

Communication and Language Development of Young Children With Autism: A Review of Research in Music

Communication Disorders Quarterly
2018, Vol. 39(2) 323–329
© Hammill Institute on Disabilities 2017
Reprints and permissions:
sagepub.com/journalsPermissions.nav
DOI: 10.1177/1525740117705117
cdq.sagepub.com



Potheini Vaiouli, PhD¹ and Georgia Andreou, PhD²

Abstract

Research demonstrates connections among children's music actions, their engagement abilities, and their language development. Although the link between music and the engagement abilities of young children with autism is well established, there is not enough evidence on the effectiveness of music strategies and music therapy interventions to promote language development of young children with autism. The purpose of this review is to examine and analyze current literature on the systematic use of music and music therapy interventions as effective strategies for the development of language and preverbal and verbal communication abilities in young children with Autism Spectrum Disorders. Findings align with previous reviews on the positive effects of music as an age-appropriate, communicative medium. Also, the review pinpoints to the collaboration of music therapists and speech and language pathologists for the design and implementation of interventions that embed music and target language development of young children with autism.

Keywords

music, language development, communication, autism

By the end of the first year of life, most children are able to use gestures or sounds to coordinate attention between people and objects, engage in social interactions, and communicate intentionally with their caregivers (Wetherby, 2006). These early intentional gestures and sounds are forms of presymbolic communication and are the foundation for the emergence of words and symbolic communication (Bruinsma, Koegel, & Koegel, 2004). Typically developing young children can use this nonverbal communication repertoire to coordinate attention with others for the purposes of requesting or commenting about people, objects, and/or events (Crais, Douglas, & Campbell, 2004). As young children become proficient communicators through this nonverbal system, they become active members of their social environment, and they build verbal language on top of this already functional communicational system (Rogers & Dawson, 2010).

However, young children with Autism Spectrum Disorders (ASD) present a wide diversity in their early developmental profiles in terms of their language development and their acquisition of preverbal and verbal skills (Tager-Flusberg, Paul, & Lord, 2005). Research shows that some children with ASD may present early delays in developmental milestones, such as the onset of words and phrases, while others may present regression in the use of words at the second year of their lives (Pickles et al., 2009). Early on in the lives of young children with ASD, impairments in

symbol use and in nonverbal skills negatively affect ability in using speech, in developing conversational abilities, and in maintaining social reciprocity with communicative partners, regardless of their cognitive abilities (Wolfberg & Schuler, 2006). Also, challenges in early communicative actions mark delays on the joint attention abilities of young children with ASD, and they further compromise their participation in early language learning experience and the acquisition of speech (Lepistö et al., 2005; Lim, 2010).

Challenges in language acquisition do not remit with time. Rather, difficulties in language and communication skills present a lifelong challenge for individuals with ASD and are among the core diagnostic features of autism (American Psychiatric Association, 2013). Findings from research show that more than 30% of young children with ASD lack the ability to communicate with speech, they may exhibit impairments in understanding language in context, and they may never develop functional speech (Paul & Sutherland, 2005; Prizant & Wetherby, 1993). Also, language deficits are compounded by challenges in social

¹European University Cyprus, Nicosia, Cyprus

²University of Thessaly, Volos, Greece

Corresponding Author:

Potheini Vaiouli, The School of Arts and Education, European University Cyprus, 6 Diogenous Street, Office 219, Nicosia 1516, Cyprus.
Email: P.Vaiouli@euc.ac.cy

interactions and, therefore, constitute important targets of early intervention for young children at risk with ASD.

Systematic early intervention projects have reported gains in language development for young children with ASD (i.e., Dawson et al., 2010). Discrete trials, behavioral approaches, exploring neural pathways, and integrating naturalistic techniques to developmental approaches are among the interventions included in a growing body of research for language development of young children with ASD. The research varies in the approaches presented (i.e., sign language), the theoretical background that guides the interventions (developmental perspectives), and the focus of the intervention (social development, production of words). Meaningful outcome measures include the production of speech, spontaneous communication in social situations, and generalization of gains across environments (National Research Council, 2001). Collectively, sociocommunication responsiveness and functional language skills are targeted as important early intervention goals in a well-established body of research on early intervention (Leekam & Ramsden, 2006; Whalen, Schreibman, & Ingersoll, 2006).

