

Critical Review:
What is the Impact of Music Therapy on the Joint Attention Skills of Preschoolers with Autism Spectrum Disorder?

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This critical review examined whether music therapy influences the joint attention skills of children aged three to five years old with Autism Spectrum Disorder. Research to date included randomized clinical trials, single subject 'n-of-1' ABC design, and a mixed design involving a series of single subject 'n-of-1' AB design and a single group pre-posttest. Three of the four studies tentatively supported the use of music therapy to increase joint attention skills. One study found mixed results. Research is not conclusive enough to support the use of music therapy for joint attention intervention. Suggestions for future research and clinical implications are discussed.

Introduction

Autism Spectrum Disorder (ASD) is the core disorder of the pervasive developmental disorders, as defined by the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) (as cited in Gold, Wigram, & Elefant, 2006). This neuro-developmental disorder is characterized by impairments in communication, social interaction, and repetitive and restricted patterns of interest (Gold et al., 2006).

Researchers have taken particular interest in understanding how the communication and social interaction deficits of ASD manifest in young children with the diagnosis. Functional communication in preschoolers with ASD (i.e. children aged five or younger) is associated with more favourable long-term communication outcomes. Therefore, early communication intervention for preschoolers with ASD is critical (Bruinsma, Koegel & Koegel, 2004). Joint attention skills, which are precursors to development of intentional communication, have been noted deficits in children with ASD. Thus, joint attention skills present a logical target for early intervention in preschoolers with ASD (Bruinsma et al., 2004).

Joint attention refers to a cluster of behaviours serving to assist an individual in nonverbal communication with another person (Bruinsma et al., 2004). This broad construct is divided into two classes: 1) a child's response to joint attention (i.e. how a child responds to an adult's point or gaze) and 2) a child's initiation of joint attention (i.e. how a child seeks another's attention). To assess joint attention skills in preschoolers with ASD, researchers use a variety of measures. These include frequency counts of behaviours related to joint attention such as a child's eye contact, turn-taking or initiation of engagement (Kim, Wigram, & Gold, 2008; Kim, Wigram & Gold, 2009; Wimpory, Chadwick & Nash, 1995). Researchers

also use scales to assess joint attention skills (Kim et al., 2008; Reitman, 2005) such as the Early Social Communication Scales (ESCS; Mundy et al., 2003) and the Social Approach subscale of the Pervasive Developmental Disorder Behaviour Inventory (PDDBI; Cohen & Subhalter, 1999). Any intervention approach which targets the joint attention skills of children with ASD may ultimately improve their functional communication and warrants closer examination.

Music therapy may address the joint attention deficits in preschoolers with ASD. Music therapy (also called improvisational music therapy and musical interactional therapy) has been defined by Bruscia as "a systematic process of intervention wherein the therapist helps the child to promote health, using musical experiences and the relationships that develop through them as dynamic forces of change (as cited in Gold et al., 2006, p. 2). Techniques involve engaging the child in free and structured improvisation, listening to music and songs. Music therapy is grounded in the process of *musical attunement*. This term captures the moment-by-moment responsive use of music to match the child's rhythmic patterns of movement and actions (Kim et al., 2008). By tuning in to the child, music therapy offers a pre-verbal shared context between the therapist and child, often creating an ideal communicative setting to develop joint attention skills (Kim et al., 2009). If music therapy can effectively improve joint attention skills, it would be a relevant approach for preschoolers with ASD who lack these skills.

Objective

The objective of this paper was to critically evaluate the existing literature on the impact of music therapy on the joint attention skills of preschoolers with ASD. A secondary objective was to provide recommendations for clinicians considering music therapy in their practice.

Methods

Search Strategy

Computerized databases (CINAHL, SCOPUS, ERIC Plus Text, CBCA Education, PubMed, ProQuest Dissertations and Theses) were searched using the following search strategy:

((music therapy) OR (improvisational music therapy) OR (musical interactional therapy)) AND ((autism spectrum disorder) OR (autistic) OR (asd) or (aspergers) or (asperger)) AND ((engagement) OR (interaction) OR ((joint attention) OR (shared attention)))

Selection Criteria

Studies selected for inclusion were required to examine the impact of music therapy on the joint attention skills of children with ASD, aged three to five years old.

