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Emotional, motivational and interpersonal responsiveness of children with autism in improvisational music therapy

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ABSTRACT Through behavioural analysis, this study investigated the social-motivational aspects of musical interaction between the child and the therapist in improvisational music therapy by measuring emotional, motivational and interpersonal responsiveness in children with autism during joint engagement episodes. The randomized controlled study (n = 10) employed a single subject comparison design in two different conditions, improvisational music therapy and toy play sessions, and DVD analysis of sessions. Improvisational music therapy produced markedly more and longer events of 'joy', 'emotional synchronicity' and 'initiation of engagement' behaviours in the children than toy play sessions. In response to the therapist's interpersonal demands, 'compliant (positive) responses' were observed more in music therapy than in toy play sessions, and 'no responses' were twice as frequent in toy play sessions as in music therapy. The results of this exploratory study found significant evidence supporting the value of music therapy in promoting social, emotional and motivational development in children with autism.

KEYWORDS *children with autism; music therapy; randomized controlled trial; social-motivational aspects*

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Children with autism do not readily engage in positive affect exchanges (smiling and laughing) with others in social situations, and difficulties in the social-affective area are not only found to be stable, but proposed to be a core deficit in children with autism (Dawson et al., 1990; Joseph and Tager-Flusberg, 1997; Kasari et al., 1990; Snow et al., 1987). However, rarely do therapeutic interventions directly address emotionally expressive interpersonal functions in children with autism (Trevarthen and Aiken, 2001).

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Improvisational music therapy, a form of music therapy widely used in the treatment of children with autism, is gaining growing recognition as an effective intervention addressing fundamental levels of spontaneous self-expression, emotional communication and social engagement for individuals with a wide range of developmental disorders (Gold et al., 2006; Robarts, 1996; Trevarthen and Aitken, 2001). Compared with other therapeutic interventions utilizing music as a background or contingent stimulus, improvisational music therapy is defined as the interactive use of live music for engaging clients to meet their therapeutic needs (Bruscia, 1998). The current study recognized the emotional aspects of interpersonal engagement as having significant importance for children with autism, and investigated the effects of improvisational music therapy on positive emotional expression, emotional engagement, interpersonal initiatives and responsiveness during joint engagement episodes in children with autism.

Music acts as an essentially emotional, relational and motivational medium when, in music therapy, it is purposefully created to engender 'interpersonal relatedness' by employing a well-measured systematic intervention. Music therapists seek to establish a meaningful relationship with the client through a shared music making process (joint clinical improvisation) (Alvin and Warwick, 1991; Robarts, 1996). Within this therapeutic intervention, the music therapist identifies musical elements (temporal beat, rhythmic patterns, dynamics of expression, pitch range and melodic contour) in the child's musical and non-musical behaviour, and then provides a predictable, empathic and supportive musical structure to attract and engage the child. This happens mainly through non-verbal and multimodal contexts, involving vocal and instrumental exchanges, eye contact, facial expressions, movement and gestures (Holck, 2007; Wigram, 2002). In this context, the children often appear to perceive and experience the therapist's music as related to their own expression, which may motivate them to respond, join in, and initiate further musical interaction with the therapist (Robarts, 1996; Wigram and Elefant, 2009). The therapeutic approach that underpins this process is 'musical attunement', requiring various musical and empathic techniques geared towards the child's responsiveness, characteristics and needs. It is an intuitive and moment-by-moment process, sensitively tuning into, elaborating and regulating each participant's behavioural and emotional expressions through musical engagement. In music therapy literature, this is often likened to early mother–infant interaction (Holck, 2007; Robarts, 1996; Wigram and Elefant, 2009).

'Musical attunement' is a term adapted from the concept of 'affect attunement' (Stern, 1985). Stern (1985, p. 135) considered that the mother's sympathetic attunement to her baby's expression enables and maintains 'interaffectivity', which was 'the most pervasive and clinically germane

feature of intersubjective relatedness' in infancy. The phenomena of finely tuned affective sharing during the early dyadic (person–person) and triadic (person–object–person) interaction between infants and mothers are well documented in infant studies and considered as the foundation for more complex communication, social cognition and language development (Adamson and Bakeman, 1985; Feldman, 2007; Stern, 1985). Studies of these early mother–infant interactions report reciprocal, rhythmically matched and synchronized communication, using various forms of vocal exchange, eye contact, facial expression and bodily movement, which is highly musical and improvisational in nature.

Studies of early interaction between infants or young children with autism and their parents do not demonstrate the patterns of the affective reciprocal communication that is widespread in typically developing infants and young children, but rather show disorganized and asynchronous social behaviour (Dawson et al., 1990; Trevarthen and Daniel, 2005; Wimpory et al., 2000). Previous studies suggested deficits in expression of emotion and emotional responsivity in children with autism (Scambler et al., 2007; Snow et al., 1987). Therefore, the sharing of emotional communication and affective interpersonal relatedness appears to be very difficult for these children to experience. A crucial question for any intervention is how to develop some form of positive emotional communication in autistic children with their communicative partners.

