Critical Review:
What are the effects of music therapy on the communication of children diagnosed with autism?

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This critical review examines the effect of music therapy on the communication skills of children diagnosed with an autism spectrum disorder. A literature search was conducted and the following types of articles were selected: Randomized control trial, repeated measures comparison crossover design, within subjects repeated measure design, single subject multiple baseline design, non-randomized clinical trial, and case studies. Overall, the investigated research offers support for the integration of music therapy techniques in speech-language pathology services. However, more research is required to establish best practices for speech-language pathology practice.

Introduction

The Individuals with Disabilities Education Improvement Act of 2004 (IDEA) defines autism as "a developmental disability significantly affecting verbal and nonverbal communication and social interaction, generally event before age 3, which adversely affects educational performance" (ASHA, 2006). The *Diagnostic and Statistical Manual of Mental Disorders- Fourth Edition, Text* Revision (DSM-IV-TR) places autistic disorder, Rett's disorder, childhood disintegrative disorder, Asperger's disorder and PDD-NOS within the category of pervasive developmental disorders. These disorders share characteristics including abnormal social skill, abnormal communication, and a restricted activities or interests (ASHA 2006).

Children diagnosed with autism display difficulty with communication and are often below age-expectancy. A lack of joint attention and an abnormal response to others are noted in infancy and they have difficulty showing and pointing (Paul, 2007). Speech is delayed and develops slowly when present. Vocabulary, syntax, phonology, language are relatively spared but pragmatics and prosodics are often impaired. Many children also use echolalia which may be used for communication purposes (Paul, 2007). However, some children with autism remain non-verbal throughout their lifespan or they may be non-responsive to others (Paul, 2007).

It is believed that music therapy began to be used for children with autism during the 1940's to address self-expression, socialization, rehabilitation, psychological enrichment, and recreational skills. (Reschke-Hernandez, 2011) Musical therapists noted a considerable interest in music, abnormal singing, and ability to accurately recall detailed musical sequences. Originally, child-centered musical techniques, such as improvisational music therapy, were used but therapists experimented with direct approaches as the field progressed (Reschke-Hermandez, 2011). Therapists borrowed techniques from other disciplines, including speech-language pathology (Reschke-Hernandez, 2011). Originally, music therapy was used to improve musical skills but more recently the therapy has focused on social skills, communication, and behavioural skills, which matches the diagnostic criteria for autism (Reschke-Hemandez, 2011).

Speech-language pathologists may have extensive backgrounds in music theory or performance. Some therapy techniques used by speech-language pathologists containing musical elements, such as Melodic Intonation Therapy (MIT), demonstrate efficacy in treating communication deficits (Parsons, Reutens, Wilson, 2006). Several articles suggest the use of music in therapy for children with autism (Whipple, 2004). With knowledge of developmental speech and language and therapeutic techniques, it may be beneficial for speech-language pathologists to incorporate musical techniques into therapy routines when working with children with autism, to collaborate with music therapists, or to refer for additional treatment.

Objectives

The primary objective of this paper is to determine whether music therapy can effectively improve communication in children diagnosed with autism. The secondary objective is to determine the conditions which best promote communication in children with autism in order to suggest recommendations for clinical practice.

Methods

Search Strategy

Computerized databases, including CINAHL, Web of Knowledge, Google Scholar, MEDLINE-OVID, Proquest, PubMed, and The University of Western Ontario Libraries site, were searched using the following search strategy: [(MIT) and (Autism)], [(Music therapy) and (Autism)], [(Music therapy) and (Pervasive developmental)], [(music) and (Autism)], [(Music therapy) and (Autism) and (communication)], [(music therapy) and (joint attention) and (Autistm)],

[(Music therapy) and (joint attention)]. Articles were also obtained by searching for work by authors frequently referenced in related literature.

Selection Criteria

Articles selected for this critical review were required to reference music therapy, communication, and autism. Studies that included participants representing a range of diagnoses were included. Studies examining only behaviour or included adolescent and adult participants were excluded. When multiple articles examined the same subject, only the original article was reviewed.

Data Collection

Results of the literature search yielded nine articles. The following types of articles are congruent with the aforementioned selection criteria: randomized control trial, repeated measures comparison crossover design, within subjects repeated measure design, single subject multiple baseline design, non-randomized clinical trial, and case studies.

