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

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 systematic review explores how active music therapy (AMT) can improve social skills in school-aged children with ASD. The research question guiding this systematic 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 systematic reviews have combined all types of music-based interventions and a wide range of ages, and sometimes even other conditions besides autism. This systematic review, on the other hand, focuses specifically on active music therapy and its benefits for the social skills of school-aged autistic children. The results of seven empirical studies are analyzed. This study 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 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, while also identifying gaps in existing research pertaining to long-term outcomes and methodological consistency.

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 and evidence-based practice that utilizes structured musical experiences to address physical, cognitive, and social needs.

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 and 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 had discovered that music affects the brain and behavior of people, especially in rehabilitation and learning. Music was shown to affect areas of the brain, especially ones involved in movement, language, memory, and emotion. As a result, it started 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 networks in the brain, 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 the brain's ability to form new connections. Music therapy changes the brain 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 – may offer the greatest benefits by providing more direct and interactive experiences that can support social development.

Past systematic reviews have explored empirical studies about music therapy's effects. For example, Applewhite et al. wrote a systematic review in 2022 titled "A Systematic Review of Scientific Studies on the Effects of Music in People with or at Risk for Autism Spectrum Disorder" (Applewhite et al. 2022). Another is written by Mayer-Benarous et al. in 2021 titled "Music Therapy for Children With Autistic Spectrum Disorder and/or Other Neurodevelopmental Disorders: A Systematic Review" (Mayer-Benarous et al. 2021). Another, by Alayidh et al., written in 2025, is titled "Music Therapy for People With Autism Spectrum Disorder: A Systematic Review of Randomized Clinical Trials" (Alayidh et al. 2025). These systematic reviews have shown that music therapy can improve the mood, attention, emotional regulation, and social skills of people with neurological disorders.

Some reviews, such as Applewhite et al's, 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. Other reviews, such as Mayer-Benarous et al.'s, specifically focus on the effects of music therapy (as opposed to simply the effects of using music in any form), but do not focus exclusively on ASD, instead including on a wide variety of disorders. In addition, some reviews, such as Applewhite et al.'s and Mayer-Benarous et al.'s, include studies about adults as well as studies about children, and even empirical studies that include both adults and children. Moreover, most of the systematic reviews, including the review by Alayidh et al., have not distinguished between passive and active music therapy, and have focused on a broad age range even when limited to children. For example, Alayidh et al.'s 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. This leaves questions about the specific effects of active music therapy (AMT) on older school-aged children with ASD.

What is missing is a systematic review that distinguishes between passive and active music therapy, focuses exclusively on ASD, and focuses on older school-aged children. This systematic review will fill 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 will focus on a more specific question than other reviews have, and the analysis will go into greater depth about the pertinent results of the empirical studies that qualify.

This systematic review aims 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 is 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 aims to use findings from relevant empirical studies to provide information about the impact of active music therapy on the social development in children with ASD. This review will also explain the type of measurement systems used and what the measurement results mean.

The following sections will 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.

Methodology

Search Method

A search was performed across many databases, including PubMed and Google Scholar, 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”).

Relevant empirical studies were identified not only by way of database searches but also through careful examination of past 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.

Inclusion and Exclusion Criteria

Studies were included if they met a series of criteria. They were included if they met the following: they were empirical studies, they involved participants primarily aged 6–13 years diagnosed with autism spectrum disorder, and 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 used, 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 the involved participants were mostly outside the target age range or 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.

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 points were excluded.

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 points in 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 Daniel 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.

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 (when applicable), measurements, results, and conclusion.

Results

This Results section does not fully summarize the selected articles. Instead, it presents and details only those findings that are pertinent for answering this systematic 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?" After summarizing the characteristics and methodologies of each of the empirical studies, this section focuses on isolating and describing the effects of ATM interventions on the children's social behavior in each study.

Seven articles met the inclusion criteria of this systematic review. Table 1, below, 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. After the table, methodological overviews and the pertinent findings of each study are presented sequentially.

