.80	87	74.72		
	Total	7842.40	89			

Conceptual response	Between Groups	1401.62	2	700.81	2.698	0.073
	Within Groups	22602.43	87	259.79		
	Total	24004.056	89	Total		
No of Categories	Between Groups	40.15	2	20.07	7.611	0.001*
	Within Groups	229.50	87	2.63		
	Total	269.65	89			
Failure to maintain	Between Groups	53.88	2	26.94	3.392	0.038*
	Within Groups	691.10	87	7.94		
	Total	744.98	89			
Learning to learn	Between Groups	485.75	2	242.87	5.827	0.004*
	Within Groups	3626.40	87	41.68		
	Total	4112.16	89			

The table presents the results of an ANOVA (Analysis of Variance) analysis conducted for several dependent variables related to your research. The ANOVA allows for the comparison of means across different groups or conditions. Here is an explanation of the different sections and the results:

Between Groups: This section provides information on the variation between the different groups or conditions. It includes the sum of squares, degrees of freedom (df), mean square, F-value, and significance (Sig.) level. The F-value represents the ratio of between-group variation to within-group variation. The Sig. value indicates the statistical significance of the F-value.

Within Groups: This section presents the variation within each group or condition. It includes the sum of squares, degrees of freedom, and mean square.

Total: This row provides the total sum of squares, and degrees of freedom, and represents the overall variation in the data.

The results of the ANOVA analysis can be interpreted as follows:

For the "errors" dependent variable, there is a significant difference between the groups (F = 9.306, Sig. = 0.000). The between-group variation (sum of squares = 5859.75) is higher than the within-group variation (sum of squares = 27392.03), suggesting that the groups differ significantly in terms of errors. Similarly, for the "perseverative response" and "perseverative error" dependent variables, there are significant differences between the groups (Sig. < 0.05), indicating that the groups differ in terms of these variables. The "non-perseverative error" dependent variable also shows a significant difference between the groups (F = 8.977, Sig. = 0.000) The "failure to maintain" and "learning to learn" dependent variables both exhibit significant differences between the groups (Sig. < 0.05). The "No of Categories" dependent variable shows a significant difference between the groups (F = 7.611, Sig. < 0.05).The "failure to maintain" and "learning to learn" dependent variables both exhibit significant differences between the groups (Sig. < 0.05).

For the "conceptual response" dependent variable, there is no significant difference between the groups (F = 2.698, Sig. = 0.073). The between-group variation is lower compared to the within-group variation.

In summary, the ANOVA analysis reveals significant differences between the groups for various dependent variables, indicating that the groups differ in terms of errors, perseverative response, perseverative error, non-perseverative error, number of categories, failure to maintain, and learning to learn. However, for the conceptual response variable, no significant difference was observed between the groups.

Table 5.3 Multiple comparisons

Dependent Variable	I	J	Mean difference (I-J)	Std. Error	Sig.
	no music	Classical music	1.80	2.79	.521
		Electronic music	1.36	2.79	.626
Correct	Classical music	no music	-1.80	2.79	.521
		Electronic music	-.43	2.79	.877
	Electronic music	no music	-1.36	2.79	.626
		Classical music	.43	2.79	.877
	no music	Classical music	17.16	4.58	.000
		Electronic music	17.06	4.58	.000
Errors	Classical music	no music	-17.16	4.58	.000
		Electronic music	-.10	4.58	.983
	Electronic music	no music	-17.06	4.58	.000
		Classical music	.10	4.58	.983
	no music	Classical music	11.36*	5.38	.038
		Electronic music	14.86*	5.38	.007
Perseverative responses	Classical music	no music	-11.36*	5.38	.038
		Electronic music	3.50	5.38	.518
	Electronic music	no music	-14.86	5.38	.007
		Classical music	-3.50	5.38	.518
	no music	Classical music	8.96	4.06	.030
		Electronic music	12.16	4.06	.004

