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The Impact of Active Music Therapy on Social Skills Development in School-Aged Children with Autism Spectrum Disorder: A Systematized Review

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Abstract

Music therapy has been increasingly recognized as an effective way of helping children with autism spectrum disorder (ASD), particularly in the development of social and communication skills. This systematized review explores how active music therapy (AMT) can improve social skills in school-aged children with ASD. The research question guiding this systematized review is: "How does active music therapy improve social communication and interaction skills in children aged 6–13 years old with autism spectrum disorder?" Empirical studies in this field have used qualitative observations, assessment scales, parent reports, and randomized controlled trials to assess behavioral and neural outcomes of AMT interventions. Past reviews have combined all types of music-based interventions and a wide range of ages, and sometimes even other conditions besides autism. This systematized review focuses specifically on active music therapy and its benefits for the social skills of school-aged children with autism spectrum disorder. The results of seven empirical studies are analyzed. This review shows that active music therapy significantly enhances social skills, such as nonverbal communication, joint attention, and emotional responsiveness, in 6–13-year-old children with ASD. These findings suggest that music's rhythmic and interactive qualities develop and improve the skills that children with autism spectrum disorder often find challenging. By narrowing the focus to school-aged children with ASD and to the impact of active, hands-on musical activities on their social skills, this review reveals that active music therapy is especially useful for autistic children at this age, who are in a key stage of their development. It contributes to the growing evidence supporting active music-based interventions as effective and reliable tools for helping the development of children with autism spectrum disorder, while also identifying gaps in existing research pertaining to long-term outcomes and methodological consistency.

Keywords: active music therapy (AMT), autism spectrum disorder (ASD), social communication, joint attention, social skills development, school-aged children, interactive music interventions, nonverbal communication, rhythm and synchronization

1. Introduction

Music is a universal language that can connect people across cultures and backgrounds. Since the mid-twentieth century, it has been studied as a way to support social development in children with autism spectrum disorder (ASD), who often experience challenges in social interaction and communication (Geretsegger et al., 2022). The specific type of music studied in this context is music therapy, a clinical, evidence-based practice that uses structured musical experiences to address physical, cognitive, and social needs (Devlin et al., 2023).

Autism spectrum disorder is a neurodevelopmental condition that causes impairment in behavior, communication, and social skills (Applewhite et al., 2022). Music therapy is the clinical, evidence-based use of music and rhythm to enhance the lives of individuals with neurological impairments (Devlin et al., 2023). According to Devlin et al. (2023), it is different from general music-based interventions because it involves a therapist who builds a therapeutic relationship with the client. Researchers have discovered that music affects the brain and behavior of people, especially in rehabilitation and learning (Applewhite et al., 2022; Mayer-Benarous et al., 2021). Music has been shown to affect areas of the brain, especially those involved in movement, language, memory, and emotion. As a result, it began to be used to help people recover from many neurological and developmental conditions.

The connection between music and learning lies in how the brain processes music's rhythm, melody, and timing. Both music and language rely on auditory temporal processing, which is the brain's ability to track patterns in sound over time. This helps explain why musical activities can strengthen skills such as speech, memory, and focus. Music activates brain networks, such as the prefrontal cortex, motor regions, and the basal ganglia. These areas are also responsible for learning and attention. Through these pathways, music therapy promotes brain plasticity—the brain's ability to form new connections. Music therapy changes brain function to make learning and communication more effective.

Moreover, within music therapy, active music therapy (AMT)—which is participation-based music therapy using singing, playing, and/or improvisation—provides direct and interactive experiences that can support social development. As Schneider et al. explain in their study "Components of Active Music Interventions in Therapeutic Settings—Present and Future Applications," active music therapy is "a combination of music and therapy where patients actively participate in making music rather than being passively exposed to music" (Schneider et al., 2022). This can include rhythmical training, practice of musical instruments, and singing (Schneider et al., 2022). Active music therapy has been used and studied as a therapeutic tool for various populations. For example, it has been used for patients with dementia, ADHD, and other conditions (Aleixo et al., 2022; Mahendran & Jagdeesan, 2017; Mayer-Benarous et al., 2021; Raglio, 2015). This systematized review aimed to explore the benefits of active music therapy for children with ASD.

Past reviews have explored empirical studies about music therapy's effects. However, those reviews had broader age ranges, included additional disorders, and did not isolate the benefits of active music therapy. An example is a review written by Applewhite et al. (2022) titled "A Systematic Review of Scientific Studies on the Effects of Music in People with or at Risk for Autism Spectrum Disorder." Another is "The Effect of Music Therapy on Language Communication and Social

Skills in Children with Autism Spectrum Disorder: A Systematic Review and Meta-Analysis" by Shi et al. (2024). Another is written by Mayer-Benarous et al. (2021) titled "Music Therapy for Children With Autistic Spectrum Disorder and/or Other Neurodevelopmental Disorders: A Systematic Review." Another, by Alayidh et al. (2025), is titled "Music Therapy for People With Autism Spectrum Disorder: A Systematic Review of Randomized Clinical Trials." These reviews have shown that music therapy can improve the mood, attention, emotional regulation, and social skills of people with neurological disorders.

