

Treatment Intervention Advisory Committee Review and Determination

Date: June 29, 2018

To: Wisconsin Department of Health Services

From: Wisconsin Department of Health Services Treatment Intervention Advisory Committee:

Lana Collet-Klingenberg, Ph.D. (chairperson) *LCK*

RE: Determination of Music Therapy as a proven and effective treatment for children and adults

This is an initial review

This is a re-review. Previously reviewed (rated) on April 9, 2012, August 17, 2012 (4), November 2013 (3), July 2014 (3), July 2015 (3), and October 2016 (3).

No new research located; determination from month, year stands (details below)

Section One: Overview and Determination

Please find below a statement of our [determination](#) as to whether or not the committee views Music Therapy as a proven and effective treatment. In subsequent sections you will find documentation of our review process including a [description](#) of the proposed treatment, a [synopsis](#) of review findings, the [treatment review evidence checklist](#), and a listing of the [literature](#) considered. In reviewing treatments presented to us by the Department of Health Services, we implement a review process that carefully and fully considers all available information regarding a proposed treatment. Our determination is limited to a statement regarding how established a treatment is with regards to quality research. The committee does not make decisions regarding funding.

Description of proposed treatment

According to the Wisconsin Chapter for Music Therapy: “Music Therapy is the clinical and evidence-based use of music interventions to accomplish individualized goals within a therapeutic relationship by a credentialed professional who has completed an approved music therapy program (American Music Therapy Association definition, 2005).”~ quoted from the Wisconsin Chapter for Music Therapy website at <http://musictherapywisconsin.org/about-us/faqs-music-therapy-in-wi/>

Theory and method: Music therapy includes a wide range of procedures where music is central to the method (as when improvisational music is used) or peripheral (as when background music is played). These treatments are often explained in cognitive and/or neuropsych terms. For example, the Kalas (2012) article suggests that music affects the anterior and posterior attention systems, or may improve sensory integration by organizing sensory input, or as a motivator because they elicit [sic] attention and therefore facilitate social communication behaviors such as joint attention. However, empirical links between the music therapy methods and the theories used to describe them have not been established. For example, if neurological changes result from music therapy, then measuring them would create an important explanatory bridge between the causes (therapy) and effects (behavioral changes). There is a broad gap between the experimental foundations and the music therapy methods they are said to explain.

Generally speaking, the criteria for an empirically-based method requires empirical connections to theory used to explain it and the data said to result from it.

Synopsis of current review (June 2018)

Committee members completing current review of research base: Roger Bass and Shannon Stuart

Please refer to the reference list ([Section Four](#)) which details the reviewed research.

Our current literature review added additional studies to those previously found.

Bieleninik et al (2017), randomized a clinical trial of 364 children in 9 countries. They found that mean autism severity, as measured on the Autism Diagnostic Observation Schedule, social affect domain, over 5 months, was reduced from 14.08 to 13.23 in an improvisational music therapy group and from 13.49 to 12.58 in an enhanced standard care group, which included parent counseling and other available interventions. This is a nonsignificant mean difference of 0.06. Therefore, music therapy did not result in significant improvements in mean symptom scores compared with enhanced standard care.

Kalas (2012) used a 2x2 repeated measures factorial design (two levels of music—simple and complex; two levels of ASD—severe-vs-mild/moderate). The study found that joint attention was more likely to occur when simple music versus complex music was played in the background. 1. Joint attention was explained from a number of points of view but not behavior analytically despite extensive research in the area. 2. Complex music entailed more notes, more connected notes (triplets, for example), rhythms that were not strict 4/4 time, etc. These musical properties are not more complex in an of themselves, they are more or less likely to occasion attention as a function of their histories. That history determines the stimulus control, not the property of the stimulus. The child was not being asked to explain the differences between the musical examples. 3. No baselines were taken. A series of counterbalanced musical sequences (simple-vs-complex) were initiated without measuring beginning levels of stimulus control. So how much change occurred is unknown. In addition, each musical condition was presented for the same duration. There is no reason to assume that the same duration will have the same effect on all people. That is one of the inter-subject variability functions that music research needs to identify. That point has multiple implications but a key one is that the author's conclusion that music modality (simple/complex) was dependent on level of functioning may well not be true—it is likely histories that differ and what they are is far more difficult to ascertain than “level of severity” indicated by a standardized test. 4. The N of 15 is too small for parametric inferential statistics.

