

## THE EFFECTIVENESS OF MUSIC THERAPY IN AUTISM SPECTRUM DISORDER: A LITERATURE REVIEW

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*Este trabajo incluye una revisión de la literatura existente sobre intervenciones en musicoterapia en personas con Trastorno de Espectro Autista (TEA) con el objetivo de analizar el grado de efectividad de estas intervenciones. Para llevar a cabo esta revisión, se realizó una búsqueda bibliográfica en las bases de datos pertinentes, y considerando los criterios de inclusión delimitados se incluyeron un total de 18 estudios, cuyos resultados han sido analizados. En 11 de las 18 intervenciones se obtienen mejoras estadísticamente significativas, mientras que en las 7 intervenciones restantes, o bien la mejoría no alcanza la significación estadística, o bien existe algún tipo de limitación en cuanto a la efectividad de la intervención en evaluaciones de seguimiento. Considerando estos resultados se concluye que la musicoterapia puede llegar a convertirse en una práctica prometedora para mejorar la comunicación e interacción social de las personas con TEA. Sin embargo, todavía es necesario un mayor volumen de investigación para aclarar qué tipo de intervenciones y en qué ámbitos del espectro autista en concreto son realmente eficaces estas intervenciones.*

**Palabras clave:** Autismo, Intervención, Musicoterapia, Revisión bibliográfica, TEA.

*This work includes a review of the literature on music therapy interventions with people with Autism Spectrum Disorder (ASD) in order to analyse the degree of effectiveness of these interventions. To conduct this review, a literature search of the relevant databases was performed and, with the inclusion criteria defined, a total of 18 studies were analysed. In 11 of the 18 interventions, statistically significant improvements were obtained, while in the remaining 7 interventions, the improvement did not reach statistical significance, or there was a limitation to the intervention effectiveness in follow-up evaluations. Considering these results, we conclude that music therapy may become a promising practice for improving the communication and social interaction of people with ASD. However, a greater volume of research is still needed to clarify the type of interventions and the areas of the autism spectrum disorder in which these interventions are actually effective.*

**Key words:** ASD, Autism, Intervention, Literature review, Music therapy.

**T**he latest edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5, APA, 2013), conceptualises autistic spectrum disorder (ASD) as a neurodevelopmental disorder characterised by persistent deficits in communication and social interaction and the possible presence of restricted and repetitive patterns of behaviour, interests or activities.

Different types of interventions have been used in the treatment of ASD. One of these intervention strategies explored in recent years to improve the characteristic deficits of people with ASD with regards to communication and social interaction is music therapy, which uses music for therapeutic purposes. This technique allows us to open communication channels, to facilitate the socialisation of these individuals and improve their quality of life.

According to the World Federation of Music Therapy

(WFMT), this technique uses music and its elements professionally as an intervention in medical, educational and everyday environments with individuals, groups, families or communities seeking to optimise their quality of life and improve their physical, social, communicative, emotional, and intellectual well-being, in addition to their spiritual health (WFMT, 2011).

The American Music Therapy Association (AMTA), more specifically, defines music therapy as the clinical and evidence-based use of musical interventions to achieve individualised goals within a therapeutic relationship by a credentialed professional. This association indicates that it is an established healthcare profession, in which music is used within a therapeutic relationship to address the physical, emotional, cognitive and social needs of individuals. In the same vein, Professor Benenson (2000) describes music therapy as a type of psychotherapy that uses sound, music, and body-sound-music instruments to establish a relationship between the music therapist and the patient, through which the quality of life is improved

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and the patient recovers and is rehabilitated into society (p.25).

As for the therapeutic effects, as well as improving quality of life at the individual level, Benenzon (2000) points out the possibility that with the use of music therapy it is also possible to improve the family environment. The author claims that the family environment of a child with autism has a disturbed communication system with this child, since its code, signals and messages are distorted and stereotypes are formed, which the author called "communication cysts". According to Benenzon (2000), working in a non-verbal context (with music therapy techniques), the family is able to deconstruct this system and restructure the "communication cysts".