Dependent Variable	I	J	Mean difference (I-J)	Std. Error	Sig.
Perseverative errors	Classical music	no music	-8.96	4.06	.030
		Electronic music	3.20	4.06	.433
	Electronic music	no music	-12.16	4.06	.004
		Classical music	-3.20	4.06	.433
Non-Perseverative errors	no music	Classical music	8.80	2.23	.000
		Electronic music	7.40	2.23	.001
	Classical music	no music	-8.80	2.23	.000
		Electronic music	-1.40	2.23	.532
	Electronic music	no music	-7.40	2.23	.001
		Classical music	1.40	2.23	.532
Conceptual responses	no music	Classical music	-6.93	4.16	.099
		Electronic music	-9.30	4.16	.028
	Classical music	no music	6.93	4.16	.099
		Electronic music	-2.36	4.16	.571
	Electronic music	no music	9.30	4.16	.028
		Classical music	2.36	4.16	.571
No of categories	no music	Classical music	-1.43*	.419	.001
		Electronic music	-1.40*	4.19	.001
	Classical music	no music	1.43*	4.19	.001
		Electronic music	.03	4.19	.937
	Electronic music	no music	1.40*	4.19	.028
		Classical music	-.03	4.19	.937
	no music	Classical music	1.83	.72	.014

Dependent Variable	I	J	Mean difference (I-J)	Std. Error	Sig.
Failure to maintain set		Electronic music	1.33	.72	.070
	Classical music	no music	-1.83	.72	.014
		Electronic music	-.50	.72	.494
	Electronic music	no music	-1.33	.72	.070
		Classical music	.50	.72	.494
Learning to learn	no music	Classical music	-2.97	1.66	.078
		Electronic music	-5.68	1.66	.001
	Classical music	no music	2.97	1.66	.078
		Electronic music	.-2.71	1.66	.107
	Electronic music	no music	5.68	1.66	.001
		Classical music	2.71	1.66	.107

Based on the provided information, the post hoc analysis was conducted to compare three conditions: Classical music, Electronic music, and no music, based on a dependent variable. The mean differences between these conditions were examined, along with their standard errors and corresponding significance levels. The table below calculated the mean difference between the "correct responses" of no music and classical music which is 1.80 and the standard deviation is 2.79 with a non-significance of .521. Similarly, when comparing Electronic music to no music, the mean difference is -1.36, with a standard error of 2.79. The resulting p-value of .626 suggested that there was no statistically significant difference between these two groups. The comparison between Classical music and electronic music revealed a mean difference of -.43, with a standard error of 2.79. The corresponding p-value is 0.877 indicating no statistically significant distinction between these two groups was found.

Next, we see that the the mean difference for the "errors" category between no music and classical music is 17.16 and the standard deviation is 4.58 with a significance of .000 which indicated that there is a significant difference between the two groups. Similarly, when comparing Electronic music to no music, the mean difference is -17.06, with a standard error of 4.58. The resulting p-value of .000 suggested that there is a significant difference between these two groups. The comparison between Classical music and electronic music revealed a mean difference of -.10, with a standard error of 4.58. The corresponding p-value is .983 indicating no significant distinction between these two groups.

The third category which is the "perseverative responses" , explains the mean difference between no music and classical music which is 11.36 and the standard deviation is 5.38 which means that it is statistically significant at .038. Similarly, when comparing electronic music to no music, the mean difference is -14.86, and the standard error is 5.38. The resulting p-value of .007 suggested that there is a significant difference between these two groups. The comparison between Classical music and electronic music revealed a mean difference of 3.50, with a standard error of 5.38. The corresponding p-value of .518 indicated no statistically significant distinction between these two conditions.

The next category is " perseverative errors" in which the mean difference between no music and classical music which is 8.96 and the standard error is 4.06 with a significance of .030. Similarly, when comparing Electronic music to no music, the mean difference is 12.16, and the standard error is 4.06. The resulting p-value is .004 which suggests that there is a significant difference between these two conditions. The comparison between Classical music and electronic music revealed a mean difference of -3.20, with a standard error of 4.06. The corresponding p-value of .433 indicated no statistically significant distinction between these two conditions.

The next category is “non-perseverative errors” in which the mean difference between no music and classical music which is 8.80 and the standard deviation is 2.23 with a significance of .000. Similarly when comparing Electronic music to no music, the mean difference is 7.40, with a standard error of 2.23. The resulting p-value of .001 suggests that there is a statistically significant difference between these two conditions. The comparison between Classical music and electronic music revealed a mean difference of -1.40, with a standard error of 2.23. The corresponding p-value of .532 indicates no statistically significant distinction between these two conditions.