Recent studies have indicated that one of the key factors in successful intervention in autism is to provide systematically individualized intervention suited for each child's developmental needs and unique characteristics (Bono et al., 2004; Trevarthen and Daniel, 2005). Previous studies have also shown that a child-centred approach involving predictability and contingent adult responses to the child's focus of attention and interests during play interaction will lead to increased joint attention and social engagement in children with autism (Lewy and Dawson, 1992; Siller and Sigman, 2002; Watson, 1998; Wimpory et al., 2007). Improvisational music therapy is just such an individualized intervention that facilitates moment-by-moment motivational and interpersonal responses in children with autism (Robarts, 1996; Trevarthen and Aiken, 2001; Wigram, 2002). Furthermore, increasing affective facial expressions and interaffectivity during shared music making between an autistic child and a music therapist are reported in case examples (Alvin and Warwick, 1991; Holck, 2007; Robarts, 1996; Wigram, 2002). However, to date there has not been a controlled study in this area.

This exploratory study employed a comparison design in two different conditions (improvisational music therapy versus toy play sessions) and two different parts of a session (an undirected/child-led part versus a more directed/therapist-led part) in each condition. This study was designed to

compare the effects of these two different media (music versus toys) and to find out how children respond in a musical context with or without direction, compared with a non-musical context such as play activities with toys with or without direction.

Method

Participants

Children aged between 3 and 5, and not previously treated with either music therapy or play therapy, were recruited from the Department of Child and Adolescent Psychiatry at Seoul National University Hospital (SNUH), Korea. The parents of the children were informed about this research project by the staff at SNUH, and were given the contact details of the first author. Twenty-five mothers voluntarily contacted the first author and met with her for the initial interview. Before the trials, each child was systematically reviewed by a senior child and adolescent psychiatrist at SNUH utilizing DSM-IV-TR diagnostic criteria (American Psychiatric Association, 2000), and the diagnosis was verified through independent second opinion. A confirmed diagnostic consent of autism was made for 18 children. Subsequently, the parents of 15 children signed informed consent forms. However, during the clinical trial, the parents of five children decided to drop out for concerns regarding health problems and long distance travel. Ten children (all male) completed the clinical trials. Table 1 presents chronological age (CA) in months at intake; the scores of the Korean version of the Childhood Autism Rating Scale (CARS: Kim and Park, 1995); the developmental quotients (DQs) of the Korean version of the PsychoEducational Profile (PEP: Kim, 1995); and the social quotients (SQs) of the Korean version of the Vineland Social Maturity Scale (SMS: Kim and Kim, 1985). The cutoff score for autism is 30 in the original CARS, whereas in the Korean version of CARS it was found to be 28 (Shin and Kim, 1998). Clinical trials started in early 2004. However, during the latter stages in 2005, the Autism Diagnostic Observation Schedule (ADOS: Lord et al., 1999) became available in SNUH and was therefore administered to the four remaining participants,

Table 1 **CA, CARS, SMS and PEP scores**

	Minimum	*Maximum*	*Mean*	*SD*
CA (months)	39.00	71.00	51.20	12.08
CARS	32.00	42.50	36.10	3.41
SMS–SQs	47.40	71.00	58.84	7.80
PEP–DQs	60.00	89.00	70.29	9.97

adding this additional diagnostic confirmation of autism for those examined children.

There was considerable variability among the children; five children were non-verbal while another five were verbal with varying degrees of language skills. Such variability is typical in children with autism, and a within-subjects crossover design was thought to be the best solution in order to take into account the variability between subjects.

Eight children were in preschool special education, and two were in mainstream preschool programmes that included additional therapeutic inputs, such as speech language therapy and cognitive and behavioural therapy. The type and frequency of educational and therapeutic inputs throughout the period of the research trials were reported as mainly consistent, with inevitable changes such as transfers in preschool placements.

Procedure

A repeated measures, within-subject comparison design was used, where each child had toy play sessions compared with improvisational music therapy sessions of the same duration consisting of weekly 30 minute sessions for 12 consecutive weeks in each condition. The therapeutic environment, including the selected play materials (toys versus musical instruments), were consistent throughout the trials (Table 2). The trials were

Table 2 **Play materials in music therapy and play conditions**

Instruments in music therapy	*Toys in play sessions*
An upright piano	A dollhouse set (a family and a dog, kitchen utensils, furniture, a house, etc.)
A standing cymbal (Istanbul, 16 inch medium crash)	A big dump truck
A 20 inch Timpani drum (Sonor)	A big bulldozer
An alto xylophone (Sonor)	A Lego block set
A chroma harp (Samick)	A pair of middle size balls
3 different colour tone bar	3 different spinning tops
4 different colour toy handbells (C = red, E = yellow, G = skyblue, A = blue)	5 different colors of play dough (red, yellow, blue, green, brown)
A pair of paddle drums	A pair of small balls
A small guiro	A peg fruits and vegetables play set (to cut in pieces and put back)
A pair of egg shakers	A range of different puzzles
A pair of finger cymbals	Two transformative robots (from robot to car)
A range of horns, whistles and bird calls in pairs: reed horns, duck, crow, skylark calls, sliding whistles, train whistles, sirens, etc.	A range of different shape and size minicars in pairs: police, fire-engine, sports, sedan, hospital emergency cars, etc.

carried out by a different therapist for each condition to avoid therapist bias and person familiarity influencing the outcome.