Music plays a pivotal role in young children's lives and can offer the context for socialization and communication with other peers and adults (i.e., Campbell, 2010). Early on in their lives, children use sounds and sound combinations to communicate with their environment. Musical elements among young children and their communicative partners (such as early vocalizations and babbling) are drawn upon to shape mutually supportive communicative and caring acts (Barrett, 2006). Such interactive dialogic vocalizations between infants and caregivers have been described as communicative musicality (CM; Malloch, 1999; Stern, 1985; Trevarthen & Malloch, 2000). Young children acquire language and shared meaning through such spontaneous actions and interactions with others in their everyday lives. Gradually, music may create the context, within which a variety of experiences, inductive to the child's development and social growth, emerge (Tarrant, North, & Hargreaves, 2000).

Music has been identified as an emerging practice for targeting language development of young children with ASD, either within the contexts of music therapy and/or as part of interdisciplinary approaches, such as speech and language discipline, special education, and/or music education backgrounds (Lim, 2010; Simpson, Keen, & Lamb, 2013; Wan et al., 2011). A growing body of research indicates that the use of music and song-based interventions enhances social responsiveness and language development (i.e., Lim, 2012; Paul et al., 2015). Integrative reviews of the literature have indicated the potential of music to promote preverbal and verbal communication and social interactions of young children with ASD within a music therapy context (Geretsegger, Elefant, Mössler, & Gold, 2014; Gold, Wigram, & Elefant, 2006; James et al., 2015; Simpson & Keen, 2011; Wiseman, 2015). While young children are

engaged in a variety of music activities, the music interventions target a wide range of social skills and language development (Adamek, Thaut, & Furman, 2008; Lim, 2012; Vaiouli, Grimm, & Ruich, 2015; Wan et al., 2011).

The response of children with ASD to music during language interventions is further supported by literature on the impact of music on the brain. Studies in neuroscience indicate that music making is a multimodal activity that involves the simultaneous processing of visual, auditory, sensory, and motoric information (Wan, Rüber, Hohmann, & Schlaug, 2010). The cerebral cortex self-organizes in response to external stimuli and learning activities (Pantev, Engelien, Candia, & Elbert, 2001). As such, extensive active engagement with music (which is an external stimulus) can induce cortical reorganization (Schlaug, Jancke, Huang, & Steinmetz, 1995), specific to the music stimuli and to the length of time engaged with music (Munte, Nager, Beiss, Schroeder, & Erne, 2003). These changes are likely to transfer into other learning domains (Schellenberg, 2004; Schlaug, Norton, Overy, & Winner, 2005). If this occurs early in the children's development, the alterations in the brain may produce permanent changes in the way information is processed (Schlaug et al., 1995).

Overall, music interventions are gaining growing recognition in promoting language development of young children with ASD. The purpose of this review is to examine and analyze current research on the use of music (either within music educational or music therapy interventions) for facilitating language development and speech production of young children with ASD. The authors synthesized literature in terms of the intervention (music therapy and/or music activities embedded in other disciplines), the type of music activities used (active music making, singing, listening to music), and the communication and language outcomes targeted (language development, speech production, social communication). The goal of this review is not to evaluate the intervention outcomes of the studies in relation to the use of music for promoting language development of young children with ASD. Rather, the purpose of the authors is to examine the use of music as an intervention tool for language and communication development and explore the context within which music and music therapy interventions are utilized in communication (either preverbal or verbal communication) and language studies for young children with ASD.