Data Collection

The literature search yielded the following studies consistent with the selection criteria: randomized clinical trials, single subject 'n'-of-1' ABC design, and a mixed design involving a series of single subject 'n'-of-1' AB designs and a single group pre-posttest. Results are organized based on these design types.

Results

Randomized Clinical Trials

Kim et al. (2008) hypothesized that the joint attention skills of 10 male preschoolers with ASD would improve more in music therapy than in play therapy. Joint attention was measured by frequency counts of eye contact and turn-taking, the ESCS, and the PDDBI. Using the same data set, Kim et al. (2009) hypothesized that another aspect of joint attention skill (initiation of engagement) would improve more in music than play therapy. These well-formulated questions were addressed with the appropriate research design, a randomized clinical trial (level 1, highest level of design evidence).

Participants were recruited from a psychiatry department of a hospital in Seoul, Korea and met eligibility criteria, (DSM-IV diagnosis of autistic disorder, preschool age). The initial *n* of 15 was reduced to a final *N* of 10, thus; only 66% of the original participants completed all key measures. The researchers provided explanations for the participants' attrition, and chose not to analyze the data of the drop-outs for 'intention to treat'. Their justification was warranted, as with such a small sample size, this analysis may have compromised the results' validity.

The remaining 10 participants were not similar at baseline regarding important indicators (i.e. language

ability, extra therapy). To account for the differences between subjects the authors employed a within-subjects crossover design. Alternatively, they could have sub-divided the groups based on verbal ability or additional programming. These sub-groups however, would have had very few participants per group, compromising the significance of any results.

Each child received 12 weeks of music therapy and 12 weeks of play therapy in a clinical setting. Testing was conducted throughout therapy but no long-term outcomes were measured. The researchers developed a treatment manual so that methods were clearly described and could be replicated if needed. The manual also provided treatment fidelity, since it confirmed proper administration of the intervention.

Participants were assigned different therapists for music and play therapy to avoid person familiarity and bias. The therapists, however, could not be randomly allocated to each participant. This introduces a nuisance variable, as the therapists' allocation may have inadvertently biased the results. Due to the nature of the intervention, participants and therapists could not be blinded to treatment condition. Participants were randomly assigned to which therapy condition they received first (music or play) and this allocation was concealed from one of the two assessors to reduce the risk of bias. The validity of the two studies would have been increased if both assessors had been blinded.

In the 2008 report, joint attention was measured with counts of eye contact and turn-taking, the ESCS, and a translated version of the Social Approach subscale of the PDDBI. In the 2009 report, counts of initiation for engagement were used. These were not equivalent measures of joint attention. Behaviour counts did not capture all of the related behaviours. The Social Approach subscale PDDBI measured aspects of joint attention in but it was not designed for that purpose. The ESCS, in contrast, measured the two classes of joint attention as it is defined in the literature. The ESCS was likely the more pure measure of the construct of joint attention, though there is no consensus in the literature to support this.

The PDDBI is an informant-based scale that has been shown to reliably measure responsiveness to treatment for individuals with ASD (Cohen & Sudhalter, 1999). The scale was translated into Korean for the current study and underwent successful validity testing. No inter-rater reliability was reported. To test group differences between music and play, appropriate analyses of variance (ANOVAs) were performed and effect sizes were calculated. Results of the PDDBI supported the use of music therapy to promote joint

attention skills more than play and yielded a strong effect size ($d=0.79$, 95% CI from -0.14 to 1.71). Despite this impressive outcome, results must be interpreted with caution since no inter-rater reliability calculations were provided and little is known regarding the reliability and validity of using a single subscale from the PDDBI.

The ESCS is a play assessment which measures communication in typically developing infants aged 6-30 months (Mundy et al., 2003). It contains frequency scores of Initiation of Joint Attention (e.g. eye contact and pointing) and Responding to Joint Attention (e.g. following another's point/gaze). These scales were combined for analysis to reduce the number of outcome variables needed for the small sample. To test group differences between music and play, appropriate ANOVAs were performed. Results indicated greater improvement of joint attention skills after music therapy than play therapy. The effect size was large and significant ($d=0.97$, 95% CI ranging from 0.20 to 1.74). Inter-rater reliability of the ESCS was good to excellent (0.71 – 0.98). Although the ESCS is not particularly designed for children with ASD, it appears to have good face validity since it captures the two core aspects of joint attention (initiating and responding). The face validity, high inter-rater reliability, and high effect size strengthen the validity of these results.