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

Author Year	**Article title**	**Study design**	**Population**	**Interventions**	**Main findings**
Ghasemtabar et al., 2015 (1)	"Music therapy: An effective approach in	Pre/post evaluation	N= 27 Age= 7–12 y.o. Gender: 14	**Experimental Group:** Orff-based Music Therapy: singing, hand clapping, rhythmic movement, and creative playing of instruments.	AMT significantly improved social skills (communication, cooperation, self-control) compared to the control group.

	improving social skills of children with autism"		boys Severity: mild to moderate	**Control Group:** Usual care with no music intervention. **Settings:** 1-hour group sessions, twice a week for 6 weeks	
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.	AMT significantly improved in both verbal and nonverbal communication, and family quality of life. fMRI showed stronger connections between brain 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 **Settings:** Weekly 30-minute sessions for 16 weeks	AMT showed improvements in nonverbal communication skills, particularly in gestures and emotional expression.
Davis, 2016 (4)	"The Effect of Music Therapy on	Pre/post evaluation	N= 4 Age= 6–7 y.o.	**Experimental Group:**	AMT showed improvements only in nonverbal communication, such as eye contact and mutual focus.

	Joint Attention Skills in Children with Autism Spectrum Disorder"		Gender: 4 boys Severity: unspecified	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	
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	AMT showed significant improvements in eye contact and joint attention, though 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	**STUDY 1:** **Experimental Group:** Dyadic drumming sessions **Control Group:** None **Settings:** Unspecified **STUDY 2:** **Experimental Group:** Dyadic drumming sessions or drumming sessions with a therapist **Control Group:** None **Settings:** Unspecified	**STUDY 1:** Children with autism who showed better synchronization during the sessions also displayed better social skills. **STUDY 2:** The drum-based rhythm intervention improved social skills, turn-taking, and joint action.

"Study 1" and "Study 2")			10.8 y.o. Gender: 8 boys, 0 girls, 1 withdrew Severity: mild to moderate		
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	AMT showed significant improvements in social skills (responding, interactions) compared to the passive group.

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. 13 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 the playing of 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 took place twice a week for six weeks. Parents reported their children's social behaviors initially and two 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 notable changes. The active music therapy group's SSRS scores significantly improved 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 a significant and lasting effect on social skill development," showing 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 "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. 26 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. 45-minute sessions took place 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 connected 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. 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." These findings show that active music therapy improves children's ability to communicate and strengthens the brain pathways that support social skills. (Sharda et al. 2018)

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." The study's participants included 24 boys with mild to moderate autism, aged 5–9. 12 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. 30-minute sessions took place 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 within children, and the third

study specifically targets the verbal, nonverbal, and social domains (Pereira et al. 2008).

While the CARS-BR scores did not differ considerably 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 mostly improved in gestures, facial expressions, and shared emotional reactions with the therapist. Gattino et al. stated, "The study found a positive statistically significant difference on subgroup analysis of nonverbal communication among patients with autistic disorder." This means that relational music therapy helped the children express themselves and socially engage nonverbally. This 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 "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 five 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 the 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 states, "Cooperative music therapy is more effective in eliciting interaction than both cooperative play and independent play" (Davis 2016). 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 Blythe LaGasse (2014), is "Effects of a Music Therapy Group Intervention on Enhancing Social Skills in Children with Autism." The 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 five 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 strongest improvements were in nonverbal aspects of social behavior. LaGasse 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 Soo Ji Yoo and Ga Eul 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 and Kim 2018).

Study 1 examined rhythmic interaction patterns between typically developing children and children with high-functioning autism. 42 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 9 children with high-functioning autism, aged 6–10. However, one withdrew, making the number of children studied 8. 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 together. 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," showing that the rhythmic interaction encouraged more social engagement (Yoo and Kim 2018). 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 "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. 26 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 took place 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 (pre-test), post-test, and a three-month follow-up.

Immediately following the active music therapy interventions, CARS scores slightly decreased, meaning that the symptom severity was reduced. Furthermore, according to the post-test 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 three-month follow-up. The authors concluded that "an effective intervention in improving social skills of autistic children with steady effects." 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.

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 study demonstrated this at the neural level, showing strengthened auditory-motor connectivity and reduced atypical auditory-visual coupling. Yoo and Kims' drumming study highlighted rhythm synchrony as a driver of turn-taking and coordination, while Gattino et al.'s 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 (LaGasse, Bharathi et al.) 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., Yoo and Kim) 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.

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 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 study showed that active music therapy is more effective than passive music therapy in improving social skills in children with ASD.

Unlike other systematic reviews that combine all types of music-based interventions and a wide range of ages, and sometimes even other conditions, this systematic review focused specifically on active music therapy and its impact on the social skills of children aged 6–13 years who have autism. Focusing more 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.

