

Melodic Mindscapes: An Exploration of Indian Classical Music's Impact On the Cognitive Content of Drawings in 4-7 Year-Old Children

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ABSTRACT

Prior research has discovered that classical music has a variety of positive impacts on cognition, especially in young children. Additionally, numerous studies have built off of this idea and revealed that through the integration of artistic expression, classical music can improve the cognitive development of young children (ages 4+). Yet, there is still a lack of research in regards to the effects that world music, or more specifically, Indian classical music may have on cognitive development in children when observed through artistic expression. Thus, this one-group pre-test post-test design measures the cognitive content of drawings in children of the ages 4-7 when listening to Indian classical music, while partaking in the Silver Drawing Test. Using the Silver Drawing Test, children were asked to draw from a predictive drawing prompt, observational drawing prompt, and imagination drawing prompt. These drawings were then graded on a scale given by the Silver Drawing Test manual, measuring cognitive content. This was done both with and without the music in the same cohort of children, and it was hypothesized that these children would have an improvement in the cognitive content of their drawings when listening to Indian classical music. However, the analysis displayed opposing results, with the conclusion being that there was a statistically insignificant improvement in the cognitive content of drawings in these children when listening to Indian classical music. This study adds to the literature by corroborating the connection between world classical music, particularly Indian classical music, and cognition in terms of artistic expression. Further research should seek to identify the variances of cognitive content produced when listening to different styles of Indian classical music and whether this existing research can be tested under more stable, consistent conditions.

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Western classical music, a genre largely associated with composers such as Bach and Mozart, is known to be one of the most beneficial types of music in improving the health of an individual (Trappe, 2012). This can be seen through a variety of emotional and cognitive processes including perception, memory, attention, and decision making that classical music elicits based on tempo, mode, and other musical components (Kiely, 2014; Kim, 2023). Furthermore, it has been concluded that such music induces positive behavioral changes in children that may not be attributed to biological traits (Habibi et al, 2018).

To measure such changes in cognition and emotional response, artistic expression can be used, and is known to be an effective mode of cognitive measurement in young children (Eisner, 1982). Artistic thinking is not only “inherent in the human condition” but children also learn to regard their environment as a “pool of expressive form” for inspiration, as well (Eisner, 1982). Consequently, demonstrating that artistic expression is an effective mode of cognitive measurement in children.

Additionally, emotions evoked as a result of listening to classical music are more accurately portrayed through drawings, rather than oral communication (Gur, 2009). This is because a child's communication levels may not have developed to the proficiency of being able to reiterate their personal feelings and perceptions (Gur, 2009). Furthermore, drawing operates as, “a unique mental tool” and “when these children were encouraged to revisit, revise and dialogue through and with their drawing, they were able to explore and represent increasingly complex ideas” (Brooks, 2005).

However, the narrow focus on Western music has been critiqued for its lack of diversity (Rauscher, 1999; Ubrangala et al, 2022). Similarly, Stevens (2012) states that “as globalization and Western music homogenize the world musical environment, diverse music and musical contexts must be documented.” In terms of child development, “active musical participation in infancy enhances culture-specific musical acquisition,” and improves social and communication development (Gerry et al, 2012). An example of this cultural, classical music, is Indian classical music.

The spectrum of Indian classical music is largely diverse due to its range of melodic modes, also known as ‘ragas’ (Mathur et al., 2015; Sanivarapu, 2015). Distinguishing factors between musical pieces in this genre further lies in variation in tempo and other musical structures (Mathur et al., 2015; Sanivarapu, 2015). Altogether, these culminating elements have been known to evoke a multitude of positive emotional responses in adults; subsequently, proving to be the backbone of the stimulation of cognitive functioning (Mathur et al., 2015; Sanivarapu, 2015).

Yet, the effects of artistic expression, and its unique harnessing of emotional, perceptive, and cognitive details in children, with the collaboration of Indian classical music is lacking in existing research.

Significance

Exploring the effects that Indian classical music has on cognition in young children is significant, as music as a whole lacks extensive research into its role as a tool in increasing cognitive functioning in children; this demands further research as cognitive abilities are extremely important in children due to its contribution to holistic development (Kasuya-Ueba et al., 2020; Peng & Kievit, 2020). Specifically, this research is vital to acknowledge the consequential loss of certain psychological processes, diversity, and musical systems that are less understood due to hyperfixation on Western classical music (Stevens, 2012).

