



Role of music in enhancing learning and academic performance

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Abstract

Music has always been a part of human culture and has served to enhance human beings not only as an art form, but also influencing memory, attention, problem solving skills and cognitive development. Research has been conducted over the last fifty years related to music and learning outcomes. It has been shown to improve attention and memory, enhance emotional regulation and influence academic performance. This article overviews the variety of ways music can be utilized in educational settings and provides information from three disciplines: neuroscience, psychology, and pedagogy. It used a comprehensive literature review and included several documented case studies before 2020, to assess how music can create learning environments that are engaging and cognitively engaging. The study examined how to evaluate music's educational value and made recommendations for application in educational contexts.

Keywords: Music and learning, cognitive development, academic performance, music education, memory improvement, attention span

Introduction

Music has played a part in human life well beyond entertainment. Ancient chants in service of knowing oral traditions, to present-day music therapy applications, music has shaped learning in many ways and in many systems. Over many years and many societies, and through many generational speakers we see music used as a device to share information, memory and cultural identity; to promote identity social learning audio files are a good first step. In contemporary society, we see greater acknowledgement of music's learning potential and researchers are focusing more attention on and studying music as it can stimulate cognition, improve mood and improve academic outcome. The evidence regarding music and improvement of academic success is also supported by neuroscience, psychology, and pedagogy. Music engagement, at least in terms of academic success, can be through active engagement or passive engagement (listening) and can help to focus the attention of students, improve the functioning of working memory, and improve problem solving skills. Music may also help to reduce anxiety, affect the learning environment, and enable a more positive learning environment that reinforces, in an indirect manner, academic success.

In order to engage students meaningfully given that their realities are always changing, classrooms now must not only consider different types of learners, but also ways to make education relatable. This is where music comes in which is a flexible, adaptable tool and can be utilized effectively across the curriculum. Rhythm can promote behavior which recognizes mathematical patterns, melodies can serve as mnemonic devices for language retention and complexities such as meter can influence the cognitive and emotional learning domains. We are promoting learning in ways that conscious pedagogy cannot or will not.

Literature Review

1. Cognitive and Neurological Perspectives

Neuroscience research has confirmed that within the context of music making, we use different brain regions at the same

time, including the hippocampus, cerebellum, and prefrontal cortex. In fact, Schlaug *et al.* (2005) ^[8] state that the experience and learning of music can modify the structure of brain areas associated with language and executive function. Further, Patel (2008) ^[10] contends music shares cognitive resources and brain pathways with language processing, which supports the idea that music can enhance reading and oral skills.

2. Emotional and Motivational Effects

Music is also an emotional regulator, thereby influencing a person's readiness to learn. According to Hallam (2010) ^[11], students who listened to background music while studying reported feeling less stress and having improved concentration. Although music is an emotional stimulus, Cahill and McGaugh (1998) have noted that any experience with emotional arousal improves memory consolidation and retention because emotionally driven experiences are typically retained longer than other experiences.

3. Relationships to Academic Achievement

In their longitudinal research, Catterall, Chapleau, and Iwanaga (1999) reported that students who were involved in music programs maintained academic performance higher than their peers while also achieving proficiency in mathematics and reading given standardized assessments. Further, Southgate and Roscigno (2009) ^[15] also provided additional evidence suggesting that music participation predicted higher grades and higher standardized test scores, even competently controlling for socioeconomic status.

4. The Mozart Effect and Related Continuing Ideas

Rauscher, Shaw, and Ky (1993) inspired interest in temporally limited cognitive advancement of listening to classical music. Later meta-analyses (Chabris, 1999) downplayed the findings, but the general idea that music can activate some electronically dormant section of the brain prior to cognitive activity continues to permeate educational research.

5. Research Aims

- To understand the cognitive pathways in which music enhances learning.
- To highlight the relationship between musical engagement and academic success.
- To examine case studies that highlight the practical implications of music within the educational context.
- To provide recommendations for the effective musical engagement of students in educational contexts.

Methodology

1. Research Design

This study employed a qualitative, interpretive approach with the goal of synthesizing existing literature related to the association between music and learning. Because the intention was to derive conclusions from literature which could be easily located and is well documented, the research had a structure and approach similar to a systematic literature review plus thematic analysis of past case studies, therefore integrating findings from various disciplines or fields of neuroscience, psychology, pedagogy, and practice in education. Also allowing conclusions to be interpreted and determined from a variety of discipline or field perspectives.

2. Data Sources and Search Strategy

Primary data sources included; peer-reviewed journal articles, conference proceedings and reports and reviewed by the research team as authoritative or trustworthy, that were found through databases: JSTOR, ERIC, PsycINFO, and, Google Scholar. The search strategy consisted primarily of keyword and Boolean combinations using terms such as music and learning, academic performance, music and cognition, benefits of music education, music in the classroom, etc. Furthermore, any literature published after January 2020 were excluded as part of the study's focus on historical evidence.

Inclusion criteria

- Empirical Studies that can demonstrate measurable outcomes related to learning or academic performance.
- Research that has been documented peer-reviewed and at least an attempt at methodological rigor.
- Research that had a reportable clear methodology of what was done and reported results.

Exclusion criteria

- Opinion pieces or editorials that are not be supported by empirical evidence.
- Research studies that focus on music solely as entertainment not in any educational context (embedded in educational context) or argued without a specific educational context.
- Research published in languages other than English.