Behaviour counts were measured from preselected excerpts of therapy sessions. To test group differences between music and play, appropriate ANOVAs were performed. The children exhibited a greater duration of eye contact, turn-taking, and initiation during music therapy than play therapy. The measures were thoroughly defined and coded by two assessors. The measures directly tally behaviours related to joint attention skills, providing strong face validity. Inter-rater reliability ranged from good to excellent (0.71 – 0.98). The researchers accounted for the skewed distribution of the frequency counts with appropriate transformations of the data.

The use of a comparison condition, random allocation to treatment order, development of a treatment manual, and use of multiple outcome measures were strengths of this study. Limitations included that not all measures met psychometric requirements (i.e. PDDBI), not all assessors were blinded to order of therapy, and a small sample size made sub-group analysis difficult to complete. Thus, the conclusions that music therapy improved the joint attention skills of preschoolers with ASD had suggestive validity. The importance of these two studies however, was compelling, as it marked the first attempts to conduct randomized clinical trials to examine the impact of music therapy.

Single Subject 'n-of-1'

Wimpory et al. (1995) hypothesized that the joint attention skills of a 3-year-old female with ASD would improve or remain stable following the onset of music therapy. The hypothesis was addressed with the appropriate research design, a single subject 'n-of-1' (level 1 study design, highest level of study design evidence). The researchers, however, labelled their work a case study. A case study, level 4 in design, is descriptive and attempts to identify patterns for future research. Their design used repeated measures at baseline and intervention, and clearly matches a single subject design. This error in labeling their study's design called into question their competency and weakened the credibility of the results.

The participant met the eligibility criteria (DSM-III-R autistic disorder diagnosis, preschool age). Other important baseline information (e.g. how she was recruited) was not discussed. Case history information was provided, allowing for comparison with other studies or with the reader's own clients.

The child's mother and a musician were trained in musical interaction therapy, a form of music therapy in which the caregiver plays with the child using words and songs, while a musician provides responsive accompaniment that matches the interaction. Music therapy sessions (20 minutes in length) were conducted bi-weekly in the home for seven months. Methods were described in some detail, though the production of a treatment manual would have increased the likelihood of accurate replication of intervention.

Video recordings of the child's interaction with her mother (outside of music therapy) were used to obtain frequency counts of joint attention skills (eye contact and initiation) before (A), during (B), and after (C) intervention. Other measures of joint attention (e.g. the ESCS, PDDBI, turn-taking) were not employed, thus the construct was not broadly assessed. Although it was not possible to blind the participant or therapist to the condition, the two assessors could have been blinded during assessment, which they were not. This likely introduced bias into the assessment. Inter-rater reliability measures were at or above 0.92, indicating an excellent level of reliability. Multiple data collection points were used, creating a rich source of information. In addition, developmental trend lines were used to fit a trend line to the baseline data and then project the line into the treatment phase. This line predicted performance on joint attention skills in the absence of change due to music therapy. Any data points *above* the line indicated an improvement on the measures following music therapy. Both eye contact and initiation increased over the course of the study, and

improved *above* what would have been expected on the trend line. This trend line was unique in the literature and provided additional support to the visual analysis of the data points. The results, however, must be interpreted with caution as other nuisance factors (e.g. the child's day care participation) may have confounded the pattern of the data points.

The thorough description of the intervention and use of multiple data collection points and a trend line were strengths of the study. Limitations included mislabeling the study's design, lack of blinding during assessment, incomplete outcome measures, and lack of therapy details for replication. Thus, the conclusion that music therapy improved the joint attention skills of the participant had equivocal validity. The clinical importance of this single subject study, however, was compelling, as it measured joint attention after music therapy had been withdrawn. Future studies may use longitudinal research to statistically track the maintenance of joint attention skills over time in children with ASD.