Children were randomly assigned either to have the music therapy sessions first and the toy play sessions later (group 1), or vice versa (group 2). There was a 1 week washout period between the two conditions.

A semi-flexible treatment manual[1] was used to further achieve consistency and comparability between conditions. Sessions were divided into two different parts: undirected (child led) and more directed (therapist led). Each session started with greeting the child. After the greeting, each child was allowed to play the way he wanted while the therapist engaged through both supporting and elaborating with the child's play. During the more directed second part, the therapist directed the child by gently introducing modelling and turn-taking activities within the child's focus of attention, range of interests, and level of tolerance. When the child became resistant, anxious, or even upset by the therapist taking control of the second half of the session, the therapist was instructed to allow the child to do what he wanted for a while, and then gently reintroduce the structured play. The directed part ended with a goodbye ritual. Each part lasted 15 minutes.

In order to differentiate the media used in these two conditions, the therapists in music therapy were instructed to interact with the child mainly through music, whereas the therapists in the toy play condition were instructed to engage the child by any means, but to avoid any musical media, such as singing or rhythmic playing. Trials in the music therapy condition were undertaken by one of two professional music therapists, and in the toy play condition by one of four healthcare professionals (music therapist, play therapist, or social worker) experienced with the population and trained in a client-centred approach. Each child was allocated to an individual therapist dependent on availability and convenience on both sides. Randomization of allocation to therapists was not possible due to the limited availability of individual therapists and each child's educational schedules. Before the trials, the first author trained each therapist in following the treatment manual.

Intervention measures

An analysis of predefined target behaviours in the two different conditions was undertaken on selected 4 minute samples taken from the undirected and more directed parts of the session, and from selected sessions (1, 4, 8, 12). Observed behaviours were recorded in terms of both their frequency and their duration. Each target behaviour was coded during joint engagement episodes, which were defined as a three-way exchange (interactive state of joint engagement) that involved the child (self), the therapist (another), and objects or events in either musical form or toy play.

There were two broad categories. The first category concerned the participant's emotional and motivational responsiveness (joy, emotional synchronicity, initiation of engagement) towards different types of attunement promoted by the therapist in these two conditions. The second category concerned two different types of responsiveness towards the therapist's initiation of interaction (social invitation and interpersonal demands). Brief definitions of these behaviours are summarized in Table 3.

Each attempted 'initiation of interaction' by the therapist was also measured as part of a fidelity check of the treatment protocol to determine whether the therapists carried out the sessions as intended.

For the microanalysis of behaviours (second by second), a coding sheet and detailed coding guidelines were developed by the first author (available from the first author).

Recording and coding procedure

Recording of the sessions was undertaken using two high-tech dome cameras (Samsung SCC-641) and a sound condenser (Sennheiser 608).

Table 3 **Brief definition of target behaviours**

Target behaviour	*Definition*	*Type of measure*
Joy	The child's joyful facial expression: joy refers to the event when the child either smiles (facial expression only), or laughs (facial expression with vocal sound) during the interaction with the therapist	Frequency and duration
Emotional synchronicity	This refers to an event when the child and the therapist share a moment of emotional affect (happiness or sadness) while engaged with each other. A typical event exemplifying emotional synchronicity is when the child smiles (or cries), and the therapist's behaviour mirrors or reflects the similar emotional state through facial, gestural or vocal reactions	Frequency and duration
Initiation of engagement	This refers to an event where the child spontaneously initiates interaction with the therapist, or initiates a change during ongoing interaction, and then expects the therapist to follow	Frequency
Compliant response	This refers to the child responding and complying with the therapist's initiation of interaction(s)	Frequency
No response	This refers to the child showing no sign of awareness to the therapist's initiation of interaction and continuing to do what he has been doing	Frequency

This was controlled and recorded remotely by a trained research assistant using a system controller (Samsung SSC-1000), a sound mixer (Behringer EURORACK MX602A), a TV monitor, and a DVD recorder (LG LCR-S 4800) in a monitoring room. The assistant was instructed to capture the child's frontal upper body with a clear view of the child's face and some view of the therapist (preferably the therapist's face).

Coding of behaviour was undertaken using the LG LCR-S 4800 time-code generator that displays hours, minutes and seconds. The coder viewed the DVDs in a predetermined randomized order using the LG LCR-S 4800 and a 25 inch TV monitor. The coder viewed each DVD repeatedly, first at normal speed and then at two to four times slower than normal speed for each target behaviour. There were 80 DVD clips for each condition (total 10.6 hours of footage).