Conclusion

The overall results from these seven studies prove 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 communications, 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 studies 1, 5, and 6, 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 systematic review reveals both gaps and facts that we currently know 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, multi-site 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 for future studies could be: "How do different types of music therapy 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 systematic 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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642 Kovacs Balint, Z et al. “Validation of the Social Responsiveness Scale (SRS) to screen
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This manuscript addresses an important and timely topic of active music therapy (AMT) on social communication and interaction in school-aged children with autism spectrum disorder. The author demonstrates clear motivation for the review and provides a well-developed rationale for why AMT requires separate examination from passive approaches. The paper is well-organized overall and shows strong engagement with relevant empirical literature. I offer a few suggestions below to further strengthen this paper:

Title

- A systematic review demonstrates systematic search, screening, and presentation of included articles with an evaluation on the quality of the paper. Since this paper does not appear to do all of these, removing "systematic review" from the title and changing it to an "Overview" or "Literature Review" would be better.

Introduction

- Paragraph 1: Cite the definition of music therapy from a peer-reviewed source
- Paragraph 2: cite the "Researchers" who "discovered that music affects the brain…"
- Paragraph 3: cite sources for the last sentence
- Line 82: what are the non-MT use of music? This can be clarified so the reader has more context
- Overall, the introduction is well written. This section could be further strengthened by adding a paragraph or two distinguishing passive music therapy or other types of music therapy/therapeutic use of music to active music therapy. Particularly, expanding on what is involved in active music therapy and citing more papers that have used it. The current section on this is too brief.
- Adding a brief paragraph in the Introduction explaining why social communication between ages 6–13 is particularly important (e.g., school participation, peer interaction, developmental trajectories) would strengthen why this age group was selected and why it needs to be distinguished from the adult population that were mixed into previous literature.

Methods

- Specify the date(s) the databases were searched and particularly how Google Scholar was used (e.g. how many pages were screened?). This is essential for transparency in systematic reviews.
- What was done with studies that were slightly outside of the age ranges?
- What was the date range that was searched?
- Was there a 2nd reviewer to cross-check the studies during study selection?
-

Results

- Include a flowchart of how many citations were gathered, how many were screened and how many were included/excluded

- Tables should be in APA style and clarification of abbreviations
- The results section reads more like an annotated bibliography. A strong review paper would require more work from the author to synthesize the findings from the empirical studies rather than describe them in a list. I would suggest to re-write the results section either according to the columns in the table presented or in a way that bring together common themes from all of the papers included. If this cannot be done, it would be advisable to change the title and write-up of the paper to reflect it's current state that is not in review paper form.

Discussion

- Integrate more critical comparison between studies. For example, discuss how differences in study design (e.g., RCT vs. pre/post) might influence conclusions. This could be done more easily if the results section was synthesized.
- Briefly note the limitations of your study/paper

Conclusion

- Line 517: instead of pointing out studies as 1, 5, and 6, cite the authors instead.
- Check APA style of all references

This is a good student manuscript with clear promise. The major revisions relate primarily to methodological transparency and deeper critical synthesis—areas that will significantly strengthen the rigor of the paper and support the author's scholarly development. With these revisions, the paper has strong potential for publication.

Final Recommendations: Accept with major revisions

Decision: Accept with major revisions

Dear Authors,

Thank you for the opportunity to review your paper entitled, *The impact of active music therapy on social skills development in children with Autism Spectrum Disorder: A systematic review.* Your paper is well-written, and you do a nice job making an argument for the contribution you are making with this review. Whereas previous reviews have explored broader areas, you have chosen to narrow in on a very specific question.

Considerations for revision:

