

MUSIC THERAPY & AUTISM

**SOCIAL INTERACTION, NONVERBAL COMMUNICATIVE
BEHAVIOURS AND EMOTIONAL RESPONSES
IN A GROUP MUSIC THERAPY SETTING**

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Tiivistelmä – Abstract The effects of Music Therapy on clients diagnosed with Autism Spectrum Disorder have been examined in several studies. There is evidence that music therapy has a positive impact on autistic people’s social skills, communication and interaction. Not all researches agree on this point, though. In this study, video excerpts from 16 music therapy sessions were analyzed. The video data refer to a group with a 4-years old boy with autism, two typically developed children and two music therapists. The aims of this study is to describe the changes observed in the social interaction and nonverbal communicative behaviours of a child with ASD as well as to examine his emotional responses in a group music therapy setting. The findings suggest that in those video excerpts there is an increase in the social interaction and communicative behaviours as well as that the child with autism responds with positive emotions to the music therapy process.	
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1 INTRODUCTION

Music and the therapeutical effects of music are so ancient like humanity itself. Music shaped human culture and in turn it was shaped by different cultures and societies. Music played a particularly important part in many ancient mythologies. In greek mythology, such was the enchanting music of the mythical Orpheus that he managed to escape from the Underworld. In the recent scientific literature, there is a lot of evidence that music can promote the wellbeing and the social and interpersonal skills.

Of particular interest is the Music Therapy research on children with Autism Spectrum Disorder. Autism Spectrum Disorder (ASD) is a complex neurodevelopmental disorder which affects social interaction and verbal and nonverbal communication. ASD can be described as an impairment of social skills and communication with the world. There is promising evidence that Music Therapy sessions and interventions can increase the social skills, the eye contact and the nonverbal behavior of children with ASD.

Probably its happens because of the improvisation of the client with the music instrument and the relation between the client and the Music Therapist.

The relation between the Music therapy client and the Music therapist is itself therapeutic.

The aim of my study was to analyze with qualitative content analysis the effects of Music therapy improvisation sessions on a 4-year-old child with Autism Spectrum Disorder. This topic was selected by me, because Autism Spectrum Disorder is a Disorder that influences many families and societies around the world and there is a lot of research needed in this topic. My study will add new light.

I will analyze the music therapy improvisation activity in 16 sessions.

My study will add to an important area of study and it can be used in the future also as a basis for further studies on this topic

2 LITERATURE REVIEW

Autism Spectrum Disorder

The core features of Autism Spectrum Disorder are (1) persistent deficits in social communication and social interaction and (2) restricted, repetitive patterns of behaviour, interests or activities as defined by the Diagnostic and Statistical Manual of Mental Disorders, fifth edition (American Psychiatric Association [APA], 2013) and the International Statistical Classification of Diseases and Related Health Problems, tenth edition (World Health Organisation, 1992) . These symptoms manifest already in early childhood and they severely affect one's functioning in areas such as social and occupational life (APA, 2013). Each person diagnosed with this neurodevelopmental disorder has a unique compound of symptoms depending on the severity of the autistic condition, the developmental level, the intellectual level, language ability and the chronological age.

Social communication and social interaction in ASD

As mentioned above, the first core feature of autism refers to deficits in social communication and social interaction. This includes the areas of social-emotional reciprocity, non-verbal communication and the way one develops and understands relationships with others.

To be more precise, in people with ASD, the deficits in social-emotional reciprocity can be seen as difficulties in initiating social interaction or responding properly to the others' communicative behaviour, for example by joining a back-and-forth conversation or just responding to their name. Apart from reduced initiation of or response to social interaction, other behaviours such as sharing one's thoughts, interests, emotions and affect with others may be limited or absent. Imitating one's behaviour, which is considered to be a common way of interaction in typically developing children, is also reduced in children with ASD.

The use of non-verbal behaviours for communicative purposes is also deficient and inefficient in people with ASD. Nonverbal communication is typically achieved through several cues including eye gaze, facial expressions, body movements, gestures, postures and proxemics. Of course, when mentioning nonverbal communication, one should always take into account that this is also affected by cultural factors. Hence, taking into account the cultural norms, there may be limited eye contact in people with ASD as well as abnormal use or even absence of facial expressions (APA, 2013).

People with ASD may not use communicative gestures such as giving, showing or pointing at an object and they often fail to understand and respond properly to such behaviours, for example by looking at the same direction which one is pointing to or looking at. Evidence shows that these abnormalities in gaze and understanding or using communicative gestures can often be indicated by limited joint attention behaviours already in early childhood (Volkmar, 2005). Joint attention is an important aspect to consider when assessing one's social behaviours. However, it is a very complex one, though. Joint attention refers to sharing attention with a partner or to monitor the partner's attention (Mundy et al., 2003). It is crucial to distinguish joint attention behaviours from other non-social behaviours. For example, when pointing at an object in order to draw somebody's attention to that object or to himself and have a shared experience, this implicates a "social reward" and could be seen as joint attention. This is different from pointing at an object with the only purpose to obtain it; this can be named as "requesting an object" or generally "behavioural request" (Mundy et al., 2003).

As regards the deficits in understanding, developing and maintaining relationships, people with ASD show limited social interest in peers which can be indicated by rejecting others, being passive or approaching them in a nonconventional way (APA, 2013). Children with ASD also show very limited participation (if at all) in pretend game or other interactive and imaginative games with peers.

Restricted, repetitive patterns of behaviour

As mentioned above, the second main feature in ASD is restricted, repetitive patterns of behaviour, and restricted or fixed interests and activities. People with ASD seem to insist in a sameness in their everyday activities or routines and in their behaviour. They may move their body parts, talk or use an object in a repetitive or stereotyped way. They may also show strong attachment or restricted interests on unusual topics and objects. Their fascination, though, to specific environmental stimuli such as pain, temperature, light, sound may be due to their hyper- or hyporeactivity to sensory input (APA, 2013).

Both social interaction-communicative behaviours and restricted, repetitive patterns of behavior are important aspects of ASD to be investigated. However they are both umbrella terms covering many different symptoms each. Therefore this study will focus on one of the two core features of ASD, namely the deficits in social communication and interaction. Before examining how these deficits are addressed in music therapy interventions, it is important to take a closer look at music therapy as a therapeutic process.

Music Therapy

There have been several variations in the definitions of Music Therapy, as there is a wide variety of professional practices and concepts involved in this field.

Bruscia's (2014) updated working definition of music therapy is presented in the third edition of the book *Defining Music Therapy*.

Music therapy is a reflexive process wherein the therapist helps the client to optimize the client's health, using various facets of music experience and the relationships formed through them as the impetus for change. As defined here, music therapy is the professional practice component of the discipline, which informs and is informed by theory and research (p.36).

There are various music experiences in which a client may engage for therapeutic purposes. The main types of such experiences are improvisational, recreative, receptive and compositional methods. According to the client's unique needs, in a music therapy session one may engage in singing, playing pre-composed music, improvising, listening to music or to one's own compositions, improvisations and performances or experience low frequency sounds, to name but a few. In all cases, the professional relationship between the client and the music therapist is a vital and indispensable aspect in the therapeutic process. This applies to all groups of clients, including children with ASD.