Data analysis

Hypotheses were generated for each variable where a comparison could be undertaken between two conditions (music therapy versus toy play), the undirected and more directed parts of the sessions, and the selected sessions (1, 4, 8, 12). A repeated measures analysis of variance (ANOVA) determined the interaction of all variables to establish whether changes were statistically significant. The distribution of values was examined for all variables. As expected with frequency and duration data, the data did not follow a normal distribution, but resembled a Poisson distribution. The appropriate procedure for a repeated measures ANOVA was a generalized linear mixed model with multivariate normal random effects, using a penalized quasi-likelihood (Venables and Ripley, 2002).

Inter-observer reliability

For establishing inter-observer reliability, 30 percent of the total DVD recordings were randomly selected and rated using the intraclass correlation coefficient (ICC). The coding procedure was highly complex and extremely time consuming. The primary coder was the first author. The first author trained a research assistant for approximately 5 hours a week over 4 months to ensure reliable inter-observer agreement. This second coder was blind to the order of the sessions. Table 4 shows the results of the ICC, demonstrating high inter-observer reliability ranging from 0.86 up to 0.98, except for compliant response and no response. These two dependent variables required interpretation of behaviours where disagreement was potentially greater. The overall results of the ICC indicated that the levels of clinical significance were between fair and excellent (Cicchetti, 1994).

Table 4 **Inter-observer reliability of dependent variables**

Dependent variables	*Agreement ICC*
Joy frequency/duration	0.91/0.98
Emotional synchronicity frequency/duration	0.90/0.92
Initiation of engagement by the child frequency	0.93
Initiation of interaction by the therapist frequency	0.86
Compliant response frequency	0.73
No response frequency	0.59

Results

The results of session analysis yielded very similar patterns of frequency and duration data on selected target behaviours, as can be seen from Table 5, which summarizes the results of all ANOVAs. Therefore, only frequency data were selected for graphical presentation in this article (graphical analyses of duration data are available from the first author). The main results of session analysis are depicted in boxplots that present the median (bold line), 25th and 75th percentile, and outliers.

Effects on emotional and motivational responsiveness

Joy Figure 1 presents the pooled result of joy behaviour. While the frequency of joy events was steadily increasing over the whole selected sessions (1, 4, 8, 12) in the music therapy condition, the median value of the toy play sessions remained almost steadily zero in both undirected and directed parts. There were more events of joy observed in the undirected part of music therapy than in the directed part.

A significant effect was found for joy behaviour when comparing the music therapy with toy play, $F(1, 135) = 24.26$, $p < 0.001$, differences between sessions (1, 4, 8, 12), $F(3, 135) = 4.40$, $p < 0.01$, and the undirected and directed parts, $F(1, 135) = 7.07$, $p < 0.01$.

Emotional synchronicity A significant effect of emotional synchronicity was found when comparing music therapy with play, $F(1, 135) = 31.26$, $p < 0.001$, different sessions, $F(3, 135) = 8.38$, $p < 0.001$, and the session parts, $F(1, 135) = 12.25$, $p < 0.001$.

In order to include only confirmable events of joyful emotional synchronicity, the researcher limited this category to a clearly joyful moment (when the child smiles and laughs, and the therapist simultaneously shows congruent behaviour through facial, gestural, or vocal expression to the child's happy expression), as the most concrete and reliable way to record

Table 5 **Descriptive results and test results of the generalized linear model**

Outcome	*Predictor*										
	Condition			*Session part*			*Session*				
	MT *Mean* *SD* *Mdn*	*Play* *Mean* *SD* *Mdn*	*MT vs. Play* *F(1, 135)*	*undirected* *Mean* *SD* *Mdn*	*directed* *Mean* *SD* *Mdn*	*undirected vs. directed* *F(1, 135)*	*1* *Mean* *SD* *Mdn*	*4* *Mean* *SD* *Mdn*	*8* *Mean* *SD* *Mdn*	*12* *Mean* *SD* *Mdn*	*1 vs 4 vs 8 vs 12* *F(3, 135)*
Joy frequency	3.00 4.64 1	1.02 2.59 0	24.26***	2.54 4.76 0	1.49 2.65 0	7.07**	1.68 3.63 0	1.05 2.12 0	2.27 4.01 0	3.05 5.02 1	4.40**
Joy duration	13.28 22.98 2.5	2.81 7.93 0	31.60***	10.31 21.61 0	5.78 13.01 0	8.89**	5.35 13.89 0	3.77 10.01 0	9.15 18.90 0	13.90 24.43 2	6.05***
Emotional synchronicity frequency	1.91 3.45 1	0.38 1.01 0	31.26***	1.51 3.44 0	0.78 1.42 0	12.25**	0.53 1.3 0	0.55 1.15 0	1.27 2.31 0	2.23 4.28 0.5	8.38 ***
Emotional synchronicity duration	12.18 22.20 3	2.44 9.35 0	15.80***	9.31 21.24 0	5.25 13.00 0	7.27**	3.75 12.43 0	2.98 7.40 0	9 19.95 0	13.5 24.31 1	5.59**
Initiation of engagement frequency	3.41 4.98 1	0.28 0.71 0	54.95***	2.16 4.71 0	1.52 2.81 0	4.85*	0.8 1.98 0	1.93 4.41 0	2.05 4.35 0	2.6 4.16 0.5	5.73**

