

INFLUENCE OF MUSIC TRAINING ON STUDENT'S COGNITIVE ABILITY: AN EXPERIMENTAL STUDY

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Abstract

This experimental research aims to investigate the impact of music training on students' cognitive abilities. The study involved two distinct groups: an experimental group and a control group. Both groups underwent pre and post-cognitive ability assessments. The experimental group received a three-month music training intervention between the pre and post-assessments, whereas the control group did not receive any music training. It was found that, even prior to the music training intervention; the experimental group demonstrated significantly higher cognitive abilities compared to the control group, with a statistical significance at the .05 level. Now, after music training was given to the experimental group, their cognitive abilities exhibited a remarkable increase, reaching statistical significance at the more stringent .01 level, when compared to the control group who had no music training. The study also revealed that when examining only the experimental group, a significant improvement in cognitive abilities was observed when comparing their performance before and after the music training. Conversely, no discernible enhancement in cognitive abilities was noted with the control group across the two assessments, as they did not partake in any music training between the pre and post-tests of cognitive abilities. These findings conclusively establish that music training has a demonstrable influence on enhancing students' cognitive abilities.

Keywords: Cognitive Abilities, Pre-Test, Post-Test, Experimental Group, Control Group

INTRODUCTION

Music holds a unique place in human culture, transcending language barriers and communicating emotions that words alone might struggle to convey. Its significance covers various aspects of our lives, from entertainment and cultural expression to therapeutic and cognitive benefits.

Music has an innate ability to arouse emotions and connect with individuals to a great extent. This emotional quality is essential for cultural expression, enabling communities to celebrate traditions, share narratives, and convey identity (Juslin & Vastfjall, 2008).

Music therapy employs the healing power of music to aid physical, emotional, and cognitive well-being. Studies have shown its effectiveness in alleviating pain, reducing stress, and enhancing the quality of life for individuals with various health conditions (Bradt et al., 2016).

Engaging with music involves complex mental processes, including memory recall, pattern recognition, and problem-solving. Learning to play a musical instrument, for instance, has been associated with improved executive functions, verbal memory, and mathematical skills (Hanna-Pladdy & Mackay, 2011).

Music can aid in language development, as rhythm and melody contribute to phonological awareness, crucial for reading and writing skills (Anvari et al., 2002). Moreover, music education cultivates discipline, teamwork, and creativity among students, contributing to holistic personal development.

Functional imaging techniques reveal that listening to music activates diverse brain regions, including those responsible for emotion processing and reward (Salimpoor et al., 2011). Besides, music training has been shown to lead to structural changes in the brain, suggesting its potential for promoting neural plasticity (Zatorre et al., 2007).

Music training is important because it offers several benefits for our minds and lives. Learning to play an instrument or sing can improve our memory, focus, and problem-solving skills. It also helps with coordination and listening abilities. Music training can boost our creativity and self-expression, allowing us to communicate emotions and thoughts in a unique way. Moreover, it can be a source of joy and relaxation, reducing stress and improving our overall well-being.

Cognitive ability refers to how well our brains can think, learn, and solve problems. It includes things like memory, attention, reasoning, and understanding. Cognitive abilities are really important because they help us in many different ways. They let us learn new things, remember information, figure out problems, and make decisions. These abilities are like our brain's tools for understanding the world, doing well in school, and succeeding in many aspects of life.

Rationale of the study

The present-day education is continuously searching for innovative method to enhance students' cognitive development. In the middle of this search, the potential relationship between music training and cognitive abilities has gained considerable attention. Music, as a complex activity, has long been associated with cognitive benefits, yet its precise impact on students remains a subject of interest. This study tries to find out the connection between music training and students' cognitive abilities as this will provide information that could be used in educational practices.

While earlier evidence suggests a positive correlation between music training and cognitive abilities, a systematic investigation aiming the student population is somewhat rare. This study

aims to address this gap by adopting an experimental approach. By comparing the cognitive abilities of students who undergo structured music training with those who do not, the present study will provide a better understanding about the cognitive benefits that may arise from music learning.

The outcomes of this study will have significant implications in education. If a positive association between music training and cognitive abilities is established, integrating music education into the school curricula will have to be emphasized. This will not only foster artistic skills but will also enhance cognitive growth of the students. Besides, this study will contribute to a more comprehensive understanding of cognitive development in the broader context of education.

SOME REVIEWS OF RELATED LITERATURE

Smith and Jones (2010) investigated the impact of music training on cognitive abilities in children and found that children who received music training demonstrated improvements in various cognitive skills, including spatial-temporal skills, mathematical abilities, and memory.

Vaquero and Vila (2007) in their study on ‘The Role of Music Education in Mathematical Proficiency’ found evidence of a positive relationship between musical training and mathematical abilities, suggesting that the cognitive processes involved in both domains might overlap and contribute to enhanced skills.

Standley (2008) in his study on the impact of music instruction on language development, particularly reading skills, in early childhood found that music education positively influenced reading abilities by enhancing phonological awareness, vocabulary, and auditory processing skills.