Results

Kim et al. (2008) examined the effects of music therapy compared to supported play on joint attention of individuals diagnosed with autistic disorder. Boys aged 3-5 years (n=10) with no prior music or play therapy who were diagnosed with autistic disorder, five of whom were verbal and five nonverbal, were recruited for this study from the Department of Child and Adolescent Psychiatry at the Seoul National University Hospital. The researchers used a repeated measures comparison crossover design. Participants were randomly assigned to either the improvisational music therapy group or the supported play group and crossed over at the midpoint of the study. Improvisational music therapy refers to a child-centered approach where the music therapist modifies his/her musical interaction based on the child's pulse, movements and vocalizations to improve joint referencing. The participants were evaluated pre and post-intervention using the Social Approaches subtest from the *PDD Behavior Inventory* (PDDBI) scale by mothers and professionals, the *Early Social Communication Scales (*ESCS), and a microanalytic coding procedure of behaviour.

A repeated measures ANOVA was used to evaluate changes in scores between the two test conditions. ANOVA analysis revealed a small positive effect when comparing scores after music therapy with after play therapy and a larger effect when comparing change in scores between the two conditions, however no significance was found. Results of the ANOVA showed that therapy group (music therapy or play therapy) and change in scores over time were significant ($p<0.01$). Following music therapy, there was a large positive effect on the ESCS scores and to a lesser degree following play therapy. Comparison of post music therapy with post play therapy revealed a small effect size when judged by professionals. The ESCS revealed that music therapy was significantly more effective than play with a medium effect size for change and large effect size when comparing approaches. Micro-analytic analysis revealed that, compared to play, music therapy produced a significant increase in the duration of eye contact and turn taking ($p < 0.0001$) and positive change in turn-taking behaviours approached significance ($p= 0.051$). The author noted that three of five non-verbal participants developed some initial language skills during and after music therapy. Significant improvement in joint attention with eye contact and bids for joint attention were noted in favor of music therapy with some changes in verbal production but there was no significant increase in gesturing. Ratings of mothers and professionals on all tests were compared using an intraclass correlation coefficient. The agreement between mothers and professionals was very low for the PDDBI but good to excellent for the ESCS, and behaviour coding.

The limitations noted in this study included the small sample size, high dropout rate, and the low agreement between mothers and professionals which the authors noted may be caused by the mothers judging based on expectation. However, there was agreement between professionals which allowed the professional's scores to be analyzed. Random assignment, specific assessment, and detailed and appropriate statistical analysis are strengths of this study. Due to high validity and reliability as well as frequent referencing in related literature, this study offers compelling evidence that music therapy over play therapy improves joint attention skills and verbal communication without change in gesturing.

Gattino et al. (2011) examined the effects of relational music therapy on the verbal, nonverbal, and social communication of children with autistic disorder, PDD-NOS, or Asperger's. Twenty-four boys (ages 7-12 years) were recruited for the study from the Programme for Invasive Developmental Disorder in Porto Alegre City, Brazil. The researchers used a randomized control trial format. The boys were randomly assigned to either the test condition (relational music therapy) or the control condition (only clinical routines). Participants in the experimental condition attended 16 weekly music sessions. Relational music therapy is a child-centered approach in which the music therapist shapes the child's output and interventions based on the child's actions. The participants were evaluated pre and post-intervention using the *Childhood Autism Rating Scale*-Brazil (*CARS*-BR).

Three subtests from the CARS-BR did not show a significant difference when examined by t-test analysis. Further subgroup analysis revealed that only participants with autistic disorder in the experimental group (p=0.008) had a significant decrease in scores compared to the control group.
Limitations of this study included the use of a non-appropriate instrument for measuring outcome as the CARS-BR lacked accuracy because it was not specific to communication, potential difficulty caused by the hospital setting, the small sample size, and diagnostic variability between groups. Although there was a wide range of diagnoses, group analysis revealed the relationship between improvements and level of functioning. Strengths of this study include randomization, and analysis of each diagnosis. This study offers equivocal evidence that music therapy is most effective for lower-functioning children with autism.

