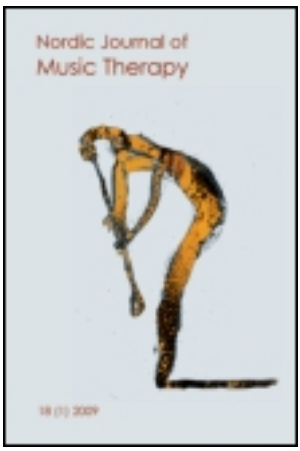

Nordic Journal of Music Therapy
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/rnjm20

Effects of relational music therapy on communication of children with autism: a randomized controlled study

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Published online: 09 May 2011.

To cite this article: Gustavo Schulz Gattino, Rudimar dos Santos Riesgo, Dânae Longo, Júlio César Loguercio Leite & Lavina Schüler Faccini (2011) Effects of relational music therapy on communication of children with autism: a randomized controlled study, Nordic Journal of Music Therapy, 20:2, 142-154, DOI: 10.1080/08098131.2011.566933

To link to this article: http://dx.doi.org/10.1080/08098131.2011.566933

Nordic Journal of Music Therapy
Vol. 20, No. 2, June 2011, 142–154

Effects of relational music therapy on communication of children with autism: a randomized controlled study*

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(*Received 18 May 2010; final version received 8 February 2011*)

The intent of this study (registration ACTRN12608000625370) was to investigate the effects of Relational Music Therapy (RMT) in verbal, nonverbal and social communication of children with autism spectrum disorders (ASDs). A randomized controlled trial (RCT) with 24 boys from the Programme for Invasive Developmental Disorders (Porto Alegre City, Brazil), was designed to compare individuals treated with music therapy ($n = 12$) and standard treatment (clinical routine activities including medical examinations and consultations, $n = 12$). The outcomes were assessed by two blind evaluators, before and after interventions, through the verbal, nonverbal and social communication scores of Brazilian version of the Childhood Autism Rating Scale (CARS-BR). The CARS-BR scores in T1 and T2 did not show a statistically significant difference in the three measured outcomes. However, the study found a positive statistically significant difference on subgroup analysis of nonverbal communication among patients with autistic disorder, $p = 0.008$ and standard mean difference of 2.22 (95% *CI* 1.90 to 2.53). The results observed in the investigation of the effects of relational music therapy on communication skills of ASD children are inconclusive. The next investigations need more rigorous designs leading to smaller effect size estimates and more accurate tools for the outcome assessment (including some specific instrument of music therapy). These modifications will increase the accuracy to observe the treatment effects in this population.

Keywords: autism; communication; music therapy

Introduction

Autism is a pervasive development disorder, characterized by impairment in three main areas: communication, social interaction and restricted,

*This article is accompanied by supplementary material, which can be found here: http://dx.doi.org/10.1080/08098131.2011.566933

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ISSN 0809-8131 print/ISSN 1944-8260 online

DOI: 10.1080/08098131.2011.566933
http://www.informaworld.com

repetitive behaviours and interests (Accordino, Comer, & Heller, 2007; Gold, Wigram, & Elefant, 2006; Mandy & Skuse, 2008). In music therapy research, one of the main issues is the influence of music therapy treatment on communication difficulties of children with autism (Amaral, Schumann, & Nordahl, 2008; Whipple, 2004; Wigram & Gold, 2006). Children with autistic spectrum disorders (ASDs) present impairments especially in expressive communication (Chiang, 2009; Chiang & Lin, 2008; Cuccaro et al., 2003; Smith et al., 2009). This handicap is characterized by the use of words, gestures and vocal sounds without context or without communicative intent (Lidstone, Fernyhough, Meins, & Whitehouse, 2009; Stephens, 2008; Volden, Coolican, Garon, White, & Bryson, 2009). Music therapy has been growing in importance in the treatment of ASD children, possibly for helping with the establishment of verbal and nonverbal communication skills through musical experiences (Hillecke, Nickel, & Baolay, 2005; Kim, Wigram, & Gold, 2009; Palac & Grimshaw, 2006). Musical activities involve different expressive qualities, dynamic shapes and dialogues. They also represent an opportunity to establish alternative ways for communication, helping the child to reach interaction and relationships with other individuals (Goldstein, 2002; Thaut, 2005; Wigram, 2002).

