

## 자폐아동의 즉흥음악치료에서 나타난 주요 음악요인 분석과 아동의 대상선정에 관한 연구

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즉흥음악치료는 자폐아동들의 사회적 상호작용을 증진시킨다고 알려져 있다. 본 연구는 즉흥음악치료에서 치료사-내담자간의 상호작용의 음악적 동시성 및 선택대상을 규명하는 것을 목적으로 한다. 또한 즉흥음악치료 상황에서 일어나는 상호작용의 핵심적 요인을 음악요소 분석을 통해 규명하고자 하였다. 본 연구는 악기를 주로 사용하는 즉흥음악치료를 장난감을 사용하는 놀이치료 상황과 비교했으며, 두 가지 치료를 무작위 배치하는 교차설계를 이용하였다 (n = 10). 특정 회기별 목표행동분석(1, 4, 8, 12회기)을 실시하고, 반복측정 분산분석을 활용하였다. 분석결과 치료사와 아동간의 음악적 동시성의 빈도와 기간이 즉흥음악치료에서 장난감 놀이치료 상황에 비해 현저히 높게 나타났다 ( $p < .001$ ). 또한 리듬과 다이내믹이 치료사와 아동간의 음악적 동시성을 가능케 하는 주요 요소로 측정되었다. 즉흥음악치료에서 자폐아동들은 나팔과 각종 호루라기를 가장 자주 선택했고, 장난감 놀이 상황에서는 인형의 집을 제일 많이 선택했다. 본 연구는 학령 전 자폐아동과 일하는 음악치료 임상가들에게 유용한 정보를 제공한다.

핵심어 : 자폐증, 즉흥음악치료, 주요 음악요인, 대상선정

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## Salient musical elements and children's choice of objects in improvisational music therapy for children with autism

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Improvisational music therapy is known to promote social engagement in children with autism. This study investigated salient features that characterize the engagement of the child with autism and the therapist in improvisational music therapy. Through video analysis of the children's behavior, this study sets out to investigate what engages children with autism into mutual play with the therapist in improvisational music therapy by measuring the shared musical elements between the child and the therapist during musical synchronicity episodes and the children's choice of instruments. A repeated measures, a crossover design was employed in two different conditions ( $n = 10$ ). Children were randomly assigned into two groups; group 1 participated music therapy first, followed by play therapy second. Group 2 followed the reverse order. Specific target behaviors were analyzed in the selected sessions 1, 4, 8 and 12. As expected, improvisational music therapy produced markedly more and longer events of musical synchronicity in children with autism than the play sessions with toys ( $p < .001$ ). Rhythm and dynamic appeared to be the two most salient elements during musical synchronicity events between the child and the therapist. Observational findings confirmed that horns and whistles were the most frequently selected instruments in music therapy, whereas a dollhouse set was in play therapy by children with autism. The clinical implications and the details of these findings are discussed further.

*Keywords* : Autism, Improvisational music therapy, Salient musical elements, Choice of objects

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## I . Introduction

Improvisational music therapy(IMT) has been known to promote self-expression, emotional communication and social engagement in children with autism (Alvin & Warwick, 1991; Brown, 1994; Edgerton, 1994; Holck, 2004; Kim, Wigram & Gold, 2008, 2009; Nordoff & Robbins, 1971; Robarts, 1996; Trevarthen, 2002; Wigram & Elefant, 2009). Since the 1960s and up until recently, there have been numerous claims in IMT on how the music therapists' finely tuned, sensitive, responsive and attentive use of music (musical attunement) engaged their clients with autism spectrum disorder (ASD) into the mutual music making process (Alvin & Warwick, 1991; Holck, 2004; Howat, 1995; Kim et al., 2008, 2009; Nordoff-Robbins, 1971; Robarts, 1996; Saperston, 1973; Wigram; 2002; Wigram & Elefant, 2009).

While such claims have been heavily accumulated, there has been no systematic study investigating the crucial elements of musical interaction that connects the therapist and the child with ASD in the mutual music making process. There is a lack of scientific evidence, or that of the guidance on what the therapist should look for when the therapist is improvising with the child with ASD, and what objects the children select to play. It is a crucial area to investigate, which will inform not only the music therapists working with this population, but also other related professionals in general.