Recent research, such as the meta-analysis by Whipple (2004), in which the results of 9 quantitative studies evaluating the effects of music therapy in people with ASD are synthesised, has shown that this can be considered an effective treatment in developing communication, interpersonal and personal responsibility, and playing skills. In the same vein, Gold, Wigram and Elefant (2006), who reviewed the effectiveness of music therapy in a total of 24 children with ASD between 2 and 9 years old, showed that music therapy has positive effects on the non-verbal communication, gestural communication and verbal communication of these children. Positive results have also been reported with adult population in terms of communication, social skills and behavioural changes (Accordino, Comer & Heller, 2007).

Recent revisions, such as the one by Geretsegger, Elefant, Mössler and Gold (2014) which includes 10 studies with a total of 165 participants with ASD, have reported satisfactory results, as the results indicate that music therapy not only improves social interaction, nonverbal and verbal skills, social and emotional reciprocity, but also the quality of relations between parents and children. The review by James et al. (2015), which includes 12 published studies with a total of 147 participants with ASD between the ages of 3 and 38, also found that after an intervention based on music therapy a decrease in undesirable behaviour occurred, social interaction was promoted, and there was an improvement in independent functioning, understanding emotions, and communication.

All the aforementioned studies suggest that music-therapy is a promising practice for improving the quality of life of people with ASD. However, it is worth considering that empirical studies on this topic are still

scarce, hence the importance of continuing to carry out research into the effectiveness of this promising intervention.

The main objective of this study is to analyse the degree of effectiveness of music therapy interventions in people with ASD. For this, a review has been carried out of the empirical studies published in the last fifteen years.

We believe that this review is an extension of the conclusions of the reviews carried out in recent studies of the same nature (Geretsegger et al, 2014; James et al, 2015), in that it extends the article search to the year 2015 (the previous reviews extended until 2012), and complemented the database search with manual searches in different specialised music therapy journals that were not used in the previous reviews. As a result, this review has included a significantly higher number of studies than the previous reviews (18 investigations compared with the 10 reviewed by Geretsegger et al., 2014 and the 12 analysed by James et al., 2015).

## METHOD

The following databases were used in performing the literature search: PsycINFO, ERIC and Google Scholar using the keywords: "music therapy", "intervention", "autism". To narrow the search and obtain a reasonable number of results, we restricted the search using filters and Boolean operators (Y/AND, O/OR and NO/NOT). In addition to the databases, a manual search was conducted in the following publications: *Journal of Music Therapy*, *Nordic Journal of Music Therapy*, *Music Therapy Perspectives*, *Autism*.

The articles included in this review were selected taking into account the following inclusion criteria:

- ✓ Search limited to the period between 2000 and 2015.
- ✓ Empirical articles published in Spanish or English.
- ✓ The inclusion of samples with ASD diagnoses.

Of all of the articles located, we eliminated the following:

- ✓ Articles that were not empirical studies.
- ✓ Ones where the intervention used did not have music as a central element.
- ✓ Studies that had participants with no ASD diagnosis or the diagnosis was not specified.

After performing the literature search described, 18 articles were selected. The total number of participants with ASD in this theoretical review is 274, of which 233 are males and 41 are females; all aged between 2-49 years old.



**RESULTS**

All of the information from the 18 selected items is included in Table 1. This table includes the authors of the study and year of publication, objectives, participant characteristics (age, sex, diagnosis), assessment tools, intervention/method, context, implementer and results.

The literature shows that many of the affected areas in children with ASD can be enhanced with music therapy interventions. It can be seen that each of the studies is focused on improving or evaluating different areas. Out of the 18 studies included in this review, three of them are focused on improving the behavioural profile and autistic behaviours (Boso et al., 2007; Brownell, 2002; Mateos-Moreno & Atencia-Doña, 2013), two on improving emotional understanding and engagement (Katagiri, 2009; Kim et al, 2009), four are focused on improving or increasing social skills (Finnigan & Starr, 2010; Kim et al, 2008; Pasiali, 2004; Schwartzberg & Silverman, 2013),

two of them aim to improve independent functioning (Kern et al, 2007a; Kern et al, 2007b), five are focused on improving communication skills (Farmer, 2003; Gattino et al, 2011; Kaplan & Steele, 2005; Lim, 2010; Lim & Draper, 2011), one on improving peer interactions (Kern & Aldridge, 2006), and another on examining the effects of group music therapy intervention on eye gaze, joint attention and communication (LaGasse, 2014).