1. **Methodology:** Overall, you are very clear in the methodology. I like that you included some examples of excluded articles to very clearly define the exclusion criteria. One minor suggestion in the methodology. You say you used many databases including PubMed and Google Scholar. It would be best to explicitly state every database you used, rather than "many".
2. **Results:** As mentioned above, you do a nice job explicitly describing the inclusion and exclusion criteria in the methodology; therefore, it was surprising that you started the results section by stating that you won't include all articles in the results. I'd like to see you either revise the inclusion/exclusion criteria in the methods or make a stronger case for why you wouldn't explore all articles in your results. Another minor point on the results is that you should define the acronym for AMT (active-music therapy) at the beginning of each section, and it seems like it may be a typo in the beginning of the results section (ATM rather than AMT). Your table is very clear and provides a great overview of the findings from each study. One minor comment is that you might consider rephrasing the wording of the results. Rather than saying *AMT improved*, say that *symptoms improved with AMT* over control. This gives emphasis to the outcome (symptom improvement) rather than the intervention (AMT). I love how you've provided a concluding sentence at the end of each article description. I'd love to see you put the conclusions in your words, based on your reading of the article, rather than direct quotes from the authors.
3. **Discussion:** This section is well-written and informative. I love how you've summarized the findings in the context of your research question. You mention that this intervention is effective across cultural contexts, but I didn't see you describe the cultural context of each study in your results. Can you include that to further validate this important point?
4. **Conclusion:** Your conclusions are strong and seem warranted based on the evidence provided. Avoid using the word "prove" and try to choose something a little weaker like "provides strong evidence for" or "substantiates the claim that".

Your future research questions are interesting and relevant. I would also consider adding some potential limitations of this review.

5. **Formatting**: The submission guidelines (link) state that the paper should be formatted in APA style. Some minor revisions need to be made to be consistent with APA formatting.
    a. **In-text citations:** Some in-text citations are incorrect. For example, the journal article title is not included when describing a study in-text. Starting on line 69, you use the title and the author's name and date, you only need the author's name(s) and date of publication. Also, this paragraph really does not say much in its current form other than listing the names of the articles. Consider revising to see if you can either cut this paragraph or describe the studies a bit more and why they do not fit within the scope of this review.
    b. **Reference Page:** This is not formatted in APA style at all. I'd encourage you to take a look at the APA manual or PurdueOwl.

Best of luck in making your revisions!

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

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 systematic review explores how active music therapy (AMT) can improve social skills in school-aged children with ASD. The research question guiding this systematic 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 systematic reviews have combined all types of music-based interventions and a wide range of ages, and sometimes even other conditions besides autism. This systematic review, on the other hand, focuses specifically on active music therapy and its benefits for the social skills of school-aged children with autism. The results of seven empirical studies are analyzed. This study 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 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, while also identifying gaps in existing research pertaining to long-term outcomes and methodological consistency.

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 and evidence-based practice that utilizes 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 and 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 was shown to affect areas of the brain, especially ones involved in movement, language, memory, and emotion. As a result, it started 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 networks in the brain, 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 the brain's ability to form new connections. Music therapy changes the brain 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

Scheider 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.” 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; Raglio 2015; Mayer-Benarous et al. 2021; Mahendran, M., & Jagdeesan 2017). This systematic review aims to explore the benefits of active music therapy for children with ASD.

Past systematic reviews have explored empirical studies about music therapy’s effects. However, those systematic reviews had broader age ranges, included additional disorders, and did not isolate the benefits of active music therapy. An example is a systematic review written by Applewhite et al. in 2022 titled “A Systematic Review of Scientific Studies on the Effects of Music in People with or at Risk for Autism Spectrum Disorder” (Applewhite et al. 2022). 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. (Shi et al. 2024). Another is written by Mayer-Benarous et al. in 2021 titled “Music Therapy for Children With Autistic Spectrum Disorder and/or Other Neurodevelopmental Disorders: A Systematic Review” (Mayer-Benarous et al. 2021). Another, by Alayidh et al., written in 2025, is titled “Music Therapy for People With Autism Spectrum Disorder: A Systematic Review of Randomized Clinical Trials” (Alayidh et al. 2025). These systematic 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 systematic reviews will have the same specific focus as this one. This paragraph will identify some existing systematic reviews about the use of music therapy for autism, as well as how each of them has a different focus from the one this systematic review will have. Some reviews, such as Applewhite et al’s, 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 Mayer-Benarous et al.’s, specifically focus on the effects of music therapy (as opposed to 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 Applewhite et al.'s and Mayer-Benarous et al.'s, include studies about adults as well as studies about children, and even empirical studies that include both adults and children. Moreover, most of the systematic reviews, including the reviews by Alayidh et al. and Shi et al., have not distinguished between passive and active music therapy and have focused on a broad age range, even when limited to children. For example, Alayidh et al.'s 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 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 is missing is a systematic review that distinguishes between passive and active music therapy, focuses exclusively on ASD, and focuses on older school-aged children. This systematic review will fill 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 will focus on a more specific question than other reviews have, and the analysis will go 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 systematic review aims 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 is 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 aims 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 will also

explain the type of measurement systems used and what the measurement results mean.