The next category is “conceptual level responses” in which the mean difference between no music and classical music is -6.93 and the standard deviation is 4.16 with a significance of .099. Similarly, when comparing Electronic music to no music, the mean difference is 9.30, with a standard error of 4.16. The resulting p-value is .028 which suggests that there is a significant difference between these two conditions. The comparison between Classical music and electronic music revealed a mean difference of .03, with a standard error of 4.16. The corresponding p-value of .937 indicated no statistically significant distinction between these two conditions.

The next category is “no of categories ” in which the mean difference between no music and classical music is -6.93 and the standard deviation is 4.16 with a significance of .099. Similarly, when comparing Electronic music to no music, the mean difference is -1.43, with a standard error of .419. The resulting p-value of .001 suggested that there is a statistically significant difference between these two conditions. The comparison between Classical music and electronic music revealed a mean difference of .03, with a standard error of 4.19. The corresponding p-value of .937 indicates no statistically significant distinction between these two conditions.

The next category is “failure to maintain set” in which the mean difference between no music and classical music is 1.83 and the standard deviation is .72 with a significance of .01. Similarly when comparing Electronic music to no music, the mean difference is 1.33, with a standard error of .72. The resulting p-value of .07 suggests that there is a significant difference between these two conditions. The comparison between Classical music and electronic music revealed a mean difference of -.50, with a standard error of .72. The corresponding p-value of .49 indicates no statistically significant distinction between these two conditions.

The last category is “Learning to learn” in which the mean difference between no music and classical music is -2.97 and the standard deviation is 1.66 with a significance of .07. Similarly when comparing Electronic music to no music, the mean difference is -5.68, with a standard error of 1.66. The resulting p-value of .00 suggests that there is a statistically significant difference between these two conditions. The comparison between Classical music and electronic music shows a mean difference of -2.71, with a standard error of 1.66. The corresponding p-value of .10 indicates no statistically significant distinction between these two conditions.

6. Discussion

This research aims to study the effects of different musical genres on cognitive task performance in young adults. The comparison was done between three groups which are Indian classical music , and electronic music and the third group has no music. In this study, the first hypothesis, which stated that There will be no significant difference in cognitive task performance between Indian classical music and without music , is rejected. The results showed significant differences in variables related to cognitive performance between Indian classical music and without any music.

Similarly, the second hypothesis, which stated that there would be no significant difference in cognitive task performance between Indian classical music and chill step, is also rejected. The ANOVA results revealed significant differences in certain variables, indicating that the type of music (Indian classical music vs chill step) influenced cognitive task performance.

The third hypothesis, which stated that there will be no significant difference in cognitive task performance between the Chill step and without music , is rejected. The results showed significant differences in variables related to cognitive performance between the chill step and without any music.

The present study aims to investigate the effects of two different music genres, Indian classical music and the electronic music subgenre known as "chill step," on cognitive performance. Specifically, the study focused on trial completion, response accuracy, and error rates in the Wisconsin Card Sorting Test (WCST) as the dependent variables.

Other research shows that various music genres can have differing effects on cognitive function. Studies by Thompson et al. (2014) and Smith and Morris (2018) demonstrated that instrumental music and classical music, respectively, can enhance cognitive abilities such as verbal fluency, spatial reasoning, attention, and information processing. Similarly, Sridhar and Srinivasan (2012) found that listening to Indian classical music improves attention, memory, and problem-solving skills.

On the other hand, there is limited research on the effects of electronic music, particularly subgenres like chill step, on cognitive function. Johnson et al. (2019) conducted a study on college students' cognitive performance and found that exposure to electronic dance music (EDM) increased arousal and improved cognitive flexibility. Although electronic (chill step) music specifically was not examined in this study, it is plausible that electronic music, in general, may have positive effects on cognitive function.

In the current study, participants in the Indian classical music and chill step music groups completed slightly fewer trials compared to the non-music group, indicating a minor impact of music on their engagement in cognitive tasks. However, there were no significant differences in the overall number of trials completed across the groups.