As for the type of intervention used, out of the 18 studies, three were based solely on singing original or modified songs (Kern et al, 2007a; Kern et al, 2007b; Lim & Draper, 2011), one used composed songs recorded on video, which the participants watched during the intervention (Lim, 2010), another used composed songs and recordings as background music (Katagiri, 2009), another seven were based on singing, either original songs or modified/adapted songs and playing musical instruments (Boso et al., 2007; Farmer, 2003; Finnigan &

**TABLE 1**  
**ITEMS INCLUDED IN THE REVIEW**

Authors (year)	Objectives	N (age, sex, diagnosis)	Instruments	Intervention/Context and implementer	Design	Results
Boso, Emanuele, Minazzi, Abbamonte & Politi (2007)	To investigate whether music therapy could improve the behavioural profile and musical skills of young people affected by severe autism.	8 (7 males and 1 female) from the ages of 23 to 38 with ASD. No participant had previous experience of music therapy.	<ul style="list-style-type: none"> <li>✓ Clinical Global Impression (CGI).</li> <li>✓ Brief Psychiatric Rating Scale (BPRS).</li> <li>✓ Musical ability (Likert scale made by authors).</li> </ul>	52 sessions, one per week of 1 hour each. Three musical activities: percussion, singing and piano. Music therapist.	One experimental group alone participated. Comparison of pre and post measures.	Significant improvement in autistic symptoms and musical ability during the first 6 months of the intervention. No further improvement in the final 6 months of the intervention (except in complex rhythms).
Brownell (2002)	To investigate the effect of a musical presentation of information of a social story on the behaviour of students with autism.	4 children aged 6 to 9 years. They have previously expressed positive reactions to musical education.	<ul style="list-style-type: none"> <li>✓ Behavioural observation record (the target behaviour to observe is different for each child, depending on their characteristics)</li> </ul>	3 conditions: Baseline, reading social stories and singing social stories. School (separate from ordinary classroom). Researcher.	Design of multiple treatments. Study of 4 cases. Comparison of measures in each treatment	For all 4 children, the target behaviour was reduced more in the conditions of reading and singing social stories. For all 4 children the reduction was greater in the condition "singing" than in the condition "reading", but this reduction was only statistically significant for one child.
Farmer (2003)	To determine whether music with gestures could increase verbal and nonverbal communication in children with autism.	10 (9 boys and 1 girl) from 2 to 5 years old with autism.	<ul style="list-style-type: none"> <li>✓ Observation form (the verbal and nonverbal responses of the participants were observed).</li> </ul>	5 sessions (20 min. each). Movement and imitation activities. Participants' homes and therapy centres. Therapist.	Randomised groups: 5 subjects were randomly placed in the experimental group and 5 in the control group. Repeated measures analysis.	Substantial increase of verbal responses for the music group. Gestural responses did not increase but the music group scored consistently higher scores than the non-music group.
Finnigan & Starr (2010)	To determine the effects of musical and non-musical interventions in sensitive and avoidance social behaviours of a child with autism.	1 girl, aged 3 years and 8 months. She had no previous exposure to music therapy sessions.	<ul style="list-style-type: none"> <li>✓ Mullen Scales of Early Learning.</li> <li>✓ Vineland Adaptive Behaviour Scales – Second Edition.</li> <li>✓ Childhood Autism Rating Scale</li> <li>✓ Autism Diagnostic Observation Schedule.</li> </ul>	29 sessions. 4 times a week for 15 minutes. Sessions with music and without music were alternated. School and home. Music therapist.	Alternating treatment design. Single case study. Comparison of measures in each treatment.	The music condition was effective both in raising sensitive social behaviours and decreasing avoidance behaviours, but this result was not maintained during the follow-up phase.