Not only this, but artistic expression contributes to knowledge regarding the brain's perceptual capabilities, and “externalizes the inner workings of the brain” (Zeki, 2001). It is these “inner workings” or cognitive processes that are particularly important in regards to cognitive development in children (Kasuya-Ueba et al., 2020; Peng & Kievit, 2020).

Altogether, acknowledging the potential benefits of understanding the relationship between Indian classical music and its impacts on child cognition.

Literature Review

A broad examination of literature regarding classical music and cognitive functioning examined through drawing in children is generally minimal, and if present, largely discusses the impact of Western classical music on the cognitive development of young children. Hence, one clear connection between these two components that is particularly under-researched is the usage of world, or cultural music, as a stimulus—which, in this study, is Indian classical music. To begin, I will analyze a broad examination of the effects of Indian classical music on cognition, as an overview. Then, I will continue into the specific connection between childrens’ cognitive function, specifically cognitive content of drawings, reflected through artistic expression, and classical music. Next,

I will conclude by examining the existing literature that hones into the convergence of cultural music and cognitive functioning assessed in children through artistic expression. Finally, I will conclude with addressing the goal of my research.

Indian Classical Music and Cognition

When observing the plethora of literature on Indian classical music and cognition, studies consistently note the emotional responses evoked in listeners. As mentioned previously, Indian classical music includes components such as ragas, are capable of evoking distinct emotion, and is correlated to cognition or cognitive functioning (Mathur et al., 2015; Sanivarapu, 2015).

More specifically, ragas are composed of combinations within two key elements: *alaap* [note delineation] and *gat* [rhythmic pace] (Mathur et al., 2015; Sanivarapu, 2015). Differentiation in these two elements of a raga contribute heavily to the differences in emotional response, and ultimately, differences in cognition and behavioral responses, as well (Mathur et al., 2015; Sanivarapu, 2015).

Examples of such responses include raga *Puriya* and raga *Kaunsi Kanada* having been recorded to reduce state anxiety scores the most in adults, accredited to differentiation in their musical composition (Ubrangala et al., 2022). Additionally, the vocal genre of *Dhrupad* which follows the raga *Yaman* was found to have evoked deep meditative and conscious sensations in adults due to the nature of its *alaap* and *gat* (Clarke and Kini, 2011).

Though when observing the context of young children specifically, *Mohana* raga is known to be particularly optimal for young children due to its simplified, and less complex *alaap* and *gat* (Ubrangala, Kirthana. Interview. 22 Jan, 2024). Precisely, this raga is known to improve attention, memory, and concentration (Nagarajan et al., 2015).

Together, this existing research asserts that due to the variation of ragas, Indian classical music has a unique effect on emotional responses, cognition, and behavior in adults.

Children's Cognitive Functioning Measured By Artistic Expression: Classical Music

Among the widely researched field of classical music, a few studies utilized artistic expression as a channel through which they could measure young children's cognitive functioning.

For instance, Elkoshi (2019) designed a study to investigate 7-8 year old children's audiovisual art with intuitive listening to classical music in which the children were asked to draw what they interpreted from the music while listening to it. The results showed that different compositions, for example components such as musical form, sequence of melody, and tempo combinations, evoked notably different morphological, structural, and conceptual responses from children, highlighting the importance of the composition within a musical piece (Elkoshi, 2019).

When measuring cognitive functioning through artistic expression, the particular term: "cognitive content of drawings" can also be used. This term refers to the measurement of specific skills that allow for cognition represented through an individual's art to be measured (Silver, 2007). This is largely deduced from the intricacy or accuracy of skill execution (Silver, 2007). When this was measured in 6 year old children, it was found that they not only experienced a calming effect, but also had increasingly detailed drawings of the assigned tasks (Gur, 2009). Consequently, displaying a development of cognitive abilities in these children (Gur, 2009).

Overall, these findings highlight the positive effect that classical music, when integrated with artistic expression, has on cognitive processes in young children.