Music Therapy for people with ASD

Music Therapy has been used for children, adolescents and adults with ASD in the form of individual intervention but also in group settings and family-centered approaches. These music-related interventions usually focus on symptoms which seem to interfere with their everyday life or challenge their relationship with their family, such as challenging obsessive or inflexible behaviour and deficits in communication and interaction with others.

One may wonder though whether music therapy intervention can significantly reduce the severity of such symptoms. There have been several randomised controlled trials, controlled clinical trials, single-case experimental designs and case studies which investigate this question. According to the last Cochrane Library Review about the effects of music therapy on people with ASD, music therapy interventions may help children with ASD improve their social interaction and communication skills which are considered to be some of the most deficient domains in the ASD (Geretsegger, et al., 2014). The meta-analysis in question indicates that music therapy is superior to standard care and "placebo" therapy in terms of social interaction skills inside and outside of the therapy context, non-verbal communicative skills inside the therapy context, as well as initiating behaviour and social emotional reciprocity.

Previous research suggests that there is an increase in eye contact duration in people with ASD over the music therapy process (Kim et al., 2008). Children with ASD also

display much higher scores of joint attention behaviours in improvisational music therapy than in play-condition, as indicated by Kim, Wigram, and Gold (2008). The results of this randomised controlled study also include improvements in initiation of engagement and turn-taking duration.

Similar effects of MT on children with ASD are indicated in Lagasse's study (2014). Seventeen children-participants with ASD were randomly assigned to two groups: a music therapy group or a social skills group with no music. The video analysis of the group sessions in each condition showed that the children in the music therapy group showed higher increase in joint attention and eye contact rather the no-music social skills group.

On the other hand there are a few studies that contradict the above results, indicating that music therapy has not significantly important beneficial effects on children with ASD. A large scale study conducted by Bieleninik et al. (2017) evaluated the effects of improvisational music therapy on generalized social communication skills of children with ASD. In this TIME-A randomized clinical trial, conducted in 9 countries, children with ASD from 4 to 7 years old were assigned either to enhanced standard care or to enhanced standard care plus improvisational music therapy, in which music therapists sang or played music with each child with ASD, in order to help children share affect and develop joint attention (Bieleninik et al., 2017). According to Bieleninik et al. (2017), improvisational music therapy, compared to enhanced standard care, "resulted in no significant difference in symptom severity based on the ADOS social affect domain over 5 months". It is clear that the results of this study contrast with the findings of previous studies regarding the contribution of improvisational music therapy in reducing symptoms in children with ASD.

It is interesting to notice that studies may have such contradicting results and it emphasises the need for even more research on this field. When attempting to explain that, one may need to take into account the practical issues when conducting the sessions as well as the length of the intervention.

3 RESEARCH QUESTIONS

The aim of this study is to investigate the effects of group music therapy sessions with children *on specific ASD symptoms*. Given that deficits in social communication and social interaction are considered to be some of the core symptoms in ASD, it is intriguing to focus on such symptoms especially the nonverbal behaviours in relation to the music therapy process. Other major impairments, though, namely restricted interests and stereotyped or repetitive movements, which do not fall in the category of social communication and interaction, will not be addressed in this study.

The emotional responses to this intervention in the case of a child with ASD are also examined, as they depict how the child reacts to this process regardless of the symptom related outcome.

The following questions are addressed in this study:

1. What changes are observed in the social interaction and non-verbal communicative behaviours of a child with ASD in a group music therapy setting?
2. How does a child with ASD emotionally respond to the group music therapy process?

4 METHOD

4.1 Content analysis

The method used in this study is content analysis. The reason that this method was chosen is that I wanted to investigate communication and social interaction behaviours, to code them and quantify them in order to detect any possible changes happening over time or patterns of behavior emerging from the data.

Content analysis is the one of the most important methods in social science research. It is always preferred because of its noninvasive nature. The historical roots of content analysis can be found even in prehistorical times, as human culture per se is about the effects and the function of symbols, paintings and later also written texts.

Modern Content Analysis is an empirically grounded method. Many of the concepts of content analysis are derived by greek language, but most ancient Greek and overall, most philosopher until the 19. century used those concepts prescriptive and classificatory. The focus of the scientific method Content Analysis is on exploration, explanation, and prediction. The main advantage of Content analysis over other methods is that it tries to understand what the data (sounds, words, texts, videos) mean subjectively to people.

Content analysis can be both qualitative and quantitative. My data were analyzed using qualitative content analysis. In quantitative content analysis you also try to measure the frequency of your data and overall to have also a quantification of the data. Of course, it does not decrease the explanatory value of content analysis.

4.2 Data

In order to examine the research questions I have used video material of group MT sessions including a boy with autism. These MT sessions have been conducted by two former music therapy graduate students. Felix Loss, one of the two music therapists who were in the sessions, has analysed three of these sessions with regard to the

beneficial effects of social inclusion to the young members of the group (Loss, 2016). His study provides me with valuable information about the profile of the young clients and information about the music therapy process, too. Although some parts of the video data were same in my study, the focus of my research was different.

According to Felix Loss (2016) the activities of the sessions “were categorized in three parts: music therapeutic, music educational, and neutral/group-cohesion activities. The categorization turned out to be quite complex in such a way that some activities were utilized in both therapeutic and educational contexts.”

The activities conducted in the MT sessions were the following: “Hello-song”, “Post-hello song with movement”, “Introduction of the instrument(s) of the day”, “Improvisation activity with the instrument(s) of the day”, “In between song with movement”, “Game with movement and/ or singing”, Therapy activity with instrument/and voice”, “Pre-Good bye song”, “Good-bye song” (Loss, 2016).

I selected one part from each session to analyse. The selection criteria were the following:

- The selected part includes at least one whole activity from the beginning to the end.
- The activity in the selected part is categorized as music therapeutic.
- The same activity is conducted in all the sessions.
- The activity is carried out at the same phase of the session (at the beginning of the session, in the middle or at the end of session)

The activity which applies to the criteria above is the “Improvisation activity with the instrument(s) of the day”. Therefore I chose to analyse the first improvisation activity from each session.

The selected parts also include the moments when the children experiment on the instruments right before the improvisation activity starts. Although the activity “Introduction to the instruments of the day” may be categorized as educational rather than music therapeutic, I considered it to have a direct connection and smooth transition to the improvisation which follows. That is why I included it in the selected parts.

The starting point of each selected part is the moment that one of the two music therapists place an instrument on the floor (such as the metallophone,) or hand it over to the children (such as the cabassa or the hand drums) or sit down holding the instrument (such as the guitar). The end point of each selected part of video is the moment that a music therapist says “Stop”. This indicates the end of the activity.

The participants of the MT sessions are two typically developing girls (4 and 7 years old), a boy with Autism Spectrum Disorder (4 years old) who was mainly nonverbal and the two music therapists mentioned above. During the first sessions, there was also another boy with ASD who finally continued with individual MT sessions. The children’s mothers participated in the beginning of the process, too.