Method

Inclusion and Exclusion Criteria

Studies included in this review were selected based on the following criteria:

1. The studies were published in peer-reviewed journals in English.

2. Participants were children (0–8 years old), and they had either a diagnosis of autism (through approved diagnostic evaluations) and/or the studies stated that the participants had strong markers of autism (for participants younger than 3 years old, who had not received a diagnosis yet).
3. The research described involved experimental or quasiexperimental methodologies.
4. The intervention was clearly outlined, and the specific uses of music activities or music therapy strategies were described as part of the intervention.
5. Language and communication skills were clearly targeted in the intervention.
6. In the case of music therapy interventions at least one of the researchers was a qualified music therapist.

To specify the focus of this article, music therapy interventions were defined as the use of live, interactive music that may include but is not limited to the use of instruments, precomposed age-appropriate songs, or interactive improvisational pieces of humming, singing, or moving to the music, to meet the children's needs (Bruscia, 1998). Music therapy was discussed as one of the early intervention services offered to young children (0–8 years old) with ASD and their families, according to Part C of the Individuals With Disabilities Education Act (2004) and the National Association for the Education of Young Children (NAEYC; Copple & Bredekamp, 2009). Within this context, music therapy is considered one of the related services associated with Early Intervention to assist young children with disabilities make progress toward their individualized goals.

Also, interventions that included the use of precomposed songs, singing familiar melodies, and music and movement activities were categorized by the authors as music educational interventions because the music was intentionally designed and implemented to address challenges encountered by children with ASD. In these cases, music activities create the context for children to make choices, express themselves creatively, and interact with others within their social environment (Kartasidou, 2004). The choice of music activities is based on the interests and strengths of the children, and music is used to support learning (either as a reward and/or a teaching tool), to enhance the competencies of children with ASD, and to bring a sense of accomplishment and self-esteem (Wiseman, 2015).

Conceptual papers, theses, and doctoral dissertations were not included in this comprehensive review. Descriptive studies that reported gains on language and communication as additional gains of the music intervention (i.e., through anecdotal reports of family members) but did not identify communication (either preverbal or verbal communicative acts) as the goal of the intervention nor presented measurable results on the language and communication outcomes were excluded from the review.

Search Procedures

A comprehensive research was conducted electronically through three databases: (a) PsychINFO, (b) Education Resources Information Center (ERIC), and (c) ProQuest. The initial search included studies within the years 2000 until June 2016. Due to the limited number of studies published within these years with the focus on language development, the researchers extended the search to include studies from 1995 until June 2016. In all databases, a combination of the terms *autism*, *music*, *music therapy*, *vocabulary*, and *language development* was used. A review of the abstracts was utilized to further determine whether the retrieved studies would be included in this review.

Results

As a result of the search process, 19 studies were identified for possible inclusion in this review. Each of these studies was then assessed by the main author to determine whether it met the inclusion criteria in terms of the participants, the target outcomes, and the music intervention. A total of nine studies met the inclusion criteria and were further categorized according to the type of the music intervention and the reported goals of the study, to explore the intentional use of music as an intervention tool in connection to the communication and language development of the participants. The selected studies fell under three main areas: (a) music as a motivator to promote preverbal communicative actions and social responsiveness (with a focus on preverbal communication attempts), (b) music as a strategy to enhance receptive language skills, and (c) music to promote speech production and expressive language skills for minimally verbal children with ASD. Table 1 presents a summary of the studies included in this review.

Music as an Engaging Medium to Promote Preverbal Communicative Actions

Prelinguistic forms of communication constitute important prerequisites for meaningful social interactions and the development of language (Keen, Meadan, Brady, & Walle, 2016). The children's ability to use various forms of prelinguistic, communicative actions for the purpose of sharing their interests with others is explored in two of the studies included in this review. Finnigan and Starr (2010) explored the effect of a music therapy intervention to promote social responsive behaviors (eye contact, imitation, and turn-taking) and social avoidant behaviors (pushing toy away and moving away) for a young child with autism, within a single-case research design. The researchers identified the use of music as an effective, engaging strategy that enhanced the participant's preverbal communication actions. Similarly, Paul et al. (2015) looked into the sociocommunicative

Table 1. Music Interventions to Promote Language Development for Young Children With ASD.