There may also be a foundation to infer that Indian classical music can potentially have an influence on cognition, through artistic expression. (Lindblom, 2017) established that world, or cultural music had an effect on cognitive abilities in children such as creativity and improvisation. For example, Javanese music was

played for the children as they were asked to visualize and draw images based on listening to the music. Through this method, it was found that the music enabled enhanced metaphor and imagery skills (Lindblom, 2017). As a result, it can be argued that when integrated with artistically-inclined methodologies such as imagery and interpretive drawing, certain styles of world music have derived results that are shown to improve cognitive abilities in children.

Even still, these examples do not include Indian classical music, and present a gap in existing literature. As the goal of my research is to add to current literature on measuring the cognitive content of drawings in children through methods of artistic expression, it is crucial that I address this gap in literature through my study.

As such, my study will specifically cover the effects that Indian classical music, Mohana raga specifically, has on the cognitive content of drawings in 6 year old children.

Thus, my research question is as follows: *Through a one group pre-test post-test quantitative research design, to what extent does Indian classical music, through Mohana raga, affect the cognitive content of drawings in 4-7 year old children that attend international schools in Singapore?*

My hypothesis, based on the findings of existing literature, is that Mohana raga will have an impact on the cognitive content of drawings in 4-7-year-old children.

Method

Overview

This research was conducted through a quantitative one-group pre-test post-test design, in which “a pre-test measure followed by a treatment and a posttest for a single group” (Creswell, 2013). This proves to be most significant for my study as a qualitative research design does not accommodate the inclusion of analyzing variables, and statistically comparing the effects of these variables within experimental or control groups, but rather focuses on contextual, and interpretive factors that are less present in the area of research I have chosen.

First, this design, since quantitative, will be able to accommodate analyzing variables, and statistically comparing the effects of these variables in different conditions (Creswell, 2013). This aligns with the experimental and control conditions that my study incorporates.

Second, most quantitative designs largely take into account a maximum of two groups of participants and may require randomization. However, this selected design, “does not randomly assign participants to groups (e.g., they may be intact groups available to the researcher)” (Creswell, 2013). This aligned with my feasibility concerns regarding the collection of participants as only a select few of participants were available, and hence could not be randomized before conducting the study.

Third, this design mirrors the methodology of Dr. Cagla Gur’s 2009 study in which a pre-test and post-test method was used. However, it is important to note that the protocols taken in her research were slightly altered in this study due to cohort size and time restrictions.

Altered protocols included conducting a pre-test post-test method on one cohort rather than multiple; thus, this design was particularly optimal as it accommodated such concerns, allowing for a pre-test post-test methodology to be conducted on a single cohort. In other words, every child in this study produced one set of drawings with no music, and one set of drawings while listening to Indian classical music.

This proves to be an effective model of measuring the efficacy of an intervention as testing on the same cohort offers further advantages such as understanding within-individual changes, and calculating predictions over time especially in regards to cognitive measuring (Farrington, 1991).

Overall, this methodology was laid out by Dr. Cagla Gur (2009) and Creswell (2013).

Cohort Selection

This study was conducted on a cohort of six children who were between the ages of 4 and 7 who met the inclusion criteria of (1) not possessing any neurodevelopmental disorders, (2) currently attending an international school in Singapore, and (3) being at an age between 4 and 7.

The inclusion criteria of contacting children without neurodevelopmental disorders was to maintain standardization across the sample size I had access to.

Moreover, the particular age of 4-7 was selected in order to accurately mirror Dr. Cagla Gur's study, in which 6 year old children participate in the Silver Drawing Test while listening to classical music as the experimental group (Gur, 2009). However, the broadening of this age range was primarily due to their demonstrative abilities, as "at the age of 4–7 years, the drawings of children are expressionistic and subjective" implying that drawings produced by children of these ages are largely reflective of their opinions, feelings, and emotion (Valovičová, et al). Children tend to have a, "more proactive, control-based mindset in which they can proactively set goals, anticipate events, and generate predictions" after the age of 4, a skill that stands important when engaging in this particular study (Finn and Gualtieri, 2022).