Out of the 18 sessions which were conducted, 2 sessions were not analysed. That was because firstly, the video from the 3rd session was not available due to technical reasons and secondly the boy with autism was absent from the 16th session. Video data from the 16th session are available but the young client whom I focus my research on is not on the video.

From the rest of the video excerpts, there is one session which although included in the analysis there is not enough information so that it can be compared to the other sessions. This refers to the video extract from the 1st session, in which the child with ASD is sitting on a blind spot. Although there is much data about all the other group members during this activity, I don’t have enough information about the specific child with ASD whom I am interested in. Therefore, session 1 is not compared to the other sessions, meaning that it is not included in the diagrams, but the real number of events and the duration is reported on the tables.

When referring to the sessions, I will keep the order of the sessions in the same way which they were contacted, which means that I will refer to the 3rd and 16th session, though without reporting data about them. I will also use the same masking names which were used by Loss (2016) so that the clients’ identity is protected and at the same time it will be easy for one to read and understand both studies which are relevant to this video data. Therefore, I will use the name Aaron when referring to the boy with autism spectrum disorder.

4.3 Analysis

For the purpose of this study, video data needed to be analysed in a micro-level, in order to detect the small changes occurring in autistic child's behaviour, during the music therapy process.

According to Wosch and Wigram (2007), microanalysis is

a detailed method investigating microprocesses. Microprocesses are processes and changes/progressions within one session of music therapy. The amount of time can be one minute (moment) or five minutes (therapy event) of one session, one clinical improvisation (episode), or one complete session. To analyze process over time, several microanalyses can be undertaken to look at several events (p.22).

Each selected part of video was watched multiple times, both at a normal speed and frame by frame.

4.3.1 Video annotation process

The video analysis started with the annotation of two sessions, namely of the 7th and the 14th session, from the "middle" and the "middle towards the end" phase of the whole music therapy process and not from the start of the process so that I could notice patterns of behaviour that could not be observable in the very first sessions and yet I would not miss some initial behaviours that tend to decrease towards the end of the process. While doing so, I had some literature-based categories in mind and I was open to any behaviour patterns which arose. Therefore the codes and categories as well as their hierarchy changed numerous times during the annotation and analysis process.

The rest of the videos were annotated in a random order.

At the beginning of the annotation process I used only a pen and a notebook. This made possible to write down any kind of observation which later formed some codes. Later, I continued the video annotation using the software ANVIL developed by Michael Kipp, so that the enormous data coming out off the video annotation would be easier to handle. The reason I chose Anvil software is because it is a free video annotation tool for audiovisual material, allowing multi-layered annotation based on a user-defined coding scheme (Kipp, 2001).

A challenge that I faced at the beginning of the annotation process, when the coding phase was still going on, was that I had to continuously add more codes on the ANVIL platform, decide about their hierarchy, make the necessary changes in a “specification” file using XML syntax and then change them again every single time that a new behaviour pattern arouse.

4.3.2 Coding process

As mentioned before, the categories and especially the codes within the categories, changed many times during the video analysis.

When constructing the categories, I referred to the definition and the diagnostic criteria of ASD according to the DSM-5 (2013). It helped me not only in defining some categories but also in focusing on some aspects of non-verbal behaviour that would have eluded me otherwise.

However, during the process I still agonised about whether the codes which I had chosen would represent as much as possible the multiple and complex aspects of non-verbal communication and the complicated aspects of social interaction and whether they are measurable. As mentioned above, much of the literature agrees that some of the most important aspects of non-verbal communication are eye contact, facial expressions, body movements or gestures, posture, proxemics and paralinguage. However, due to my inexperience, it was not clear enough to me how one can properly measure all these visual and auditory cues and then make conclusions about how the overall non-verbal communicative behaviour of a child with ASD changes over time. The same question applies to the social interaction, too. After extensive research on what criteria could be taken into account as audio-visual indicators of

non-verbal communication and indicators of social interaction I decided to focus more on some specific and basic non-verbal communicative behaviours and specific and basic social interaction behaviours rather than trying to make generalizations about the overall non-verbal communication and social interaction without having covered all aspects of them.

At that point, a valuable tool for constructing and grouping the codes was the KAtegoriensystem MUsikTHERapie (KAMUTHE) which was developed by Plahl (2000), as described in the book *Microanalysis in Music*. Kamuthe is a category system for video analysis of music therapy sessions and it focuses on both the music therapist's and the child's communication covering the areas of verbal, non verbal and musical behaviour which are the three different channels of communication that I was interested in. (Wosh & Wigram, 2007).

According to Plahl (2000, as cited in Wosch & Wigram, 2007), the following requirements should be fulfilled, when developing the codes of the categories:

1. All codes had to be mutually exclusive, which means that only one coding can be associated with one event.
2. All coding had to be exhaustive, which means that each event is represented by one specific coding (p.44).

For the purpose of investigating Aaron's non-verbal communication, I used the same categories as in KAMUTHE (Plahl, 2000, as cited in Wosch & Wigram, 2007), namely "gaze", "musical activity", "vocalizations" "gestures", but I changed some of the codes in each category.

Apart from non-verbal communication more categories were added for the fields of social interaction and emotional wellbeing. All the above categories as well as other important "areas to examine" will be described in the next section.

4.4 Categories and other areas to investigate

4.4.1 Eye gaze (category)

The first category which was investigated was eye gaze. It is important to track both where Aaron looks at and how often or how long. I distinguished Aaron's gazes at a

person generally or at a part of their body from the gazes at a person's face which sometimes could imply that there is eye contact, but not always. When Aaron is not looking neither at the group members nor at a musical instrument the code "gaze around the room" is used. However, during the process it was noticed that he often focused his attention on a specific non-musical object, namely an apple, therefore another code arose "gaze at his apple", so that it would be investigated separately.

Table 1 shows all codes for the category eye gaze and the respective clarifications.

Category: Eye gaze	
Codes	Explanation & Clarifications
gaze at male therapist	The child is looking towards the male therapist, at any part of his body except his face.
gaze at male therapist's face	The child is looking directly at the male therapist's face or eyes.
gaze at female therapist	The child is looking towards the female therapist's body.
gaze at female therapist's face	The child is looking at the female therapist's face
gaze at older girl	The child is looking towards the older girl's body.
gaze at older girl's face	The child is looking at the older girl's face.
gaze at younger girl	The child is looking towards the younger girl's body.
gaze at younger girl's face	The child is looking towards the younger girl's face.
gaze at Victor	Child is looking at the other autistic boy who participated in the first 4 sessions. (Victor is a masked name.)
gaze at Victor's mother	Child is looking at the other autistic boy's mother.
gaze at the group	This code is used when the child with ASD is looking towards the group but it is not clear whom he focuses his attention on. This may be due to the fact that he is standing away from the group or that the group members are sitting too close to each

	other to distinguish whom or what in the group he is looking at.
gaze at a musical instrument or object	The child is looking at a musical instrument such as metallophone, hand dram, shaker egg etc. or at a music-related instrument such as mallets or violin bow.
gaze at his apple	The child is looking at his apple(s).
gaze around the room	The child is looking at any other part of the room (windows, walls, door) or at any non-musical object except for his apple.
closing or covering his eyes	This code applies to the case that Aaron is closing his eyes or covering his eyes with his hands for longer than usual, namely for much more than half a second. If he is just blinking then it is not taken into account.
face not visible (although body is visible)	This code applies when Aaron's body can be seen in the video but his face cannot be spotted on the camera. This may happen when a group member is walking or standing between him and the camera, hence his face is hidden for a few moments. Another case in which this code is applied is when Aaron is standing for a long time on the edges of the room where the cameras can spot part of his body but not his face.