Mössler, K., Gold, C., Aßmus, J. et al. (2017). Mossler, Gold, et al found that when the quality of the relationship between therapists and children with autism, as measured by the Assessment of the Quality of Relationship (AQR) was high (strong engagement) children's social and communication skills increased, as measured by the Autism Diagnostic Observation Schedule (ADOS). Specifically, the Language and Communication sub-domain of the Social Affect Scale showed significant improvements in the high engagement condition at 5 months, though these faded somewhat at 12 months. SRS scores (parent ratings that assess symptoms of ASD social awareness, social information processing, capacity for reciprocal social communication, social anxiety/avoidance and autistic preoccupation and traits) also increased in conditions of high engagement. In sum, the therapeutic relationship predicted generalized

clinical changes of symptom severity in children with autism spectrum disorders. Five of the eight authors are clinically-trained music therapists. The AQR tool is designed for nonverbal children and may have limited use with children who have fluent language. Further, its use outside of Central European areas is limited and may not correspond to views in other parts of the world including the United States. Further, the observational design of this study brought about the limitation that the AQR match or mismatch rate was only observed, not manipulated experimentally.

Preis et al (2016) found that background music (classical, children's music, and Reggae) had no effect on the number of utterances and engagement of young children with ASD. This study stands out because nearly all the methodological criticisms mentioned in previous and the current review do not apply. It was a single-case alternating treatments design where inter- and intrasubject variability were plotted, treatment effects (or lack of in this case) were clear, and data collection directly measured targeted responses. This increased level of methodological rigor yielded results that were clearly inconsistent with group designs where extensive statistical analyses and post-hoc procedures were used to find a few small effects.

Porter et al. (2017) examined the efficacy of music therapy (MT) in clinical practice. Two hundred and fifty-one child (8–16 years, with social, emotional, behavioral and developmental difficulties) and parent dyads from six Child and Adolescent Mental Health Service community care facilities in Northern Ireland were randomised to 12 weekly sessions of MT plus usual care [n = 123; 76 in final analyses] or usual care alone [n = 128; 105 in final analyses]. Follow-up occurred at 13 weeks and 26 weeks postrandomisation. Primary outcome was improvement in communication (Social Skills Improvement System Rating Scales) (SSIS) at 13 weeks. They found no significant difference for the primary outcome (adjusted difference in mean 2.4; 95% CI -1.2 to 6.1; p = .19).

Schwartzberg and Silverman, M. J. (2016), used two independent groups designs. They implemented three days of reading a story or singing a story. The study found no differential effect. No difference between groups—singing-vs-stating story had no differential effect. In addition the vocabulary and retention were not balanced over groups (e.g., matching). Further, the control group's data (reading group) had increasing comprehension scores over the three days—the trend was up but the total number of days too short to confirm a trend. The singing story group was highly variable.

Simpson, Keen, and Lamb, J. (2015), focused on teaching receptive labelling to children ages 3-8 years with autism spectrum disorder. This study's independent variable was sung instructions versus spoken instructions. Both instructions were imbedded into a computer-assisted instructional system that was designed to teach receptive language skills. The dependent variable was receptive labeling. The study included 22 children with asd in a cross over design. Results found no significant differences in receptive language between the sung instruction and spoken instruction conditions.

Venuti, P., Bentenuto, A., Cainelli, S., Landi, I., Suvini, F., & Tancredi, R. et al. (2016), aimed to quantitatively verify whether: 1) children with ASD improve synchrony with their therapist during music therapy sessions, and 2) this ability persists in different structured contexts. They found that the amount of synchronic activity increased, with a significant difference from Session 1 to Session 20 in behavioral synchronicity and emotional attunement. The increase of synchronicity was confirmed at the end of the therapy cycle as measured by an interactive ADOS section. This study had no control sample

though which to demonstrate that the increase of synchrony effectively depends on improvisational music therapy rather than on the patient-therapist relationship. The study is also limited by a small sample size.

Zhin Zhi-Min Shi, et al (2016) completed a meta-analysis of Chinese publications from the last ten years. Six research articles were included in the meta-analysis. These articles reported randomized control trials, but they did not mention specific randomization and setting control methods. Further, only two articles described the number of withdrawal cases, which affected the quality of the meta-analysis results.

Committee's Determination: After reviewing the research and applying the criteria from the [Treatment Review Evidence Checklist](#), it is the decision of the committee that Music Therapy retain an efficacy rating of Level 3 - Emerging evidence (promising as a proven & effective treatment).

Review history (October 2016)

In the case of Music Therapy, please refer to the attached reference listing detailing the reviewed research. The committee's conclusions regarding Music Therapy include:

The published empirical literature on Improvisational Music Therapy continues to be emerging, given limitations involving experimental control, rater bias, and small samples. However, a recent Cochrane Review states that:

“The findings of this updated review provide evidence that music therapy may help children with ASD to improve their skills in primary outcome areas that constitute the core of the condition including social interaction, verbal communication, initiating behavior, and social-emotional reciprocity. Music therapy may also help to enhance non-verbal communication skills within the therapy context. Furthermore, in secondary outcome areas, music therapy may contribute to increasing social adaptation skills in children with ASD and to promoting the quality of parent-child relationships. In contrast to the studies included in an earlier version of this review published in 2006, the new studies included in this update enhanced the applicability of findings to clinical practice. More research using larger samples and generalized outcome measures is needed to corroborate these findings and to examine whether the effects of music therapy are enduring. When applying the results of this review to practice, it is important to note that the application of music therapy requires specialized academic and clinical training.”