The chosen cohort of International school children in Singapore was purposeful based on observations made by Melissa Cain (2010) in which diverse music in these settings was noted as a "natural consequence" and that elementary school children were exposed to a variety of cultural and diverse music (Cain, 2010). Teachers undergoing training in musical education at such schools believed that, "moving internationally and teaching in an environment supportive of a global outlook had a significant impact on their ability to learn about unfamiliar musics both theoretically and practically" and can "influence the ways in which musics are perceived by students" (Cain, 2010).

Parental consent was collected, and anonymity was maintained for all components of the study. This parental consent was the basis of voluntary participation, as they represented a decision for their children.

Stimuli Selection: The Silver Drawing Test

The selection of stimuli, the Silver Drawing Test, was based on Dr. Cagla Gur's study in which the same stimuli was used to test cognitive content in the produced drawings. The Silver Drawing Test consists of three sections: Prediction, Imagination, and Observation (Silver, 2007). Each section had listed instructions to be read out in the Silver Drawing Test manual, as well as scoring guidelines with examples, in order to avoid as much bias and personal interpretation as possible from the scorer (Appendix A). Each criteria within the categories is scored from 0 to 5 points, with three criteria total, amounting to a number out of 15 points for each category.

The prompts used are below: Figures 1-4

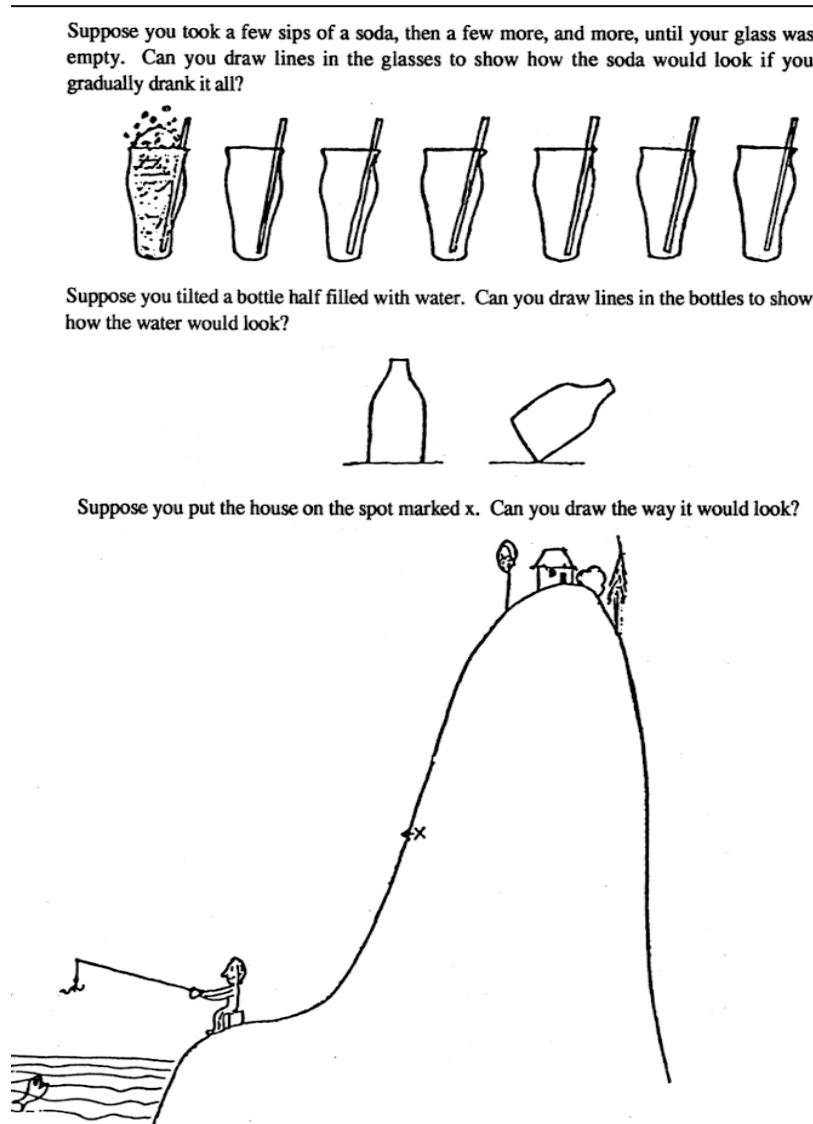


Figure 1. Predictive Drawing Sub-Test

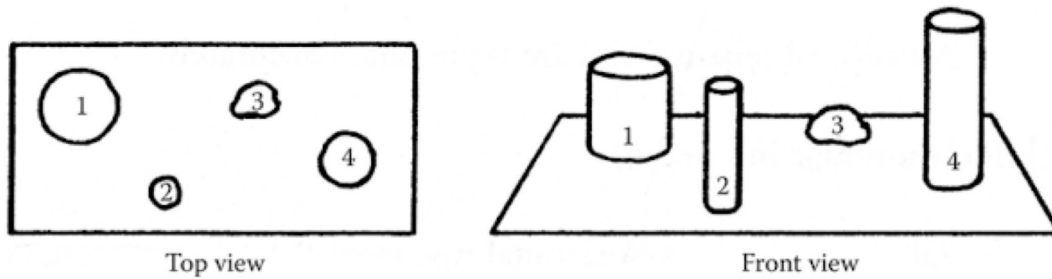


Figure 2. Drawing from Observation Sub-Test

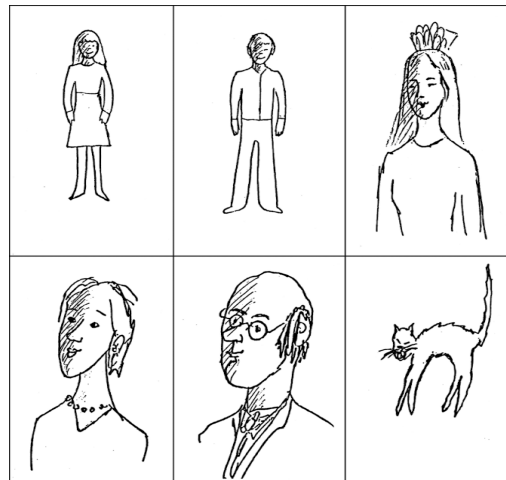