4.4.2 Eye contact (area to investigate)

Eye contact is one of the most important areas to examine because in typical children it is a clear indicator of both interaction and communication with others but children with autism have serious difficulties in making and maintaining eye contact. Using the data about Aaron's "eye gaze at one's face", I examined which of these gazes are actually moments of eye contact with somebody. Eye contact was not considered as a

different category as such, due to the fact that some eye contact events overlap with some eye gazes events. It is just a slightly different area to investigate, not a category.

4.4.3 Vocal activity (category)

Any vocal activity was coded as one of the following: high-pitched vocalizations, laughing, humming, moaning, complaining, panting/breathing heavily, making “shhh” sound, other type of vocal activity.

4.4.4 Facial expressions (category)

The facial expressions that were noticed were smile and frown.

Although facial expressions are visual observations and vocalizations are audible observations, and hence one could suppose that they are mutually exclusive categories, there is one case where an event could be included in both categories. This is the case when the child with ASD laughs out loud and at the same time has a smiling face. I decided that a behaviour could be coded as smile only when it was *not* accompanied by laugh in order to avoid any “duplications” when summing up the results of facial expressions and vocal activity.

4.4.5 Joint attention (area to investigate)

Although joint attention could be a special attribute or sub-code attached to the gaze category or to the gestures category, I decided to examine it separately and independently from all the other categories. The reason was that joint attention is a quite complex behaviour which does not fit in only one category, for example only gaze, but it is a mixture of gaze, gestures, social referencing. Due to its complexity, I found it very challenging to examine it. One need to understand the context of the event and clarify whether the purpose of the child’s behaviour is social or non-social so that mislabeling certain behaviours as joint attention will be avoided. When looking for joint attention events,

4.4.6 Communicative gestures (category)

There are several gestures that occur in a social context. In this study, the events which could be coded as communicative gestures should be one of the following: giving, showing or pointing at an object.

4.4.7 Social interaction behaviours

There is a great variety of behaviours which show that one socially interacts with each other. Aspects of nonverbal communication, such as eye contact and joint attention, can also be seen in a social interaction context. In this study, the behaviours which were coded as such are the following: responding to his name, responding to therapist's invitation to come closer to the group, responding by taking something he is given, responding by touching something he is given, imitating a movement, imitating an action with a musical instrument, initiating chasing game and teasing.

4.4.8 Musical behaviour (category)

It is possible that Aaron's musical behaviour may be an indicator of how much he participates in the group activities and how much he interacts with each other. Therefore, I examined such behaviours, namely touching an instrument, playing an instrument, guided by therapist in playing an instrument.

4.4.9 Emotional Responses (area to investigate)

In order to address the second research question and investigate Aaron's emotional responses, I looked for behaviours which could be observed and measured. This includes his facial expressions, namely smile and frown and *some* vocal behaviours which convey emotions, namely moaning and complaining (nonverbally) and laughing. Therefore data from these two categories (facial expressions and vocal behaviours) were combined in order to investigate Aaron's emotional signaling.

5 RESULTS

The results of the analysis will be presented below. Due to the fact that the video excerpts vary in length, the results would not be reliable if I would compare the progress of a behaviour (such as vocalizing) based on the duration of the event. For this reason, instead of the actual duration, I used percentages of the duration when examining the progress of each behaviour. In particular, when calculating the percentages, I took into account the ratio of the duration of each event (such as eye contact) *to the total duration of the video that Aaron's face is in the camera field of view*. This is what I will call “total duration” from now on.

The percentages are presented in the diagrams below where changes that occur in the music therapy sessions over time can be observed. The actual duration as well as the number of the events will also be available in the tables.

For the reasons mentioned in the Method section, sessions 1, 3 and 16 will not be included in the diagrams.

I need to clarify that in the Results and Discussion sections, when mentioning “session 1”, “session 2”, “session 3” et cetera, I will *not* refer to the whole sessions which were conducted but to the selected *video excerpts* from those sessions that display a specific music therapy activity.

The horizontal axis of the diagrams shows the order of the sessions.

5.1 Eye contact, eye gaze, joint attention

Figure 1 shows the percentage of Aaron's overall eye contact duration in each video excerpt. The overall eye contact in each session includes the data of Aaron's eye contact with male therapist, female therapist, older girl and younger girl.

The percentages of Aaron's eye contact duration are higher in the second half of the music therapy process than in the first sessions. The minimum percentage score is 0.53% in session 6 and the maximum score is 11,45 % in session 17.

Figure 2 shows how Aaron allocates his attention based on where he is looking at. The bars depict the percentages of Aaron's gaze duration for each of the following subcategories: eye gaze at group members and at group as a whole, eye gaze at a musical instrument, eye gaze elsewhere.

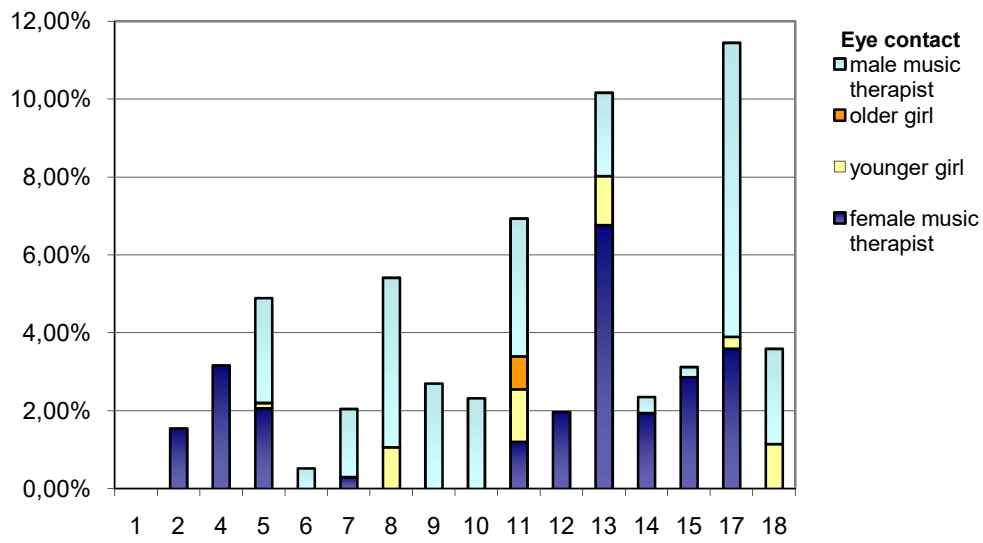
In the diagram, the subcategory "eye gaze at group and group members" includes data derived from these codes: at male therapist, at male therapist's face, at female therapist, at female therapist's face, at younger girl, at younger girl's face, at older girl, at older girl's face, at the group, at Aaron's mother, at Victor, at Victor's mother. As for the subcategory "gaze elsewhere" the following codes were taken into account: gaze around the room, at his apple, at a non-musical object, and closing or covering his eyes.