Author	Study			Music intervention		
	Year	Design	<i>n</i>	Focus	Technique	Approach
Buday	1995	WSD	10	Receptive communication	Songs	Music educational intervention
Finnigan and Starr	2010	SSD	1	Preverbal communication	Songs and familiar melodies	Music therapy intervention
Lim	2010	RCT	50	Speech production	Songs	Music therapy intervention
Lim and Draper	2011	RCT	22	Speech production	Songs	Music therapy intervention
Paul et al.	2015	SSD	3	Preverbal communication	Sung directives	Music educational intervention
Sandiford, Mainess, and Daher	2013	RCT	12	Expressive language	Familiar melodies	Music therapy intervention
Simpson and Keen	2010	SSD MBD	3	Receptive communication	Precomposed songs	Music educational intervention
Simpson, Keen, and Lamb	2013	RCT	22	Receptive communication	Precomposed songs	Music educational intervention
Wan et al.	2011	AMMT	6	Expressive language	Singing and tapping	Music therapy intervention

Note. WSD = within-subject design; SSD = single-subject design; MBD = multiple baseline design; RCT = randomized control trial; AMMT = Auditory Motor Mapping Training.

responsiveness in children with ASD and compared the effect of spoken directives with sung ones. The researchers implemented a single subject design and examined the use of music to facilitate preverbal communication acts of the participants, targeting eye contact and social gestures. The results showed that participants in the music condition scored higher on all measures and improved their sociocommunicative responsiveness.

In both studies, music was discussed as the engaging medium that promoted the children's participation and their communicative actions. More specifically, the researchers looked into the relationship of music, engagement, and learning and provided evidence for the use of music as an age-appropriate, communicative scaffold that allows young children with ASD to experience interactions for the purpose of sharing. As such, the music experience was identified as a successful strategy to be considered in language and communication interventions as it may lay the foundations for the child's later language development.

Receptive Language Skills Through Music Interventions

Three of the studies included in this review explored music as a strategy to support imitation and receptive language skills of young children with ASD in comparison with traditional speech and language interventions. Buday (1995) compared the use of music versus speech when teaching manual signs in 10 children with ASD. For the two conditions of the experiment, there was a music and rhythm audio portion of the target sign words. Participants responded higher in the sung condition, and the researcher concluded that music promoted the participants' attention, had a positive effect on their short-term memory, and enhanced their ability to correctly imitate signs during the experiment.

Music was, also, paired with alternative and augmentative communication intervention to facilitate receptive language production of young children with ASD. Using a single subject multiple baseline across participants, Simpson and Keen (2010) used a precomposed, familiar song to teach animal symbols to the three participants of the study (age, 3–5 years). The response rates of the participants were higher during the music condition compared with the nonmusic condition. The results of the study indicated that the use of precomposed songs can facilitate receptive labeling in young children with ASD.

The relationship between music and receptive language abilities of young children with ASD was further explored by Simpson et al. (2013). The researchers implemented randomized control trial design and compared sung and spoken condition embedded into a computer-based intervention in 22 young children with ASD. In their study, music was described as the active ingredient that can create an engaging environment for learning, one that holds the potential to facilitate language acquisition for young children with ASD. The emphasis of the study seemed to be on engagement, and the language skills of the participants were considered as part of the learning process that the music environment facilitated. Also, the authors identified musical elements (such as rhythm, familiarity, and simple melodies of the songs) as important features of a music intervention to teach language skills to children with ASD, especially when paired with speech therapy strategies.

Music to Promote Speech Production and Language Training

A total of four studies reported gains on the participants' receptive language abilities and speech production. Sandiford, Mainess, and Daher (2013) compared the

efficacy of Melodic Based Communication Therapy (MBCT) with traditional speech therapy for eliciting speech in 12 nonverbal children with autism. The intervention was delivered by speech and language clinicians who were trained to work with the participants in both conditions in producing 25 target words. While the results were positive for both groups, there was evidence for faster rate of improvement for the MBCT group with greater overall gains in verbal attempts and imitative attempts. The authors indicated that music-based interventions may be included in the training and clinical work of speech-language pathologists.