None of the other reviews have the same specific focus as this one. This paragraph will identify some existing reviews about the use of music therapy for autism, as well as how each of them has a different focus from the focus of this systematized review. Some reviews, such as that by Applewhite et al. (2022), focus on using music for people with autism in particular but do not distinguish between music therapy (MT) and other, non-MT uses of music, such as casual listening or playing of instruments. Other reviews, such as that by Mayer-Benarous et al. (2021), specifically focus on the effects of music therapy (rather than simply the effects of using music in any form) but do not focus exclusively on ASD, instead including a wide variety of disorders. In addition, some reviews, such as those by Applewhite et al. (2022) and Mayer-Benarous et al. (2021), include studies about adults as well as studies about children, including empirical studies that include both adults and children. Moreover, most of the reviews, including those by Alayidh et al. (2025) and Shi et al. (2024), did not distinguish between passive and active music therapy and focused on a broad age range, even when limited to children. For example, Alayidh et al.'s (2025) review includes empirical studies of receptive music therapy, and the majority of its studies (all but one) involve only very young children, aged 2–7, with some being limited to children aged 2–5. Shi et al.'s (2024) review, likewise, does not distinguish between passive and active music therapy and is also not limited to children under 13. This leaves questions about the specific effects of active music therapy (AMT) on children aged 6–13 with ASD.

What was missing was a review that distinguishes between passive and active music therapy, focuses exclusively on ASD, and focuses on older school-aged children. This systematized review fills this gap by considering only empirical studies that are limited to active music therapy, autism spectrum disorder (ASD), and children aged 6–13 years old. This review focuses on a more specific question than other reviews have, and the analysis goes into greater depth about the pertinent results of the empirical studies that qualify. The age range of 6–13 years old is crucial for social interactions and communication. Children near the age of 6 are at the beginning of elementary school. In that setting, socializing and communicating become crucial and more intense. Because of this, the age range of 6–13 years old was chosen in order to focus on the most critical time for children regarding how to improve their social skills.

This systematized review aimed to answer the question: "How does active music therapy improve social communication and interaction skills in children aged 6–13 years old with autism spectrum disorder?" This was intended to help parents and caregivers determine whether active music therapy may be a potential way to help develop their child's social and communication skills. By focusing on this specific type of music therapy, age group, and ASD, the study aimed to use findings from relevant empirical studies to provide information about the impact of active music therapy on the social development of children with ASD. This review also explains the types of measurement systems used and what the measurement results mean.

The following sections first describe the methodology used to select and analyze relevant empirical studies, then present findings from the multiple sources and articles, followed by a discussion of the results, and finally a conclusion identifying key takeaways and suggestions for future research and studies.

2. Methodology

2.1. Search Method

A search was performed across two major databases, PubMed and JSTOR, in order to find relevant published articles. Search terms combined keywords related to the intervention and population. The search terms used were: ("music" OR "music therapy" OR "active music therapy") AND ("autism" OR "autism spectrum disorder" OR "autistic" OR "ASD") AND ("social skills" OR "social interaction" OR "communication skills" OR "social communication") AND ("children"). The searches were conducted, and the selection of the seven studies was finalized in July 2025.

Relevant empirical studies were identified not only through database searches but also through careful examination of existing systematic reviews that included studies about music therapy and autism. These reviews synthesized empirical studies and provided detailed information on the type of music therapy or music-based intervention used, participant age groups, outcomes, and other pertinent variables. The empirical studies found within the systematic reviews were also assessed individually, and those that met all inclusion criteria were incorporated into the analysis.

2.2. Inclusion and Exclusion Criteria

Studies were included if they met a series of criteria. Studies were included if they met the following criteria: they were empirical studies, they involved participants primarily aged 6–13 years diagnosed with autism spectrum disorder, and they focused specifically on music therapy without other types of therapy or interventions. Only studies using active music therapy (improvisation, singing, instrument playing, structured music-making) were included, and if passive music therapy was included, the study had to clearly distinguish it from active music therapy. Additionally, studies had to include measurements or outcomes of the participants' social communication and/or social interaction and had to be written in English.

Studies were excluded if they involved participants who were mostly outside the target age range or were not diagnosed with autism spectrum disorder. Studies were also excluded if they used only passive music therapy (passive listening), if they combined active and passive music therapy without distinguishing between them in the data, or if they focused on a type of therapy or intervention other than music therapy. In addition, studies were excluded if they did not assess social or communication-related outcomes, if they were not written in English, or if they were study protocols, systematic reviews, literature reviews, or preliminary investigations.

2.3. Study Selection

Articles from the database searches and systematic reviews were independently reviewed for relevance. Articles' full texts were then reviewed using the inclusion and exclusion criteria. Any articles that met all of the inclusion criteria were included. Any articles that fell into any one of the exclusion criteria were excluded. The final selection of articles was cross-checked by a second reviewer.

An example of an excluded article is "Music for Autism: A Protocol for an International Randomized Crossover Trial on Music Therapy for Children with Autism" by Ruiz et al. (2023). Although this article included children with autism in the

target range of 6–12 years old, it was only a study protocol, which fell into one of the exclusion criteria.

Another example of an excluded article is "Effect of a Combined Dance/Movement and Music Therapy on Young Adults Diagnosed with Severe Autism" by Mateos-Moreno et al. (2013). This article was excluded because the study included dance/movement in addition to music therapy. This fell into the exclusion criterion of focusing on another type of therapy or intervention other than music therapy.