**TABLE 1**  
**ITEMS INCLUDED IN THE REVIEW (Continued)**

Authors (year)	Objectives	N (age, sex, diagnosis)	Instruments	Intervention/Context and implementer	Design	Results
<b>Gattino, Riesgo, Longo, Leite &amp; Faccini (2011)</b>	To investigate the effects of relational music therapy (RMT) on the verbal, nonverbal and social communication of children with ASD.	24 boys from 7 to 12 years: 10 with Autistic Disorder, 12 with pervasive developmental disorder-not otherwise specified and 2 with Asperger syndrome. They had no previous experience of music therapy.	<ul style="list-style-type: none"> <li>✓ Brazilian version of the CARS</li> <li>✓ Brazilian version of ADI-R.</li> <li>✓ Test Raven Color</li> </ul>	Experimental group music therapy interventions and control group routine activities. 16 sessions of 30 min. 7 months. Hospital of Porto Alegre (Brazil). Music therapist.	Randomised groups. Comparison of pre and post measures.	There were no statistically significant improvements. A statistically significant difference was found however in the subgroup analysis of non-verbal communication among patients with ASD.
<b>Kaplan &amp; Steele (2005)</b>	To analyse the goals of the music therapy program and the results for people with ASD, focused on improving communication and language, and promoting social and behavioural skills.	40 children and adults (28 males and 12 females), from the ages of 2 to 49 with ASD.	<ul style="list-style-type: none"> <li>✓ Measurement program to collect and organise data.</li> <li>✓ Questionnaires for parents/caregivers.</li> <li>✓ Observation record (initial and intermediate objectives).</li> </ul>	Five areas: behavioural/psychosocial; language/communication; perceptual/motor; cognitive; and musical. Music school and home. Music therapist.	Groups according to type of treatment received. Comparison analysis of treatments.	All achieved the initial objectives in one year. The parents and caregivers surveyed indicated generalisation of the skills acquired in music therapy to non-music therapy environments.
<b>Katagiri (2009)</b>	To examine the effect of background music and songs texts to teach emotional understanding to children with autism.	12 students with ASD between the ages of 9 and 15.	<ul style="list-style-type: none"> <li>✓ Japanese and Caucasian Facial Expressions of Emotion (JACFEE).</li> <li>✓ Teaching Children with Autism to Mind-Read.</li> <li>✓ Camera to capture facial expressions.</li> <li>✓ Form for recording specific emotions: happiness, sadness, anger and fear.</li> </ul>	4 conditions: not teaching emotion; teaching verbal emotion; teaching verbal emotion with background music; and teaching emotion singing. 8 sessions of 30 min. School and home of the participants. Researcher.	Comparison of pre and post measures after 8 sessions of individual treatment with 4 conditions to analyse their effectiveness.	All participants improved significantly in their understanding of the four selected emotions. All conditions of the intervention resulted in significant improvements in the emotional understanding of the participants, although the background music led to the greatest improvements.
<b>Kern &amp; Aldridge (2006)</b>	Improving peer interaction and meaningful play of children with autism through music therapy interventions.	4 boys aged 3 to 5 years with autism. Participants had to have an interest in and a positive response to music.	<ul style="list-style-type: none"> <li>✓ Childhood Autism Rating Scale (CARS).</li> <li>✓ Recorded observation of behaviours and peer interactions.</li> </ul>	Each observation lasted 10 min daily for 8 months. 4 conditions: baseline, playground adaptation, teacher-mediated intervention and peer-mediated intervention. School playground. Teachers and therapists.	Multiple baseline design with four conditions carried out with each child.	The results indicate an increase in peer interactions in the phase of teacher-mediated and peer-mediated intervention, compared with the initial baseline and the patio adaptation phase. Playing and handling of material and equipment increased significantly in the last two conditions.
<b>Kern, Wakeford &amp; Aldridge (2007a)</b>	To improve the performance of a child with autism during personal care tasks through song interventions.	One boy aged 3 years and 2 months with ASD.	<ul style="list-style-type: none"> <li>✓ Psychoeducational Profile- Revised (PEP-R).</li> <li>✓ Autism Diagnostic Observation Schedule (ADOS).</li> <li>✓ Vineland Adaptive Behavior Scales.</li> <li>✓ Childhood Autism Rating Scale (CARS).</li> <li>✓ Clinical observation.</li> <li>✓ Interviews with parents.</li> </ul>	3 tasks to improve: hand washing, toileting and cleanliness. Two conditions: intervention composed songs and lyrical intervention using words. School of the participant. Teacher and music therapist.	Alternating treatment design. Single case study. Comparison of measures in each treatment.	Both the song and lyrical interventions were beneficial for all selected tasks; but the frequency, intensity, complexity and novelty of the tasks produced differences in the specific results between the three tasks. The results did not show that any one condition was much more effective than the others.