Table 5 **Continued**

Outcome	*Predictor*										
	Condition			*Session part*			*Session*				
	MT *Mean* *SD* *Mdn*	*Play* *Mean* *SD* *Mdn*	*MT vs. Play* *F(1, 135)*	*undirected* *Mean* *SD* *Mdn*	*directed* *Mean* *SD* *Mdn*	*undirected vs. directed* *F(1, 135)*	*1* *Mean* *SD* *Mdn*	*4* *Mean* *SD* *Mdn*	*8* *Mean* *SD* *Mdn*	*12* *Mean* *SD* *Mdn*	*1 vs 4 vs 8 vs 12* *F(3, 135)*
Initiation of interaction frequency	8.05 5.13 8	10.05 6.47 9	9.40**	5.83 4.27 5	12.28 5.56 12	60.00***	9.07 5.84 8	9.18 5.84 7.5	9.03 5.85 9	8.93 6.31 8	0.01 (n.s)
Compliant response frequency	4.61 3.22 4	4.16 4.00 3	26.34***	2.88 2.51 2	5.90 3.93 5	0.07 (n.s)	3.27 3.21 3	4.5 3.72 4	5.1 4.06 5	4.67 3.31 4.5	2.77*
No response frequency	1.43 1.79 1	3.04 2.68 2	12.33***	1.38 1.80 1	3.09 2.64 2	0.29 (n.s)	2.45 2.44 1	2.48 2.55 2	1.8 2.31 1	2.2 2.37 1	0.15 (n.s)

Note. Two- and three-way interactions of the predictors were also included in the models, but were not significant for any of the outcomes. Mdn – median. *** $p < .001$, ** $p < .01$, * $p < .05$, n.s not significant ($p > .05$).

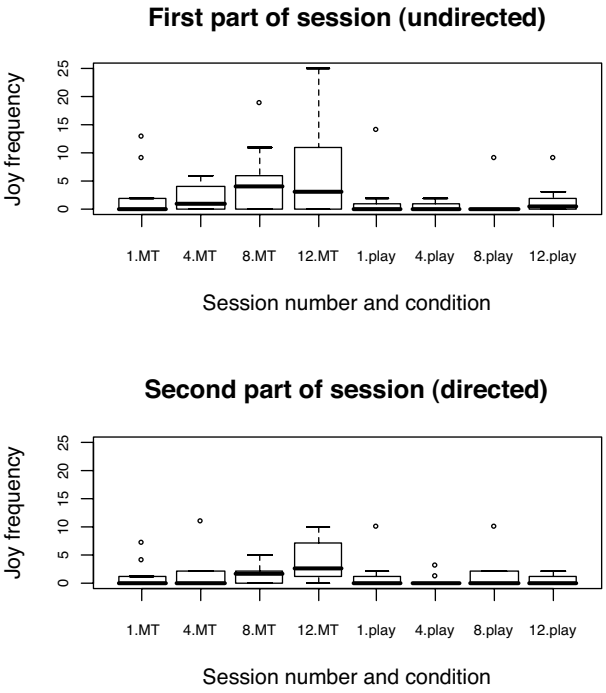

Figure 1 **Joy frequency**

events. As there were only a few events of sadness (in only one session in the sessions selected for analysis did a child cry), emotional synchronicity data were closely linked to the events of 'joy'. Figure 2 indicates that the children shared their affective state with the therapist more when they were in control of what was happening than when the therapist made demands on them.

Initiation of engagement by the child A significant effect was found for initiation of engagement behaviours when comparing the conditions, $F(1, 135) = 54.95$, $p < 0.001$, the different sessions, $F(3, 135) = 5.73$, $p < 0.01$, and the session part, $F(1, 135) = 4.85$, $p = 0.03$.

The results described in Figure 3 indicate that music therapy has a greater effect in increasing initiation of engagement than toy play. The children showed slightly more initiatives in the undirected part of the sessions in both conditions, and the initiatives were markedly more frequent in music therapy than in toy play.

Effects on interpersonal responsiveness

Initiation of interaction by the therapist A significant effect was found for initiation of interaction by the therapist when comparing music therapy