Most of the literature on music therapy, and its effects on communication of autistic children, represents case reports and theoretical studies. There are not many experimental studies in this area, and only a few of those have included adequate controls. This situation stresses the need for studies on the effects of music therapy on ASD children. In a systematic review of the Cochrane Library (Gold, Wigram & Elefant, 2006), two randomized controlled trials (RCTs) about the influence of music therapy on communicative skills of autistic children were analysed (Buday, 1995; Farmer, 2003). Buday (1995) investigated the effects of music therapy on imitation, whereas Farmer (2003) evaluated the influence on verbal and gestural responses. Both investigations used interventions based on a behavioural modification approach. These studies included a short intervention period (two weeks at most) and small sample size ($n = 10$). Considering the meta-analyses as a whole, a standard mean difference (*SMD*) of 0.50 was observed for verbal communication (2 RCTs, $n = 20$; 95% *CI*: 0.22–0.79), and of 0.36 (2 RCTs, $n = 20$; 95% *CI* 0.15–0.57) for nonverbal communication. According to the authors, studies with larger sample sizes and longer intervention periods are necessary in order to assess the effects of music therapy on communication skills of autistic children.

Another important RCT was published by Kim, Gold and Wigram (2008). This trial investigated the role of music therapy in joint attention skills (an important precursor of communication). The authors used improvisational music therapy in pre-school children with autism, employing a single subject comparison design in two different conditions: improvisational music therapy and play sessions with toys. This study utilized standardized tools and

DVD analysis of sessions to evaluate behavioural changes in children with autism. The *SMD* for joint attention was 0.63, (95% *CI* 0.31 to 0.95).

In addition to these music therapeutic interventions (studied in clinical trials), there are others that can be applied to children with autism. An example is the intervention proposal based on Relational Music Therapy (RMT). This proposal was created by music therapist Rubén Gallardo (2004) and has the goal of helping individuals to develop their capacities (motor, communicative, social, cognitive and emotional, for example) according to the interactions in the therapeutic setting. These interactions take place through experiences such as singing, composing, improvising and playing musical games. In RMT, the focus is on the actions of the participant. The music therapist adopts a non-directive approach where he/she realizes interventions based on his/her observations of the participant in each session. Thus, there are improvised activities in the RMT. The activities arise from the initiatives of the participant or from the initiatives of the music therapist based on the participant behaviours observed. This proposal focuses on some psychodynamic principles (free association, unconscious conflicts, drive component, transference and counter-transference) and therefore prioritizes initiatives and observation of the subject treated.

The RMT does not provide a structured protocol for intervention. There are only basic guidelines for conducting the sessions (Cabrera & Caniglia, 2007). All sessions must comply with a common order. At first, the music therapist provides various instruments on the floor or on a table so that the patient can choose one or several instruments. Then, the music therapist observes the patient's contact developed through the instruments (Gallardo, 1998). From then on, the music therapist starts interacting in this relationship. If the child shows no interest in the instruments the music therapist may encourage him to participate a few times. When the child does not participate in a session, even with the therapist's insistence, the music therapist has to respect this. Another important guideline in RMT is the effective participation of parents in the therapeutic process (Cabrera, 2000). Parents should participate in some meetings so that the music therapist can understand, through musical activities, how the child manifests his/her difficulties and potentialities to his/her family and how the family interacts and assists the child. The music therapist does not invite the parents for all sessions, because the patient needs to develop autonomy to express his/her desires and wishes during the music therapy process.