The Cochrane Review notes that improvements in social interaction, initiating, social adaptation, and parent-child relationship due to this therapy were of moderate effect. As a result, Improvisational Music Therapy has continued to develop empirical support towards being considered an established or well-established treatment for children and adolescents with Autism Spectrum Disorder or with other developmental disabilities.

Further, the National Standards Project (NSP), in its most recent review, continues to list Music Therapy as an Emerging treatment. The National Professional Development Center's most recent review also continues to not list Music Therapy as an Evidence Based practice, but as a practice with “Some

Support” (one level down, in agreement with the NSP). Therefore, these two national standards rating projects are in agreement about Music Therapy as a practice with an Emerging evidence base.

One new single case design study and one new group design study were found for this review. Although the single case study (Vaiouli, 2015) had good results of music therapy on eye contact and joint attention, the therapist was also the first author of the paper. The group design study (Ghasemtabar et al., 2015) showed small effects on social skills via parent ratings, which is potentially a bias limitation. Given these results and the reviews from national standards ratings, it is the decision of the committee that Music Therapy remain at a Level 3 treatment with Emerging Evidence (DHS 107 –Promising as a Proven & Effective Treatment).

(July 2015)

The published empirical literature on Improvisational Music Therapy continues to be problematic given limitations involving lack of empirical studies (versus case reports), detailed subject characteristics, treatment integrity data, experimental control, and maintenance data. Furthermore, rater bias and small samples sizes negatively impacting test power continue to plague research on music therapy as a treatment for children with autism and other developmental disabilities. Multiple recent reviews and meta-analyses (Geretsegger et al., 2014; James et al., 2014; Simpson & Keen, 2009) of the Music Therapy literature state that music therapy research must focus on increasing sample sizes, improving experimental control, and assessing the efficacy of specific music therapy applications. As a result, Improvisational Music Therapy continues to not have sufficient empirical support to be considered an established or well-established treatment for children and adolescents with Autism Spectrum Disorder or with other developmental disabilities.

In sum, it is the decision of the committee that Music Therapy remains a Level 3 treatment with Emerging Evidence (DHS 107 – Promising as a Proven & Effective Treatment)

(July 2014)

The published empirical literature on Improvisational Music Therapy continues to be problematic given limitations involving lack of empirical studies (versus case reports), detailed subject characteristics, treatment integrity data, experimental control, and maintenance data. Furthermore, rater bias and small samples sizes negatively impacting test power plague research on music therapy as a treatment for children with autism. Whipple’s (2012) most recent review of the Music Therapy literature stated that music therapy research must focus on increasing sample sizes and assessing the efficacy of specific music therapy applications. As a result, Improvisational Music Therapy does not have sufficient empirical support to be considered an established or well established treatment for children and adolescents on the Autism Spectrum.

The Committee recommends retaining Music Therapy at Level 3-Emerging evidence (promising as a proven & effective treatment).

(November 2013)

The published empirical literature on improvisational music therapy continues to be problematic given limitations involving lack of empirical studies (versus case reports), detailed subject characteristics, treatment integrity data, experimental control, and maintenance data. Furthermore, rater bias and small samples sizes negatively impacting test power plague research on music therapy as a treatment for

children with autism. Whipple's (2012) most recent review of the music therapy literature stated that music therapy research must focus on increasing sample sizes and assessing the efficacy of specific music therapy applications. As a result, improvisational music therapy does not have sufficient empirical support to be considered an established or well-established treatment for children and adolescents on the Autism Spectrum. The outcomes of another study (Lai, Pantazatos, Schneider & Hirsch, 2011), described in a manuscript sent to the TIAC on November 15, 2013, support the hypothesis that, for children with autism, functional brain systems that are thought to process speech and song are more active for song than for speech. The paper does not conclude that music therapy, as an intervention, is either efficacious or effective. In fact, the last sentence of the manuscript suggests that future research should evaluate systematically varying "musical and linguistic properties" to further evaluate the hypothesis. In sum, the study provides additional theoretical support for using music therapy to improve language in children with autism but does not evaluate music therapy as an intervention. In addition, the dependent variables are not necessarily related to the functional impairments associated with autism. In summary, continued reviews of the music therapy literature continue to find that most of the extant research is translational - building theories about how the basic research can inform practice. Much of the research is being done with more general populations, but even those that use participants with autism, do not imply that the procedures are, in fact, an intervention and the dependent variables are not intervention outcome variables (e.g., frequency of utterances during social interaction) that can substantially support learner gains related to behavior, communication or social skills.