The following sections will 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.

Methodology

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 done, and the selection of the seven studies was finalized in July 2025.

Relevant empirical studies were identified not only by way of database searches but also through careful examination of past 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.

Inclusion and Exclusion Criteria

Studies were included if they met a series of criteria. They were included if they met the following: they were empirical studies, they involved participants primarily aged 6–13 years diagnosed with autism spectrum disorder, and 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 used, 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 the involved participants 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.

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 points 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 points in 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 Daniel 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.

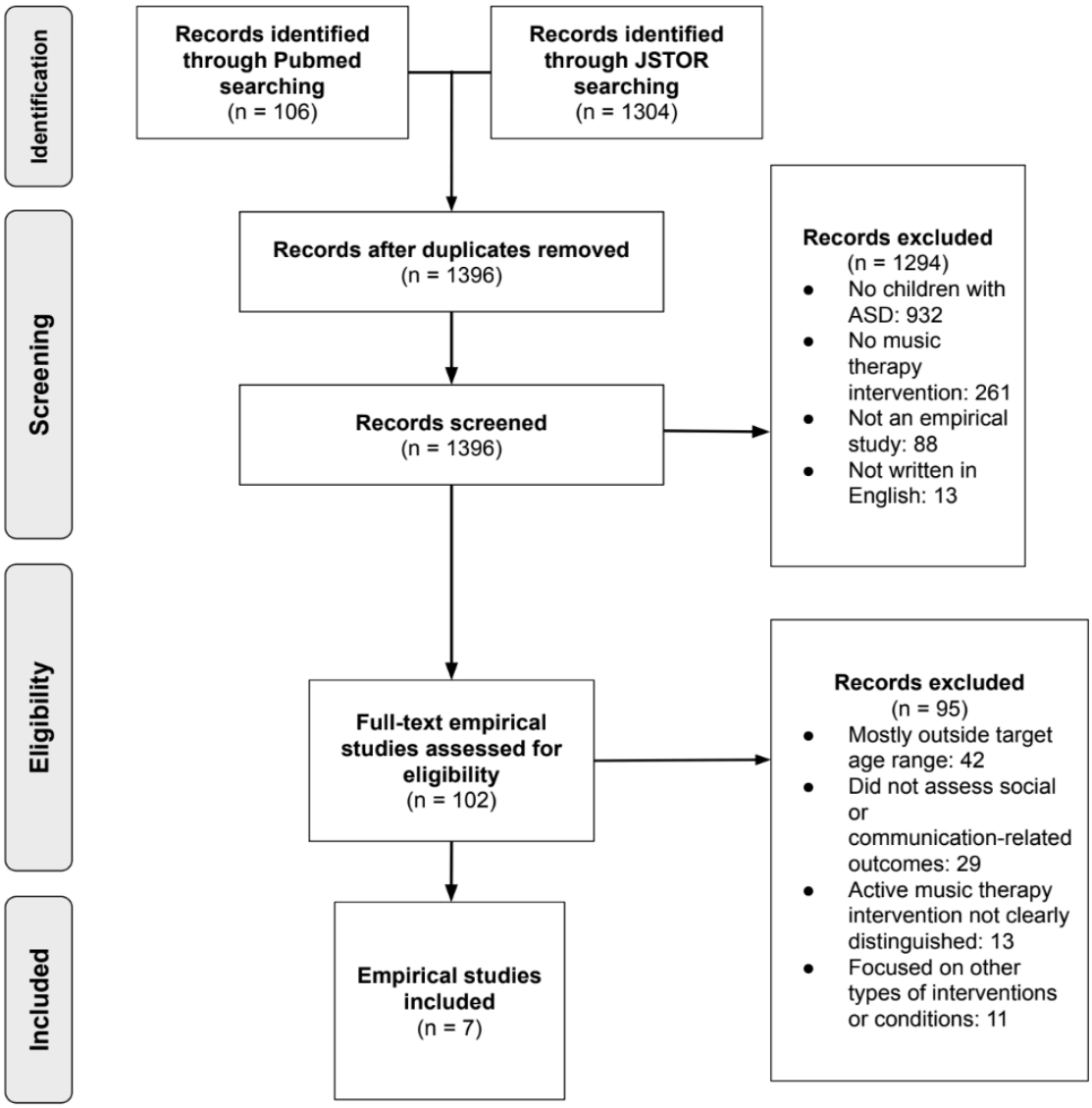
Data Analysis

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

Results

Figure 1

Flow-chart of study selection.



