Music and Language Acquisition

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Abstract. This literature review is aimed at how music affects language acquisition throughout the long term music training process or music therapy sessions. We discussed, analyzed and summarized several experiment's results about music's effects on both physiological (brain, natural system…) and psychological side of people in different life stages. We found the obvious similarity and differences of music and language and their mutual effect. Also, we developed music as a therapeutic tool to improve language acquisition. All in all, we come to the conclusion that specific attention will be paid to the influence of music on the language learner, as well as the implications of incorporating music into the language learning curriculum.

1 INTRODUCTION

Music extending beyond mere entertainment, possesses the potential to enhance numerous capabilities, as elucidated by Schellenberg [8]. Among these capabilities, the association between music and linguistic skills stands prominently. A considerable number of individuals uphold the notion that music can effectively aid in language acquisition. As Gerry et al. argue, music nurtures the evolution of the nervous system, hence frequently assisting infants in learning language. Alternatively, it is proposed that music allows children at their earliest developmental stages to perceive their surroundings independent of language comprehension. Given that both are modes of expression, creativity can potentially augment their capacity to acquire and apply language.

Furthermore, research conducted by Janus et al. [7] suggested that individuals who have undergone musical training and have successfully mastered a second language frequently exhibit superior performance in non-verbal executive control tasks. This leads to the inference that music and language may share certain inherent characteristics. Some practitioners have even employed music as an instructional strategy for teaching languages, as songs can potentially fortify memory consolidation. This enhancement in language learning could further extend to other cognitive effects engendered by music.

Notwithstanding the ample research dedicated to exploring the interaction between music and cognitive abilities, the direct examination of the interrelationship between music and language remains relatively scarce. This literature review, therefore, intends to scrutinize studies that have investigated individuals' encounters with language and music within the context of cognitive capabilities, language productions, and neural development.

2 LITERATURE REVIEW

2.1 Influence of Language Training at Different Life Stages

Dehaene-Lambertz et al. [2] embarked on a research study involving 24 neonates, each two months old. Among these, 22 infants were exposed to three distinct stimuli: music, their mother's voice, and the voices of unfamiliar individuals. The study's findings illuminated that the left planum temporale of the neonates exhibited symmetric activation. These infants demonstrated a tendency for greater activation in the left hemisphere of the brain in response to language and the voice of their mothers, as opposed to music. The right hemisphere was principally engaged in the differentiation of voices based on gender, whereas the left hemisphere was primarily responsible for vowel distinction. The results suggested that, rather than simply reacting to sound stimuli, the infants had already initiated the development of various language-related functions.

Cohrdes et al. [7] endeavored to provide a comprehensive exploration of the nexus between language and music among the youth population. The sample comprised 44 children, aged between five to seven years, and a control group of 20 young adults. A range of dependent variables were considered, including intelligence, executive function, literacy environment, and others. Both musical and linguistic competencies were evaluated, with aspects such as sound discrimination and narrative comprehension among the assessed parameters. The tasks were delineated across five distinct tiers, encompassing vowels, word repetition, SI skills, emotion recognition, and synchronization tasks. The findings revealed that, barring tonal sequences and emotion recognition, young adults generally exhibited superior skills in both language and music. Furthermore,
the proficiency in lower-level language and musical abilities was found to potentially predict the magnitude of higher-level skills, suggesting a possible correlation among children and adults.

In the research presented by Miranda, it was posited that music significantly impacts individuals across various domains, encompassing biological, psychological, and social spheres. Based on a meta-analysis, longitudinal evaluation studies manifested a 'dose effect', signifying that the number of articles pertaining to music therapy (integrating emotional, social, and motivational facets) anticipated fewer symptoms of depression in patients. Gold et al. discovered that music therapy exerted a moderate to large positive influence among children and adolescents suffering from psychopathology. Additionally, within clinical environments, music therapy interventions were found to assist adolescents in establishing their identity, rekindling their connectivity, and regaining their capacities.

The inferences drawn suggested that learning via music plays a substantial role in forming brain networks, and varying stimuli are likely to elicit disparate activations within brain regions. Higher-order capabilities are built upon foundational abilities. The varying levels of music and language processing were found to overlap within neurological and biological regions. This research could potentially contribute to a more precise identification of the factors leading to the development of speech or language disorders in some individuals. While a definitive causal relationship has not yet been established, the potential for music training to enhance language abilities, or vice versa, exists. This could prove beneficial for children grappling with language disabilities or challenges, particularly regarding early intervention and prevention strategies employing music therapy.