In sum, our re-review of music therapy as an intervention for children with autism spectrum disorder (ASD) finds it to have emerging evidence (DHS 107 – Promising as a Proven & Effective Treatment). Specifically, the practice of improvisational music therapy has emerging empirical support based on the following:

- The National Autism Center's National Standards Project classified music therapy as an emerging treatment that may produce favorable outcomes but requires additional high quality studies to be considered proven and effective.
- There exists one published high quality group design study that demonstrates the effectiveness of improvisational music therapy on initiation of engagement behavior and compliance with therapists' interpersonal demands when compared to toy play therapy (Kim, Wigram, & Gold, 2009).
- There is also research suggesting Auditory-Motor Mapping Training (Wan, Banzen, Baars, Libenson, Zipse, et al., 2011), Developmental Speech and Language Training Through Music (Lim, 2010), and Music Therapy incorporated with Applied Behavior Analysis Verbal Behavior Approach (Lim & Draper, 2011) have emerging evidence as treatments of children with ASD.

Please note that all of these published treatment studies were conducted with children not adolescents. Furthermore, improvisational music therapy was found to be effective when targeting initiation of engagement behavior (e.g., spontaneously interacts with therapist, initiates a change during ongoing interactions with therapist) and responding and complying with therapist initiation of interactions. A letter of testimony by Dr. Dale Taylor included a reference list of 18 publications with a short description of how music is believed to impact brain functioning and which functional tasks are affected. However, the studies listed are neural imaging studies and do not have functional outcomes, i.e, they do not include dependent variables that are specific functional, observable and measurable behaviors or skills. Thus, the reader can only conclude that while the publications referenced represent the theory and some evidence of neuroplasticity research in the area of music and its effect on the brain, that at this

time they do not qualify as high quality research directly related to target behaviors such as communication, social or behavior skills. It is further noted that none of the studies in the list included individuals with developmental disabilities and a number of the publications were chapters in books dedicated to theory or practice and not actually research. Dr. Taylor's document of testimony is attached to this review summary.

(August 2012)

In reviewing treatments presented to us by DHS/DLTC, we implemented a review process that began with defining the proposed treatment and then considered extant research in terms of how specific the research was to the proposed practice, who funded/conducted the research, and how much research was available that reviewed the practice.

We began by reviewing two published meta-analysis (Gold, Wigram & Elefant, 2010; Whipple, 2004) and one published narrative review paper (i.e., Accordino, Comer, & Heller, 2007) on Music Therapy for children and adolescents with ASD. While Whipple (2004) and Gold et al (2010) concluded that music interventions could be effective at improving the social behavior, communication, and cognitive skills of children with autism, only three of the studies were published in peer reviewed journals (Whipple, 2004) or met criteria for a randomized controlled study (Gold et al, 2010). Gold et al (2010) reported for the Cochrane Library review that small sample size, crossover designs and the measurement of only short term outcomes reduced the quality of the three studies that met the minimum criteria for review of an evidence base. Of the three, two studies included music in the context of other established interventions (i.e., putting social stories to music, using music as reinforcement for participation in sessions) and the third study was a case study (i.e., one participant). Accordino et al. (2007) completed perhaps the most comprehensive review of Music Therapy for children with ASD and concluded that limitations within the literature make it difficult to determine the overall effectiveness of music therapy as an intervention.

Our own review of the literature on Music Therapy as an intervention for children and adolescents with ASD is generally consistent with Accordino et al. (2007). We found that a lack of empirical studies (versus case reports), identification of specific participant characteristics, treatment integrity and interrater reliability data, experimental control, and rater bias make it difficult to establish Music Therapy's effectiveness. Furthermore, the literature on Music Therapy as a treatment for children and adolescents with ASD offers varying definitions and intervention protocols. For example, much of the published research on Music Therapy examines the use of music with other, more established treatments such as using individually composed songs to prompt children with ASD to better transition to their preschool classroom in the morning. This inconsistency in intervention procedures across studies poses challenges when evaluating the entire literature. Finally, perhaps the two most methodologically sound studies we reviewed did not show statistically significant results. Kim (2008) found results from standardized measures in a RCT study that favored music therapy over a play condition when measuring joint attention behaviors of 13 children between the ages of 3-5 with ASD, but the results were not significant. Gattino, dos, Santos Riesgo, Longo, Leite, & Faccini (2011) found that a Relational Music Therapy intervention did not show statistical significance between pre- and post-test measures of verbal, nonverbal, and social communication of 12 children with ASD when compared to a standard treatment group.

In sum, given the existing problems with the quality of the Music Therapy literature and the lack of empirical support for Music Therapy as an intervention for children and adolescents with ASD, it is our decision that Music Therapy has insufficient evidence at this time to be considered a proven and effective treatment. While we do not believe Music Therapy is a harmful practice, at this time, this committee considers it an experimental practice.