The percentages of Aaron's gaze duration towards the group and group members range from 11,64% to 58,03%. Out of them, the higher scores are observed in the sessions 9, 11, 17.

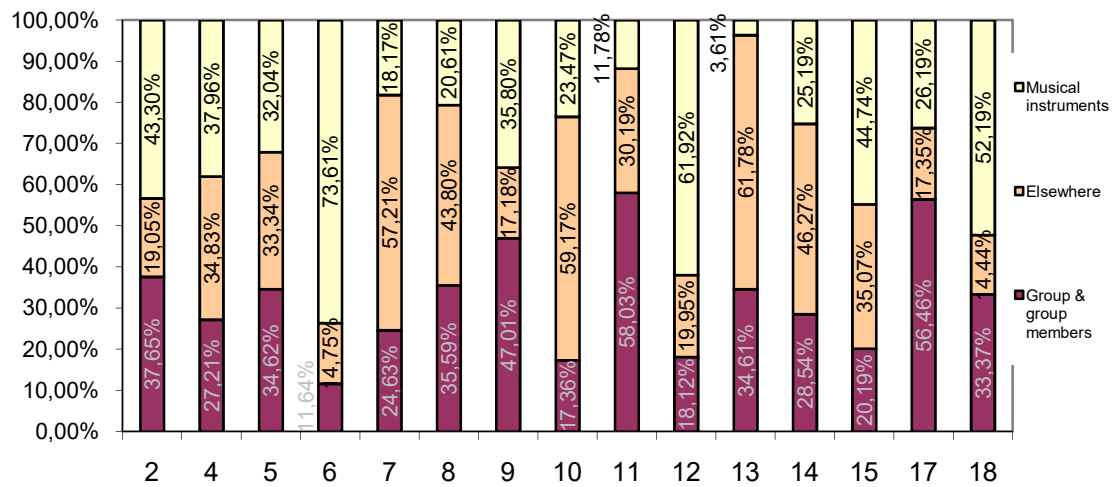
His gazes towards non-musical objects decrease in duration in the last sessions.

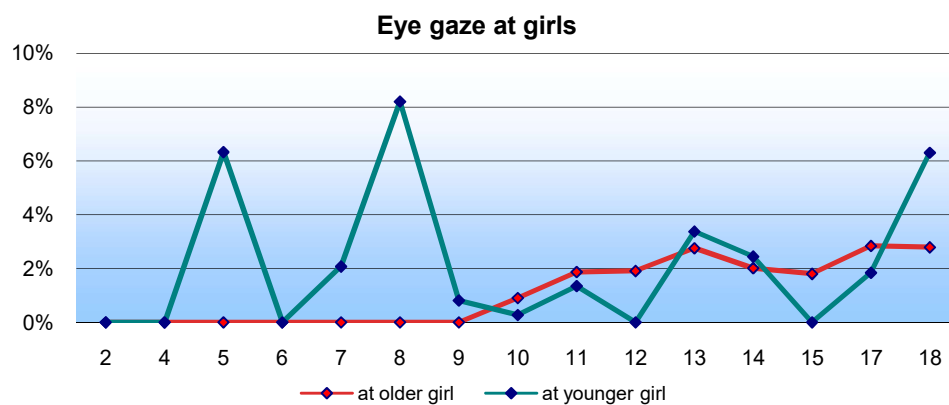
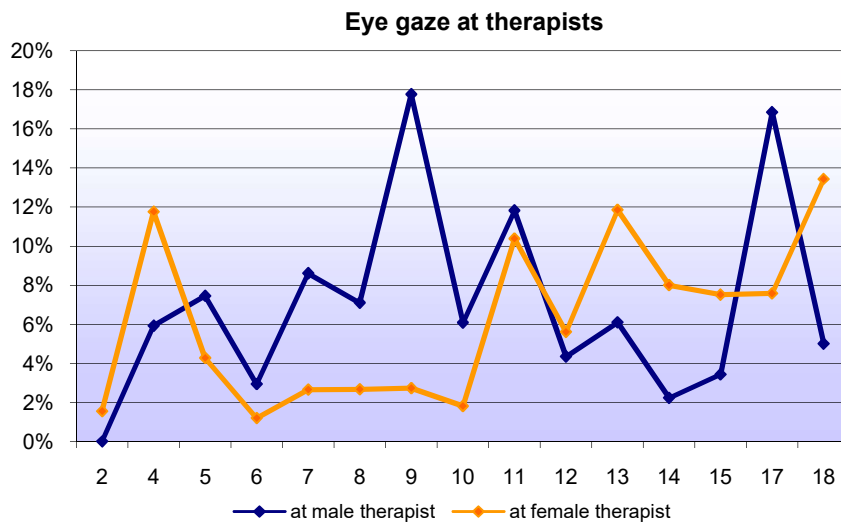
Table 4 presents the actual number of joint attention events in each session and figure 3 shows the people with whom Aaron had joint attention. It seems that there are more joint attention behaviours in the sessions 5 and 17.

Eye Contact



Eye Gaze

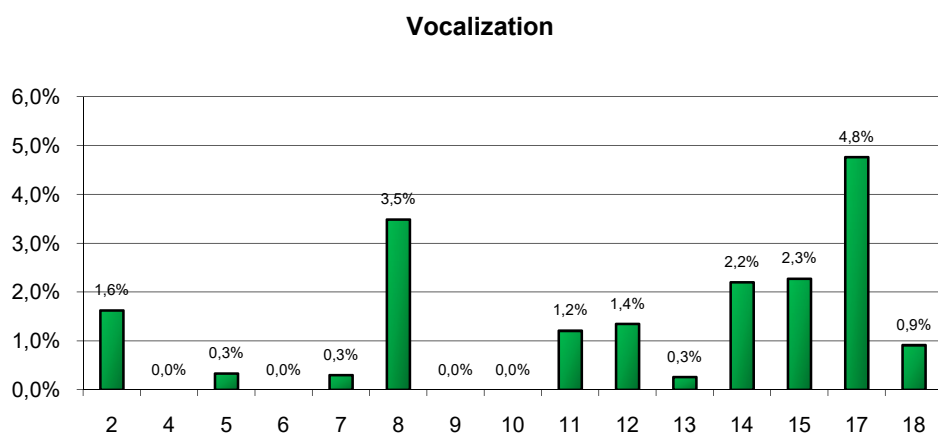




5.2 Vocalizations

Aaron communicates nonverbally through different sounds and vocalizations. Out of his total vocal activity, the vocal behaviours which convey emotions along with the facial expressions will be presented in the Emotional Responses section. In this section high-pitched vocalizations will be presented separately. Figure 4 shows the percentage of the duration of the high-pitched vocalizations and Table 5 reports the actual duration and number of events. In the first half of the music therapy process there is limited number of high-pitched vocal behaviours while in the second half such vocal activity is significantly increased both in duration and frequency.