Based on the methods described above, this review is best categorized as a systematized review. According to Grant and Booth (2009), systematized reviews incorporate one or more elements of the systematic review process but do not meet the comprehensiveness required of a full systematic review. This is often due to resource constraints, such as the lack of multiple reviewers. This review used structured database searching, clearly defined inclusion and exclusion criteria, and a transparent study selection process. However, it did not apply all components of a systematic review, such as protocol registration or dual independent screening. Therefore, according to Grant and Booth's (2009) definition, a "systematized review" most accurately describes this study.

2.4. Data Analysis

Data from eligible articles were organized into the following categories: participant information (number and ages), study design, interventions (duration and frequency), control group (where applicable), measurements, results, and conclusion.

3. Results

Seven articles met the inclusion criteria of this systematized review. Table 1 presents an overview of each article—including the author, title, year, study design, participant information, interventions (groups and session systems), and main findings of the study.

This results section presents findings from the seven selected empirical studies. This section, however, does not present every finding of those articles but rather only those aspects that are pertinent for answering this systematized review's research question, which is: "How does active music therapy improve social communication and interaction skills in children aged 6–13 years old with autism spectrum disorder?" First, a brief overview synthesizes the key findings of the selected studies. Next, the characteristics and methodologies of each study are summarized sequentially. Finally, the effects of active music therapy on the children's social behavior in each study are isolated and described.

After the relevant results from each study are presented in this results section, the discussion section further synthesizes and analyzes the empirical findings to provide a fuller understanding of how active music therapy affects autistic children.

There is a clear pattern in the seven empirical studies: active music therapy (AMT) is linked with improvements in social skills in children with autism spectrum disorder (ASD). Although there are differences in population size, autism severity, age range, and intervention methods, all of these studies show that the social skills of the children who engaged in AMT improved measurably. Foundational social skills, such as joint attention, turn-taking, eye contact, nonverbal communication, and cooperative engagement, improved the most. This suggests that AMT supports social processes that autistic children often find challenging.

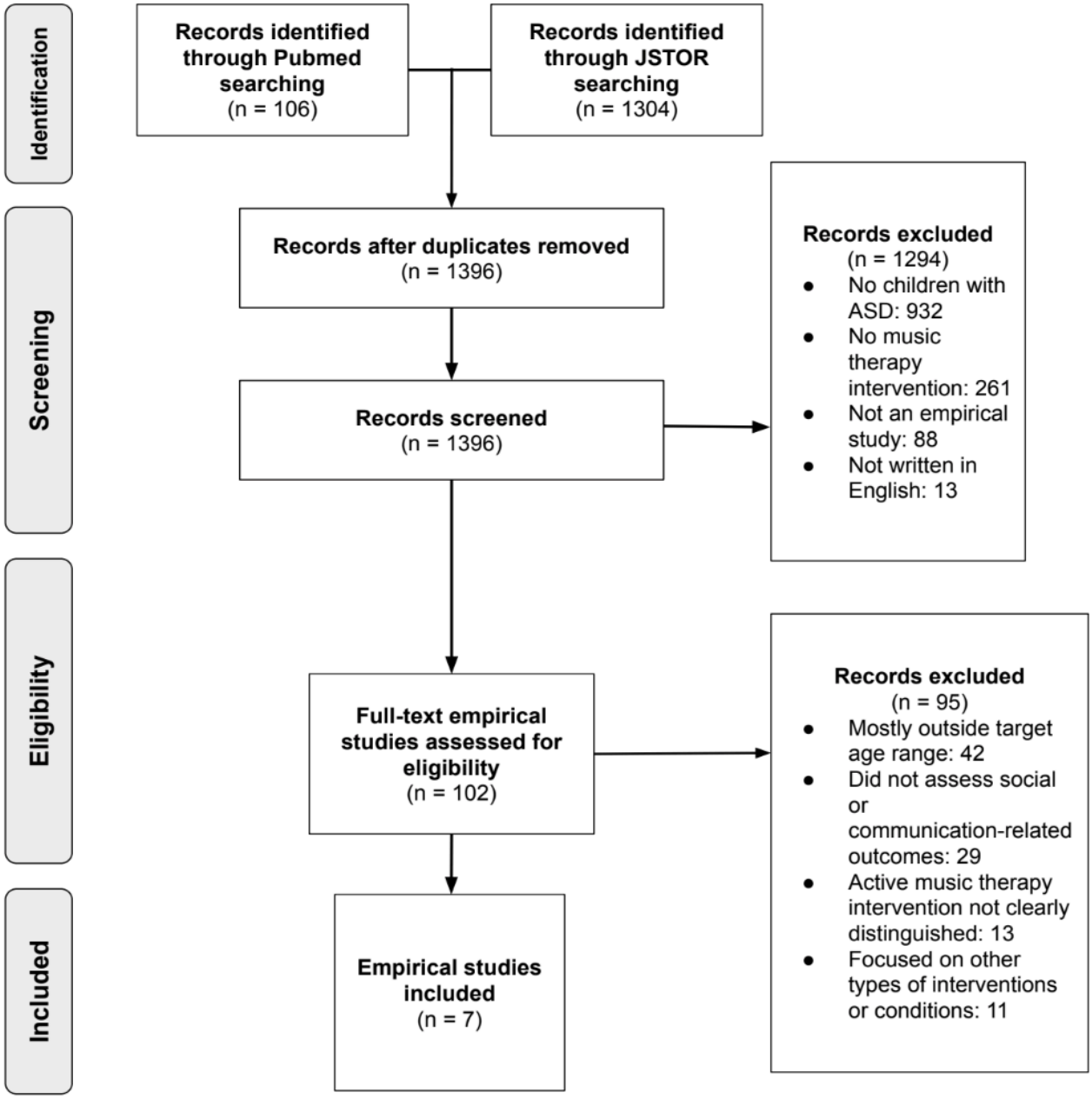

Figure 1: Flow-chart of study selection.