Section Two: Rationale for Focus on Research Specific to Comprehensive Treatment Packages (CTP) or Models

In the professional literature, there are two classifications of interventions for individuals with Autism Spectrum Disorder (National Research Council, 2001; Odom et al., 2003; Rogers & Vismara, 2008):

- (a) **Focused intervention techniques** are individual practices or strategies (such as positive reinforcement) designed to produce a specific behavioral or developmental outcome, and
- (b) **Comprehensive treatment models** are “packages” or programs that consist of a set of practices or multiple techniques designed to achieve a broader learning or developmental impact.

To determine whether a treatment package is proven and effective, the Treatment Intervention Advisory Committee (TIAC) will adopt the following perspective as recommended by Odom et al. (2010):

The individual, focused intervention techniques that make up a comprehensive treatment model may be evidence-based. The research supporting the effectiveness of separate, individual components, however, does *not* constitute an evaluation of the comprehensive treatment model or “package.” The TIAC will consider and review only research that has evaluated the efficacy of implementing the comprehensive treatment *as a package*. Such packages are most often identifiable in the literature by a consistently used name or label.

National Research Council. (2001). *Educating children with autism*. Washington, DC: National Academy Press.

Odom, S. L., Brown, W. H., Frey, T., Karusu, N., Smith-Carter, L., & Strain, P. (2003) Evidence-based practices for young children with autism: Evidence from single-subject research design. *Focus on Autism and Other Developmental Disabilities, 18*, 176-181.

Odom, S. L., Boyd, B. A., Hall, L. J., & Hume, K. (2010). Evaluation of comprehensive treatment models for individuals with Autism Spectrum Disorders. *Journal of Autism and Developmental Disorders, 40*, 425-436.

Rogers, S., & Vismara, L. (2008). Evidence-based comprehensive treatments for early autism. *Journal of Clinical Child and Adolescent Psychology, 37*, 8-38.

Section Three: TIAC Treatment Review Evidence Checklist

Name of Treatment: **treatment modality to be reviewed**

Level 1- Well Established or Strong Evidence (DHS 107 - Proven & Effective Treatment)

- Other authoritative bodies that have conducted extensive literature reviews of related treatments (e.g., National Standards Project, National Professional Development Center) have approved of or rated the treatment package as having a strong evidence base; authorities are in agreement about the level of evidence.
- There exist ample high quality studies that demonstrate experimental control and favorable outcomes of treatment package.
 - Minimum of two group studies or five single subject studies or a combination of the two.
 - Studies were conducted across at least two independent research groups.
 - Studies were published in peer reviewed journals.
- There is a published procedures manual for the treatment, or treatment implementation is clearly defined (i.e., replicable) within the studies.
- Participants (i.e., N) are clearly identified as individuals with autism spectrum disorders or developmental disabilities.

Notes: At this level, include ages of participants and disabilities identified in body of research

Level 2 – Established or Moderate Evidence (DHS 107 - Proven & Effective Treatment)

- Other authoritative bodies that have conducted extensive literature reviews of related treatments (e.g., National Standards Project, NPDC) have approved of or rated the treatment package as having at least a minimal evidence base; authorities may not be in agreement about the level of evidence.
- There exist at least two high quality studies that demonstrate experimental control and favorable outcomes of treatment package.
 - Minimum of one group study or two single subject studies or a combination of the two.
 - Studies were conducted by someone other than the creator/provider of the treatment.
 - Studies were published in peer reviewed journals.
- Participants (i.e., N) are clearly identified as individuals with autism spectrum disorders or developmental disabilities.

Notes: **at this level, include ages of participants and disabilities identified in body of research**

Level 3 – Emerging Evidence (DHS 107 – Promising as a Proven & Effective Treatment)

- Other authoritative bodies that have conducted extensive literature reviews of related treatments (e.g., National Standards Project, NPDC) have recognized the treatment package as having an emerging evidence base; authorities may not be in agreement about the level of evidence.
- There exists at least one high quality study that demonstrates experimental control and favorable outcomes of treatment package.
 - May be one group study or single subject study.
 - Study was conducted by someone other than the creator/provider of the treatment.
 - Study was published in peer reviewed journal.
- Participants (i.e., N) are clearly identified as individuals with autism spectrum disorders or developmental disabilities.

Notes: (July 2015) 3-5 year olds with ASD; (November 2013) children diagnosed with autism aged between 3 and 5 years old

Level 4 – Insufficient Evidence (Experimental Treatment)

- Other authoritative bodies that have conducted extensive literature reviews of related treatments (e.g., National Standards Project, NPDC) have not recognized the treatment package as having an emerging evidence base; authorities are in agreement about the level of evidence.
- There is not at least one high quality study that demonstrates experimental control and favorable outcomes of treatment package.
 - Study was conducted by the creator/provider of the treatment.
 - Study was not published in a peer reviewed journal.
- Participants (i.e., N) are not clearly identified as individuals with autism spectrum disorders or developmental disabilities.