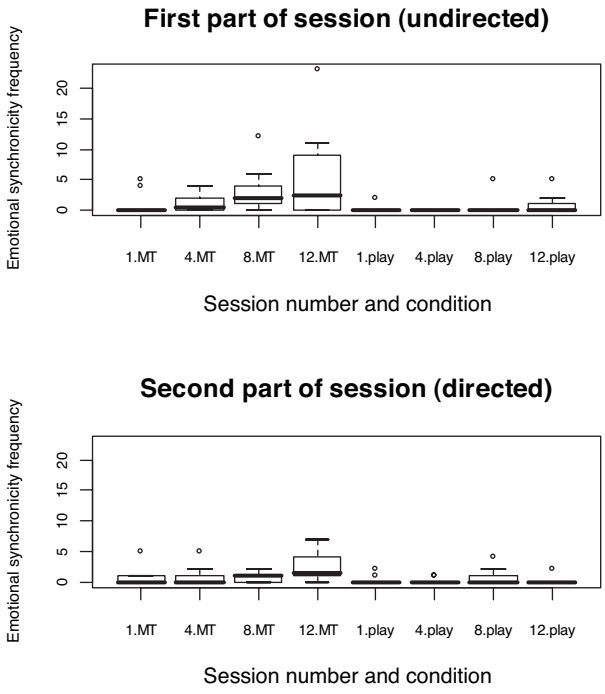

Figure 2 **Emotional synchronicity frequency**

with play, $F(1, 135) = 9.40$, $p < 0.01$, and the undirected with the directed part of the session, $F(1, 135) = 60.00$, $p < 0.001$. In both conditions, the directed part of the session reported a higher frequency of initiation of interaction by the therapist than the undirected part (mean score of 12 versus 5 per session), confirming that the therapists were able to follow the instructions of the treatment manual.

Compliant response A significant effect was found in compliant response when comparing conditions, $F(1, 135) = 26.34$, $p < 0.001$, and different sessions, $F(3, 135) = 2.77$, $p < 0.05$. Figure 4 shows that more compliant behaviours were shown by children with autism in music therapy than in toy play.

In both conditions, the range of values increased over the four sessions selected for analysis. It is interesting to observe that the range of values in the final session of the play condition achieved almost the same reported range of values found in the first session of the music therapy condition.

No response A significant effect was found for no response behaviour when comparing two conditions, $F(1, 135) = 12.33$, $p < 0.001$. Figure 5

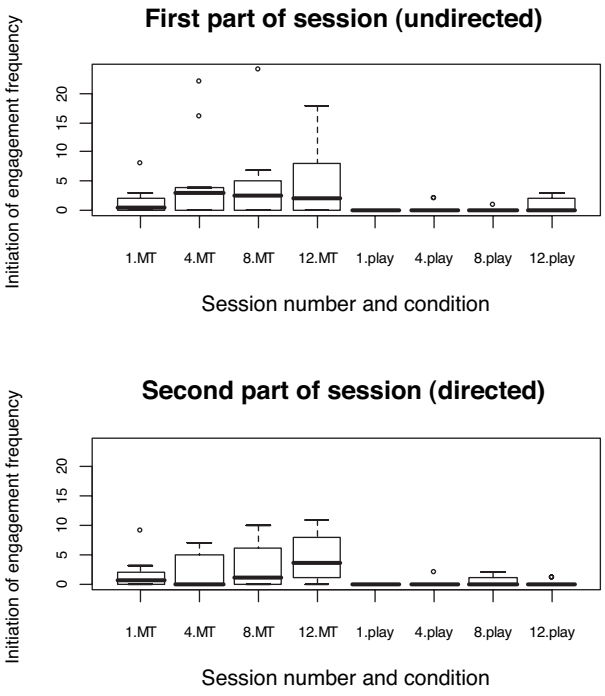

Figure 3 **Initiation of engagement frequency**

shows approximately double the frequencies of no response behaviour were displayed by the children in the toy play condition compared with the music therapy condition.

Discussion

The results of the ANOVAs found a marked difference between the effects of improvisational music therapy and toy play sessions ($p < 0.05$). The most clinically relevant and important findings from the analysis of behaviours in the sessions were social-motivational aspects of musical interaction whereby improvisational music therapy produced 'joy' and 'emotional synchronicity' events that were significantly more frequent and of a longer duration than in the toy play condition, which was linked to the degree of spontaneous 'initiation of engagement' behaviours in children.

Children with autism are often reported to have difficulty in expressing their emotions at the right time and place within a social context, and Newson (1984) proposed social timing difficulties in children with autism. Data presented in Figures 1 and 2 indicated that the social timing aspects of behaviour in the children, especially in regard to expressing and matching