**TABLE 1**  
**ITEMS INCLUDED IN THE REVIEW (Continued)**

Authors (year)	Objectives	N (age, sex, diagnosis)	Instruments	Intervention/Context and implementer	Design	Results
<b>Kern, Wolery &amp; Aldridge (2007b)</b>	To assess the effects of incorporating a music therapy intervention on the independent functioning of children with autism during routine arrival / morning greeting.	2 children with autism (P1 aged 3 years and 5 months; P2 aged 3 years and 2 months).	<ul style="list-style-type: none"> <li>✓ Childhood Autism Rating Scale (CARS).</li> <li>✓ Behaviour observation record (help by the teacher, problem behaviours).</li> </ul>	Study carried out during routine morning greeting. For P1 an ABAB design and for P2 an ABCAC design was used, where A is the baseline, B involved the use of the song during the routine, and C was a modification of the song. School. Music therapist and teachers.	Study of the effectiveness of the intervention in two cases.	P1's performance in the routine morning greeting increased. In the second baseline the frequency decreased, and again increased with the reintroduction of the intervention. For P2 the initial application of the intervention did not show an increase in performance. The application of modified intervention did show an increase in performance, while the second baseline showed a decrease.
<b>Kim, Wigram &amp; Gold (2008)</b>	To investigate the effects of music therapy improvisation on joint attention behaviours in children with autism.	15 (13 boys and 2 girls) aged between 3 and 5 years with autism. They had no previous experience in music therapy.	<ul style="list-style-type: none"> <li>✓ Korean version of CARS.</li> <li>✓ The Autism Diagnostic Observation Schedule (ADOS).</li> <li>✓ Korean version of Psychoeducational Profile (PEP).</li> <li>✓ Pervasive Developmental Disorder Behavior Inventory-C (PDDBI).</li> <li>✓ Early Social Communication Scales (ESCS).</li> <li>✓ Observation of the target behaviours.</li> </ul>	12 sessions of 30 min. music therapy, and 12 sessions of 30 mins play therapy. Between 7 and 8 months program of 24 sessions. Department of child and adolescent psychiatry at Seoul National University Hospital (SNUH). Two music therapists, one play therapist and three graduate students in music therapy.	A randomised controlled study design using a single comparison design in two different conditions, music therapy sessions and improvisation games with toys.	The improvisation music therapy was more effective than the play therapy in facilitating the behaviours of joint attention and nonverbal social communication skills. Eye contact duration was significantly longer in music therapy than in play therapy. As for turn-taking, music therapy was more effective. There was a longer duration of turn-taking activity in the part directed by the therapist.
<b>Kim, Wigram &amp; Gold (2009)</b>	To investigate the effects of music therapy improvisation by measuring the ability of emotional, motivational and interpersonal response in children with autism.	15 (13 boys and 2 girls) aged 3 to 5 years with autism. They had no previous experience of music therapy	<ul style="list-style-type: none"> <li>✓ Korean version of CARS.</li> <li>✓ Korean version of the Psycho Educational Profile (PEP).</li> <li>✓ Korean version of the Vineland Social Maturity Scale (SMS).</li> <li>✓ The Autism Diagnostic Observation Schedule (ADOS).</li> <li>✓ Record sheet for behaviours.</li> </ul>	12 sessions of 30 mins of music therapy, and 12 sessions of 30 mins of play therapy. Each session was divided into two: one part undirected and the other part directed. Department of Child and Adolescent Psychiatry at Seoul National University Hospital (SNUH). Play therapist and music therapist, and social worker.	Randomised controlled study using a single design comparison in two different conditions: improvisational music therapy and play sessions.	Significantly more frequent and longer lasting results in music therapy than in play therapy. The social aspects of behaviour constantly and more improved in the condition of music therapy. Compliance with the responses had noticeably more presence in music therapy than in play therapy.
<b>LaGasse (2014)</b>	To examine the effects of a music therapy group intervention on eye gaze, joint attention, and communication in children with autism.	17 (13 boys and 4 girls) aged from 6 to 9 years with ASD diagnosis. Average age: 7.58 years.	<ul style="list-style-type: none"> <li>✓ Childhood Autism Rating Scale - second edition (CARS2).</li> <li>✓ Social Responsiveness Scale (SRS).Autism Treatment Evaluation Checklist (ATEC).</li> <li>✓ Observation of behaviour (eye gaze, joint attention, communication, withdrawal/behaviours).</li> </ul>	Music Therapy Group (MTG; N = 9) and group social skills (5.5G; N = 8). 10 sessions of 50 min. Each session: welcome exercise, sensory and social experiences, interaction (with or without music), cooperative play and closing exercise. Music therapist and educator.	Randomised groups. Comparison of measures between groups.	There were significant differences between the groups for joint attention with peers and eye gaze looking at people, MTG participants showing higher results. There were no significant differences between the groups for initiation of communication, the response to the communication, or withdrawal / behaviours.