Table 1: Summary of studies included in the systematized review

Author and Year	Article Title	Study Design	Population	Interventions	Main findings
Ghasemtabar et al., 2015 (1)	"Music therapy: An effective approach in improving social skills of children with autism"	Pre/post evaluation	N= 27 Age= 7–12 y.o. Gender: 14 boys Severity: mild to moderate	**Experimental Group:** Orff-based Music Therapy: singing, hand clapping, rhythmic movement, and creative playing of instruments. **Control Group:** Usual care with no music intervention. **Settings:** 1-hour group sessions, twice a week for 6 weeks	Social skills (communication, cooperation, self-control) significantly improved with active music therapy (AMT) compared to the control group.
Sharda et al., 2018 (2)	"Music improves social communication and auditory–motor connectivity in children with autism"	Randomized Control Trial	N= 51 Age= 6–12 y.o. Gender: 33 boys Severity: moderate to severe	**Experimental Group:** Interactive Music Therapy: singing, rhythm games, movement, and music turn-taking **Control Group:** Similar play interactions with no music intervention. **Settings:** 45-minute sessions, twice a week for 8 to 12 weeks.	Both verbal and nonverbal communication and family quality of life significantly improved with AMT. fMRI (Functional Magnetic Resonance Imaging) showed stronger connections between the brain's auditory and motor areas.
Gattino et al., 2011 (3)	"Effects of relational music therapy on communication of children with autism: A randomized controlled study"	Randomized Control Trial	N= 24 Age= 7–12 y.o. Gender: 24 Boys Severity: mild to moderate	**Experimental Group:** Relational Music Therapy: improvisational music-making through instrument playing and mirroring **Control Group:** Standard care	Nonverbal communication skills, particularly in gestures and emotional expression, improved with AMT.

				Settings: Weekly 30-minute sessions for 16 weeks	
Davis, 2016 (4)	"The Effect of Music Therapy on Joint Attention Skills in Children with Autism Spectrum Disorder"	Pre/post evaluation	N= 4 Age= 6–7 y.o. Gender: 4 boys Severity: unspecified	**Experimental Group:** Cooperative Music Therapy: singing, call-and-response, rhythmic imitation, and instrument playing **Control Group:** Same social games with no music intervention **Settings:** 20-minute sessions, twice a week for 5 weeks	Only nonverbal communication, such as eye contact and mutual focus, improved with AMT.
LaGasse, 2014 (5)	"Effects of a Music Therapy Group Intervention on Enhancing Social Skills in Children with Autism"	Randomized Control Trial	N= 17 Age= 6–9 y.o. Gender: 13 boys Severity: unspecified	**Experimental Group:** Group Music Therapy: singing, rhythm play, and turn-taking games with instruments **Control Group:** Social skills group with no music intervention **Settings:** 50-minute sessions, twice a week for 5 weeks	Eye contact and joint attention significantly improved with AMT, though there were no improvements in verbal communication.
Yoo and Kim, 2018 (6) (Note: This article presents two empirical studies, which are identified in this table as	"Dyadic drum playing and social skills: implications for rhythm-mediated intervention for children with autism spectrum disorder"	Pre/post evaluation	**STUDY 1:** N= 10 Age= 6-10 y.o. Gender: unspecified Severity: mild to moderate **STUDY 2:** N= 9 Age= Mean 10.8 y.o.	**STUDY 1:** **Experimental Group:** Dyadic drumming sessions **Control Group:** None **Settings:** Unspecified **STUDY 2:** **Experimental Group:**	**STUDY 1:** Children with autism who showed better synchronization during the sessions also displayed better social skills. **STUDY 2:** Social skills, turn-taking, and joint action improved with

"Study 1" and "Study 2")			Gender: 8 boys, 0 girls, 1 withdrew Severity: mild to moderate	Dyadic drumming sessions or drumming sessions with a therapist **Control Group:** None **Settings:** Unspecified	drum-based rhythm intervention.
Bharathi et al., 2019 (7)	"Music therapy as a therapeutic tool in improving the social skills of autistic children"	Pre/post evaluation	N= 52 Age= 6-12 y.o. Gender: unspecified Severity: mild to severe	**Experimental Group:** Orff-based Music Therapy: singing, body percussion, movement, and instrument playing **Control Group:** Passive music-listening **Settings:** Sessions took place over 3 months	Social skills (responding, interactions) significantly improved with AMT compared to the passive group.

In contrast, control groups—whether receiving standard care, non-musical play, discussion-based social skills training, or passive music listening—showed little to no improvement. This pattern suggests that the interactive, rhythmic nature of active music therapy plays an important role in improving the children's social skills, rather than music exposure alone.

A notable finding across the studies is that nonverbal and interaction-based social skills improved more than verbal communication skills. Multiple studies found increases in behaviors such as shared attention, gesture use, imitation, and mutual focus, especially in rhythm-based or cooperative musical activities. These findings were present in different active music therapy types, including Orff-based music therapy, relational music therapy, cooperative music therapy, and dyadic drumming interventions.