Therefore, this study sets out to explore the salient features that characterize the engagement of the child with autism and the therapist in IMT by searching for salient musical elements that have been shared between the child and the therapist during the mutual music making process. The mutual music making process in this context involves two individuals (the therapist and the child) playing simultaneously. Therefore, the mutual music making process has been defined as 'musical synchronicity' in order to highlight the timing of playing together simultaneously. Musical synchronicity will be examined and the shared musical elements between the child and the therapist will be noted. The children's choice of objects will also be investigated as clinically relevant aspects when working with children with autism.

To the present knowledge of the author, there has been no controlled study carried out to examine these aspects in IMT. However, there have been many case studies where music therapists recorded what instruments the child and the therapist played, and how musical interaction developed within one session and over time. Alvin (Alvin & Warwick, 1991) often used her own cello in working with children with ASD. Nordoff (Nordoff & Robbins, 1971, 1977) used the piano for the most part, while children often played the drum and the cymbal.

Wigram (2002) described the piano duet with a boy named Joel. Robarts (1996) described a boy using the snare drum and the cymbal, and herself the piano and her own voice. It seems that the therapist using the piano and the child using the drum and the cymbal is a frequent choice reported in literature. This is, of course, only the author's impression, not the results of a detailed search and analysis, and can only be interpreted from therapists who have published their work. It is, however, unclear in these reports whether those instruments played by these children were in fact the children's own choice of instruments, or the therapist's choice and preparation.

The most recent randomised controlled studies in IMT also involved pre-school children with ASD (Gattino et al., 2011; Geretsegger et al., 2012; Thompson, 2012). These studies has reported either the range of instruments used in IMT (guitar, egg shakers, tambourine, kazoo, slide whistle, drum, xylophone, keyboard, etc), and/or the specific therapeutic approaches the therapist used, but has not investigated the children's choice of objects, nor shared musical elements during musical interaction between the child and the therapist.

This preliminary study set out to explore these aspects in IMT compared to play therapy with toys. The study was conducted between the year 2004 - 2006 and was approved by the human ethics committee at Aalborg University, Denmark.

## II. Method

### 1. Participants

Ten pre-school children (male) with clear diagnoses of autism (ages between three to five) were recruited from the Child and Adolescent Psychiatry at Seoul National University Hospital, Seoul, Korea ( $n = 10$ ). None of them had ever attended either music therapy, or play therapy. Informed consents were obtained from their parents. Participants were diagnosed independently by two child psychiatrists and each child met the DSM-IV-TR criteria for Autistic Disorder. Every participant scored above the autism cut-off score on the Korean version of the Childhood Autism Rating Scale ( $M = 36.10$ ; range 32-42.50;  $SD = 3.41$ ). At intake, the mean chronological age of the participants was 51 months ( $SD = 12.08$ ; range 39-71 months). As expected with young children with autism, variability among the participants was noted; five children were non-verbal and the rest were verbal with different

degrees of language skills. Eight participants were in special education and two were in a mainstream pre-school program. Every child received additional therapy, including speech therapy and behavioral intervention.

## 2. Procedures

The clinical trial was carried out as repeated measures, within a subject comparison design, in which each child had play therapy with toys as a control condition to compare with IMT sessions of the same length (30 minutes weekly for 12 consecutive weeks for each condition). Children were randomly assigned into two groups. One group had music therapy first and then play therapy with toys later, while another group followed the reverse order. A week washout period between conditions was installed.

In order to achieve treatment consistency and comparability between conditions, a semi-flexible treatment manual (available upon the request) was developed and applied. The therapist started each session with a greeting and ended with a good-bye ritual. The therapist used both hello and good-bye songs in IMT, whereas the therapist in play therapy dealt with these rituals verbally. The primary task of the therapist was to engage the children at their level and interest, and then expand the children's experience by introducing some structure via modeling and turn-taking activities. The therapist allowed the child to lead the interaction by following and supporting the child's behavioral cue and interests. Even when the therapist introduced some structure, the therapist gently led the child into modeling and turn-taking activities that were within the child's focus of attention, interests and tolerance. Children were allowed to play with objects of their own choice.