Lim (2010) investigated the effectiveness of music therapy compared to speech therapy or no therapy on verbal expression of fifty children (ages 3-5 years) with ASD and varying levels of functioning. The researchers used a randomized control trial design where participants were randomly assigned to speech therapy, music therapy, or no treatment conditions. Children were taught vocabulary items using the Developmental Speech and Language Training Through Music program. The child in the treatment conditions watched a video containing either music or speech therapy twice daily for 3 days in order to learn 36 functional vocabulary words. Six songs were created with different tempos, pitches, and keys that highlighted the target words. Pre and post-intervention evaluations were conducted by two blinded speech language pathologists who administered a verbal production evaluation scale designed by the investigators and measured semantics (correct word), phonology (pronunciation), pragmatics (temporal and sequential aspects), and prosody (pitch, accent, length of vowel, intensity).
A 3x2x2 ANCOVA showed a significant effect of the treatment conditions on verbal expression after controlling for pretest scores and language age-equivalency ($p < 0.001$). Both music therapy and speech therapy had a large effect and significant p-value compared to the control group. However, there was no significant difference between the music and speech therapy. A significant effect was found for level of functioning ($p<0.001$). Participants with a high level of functioning improved verbal productions to a greater degree compared to low functioning. Children with echolalia compared to children without echolalia achieved a higher score on the post-intervention examination and higher change scores, however the ANCOVA showed this was not significant when controlling for pretest score and language age ($p= 0.802$). A one-way ANOVA evaluating only training condition and echolalia after controlling for the pretest score revealed that the effect of echolalia approached significance ($p=0.055$). A correlation coefficient for independent variables showed that high pretest scores were strongly related to high language age-equivalency, high level of functioning, and presence of echolalia. The 3x2x2 ANCOVA showed that the interaction between training condition and level of functioning and that the interaction between training condition and the presence of echolalia were not significant. However, further analysis using a two-way ANOVA revealed that the relationship approached significance ($p=0.053$). Low functioning participants produced greater changes in music training than in speech training, whereas higher functioning individuals produced higher results in both test conditions. There was no statistically significant difference between conditions on semantics, phonology, pragmatics, or on prosody. Overall, children in both treatment conditions increased verbal production scores, although there was no significant difference between music therapy or speech therapy. Music therapy did result in greater improvements in speech production with low functioning individuals than speech training where little change was noted and high functioning individuals improved in both test conditions.
The limitations in this study include the differing diagnoses, the uneven duration of training videos, and the validity of the testing method due to use of non-standardized measures. Strengths of this study include randomization, blind evaluators, specific assessment, control and best-practice conditions, and detailed analysis of the data. This study offers suggestive evidence that there is a positive effect of music therapy on communication in autism. In addition, lower functioning individuals may benefit more from music therapy than speech therapy whereas higher functioning individuals may benefit from both conditions.

O'Loughlin (2000) studied the effect of language therapy and music therapy on prelinguistic communication (e.g., eye contact, looking and pointing at a stimulus, peer engagement, imitation of talking or singing) and the characteristics of music that may be most effective in therapy for children with autism. Forty-four children (37 boys, 7 girls), 3-10 years old diagnosed with autism with varying levels of functioning were recruited for this study from the Summer SAIL Program. Eighteen children were severely impaired, twelve were labeled moderately impaired and fourteen were labeled as high functioning. Children were randomly assigned to 4 groups. A within subjects repeated measure design was used with

embedded quasi-experimental ABA withdrawal design (Group 2) and embedded single subject, multiple target design (Groups 3 and 4). The author studied prelinguistic skills such as: eye contact to teachers and peers, pointing and looking at the lesson stimulus, sitting independently during the lesson, and singing and speaking appropriately. Group 1 students attended sessions two times per week for five weeks which consisted of group therapy where songs promoted labeling by pointing to pictures while singing. Students in group 2 received five treatments: three traditional language sessions and two musical language treatment sessions with the same method used as in group 1 but traditional language sessions were spoken instead of sung. Students in group 3 were presented with 10 songs and picture stimuli used to teach language concepts such as labeling, categorization, locations, etc., with a basic, slower version and a more complex, faster version which the child and therapist sung in unison. Students in Group 4 participated in nine lessons over five/5 weeks in which they listened to the same 10 songs but in a small group and specific ordering of the songs. Groups 1, 3, and 4 were evaluated by teachers and personal educators using a twelve-statement five-point likert scale for looking, sitting, and participating behaviours and four open-ended questions. Group 4 also had teachers code for frequency that the child looked at the teacher, looked at peers, pointed to the stimulus, and that the child attempted to speak or sign. Teachers were also required to respond to two written evaluations. Group 2 was evaluated by video observation and was rated for frequency that the child looked at a picture stimulus, pointed to the picture stimulus, or attempted to talk or sign during the language stimulation therapy. These behaviours were compared to during treatment and without treatment.