From the video data, it was noticed that this type of vocalizations usually occur along with smile, laugh, gaze at somebody or eye contact. High-pitched vocalizations are usually observed during or right after an eye-contact event or when a one is walking towards Aaron.



5.3 Other communicative and social interaction behaviours

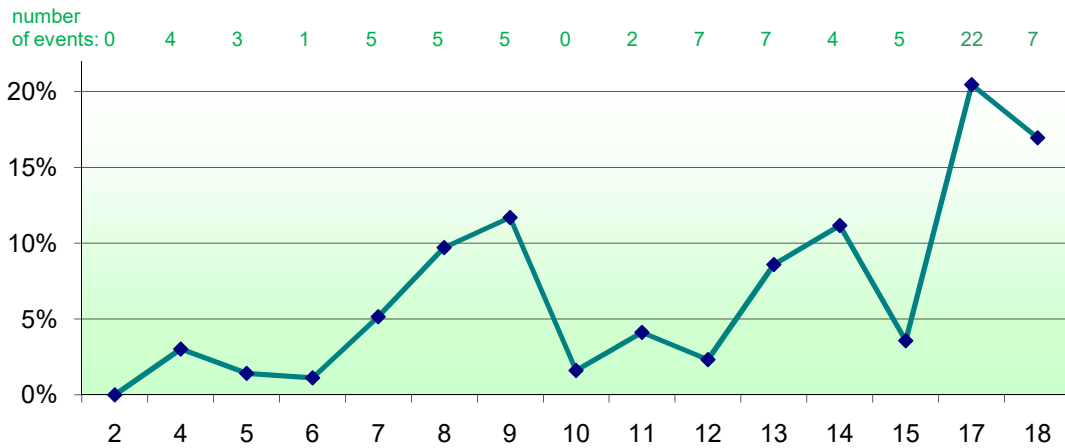
In the video excerpts, there were no communicative gestures that could fit in the codes giving, showing or pointing at an object.

As regards the other behaviours that occur in a social interaction context, Figure shows the percentage of their duration.

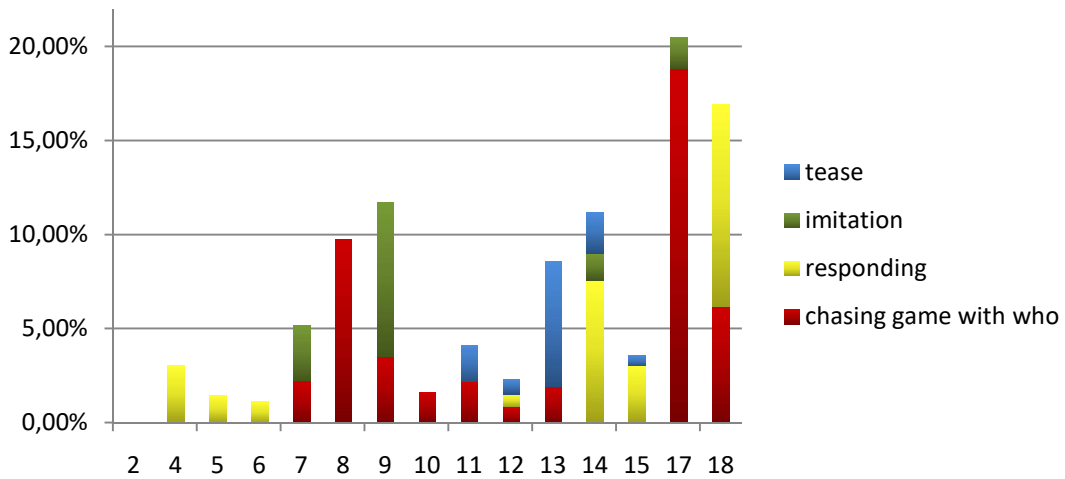
As mentioned in the Methods section, the behaviours taken into account are the following: responding to his name, responding to therapist's invitation to come closer to the group, responding by taking something he is given, responding by touching something he is given, imitating a movement, imitating an action with a musical instrument, initiating chasing game and teasing.

The “chasing game” is the longer and most frequent event out of these behaviours. When Aaron is approached by a music therapist and less frequently by the typical girls he stands up and he starts running around the room. He then turns his head towards the group. He sometimes makes eye contact with another group member, while other times he gazes at their body. The “chasing game” event is almost always accompanied by high-pitched vocalizations or laugh or both.

Social Interaction Behaviours



Social Interaction Behaviours

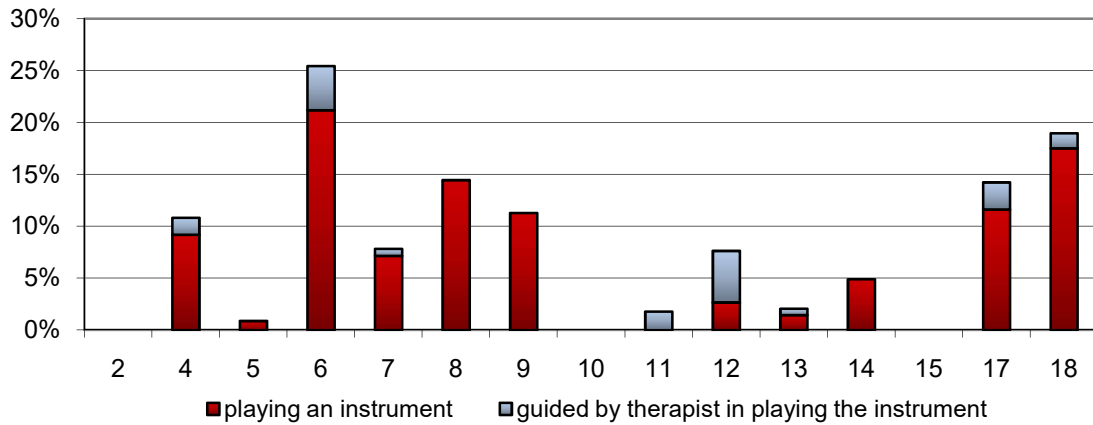


5.4 Musical activity

As regards musical activity, Aaron touches an instrument or a musical object more often and for longer periods of time than improvising on the instruments.

As regards the percentages of actual playing music there are ups and downs, as indicated in the Figure.