Objects in both conditions were selected according to two principles. First, the researcher considered the developmental stages and needs of the pre-school children with autism, and selected objects based on the researcher's clinical experiences and other experts' recommendations. A search of relevant literature confirmed what was commonly used both in IMT (Alvin & Warwick, 1991; Brown, 1994; Edgerton, 1994; Holck, 2004; Nordoff & Robbins, 1971, 1977; Robarts, 1996; Wigram 2002) and toy play conditions (El-Ghonoury & Romanczyk, 1999; McArthur & Adamson, 1996; Watson, 1998; Williams, Reddy & Costall, 2001).

In order to distinguish a musical medium from toy play materials used in these two conditions, the music therapists were instructed to interact with the child mainly through music,

and the therapists in play therapy condition were instructed to use mainly non-musical mediums. The author trained each therapist to ensure the fidelity of the treatment. The equipment used in both conditions were pre-selected and made available to participants throughout the trials in order to achieve consistency and to permit replicability.

<Table 1> Play materials in music therapy and play therapy conditions

Instruments in music therapy	Toys in play therapy sessions
A upright piano	A dollhouse set (A family of four and a dog - a father, a mother, a daughter and a son, kitchen utensils, furniture, a house, etc)
A standing cymbal	A dump truck
A Timpani Drum	A bulldozer
A xylophone	A Lego block
A chroma harp	A pair of large balls
3 different color tone bar	3 different spinning tops
4 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 fruit and vegetable set (to cut them into pieces and put together again)
A pair of egg shakers	A range of different puzzles
A pair of finger cymbals	Two small transformative robots (from Robot to Car)
A range of horns and bird calls in pairs	A range of different shapes and size mini -cars in pairs

### 3. Intervention measures

DVD analysis of the children's behavior was conducted. There were three target areas: musical synchronicity, salient musical elements, and the children's choice of objects in both conditions. As the purpose of measuring musical synchronicity and salient musical elements between the child and the therapist is to find out what engages them into joint improvisation,

one can not expect to find significant musical synchronicity events in play therapy condition. Target behaviors were coded using microanalyses (second by second), and a coding sheet and elaborate coding guidelines were developed by the author (available upon the request).

〈Table 2〉 Brief definition of target behaviors

Target behavior	Definition	Type of measures
Musical Synchronicity	This refers to the event where the child and the therapist are engaged in music making together with some congruence in two or more elements (rhythm, dynamic, melody, vocalization and gesture). MS is the concept that has something to do with 'sharedness' in playing. Typical example of MS is when the child plays the drum and the therapist plays the piano accordingly. Rhythm and dynamics may appear to be the most dominant musical elements in their shared playing.	Frequency and duration
Salient musical elements	Five elements were chosen as the salient musical elements shared between the child and the therapist as dynamic (volume, intensity, and accentuation), melody, rhythm, vocalization and gesture. Harmony was not chosen since children in this age usually do not have the ability to harmonize.	Frequency
Children's choice of objects	This refers to the children's choice of objects, not the therapist's choice of objects.	Frequency

#### 4. Recording and coding procedures

Sessions in both conditions were DVD recorded using DVD recording sets including two dome cameras (Samsung SCC-641) and a remote controller. As there were 240 recorded sessions of DVDs, session one, four, eight and twelve (four minutes from the first half - minutes four to seven, and also same from the second half - minutes 19 to 22) were selected for analysis in order to achieve representative samples and examine changes over time.

The coding of target behavior was undertaken by the coders viewing each DVD clips repeatedly. The basic coding consists of DVD viewing and scoring on the coding sheet developed by the author (available upon the request).

## 5. Data analyses

Before proceeding to the analysis of the DVD data, the distribution of values was examined for all variables. As would be expected with frequency and duration data, the data did not follow a normal distribution. Instead, the distribution of values resembled what is known as a Poisson distribution (Upton & Cook, 2002). The appropriate procedure for a repeated measures ANOVA based on a poisson distribution is available in R ([www.r-project.org](http://www.r-project.org), package MASS, function `glmmPQL`) and described in Venables & Ripley (2002). Generalized Linear Mixed Model with multivariate normal random effects, using Penalized Quasi-Likelihood, was employed. It is basically a repeated measures ANOVA that is appropriate for frequency and duration data. Significant effects will be calculated and depicted in boxplots. Intraclass correlation coefficient (ICC) was used to determine inter-observer reliability. 30 percent of the total DVD excerpts were randomly selected and rated using the ICC. The author was the primary coder and she trained a research assistant once a week for four months to ensure reliable inter-observer agreement. The research assistant were blind to the order of the session. There were high inter-observer reliability ranging from 0.86-0.98.