Sharing a speech-pathology background, Lim (2010) examined the effects of music on the speech-language training of 50 preschool children (age, 3–5 years) with ASD. The researcher coupled language therapy techniques with music, and the intervention included three groups: (a) music treatment videos, (b) speech treatment videos, and (c) no treatment. The research findings showed gains for the participants in the speech treatment groups in regard to their verbal production. The researcher suggested that music experiences in conjunction with language training can substantially support verbal behaviors of children with ASD. Songs, various musical instruments, and sounds seem to be strong reinforcements in the language training of children with ASD.

Next, Lim and Draper (2011) examined music incorporated within an Applied Behavioral Analysis Verbal Behavior (ABA VB) on the production of speech in children with ASD. Participants were 22 children, 3 to 5 years old. The participants were randomly assigned into three groups: (a) music incorporated ABA VB, (b) traditional ABA VB, and (c) no training. Although there was no statistical difference between the first and second group, the researchers concluded that music can be a reliable, effective component of speech and language interventions for children with autism to facilitate communication and language skills.

Capitalizing on the association between sounds and speech production, Wan and his colleagues (2011) evaluated the efficacy of an intonation-based intervention, the Auditory Motor Mapping Training (AMMT) in facilitating expressive language skills of six nonverbal young children with ASD. The AMMT intervention included intonation (singing) and tapping on the drum for each target word introduced to the participants. The researchers identified the engaging aspect of motor activity (tapping on the drum) along with the intonation of words as two important components of the intervention, and the results indicated that the participants showed significant improvements in speech production. When discussing the relationship between speech output and functional communication, the researchers noted that the ability for speech production could be considered an important foundation for the participants' further, gradual acquisition of functional communication and language.

Conclusion

The purpose of this review was to present research on the use of music as a tool to promote language development of young children with ASD. Two important points derive when examining studies that use music as the medium to promote communication abilities (both preverbal and verbal actions) of young children. First, there is emphasis on the similarities that music and language share during children's early development. Second, music is seen as the communicative medium that supports engagement and allows for communication episodes to unfold according to the children's abilities.

Looking into the connection between music and language, a number of music characteristics can be used to promote young children's interactions with their social environment. In the studies reviewed in the article, music activities seem to promote a wide range of preverbal skills, including early vocalizations for young children (such as babbling, vocal play, and melodic utterances). These vocal expressions share many common characteristics with music in terms of pitch, rhythm, tempo, dynamics, and the use of short melodic phrases (Chen-Hafteck, 2007). At the same time, these forms of early vocalizations constitute important developmental stages that lead to the development of language (Crystal, 1987). While young children interact through sounds, they become more capable of producing particular sounds and eventually use words (Keen et al., 2016). Therefore, the design and delivery of interventions that intentionally use music to promote singing and interactions through musical actions hold the potential to promote preverbal and verbal forms of communication in an age-appropriate manner for young children with ASD.

Another important point of the interventions was related to preverbal developmental milestones and the sharing of intentions and interests, as critical skills among communication partners. A number of studies in this review explored the connection between music as the engaging medium to promote preverbal skills of young children with ASD. Researchers with either a music and/or speech pathologist background focused on the relationship between prelinguistic forms of communication (such as eye contact, imitation, turn-taking, and pointing) and the children's consequent development of language. Music activities were intentionally used as the communication scaffold that enhanced receptive language development. The experience of engagement through music provided opportunities for sharing of intentions and attention, and created the preconditions for language development in a developmentally appropriate social context.

Findings from this review align with a growing body of research on the connection between music and communication development of young children with ASD (i.e., DeVries, Beck, Stacey, Winslow, & Meines, 2015). Although there is not excessive research looking into the interplay among

music, engagement, and language development of young children, there seems to be a clear connection between music and language development as well as between music and engagement episodes. Complex forms of preverbal communication during early years of life may promote young children's later receptive and expressive language skills (Chen-Hafteck, 2007). Music is an essential component of early childhood that may enhance a variety of preverbal, communicative actions (Geretsegger et al., 2014). As such, when used as part of communication and language interventions, music experiences may promote speech output for minimally verbal young children and enhance verbal interactions (Schön et al., 2008).