The studies also help explain why active music therapy may be effective. The rhythm and shared musical structure give the children a clear and predictable framework that supports timing, coordination, and turn-taking. In Sharda et al.'s (2018) study, brain imaging shows that changes in how auditory and motor areas of the brain work together could lead to improvements in social skills. Several of the studies also found that these social improvements continued after the intervention ended, suggesting that music therapy can have lasting effects rather than merely causing short-term behavior changes. Collectively, the studies show that active music therapy is an effective way of improving social communication in children with ASD, especially in nonverbal interaction, joint attention, and cooperative engagement, which are important for overall social development.

The first study, by Ghasemtabar et al. (2015), is titled "Music Therapy: An Effective Approach in Improving Social Skills of Children with Autism." This study's participants included 27 children diagnosed with mild to moderate autism, aged 7–12. Thirteen of the children were placed in an Orff-based music therapy group, while the other 14 were placed into a control group with no music intervention (Ghasemtabar et al., 2015). Orff-based music therapy is a form of active music therapy that combines music—including singing and playing musical instruments such as percussion—with speech, movement, and

drama (Orff, 1980). The children placed in the active music therapy group took part in many musical activities, including singing, clapping, and playing instruments. These sessions occurred twice a week for 6 weeks. Parents reported their children's social behaviors initially and 2 months later. To measure the children's progress, the study used the Social Skills Rating System (SSRS), which is a standardized questionnaire that asks parents to rate the child's everyday social abilities, such as cooperation, self-control, and responsibility (Gresham et al., 1990).

The children in the active music therapy group showed improvements in social behaviors such as nonverbal communication and turn-taking. The children in the control group, on the other hand, showed no significant changes. The active music therapy group's SSRS scores improved significantly compared to the control group ($p < 0.001$). The letter p stands for probability. The smaller the p-value is, the less likely the results could have happened by chance; values below 0.05 are considered statistically significant. Parents of the active music therapy group children also reported an increase in their children's cooperation and self-control.

The authors concluded that "music therapy had significant and lasting effects on social skill development" (Ghasemtabar et al., 2015), indicating that active group music therapy led to measurable and lasting improvements in social interaction for children with autism.

The second study, by Sharda et al. (2018), is titled "Music Improves Social Communication and Auditory–Motor Connectivity in Children with Autism." This study's participants included 51 children with moderate to severe autism, aged 6–12. Twenty-six children were assigned to an active music therapy group, while the other 25 were assigned to an active non-music control group. The children in the active music therapy group took part in music activities such as singing, rhythm training, and musical turn-taking. The children in the control group received a similar play-based behavioral program but with no music. Sessions lasting 45 minutes occurred over 8 to 12 weeks (Sharda et al., 2018). The study measured the children using the Children's Communication Checklist–2 (CCC-2) and the Social Responsiveness Scale–2 (SRS-2). The CCC-2 evaluates how well children use language in social situations, such as through conversational flow, turn-taking, and the use of gestures (Wellnitz et al., 2021). The SRS-2 measures the severity of social and communication problems related to autism (Constantino et al., 2012). They also performed resting-state fMRI scans, a type of brain imaging that shows how different brain areas connect as the child is resting (Sharda et al., 2018).

The music therapy group showed significant improvements in communication skills, such as initiating and responding appropriately in conversations. In contrast, the control group showed none of these improvements. Brain scans also showed that the active music therapy group developed stronger auditory-motor brain connections related to communication. The active music therapy group's pragmatic communication scores on the CCC-2 increased by an average of 4.84 points ($p = 0.01$), while the control group remained unchanged. The fMRI results revealed stronger functional connectivity between auditory and motor brain regions, and these neural changes were associated with the children's improved communication scores (Sharda et al., 2018).

According to the authors, "Music therapy enhances communication and reorganizes auditory–motor brain networks" (Sharda et al., 2018). These findings show that active music therapy improves children's ability to communicate and strengthens the brain pathways that support social skills.

The third study, by Gattino et al. (2011), is titled "Effects of Relational Music Therapy on Communication of Children with

Autism: A Randomized Controlled Study." This study's participants included 24 boys with mild to moderate autism, aged 5–9. Twelve were randomly placed into an active music therapy group, while the other 12 were placed into a standard care group. The active intervention was relational music therapy, a form of active music therapy in which the therapist uses musical play, imitation, and shared rhythm to build interaction with the child. Sessions lasting 30 minutes occurred over 16 weeks (Gattino et al., 2011). Communication was evaluated using the Brazilian Childhood Autism Rating Scale (CARS-BR). The CARS-BR is used to measure the severity of autism in children, and the third study specifically targeted the verbal, nonverbal, and social domains (Pereira et al., 2008).

Although the CARS-BR scores did not differ significantly between the two groups, the children in the active music therapy group showed significant improvement in the nonverbal communication subscale ($p \approx 0.008$). On the other hand, the control group showed no significant changes. The children improved mostly in gestures, facial expressions, and shared emotional reactions with the therapist. Gattino et al. (2011) stated, "The study found a statistically significant positive difference on subgroup analysis of nonverbal communication among patients with autistic disorder." This finding indicates that relational music therapy helped the children express themselves and socially engage nonverbally. This finding also suggests that active music therapy provides an effective way for children with autism to improve their nonverbal communication.