Mixed Design

Reitman (2005) hypothesized that as a group and on an individual basis, the joint attention skills of 10 male preschoolers would increase following music therapy. This well-formulated research question was appropriately addressed with a series of single subject 'n-of-1' AB designs (level 1 study design) and a single group pre-posttest (level 3 study design).

Participants were recruited from multiple centers in the Greater Miami and Ft. Lauderdale areas, United States. All met age and diagnostic eligibility criteria (formal diagnosis of ASD, aged three to five years). Criteria could have been specified further by the researcher, as it was not clear if the children had received a diagnosis as per the Diagnostic Statistical Manual (DSM) and to what severity. Additional programming of the participants was tracked and parents were asked to maintain this level of programming throughout therapy to reduce any confounding variables during the study. The initial *n* of 14 was reduced to a final *N* of 10 since equipment malfunctions destroyed four participants' post-intervention data. Thus, only 71% of the original participants completed all key measures.

Children received eight sessions of music therapy in a one-month period, delivered by a certified music therapist in a clinical setting. Methods are described with useful detail. The production of a treatment manual would have increased the likelihood of accurate replication and allowed for treatment fidelity checks.

Joint attention was measured with an altered version of the Social Approach subscale of the PDDBI completed by both the parents and a music therapist. Participants were measured prior to therapy and at the initial and final therapy sessions. No long-term outcomes were taken. No other measures were used, suggesting the construct may not have been tested in its entirety. Low inter-rater reliability ratings were found between the two music therapists conducting assessment. This discrepancy was disregarded and only the ratings of the therapist with more experience with the ASD population were used in analysis. This introduces an alarming degree of bias to the outcomes, which should be interpreted with caution.

Using an appropriate test of mean differences, the PDDBI ratings of the parents and therapist both indicated a group increase in joint attention skills when comparing ratings prior to therapy to those taken on the last session. Visual analysis of individual results was also conducted. Results would have been strengthened if developmental trend analysis had been conducted. Single subject analysis of parent and therapist ratings revealed that while seven children did increase in joint attention skills, two participants had no change and one participant's ratings worsened.

The broad recruitment method, tracking of the participants' programming, details of intervention, and use of both parent and therapist ratings were strengths of the study. Limitations included a single outcome measure, a lack of psychometric information, and a single assessor. Thus, the conclusion that music therapy had varying effects on the joint attention skills of preschoolers with ASD had equivocal validity. The results however, had compelling importance, as they were the first to identify a potentially negative effect of music therapy with some individuals with ASD. It was also the only study to examine parental perceptions of the participants' joint attention skills.

Discussion

To date, the literature provided no results with compelling validity that music therapy can impact the joint attention skills of preschoolers with ASD. In fact, one study suggests that music therapy may decrease joint attention. Validity of all results was compromised by limitations in participant sampling, procedures, and outcome measures.

Common participant sampling limitations across the studies included small sample sizes which made within-group comparisons and 'intention to treat' analysis difficult to achieve. Within-group comparisons would be useful, as the ASD population often presents with

varying levels of language ability and differing degrees of diagnosis severity. Studies with larger sample sizes would make these comparisons possible. Also, all but one study (Reitman, 2005) recruited from a single location, potentially introducing selection bias. Multiple recruitment sites could be used to account for this bias. Furthermore, participant involvement in extra programming was only monitored in one study (Reitman, 2005), creating a nuisance variable which may have influenced the impact of music therapy. Researchers must diligently track participants' activities to account for this potential nuisance variable.

Methodological weaknesses were also present in all the studies reviewed. With the exception of one study (Wimpory et al., 1995), there was no examination of the maintenance of joint attention skills post-intervention. There were also inconsistencies in the implementation of intervention. Each study's music therapy varied in length of session, total number of sessions, instruments used, number of therapists involved, location of intervention, etc. Only Kim et al., (2008, 2009) developed a treatment manual to provide details of intervention and ensure treatment fidelity. In all other studies, insufficient information was provided in order to replicate the intervention, making cross-study comparisons difficult to impossible.