Effects of RMT on the communication skills of autistic children were, to date, only observed in case studies (Gallardo, 2007). Based on Gallardo's finding, this study will examine whether this intervention improves the communication of children with ASD in a more rigorous research design: a randomized controlled trial. The approach created by Gallardo was not formally systematized through an intervention protocol (Cabrera & Caniglia, 2007). However, through the basic guidelines of the RMT, it is

possible to evaluate whether this proposal will bring benefits to the communication of children with ASD. The initial hypothesis is that participants treated with RMT will improve communication skills as compared with individuals treated with standard procedures.

Materials and methods

Design

A parallel randomized controlled trial, with balanced randomization (1:1), registered in the *International Committee of Medical Journal Editors* (ICMJE) through the *Australian New Zealand Clinical Trials Registry* (ANZCTR: http://www.anzctr.org.au) with number ACTRN12608000625370. The CONSORT statement was used as guidance to ensure the quality of the study (Moher, Schulz, & Altman, 2005). The participants were randomized into two different conditions: relational music therapy interventions plus clinical routine activities (medical examinations and neurological or psychiatric consultation), and just clinical routine activities. The group that received relational music therapy and clinical routine activities was the experimental group. The group that received just the clinical routine activities was the control group. These groups were compared before and after treatments.

Participants

The study was conducted with male participants aging from 7 to 12 years old, who had not been previously treated with any music therapy treatment. Boys were recruited through the Programme for Invasive Developmental Disorders (*Programa de Transtornos Invasivos do Desenvolvimento*, PROTID) of the Hospital de Clínicas de Porto Alegre (HCPA, Porto Alegre city, Brazil). The exclusion criteria were intolerance to sounds or music and profound hearing loss.

The sample size was determined according to Whipple (2004), who observed a standard mean difference (*SMD*) of 0.77. Group sizes were determined as 12 individuals to estimate an effect which could be 50% higher (1.54), with a 0.05 alpha and 80% power. The justification of proposing an *SMD* that should be 50% higher than that in Whipple's review can be explained by the treatment duration in different studies. In the Whipple review, the studies did not last more than two weeks. Differently, this study lasted 20 weeks. Thus, it is considered that this factor could cooperate in seeking a greater effect size.

Twenty-four participants were included in this study, after written authorization had been given by their parents by signing an informed consent. None of the children were lost during the follow-up. Participants had a mean chronological age of 9.75 years ($SD = 1.\ 39$, range 6.75–12.17). All participants were independently evaluated by neurologists of the

PROTID, receiving one of the following diagnoses according to DSM IV-TR criteria: autistic disorder, pervasive developmental disorder not otherwise specified (PDD-NOS), and Asperger's syndrome (American Psychiatric Association, 2000). Ten of the participants were diagnosed with autistic disorder, 12 with PDD-NOS, and two with Aspergeŕs syndrome. All participants were evaluated according to diagnostic criteria from the *Childhood Autism Rating Scale* adapted for Brazil (Pereira, Riesgo, & Wagner, 2008), CARS-BR (mean 35.77, $SD = 4.37$, range 27–44). Table 1 presents the baseline sample data of experimental and control group.

The Brazilian version of *Autism Diagnostic Interview Revised* (ADI-R) was used for seven of the 24 participants, all diagnosed with autism (Becker, Riesgo, & Wagner, 2009). The ADI-R was used because it is a gold standard for autism diagnosis. Intelligence tests according to Raven's Coloured Progressive Matrices for Children (used with 22 participants) showed that six children presented intellectual disability, nine presented below average intelligence, five presented expected average intelligence and two presented above average intelligence (Pasquali, Wechsler, & Bensusan, 2002). The Coloured Progressive Matrices test (CPM) compared the sample of this study with the reference values for children with normal intelligence, as determined for students of the Brazilian public educational network aging from 11 years and 3 months to 11 years and 4 months (Pasquali et al., 2002). The CPM was applied to acquire an idea of the IQ of the participants, since children with different levels of intelligence could manifest themselves differently in the interventions. Unfortunately, it was not possible to apply the ADI-R and the CPM in all participants due to the impossibilities of families to attent the hospital to perform the evaluations. Therefore, the CPM could not be used to control for intelligence level as initially planned.