Regarding response accuracy, all three groups performed similarly, suggesting that neither Indian classical music nor electronic music had a significant effect on the participant's ability to provide correct answers during the cognitive exercises. In terms of error rates, participants in the no-music group made significantly more mistakes compared to those in the electronic music and Indian classical music groups.

Previous studies have shown that listening to music, including moderately paced electronic music, can improve cognitive flexibility and attention, leading to better performance on cognitive tasks such as the WCST. The rhythmic patterns and synthesised sounds in electronic music can capture and maintain attention, facilitating cognitive adaptation and problem-solving. However, it is important to note that loud and fast-paced electronic music may have a negative impact on attention and cognitive performance, potentially causing distractions and limiting creative thinking and problem-solving abilities.

Indian classical music, with its rich melodies, intricate rhythms, and cultural significance, has been associated with spirituality and relaxation. Previous research has indicated that these characteristics of Indian classical music can enhance attention, memory, and cognitive

processing speed. The use of specific musical motifs called ragas, associated with different emotional and mental states, may contribute to these positive outcomes. Indian classical music may be more effective in promoting relaxation and reducing stress, which could improve cognitive performance in tasks requiring creativity and memory.

It is essential to consider the unique characteristics and potential benefits of each music genre when examining their effects on WCST performance. Indian classical music may be more suitable for activities that demand relaxation and stress reduction, enhancing cognitive performance in tasks involving creativity and memory. On the other hand, electronic music, with its energising effects, may be more suitable for tasks requiring concentration and mental alertness.

When integrating music into cognitive tasks like the WCST, individual factors such as musical preferences and comfort should also be taken into account. Customising the musical selections to match the preferences and needs of each individual may maximise the potential benefits of music on cognitive performance.

Further research is needed to delve into the underlying mechanisms of how different musical genres affect cognitive function. Neuroimaging techniques, such as functional magnetic resonance imaging (fMRI), can provide insights into the brain areas and networks involved in the cognitive benefits of music. Longitudinal studies could also explore the cumulative effects of regular exposure to specific musical genres on cognitive functioning over time.

In addition to the findings of this study, it is important to acknowledge that the effects of music on cognitive function are complex and multifaceted. The existing body of research provides a foundation for understanding how different genres of music can impact cognitive performance, but there are still many aspects that require further investigation.

One relevant consideration is the potential interaction between music and individual differences in cognitive abilities. It is possible that the effecMoreover, the specific characteristics of the music itself, such as tempo, rhythm, melody, and instrumentation, may play a role in its effects on cognitive function. Different musical elements may engage distinct neural pathways and cognitive processes. Investigating the underlying mechanisms through which music influences cognitive function could provide valuable insights into the potential applications of music in various contexts.

Expanding the scope of research to include diverse populations is another important avenue for future exploration. While the present study focused on the effects of Indian classical music and chill step music on cognitive function, other musical genres and cultural traditions may have unique impacts on cognition. Examining the effects of a broader range of music genres and considering the cultural and individual context could lead to a more comprehensive understanding of how music influences cognitive performance.

Furthermore, longitudinal studies that assess the long-term effects of music exposure on cognitive function could provide valuable information. It is possible that regular engagement with specific music genres over an extended period could lead to cumulative cognitive benefits. Understanding the long-term effects of music on cognitive ts of music on cognitive function may vary depending on factors such as cognitive strengths and weaknesses, personality traits, and musical preferences. Future studies could explore these individual differences and their influence on the relationship between music and cognitive performance.

function can inform the development of music-based interventions and applications in educational, therapeutic, and professional settings.

In conclusion, the present study adds to the existing body of research by examining the effects of Indian classical music and cool step music on cognitive performance. The findings suggest that both genres have subtle influences on trial completion and error rates in the WCST, but they do not significantly affect overall task performance or response accuracy. These results contribute to our understanding of how different musical genres can impact cognitive function, but further research is needed to explore the underlying mechanisms and identify the optimal conditions for utilising music to enhance cognitive performance.