**TABLE 1**  
**ITEMS INCLUDED IN THE REVIEW (Continued)**

Authors (year)	Objectives	N (age, sex, diagnosis)	Instruments	Intervention/Context and implementer	Design	Results
Lim (2010)	To examine the effect of speech training and language development through music in speech production in children with ASD.	50 children with ASD (44 boys and 6 girls) from 3 to 5 years.	<ul style="list-style-type: none"> <li>✓ Childhood Autism Rating Scale (CARS).</li> <li>✓ Autism Diagnostic Interview Revised (ADI-R).</li> <li>✓ Preschool Language Scale.</li> <li>✓ Peabody.</li> <li>✓ Receptive and Expressive One Word Picture Vocabulary Test.</li> <li>✓ Developmental Speech and Language Training through Music (DSLUM).</li> <li>✓ Verbal Production Evaluation Scale (VPES). Evaluates: semantics, phonology, pragmatics and prosody.</li> </ul>	3 conditions: musical training (N = 18), speech training (N = 18) and a control group with no intervention (N = 14). Each group watched a video, of either music or speech, twice daily for 3 days. Schools or the participants and therapy centres. Researcher.	Randomised groups. Comparison of pre and post training measures.	Both music and speech training are effective in improving speech production. The participants who received musical training made greater progress than the participants who received speech training; however, the difference was not statistically significant. High-functioning children present more expressive and active communication during musical training.
Lim & Draper (2011)	To compare a common form of ABA VB approach without music with the same approach with music incorporated on the speech production of children with autism.	22 children (17 boys and 5 girls) aged 3 to 5 years with autism.	<ul style="list-style-type: none"> <li>✓ Verbal Production Evaluation Scale (VPES).</li> </ul>	3 conditions: musical training, speech training and no training; and 4 verbal operant conditions: mand, tact, echoic and intraverbal. ABA VB training method. They received both trainings 3 days a week for 2 weeks. Music therapist and researcher.	Randomised groups. Comparison of measures between groups / conditions.	The score on the VPES for musical training target words was higher than the score in the VPES for the speech training target words; however, the difference was not significant. The music and speech training had a significant effect on verbal operant production compared to the condition of no training.
Mateos-Moreno & Atencia-Doña (2013)	To examine the effect of combining dance / movement and music therapy in young adults diagnosed with severe autism.	16 (15 men and 1 woman) with severe autism. Average age: 25 years. They had no previous experience in music or dance.	<ul style="list-style-type: none"> <li>✓ Childhood Autism Rating Scale.</li> <li>✓ Revised Clinical Scale for the Evaluation of Autistic Behavior (ECA-R).</li> </ul>	Experimental group (N = 8) and control group (N = 8). 36 sessions combining music therapy and dance / movement with one hour duration, for 17 weeks. Specialised care centre. Music therapist and dance therapist, and three assistants.	Randomised groups. Comparison of pre and post training measures.	Both the experimental and the control group had a positive development. Statistically significant differences at the post-test level were found for the interaction disorder, and for the functions of imitation, emotion, instinct and behaviour regulation without variability.
Pasiali (2004)	To investigate the effect of prescriptive therapeutic songs to promote the acquisition of social skills of children with autism.	2 boys: P1, 7 years old, and P2, 9 years old; and 1 girl of 8 years of age (P3). All with ASD. No participant had previous experience in music therapy.	<ul style="list-style-type: none"> <li>✓ Behaviour registration form (child's name, identified target behaviour, definition of behaviour, when the behaviour occurs, how often).</li> </ul>	An ABAB design, where A is the baseline, and B is the intervention used. Protocol of prescriptive therapeutic song, adapting some favourite songs of the child. Each 15 min session consists of three applications of music therapy: listening, playing rhythmical instruments and singing. Isolated room in the home of each participant. Researcher.	Study of effectiveness of the intervention in two cases.	The application of the intervention protocol of prescriptive song succeeded in reducing the behaviour objective of each participant during the early stages of intervention. For P1, the change was significant. For P2, both the comparison of the scores of the two basic conditions with the scores of the two intervention conditions, and the comparison between the first baseline and the first intervention conditions were significant. For P3 none of the comparisons were significant.