Procedure

Participants were randomly assigned the following simple randomization procedures (computerized random numbers) to one of two treatment groups. The allocation was conducted by an investigator external to the stud, who organized the randomization results in two separate lists

Table 1. The baseline diagnostic data of experimental and control group according to DSM-IV-TR criteria.

	Experimental group	Control group
Autistic disorder	$n = 5$	$n = 5$
Asperger's syndrome	$n = 0$	$n = 2$
PDD-NOS	$n = 7$	$n = 5$
Total	12	12

according to the two groups. Details of the series were unknown to any of the investigators. The lists of participants were directly delivered to the music therapists participating in the study, who determined the individualized intervention for each participant.

Each child of the experimental group received three music therapy assessment sessions (30 minutes per session), 16 weekly interventions of relational music therapy (30 minutes per session), one final music therapy assessment session (30 minutes of duration), besides weekly clinical routine activities in HCPA. Participants of the control group only participated in weekly routine clinical activities during this period. Music therapy was offered to participants in the control group at the end of the follow up. Due to school activities and vacations, participants of the experimental group completed the 16 RMT treatment sessions in seven months. In order to assess outcomes, CARS was used as pre- and post-treatment measures. The therapeutic interventions were conducted by two graduate music therapists, and took place in the Genetics Service, Psychiatry Service and Pediatrics Service of HCPA.

Most children included in the study were in special education, psychotherapy, speech therapy or equotherapy, when they entered music therapy trial. The educational and therapeutic interventions usually stayed the same throughout the research trial period for most of the sample.

Measures

Results were assessed using the CARS-BR scale, which was established to determine the presence and degree of autism in a participant (mild-moderate or severe). According to three studies published in the *Journal of Autism and Developmental Disorders* (DiLalla & Rogers, 1994; Stella, Mundy, & Tuhchman, 1999; Magyar & Pandolfi, 2007), CARS has other important functions besides providing a diagnosis and measuring the level of autism in an individual. The writings of the authors cited above argue that CARS can be used to assess specific behaviours of children with ASD. Therefore, the CARS could be used to monitor the modification of certain behaviours of the subject over a process of intervention, for instance. CARS has been translated and validated for use in Brazil (Pereira et al., 2008). The internal consistency of the scale presented a Cronbach's alpha of 0.82. CARS aspects assessed in the present study included verbal, nonverbal and social communication. This last aspect is not a direct component of the scale, but it represents the combination of five of its items which are related to social communication skills (imitation, verbal and nonverbal communication, consistency of intellectual responses and general impressions).

CARS-BR evaluations were conducted before and after the implementation of music therapy and conventional treatment. The periods before and after interventions were designated as time 1 (T1) and time 2 (T2), respectively.

Measurements were conducted by two investigators who were blind to group identities to increase the objectivity of outcome assessments. In T1, the fourth author of this work conducted the evaluations before the randomization, whereas in T2, evaluations were done by an external investigator after the randomization. CARS-BR evaluations were conducted at HCPA.

The degree of agreement between the two CARS-BR evaluators was assessed by the Intraclass Correlation Coefficient (ICC), using the scale with seven ASD children who were not participating in the study. The interobserver agreement, considering the five CARS items used in outcome assessment, was 0.91.

The music therapy sessions were conducted using musical instruments and an audio system (Hyundai®). Each of the music therapy sessions was described in a report, each of an average of 150 words. The materials used in the interventions are described in Table 2.