Seven articles met the inclusion criteria of this systematic 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 and details 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 systematic 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.

Table 1

Summary of studies included in the systematic review.

Author 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	Randomized Control Trial	N= 24 Age= 7–12 y.o. Gender: 24	**Experimental Group:** Relational Music Therapy: improvisational music-making through instrument playing and mirroring	Nonverbal communication skills, particularly in gestures and emotional expression, improved with AMT.

	communication of children with autism: A randomized controlled study"		Boys Severity: mild to moderate	**Control Group:** Standard care **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)	"Dyadic drum playing and social skills:	Pre/post evaluation	**STUDY 1:** N= 10	**STUDY 1:** **Experimental Group:** Dyadic drumming sessions	**STUDY 1:**

(Note: This article presents two empirical studies, which are identified in this table as "Study 1" and "Study 2")	implications for rhythm-mediated intervention for children with autism spectrum disorder"		Age= 6-10 y.o. Gender: unspecified Severity: mild to moderate **STUDY 2:** N= 9 Age= Mean 10.8 y.o. Gender: 8 boys, 0 girls, 1 withdrew Severity: mild to moderate	**Control Group:** None **Settings:** Unspecified **STUDY 2:** **Experimental Group:** Dyadic drumming sessions or drumming sessions with a therapist **Control Group:** None **Settings:** Unspecified	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 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.

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 in the children who engage 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.

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 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 for 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. 13 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 the playing of 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 took place twice a week for six weeks. Parents reported their children's social behaviors initially and two 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 notable changes. The active music therapy group's SSRS scores significantly improved 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 a significant and lasting effect on social skill development," showing 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 "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. 26 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. 45-minute sessions took place 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 connected 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. 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." These findings show that active music therapy improves children's ability to communicate and strengthens the brain pathways that support social skills. (Sharda et al. 2018)

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." The study's participants included 24 boys with mild to moderate autism, aged 5–9. 12 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. 30-minute sessions took place 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 within children, and the third

study specifically targets the verbal, nonverbal, and social domains (Pereira et al. 2008).

While the CARS-BR scores did not differ considerably 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 mostly improved in gestures, facial expressions, and shared emotional reactions with the therapist. Gattino et al. stated, "The study found a positive statistically significant difference on subgroup analysis of nonverbal communication among patients with autistic disorder." This means that relational music therapy helped the children express themselves and socially engage nonverbally. This 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 "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 five 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 the 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 states, "Cooperative music therapy is more effective in eliciting interaction than both cooperative play and independent play" (Davis 2016). 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 Blythe LaGasse (2014), is "Effects of a Music Therapy Group Intervention on Enhancing Social Skills in Children with Autism." The 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 five 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 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 Soo Ji Yoo and Ga Eul 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 and Kim 2018).

Study 1 examined rhythmic interaction patterns between typically developing children and children with high-functioning autism. 42 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 9 children with high-functioning autism, aged 6–10. However, one withdrew, making the number of children studied 8. 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," showing that the rhythmic interaction encouraged more social engagement (Yoo and Kim 2018). 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 "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. 26 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 took place 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 (pre-test), post-test, and a three-month follow-up.

Immediately following the active music therapy interventions, CARS scores slightly decreased, meaning that the symptom severity was reduced. Furthermore, according to the post-test 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 three-month follow-up. The authors concluded that "an effective intervention in improving social skills of autistic children with steady effects." 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.

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 study demonstrated this at the neural level, showing strengthened auditory-motor connectivity and reduced atypical auditory-visual coupling. Yoo and Kim's drumming study highlighted rhythm synchrony as a driver of turn-taking and coordination, while Gattino et al.'s 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 (LaGasse, Bharathi et al.) 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., Yoo and Kim) 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 Gattino et al., LaGasse, and Sharda et al.'s, 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 and Yoo & Kim's, 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 study was conducted in Porto Alegre, Brazil. Sharda et al.'s study was conducted in Montreal, Canada. Ghasemtabar et al.'s 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 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 study showed that active music therapy is more effective than passive music therapy in improving social skills in children with ASD.

Unlike other systematic reviews that combine all types of music-based interventions and a wide range of ages, and sometimes even other conditions, this systematic review focused specifically on active music therapy and its impact on the social skills of children aged 6–13 years who have autism. Focusing more 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 systematic 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 systematic 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.