Notes:

Level 5 – Untested (Experimental Treatment) &/or Potentially Harmful

- Other authoritative bodies that have conducted extensive literature reviews of related treatments (e.g., National Standards Project, NPDC) have not recognized the treatment package as having an emerging evidence base; authorities are in agreement about the level of evidence.
- There are no published studies supporting the proposed treatment package.
- There exists evidence that the treatment package is potentially harmful.**
 - Authoritative bodies have expressed concern regarding safety/outcomes.
 - Professional bodies (i.e., organizations or certifying bodies) have created statements regarding safety/outcomes.

Notes: At this level, please specify if the treatment is reported to be potentially harmful, providing documentation

References Supporting Identification of Evidence Levels:

Chambless, D.L., Hollon, S.D. (1998). Defining empirically supported therapies. *Journal of Consulting and Clinical Psychology, 66*(1) 7-18.

Chorpita, B.F. (2003). The frontier of evidence-based practice. In A.E. Kazdin & J.R. Weisz (Eds.). *Evidence-based psychotherapies for children and adolescents* (pp. 42-59). New York: The Guilford Press.

Odom, S. L., Collet-Klingenberg, L., Rogers, S. J., & Hatton, D. (2010). Evidence-based practices in interventions for children and youth with autism spectrum disorders. *Preventing School Failure, 54*(4), 275-282.

Section Four: Literature Review

Literature reviewed for current determination:

- Bieleninik, L, Geretsegger, M, et al. (2017). Effects of improvisational music therapy vs enhanced standard care on symptom severity among children with autism spectrum disorder. *Journal of the American Medical Association*, 318(6), 525-535.
- Kalas, A. (2012). Joint attention responses of children with autism spectrum disorder to simple versus complex music. *Journal of Music Therapy*, 430-452.
- Mössler, K., Gold, C., Aßmus, J. et al. (2017). The therapeutic relationship as predictor of change in music therapy with young children with autism spectrum disorder. *Journal of Autism Developmental Disorders*. <https://doi.org/10.1007/s10803-017-3306>
- Porter, S., McConnell, T., McLaughlin, K., et al. (2017). Music therapy for children and adolescents with behavioral and emotional problems: A randomized controlled trial. *Journal of Child Psychology and Psychiatry*, 58(5), 586-594.
- Preis, J., Amon, R., Robinette, D.S., Rozegar, A. (2016). Does music matter? The effects of background music on verbal expression and engagement in children with autism spectrum disorders. *Music Therapy Perspectives*, 34(1), 106-115.
- Schwartzberg E.T., Silverman, M. J. (2016). Effects of a music-based short story on short- and long-term reading comprehension of individuals with Autism Spectrum Disorder: A cluster randomized study, *The Arts in Psychotherapy*, 48, 54-61.
- Simpson K., Keen, D., Lamb, J. (2015). Teaching receptive labelling to children with autism spectrum disorder: A comparative study using infant-directed song and infant-directed speech. *Journal of Intellectual & Developmental Disability*, 40(2), 126-136. <http://dx.doi.org/10.3109/13668250.2015.1014026>
- Venuti, P., Bentenuto, A., Cainelli, S., Landi, I., Suvini, F., & Tancredi, R. et al. (2016). A joint behavioral and emotive analysis of synchrony in music therapy of children with autism spectrum disorders. *Health Psychology Report*, 5(2), 162-172. <https://doi.org/10.5114/hpr.2017.63985>.

Literature reviewed for previous determinations:

- Accordino, R., Comer, R., & Heller, W.B. (2007). Searching for music's potential: A critical examination of research on music therapy with individuals with autism. *Research in Autism Spectrum Disorders*, 1, 101-115.
- Aldridge, D., Gustorff, D., & Neugebauer, L. (1995). A preliminary study of creative music therapy in the treatment of children with developmental delay. *The Arts in Psychotherapy*, 22, 189-205.

Boso, M., Emanuele, E., Minazzi, V., Abbamonte, M., & Politi, P. (2007). Effect of long-term interactive music therapy on behavior profile and musical skills in young adults with severe autism. *The Journal of Alternative and Complementary Medicine*, 12(7), 709-712.

Brownell, M.D. (2002). Musically adapted social stories to modify behaviors in students with autism: Four case studies. *Journal of Music Therapy*, 39, 117-144.

Carnahan, C., Basham, J., & Musti-Rao, S. (2009b). A low-technology strategy for increasing engagement of students with autism and significant learning needs. *Exceptionality*, 17(2), 76-87. (music therapy not employed- books had music or not)

Carnahan, C., Musti-Rao, S., & Bailey, J. (2009a). Promoting active engagement in small group learning experiences for students with autism and significant learning needs. *Education and Treatment of Children*, 32(1), 37-61. (music therapy not employed- books had music or not)

*DePape, A., Hall, G., Tillman, B., Trainor, L. (2012). Auditory processing in High-functioning adolescents with ASD. *PLoS ONE* 7(9): e444084. doi:10.1371/journal.pone0044084 (music therapy not employed- research study of music processing differences)

Edgerton, C.L. (1994). The effects of improvisational music therapy on the communicative behaviors of autistic children. *Journal of Music Therapy*, 31(1), 81-93.