Figure 3. Drawing from Imagination Sub-Test

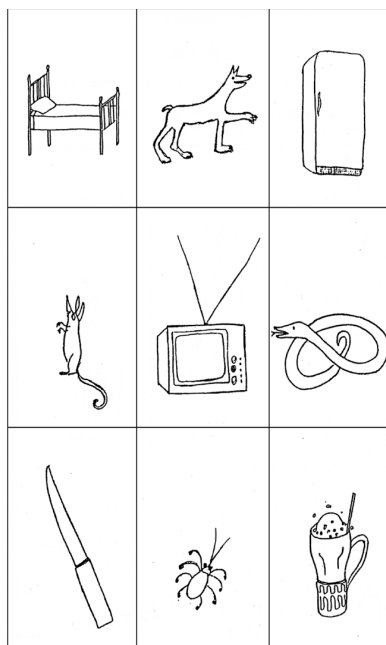


Figure 4. Drawing from Imagination Sub-Test

Moving onto the requirements for the children to obtain full marks. First, in terms of obtaining a perfect score of 5 for the predictive drawing sub-test, the children were expected to demonstrate skills that required calculating predictions with confidence, accuracy, and high intuitivity (Appendix). Refer to Figure 1 for the specific activities the children were expected to engage with.

Second, for the observational drawing sub-test, the Silver Drawing Test manual provided guidelines for the placement of the objects that the children were expected to draw (refer to Figure 2). I mimicked this example placement to the best of my ability. For the children to obtain a perfect score of 5 for this sub-test, they were expected to replicate left to right positioning with accuracy, 3D status, depth, and height of the objects presented in front of them (Appendix).

Lastly, in terms of the drawing from the imagination task, the children were handed two sheets of paper with subject icons (refer to Figure 2 and 3) and were expected to select two of these icons, and draw a progression of events and/or a story between them. To obtain a perfect score of 5, the children were expected to clearly show a relationship between the two characters they selected, take into account their entire drawing space, and constructively express specific ideas and feelings (Appendix).

Validity concerns may arise as a result of myself being a highschool student; however, the Silver Drawing Test considers such untrained individuals, and proves that there is little significance in the difference in scoring accuracy when compared to scores given by trained professionals (Silver, 2007).