**TABLE 1**  
**ITEMS INCLUDED IN THE REVIEW (Continued)**

Authors (year)	Objectives	N (age, sex, diagnosis)	Instruments	Intervention/Context and implementer	Design	Results
Schwartzberg & Silverman (2013)	To examine the effects of social stories based on music on the understanding and generalisation of social skills in children with autism spectrum disorders.	30 (29 men and one woman) from 9 to 21 years with autism	<ul style="list-style-type: none"> <li>✓ Autism Social Skills Profile (ASSP): 3 subcategories: social reciprocity (SR), social participation (SP) and detrimental social behaviors behaviours (DSB)</li> <li>✓ Comprehension checking questions (CC) to determine levels of understanding of participants for each social story</li> </ul>	3 not musical control groups (reading social stories) and 3 experimental groups of music therapy (social stories told). 3 consecutive sessions of 50 mins for each group. Summer Camp. Music therapy.	Randomised groups. Comparison of pre and post training measures.	The only main effect for the ASSP that was significant was subcategory (SR versus SP versus DSB). The main effects of time (pre-test versus post-test) in the CC were significant, the scores being higher in the post-test. The participants showed mixed results. Camp staff supports the use of social stories with music as a means for learning social skills.

Starr, 2010; Kaplan & Steele, 2005; Kern & Aldridge, 2006; LaGasse, 2014; Pasiali, 2004); additionally, one study also included dance (Mateos-Moreno & Atencia-Doña, 2013), two were based on the singing of social stories (Brownell, 2002; Schwartzberg & Silverman, 2013), two other studies focus on improvisation (Kim, et al, 2008; Kim, et al, 2009), which divided the sessions into two halves, one led by the children and another led by the therapist, and another study was based on relational music therapy (Gattino et al., 2011), which takes place through experiences such as singing, composing, improvising and playing musical games.

The duration of the interventions varied from less than 10 sessions to a total of between 50 and 60 sessions. In some studies, the number of sessions was not specified, but instead the study duration was indicated, ranging from a duration of 4 weeks to 2 years. As for the context of the intervention, the sessions were held in hospitals or therapy centres, at school, at home or even in a summer camp. With regards to the people who implement the intervention, these included both specialists, either music therapists or therapists specialising in play and dance, and generalist teachers and researchers.

Finally, with regards to the results, in 11 of the 18 studies significant improvements were obtained with the intervention condition in music therapy, compared to the control group or the base line (Farmer, 2003; Finnigan & Starr, 2010; Kaplan & Steele, 2005; Katagiri, 2009; Kern & Aldridge, 2006; Kern et al, 2007b; Kim et al, 2008; Kim et al, 2009; Lim, 2010; Lim & Draper, 2011; Mateos-Moreno & Atencia-Doña, 2013).

In the remaining 7 studies, improvements were obtained that did not reach statistical significance (Gattino et al, 2011; Kern et al, 2007a; LaGasse, 2014; Schwartzberg

& Silverman, 2013), or improvements occurred that were not maintained throughout the procedure (Boso et al., 2007; Pasiali, 2004) or ones that occurred only in some participants, but not in all of them (Brownell, 2002).

