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The Effect of Music-Based Teaching on Mathematical Anxiety

Mahima Mali

Department of Education, Udaipur, Rajasthan, India

mahimali6511[at]gmail.com

Abstract: ***Mathematical anxiety is a widespread psychological issue that adversely affects students' academic achievement, self-confidence, and attitude toward mathematics. Traditional teaching methods often fail to address the emotional barriers associated with mathematics learning. The present experimental study investigates the effect of music-based teaching on reducing mathematical anxiety among primary school students. A single-group pre-test and post-test experimental design was employed. The sample consisted of 35 Grade V students selected through random sampling from a primary school in Udaipur, Rajasthan. A self-constructed Mathematical Anxiety Scale was used for data collection. Mean, standard deviation, and t-test were applied for statistical analysis. The results revealed a statistically significant reduction in mathematical anxiety after the implementation of music-based teaching. The findings suggest that integrating music into mathematics instruction enhances students' confidence, engagement, and learning outcomes. The study supports the implementation of music-based teaching in alignment with the National Education Policy (NEP) 2020.***

Keywords: Music-Based Teaching, Mathematical Anxiety, Primary Education, Innovative Teaching Methods, NEP 2020

1.Introduction

Mathematics is an essential component of everyday life and plays a crucial role in scientific and technological development. Despite its importance, mathematics is often perceived by students as a difficult and fear-inducing subject. This fear gradually develops into mathematical anxiety, which negatively influences students' academic performance and overall learning experience.

At the school level, mathematical anxiety has emerged as a serious educational concern. Students experiencing anxiety often avoid mathematical tasks, show low confidence, and perform poorly in assessments.

The **Annual Status of Education Report (ASER) 2022** highlighted a severe decline in mathematical learning outcomes among Indian students after the COVID-19 pandemic. According to the report, a significant percentage of primary school students are unable to recognize basic numbers or perform fundamental arithmetic operations. These findings indicate a national learning crisis in mathematics, particularly at the primary level.

In this context, innovative teaching strategies are required to address not only cognitive difficulties but also emotional barriers. Music, as an engaging and emotionally stimulating medium, has the potential to make mathematics learning enjoyable and stress-free.

2.Review of Related Literature

Several studies have explored the relationship between emotional factors and mathematics learning. Tobias and Weissbrod (1980) defined mathematical anxiety as a mental block that interferes with mathematical problem-solving. Beilock and DeCaro (2007) reported that stress significantly impairs mathematical performance.

Research in the field of music-based learning indicates that music enhances memory, attention, and emotional regulation. Vaughn (2000) found a positive association between music education and mathematical achievement. Joshi (2018) concluded that music-based instruction significantly reduces mathematical anxiety and improves students' attitudes toward mathematics.

However, limited experimental research has been conducted in the Indian primary school context, particularly focusing on music-based teaching as an intervention for mathematical anxiety. The present study attempts to bridge this research gap.

3.Statement of the Problem

The Effect of Music-Based Teaching on Mathematical Anxiety

4.Objectives of the Study

1. To assess the level of mathematical anxiety among primary school students.
2. To study the effect of music-based teaching on mathematical anxiety.
3. To compare pre-test and post-test mathematical anxiety scores of students.

5.Hypotheses

- **H_0 (Null Hypothesis):** Music-based teaching has no significant effect on mathematical anxiety.
- **H_1 (Alternative Hypothesis):** Music-based teaching has a significant effect on mathematical anxiety.

6.Research Methodology

A. Research Design

The study adopted an experimental research method using a **single-group pre-test and post-test design**.

B. Sample

The sample consisted of **35 students of Grade V**, selected through random sampling from a primary school in Udaipur, Rajasthan.

C. Research Tool

A **self-constructed Mathematical Anxiety Scale** was used to collect data from the students.

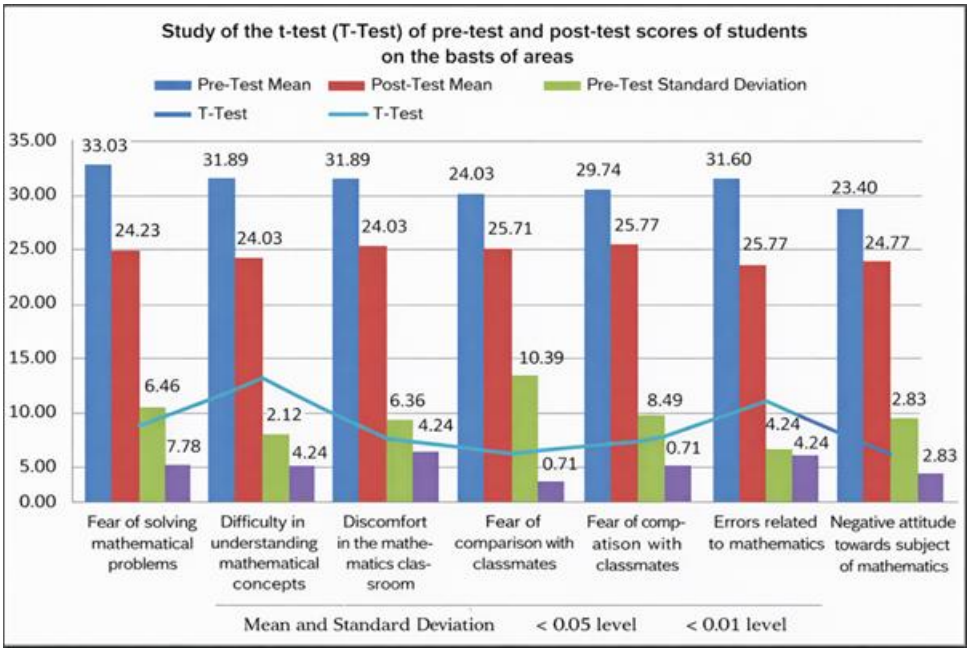
D. Statistical Techniques

In the present experimental study, in order to examine the effect of music-based teaching as a controlled variable on mathematical anxiety, it was considered necessary to compare the scores obtained in the pre-test and post-test. Therefore, the statistical techniques of mean, standard deviation, and t-test were selected.