Stimuli Selection: Mohana Raga

The selection of the Mohana raga musical track played for the children was by musician Kunnakudi Vaidyanathan, and had a duration of 15 minutes to coincide with the expected duration of the Silver Drawing Test.

Detailed Data Collection Process

In terms of the data collection process, each session had a time limit of 1 hour due to the age of the participants and consent given by parents. Regarding duration, though the test is not timed, it is generally estimated that the completion of the drawing test would last around 15 minutes (Silver, 2007). All instances of test taking followed the same procedure of reading out instructions, as well as playing the same sample of music for each participant. There were no external or additional instructions given, other than the word-for-word paragraph given in the manual to avoid bias or personal involvement. For every session, both before the control and experimental, instructions were read out intentionally before music was played to avoid any bias and unwanted intervention.

Based on this, the first meeting consisted of participants listening to a clip of Mohana raga for 15 minutes while completing all the predictive, observational, and imaginal sub-tests. The chosen clip of Mohana raga was played throughout the session while the children were drawing, and lasted around 15 minutes which was consistent with the duration of time the children took to complete the drawing test.

The speaker the music was played on was placed equidistant to each participant, so that the musical intake and room for interpersonal interaction remained as consistent as possible.

Each session took place in the same room, and this protocol repeated itself for each child. For the control session, the same rules remained, only that participants were made to complete the entire Silver Drawing Test in one 15 minute session while no music was played.

Only once the children were finished with each drawing test, did I interact with them to take their papers.

With all this completed, my data collection protocol was complete

Statistical Analysis

Initially, the reasonable selection of the data analysis method for this study would have been the paired t-test analysis as it holds the purpose of (1) quantifying a, “measurement taken at two different times (e.g., pre-test and post-test score with an intervention administered between the two time points)” and (2) “a measurement taken under two different conditions (e.g., completing a test under a "control" condition and an "experimental" condition)” (Kent State University, 2023). This is particularly relevant to my study, as it corresponds to my experimental group and my control group having the same sample of participants.

However, this analysis method can only be conducted under the assumption that the sample size is above 15 (Skaik, 2015). Because my study only had a sample size of 6, a matched t-test analysis can be considered unfit. Hence, a non-parametric test needs to be performed, as it does not assume normality in the data (Xia, 2020). In this case, the nonparametric data analysis method that replicates the idea of a paired t-test is the Wilcoxon signed-rank test as it can compare two matched samples to measure whether their population mean ranks differ (Xia, 2020).

This test also takes into account the magnitude of the observed differences even under the occurrence of a statistically insignificant result (LaMorte, 2017). To conduct this test, the difference of the scores produced with listening to Indian classical music and without are calculated. Next, these values are numerically ranked smallest to largest (1 being smallest) based on the absolute value of each number.

Next, the negatives disregarded previously are now considered and the rankings are separated into two pools: those given to positive numbers, and those given to negative numbers. These rankings are added together in their respective pools, and only then a w value is derived. The smaller sum of the two is represented as this w value. This value can then be used to calculate the p value that will be compared with the confidence level of $p = 0.05$ to determine statistical significance.

However, regardless of statistical significance, this method gives access to the degree of effect (or the magnitude of difference) between the scores produced before and after listening to Indian classical music: The r value. This value is calculated by dividing the z value, the w value subtracted by the expected w value of assumed equilibrium, divided by the standard deviation.

The absolute value of this number, if less than 0.1 has little to no effect, if equal to 0.1 has a small effect, if equal to 0.3 has a medium effect, and if equal to 0.5 has a significant or large effect (Cohen, 1988).

Results

The alternative hypothesis in this case stated that there is a difference in the central tendencies of the two values given per participant, and the null hypothesis stated that there is no difference in the central tendencies between the two values given per participant.

Table 1, 2 and 3 all the sum of the rankings in the positive and negative pools, including the derived w , p , and r values from the data. Though the statistical analysis did not need to assume normal distribution, the calculated p -values were all greater than the significance value of 0.05 in all the sub-tests, indicating statistically insignificant results.