Music and music therapy as systematic forms of intervention can create the context for the development of young children's communication abilities, both preverbal and verbal ones. Future research may look into different structures of collaboration among music therapists and other professionals in the field of early intervention, such as speech and language pathologists, special instructors, and the families of children with autism. Music has been identified as an emerging practice for targeting language development of young children with ASD, either within the contexts of music therapy and/or as part of other interdisciplinary approaches, such as speech and language therapy, special education, and/or music education.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

References

- References marked with an asterisk indicate studies included in the meta-analysis.
- Adamek, M. S., Thaut, M. H., & Furman, A. G. (2008). Individuals with autism and autism spectrum disorders (ASD). In W. B. Davis, K. E. Gfeller & M. H. Thaut (Eds.), *An introduction to music therapy: Theory and practice* (pp. 117–142). Silver Spring, MD: American Music Therapy Association.
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.
- Barrett, M. S. (2006). Inventing songs, inventing worlds: The “genesis” of creative thought and activity in young children's lives. *International Journal of Early Years Education, 14*, 201–220.
- Bruinsma, Y., Koegel, R. L., & Koegel, L. K. (2004). Joint attention and children with autism: A review of the literature. *Mental Retardation & Developmental Disabilities Research Reviews, 10*, 169–175.
- Bruscia, K. E. (1998). *Defining music therapy*. New Braunfels, TX: Barcelona Publishers.
- *Buday, E. M. (1995). The effects of signed and spoken words taught with music on sign and speech imitation by children with autism. *Journal of Music Therapy, 32*, 189–202.
- Campbell, P. (2010). *Songs in their heads: Music and its meaning in children's lives*. Oxford, UK: Oxford University Press.
- Chen-Hafteck, L. (2007). Children, music, and culture: A cross-cultural perspective on musical development. In K. Smithrim & R. Uptis (Eds.), *Listen to their voices: Research and practice in early childhood music* (pp. 140–160). Toronto, Ontario: Canadian Music Educators Association.
- Copple, C., & Bredekamp, S. (2009). *Developmentally appropriate practice in early childhood programs serving children from birth through age 8*. Washington, DC: National Association for the Education of Young Children.
- Crais, E., Douglas, D. D., & Campbell, C. C. (2004). The intersection of the development of gestures and intentionality. *Journal of Speech, Language, and Hearing Research, 47*, 678–694.
- Crystal, D. (1987). *The Cambridge encyclopedia of language*. Cambridge, UK: Cambridge University of Press.
- Dawson, G., Rogers, S., Munson, J., Smith, M., Winter, J., Greenson, J., & Varley, J. (2010). Randomized, controlled trial of an intervention for toddlers with autism: The Early Start Denver model. *Pediatrics, 125*(1), 17–23.
- DeVries, D., Beck, T., Stacey, B., Winslow, K., & Meines, K. (2015). Music as a therapeutic intervention with autism: A systematic review of the literature. *Therapeutic Recreation Journal, 49*, 220–237.
- *Finnigan, E., & Starr, E. (2010). Increasing social responsiveness in a child with autism: A comparison of music and non-music interventions. *Autism, 14*, 321–348.
- Geretsegger, M., Elefant, C., Mössler, K. A., & Gold, C. (2014). Music therapy for people with autism spectrum disorder. *Cochrane Database of Systematic Review, 6*, CD004381. doi:10.1002/14651858.CD004381.pub3
- Gold, C., Wigram, T., & Elefant, C. (2006). Music therapy for autistic spectrum disorder. *Cochrane Database of Systematic Review, 2*, CD004381.
- Individuals With Disabilities Education Act (2004). 20 U.S.C. § 1400 (2004)
- James, R., Sigafoos, J., Green, V. A., Lancioni, G. E., O'Reilly, M. F., Lang, R., . . . Marschik, P. B. (2015). Music therapy for individuals with autism spectrum disorder: A systematic review. *Review Journal of Autism and Developmental Disorders, 2*, 39–54.
- Kartasidou, L. (2004, July). “Creativity in its broadest sense” and its role in the education of children with severe disabilities—A case study. *Creative Engagements*, pp. 13–19.
- Keen, D., Meadan, H., Brady, N. C., & Walle, J. W. (2016). *Prelinguistic and minimally verbal communicators on the autism spectrum*. Singapore: Springer Verlag.
- Leekam, S. R., & Ramsden, C. A. (2006). Dyadic orienting and joint attention in preschool children with autism. *Journal of Autism and Developmental Disorders, 36*, 185–197.
- Lepistö, T., Kujala, T., Vanhala, R., Alku, P., Huotilainen, M., & Näätänen, R. (2005). The discrimination of and orienting to