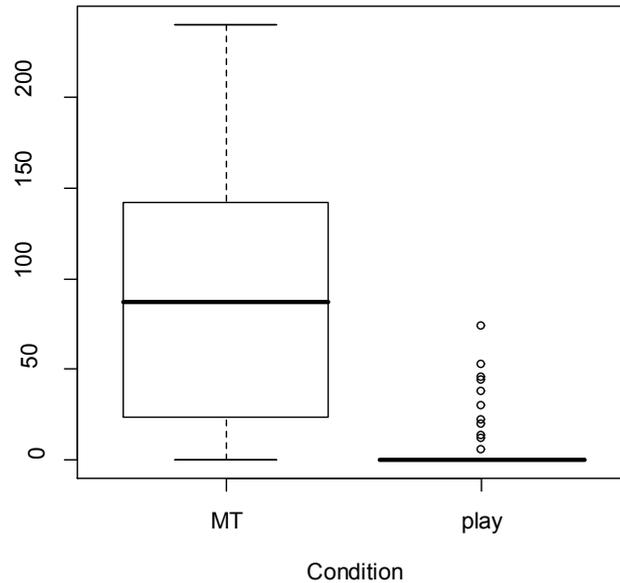
## III. Results

The results of the session analysis indicated similar patterns of frequency and duration data for musical synchronicity. Therefore, the duration data was chosen for a graphical presentation in this article. The results of the session analysis are presented in boxplots.

### Musical Synchronicity (MS)

Figure 1 depicts the pooled results of musical synchronicity events between the child and the therapist. A significant effect was found comparing the music therapy condition with the play therapy condition  $F(1, 135) = 76.58, p < .001$ , revealing how the effects of music therapy were larger than the effects of play therapy on musical synchronicity. Although the two conditions are incomparable for this variable, it is interesting to see that some musical interaction did occur in the play therapy condition even sporadically. The results approached significance in the session part ( $p = .0973$ ) and the session order (1st, 4th, 8th,

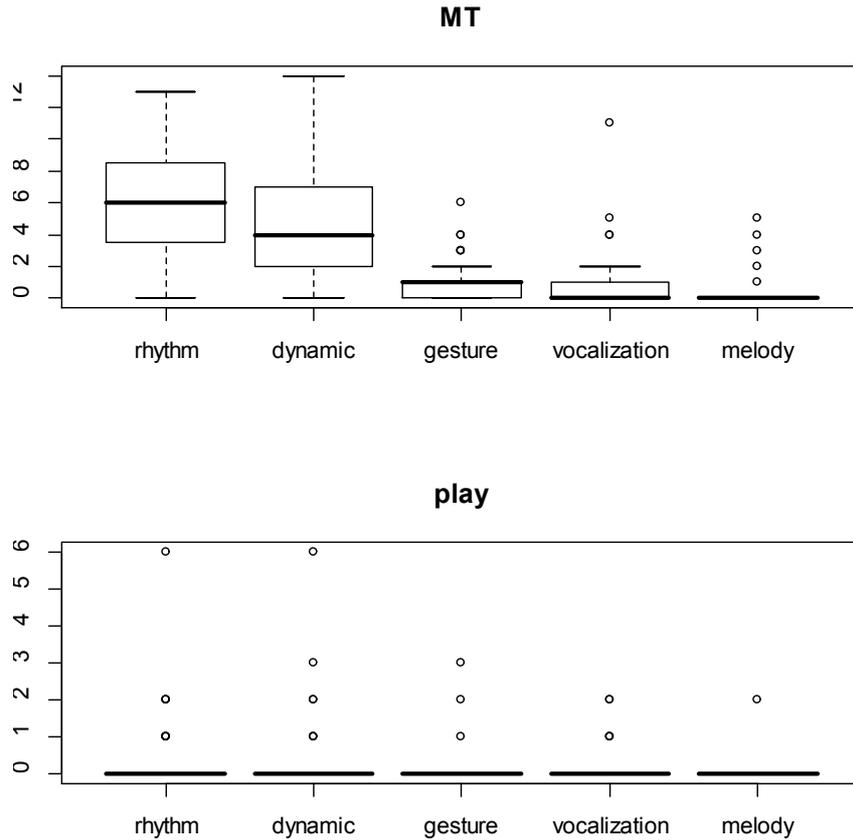
12th;  $p = .0661$ ). If the samples had been larger, differences in the session part and the session order may have reached significance. No other independent variables reached significance.