Table 1. (Prediction)

		n	Mean Rank	Sum of Ranks	
P(W out) - P(W)	Negative Ranks	4	3.88	15.5	
	Positive Ranks	2	2.75	5.5	
	Ties	0			
Total		6			
		W	z	p	r
P(W out) - P(W)		5.5	-1.05	.293	0.43

Table 2. (Observation)

		n	Mean Rank	Sum of Ranks
O(W out) - O(W)	Negative Ranks	4	3.25	13
	Positive Ranks	1	2	2
	Ties	1		
Total		6		

	W	z	p	r
O(W out) - O(W)	2	-1.51	.131	0.62

Table 3. (Imagination)

		n	Mean Rank	Sum of Ranks
I(W out) - I(W)	Negative Ranks	4	2.5	10
	Positive Ranks	1	5	5
	Ties	1		
Total		6		

	W	z	p	r
I(W out) - I(W)	5	-0.68	.496	0.28

Nevertheless, when observing the r value between the two sessions' results, there were some results that can be taken into consideration. For instance, when observing the results from the predictive drawing sub-test, the r value calculated was 0.43 indicating a medium magnitude of difference between the two sessions' results. When observing the results from the observational drawing sub-test, the r value calculated was 0.62, indicating a large magnitude of difference between the two sessions' results. Lastly, when observing the results produced from the imaginative drawing sub-test, the r value calculated was 0.28, displaying a small magnitude of difference between the two sessions' results.

Yet, in terms of the final statistical verdict, the null hypothesis that Indian classical music does not have a significant effect on the cognitive content of drawings in 4-7 year old children, fails to be rejected.

Discussion

The Cognitive Content of Drawings

In my study, I drew the conclusion that the effects of Indian classical music on childrens' cognitive content of drawings was statistically insignificant. Hence, largely underscoring my initial hypothesis.

In comparison to current literature, previous research does not exist on the specific area of integrating Indian classical music with artistic expression, but rather focuses more on classical music. This literature, high-

lighting the effects of classical music on cognitive functioning and development in children, all display statistically significant results. This situates my statistically insignificant findings as being discordant with the existing literature.

As my study is centered around the specific usage of the Silver Drawing Test, existing literature this study can be compared to, is limited. Hence, the closest research that this study can be accurately compared to is Dr. Cagla Gur's 2009 study. In her study, classical music was played and the children displayed statistical significance in regards to their cognitive content of drawings in the predictive and imaginal drawing sub-test, but proving the contrary in terms of the observational drawing sub-test.

Interestingly, my results show slight differences in these imbalances. Though all my findings were holistically statistically insignificant, the magnitude of difference in test scores (r values) for each sub-test showed varying degrees of effect across all three sub-tests. This value was calculated as having the largest effect for the observational section in particular, and a smaller-medium effect in the other two sections, slightly differing from Dr. Gur's results.

In regards to the observational section of the Silver Drawing Test, the magnitude of difference in test scores was observed to be 0.62. This value, as it is larger than 0.5 and follows the magnitude value interpretation laid out by Cohen (1998), displays a large effect of difference between the results produced within these two sessions. None displayed a value less than 0.1, a value of which would indicate a little to no effect in the difference of results under both conditions. Thus, coinciding with the idea that there were some differences in Dr. Gur's study as well, the children who listened to classical music in her study displayed more intuitive and artistically intrinsic drawings (Gur, 2009). Hence, albeit the r value does not signify whether the magnitude of difference between the two scores were positive or negative, we cannot directly strike out the possibility that Indian classical music has *no* effect on the cognitive content of drawings in these children.

Therefore, this study reveals a new understanding that Mohana Raga does have an impact on the cognitive content of childrens' drawings, especially from an observational standpoint.

Behavioral Parameters

Additionally, though not formally incorporated into my statistical analysis, there were other observations I noted which may provide a deeper understanding on the crux of my research: Cognitive performance. Aside from my results being statistically insignificant, the r value (magnitude of difference) of the two sessions' test scores do present certain findings relevant to potential behavioral responses as well.

Most existing literature on the effects of Indian classical on cognition, as mentioned previously, have a lot to do with behavioral and emotional parameters. For instance, Mathur (2015) and Sanivarapu (2015) came to the joint conclusion that the *alaap* and *gat* of Indian classical music contributes heavily to emotional and cognitive responses. Similarly, when conducting my study I observed certain behavioral and emotional responses in the children that were present while listening to Mohana raga compared to the sessions when they were not listening to any music at all.