Schellenberg (2011) explored the association between music lessons and various cognitive abilities, including emotional intelligence. The results suggested that music lessons positively influenced emotional expression, social interaction skills, and empathy among students

Objectives of the study

- 1) To find out the difference in cognitive abilities between experimental and control group prior to music training (pre-test).
- 2) To find out the difference in cognitive abilities between experimental and control group after music training (post-test).
- 3) To find out the difference in cognitive abilities among experimental group prior to music training (pre-test) and after music training (post-test).
- 4) To find out the difference in cognitive abilities among control group prior to music training (pre-test) and after music training (post-test).

Hypotheses

- 1) There is no significant difference in the cognitive abilities between experimental and control group in the pre-test.
- 2) There is no significant difference in the cognitive abilities between experimental and control group in the post-test.
- 3) There is no significant difference in the cognitive abilities between pre-test and post-test among the experimental group.
- 4) There is no significant difference in the cognitive abilities between pre-test and post-test among the control group.

Method of Study

The present study is to find out the influence of music training on students cognitive abilities, so, pre-test and post-test Experimental design was applied for the present study.

Sample of study

The sample for the present study comprised of 62 students from Staines Memorial Secondary School in Aizawl, Mizoram. These students were chosen at random and divided into two groups: an experimental group and a control group. The experimental group consisted of 32 students, while the control group had 30 students.

Tools Used

- 1) In order to find out the students' cognitive abilities, Standard Progressive Matrices – sets A, B, C, D and E. (Raven, 1998) was used.
- 2) Interventional music training module which was developed by the investigator was used for the purpose of training the experimental group of students.

Mode of Data Collection

Since the present study is of an experimental nature, the researchers selected Staines Memorial School in Aizawl, Mizoram, to conduct the experimental research. The students were categorized into two distinct groups: the experimental group and the control group. To assess their cognitive capabilities, both groups underwent the Standard Progressive Matrices test (pre-test). The objective was to gauge their cognitive aptitudes accurately. Following this initial assessment, the researchers exclusively provided music training to the experimental group. This intervention involved using a specialized music training module created by the researchers. Over a span of three months, the experimental group participated in music training twice a week, with each session lasting 45 minutes. On the other hand, no music training was offered to the control group during this period. Subsequent to the three-month duration, the researcher once again administered the Standard Progressive Matrices test (post-test) to both the experimental and control groups, aiming to evaluate any changes in their cognitive abilities.

Statistical Treatment of Data

Scores obtained in the Pre-test of cognitive abilities as well as in the post-test of cognitive abilities for both the experimental group as well as the control group were computed. For analyzing the collected data relevant statistical techniques such as mean, standard deviation, independent sample t-test as well as paired sample t test was employed.

ANALYSIS AND INTERPRETATION

The findings of the present study and their interpretations are presented in the following tables in accordance with the objectives.

Objective 1: To find out the difference in cognitive abilities between experimental and control group prior to music training (pre-test).

The mean differences in cognitive abilities between experimental group and control group prior to music training (pre-test) is tested by applying independent sample ‘t’ test and is presented in the following table – 1.

Table 1: Differences in cognitive abilities between experimental and control group in the pre-test

Groups in the pre-test	Number	Mean	SD	MD	t-value	Sig. level
Experimental group	32	38.84	9.85	4.94	2.16	.05
Control group	30	33.90	7.93			

Table No. 1 shows that ‘t’ value for comparing the cognitive abilities of the experimental group and the control group in the pre-test is 2.16. The 't' value needed to show a significant difference is 2.00 at a .05 level of significance. Since the calculated 't' value is greater than the required 't' value at .05 level, it can be said that there is a significant difference in cognitive abilities between the experimental group and the control group in the pre-test at a .05 level. Therefore, the first hypothesis, which suggests no significant difference in the cognitive abilities between experimental and control group in the pre-test is rejected. This shows that a meaningful difference in cognitive abilities existed between the experimental and control groups in the pre-test of cognitive ability. A look at their mean score tells us that the experimental group had a significantly higher cognitive abilities compared to the control group, with a statistical significance at the .05 level even before the experiment actually started

Objective 2: To find out the difference in cognitive abilities between experimental and controlled group after music training (post-test).

The mean differences in cognitive abilities between experimental group and controlled group after music training (post-test) is tested by applying independent sample ‘t’ test and is presented in the following table – 2.

Table 2: Differences in cognitive abilities between experimental and control group in the post-test

Groups in the post-test	Number	Mean	SD	MD	t-value	Sig. level
Experimental group	32	42.25	10.45	7.15	2.99	.01
Controlled group	30	35.10	8.13			

Table No. 2 displays that the 't' value for measuring the significance differences of cognitive ability between the experimental group and control group in the post-test is 2.99. Since the calculated 't' value is larger than the criterion 't' value, it can be concluded that there is a significant difference in cognitive abilities between the experimental group and the control group in the post-test. Thus, hypothesis number 2, which suggests no significant difference in the cognitive abilities between experimental and control group in the post-test, is rejected. This is because there is indeed a significant distinction between these two groups at a .01 confidence level. The mean score of the experimental group is higher than that of the control group. This indicates that the music training provided to the experimental group has a noteworthy effect on their cognitive abilities, as they achieved notably higher scores compared to the control group in the post-test.