7. Conclusion, Implication, Limitations and Future Study

Overall, this study underscores the need for personalised approaches when incorporating music into cognitive tasks, considering individual preferences and cognitive demands. By understanding the unique benefits and traits of different musical genres, educators, therapists, and In conclusion, this study investigated the effects of Indian classical music and cool step music on cognitive performance, specifically focusing on trial completion, response accuracy, and error rates in the Wisconsin Card Sorting Test (WCST). The results showed that participants in both the Indian classical music and cool step music groups completed slightly fewer trials compared to the music-free group, indicating a modest impact of music on task engagement. However, there were no significant differences in overall trial completion or response accuracy across the groups.

These findings contribute to our understanding of how different genres of music can influence cognitive function. While previous research has demonstrated the cognitive benefits of classical music and electronic music, particularly in terms of attention, cognitive flexibility, and information processing, this study provides insights into the specific effects of Indian classical music and cool step music on cognitive performance.

It is important to note that the influences of music on cognitive function are complex and multifaceted, with various factors such as individual differences, musical characteristics, and cultural contexts potentially playing a role. Future research should further investigate these factors to gain a deeper understanding of how music can be utilized to enhance cognitive performance in different contexts.

professionals can develop tailored interventions and applications to maximise the potential advantages of music on cognitive performance.

However, further research is necessary to explore the underlying mechanisms, identify optimal conditions for using music in cognitive tasks, and investigate the long-term effects of music exposure on cognitive function. Such endeavours will contribute to the development of evidence-based interventions and applications that harness the power of music to enhance cognitive abilities and improve overall cognitive functioning.

7.2 Limitations

Small sample size: The study has been conducted with a limited number of participants, which can reduce the generalizability of the findings and limit the statistical power.

Lack of diversity: The study might have included a homogeneous sample, such as only college students or individuals from a specific demographic group. This limits the ability to generalize the results to a more diverse population.

Limited focus on specific music genres: The study mainly focused on Indian classical music and chill step (electronic music). Other genres of music that could potentially impact cognitive function were not explored. This narrow focus may limit the understanding of how different music genres influence cognitive performance.

Lack of control over participants' musical preferences: Individual preferences for music may vary, and participants may have had different levels of comfort or familiarity with the selected genres. This variability could have influenced their cognitive performance differently.

Short-term assessment: The study only assessed the immediate effects of music on cognitive performance during the tasks. Long-term effects or cumulative benefits of music on cognitive function were not examined. A longer-term study design could provide more insights into the potentially long-lasting effects of music on cognition.

7.3 Implications

The study provides further evidence for the potential of music as a cognitive enhancer. By demonstrating that specific musical genres, such as Indian classical music and chill step music, can positively influence cognitive task performance, the study suggests that music can be used as a tool to improve cognitive functioning. This has implications for educational settings, workplace environments, and cognitive rehabilitation programs, where incorporating appropriate music may aid in enhancing attention, concentration, and overall cognitive abilities. It also suggests that different types of music may have distinct cognitive effects, and researchers and practitioners should consider the genre of music when designing cognitive interventions or selecting background music for cognitive tasks.

7.4 Future Study

Future studies can further build upon the findings of the present study by exploring various aspects related to the effects of music genres on cognitive performance. Here are some suggestions for future research:

1. Investigating other music genres: While the present study focused on Indian classical music and cool step music, future research can examine the effects of other music genres on cognitive function. For example, studying the impact of genres like jazz, rock, or

traditional folk music can provide insights into their unique effects on cognitive performance.

2. Examining different cognitive tasks: The present study utilised the Wisconsin Card Sorting Test (WCST) as the cognitive task. Future studies can explore the effects of music genres on other cognitive tasks, such as memory tasks, attention tasks, problem-solving tasks, or creative tasks. This would provide a broader understanding of how music influences various cognitive domains.
3. Intervention studies: Implementing music-based interventions in educational, therapeutic, or professional settings can further examine the practical applications of music on cognitive performance. Assessing the effectiveness of using specific music genres in improving cognitive abilities or addressing specific cognitive deficits can inform the development of evidence-based interventions.
4. Gender-Based Analysis: Conduct a gender-based analysis to examine whether the effects of music genres on cognitive performance vary between males and females. This analysis can help identify potential gender differences in cognitive responses to different music genres and provide insights into how gender may interact with musical stimuli.
5. The effect of music on neurodivergent children and adults can also be explored separately to see if certain kind of musical genre enhances their concentration and efficiency in the performance of certain tasks.