I consistently observed that once the children began listening to Mohana raga, their attitudes to the task at hand became more positive. The children asked more questions regarding the task, increasing their attention to the specific needs the drawing test warranted from them, and physically seemed more relaxed. Essentially, this may have displayed what had been mentioned in previous literature regarding the positive behavioral responses Mohana raga evoked in individuals, especially children.

My study further aligned with existing research in the domain of behavioral response through observing improvements in the childrens' drawing abilities. Elkoshi (2019), Gur (2009), and Lindbolm (2017) altogether asserted that specific positive reactions such as improvements in creativity, improvisation, and attention to detail occurred when children listened to different compositions of classical music. Similarly, the children

had developed more visibly detailed drawings during the imaginative drawing portion of the test while listening to Mohana raga, compared to when they were not listening to any music at all.

Such behavioural responses, established to be correlated to improved cognitive performance, may indicate a potential relationship between the magnitude of difference between the childrens' drawing test results (r value produced) and the observed behavioral parameters evoked from Indian classical music.

Hence, though not formally analyzed, there may be some effect that Indian classical music had on behavioral parameters in young children.

Implications

While the conclusions that I drew do not entirely align with previous research, my findings present valid implications for this field of research as well as for facilities that nurture young children.

At the community level, the implications of this study include imploring facilities responsible for holistic development in children to solidify whether Indian classical music positively enhances cognitive functioning in young children. The results of this future research may inform musical and/or artistic programs in international schools in Singapore, the cohort of which the study was conducted on, to provide a further supplemented early educational experience.

However, these findings may extend beyond international schools in Singapore; elementary schools and educators may utilize these results to strengthen their creative programs for younger students, and potentially other tasks that may require the skills measured by the Silver Drawing Test.

Limitations

The main limitations of this research that should be emphasized include how the stimuli presented may have been too complex for some children who may have not reached a sufficient level of understanding of the instructions before performing the task. This could have also been due to potential broadness in the instructions which, in turn, may have influenced their score, inaccurately displaying their level of cognitive content.

A second limitation is that there were inconsistencies in regards to the time taken between each session. This may have potentially impacted the childrens' ability to perform the test without any bias or memorisation. Third, there were some external factors that may have influenced the creative decisions of the children such as conversation between participants, conversation between parent and participants, as an over explanation of instructions given by the Silver Drawing Test that may have inflicted potential bias. Explicitly, their ability to reflect entirely original ideas and creative ability.

Third, my cohort size may have been a significant hindrance to the potential outcome of statistically significant results. Though the data analysis method chosen was meant to accommodate such limitations, this method was not the most ideal. A parametric data analysis method that takes into account normal distribution is considered more preferable, as it has a "better ability to distinguish between the two arms" (Chin & Lee, 2008). Therefore, it is suggested for future researchers to aim to obtain a wider sample size.

Concluding Remarks

In considering the purpose of my research and its existing limitations, my results can still inform future research. The foremost suggestion my study has for future research is to replicate this process, while resolving all the limitations in my current design, both in the method and cohort size which impacted the selection of statistical analysis. This may allow my original hypothesis, that Indian classical music does affect the cognitive content

of drawings in 4-7 year old children, to potentially yield more depth in terms of understanding whether this observed impact is positive or negative.

In terms of potential steps to validate my results, future researchers could conduct a mixed-method approach to analyze the behavioral reactions younger children may have to such music. This was left out in my statistical analysis as it was not the goal of the study at hand, but did show some effect while conducting the experiment and could be a pathway to further knowledge on this topic.

Second, further research is warranted on analyzing the respective efficacy rates that varying ragas may have on cognitive functioning in young children.

Lastly, future researchers should address a limitation in my study by considering the cultural factors around the acceptance and processing of Indian classical music to understand its effects on a cohort with a wider cultural variance, as well as sample size.

Even beyond such limitations, this study not only sheds light on the magnitude of difference Indian classical music inflicts on certain cognitive skills, namely in terms of observational interpretation, but also potential behavioral effects that Indian classical music may have on young children.

Thus, providing the first stepping stones in bridging the gap between Indian classical music and young childrens' cognitive performance.

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