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.

Gattino, G.S., dos Santos Riesgo, R., Longo, D., Leite, J.C.L., & Faccini, L.S. (2011). Effects of relational music therapy on communication of children with autism: A randomized controlled study. *Nordic Journal of Music Therapy*, 20, 142-154.

*Geretsegger, M., Elefant, C., Mössler, K. A., & Gold, C. (2014). Music therapy for people with autism spectrum disorder. *The Cochrane Library*. (review paper/meta-analysis of previous studies covered in this and prior reviews, and thus does not fulfill the criteria to be individually reviewed here)

Geretsegger, M., Holck, U., Bieleninik, L., & Gold, C. (2016). Feasibility of a Trial on Improvisational Music Therapy for Children with Autism Spectrum Disorder. *Journal of Music Therapy*, thv038. (no outcome data reported)

Geretsegger, M., Holck, U., Carpena, J. A., Elefant, C., Kim, J., & Gold, C. (2015). Common characteristics of improvisational approaches in music therapy for children with autism spectrum disorder: Developing treatment guidelines. *Journal of music therapy*, 52(2), 258-281. (no outcome data reported)

Geretsegger, M., Holck, U., & Gold, C. (2012). Randomised controlled trial of improvisational music therapy's effectiveness for children with autism spectrum disorders (TIME-A): study protocol. *BMC Pediatrics*, 12(1), 2. (no research provided- study outline only)

#Ghasemtabar, S. N., Hosseini, M., Fayyaz, I., Arab, S., Naghashian, H., & Poudineh, Z. (2015). Music therapy: An effective approach in improving social skills of children with autism. *Advanced biomedical research*, 4.

Gold, C. Wigram, T., & Elefant, C. (2010). *Music therapy for autism spectrum disorder*. The Cochrane Collaboration. JohnWiley & Sons, Ltd.

Gooding, L.F. (2011). The effects of a music therapy social skills training program on improving social competence in children and adolescents with social skills deficits. *Journal of Music Therapy*, 48 440-162.

*Hardy, M. W., & LaGasse, A. B. (2013). Rhythm, movement, and autism: using rhythmic rehabilitation research as a model for autism. *Frontiers in Integrative Neuroscience*, 7. (music therapy not employed-theory paper)

James, R., Sigafoos, J., Green, V. A., Lancioni, G. E., O'Reilly, M. F., Lang, R., ... & Marschik, P. B. (2014). Music therapy for individuals with Autism Spectrum Disorder: A systematic review. *Journal of Autism and Developmental Disorders*, 2(1), 39-54. (review paper)

Kaplan, R.S., & Steele, A.L. (2005). An analysis of music therapy program goals and outcomes for clients with diagnoses on the Autism Spectrum. *Journal of Music Therapy*, 42(1), 2-19.

Katagiri, J. (2009). The effect of background music and song texts on the emotional understanding of children with autism. *Journal of Music Therapy*, 46, 15-31.

Kern, P., Wakeford, L., & Aldridge, D (2007). Improving the performance of a young child with autism during self-care tasks using embedded song interventions: A case study. *Music Therapy Perspectives*, 25 (1), 43-51.

Kern, P., Wolery, M., & Aldridge, D. (2007). Use of songs to promote independence in morning greeting routines for young children with autism. *Journal of Autism and Developmental Disorders*, 37, 1264-1271.

***Kern, P., & Aldridge, D. (2006). Using embedded music therapy interventions to support outdoor play of young children with autism in an inclusive community-based child care program. *Journal of Music Therapy*, 43(4), 270-294.

Kern, P., Rivera, N. R., Chandler, A., & Humpal, M. (2013). Music therapy services for individuals with autism spectrum disorder: A survey of clinical practices and training needs. *Journal of Music Therapy*, 50(4), 274-303. (review paper)

***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 and Developmental Disorders*, 38, 1758-1766.

Kim, J., Wigram, T., & Gold, C. (2009). Emotional, motivational, and interpersonal responsiveness of children with autism in improvisational music therapy. *Autism*, 13(4), 389-409.

*#LaGasse, A. B. (2014). Effects of a music therapy group intervention on enhancing social skills in children with autism. *Journal of Music Therapy*, 51(3), 250-275.

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 (1), 2-26.

Lim, H.A. (2010) Use of music in the applied behavioral analysis verbal behavior approach for children with autism spectrum disorders. *Music Therapy Perspectives*, 28(2), 95-105.

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(4), 532-550.