Discussion

When the cognitive abilities of both the experimental and control groups of students were examined in the pre-test, a significant difference was identified at the .05 level. One can easily sum up that there is a pre-existing difference between the control group and experimental group from the start. Following this, music training was exclusively given to the experimental group. In the subsequent cognitive ability test, conducted after the training, another significant difference was observed between these two groups. However, this time, the experimental group's cognitive abilities had considerably improved compared to the control group. Hence, the considerable enhancement in cognitive abilities within the experimental group during the post-test can be attributed to the music training they underwent between the pre-test and post-tests. As a result, it can be confidently concluded that music training had a discernible impact on the cognitive abilities of the school students.

Objective 3: To find out the difference in cognitive abilities among experimental group prior to music training (pre-test) and after music training (post-test).

The mean differences in cognitive abilities among experimental group prior to music training (pre-test) and after music training (post-test) is tested by applying paired sample 't' test and is presented in the following table – 3.

Table 3: Differences in cognitive abilities between pre-test and post-test among experimental group

Experimental groups	Number	Mean	SD	MD	t-value	Sig. level
Pre test	32	38.84	9.85	3.41	2.23	.05
Post test	32	42.25	10.45			

Table 3 shows that the 't' value for determining the significance of difference in cognitive abilities between the pre-test and post-test within the experimental group is 2.23. As the calculated 't' value surpasses the required 't' value, it can be concluded that there is a significant difference in the cognitive abilities of students between the pre-test and post-test among the experimental group. Hence, hypothesis number 3, which suggests no significant difference in the cognitive abilities between pre-test and post-test among the experimental group is rejected. This is due to the significant difference in students' cognitive abilities between the two tests at a .05 confidence level. Notably, the mean score in the post-test is significantly higher than that in the pre-test, signifying that the music training provided to the experimental group between the two tests had a significant impact on enhancing the students' cognitive abilities. It is evident that students' cognitive abilities improved due to the music training they received between the two tests.

Objective 4: To find out the difference in cognitive abilities among control group prior to music training (pre-test) and after music training (post-test).

The mean differences in cognitive abilities among control group of students prior to music training (pre-test) and after music training (post-test) is tested by applying paired sample 't' test and is presented in the following table – 4.

Table 4: Differences in cognitive abilities between pre-test and post-test among the control group

Control Groups	Number	Mean	SD	MD	t-value	Sig. level
Pre test	30	33.90	7.93	1.2	1.41	NS
Post test	30	35.10	8.13			

As indicated in Table No. 4, it is evident that the 't' value for the significance of difference in cognitive abilities between the pre-test and post-test among the control group is 1.41. Given that the calculated 't' value falls below the required 't' value, it can be concluded that there is no significant difference in cognitive abilities between the pre-test and post-test among the control group. Consequently, hypothesis number 4, which suggests no significant difference in the cognitive abilities between pre-test and post-test among the control group is accepted, since there is indeed no significant difference in cognitive abilities between these two assessments. It means the cognitive abilities of the control group remains almost the same between the pre-test and post-test. There is no significant improvement in the student's cognitive abilities in between the two assessments.

DISCUSSION

Upon conducting both the pre-cognitive ability test and the post-cognitive ability test with the experimental group, it was observed that there was a noteworthy enhancement in their cognitive abilities. Conversely, when the pre-cognitive ability test and post-cognitive ability test were carried out on the control group, it was apparent that their cognitive abilities did not experience any substantial improvement. It is important to mention that only the experimental group received music training between the pre-test and post-test, whereas the control group did

not receive any music training between these two assessments. Consequently, the mean score of the experimental group climbed from 38.84 in the pre-test to 42.25 in the post-test, whereas the mean score of the control group rose from 33.90 in the pre-test to 35.10 in the post-test. A closer look at the difference in mean scores between the pre-test and post-test among the experimental group reveals a significant improvement of 3.41. In contrast, the control group's mean difference between the two tests was merely 1.20, indicating a lack of substantial improvement. This starkly demonstrates that the enhancement in cognitive abilities among the experimental group, which underwent music training, far exceeded that of the control group, which did not receive such training. Consequently, we can confidently conclude that music training did indeed have a notable impact on students' cognitive abilities.

SUGGESTIONS AND CONCLUSION

Educational institutions should consider integrating music training programs into their curriculum. Such programs can be designed to supplement traditional learning methods and contribute to overall cognitive development.

While recognizing the positive impact of music training on cognitive abilities, educators could explore various learning approaches that cater to students' diverse learning styles and strengths.

The study highlights the possibility of cross-disciplinary approaches in education. So, also music expert and cognitive science expert could collaborate together to find new and creative ways to teach. This could help students become smarter and better at thinking.

Since the study highlighted the positive outcomes of music training in cognitive enhancement, educators and parents could focus on introducing music education at an early age to foster cognitive development.

To conclude, the current experimental study highlights the importance of music training in significantly enhancing students' cognitive abilities. This discovery not only offers practical suggestions for educators but also highlights the need for a more comprehensive and multidimensional approach to education that embraces music as a powerful tool for cognitive growth.

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