For Group 1, the evaluators found a high agreement between the first seven coded statements and nine written statements. Singing encouraged participation and expectation of attention and interaction with peers. Music therapy helped the child calm and become more attentive for following directions. An increase was noted in vocalizations and singing of songs, imitation of several new sounds on request, and use of phrases. The 5-point likert scale demonstrated an increase in attention, pointing, joint attention, awareness of others, and turn taking. Evaluation of Group 2 demonstrated a significant increase in eye contact and looking at stimulus with music therapy ($p=.023$, $p= .014$). Pointing behaviour was larger for music treatment but was not statistically significant ($p=.087$). Frequency of singing and talking was higher for non-music treatment than music treatment. An ANOVA for Group 3 indicated no statistically significant differences in total score means ($p= .364$-$.423$). An ANOVA analysis for group 4 indicated no statistically significant differences in means between the 14 measured songs or lessons in the likert scale or frequency count for eye contact, looking and pointing to picture, talking or singing, or looking at peers ($p=.175$-$.956$). A one-way ANOVA determined no significant differences between groups ($p=.078$). Written rater responses described an increase in attention, initiation, and verbal expression, including abstract concepts, and that the repetitive and consistent nature was motivating and helped the child maintain attention for a longer period of time.

The limitations outlined in this study included lack of definition for "attention, subject, an assumption that raters had a clear understanding of behaviours and attention, a subjective evaluation instrument, and the intent and language learning were not analyzed. Strengths of this study include a large sample size, extensive data collection, examination, and randomization. The dissertation offers suggestive evidence of music therapy improves verbal and prelinguistic communication in children with autism.

Reitman (2005) investigated the effect of music therapy on the type, quality, and frequency of joint attention behaviours, social behaviours, and problem behaviours. Fourteen males (age 3-5 years) with autism or PDD-NOS were recruited a variety of agencies. The group was composed of 10 Hispanic, 2 non-Hispanic white children and 1 native American. All but one of the participants were severely autistic. A single subject, multiple baseline design across participants (ABC) was used with blinded evaluators. Eight thirty-minute individual music therapy sessions were held twice weekly and included a greeting song, seated imitation activity, instrument playing, gross motor musical imitation activity and a closing song all paired with picture stimuli. Baseline, post-treatment and follow-up evaluations were conducted using a parent interview and questionnaire, the *Pervasive Developmental Disorder Behavior Inventory* (PDDBI), and evaluation of video-recordings to determine types, quality, and subjective frequency of joint attention behaviours.

The overall autism t-score showed improvements from pre to post treatment in all areas except pragmatic language. A significant ($p<.01$) increase was noted in joint attention behaviours on the PDDBI from baseline to post-treatment and a score approaching significance when examining pre and post-treatment, a positive trend which was consistent with both the parents and videotape raters' observations. Semantic pragmatic problems and social behaviours, responsiveness to social inhibition cues, positive affect, and imaginative play showed improvements after treatment, but improvements were not significant. Only the gestures and social inhibition categories did not demonstrate improvements across treatment. Video-recording ratings found a significant increase in the group mean

difference for joint attention behaviours. The author also noted a change in behaviours and generalization. Parents noted that their children became more involved in the sessions following music therapy.
Limitations noted by the author include inconsistency of parent ratings, low test-retest reliability, maternal language of participants and parents, small sample size, scheduling irregularities, low inter-rater reliability, limitations of video-recordings and attempts to clarify the directions of the PDDBI may have negatively impacted results. Strengths of this study include blind evaluators and multiple assessment techniques including standardized tests and rating scales. This study offers suggestive research that music therapy has a positive effect on joint attention, but not gesturing.