- Study of the t-test (t-Test) of pre-test and post-test scores of students on the basis of areas.

Area	Test	Number of Students	Mean	Standard Deviation	t-value	Significance at 0.05 Level	Significance at 0.01 Level
Fear of solving mathematical problems	Pre-test	35	33.0286	7.77817	6.4574	Significant	Significant
	Post-test	35	24.2286	2.12132			
Difficulty in understanding mathematical concepts	Pre-test	35	31.8857	4.24264	10.3939	Significant	Significant
	Post-test	35	24.0286	1.41421			
Discomfort in the mathematics classroom	Pre-test	35	31.7429	6.36396	4.8990	Significant	Significant
	Post-test	35	25.7143	3.53553			
Fear of comparison with classmates	Pre-test	35	29.7429	11.3137	2.5945	Significant	Not Significant
	Post-test	35	24.7714	0.70711			
Errors related to mathematics	Pre-test	35	30.7429	8.48528	3.4190	Significant	Significant
	Post-test	35	25.7714	1.41421			
Inability to understand mathematical figures	Pre-test	35	31.6	4.24264	8.0853	Significant	Significant
	Post-test	35	23.4	4.2426			
Negative attitude towards the subject of mathematics	Pre-test	35	28.4857	7.77817	2.6550	Significant	Not Significant
	Post-test	35	24.7714	2.82843			

DF: 35-1= 34

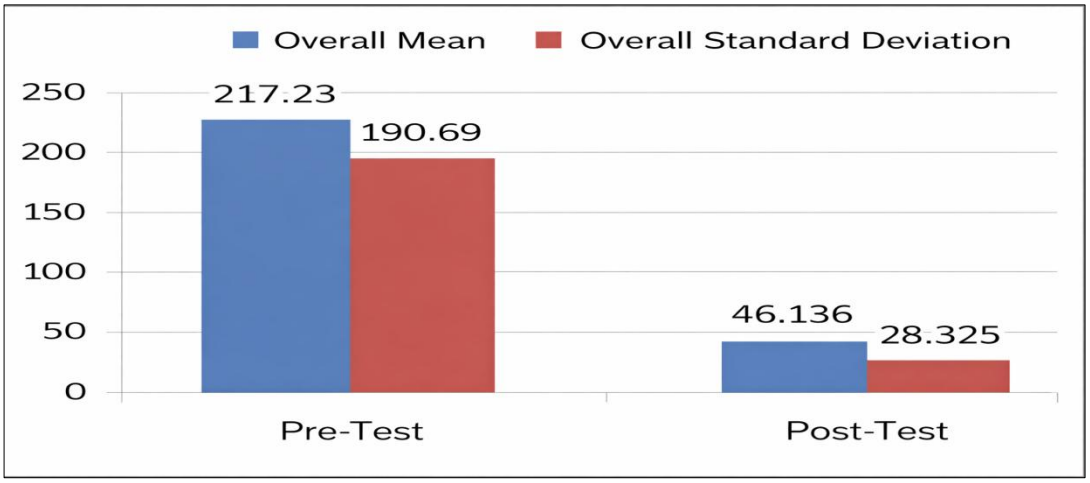


Overall Mean and Overall Standard Deviation

Test	Overall Mean	Overall Standard Deviation
Pre-Test	217.23	190.69
Post-Test	46.136	28.325
t-test	2.90	

At df = 34, the table value of t at the 0.05 level = 2.03

At df = 34, the table value of t at the 0.01 level = 2.72



7.Data Analysis and Interpretation

The calculated t-value was **2.90** with **34 degrees of freedom**.

The table value at the 0.05 level is **2.03**, and at the 0.01 level is **2.72**.

Since the calculated t-value is greater than the table values at both significance levels, the null hypothesis was rejected. This indicates that music-based teaching has a **statistically significant effect** on reducing mathematical anxiety among students.

Since the calculated t-value (2.90) is greater than the table value at the **0.05 level** (2.03), the result is **statistically significant** at the 0.05 level.

Since the calculated t-value (2.90) is also greater than the table value at the **0.01 level** (2.72), the result is **statistically significant** at the 0.01 level.

8.Major Findings

1. Music-based teaching significantly reduced mathematical anxiety.
2. Students showed improvement in mathematical understanding and performance.
3. Self-confidence and classroom participation increased.
4. Mathematics learning became enjoyable and less stressful.

9.Educational Implications

- Encourages innovative and learner-centered teaching practices
- Supports inclusive education by addressing emotional learning barriers
- Aligns with **NEP 2020** and **Art-Integrated Learning**
- Promotes positive attitudes toward mathematics
- Contributes to holistic development of students

10. Conclusion

The present study concludes that music-based teaching is an effective instructional strategy for reducing mathematical anxiety among primary school students. The integration of music into mathematics instruction not only improves academic performance but also enhances confidence, engagement, and emotional well-being. Therefore, educators are encouraged to incorporate music-based activities in mathematics classrooms to make learning meaningful and enjoyable.

11. Scope for Future Research

1. Similar studies may be conducted at secondary and higher education levels.
2. Long-term effects of music-based teaching can be examined.
3. Comparative studies between rural and urban schools may be undertaken.
4. The impact of different musical styles on mathematics learning may be explored.
5. Teachers' perceptions and challenges related to music-based teaching may be studied.

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