Musical Activity



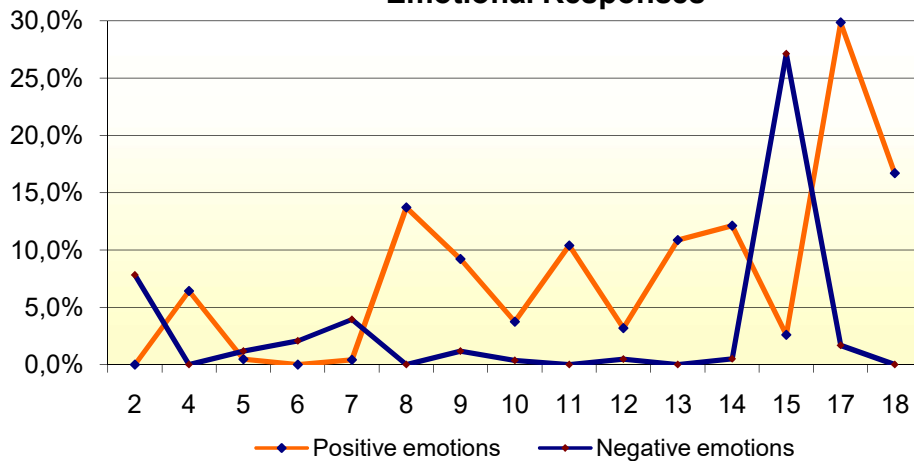
5.5 Emotional responses

Figure 5 shows the changes in Aaron’s emotional signaling behaviours. Like before, the duration of such behaviours is divided by the total duration of the each video.

“Positive emotions” refer to the *behaviours* which convey such emotions, namely smile and face while “Negative emotions” refer to frown, moaning and complaining.

The diagram depicts a significant increase in the positive emotions. The percentage scores of negative emotions are very low with the only exception of the 15th session.

Emotional Responses



6 DISCUSSION

The results show that there are ups and downs in the percentages of Aaron's eye contact duration. However they are quite increased in the second half of the therapy process in comparison to the first half. This finding is in line with Loss's (2016) study on the same group as well as with previous studies on the effects of music therapy in autism.

At a first glance, the percentage scores of eye contact may seem to be quite low ranging from 0,53% to 11,45 % of the total duration but this is as expected, given that children with autism have difficulties in making and maintaining eye contact.

In the 6th session, that the eye contact score is low (in that particular activity), Aaron was the only child attending the session. He was calm and he actively participated in the improvisation activity. His focus was mainly on the guitar which the therapists were playing and later he also played. This may explain the short eye contact duration.

Overall, Aaron had more eye contact with the two therapists than with the girls, especially with the female therapist. This indicates that Aaron is more familiarized with the therapists than with the girls. The eye contact scores suggest that he engages in a form of nonverbal communication with the two therapists, which is important as such because maintaining eye contact with others may allows other forms of communication and interaction with them.

Around at the middle of the process, he started having eye contact with the younger girl as well. When looking closer to the video data, it seems that (in the middle of the process) he starts developing some unusual forms of interaction with her such as the chasing game.

Apart from Aaron's eye contact, it is interesting to observe where he is looking at during the activity.

As mentioned above, Aaron looked at the group and group members for a bit longer than usual, in the sessions 9, 11, 17. However we cannot make conclusions about any predominant focus of Aaron's eye gaze. It is also difficult to make conclusions about Aaron's overall joint attention. What one can observe is that there is not a consistent increase or decrease in the joint attention behaviours,

As regards the musical activity, Aaron touches the musical instruments for longer periods of time than actually playing. Even this behaviour though is important for an autistic child as he first examines the instrument thoroughly before starting improvising on it. Moreover, even though Aaron may not participate in the improvisation activity for such a long time in comparison to the typical girls, he often stares towards the group taking notice of what the group is exactly doing.

Another interesting observation is that, even though Aaron looks as if he doesn't gaze towards the people approaching him or doesn't take notice of, he often Aaron very often to their movement, for example by starting a chasing game with them. This implies that he may often use his peripheral vision instead of making direct eye contact, even when interacting with somebody.

Apart from that, there is a possibility that Aaron may stare at the group through the reflections on the window. For example, when Aaron was looking at the window, while being dark outside, he often changed his behaviour and run around the room the moment that somebody tried to approach him from behind. However, when Aaron is standing in front of the window, it is not clear to notice whose reflection he stares at, if he stares at all and whether it is the group's or his own reflection.

As regards his eye gaze towards the group members, he looks at the therapists more often than at the girls. Moreover, the duration of his gazes towards the female therapist significantly increases over time.

The quantitative data of this study also suggest that there is an upward trend in what I called "social interaction behaviours". Of course it is difficult to take into account all social interaction behaviours as this is a very complex aspect, but I will refer only to those behaviours that were examined. When combining the quantitative data with the qualitative data of the video analysis, one may understand better the quality and

character of Aaron's interaction with others. The findings suggest that Aaron has an unusual way to engage with others such as initiating chasing game. The reason why I have come to this conclusion is that his "chasing game" is accompanied by emotional signaling behaviours, namely smile and laugh, eye contact or eye gazes towards them and high pitched vocalizations. According to the diagrams the percentage score of the duration of chasing game does not steadily increase. On the contrary there are ups and downs, but the appearance of a social behaviour as such is important.

In the case of this particular child, the chasing game was first noticed by Loss (2016) as a new "*social behavioral pattern*" that was developed during the music therapy process. Felix's observations were what drove me to take a closer look at this behaviour. However the reasons why this new social behavioral pattern arose are yet to be investigated. I do not know whether it is the music, the relationship with the therapists, the group dynamics or something else that made this change possible; I can only make assumptions.

Another interesting element is high-pitched vocalizations. They should not be seen as random sounds without meaning or context. The results of the video analysis indicate that high-pitched vocalizations are a way to communicate with others as they follow or are followed by short eye contact events. This study also shows that this type of vocal *communicative* behaviour is clearly increased in the second half of the process and that from the 11th session onwards there is at least one event of high pitched vocalization in each session.

As regards the emotional responses, according to the corresponding figures, Aaron clearly shows many more signs of positive emotions than negative and for longer periods of time.

Both the percentage scores in each session and the "raw" duration of positive feelings are high and they get higher over time. This finding suggest that at least in these video excerpts music therapy process induces emotionally positive responses in the child with ASD.

His quite high percentage scores in positive emotions should be discussed in relation to his interaction with the group members. This is clear because of the fact that Aaron's smile and laugh is almost always accompanied with eye gazes towards a group member or towards the group as a whole. Through this music therapy process, Aaron seems to have developed positive relationships with the other members and that he enjoys engaging with them. There are also some events that he shared affect with the female therapist such as in session 11 where he kissed her nose. This is a remarkable event for a child with ASD in terms of his social interaction with others.

7 LIMITATIONS

There are several limitations in this study. A major limitation has to do with the fact that the child with autism is not always in the cameras' field of view. Therefore much data is not available and the findings of the study cannot be generalized and make conclusions about the child's overall social interaction and nonverbal communication or emotional wellbeing.

An example of the implications of this limitation is the following. There were moments that Aaron raised his head and looked towards a part of the room where a group member was standing and then he smiled. The other person's face was not visible however it was clear that they made eye contact judging from Aaron's reactions. Despite that, I could not code it neither as eye contact nor as eye gaze to one's face because I had to take into account only what is depicted in the video data and not my intuition. Therefore, there is probably more eye contact in the sessions than what is reported.

Another limitation is that not all body movements were taken into account. It would be ideal if I could measure all types of body movements that imply social interaction. However it was difficult to tell whether a body movement happens within a social context or not. For example, when the boy is sitting down, it's not clear whether he imitates the group members' body movements or this is because of getting tired. In order not to jump to conclusions such body movements were not taken into account.