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 communications, 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 Ghasemtabar et al., LaGasse, and Yoo and Kim's studies, 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 systematic review reveals both gaps and facts that we currently know 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, multi-site 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 for 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 systematic 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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Track Changes

Introduction

- Paragraph 1:
    - Added the in-text citation “(Devlin et al., 2023)” to the end of the final sentence.
- Paragraph 2:
    - Added the citations “(Applewhite et al., 2022; Mayer-Benarous et al., 2021)” after the sentence: “Researchers have discovered that music affects the brain and behavior of people, especially in rehabilitation and learning.”
- Paragraph 3:
    - Removed “Moreover, within music therapy, active music therapy (AMT) – which is participation-based music therapy using singing, playing, and/or improvisation – may offer the greatest benefits by providing more direct and interactive experiences that can support social development.” from the end of the paragraph.
- Paragraph 4
    - Newly added paragraph explaining what active music therapy is.
- Paragraph 5:
    - Added Shi et al.’s systematic review.
- Paragraph 6:
    - Added “None of the other systematic reviews will have the same specific focus as this one. This paragraph will identify some existing systematic reviews about the use of music therapy for autism, as well as how each of them has a different focus from the one this systematic review will have.” to the beginning of the paragraph.
    - Added and explained Shi et al.’s systematic review.
- Paragraph 7:
    - Added “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 to focus on the most critical time for children regarding how to improve their social skills.” to the end of the paragraph.

Methodology

- **Search Method**
    - Paragraph 1:
        - Replaced “Google Scholar” with “JSTOR”.

        - Added the sentence: “The searches were conducted, and the selection of the seven studies was finalized in July 2025.” to the end of the paragraph.
- **Study Selection**
    - Paragraph 1:
        - Added the sentence: “The final selection of articles was cross-checked by a second reviewer.”

Results

- Added a flowchart of the literature search.
- Paragraphs 1 and 2:
    - Revised the order and wording of the first two paragraphs.
- Chart:
    - Revised the wording in the “Main findings” column for all seven studies by changing phrases such as “AMT improved” to more specific phrasing, such as “[specific symptoms] improved with AMT.”
- Before ‘The first study’ paragraph:
    - Added three synthesis paragraphs summarizing overall trends and shared findings across all seven studies, rather than immediately listing individual studies.

Discussion

- Paragraph 4:
    - Added a new paragraph discussing how differences in study design (e.g., intervention length, sample size, and outcome measures) may have influenced study results.
- Paragraph 5:
    - Added a new paragraph discussing the effectiveness of active music therapy across different cultural contexts.
- Paragraph 8:
    - Added a new paragraph discussing some potential limitations of this systematic review.

Conclusion

- Paragraph 1:
    - Replaced the word “proves” with the phrase “provide strong evidence” to maintain an appropriately cautious academic tone.
- Paragraph 3:
    - Replaced “studies 1, 5, and 6” with “Ghasemtabar et al., LaGasse, and Yoo and Kim.
- Paragraph 5:
    - Changed “How do different types of music therapy compare in effectiveness for specific social skills like eye contact, turn-taking, etc., in

children with autism?" to "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?"

References

- Converted all citations to APA format.
- Reordered the reference list alphabetically by authors' last names.
- Added six new references:
    - Aleixo, M. A. R., et al. (2022). *Active music therapy in dementia: Results from an open-label trial.* Jornal Brasileiro de Psiquiatria, 71(2), 117–125. https://doi.org/10.1590/0047-2085000000363
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Referees' Comments Responses

My response points correspond to the referees' points in the same order.

Referee 1:

Title:

- I will keep the title as a systematic review, but I will add a flowchart of the study selection in the methodology section in order to meet the systematic review criteria.

Introduction:

- Paragraph 1: I cited the definition of music therapy with "Devlin et al., 2023."
- Paragraph 2: I cited the "Researchers" with "Applewhite et al. 2022; Mayer-Benarous et al. 2021."
- Paragraph 3: I added an entirely new paragraph that cites examples of other conditions that music therapy has been used to treat with "(Aleixo et al. 2022; Raglio 2015; Mayer-Benarous et al. 2021; Mahendran, M., & Jagdeesan 2017)."
- I added casual listening and playing of instruments as the non-MT use of music.
- I cited more articles that have used music therapy for other conditions. I also added a systematic review by Shi et al., which is also about music therapy and social skills in children with autism, to provide necessary background information about past research and to strengthen my argument that existing reviews did not do what mine does.
- I added a brief explanation at the end of paragraph 7 about why 6-13 years old was selected as the target age range, stating how socializing and communicating become crucial and more intense at those ages.