The fourth study, by Davis (2016), is titled "The Effect of Music Therapy on Joint Attention Skills in Children with Autism Spectrum Disorder." This study involved four boys with ASD, ages 6–7, and focused on joint attention as a foundational social-communication skill. Each child participated in three different types of play conditions: Cooperative Music Therapy, Cooperative Play, and Independent Play. Cooperative Music Therapy involved live singing, instrument play, rhythmic imitation, and musical turn-taking between the therapist and the child (Davis, 2016). Cooperative Music Therapy qualifies as a form of active music therapy because it involves direct musical participation and interaction between the therapist and child through singing, rhythm, and instrument play. Cooperative Play involved similar social games and activities but without music (for example, using toys, blocks, or books). Independent Play involved the child playing alone with minimal interaction with the therapist. Sessions were held twice per week for 5 weeks and lasted approximately 20 minutes. The music therapy included songs written or adapted by the therapist to fit the children's preferred tempo and responses. The therapist used call-and-response, question-and-answer singing, and instrumental imitation to promote eye contact, turn-taking, and shared focus. The study measured the children's behaviors using Initiating Joint Attention (IJA) and Responding to Joint Attention (RJA). IJA measures when a child attempts to share interest (for example, by looking at the therapist or showing an object), and RJA measures when the child follows the therapist's verbal or musical cue to share attention (Bruinsma et al., 2004). All sessions were video-recorded and analyzed in 15-second intervals to count the two types of behaviors.

The children's IJA and RJA scores were both highest during Cooperative Music Therapy compared to the two other interventions. The children showed more consistent eye contact and mutual focus, especially when the therapist and child played the same instrument, such as a drum or tambourine. When they changed to a different instrument, the children initiated more interactions, likely because the change encouraged them to communicate. On the other hand, the Independent Play intervention showed the fewest social interactions, as the children usually remained disengaged or only focused on objects. Davis (2016) states, "Cooperative music therapy is more effective in eliciting interaction than both cooperative play and independent play." She explains that music provides a structured and flexible environment in which rhythm and melody naturally capture the children's attention, encouraging them to interact. This shows that active,

cooperative music therapy can improve joint attention, imitation, and social engagement.

The fifth study, by LaGasse (2014), is titled "Effects of a Music Therapy Group Intervention on Enhancing Social Skills in Children with Autism." This study's participants included 17 children with mild to moderate autism, aged 6–9. The children were randomly placed into either an active music therapy group or a non-music social skills group. The active music therapy group engaged in active singing, rhythm, and instrument play designed to support joint attention and turn-taking, while the control group participated in traditional discussion-based social skills activities without music. Both groups met for ten 50-minute sessions across 5 weeks (LaGasse, 2014). The study measured the children using the Social Responsiveness Scale (SRS) and the Autism Treatment Evaluation Checklist (ATEC). The SRS measures how well a child responds to others in social settings (Kovacs et al., 2021), and the ATEC tracks changes in speech, socialization, and sensory awareness of individuals over time (Mahapatra et al., 2018). Additionally, the researchers used video analyses to observe joint attention and eye contact behaviors during sessions.

SRS and ATEC scores for the active music therapy group improved only slightly and did not reach statistical significance. However, children in the AMT group significantly improved in joint attention with peers and eye gaze toward people ($p < 0.05$). The control group, on the other hand, had no such improvements. This indicates that active music therapy helped the autistic children visually connect and share attention during interaction. However, there were no significant group differences in initiating or responding to verbal communication. This suggests that the greatest improvements were in nonverbal aspects of social behavior. LaGasse (2014) wrote that "music provided a motivating structure for social engagement, meaning that rhythmic and musical frameworks can catch children's attention and help their social exchanges. Active music therapy created a fun and structured environment that helped the children socially connect and improve their social skills, such as eye contact and joint attention.

The sixth study—which is actually a paper that describes two empirical studies—is by Yoo and Kim (2018) and is titled "Dyadic Drum Playing and Social Skills: Implications for Rhythm-Mediated Intervention for Children with Autism Spectrum Disorder." This paper consisted of two studies—Study 1 and Study 2—that focus on rhythm and social interaction in children (Yoo & Kim, 2018).

Study 1 examined rhythmic interaction patterns between typically developing children and children with high-functioning autism. Forty-two typically developing children and 10 children with autism took part in drumming sessions. Researchers observed how each child adjusted their rhythm, responded to cues, and synchronized with a partner. The goal was to understand which rhythmic behaviors were most strongly linked to social skills such as cooperation and shared attention.

The results of Study 1 showed that children with autism who were better at synchronizing rhythms also tended to show stronger social engagement, suggesting that rhythm and timing may play an important role in social interaction.

Then, Study 2 tested whether active rhythm-based intervention can actually improve social skills in children with autism. This study's participants originally included nine children with high-functioning autism, aged 6–10. However, one withdrew, making the number of children studied eight. The children participated in dyadic drumming sessions with either a therapist or a peer. Each session involved matching rhythms, adjusting tempo, and coordinating drumming patterns. Researchers measured how well the children synchronized their timing using tapping synchrony and observed changes in imitation, shared attention, and joint action, which are key parts of social communication. The researchers tracked tapping

synchrony using timing sensors, which measured the time difference between the child's and therapist's drumming. They also used direct observation to score joint attention, imitation, and shared action, which are key social communication skills for children with autism.