〈Figure 1〉 Musical synchronicity duration in both conditions

### Salient musical elements during musical synchronicity

Significant effects were found for element,  $F(4, 351) = 43.67, p < .0001$  and condition,  $F(1, 351) = 103.63, p < .0001$ . All other independent variables were not significant. Figure 2 reveals that in music therapy, rhythm and dynamics appeared to be the two most salient elements, followed by gesture, during musical synchronicity events between the child and the therapist. Vocalization appeared to be the second least frequently observed musical element in the musical synchronicity events. Melody was the least observed element of music in the musical synchronicity events. The order of the salient musical elements in play therapy condition were the same as in IMT though happening far less frequently.

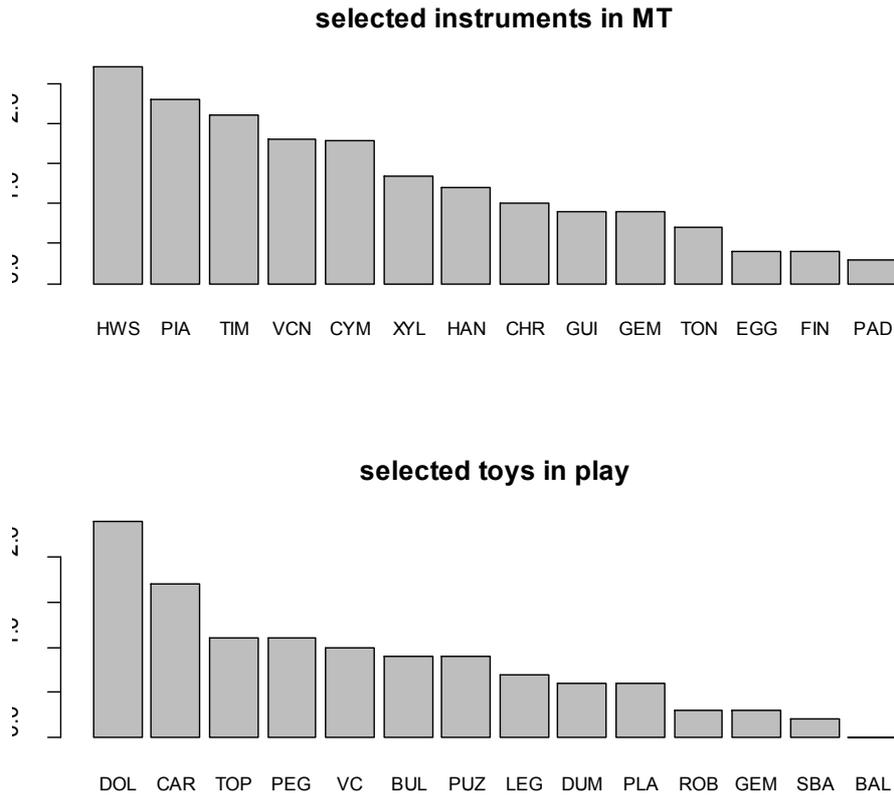


〈Figure 2〉 Salient musical elements

### Children's choice of objects

The bar graphs 〈Figure 3〉 depicted here show the order of the most selected instruments / toys to the least selected ones. The most selected instruments in the music therapy condition were in the following ranking order: 1) horns and whistles; 2) piano; 3) timpani drum; 4) vocalization; 5) cymbal; 6) xylophone; 7) handballs; 8) chroma harp; 9) guiro; 10) gesture and movement, 11) tone bars. The three least selected instruments were egg shakers, finger cymbals and paddle drums.

The most selected toys in order of ranking were: 1) a dollhouse; 2) cars; 3) tops; 4) peg (wood) kitchen play set; 5) vocalization; 6) bulldozer; 7) puzzle; 8) lego; 9) dump truck; 10) play dough; 11) robot. The three least selected toys were small balls, big balls, and gesture/movement.