### 2.2 The Effect of Music Therapy on Brain and Neural Development

Hyde et al. [3] initiated a study to ascertain whether the neural disparities observed between adult musicians and non-musicians could be attributed to innate biological factors (nature) or were the result of extensive musical training (nurture). They organized an experimental group comprising 15 children, with an average age of 6.32 years, who undertook private keyboard lessons for a duration of 15 months. Conversely, the control group, consisting of 16 children with a mean age of 5.90 years, did not participate in any musical training during the same period. The children across both groups shared similarities in terms of gender, age at the inception of the study, and socioeconomic status. At the outset of the study, all children underwent behavioral assessments and MRI scans, with these evaluations being repeated upon conclusion of the 15-month period.

Initial comparisons of behavioral and MRI test results revealed no significant differences between the experimental and control groups prior to the onset of musical training. This observation lends credence to the notion that brain differences between adult musicians and non-musicians are more likely the consequence of rigorous musical training (nurture) rather than innate biological inclinations towards music (nature). Post the 15-month period, the children in the instrumental group demonstrated considerable behavioral improvements in finger motor tasks. The MRI scans for the experimental group revealed variances in motor-related brain areas, specifically the right precentral gyrus and the corpus callosum, as well as the right primary auditory region. These structural brain disparities align with the differences previously identified between adult musicians and non-musicians.

On the basis of this study, it can be posited that music therapy could potentially contribute to the structural development of the brain. For instance, sustained musical training might enhance activity in motor-related brain areas for individuals who have experienced strokes, thereby promoting increased bodily flexibility.

Sachs et al. [1] conducted a study involving an online survey, which was distributed via email to various universities and communities in the Boston region, with a total of 235 participants. The survey encompassed the 10-Item Personality Measure Index (TIPI) for personality assessment, and the Short Test of Musical Preferences (STOMP) to evaluate musical predilections. The outcomes indicated that individuals with a propensity for openness to experience, and who had undergone more extensive musical training, tended to exhibit enhanced emotional responses to music, a finding in alignment with previous research. The investigators concluded that the connectivity of white matter between the sensory processing regions in the temporal gyrus and the medial prefrontal cortex regions, responsible for emotional and social processing, might be correlated with the sensory accessibility variations of the reward system. The study reinforced the notion that social and emotional communication could be interrelated with an evolutionary perspective concerning the rewarding aspect of music aesthetics. Investigations into music constitute a critical focus in the context of social and emotional responses, as well as the functionality of the human brain's processing center. Despite the consistency in research findings, this subject warrants further exploration to more comprehensively elucidate the relationship.

### 2.3 Music Training on Neuroplasticity and Language

Kraus et al. [4] conducted a study involving 26 primary school children from gang-ridden regions of Los Angeles. Over a two-year period, these students participated in music training twice a week, focusing on pitch-matching, rhythm skills, instrument playing, among other aspects. They followed a standard class schedule and were monitored for progression, determining when they could advance to the next level. Over the course of two years, the students accumulated over 210 hours of music training and were evaluated by their music training instructors. Comprehensive assessments were conducted before and after the training program, including reading tests and neurophysiological measures.
The findings suggested that children who underwent music training tended to demonstrate enhanced language skills and neuroplastic abilities in the classroom setting. However, the study did not employ a control group, hence potential confounding variables such as involvement in other extracurricular activities could not be ruled out. It was observed that students exhibiting higher levels of participation and effort, the benefits of music training may not fully manifest. It was also found that identifying as a musician could potentially have a positive impact on an individual's cognitive traits due to the sustained practice involved. The researchers advocated for further exploration into the impact of music training on child development, particularly through the use of control groups to garner more conclusive evidence. This might have significant implications for education, particularly for children exposed to disadvantaged auditory environments. For instance, public schools should endeavor to facilitate increased student participation in music classes. However, the feasibility of widespread training remains contingent upon available funding.

2.4 Influence of Music Therapy on Cognitive Ability and Speech production

Schellenberg [8], a researcher from the University of Toronto, carried out a study aimed at investigating the potential non-musical benefits of music lessons. The researcher randomly assigned 144 six-year-old children to various conditions, initially evaluating them using a standardized IQ test. One subset of children underwent 36 weeks of instruction in keyboard or vocal music, while a control group was exposed to theater courses, and another control group did not participate in any specialized programs. Following the intervention period, the participants were reevaluated with an intelligence test.