After the active intervention, the children showed significant reductions in asynchrony ($p < 0.05$), meaning their drumming became better synchronized with their partner's. After the sessions, the children were observed to be engaged in more joint actions and imitation behaviors. The authors wrote that "participants showed greater engagement in joint action following the intervention" (Yoo & Kim, 2018), showing that the rhythmic interaction encouraged more social engagement. Overall, Study 2 provides preliminary evidence that active rhythm-based music therapy can improve coordination, turn-taking, and shared focus in children with autism, supporting the idea that rhythm can serve as a bridge for social communication.

The seventh study, by Bharathi et al. (2019), is titled "Music Therapy as a Therapeutic Tool in Improving the Social Skills of Autistic Children." This study's participants included 52 children with mild to severe autism, aged 6–12. The children were divided into two groups. Twenty-six children were placed in an active Orff-based music therapy group, and the other 26 were placed in a passive listening group. The active music therapy (Orff-based Music Therapy) group engaged in singing, movement, and playing instruments, while the passive group only listened to music. Sessions occurred over 3 months (Bharathi et al., 2019). Autism severity was measured with the Childhood Autism Rating Scale (CARS), which measures behavioral symptoms to determine the level of autism severity (Moon et al., 2019). Social skills were measured using the TRIAD Social Skills Assessment System (TSSA)—which measures understanding, initiating, responding, and maintaining social interaction (Stone et al., 2010)—at baseline (pretest), posttest, and a 3-month follow-up.

Immediately following the active music therapy interventions, CARS scores slightly decreased, meaning that symptom severity was reduced. Furthermore, according to the posttest TSSA results, the active music therapy group also showed significant improvements in social skills such as maintaining interactions and responding to others ($p < 0.05$). The passive group, on the other hand, showed minimal or no change. The improvements in the AMT group persisted at the 3-month follow-up. The authors concluded that it was "an effective intervention in improving social skills of autistic children with steady effects" (Bharathi et al., 2019). Overall, this study demonstrates that actively engaging with music through movement and instruments leads to broader and longer-lasting improvements in social communication than passive music listening alone.

4. Discussion

These seven studies consistently confirm that active music therapy is an effective approach for enhancing social communication in school-aged children with ASD. The randomized controlled trials provide strong evidence that active music therapy results in measurable improvements in communication, joint attention, and social responsiveness.

A factor related to the improvement of the children's social skills is the mechanism of engagement. Music naturally integrates auditory, motor, and emotional systems, giving children with ASD a structured yet flexible environment in which to practice social interaction. Sharda et al.'s (2018) study demonstrated this at the neural level, showing strengthened auditory-motor connectivity and reduced atypical auditory-visual coupling. Yoo and Kim's (2018) drumming study highlighted rhythm synchrony as a driver of turn-taking and coordination, while Gattino et al.'s (2011) relational approach

emphasized improvisation as a way to foster emotional expression. Overall, these findings suggest that music's rhythmic and interactive qualities develop and improve the skills that children with autism often find challenging.

The studies also highlight the importance of context and format. Group-based interventions (Bharathi et al., 2019; LaGasse, 2014) not only improved individual skills but also created opportunities for peer interaction and generalization of behaviors beyond the therapy setting. Relational and partner formats (Gattino et al., 2011; Yoo & Kim, 2018) showed the value of one-to-one musical dialogue, in which the therapist or partner becomes a co-creator of meaning through sound. This diversity of approaches suggests that active music therapy is adaptable: it can be tailored to individual needs while also scaling to group contexts that mirror real-world social environments.

The varying results across these studies could be explained by their different study designs. Some studies used randomized controlled designs, such as those by Gattino et al. (2011), LaGasse (2014), and Sharda et al. (2018), which makes it more likely that the observed social improvements were caused by active music therapy rather than outside factors. In contrast, studies using pre/post evaluation, such as Davis (2016) and Yoo and Kim (2018), may be more sensitive to individual differences, the children's interests, or therapist interaction. These factors could have inflated the children's short-term gains. The reports by the children's parents may also be influenced by expectation bias, while observational and neuroimaging methods may provide more direct evidence of behavioral or neural change. These study design differences could explain why some studies show large and statistically significant improvements while others show more modest or specific ones, especially in nonverbal skills. Ultimately, the results across all of these studies suggest that active music therapy improves social skills in children with autism, even though the significance of the results may have depended on how the intervention was measured and studied.

An important consideration is the effectiveness of active music therapy across different cultural contexts. The studies included in this review were conducted in diverse national settings. Gattino et al.'s (2011) study was conducted in Porto Alegre, Brazil. Sharda et al.'s (2018) study was conducted in Montreal, Canada. Ghasemtabar et al.'s (2015) study was conducted in Tehran, Iran. Despite differences in language, educational systems, and local practices, all three studies resulted in improvements in social communication and interaction skills following active music therapy intervention. This consistency across these varied settings suggests that active music therapy may be effective for children with ASD across different cultural contexts.

Finally, the collective evidence shows that active music therapy is both effective and versatile. Improvements were observed across cultural contexts and across domains, particularly in social skills—including nonverbal communication, joint attention, eye contact, and emotional expression—and in family quality of life. The behavioral outcomes of the studies, as well as the neurological evidence from Sharda et al.'s (2018) study, strengthen the case for active music therapy as more than an enjoyable activity: AMT is a structured, evidence-based intervention with the potential to reshape developmental trajectories for school-aged children with ASD. Additionally, Bharathi et al.'s (2019) study showed that active music therapy is more effective than passive music therapy in improving social skills in children with ASD.