〈Figure 3〉 Children's choice of objects in both conditions.

#### IV. Discussion

The results of the data indicated that there were marked instances of musical synchronicity both in frequency and duration measures in each four-minute session analysis throughout the sessions and across cases in music therapy. The results of a repeated measures ANOVA revealed a highly significant effect, comparing the music therapy and play therapy condition in frequency and duration measures ( $p < .0001$ ).

Both musical synchronicity and the salient musical elements were originally designed for the music therapy condition; therefore, the results were expected to be favoured towards music therapy. Clinical observation, however, confirms that there were occasions where musical synchronicity between the child and the therapist happened during play therapy. Anecdotal

records confirmed that these moments were when the child became spontaneously involved in vocalization and body movement with the therapist, to which the therapist responded via sensitive attunement using instinctively musical media.

There are a number of musical and therapeutic features that were not measured statistically. Cross modality in musical synchronicity was often observed. The most common scene in music therapy was when the child played a certain instrument (e.g., the drum), and then the therapist accompanied the child's playing via the piano (and often singing). The child's musical expression was met by a matching technique, where the temporal beat, duration, intensity and rhythm were shared and reflected. The therapist's matching may display different timbre and rhythmic figures, and often add melodic phrases and harmonization of the original performance of the child, reflecting a certain emotional expression of the child and that of interpersonal events.

Even though therapists' methods were not analyzed in the study, clinical observation confirmed that most methods used in musical synchronicity were predominantly empathic in nature, such as 'matching' 'mirroring' 'grounding' and at a more advanced level, 'frameworking' (Kim et al., 2008, 2009; Wigram, 2004; Wigram & Elefant, 2009). The results indicate that the musical attunement of the therapist plays a significant role in engaging the child in on-going musical activities and seems to facilitate the child into mutual play.

There were five categories of musical elements; rhythm, dynamics (intensity, accent and volume included), gesture (movement included), vocalization and melody. Complex musical components such as harmony are not included, since harmony is hardly ever created by a pre-school age group of children with autism. Statistical analysis revealed that rhythm and dynamics were two of the most common salient musical elements between the child and the therapist within these musical synchronicity events.

Clinical observation confirms that when children were relatively well-engaged, showing some levels of spontaneity in musical interaction with the therapist, approximately in the middle of (fourth to seventh session) the clinical trial, gestural elements in musical interaction stood out as one of the salient elements between the child and the therapist, which was mostly initiated by the child. The children in these particular cases not only interacted musically, but they interacted with the music therapist with increasing complexity using spontaneous gestures and body movements simultaneously with increased eye contact. Vocalization came in fourth position and melody was classified as the least salient musical element in this study.

The children's choice of objects in both conditions were also recorded. The most selected

objects were horns and whistles in IMT and the dollhouse set in play therapy. This result is quite surprising in that horns and whistles were selected more than the piano, the drum and the cymbal, which appeared to be the typical instruments most widely reported in IMT literature (Alvin & Warwick, 1991; Brown, 1994; Edgerton, 1994; Holck, 2004; Nordoff & Robbins, 1971; Robarts, 1996; Wigram 2002). The piano, the drum and the cymbal were, however, still listed in the top five instruments. In both conditions, vocalization were in the top five chosen mediums of interaction by the children. Anecdotal records indicated that non-verbal children vocalized increasingly more as sessions went on under both conditions.

The results of this data should be treated with caution since horns and whistles were often selected by the children who are either verbal, or knew how to blow. Low functioning children who did not understand the act of blowing, and did not respond well to horns and whistles. It is also interesting to find out that the dollhouse was the most selected toy among children with autism since children with autism were not often reported to play with dolls. Anecdotal records of sessions indicate that the way the children played with these dolls were rather repetitive and idiosyncratic.

The findings in this study were based on small samples and may be biased by the initial selection of objects, session orders and session parts under both conditions. As the primary coder was the author who took the role of both the researcher and the therapist, the coding may have been favoured towards music therapy. Nevertheless, the results of the analysis were supported by the very high inter-observer reliability. As the study involved only 10 subjects, one has to consider the small sample size when interpreting the results. However, the results still offer clinically relevant facts to provide proper guidelines to music therapists and professionals in related fields, which can be easily applicable for everyday practice and future study.

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