Outcomes measures were another challenging limitation in the literature. By definition, joint attention is difficult to capture, as it represents a cluster of behaviours, including eye contact, initiation, and responding to the attention of others (Bruinsma et al., 2004). Because of this broad definition, joint attention was assessed with a variety of outcome measures, compromising the ease of cross-study comparison. There was also no consensus about which of these measures most effectively captured the construct. This may explain why no systematic reviews have been conducted on the topic of joint attention skills in music therapy to date.

Each outcome measure presented a unique set of strengths and challenges. Behavioural counts, though strong in face validity, were time consuming to code and analyze. The counts were based on the subjective response of each assessor, sometimes yielding inconsistent results and low inter-rater reliability. Multiple blinded assessors are needed to accommodate this challenge. Measures like the PDDBI and ESCS presented other challenges. Specifically, the PDDBI was altered for study-specific purposes with only certain subscales being used, compromising its psychometric value. Furthermore, the PDDBI had been designed to specifically test the ASD population. Although this type of focus may initially seem

appropriate, it may have narrowed the range of items and limited the extent to which joint attention was measured. The ESCS, with its joint attention specific frequency scores, appeared to be the most comprehensive construct to date. Despite its apparent usefulness it was only employed in one (Kim et al., 2008) of the four studies reviewed. Finally, the perspectives of parents were only considered in one study (Reitman, 2005), all others were therapist ratings.

Based on these limitations, research is still inconclusive on the use of music therapy to build joint attention skills in preschoolers with ASD. Future research should consider the following recommendations:

- a) Single subject 'n-of-1' design or a randomized clinical trial with sufficient sample size to afford within group comparisons on important differences between children with ASD.
- b) Thoroughly defined details of intervention through the development of a treatment manual, with treatment fidelity checks conducted throughout administration.
- c) Reliable outcome measures with proven validity in capturing joint attention.
- d) Long-term follow up to understand what lasting effects music therapy may have for a preschooler with ASD.

Conclusion

Joint attention skills are a precursor to intentional communication and should be targeted in early intervention for preschoolers with ASD (Bruinsma et al., 2004). To date, no single study has compelling validity that music therapy can influence joint attention skills. All studies, however, contribute compelling preliminary information that can guide future research.

Clinical Implications

Music, in general, may provide a preverbal context for interaction for children with ASD (Gold et al., 2006). Clinicians may systematically incorporate music into their practice and report their findings to contribute to the literature's knowledge base. Clinicians should not, however, rely on music therapy as their sole mode of joint attention intervention.

References

- Bruinsma, Y., Koegel, R.L., & Koegel, L.K. (2004). Joint attention and children with autism: A review of the literature. *Mental Retardation and Developmental Disabilities Research Reviews*, 10, 169 – 175.

- Cohen, I.L., & Sudhalter, V. (1999). *Pervasive Developmental Disorder Behaviour Inventory (PDDBI-C)*. NYS Institute for Basic Research in Developmental Disabilities.
- Gold, C., Wigram, T., & Elefant, C. (2006). Music therapy for autistic spectrum disorder. *Cochrane Database of Systematic Reviews*, (2), 1-22.
- Kim, J., Wigram, T., & Gold, C. (2008). The effects of improvisational music therapy on joint attention behaviors in autistic children: A randomized controlled study. *Journal of Autism & Developmental Disorders*, 38(9), 1758-1766.
- Kim, J., Wigram, T., & Gold, C. (2009). Emotional, motivational and interpersonal responsiveness of children with autism in improvisational music therapy. *Autism: The International Journal of Research & Practice*, 13(4), 389-409.
- Mundy, P., Delgado, C., Block, J., Venezia, M., Hogan, A., & Seibert, J. (2003). *A manual for the abridged Early Social Communication Scales (ESCS)*. University of Miami.
- Wimpory, D., Chadwick, P., & Nash, S. (1995). Brief report: Musical interaction therapy for children with autism: An evaluative case study with two year follow-up. *Journal of Autism & Developmental Disorders*, 25(5), 541-552.
- Reitman, M. R. (2005). *Effectiveness of music therapy interventions on joint attention in children diagnosed with autism: A pilot study*. Unpublished doctoral dissertation, Carlos Albizu University, Florida.