For the same reason as body movements, proxemics was not taken into account. Although proxemics is an important indicator of social communication, sometimes it was hard to tell whether walking towards the therapist or towards the other children was an intentional effort for social communication and interaction or an unintentional body movement around the room without social meaning.

Due to the complexity of social interaction as such, not all the variables of social interaction could be taken into account in this study.

8 CONCLUSION

In summary, the aims of this study were to describe the changes that can be observed in the social interaction and nonverbal communicative behaviours of a child with ASD as well as examine his emotional responses in a group music therapy setting. Video excerpts of an improvisation activity from 16 music therapy sessions were analysed. Despite the limitations of this study, the findings suggest that in those video excerpts, some social communicative behaviours as well as some social interaction behaviours seem to increase in number, percentage of duration to the total duration of the observable data as well as in quality. The child with ASD also responds to the music therapy process with mostly positive emotions which also increase over time. Although the results cannot be generalized, this study may be an indicator for the influence of music therapy in children with ASD and highlights the need for more research in larger samples.

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10 APPENDIX

Session		Eye contact with...			
		female music therapist	younger girl	older girl	male music therapist
2	count	1	0	0	0
	duration	0,8	0	0	0
4	count	7	0	0	0
	duration	15,44	0	0	0
5	count	8	1	0	12
	duration	11,12	0,76	0	14,48
6	count	0	0	0	1
	duration	0	0	0	0,88
7	count	1	0	0	7
	duration	0,88	0	0	5,08
8	count	0	2	0	4
	duration	0	1,04	0	4,24
9	count	0	0	0	3
	duration	0	0	0	4
10	count	0	0	0	2
	duration	0	0	0	5,44
11	count	2	2	1	5
	duration	2,12	2,36	1,48	6,2
12	count	6	0	0	0
	duration	11,68	0	0	0
13	count	10	2	0	4
	duration	21,88	4,08	0	6,92
14	count	4	0	0	1
	duration	5,4	0	0	1,16
15	count	7	0	0	1
	duration	9,28	0	0	0,84
17	count	5	1	0	11
	duration	9,36	0,8	0	19,64
18	count	0	1	0	1
	duration	0	0,92	0	1,96

	female music therapist	younger girl	older girl	male music therapist
total number of events	51	9	1	52
total duration	51	9	1	52

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Aaron's joint attention with therapists

Sessions	Number of events	Duration	Duration (%)
2	0	0	0,00%
4	0	0	0,00%
5	6	21,44	3,98%
6	1	2,04	1,22%
7	2	3,56	1,22%
8	0	0	0,00%
9	1	2,44	1,65%
10	0	0	0,00%
11	0	0	0,00%
12	1	2,52	0,43%
13	0	0	0,00%
14	3	8,4	3,02%
15	2	3,64	1,12%
17	1	18,32	7,04%
18	1	1,4	1,69%

Vocalizing

Session	Duration	Duration (%)
1	0	0,0%
2	0,84	1,6%
4	0	0,0%
5	1,8	0,3%
6	0	0,0%
7	0,88	0,3%
8	3,4	3,5%
9	0	0,0%
10	0	0,0%
11	2,12	1,2%
12	8	1,4%
13	0,84	0,3%
14	6,12	2,2%
15	7,36	2,3%
17	12,4	4,8%
18	0,76	0,9%

Eye Gaze (duration)

Session	Group & group members	Musical instruments	Elsewhere
1	42,50	0,00	57,50
2	37,65	43,30	19,05
4	27,21	37,96	34,83
5	34,62	32,04	33,34
6	11,64	73,61	14,75
7	24,63	18,17	57,21
8	35,59	20,61	43,80
9	47,01	35,80	17,18
10	17,36	23,47	59,17
11	58,03	11,78	30,19
12	18,12	61,92	19,95
13	34,61	3,61	61,78
14	28,54	25,19	46,27
15	20,19	44,74	35,07
17	56,46	26,19	17,35
18	33,37	52,19	14,44

Eye gaze at...

Session	male therapist	female therapist	older girl	younger girl	the group
2	0	0,8	0	0	18,64
4	28,88	57,32	0	0	39,92
5	40,12	23	0	34,08	89,2
6	4,92	2	0	0	12,56
7	25,04	7,72	0	6,04	32,84
8	6,92	2,6	0	8	17,16
9	26,32	4,04	0	1,2	38,04
10	14,24	4,24	2,12	0,64	19,4
11	20,72	18,2	3,28	2,36	57,16
12	25,76	33,2	11,32	0	37,04
13	19,72	38,32	8,92	10,92	34,04
14	6,2	22,24	5,6	6,8	38,52
15	11,12	24,32	5,84	0	24,08
17	43,88	19,72	7,4	4,8	71,16
18	4,16	11,16	2,32	5,24	4,84

Emotional Responses

Session	Positive emotions		Negative emotions	
	count	duration	count	duration
2	0	0	1	4,04
4	12	31,32	0	0
5	2	2,68	3	6,4
6	0	0	3	3,48
7	1	1,24	5	11,48
8	11	13,36	0	0
9	5	13,64	1	1,76
10	3	8,76	1	0,88
11	9	18,2	0	0
12	7	18,92	3	2,88
13	10	43,16	0	0
14	8	33,76	1	1,44
15	4	8,4	16	87,76
17	34	77,72	5	4,4
18	8	13,88	0	0
total	114	285,04	39	124,52

Social interaction behaviours (duration)

Session	responding	imitation	tease	chasing game
2	0	0	0	0
4	14,8	0	0	0
5	7,68	0	0	0
6	1,88	0	0	0
7	0	8,48	0	6,52
8	0	0	0	9,48
9	0	12,08	0	5,24
10	0	0	0	3,76
11	0	0	3,4	3,84
12	4,08	0	4,64	5,04
13	0	0	21,56	6,24
14	21,12	3,96	6	0
15	9,88	0	1,72	0
17	0	4,2	0	49,08
18	8,97	0	0	5,12

Social interaction behaviours

Session	total number of events	total duration
2		0
4	4	14,8
5	3	7,68
6	1	1,88
7	5	15
8	5	9,48
9	5	17,32
10		3,76
11	2	7,24
12	7	13,76
13	7	27,8
14	4	31,08
15	5	11,6
17	22	53,28
18	7	14,09

		Musical activity	
		playing an instrument	guided by therapist in playing the instrument
2	count	0	0
	duration	0	0
4	count	4	3
	duration	44,8	7,92
5	count	1	0
	duration	4,72	0
6	count	4	1
	duration	35,48	7,12
7	count	2	1
	duration	20,8	1,96
8	count	2	0
	duration	14,08	0
9	count	3	0
	duration	16,72	0
10	count	0	0
	duration	0	0
11	count	0	2
	duration	0	3,12
12	count	1	3
	duration	15,76	29,44
13	count	1	1
	duration	4,68	1,96
14	count	2	0
	duration	13,6	0
15	count	0	0
	duration	0	0
17	count	2	1
	duration	30,24	6,8
18	count	2	1
	duration	14,56	1,2