The findings indicated that all participants who engaged in the structured classes, regardless of the nature of instruction, demonstrated significant improvement on the general intelligence test. However, the most substantial improvement was observed among the music group, compared to the control groups. Further validation of these findings was sought by conducting additional testing on 147 children and 150 college students, while controlling for their socioeconomic status. The outcomes generally aligned with the initial findings, although the improvement in intelligence was somewhat less pronounced among adult participants in comparison to children.

The researcher explored several potential factors contributing to the impact of music. One factor under consideration is the similarity between music courses and traditional schooling, which is strongly associated with IQ. The second factor is the correlation between music-related activities and enhanced concentration, training, and memory, among other cognitive functions. The final factor involves the abstract nature of music, which potentially facilitates intellectual development due to its reliance on relational information. In conclusion, the author posited that music has the potential to augment individuals' intelligence; however, the efficacy of music lessons as a quick means of achieving this is contingent upon the time invested in learning. This study demonstrated the manifold benefits of music training on human development. Music therapy sessions typically prioritize the enhancement of cognitive skills. Over the long term, music can particularly foster the intellectual development of children, including those with intellectual disabilities. Moreover, the author suggested the possibility of utilizing music therapy for language development. Given the current utilization of music in these domains by music therapists, researchers could explore clients' progress in cognitive and language areas.

Lim [9] conducted a research study involving 50 children diagnosed with autism spectrum disorder (ASD), who were randomly assigned to three different treatments: music therapy, language training, or no training. The training sessions were administered daily, and participants underwent pre- and post-training assessments with the objective of facilitating the production of target words within specified time limits. Two speech pathologists evaluated the children's language proficiency and progress. The findings demonstrated the efficacy of both music and language training in enhancing the language abilities of children with ASD. The research indicated that music assists children with ASD in perceiving and recognizing speech information, aligning with previous studies in this area. Additionally, the research revealed that children with autism possess language perception capabilities akin to those observed in typically developing individuals. Consequently, the gestalt style test appeared to stimulate the language and expressive functions of the children.

The study suggested that music therapy has the potential to be a highly effective intervention for enhancing children's language abilities, particularly in terms of language organization and learning target words. Notably, music may facilitate the development of language abilities and functions that are typically inhibited. The information received through music therapy has the potential to transfer to language-related information. This study holds significant meaning and provides valuable insights, lending support to the use of music as a means of aiding children with ASD in the cultivation of their language skills and expressive capabilities.

For advanced-stage students, the use of songs can also be beneficial to improve their pronunciation skills. Focusing on the musicality of language is an important means to enhance the listening proficiency of second language learners. Training students to pay attention to the speaker's intonation and the language and attitude reflected in speech can help them reproduce their language environment, which is not typically available when listening to tapes. In general, using music in language teaching creates a tranquil environment for
students as it eliminates other auditory distractions. Therefore, it creates a relaxed atmosphere for certain writing activities. Music alters the listener's emotions by stimulating imagination. Songs are also useful as they enhance students' pronunciation skills when singing. Additionally, the repetition of lyrics has a positive impact on students' language acquisition. Lyrics are easily memorized and effectively stored in the brain, which enables easy application in future communication. Certain lyrics, such as "It never rains in Southern California" or "We almost have it all," aid second language learners in retaining useful sentence structures and grammatical knowledge, such as the position of adverbs. One challenge for students learning a second language is the lack of opportunities for exposure to the target language outside the classroom. However, when asked about their hobbies, students often mention music, dancing, singing, or playing musical instruments. They can sing along and remember the lyrics, even if they don't understand the language at all. People may remember a song from their childhood and only understand its meaning years later. Teachers should encourage students to utilize this convenient and enjoyable method of language input.

3 IMPLICATIONS FOR MUSIC THERAPY AND CONCLUSION

Based on the existing literature, it is recommended that music therapists establish stronger connections between biological changes, cognitive abilities, and music therapy. Music training has the potential to influence brain development and connectivity. Numerous studies have demonstrated the benefits of music training and music therapy in promoting language and music development, with earlier interventions yielding greater effectiveness. Additionally, several studies have explored the relationship between cognitive abilities and music training, providing evidence supporting the use of music as a tool for cognitive development. Particularly for individuals with physical and mental illnesses involving speech difficulties, music therapy offers an opportunity to address and improve these skills. If further evidence supports the effectiveness of such interventions, music therapy could be more consistently employed in special education and in working with clients with ASD.

According to Kraus et al., music therapy could also serve as a means for public schools to address communication and cognitive development disparities among children from disadvantaged environments and their typically developing peers. In conclusion, research has consistently demonstrated the efficacy of music as a facilitator for enhancing communication and cognitive.

References