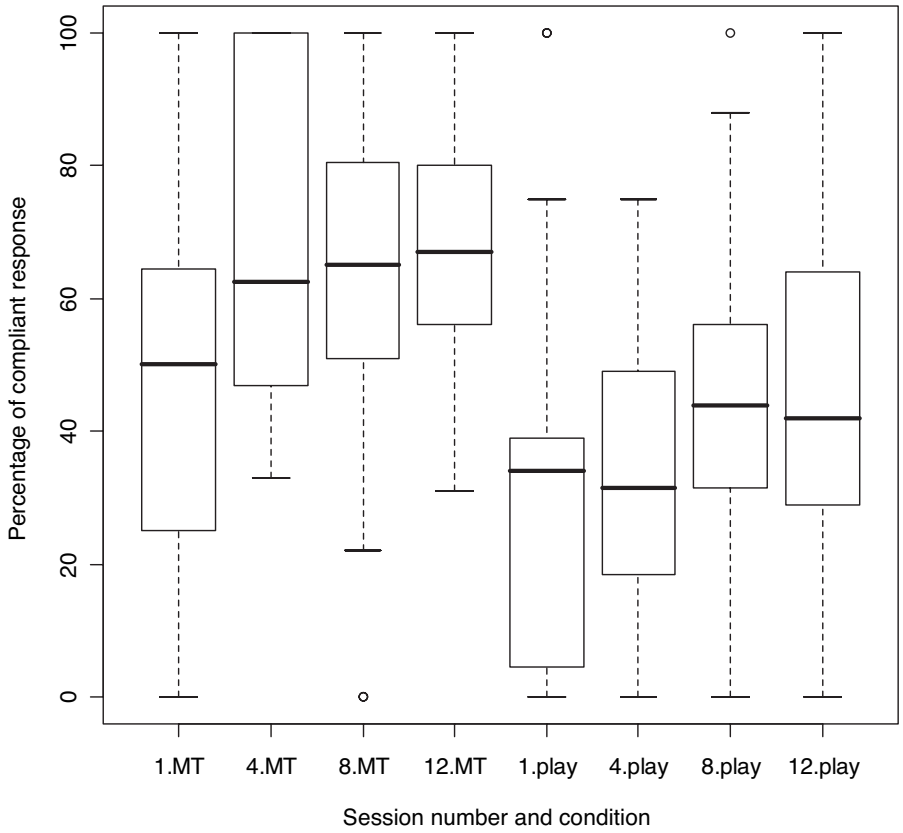

Figure 4 **Compliant response**

positive emotional expression, improved consistently over sessions and clearly more so in the music therapy condition. This draws attention to the role of 'musical attunement' (in comparison with solely 'attunement' in toy play sessions) for the development of interaffectivity in children with autism. The temporal structure of music and the specific use of musical attunement in improvisational music therapy suggest that we can help children with autism experience and develop affective skills in a social context.

To date no controlled studies have investigated the expression of joy and emotional synchronicity in children with autism during music therapy intervention. In a qualitative study involving the microanalysis of the music therapy process, Holck (2007) demonstrated the chain of musical interaction between the child and the therapist through detailed, time-based documentation of facial expression (smile), eye contact, and the initiatives of the child with well-timed responses of the therapist to the child's musical

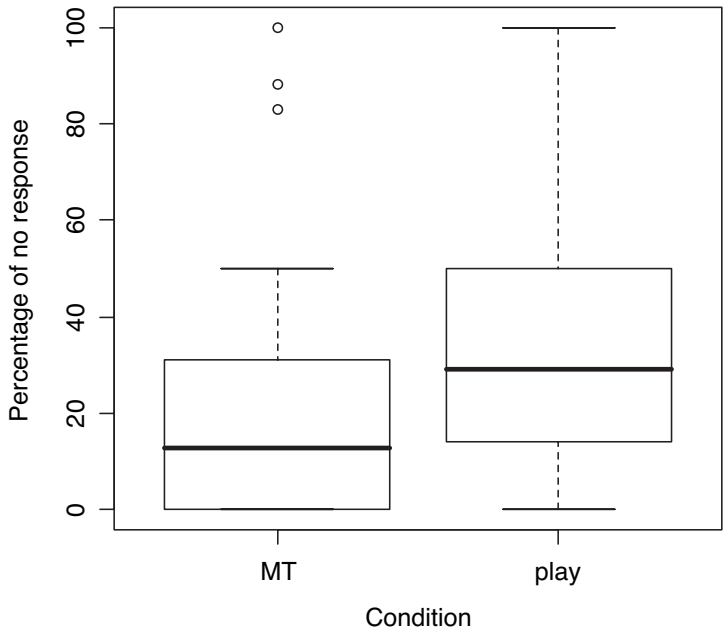

Figure 5 **No response**

expression. The findings from the present study provide some initial quantitative evidence suggesting improvisational music therapy does promote positive emotional expressions and interaffectivity.

The results lead to some speculation regarding why 'musical attunement' was more effective than solely 'attunement'. While children with autism are generally found to have impaired perception of linguistic and social auditory stimuli (Boddaert et al., 2004), they are also reported to possess either intact or somewhat superior musical perception compared with their typical and clinical control group of individuals (Thaut, 1988). Creating music that, by its qualities, relates to the child's expression, interest and focus of attention may evoke responses from the child to a therapist creating such relational music for them. Moreover, improvising music together is an emotionally engaging process.