Methods:

- I provided the month in which the databases were searched, and the final seven articles were selected. I narrowed down the databases I used to PubMed and JSTOR, as those are the two databases that the considered articles were from.
- I did not include what was done with studies that were slightly outside the age range because it is already stated that "Studies were excluded if the involved participants were mostly outside the target age range."
- I added the month that the databases were searched.
- Added, "The final selection of articles was cross-checked by a second reviewer." into the study selection section. The second reviewer was my academic advisor.

Results:

- I added a flowchart of the study selection.
- I changed the table to APA format and clarified the abbreviations in the “Main findings” column.
- I used a hybrid approach where I synthesized thematically rather than summarizing the articles one at a time in isolation. I added three paragraphs that explain the findings of all of the studies as a whole before the individual overviews of the studies.

Discussion:

- I added a paragraph that discusses how the differences in the study designs might have influenced the results.
- I added a paragraph discussing the potential limitations of the paper.

Conclusion:

- I changed “studies 1, 5, and 6” to “Ghaesemtabar et al., LaGasse, and Yoo and Kims’ studies”
- I changed all of the references into APA format and reordered them alphabetically by authors’ last names.

Referee 2:

1. Methodology
    - I narrowed down the databases I used to PubMed and JSTOR, as those are the two databases that the considered articles were from.
2. Results
    - What I meant by “This Results section does not fully summarize the selected articles.” was not that I excluded relevant articles that met the inclusion criteria. What I meant was that only relevant information from the selected articles (parts that were useful for answering the research question) was included. I have rewritten the first two paragraphs to clarify what I meant.
    - I changed the phrasing in the main findings section of the chart from “AMT improved” to “[symptoms] improved with AMT.”
3. Discussion
    - I added a paragraph discussing the effectiveness of active music therapy across different cultural contexts.
4. Conclusion
    - I changed “prove” to “provides strong evidence” in the first sentence of paragraph 1.

- I added a paragraph discussing potential limitations of this paper in the “Discussion” section.

5. Formatting
    a. Although it was not required by format, I felt it was important to include the titles of the existing systematic reviews. I wanted to show what past systematic reviews have been done, what they were titled, and how my systematic review differs from them.
    b. I changed all of the references into APA format and reordered them alphabetically by authors’ last names.

You have made clear and thoughtful efforts to revise the paper, and the changes demonstrate improved clarity, coherence, and engagement with the literature. The manuscript is now well written and presents a meaningful synthesis of existing research that is relevant and timely. Your ability to integrate feedback and refine your work is evident, and this is a strong foundation for publication.

However, it is important to clarify the methodological classification of the paper. While the manuscript is currently framed as a systematic review, it does not yet meet the methodological requirements of a systematic review. Specifically, systematic reviews require a formal and transparent appraisal of the quality of the included studies. This step is essential for assessing risk of bias, methodological rigor, and the overall strength of the evidence base, and it allows readers to interpret findings with appropriate caution.

To meet systematic review standards, a validated quality appraisal tool—such as AMSTAR 2—would need to be applied to the included studies, with results reported and incorporated into the analysis. This quality assessment would guide readers, as well as yourself, in interpreting the findings in your discussion and conclusion. For example, your current paper reads with certainty that AMT is beneficial for children:

> *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.(Discussion, paragraph 1).*

> *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. (Conclusion, paragraph 1).*

However, your paper did not evaluate the strength of the evidence, the study design, risk of bias, and limitations of the studies you included in the review have not been assessed. Having not assessed the quality, these statements are misleading and calling this paper a systematic review is misleading. As this quality assessment has not been conducted, the manuscript cannot be classified as a systematic review at this time.

That said, the current work aligns well with the aims and methodology of a scoping review or an overview of the literature. The paper effectively maps existing research, identifies key themes, and highlights gaps in the field, which are central objectives of scoping reviews. Reframing the manuscript accordingly by revising the title (and, where necessary, minor wording in the methods section) would accurately reflect the scope and strengths of the work.

With the title changed *or* conducting an assessment of the quality of the included studies added, this paper is suitable for publication.