- speech and non-speech sounds in children with autism. *Brain Research*, 1066, 147–157.
- *Lim, H. A. (2010). Effect of developmental speech and language training through music on speech production in children with autism spectrum disorders. *Journal of Music Therapy*, 47, 2–26.
- Lim, H. A. (2012). Communication and language development: Implications for music therapy and autism spectrum disorders. In P. Kern & M. Humpal (Eds.), *Early childhood music therapy and autism spectrum disorders* (pp. 199–213). London, England: Jessica Kingsley Publishers.
- *Lim, H. A., & Draper, E. (2011). The effects of music therapy incorporated with applied behavior analysis verbal behavior approach for children with autism spectrum disorders. *Journal of Music Therapy*, 48, 532–550.
- Malloch, S. N. (1999). Mothers and infants and communicative musicality. *Musicae Scientiae*, 3(1, Suppl.), 29–57.
- Munte, T. F., Nager, W., Beiss, T., Schroeder, C., & Erne, S. N. (2003). Specialization of the specialized: Electrophysiological investigations in professional musicians. *Annals of the New York Academy of Sciences*, 999, 131–139.
- National Research Council. (2001). *Educating children with autism*. Washington, DC: National Academy Press.
- Pantev, C., Engelien, A., Candia, V., & Elbert, T. (2001). Representational cortex in musicians. *Annals of the New York Academy of Sciences*, 930, 300–314.
- *Paul, A., Sharda, M., Menon, S., Arora, I., Kansal, N., Arora, K., & Singh, N. C. (2015). The effect of sung speech on socio-communicative responsiveness in children with autism spectrum disorders. *Frontiers in Human Neuroscience*, 9, 555.
- Paul, R., & Sutherland, D. (2005). Enhancing early language in children with autism spectrum disorders. In F. R. Volkmar, R. Paul, A. Klin & D. Cohen (Eds.), *Handbook of autism and pervasive developmental disorders* (Vol. 2, 3rd ed., pp. 946–976). Hoboken, NJ: John Wiley.
- Pickles, A., Simonoff, E., Conti-Ramsden, G., Falcaro, M., Simkin, Z., Charman, T., & Baird, G. (2009). Loss of language in early development of autism and specific language impairment. *Journal of Child Psychology and Psychiatry*, 50, 843–852.
- Prizant, B. M., & Wetherby, A. M. (1993). Communication in preschool autistic children. In E. Schopler, M. E. Van Bourgondien & M. M. Bristol (Eds.), *Preschool issues in autism* (pp. 95–128). New York, NY: Springer.
- Rogers, S. J., & Dawson, G. (2010). Developing nonverbal communication. In S. J. Rogers & G. Dawson (Eds.), *Early Start Denver model for young children with autism: Promoting language, learning, and engagement* (pp. 154–167). New York, NY: Guilford Press.
- *Sandiford, G. A., Mainess, K. J., & Daher, N. S. (2013). A pilot study on the efficacy of melodic based communication therapy for eliciting speech in nonverbal children with autism. *Journal of Autism and Developmental Disorders*, 43, 1298–1307.
- Schellenberg, E. G. (2004). Music lessons enhance IQ. *Psychological Science*, 15, 511–514.
- Schlaug, G., Jancke, L., Huang, Y., & Steinmetz, H. (1995). In vivo evidence of structural brain asymmetry in musicians. *Science*, 267(5198), 699–701.
- Schlaug, G., Norton, A., Overy, K., & Winner, E. (2005). Effects of music training on the child's brain and cognitive development. *Annals of the New York Academy of Sciences*, 1060, 219–230.