**DISCUSSION**

The number of published papers that met the search criteria discussed in the method was low, only 18 articles in a period of 15 years. This may be because it is not common for the studies and interventions in this area to be carried out as experimental works that include comparison groups and pre test-post test type designs, so during the literature search for the review many studies were discarded that did not offer sufficient factual information on the effects of the interventions described.

Furthermore, only 11 of the 18 studies reviewed showed a proven improvement in the aspects evaluated in the study participants, while the remaining 7 studies reviewed obtained results in which the improvements did not reach the statistical significance required to confirm with adequate certainty that they produce improvements in subjects with ASD.

The obtaining of mixed and seemingly contradictory results in the different studies reviewed is somewhat reasonable, if we consider two fundamental aspects:

Firstly, the heterogeneity of the characteristics of the participants of the various investigations, a heterogeneity in accordance with the breadth of symptoms that are collected within the autistic spectrum; and, secondly, the great diversity in the interventions grouped under the label of music therapy. As demonstrated in this review, the interventions that were carried out in the different research studies had a different duration, were implemented by different professionals and address



different aspects of interventions related to music (listening, singing, practicals with instruments, improvisations, combining with social stories, etc.).

The combination of these two factors contributes to the fact that the results are not clear or easily replicated by the different investigations, because in all probability some types of interventions may be appropriate for some individuals with ASD, but not for other subjects with the same diagnosis but a different level of severity and associated characteristics. This is evident in some of the interventions covered in this review, in which multiple case studies show how the same intervention has different effects on different participants (Brownell, 2002; Kern et al, 2007b; Pasiali, 2004).

Therefore, although the results of some of the studies are promising, it is still necessary to continue accumulating evidence that allows us to find out exactly which type of interventions are appropriate to improve which specific aspects within the autism spectrum.

Music is a very powerful element of communication that can facilitate and promote communication and social interaction in people with ASD –areas in which these people usually have serious difficulties. In addition, music is a source of pleasure, so it can produce relaxing effects and contribute to reducing behaviour problems. It can also be an interesting strategy for regulating excess energy and controlling anger or other negative emotions, so we must continue in this area of research to try to find out in which cases interventions based on music therapy should be added to the other interventions that are usually carried out with people with ASD (social skills training, establishing routines, communication strategies, etc.) in order to achieve comprehensive interventions.

However, interventions based on music therapy face many challenges. One of them concerns which professional should carry out these interventions. It is possible that the effectiveness of the interventions does not depend only on the intervention itself, but also on the training of the professional, which can positively (or negatively) affect the results for reasons outside the intervention itself, which would have significant repercussions in the training of professionals who work directly with people with ASD in the different contexts (educational, clinical, etc.).

A number of limitations have been found in this review, such as the low number of experimental studies found; the low number of participants in some studies, which means that in some cases the findings are not generalisable to other children with ASD; or the short

duration of some of the interventions reviewed, which has perhaps not enabled us to assess with sufficient accuracy the effectiveness of these shorter interventions. Moreover, unpublished studies have not been included in the review, so the conclusions of the review may be affected by publication bias. Finally, in the vast majority of the studies reviewed the degree of severity of the ASD of the participants was not specified, an aspect of considerable importance, given the heterogeneity of the characteristics that are grouped under the label ASD.

Due to all the limitations discussed above, several proposals are made for future investigations. First, it has become clear that it is necessary to develop a greater volume of empirical studies in which objective indicators (quantitative or qualitative) are offered of the effectiveness of interventions in music therapy. These studies should have sufficiently large samples to allow the extrapolation of the results to the population of subjects with ASD, and special attention should be paid to the description of these subjects, in order to allow other researchers to replicate and compare the results of the different studies. The duration of the intervention should also be extended, and follow-ups should be carried out after the interventions to ensure that the positive effect was consolidated over time. In addition, comparisons could be made between different types of music therapy, and also music therapy should continue to be researched in comparison with other interventions. Finally, it would be very interesting to explore the relationship of possible alterations in the sensory profile of children with ASD with the effects of music therapy, because the sensory profile of these children is a characteristic that is being given more weight in the diagnosis of ASD.

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