Statistical analysis

Data were summarized as means, standard deviation and delta score. The changes of the groups and subgroups during the different stages were assessed with the Student's t-test for independent samples and the calculation of the standard mean difference (*SMD*). Subgroup analyses were used to evaluate possible interactions among different diagnoses, autistic disorder and other types of ASD (PDDNOS and Asperger's syndrome).

Results

Table 3 presents the descriptive data (mean, standard deviation and delta score) and the Student's t-test with the standard mean difference (*SMD*) for the different outcomes. CARS-BR scores in T1 and T2 did not show a statistically significant difference in the three measured outcomes.

As presented in Table 3, the subgroup analysis of outcomes shows that only participants with autistic disorder in the experimental group had a statistically significant decrease in scores when compared with the same type

Table 2. Equipment in music therapy condition.

A portrait audio system (Hyundai)	An acoustic guitar (Jerez)
A 4-octave keyboard (Yamaha)	A small indigenous drum
A pair of small metal rattles (Izzo)	A pair of large metal rattles (Izzo)
A small rainstick	A pair of drum sticks
A tamborim (Luen)	A small wooden guiro
A tambourine (Show)	A pair of cabasas (musical)
A cowbell (Liverpool)	A pair of wood claves (Izzo)

Table 3. Results of descriptive and analytical statistics.

	Experimental group	Control group
Verbal communication $p = 0.50$ $t = 0.70$, $df = 22$ *SMD*: 0.28 (95% *CI* − 0.01 to 0.57)	$n = 12$	$n = 12$
T1	2.67 (0.49)	2.54 (0.33)
T2	2.54 (0.45)	2.58 (0.44)
Delta score	−0.13 (0.57)	0.04 (0.62)
Nonverbal communication $p = 0.35$ $t = 0.95$, $df = 22$ *SMD*: 0.39 (95% *CI* − 0.21 to 0.57)	$n = 12$	$n = 12$
T1	2.42 (0.42)	2.08 (0.47)
T2	2.50 (0.37)	2.33 (0.54)
Delta score	0.08 (0.47)	0,25 (0.40)
Social communication $p = 0.34$ $t = 0.97$, $df = 22$ *SMD*: 0.39 (95% *CI* − 0.08 to 0.86)	$n = 12$	$n = 12$
T1	12.29 (1.78)	11.38 (1.65)
T2	12.25 (1.54)	11. 92 (1.24)
Delta score	−0.04 (1.63)	0.54 (1.29)

Note: Standard deviations are bracketed. Delta scores represent the difference in points between time 1 and time 2 (T2–T1), and are represented by means and standard deviations.

Note: Verbal communication range in the scale: 1–4; Nonverbal communication range in the scale: 1–4; Social communication range in the scale: 5–20.

Note: Delta scores < 0 represent reduction of CARS score (positive result); delta scores > 0 represent increase of CARS score (negative result).

of participants in the control group ($p = 0.008$). *SMD* was 2.22 (95% *CI* 1.90 to 2.53), higher than 1.54, as expected according to sample size calculation. The other subgroup analysis did not show statistical significance. The subgroup analysis is presented in Table 4.

Discussion

The overall results from the three outcomes measured were inconclusive. Only in the subgroup analysis was the result in favour of relational music therapy over the control condition in improving the nonverbal communication behaviours of participants with autistic disorder.

The main reasons for these research findings were: the use of a non appropriate instrument for measuring the outcomes and potential difficulties

Table 4. Results for nonverbal communication stratified for autism disorder diagnosis.

	Experimental group	Control group
Nonverbal communication (autistic disorder) $p = 0.008$* $t = 3.51$, df = 8 *SMD*: 2.22 (95% *CI* 1.90 to 2.53)**	$n = 5$	$n = 5$
T1	2.80 (0.27)	2.40 (0.22)
T2	2.50 (0.35)	2.70 (0.44)
Delta score	−0.30 (0.27)	0.30 (0.27)

*Statistically significant.
***SMD* higher than 1.54.

caused by the physical setting of the music therapy interventions. Furthermore, the small sample size and diagnostic variability between groups might collaborate for the lack of statistical significance in the outcomes.