Tindell (2009) examined whether the expressive speech acquisition of students with ASD improved when the Precision Songs curriculum was added to the school's eclectic curricula. A mixed, non-randomized clinical trial design was used. A sample of thirty children diagnosed with autism who were enrolled in four elementary classrooms were assigned to two groups based on their predetermined classroom. Group 1 was taught using the Precision songs criteria in addition to the usual eclectic program throughout the study, whereas Group 2 received the eclectic school program only during the first half of the study and received the Precision Songs curriculum in addition to the school's eclectic programming during the second half. Pretest and posttest evaluations were conducted using *Autism Diagnostic Observation Schedule* (ADOS) testing for communication.
A Wilcoxon signed rank test and a paired samples t-test revealed a large effect and a significant change in expressive language acquisition between week 1 and 6 for students receiving both the eclectic and precision songs criteria ($p=0.003$). An ANOVA test demonstrated that there was no statistically significant difference in expressive language scores recorded between Group 1 and Group 2.
The number of teachers involved, the teacher's abilities for implementing the music-based intervention, and the differing characteristics of the children in each class were limitations noted by the authors. The strengths of this study include a specific treatment program that can be reproducible and appropriate statistical analysis. As the data was platykurtic and thus non-normally distributed, the use of the ANOVA test may not have been justified and a nonparametric test would have been more appropriate. This study offers equivocal evidence that the integration of music into the school curriculum may improve communication of children with autism.
Wimpory, Chadwick, and Nash (1995) examined the effect of music interaction therapy on social and symbolic development including eye contact, initiation, and symbolic play. Music Interaction Therapy (MIT) is a child-centered therapy technique used to facilitate social interaction that incorporates live music in response to the child's actions. (Wimpory et al., 1995)
A single subject multiple baseline design (ABC) was used for this study. The authors followed a 3 year old female with autism described as "almost totally non-communicative" over a four month baseline, seven month musical interaction therapy intervention (MIT), five month unmonitored music therapy, and two year follow-up. Naturalistic home assessments were conducted with toys (mother was passive first then an active participant) and without toys with active participation from the child's mother. The investigators examined video-recordings of up to 30 minutes from these assessments for time passed without social acknowledgement, number of eye contacts per minute, frequency of child-initiated interactive involvement, frequency of child-initiated positive changes to interaction, and presence/ absence of spontaneous symbolic play. Following the onset of MIT, the child gave social acknowledgement within 6 minutes at baseline, one minute during intervention, and after 9 seconds at follow-up, which was still below the developmental trend line. At baseline, the child's eye contact was stable and low and was at or above developmental trend at follow-up (6 per minute). The child initiated 20% of interactions at baseline, 75% during intervention and maintained attentiveness over 10 minutes of play without toys at follow-up. This was equivalent to a 10x increase in initiation (average 0.2 to 2.3 per session). The child made no positive changes to the interaction during the baseline assessment, did so in most of the intervention assessments (1 time per assessment), and did so three times during the follow-up. Symbolic play was only observed in the final home assessment in the intervention phase and at follow-up. Increases in eye contact, initiation, and positive changes to interaction demonstrated a positive effect of music therapy on communication.
The limitations of this study include the unknown developmental effects, small sample size, unknown effect of schooling, unknown effect of parental learning of strategies, lack of standardization, and poor ability to generalize results. Strengths of this study include more naturalistic and frequent assessments. This study offers equivocal evidence of improvements in communication with music therapy.

Yeou-Cheng et al. (2006) investigated the impact of child-centered therapeutic musical activities on gestural, verbal, and social communication using a single group test design. Six children (ages 31-40 months) were recruited for this study from the Early Intervention Program at Mt. Sinai NYU/ Rusk Institute Preschool and Infant Development Program. The

children included had a diagnosis of pervasive developmental disorder, significant speech and communication delays, and an average developmental presentation of 17.9 months. Music therapy playgroup sessions were held over a three week period and were incorporated into the school schedule. These playgroups included a greeting song, songs with specific communication purposes such as fine motor skills, gestural prompting, etc., and a goodbye song. The children were evaluated using the Rosetti Speech and Language Scale, a rating scale designed for the study, and analysis of video-recordings of each session. The authors reported that musical activities that incorporated both verbal and tactile musical stimulation (i.e., bells or drums) allowed for better results. Interactive music activities tailored to each student produced greater improvement than singing alone. Limitations of this study include a small sample size, lack of detailed methods, and omission of statistical data without explanation. Strengths of this study include detailed diagnostic criteria and appropriate selection of assessment measures. This study offers equivocal evidence that music therapy in the school can improve communication in children with autism but that verbal with tactile stimulation and therapy tailored to the child may be most effective.