**Lundqvist, L., Andersson, G., Viding, J. (2009). Effects of vibroacoustic music on challenging behaviors in individuals with autism and developmental disabilities. *Research in Autism Spectrum Disorders*, 3, 390-400.

*Quintin, E. M., Bhatara, A., Poissant, H., Fombonne, E., & Levitin, D. J. (2013). Processing of musical structure by high-functioning adolescents with autism spectrum disorders. *Child Neuropsychology*, 19(3), 250-275. (music therapy not employed- research study of music processing differences)

*Rossignol, D. A. (2009). Novel and emerging treatments for autism spectrum disorders: A systematic review. *Ann Clin Psychiatry*, 21(4), 213-36. (review paper)

Schwartzberg, E. T., & Silverman, M. J. (2013). Effects of music-based social stories on comprehension and generalization of social skills in children with autism spectrum disorders: A randomized effectiveness study. *The Arts in Psychotherapy*, 40(3), 331-337. (music therapy not employed- social stories sung or spoken)

*Sharda, M., Midha, R., Malik, S., Mukerji, S., & Singh, N. C. (2015). Fronto-Temporal connectivity is preserved during sung but not spoken word listening, across the Autism Spectrum. *Autism Research*, 8(2), 174-186. (music therapy not employed- research study of neural music processing differences)

Silverman, M.J. (2008). Nonverbal communication, music therapy, and autism: A review of the literature and case example. *Journal of Creativity in Mental Health*, 3, 3-19.

Simpson, K., & Keen, D. (2011). Music interventions for children with autism: narrative review of the literature. *Journal of autism and developmental disorders*, 41(11), 1507-1514. (review paper)

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(12), 1489-1496. (music therapy not employed- directions were sung or spoken)

Sorel, S. (2010). Presenting Carly and Elliot: Exploring roles and relationships in a mother-son dyad in Nordoff-Robbins music therapy. *Qualitative Inquiries in Music Therapy*, 5, 173-238.

Srinivasan, S. M., & Bhat, A. N. (2013). A review of “music and movement” therapies for children with autism: embodied interventions for multisystem development. *Frontiers in Integrative Neuroscience*, 7. (review paper)

Standley, J.M. (1996). A meta-analysis on the effects of music as reinforcement for education/therapy objectives. *Journal of Research in Music Education*, 44, 105-133.

*Stegemöller, E. L. (2014). Exploring a neuroplasticity model of music therapy. *Journal of Music Therapy*, 51(3), 211-227. (music therapy not employed- theory paper)

#Thompson, G. A., McFerran, K. S., & Gold, C. (2013). Family-centered music therapy to promote social engagement in young children with severe autism spectrum disorder: A randomized controlled study. *Child: Care, Health, and Development*, 40, 840-852. doi:10.1111/cch.12121

#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.

Walworth, D.D. (2007). The use of music therapy with the SCERTS Model for children with autism spectrum disorders. *Journal of Music Therapy*, 45(1), 2-22.

Wan, C.Y., Bazen, L., Baars, R., Libenson, A., Zipse, L., et al. (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.

Whipple, J. (2004). Music in intervention for children and adolescents with autism: A meta-analysis. *Journal of Music Therapy*, 41, 90-106.

Whipple, J. (2012). Music therapy as an effective treatment for young children with autism spectrum disorders: A meta-analysis. In P. Kern & M. Humpal (Eds.) *Early Childhood Music Therapy and Autism Spectrum Disorders* (pp 58-76). London: Jessica Kingsley Publishers.

*Whipple, C. M., Gfeller, K., Driscoll, V., Oleson, J., & McGregor, K. (2015). Do communication disorders extend to musical messages? An answer from children with Hearing Loss or Autism Spectrum Disorders. *Journal of Music Therapy*, 52(1), 78-116. (music therapy not employed- research study of music processing differences)

Wigram, T. & Gold, C. (2006). Music therapy in the assessment and treatment of autistic spectrum disorders: Clinical application and research evidence. *Child: Care, Health and Development*, 32(5), 535-542.

Wimporoy, 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 and Developmental Disorders*, 25(5), 541-552.

* These studies were brought to our attention in an email dated 6/4/15 by Laurie Farnan, MMT, MT-BC, WMTR, on behalf of the AMTA Wisconsin Chapter for Music Therapy in which she asked for our review and conclusions on these 9 articles. Only one from these nine met criteria for a full review checklist.

** These studies were brought to our attention in an email dated 4/23/14 by Laurie Farnan, MMT, MT-BC, WMTR, Retired Senior Therapist, DHS, on behalf of the AMTA Wisconsin Chapter for Music Therapy in which she asked for our review and conclusions about these three articles. Two of these met criteria for a full review checklist, although one of the two (Kim et al, 2008) was questionable due to attrition and failure to clearly report reliability of outcome measures.

#These studies met criteria for a full review checklist.