The lack of statistical significance in the results may be due to the use of CARS to assess outcomes. This tool may not be accurate for the assessment of the development in the children over a short period of time. This scale was initially proposed to help with diagnosis, to show presence/absence of autism and its severity (Rapin & Goldman, 2008). The CARS was used in the present study since it is the only tool available that is validated for the assessment of ASD children in the Portuguese language. It is possible that other studies, such as Kim, Wigram and Gold (2008) have facilitated the statistical significance due to the greater accuracy of the tools employed. That study used, for example, microanalyses of the target behavioors. This method involves the analysis of video sequences recorded during music therapy sessions, to determine how often positive or negative specific behaviours are observed. This assessment method could be a viable alternative to CARS evaluation in randomized controlled trials with ASD children in Brazil. The assessment instruments Children Communication Checklist 2 (CCC-2), Pervasive Developmental Disorder Behaviour Inventory-C (PDDBI) and Early Social Communication Scales (ESCS) are others possible assessment tools for evaluate the communication of ASD children in music therapy (Gattino, 2009; Kim, Wigram, & Gold, 2008).

It is believed that the hospital setting may be a possible space for music therapy interventions. However, this space may cause difficulties for the attendance of autistic children. Individuals with autism are often resistant to invasive procedures performed in hospital setting such as blood collection and dental treatment (Nader, Oberlander, Chambers, & Craig, 2004). This can be explained by the hypersensitivity to pain found in a significant

number of cases of autism (Baron-Cohen et al., 2009; DeLorey et al., 2011). In some situations, the child needs to receive anaesthesia in order to realize simple medical procedures (Shah, Apuya, Gopalakrishnan, & Martin, 2009). In this sense, autistic children can associate hospital procedures to pain and suffering situations. According to some parents' reports in this current study, some children came to the sessions with agitation, because they believed that they would be exposed to an invasive procedure. This relationship between pain, suffering and hospital environment cannot be generalized. However, in Brazil this is a common reality and so this subject is widely studied (Furtado & Lima, 1999; Milanesi, Collet, Oliveira, & Vieira, 2006; Motta & Enumo, 2004). Therefore, intervention by the next experiment (which will evaluate the role of music therapy in the communication of children with only autistic disorder) will be made in a school. The school is an inviting environment for the children (as part of their daily lives), that offers less invasive options for interaction.

The subgroup analysis of nonverbal communication among participants with autistic disorder showed the only statistically significant result in this study, with $P < 0.05$ and *SMD* higher than 1.54. This result presented a similar *SMD* (2.22, 95% *CI* 1.90 to 2.53) to those reported by Kim et al. (2008) for social communication (0.79, 95% *CI* − 0.14 to 1.71) and to the Cochrane review (Gold et al., 2006) for gestural communication (0.50, 95% *CI* 0.22 to 0.79).

The different results observed for subgroup analysis of nonverbal communication are possibly due to the more pronounced use of alternative communication tools by autistic children who do not have verbal communication skills. This is frequently seen in children with severe cognitive impairment and difficulties in social interaction (Happé & Ronald, 2008; Lidstone et al., 2009). In our sample, most of the participants with classic autism presented deeper cognitive and social impairment than children with other types of autism (Aspergeŕs syndrome and PDD-NOS), according to CARS and Raven's Colorued Progressive Matrices scores. This positive result must not be overestimated, since it derived from a secondary analysis.

The findings suggest that future studies need to use more rigorous designs leading to smaller effect-size estimates and future RCTs should use those estimates as a basis for power calculation. The next investigations also need longer periods of intervention and more accurate tools for the outcome assessment (including some specific instrument on music therapy). These modifications will increase the accuracy to observe the treatment effects in this population.

Acknowledgements

This work was supported by FIPE/HCPA (project no. 08006) and by the Brazilian Research Council (CNPq).

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