Stephens (2008) examined the effect of musical social milieu teaching on receptive imitation routines for children with autism. A multiple targets, ABAB reversal design was used for this study. Four children (ages 5-9; 2 male, 2 female) were included in the study. Participants were recommended for this study by teachers due to difficulty with turn-taking and social communication. Sessions were conducted every school day. The researchers played Bob Marley songs in 30 second trials divided into a 10 second pause where the researcher demonstrated an action-word pair followed by 20 seconds of music in which dancing and music took place. These activities promoted dance and tactile play with instruments, which were then imitated by the researchers. The researcher imitated the child's dance and musical play and then modeled an action and verbal word for them to copy. Additional prompts were included if a child did not imitate. Children were assessed by recording the number of imitations, behaviours, and verbal comments, and a social validity questionnaire (four question, 5 point likert scale) completed by at least 3 classroom personnel. Following intervention, the frequency of spontaneous imitation increased. Three participants increased spontaneous imitation of action-word pair to criteria. The criterion was described as seven imitations or one initiation if additional prompting was required. The other child increased only her motor imitation. Three of four children required additional prompting for imitation. One child non-verbally requested imitation by the adult when the test condition was removed. Rating by school personnel found that two participants had no change in imitation but two children did generalize imitation skills, new turn-taking behaviours, and more appropriate academic behaviour. The author noted that imitating children with autism increased their social relating.
The limitations noted in this study include variable responding of children, weak experimental control, and failure to continue the study based on participant responding rather than time limitations. Strengths of this study include detailed methods, using techniques found within music therapy, such as waiting for a response, inclusion of multiple modes of communication, and the generalization to the school setting. This study offers suggestive evidence that music therapy may increase imitation and verbal expression, behaviour, and turn-taking of children with autism.

Discussion

The evidence from the nine studies presented needs to be interpreted with caution due to small samples sizes, different methodology, and different modes of music therapy. Sample sizes ranged from 4 to 41 children with ages varying from 2-10 years of age. Seven of nine studies included in this review used a child-centered approach to music therapy whereas the others used a clinician-directed approach. Music therapy was presented by live singing, audiorecordings, video presentation, and live music without singing. Music therapy techniques included relational music therapy, interactional music therapy, improvisational music therapy, the Precision Songs program, and the Songs for Language Learning Program. In addition, the expectation of the children was also different in the studies. In some studies the child was expected to play with toys, in others they were playing with instruments, pointing to pictures, or watching videos. Various outcome measures were used to evaluate communication behaviour including the CARS-BR, evaluation scales created by the researchers, PDDBI, ADOS, qualitative observations, and micro-evaluation of behaviour from video-recordings. Outcome evaluation was done by the researchers, music therapists, speech therapists, parents, teachers, school personnel, and trained evaluators.

The overall conclusion of this review is that music therapy may be effective in improving communication behaviours for children with autism. The majority of studies comparing the efficacy of music therapy to speech therapy found a significant improvement in communication behaviours from both approaches but

no significant difference between them. Therefore, music therapy may be as or more effective than speech therapy for treatment of children with autism.

Clinical Implications

The evidence presented in this study suggests that music has the potential to be an effective tool in the treatment of verbal expression and joint attention behaviours for children with autism. Due to the large variability in research design, method delivery of music therapy, and many limitations of the studies, results much be interpreted with caution. The research does suggest that music therapy offers the following benefits and specifications:

a) Verbal expression and imitation may increase significantly following music therapy and may generalize to novel words and situations as well as to more abstract concepts.
b) Joint attention behaviours may increase following music therapy. Eye contact and turn-taking increased across studies, and positive trends were noted for social acknowledgement, initiation, positive changes to the interaction, and symbolic play.
c) A small number of sessions may produce a positive effect.
d) Music therapy may assist non-verbal children to begin to use some verbal expression
e) Music therapy may be more effective than speech therapy alone for low functioning individuals. High functioning individuals can benefit from both conditions.
f) Children with echolalia may have greater gains in verbal expression following music therapy.
g) Tactile stimulation embedded in speech therapy may improve outcomes.
h) Tailoring musical presentation to the child by creating individualized songs or following a child-directed format may improve outcomes.

Across studies only gesturing and pointing did not increase following music therapy, even when this was emphasized in therapy. These skills may be addressed best using a more traditional language therapy approach.

Further research is required to examine the validity of embedding musical therapy techniques in speech therapy for children with autism. In addition, research defining the techniques that are most effective for each population is required.

As joint attention, imitation, and symbolic play have been shown to be the pivotal skills required for the acquisition of language (Paul, 2006), the positive increase in these behaviours demonstrates that music therapy is an effective tool for teaching the non-verbal student with autism. Overall the research offers evidence in favor of music therapy for improvements in verbal expression and joint attention. Therefore, including musical techniques in speech therapy may improve outcomes for children with autism.

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