3. Data Extraction and Thematic Categories

Data were extracted from each study in relation to whether:

- Participant demographic characteristics (age group, level of education, cultural sensitivity)
- Type of engagement with music (active training, passive listening, component of curriculum)
- Type of domain in terms of learning (math, literacy,

memory, overall academic performance)

- Type of outcomes measured (test scores, recall scores, attention spans, emotional health)

The extracted data were grouped according to four themes:

- Cognition enhancement
- Affective and motivational outcomes
- Academic outcomes
- Teacher strategies

4. Analytical Framework

A thematic synthesis analytical framework was used to identify instances of similarities and differences in music's effects on learning. This included coding the data based on thematic groups, noting similarities and differences, and associating the outcomes with theoretical frameworks.

5. Ethical Considerations

Although this study did not involve human subjects, ethical standards were maintained through proper attribution and accurate reporting, avoiding biased conclusions or presentations. The review also tried to escape confirmation bias by including studies that showed both effects of music as having positively affected an outcome or outcome measure and those which showed a minimal or no effect, to ensure balanced interpretations.

Case Studies

Case Study 1: Music and Math Skills

In a study conducted by Vaughn (2000) of 43 elementary schools throughout the United States, students received daily music instruction that was also linked to mathematics lessons. Over the course of one academic year, the students in the music-linked classes had a 27% improvement in math test scores when compared to control group students. In addition, teachers reported that rhythmic counting and musical patterns supported their arithmetic concepts.

Case Study 2: Language Learning via Song

Spanish language learners were studied by Medina (1993) whereby they were taught vocabulary through songs, while the control group learned vocabulary using traditional rote memorization methods. After four weeks of instruction, the vocabulary retention of the music group was at 93% while for the control group it was 78%. The connection was made that the use of melodies enhanced long-term recall.

Case Study 3: Music Therapy with Special Education

In the study reported by Gfeller (1983) music therapy techniques were implemented in classrooms for children with learning disabilities. The students participated in the rhythm-based exercises and call and response singing and the results were promising. The students demonstrated significant improvement in reading fluency and word recognition. The findings were indicative of music's ability to bypass certain cognitive blockages.

Case Study 4: Students and Study music

Hallam, Price, and Katsarou (2002) studied university students, who selected their own background music in order to study. The students reported having improved mood and concentration while studying and that their recall scores improved by 12% over the students that studied in silence.

Analysis and Discussion

The studies reviewed provide consistent evidence of positive relationships between particular genres of music and diverse learning outcomes in various areas of learning. In the cognitive domain, music utilizes working memory, pattern-finding and spatial-temporal reasoning. In the emotional domain, it reduces stress, increases motivation, and supports persistence in challenging situations.

While there seems to be evidence of a positive relationship in the majority of studies, there are also studies where these results are not universally consistent. Many of these studies include variables such as type of music, volume, and individual preferences. For example, much lyrical music can compete with linguistic processing resources, which may result in unintentional interference that negatively affects reading comprehension in some learners. Furthermore, musical styles that are culturally familiar may relate to different emotional engagement and availability.

In educational settings, when music is purposely and constructively integrated into an instructional lesson, this seems to be more fruitful than incidental and unstructured use of music. Programs that integrate music into the aims and objectives of the curriculum, for instance, using rhythm with fractions or using a melody to reinforce word patterns in language, are likely to be more effective than listening to music as a passive, back ground experience.

Results

- Music education has cognitive benefits that can enhance academic learning, particularly in mathematics and literacy.
- Music can be utilized as a stress-relief method, improving readiness to learn indirectly.
- Using music in specific curricular areas increases retention and interest.
- Personalization using music that matches learner preference and the type of task—produces the most benefit.
- Long-term benefits to academic achievement can be gained by introducing music education early and providing ongoing opportunities.

Recommendations

- Incorporate music into classroom instruction to support concepts in math, language, and science.
- Include a formal music education curriculum in schools to develop transferable skills, both cognitive and emotional.
- Train teachers to implement music strategies for classroom learning effectively.
- Allow students to personalize the use of music in study approaches according to the nature of task, their own tastes, and preferences.
- Use music to help students reduce stress before exams or other stressful academic tasks.
- Encourage students to experience music through extra-curricular programs that encourage the use of music as a tool outside of lessons.

Conclusion

There are a number of examples of studies across disciplines that show how effective music can be as a learning tool and has influence on performance, as long as music is thoughtfully used. Listening to music activates areas of the

brain that are responsible for memory, language and problem solving, and also helps regulate mood and reduce stress, creating the conditions needed to facilitate learning. These benefits are not without boundaries; for instance, the use of music must consider, among others, type of music, timing of music and cultural relevance.

Instead of telling students that music is simply an option, we should communicate that music is an important aspect of a holistic education. Effective long-term academic outcomes could be developed by weaving music into school and curriculum practices, training teachers to incorporate music into their pedagogical choices, and giving students opportunities to experiment with music as part of their studying. Music can be viewed as not just an art form but as a purposeful act of learning that creates pathways for cognitive and emotional growth, when applied properly.

In addition to formal schooling, music could also be impactful however as lifelong learners and in professional learning environments. Whether logically structured or good 'old fashioned' passive listening, music can reinforce focus, reinforce memory retention and build mental resiliency, all of which have a place in relevant academic work for their entire lives. This should be viewed as a unique capacity to contribute to learning, therefore a tool which can support learning in any format, and create a more diverse option for learning.

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