- Schön, D., Boyer, M., Moreno, S., Besson, M., Peretz, I., & Kolinsky, R. (2008). Songs as an aid for language acquisition. *Cognition*, 106, 975–983.
- *Simpson, K., & Keen, D. (2010). Teaching young children with autism graphic symbols embedded within an interactive song. *Journal of Developmental and Physical Disabilities*, 22, 165–177.
- Simpson, K., & Keen, D. (2011). Music interventions for children with autism: Narrative review of the literature. *Journal of Autism and Developmental Disorders*, 41, 1507–1514.
- *Simpson, K., Keen, D., & Lamb, J. (2013). The use of music to engage children with autism in a receptive labelling task. *Research in Autism Spectrum Disorders*, 7, 1489–1496.
- Stern, D. (1985). *The interpersonal world of the infant*. New York, NY: Basic Books.
- Tager-Flusberg, H., Paul, R., & Lord, C. (2005). Language and communication in autism. In F. R. Volkmar, R. Paul, A. Klin & D. Cohen (Eds.), *Handbook of autism and pervasive developmental disorders* (Vol. 1, pp. 335–364). Hoboken, NJ: John Wiley.
- Tarrant, M., North, A. C., & Hargreaves, D. J. (2000). English and American adolescents' reasons for listening to music. *Psychology of Music*, 28, 166–173.
- Trevarthen, C., & Malloch, S. N. (2000). The dance of wellbeing: Defining the musical therapeutic effect. *Nordisk tidsskrift for musikkterapi*, 9(2), 3–17.
- Vaiouli, P., Grimmet, K., & Ruich, L. J. (2015). "Bill is now singing": Joint engagement and the emergence of social communication of three young children with autism. *Autism*, 19, 73–83. doi:10.1177/1362361313511709
- *Wan, C. Y., Bazen, L., Baars, R., Libenson, A., Zipse, L., Zuk, J., & Schlaug, G. (2011). Auditory-motor mapping training as an intervention to facilitate speech output in non-verbal children with autism: a proof of concept study. *PLoS ONE*, 6(9), e25505. doi:10.1371/journal.pone.0025505
- Wan, C. Y., Rüber, T., Hohmann, A., & Schlaug, G. (2010). The therapeutic effects of singing in neurological disorders. *Music Perception*, 27, 287–295.
- Wetherby, A. M. (2006). Understanding and measuring social communication in children with autism spectrum disorders. In T. Charman & W. Stone (Eds.), *Social and communication development in autism spectrum disorders: Early identification, diagnosis, and intervention* (pp. 3–34). New York, NY: Guilford Press.
- Whalen, C., Schreibman, L., & Ingersoll, B. (2006). The collateral effects of joint attention training on social initiations, positive affect, imitation, and spontaneous speech for young children with autism. *Journal of Autism and Developmental Disorders*, 36, 655–664.
- Wiseman, S. (2015). The use of music as an educational intervention for children with autistic spectrum disorder (ASD). *Research in Teacher Education*, 5(1), 7–14.
- Wolfberg, P. J., & Schuler, A. L. (2006). Promoting social reciprocity and symbolic representation in children with autism spectrum disorders: Designing quality peer play interventions. In W. Charman & W. Stone (Eds.), *Social and communication development in autism spectrum disorders: Early identification, diagnosis, and intervention* (pp. 180–218). New York, NY: Guilford Press.