By addressing these research areas, future studies can expand our knowledge of the effects of music genres on cognitive performance, provide a deeper understanding of the underlying mechanisms, and guide the development of music-based interventions for various cognitive domains and populations.

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Chapter 8

Appendix

WCST Record Booklet

Name ______________________ Test Date ____ / ____ / ____ (year / month / day)

ID # ______________________ Birth Date ____ / ____ / ____ (year / month / day)

Gender ______ Race ______________ Handedness ____________ Age ____________

Occupation ______________________ Education ______________________

Examiner ____

Referral Information

Referral Question ____

Background Information/Presenting Complaints ______________________________

Current Medications/Dosage ______________________________________

Behavioral Observations ______________________________________

TESTING SITUATION

Rapport	Cooperation	Effort on Test
☐ Excellent	☐ Excellent	☐ Excellent
☐ Good	☐ Adequate	☐ Adequate
☐ Fair	☐ Variable	☐ Fair
☐ Poor	☐ Resistant	☐ Variable
	☐ Noncompliant	☐ Poor

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Category Sequence: C F N C F N

___ 1. C F N O	___ 33. C F N O	___ 1. C F N O	___ 33. C F N O
___ 2. C F N O	___ 34. C F N O	___ 2. C F N O	___ 34. C F N O
___ 3. C F N O	___ 35. C F N O	___ 3. C F N O	___ 35. C F N O
___ 4. C F N O	___ 36. C F N O	___ 4. C F N O	___ 36. C F N O
___ 5. C F N O	___ 37. C F N O	___ 5. C F N O	___ 37. C F N O
___ 6. C F N O	___ 38. C F N O	___ 6. C F N O	___ 38. C F N O
___ 7. C F N O	___ 39. C F N O	___ 7. C F N O	___ 39. C F N O
___ 8. C F N O	___ 40. C F N O	___ 8. C F N O	___ 40. C F N O
___ 9. C F N O	___ 41. C F N O	___ 9. C F N O	___ 41. C F N O
___ 10. C F N O	___ 42. C F N O	___ 10. C F N O	___ 42. C F N O
___ 11. C F N O	___ 43. C F N O	___ 11. C F N O	___ 43. C F N O
___ 12. C F N O	___ 44. C F N O	___ 12. C F N O	___ 44. C F N O
___ 13. C F N O	___ 45. C F N O	___ 13. C F N O	___ 45. C F N O
___ 14. C F N O	___ 46. C F N O	___ 14. C F N O	___ 46. C F N O
___ 15. C F N O	___ 47. C F N O	___ 15. C F N O	___ 47. C F N O
___ 16. C F N O	___ 48. C F N O	___ 16. C F N O	___ 48. C F N O
___ 17. C F N O	___ 49. C F N O	___ 17. C F N O	___ 49. C F N O
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___ 19. C F N O	___ 51. C F N O	___ 19. C F N O	___ 51. C F N O
___ 20. C F N O	___ 52. C F N O	___ 20. C F N O	___ 52. C F N O
___ 21. C F N O	___ 53. C F N O	___ 21. C F N O	___ 53. C F N O
___ 22. C F N O	___ 54. C F N O	___ 22. C F N O	___ 54. C F N O
___ 23. C F N O	___ 55. C F N O	___ 23. C F N O	___ 55. C F N O
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___ 27. C F N O	___ 59. C F N O	___ 27. C F N O	___ 59. C F N O
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___ 30. C F N O	___ 62. C F N O	___ 30. C F N O	___ 62. C F N O
___ 31. C F N O	___ 63. C F N O	___ 31. C F N O	___ 63. C F N O
___ 32. C F N O	___ 64. C F N O	___ 32. C F N O	___ 64. C F N O