Anecdotal records of sessions informed the authors that the children had almost no difficulty in object engagement (the child attending exclusively to an object: Adamson and Bakeman, 1985) in both conditions. This suggests that the range of toys and musical instruments used in this trial were interesting to the children. Most children had a range of preferred objects in both conditions even though the way they played with these objects was often idiosyncratic and repetitive. They tended to play with their chosen objects alongside the therapist when the therapist sensitively

attended to and supported their play in both conditions. The children were, however, very territorial with their chosen objects. The younger and the more severely autistic the child, the more territorial and exclusive they were in their play with objects. Therefore, trying to share an object (a set of objects) of the child's choice, or trying to engage a child who was already preoccupied with a certain toy, was often quite difficult. On the other hand, music can be an attractive medium, allowing the child his/her own space and the choice of objects, at the same time engaging the child with different objects of the therapist's choice. A recent study (Wimpory et al., 2007) also reports that an adult's musical and motoric behaviours that followed the child's focus of attention were significantly associated with episodes of social engagement in young children with autism. Although this current study excluded the use of musical media in the toy play condition to differentiate, music is often actively used in early intervention programmes for children with ASD. Both Musical Interaction Therapy (Wimpory and Nash, 1999) and the Mother–Child Attachment Program at SNUH (Ju, 2005) have used structured and precomposed music (i.e. songs) as part of preverbal interaction between the child and a familiar adult (mother). Wimpory and Nash (1999) recognize that the supportive use of music towards the dyadic interaction between the child and the mother can enhance interests and meaning to social situations for the child. Both previous and the current study indicate that we should use music within the child's focus of attention, behavioural cue and interests, whether it is improvised or precomposed. A future study should perhaps look at the differential effect on response of improvised and precomposed music with young children with autism.

The pattern of results in 'joy', 'emotional synchronicity' and 'initiation of engagement' was almost synchronous. In the music therapy condition, there were more 'joy', 'emotional synchronicity' and 'initiation of engagement' events in the undirected part than the directed part, suggesting that children were happier, more able to express their happy emotions and more able to share their affects with the therapist when leading. They also displayed more initiatives when they were leading and controlling the musical interaction with the therapist than when the therapist imposed demands. As spontaneous 'initiation of engagement' is a rare behaviour in children with autism, the clinical implication of this result is significant. Previous studies indicated that a consideration of the emotional and motivational process is crucial in understanding the role of joint engagement in social development (Joseph and Tager-Flusberg, 1997; Kasari et al., 1990; Trevarthen and Aitken, 2001; Trevarthen and Daniel, 2005), and the results of the present study indicated the same direction.

This aspect was clearly connected to the interpersonal responsiveness of children. 'Compliant responses' were markedly more present in music

therapy than toy play, and 'no responses' were twice as frequent in toy play as in music therapy. This suggests children displayed more cooperative and interactive behaviours in music therapy. A recent study (Jackson et al., 2003) dealing with responses to social bids compared children with autism to verbal-age-matched children with mental retardation in naturalistic settings. Children with autism produced fewer 'positive responses' and more 'no responses' than children in the control group. The results of the current study suggest that musical attunement enhances musical-emotional communication together with 'joy' and 'emotional synchronicity', which results in children's spontaneous willingness to respond, initiate and engage further.

This leads one to consider what the optimum condition is to engage and motivate these children towards social interaction. The results of this study seem consistent with previous studies (Lewy and Dawson, 1992; Siller and Sigman, 2002; Watson, 1998; Wimpory et al., 2007). Siller and Sigman (2002) pointed out the close relationship of a sensitive and attentive approach of the adult to the concept of 'child choice'. The results of this study suggest that it is important to allow the child to lead and to control more of what is happening, especially in the early phase of therapy sessions, and also in the earlier (undirected) part of the session. Future research studies in this area might further test this hypothesis by randomizing the order of the directed and undirected parts of sessions to objectively explore the impact of modelling and leading on children with autism.

There was also a lesser, but nevertheless consistent increase of 'joy', 'emotional synchronicity' and 'initiation of engagement' in the directed part of the session. One has to recognize the fact that the therapists in this study were instructed to work within the child's focus of attention and interests sensitively and contingently in the directed part. Therefore, a future study should compare attunement and non-attunement experimental conditions to find out whether children respond differently.

As this study was based on a small sample, drawing any generalizable conclusion is premature. The test power was low in this exploratory study and this should be considered in interpreting the results of the study. In planning future studies, test power should be considered and calculated. It was not possible for both coders to be blind to session conditions in this design. However, it might be possible in a future study examining the generalization of behaviours to other situations. This study contained a number of unexpected limitations. For example, one child was under medication (methylphenidate) for 2 months during the music therapy condition. This child displayed a dramatic reduction in response and a depressive mood while under medication. Although this met exclusion criteria for the study, in line with the CONSORT principles for reporting experimental studies, the results from this child were retained and included in the analysis.

There was considerable variability among the children. Subgroup analyses based on differences in language capacity, severity of autism, and age would have been clinically relevant and very interesting as well as an analysis of different therapists' effects. However, small sample size limits the relevance of such subgroup analyses, which, with a larger sample, would demonstrate how children with different developmental needs respond to this type of intervention and different therapists.

In conclusion, the findings of this study highlighted the importance of social-motivational aspects of musical interaction between the child and the therapist, the therapeutic potential of such aspects in improvisational music therapy, and the relative value of less directed and more child-centred approaches for children with autism.

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Note

1 The full treatment manual is available from the first author.

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