Unlike other reviews that combine all types of music-based interventions and a wide range of ages, and sometimes even other conditions, this systematized review focused specifically on active music therapy and its impact on the social skills of children aged 6–13 years who have autism. Focusing on this age group, in particular, made it possible to see how direct participation in music helps school-aged children improve their social skills, such as eye contact, turn-taking, and

responding to others. Moreover, other reviews tend to focus broadly on general emotional or behavioral outcomes, but this one highlights how active involvement in music directly builds the communication and interaction skills that are difficult for children with autism to develop. By narrowing the focus to school-aged children with ASD and to the impact of active, hands-on musical activities on their social skills, this review reveals that active music therapy is especially useful for autistic children at this age, who are in a key stage of their development.

This systematized review may have some potential limitations. First, none of the empirical studies directly compared active and passive music therapy as separate intervention groups. While this systematized review focused on active music therapy and one of the studies had a passive music-listening control group, the resulting data were insufficient to clearly determine whether active music therapy is more effective than passive music therapy. Second, although major databases such as PubMed and JSTOR were searched, additional databases such as ResearchGate or ScienceDirect were not. This may have led to relevant studies being missed. Third, only studies published in English were included, potentially excluding relevant research in other languages. Finally, there were only a few randomized controlled trials, and the existing studies did not clearly distinguish between varying levels of autism severity. This limits the ability to determine which active music therapy approaches are most effective for children with different levels of ASD.

5. Conclusion

The overall results from these seven studies provide strong evidence that active music therapy consistently improves social communication and interaction skills in children with ASD aged 6–13. Across all types of active music therapy, ranging from group-based sessions to dyadic drumming and relational improvisation, children showed measurable improvements in joint attention, turn-taking, expressive communication, and social responsiveness. These behavioral gains were supported by neuroimaging evidence of strengthened auditory-motor connectivity, suggesting that active music therapy not only improves observable social behaviors but also reshapes underlying neural pathways. Together, these findings highlight music's unique role as a multisensory, motivating, and socially engaging medium that scaffolds the very skills children with ASD often find most challenging.

When comparing the results of all the studies, there were studies that showed improvements in both verbal and nonverbal communication, but also a notable number of studies that showed improvements in only nonverbal communication. To understand what causes the absence of improvements in verbal communication, questions to consider in future research are: "Do nonverbal and verbal communication respond to active music therapy in different ways?" and "Are certain types of active music therapy more effective than others in improving nonverbal communication and/or verbal communication, and if so, which ones and in what ways?"

In the studies by Ghasemtabar et al. (2015), LaGasse (2014), and Yoo and Kim (2018), rhythm was a large part of the music therapy, and there were notable improvements in the children's verbal and nonverbal communication. To understand rhythm's role in improving social skills, a question to consider in future research is: "Is rhythm the core mechanism that improves social communication in children with autism?"

This systematized review reveals both gaps and facts that are currently known about active music therapy's effectiveness for people with ASD. Future empirical research should expand on the results of these seven studies by addressing several gaps. Larger-scale, multisite randomized controlled trials are needed to confirm generalizability across different

populations and cultural settings. Longitudinal studies could clarify the durability of improvements and whether early intervention produces stronger developmental outcomes. Mechanistic research should further explore how specific musical elements, such as rhythm synchrony, improvisation, or group singing, differentially influence neural and social outcomes. Future studies could investigate whether active music therapies can be effectively integrated with other evidence-based interventions and whether their benefits extend beyond social communication to domains such as emotional regulation, academic engagement, or family dynamics.

Accordingly, some additional questions to answer in future studies could be: "How do different types of music therapy (particularly active versus passive) compare in effectiveness for specific social skills like eye contact, turn-taking, etc., in children with autism?", "What specific element of active music therapy most effectively improves autistic children's social skills?", or "How does the severity of the children's autism affect how much their social skills improve?" In addition, future reviews could focus on active music therapy for adults with ASD. These directions would deepen our understanding of active music therapy's full potential and refine its application as an effective therapeutic tool.

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Jacob Enyi Li is a senior at Millburn High School in Millburn, New Jersey. He is deeply interested in music and medicine. Outside of school, he studies percussion at the Juilliard Pre-College Program and holds a Level 4 Diploma in Piano Performance from the London College of Music.

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Mentor Contribution Statement

Aaron Litvin served as an academic mentor to Jacob Li throughout Jacob's research project. Litvin's role was advisory in nature and consistent with standard research supervision. Litvin provided feedback at multiple stages of the process, including *advice* on refining the research question, identifying and evaluating relevant scholarly sources, clarifying methodological choices, structuring the paper, interpreting results, and improving clarity and organization in the writing.

Mr. Litvin did not conduct research, collect or analyze data, or write any portion of the manuscript. All research design decisions, data analysis, interpretations, and written content were produced independently by Jacob Li. Litvin's contributions were limited to comments, suggestions, and critical questions intended to help Jacob strengthen the rigor, coherence, and presentation of his work, while leaving all substantive decisions and execution to the student.

Jacob Li demonstrated full intellectual ownership of the project and responded to feedback autonomously, revising the paper based on his own judgment. The final manuscript reflects Jacob's independent research efforts, analytical reasoning, and writing.