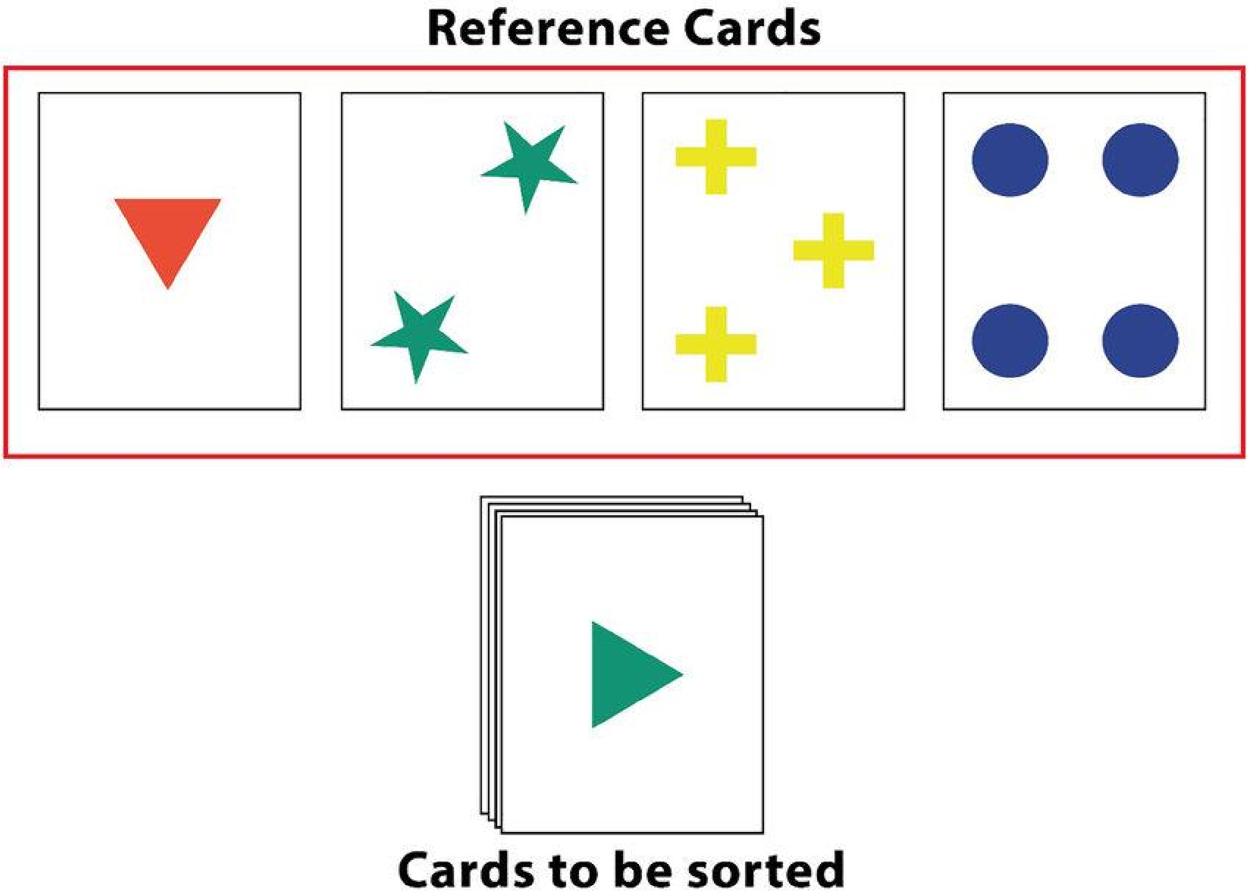
Scoring Area

	Raw score	Standard score	*T* score	Percentile score
Number of Trials Administered				
Total Number Correct				
Total Number of Errors				
Percent Errors				
Perseverative Responses				
Percent Perseverative Responses				
Perseverative Errors				
Percent Perseverative Errors				
Nonperseverative Errors				
Percent Nonperseverative Errors				
Conceptual Level Responses				
Percent Conceptual Level Responses				

	Raw score	Percentile range
Number of Categories Completed		
Trials to Complete First Category		
Failure to Maintain Set		
Learning to Learn		

Normative table ______________________________

Learning to Learn Score Worksheet				
Category number	**Number of trials**	**Errors**	**Percent errors**	**Percent errors difference score**
1				
2				
3				
4				
5				
6				
			Average difference	


Reference Cards
Cards to be sorted