CONTEXT-SITUATED COMMUNICATIVE COMPETENCE IN A CHILD WITH AUTISM SPECTRUM DISORDER

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Autism Spectrum Disorder (ASD) is often linked with difficulties in triadic interaction or joint attention. This paper investigated the communicative competencies that children with ASD might have in these skills. We report findings from a pilot case study that focused on a school-aged child with ASD who interacted with his adult co-participants in various technology-enhanced contexts. The primary data consisted of video recordings that were analysed utilising mixed methods. Focusing on behaviours that were realised via the use of eye-gaze, we wanted to discover whether they would differ according to context. The results of this study show that the use of eye-gaze differed in the contexts studied. The communicative competence was revealed when the child's behaviours were not investigated in isolation but rather in relation to the context of their occurrence. This paper discusses the implications of the described context-situated view of competence and suggests widening the approaches of studies of ASD.

Introduction

Autism and Deficit-orientation

Autism, as a diagnosis, refers to impairments in reciprocal social communication and social interaction, and to presence of restricted and repetitive behaviours, interests, or activities (American Psychiatric Association, 2013). Children with Autism Spectrum Disorder (ASD) are often studied from the perspective of these abnormalities because there is an interest in identifying ASD as early in development as possible (Charman & Baird, 2002; Stiegler, 2007). The research conducted on children with ASD thus far has often focused on comparing differences in various developmental areas between children with ASD and children with typical development. Consequently, the behaviour of the children with ASD is often interpreted as pathologic due to its atypical character, resulting in a deficit-oriented approach.

Recently, a growing interest has arisen toward the competencies that the children with ASD have (e.g., Conn, 2013; Happé, 1999; Mottron, 2011; Stiegler, 2007). Also, research on the savant skills of the individuals with ASD has been conducted (e.g., Bennett & Heaton, 2012) but there is far less research on so-called low-functioning children with ASD (LFA), who have limited speech or comorbid intellectual disabilities. There is a threat that the view of autism is reduced to one of *either diminished capacity or superhuman capacity, but nothing in between* (Draaisma, 2009, 1477). Thus, our understanding of the abilities of these individuals is often divided between two polarities, and the competencies of children with LFA might be overlooked.

In order to understand ASD more comprehensively, we should focus on discovering what facilitates optimal functioning, not only on what prevents it (e.g., Linley, Joseph, Harrington, & Wood, 2006). Thus, it is worth keeping in mind that the unusual behaviour of an individual with ASD is not, by definition, less adaptive or meaningful (Dinishak & Akhtar, 2013; Mottron, 2011) but rather something to be studied in detail. In this paper, we will focus on the use of eye-gaze in a child with ASD from the perspective of communicative competence, instead of the widely documented difficulties. In this case, we understand communicative competence to be a means of using one's eye-gaze in a way that shows understanding of the particular social situation (see Duchan, Maxwell, & Kovarsky, 1999).

Triadic Interaction and Eye-Gaze Use as an Example of Deficit-oriented Research

In this paper, the term triadic interaction is understood as coordinating and sharing of object- or event-directed attention with a social partner (Bakeman & Adamson, 1984). It is a skill that is often referred to as joint attention. On a group level, children with ASD are reported to have extensive difficulties with joint attention (Loveland & Landry, 1986; Meindl & Cannella-Malone, 2011) which is thought to have a particularly important role in the development of ASD (Charman, 2003; Kasari & Patterson, 2012; Loveland & Landry, 1986). Previous research has also shown that children with ASD intentionally communicate less than children with other developmental delays or with typical development (Maljaars, Noens, Jansen, Scholte, & Van Berckelaer-Onnes, 2011; Shumway & Wetherby, 2009), and when they do communicate, their purpose is more often instrumental and imperative (e.g., aiming to receive aid from another person with pointing) than declarative (e.g., sharing an object of interest with another person via the use of eye-gaze) (Maljaars et al., 2011; Shumway & Wetherby, 2009).

Communicative intentions can be expressed in multiple ways, but often, the difficulty in seeking or maintaining eye contact seems as the most striking feature of ASD because it violates our everyday understanding of the way social encounters are realised. Also, joint attention is typically attained through the use of eye-gaze. Children with ASD differ from children with typical development in various areas related to the use of eye-gaze: they rarely look at another person for social information or to get an assurance regarding something (i.e., referential looking) (Noris, Nadel, Barker, Hadjikhani, & Billard, 2012), they do not follow another person's head turn as often as children with typical development (Leekam, Hunnisett, & Moore, 1998), and they have difficulties with gaze following (Carpenter, Pennington, & Rogers, 2002; Leekam et al., 1998). Although, it is important to notice that individual variation occurs as the spectrum of ASD is vast.

The results mentioned are often yielded by studies that are conducted in controlled settings (see Kidwell & Zimmerman, 2007). Because of this control over the elements affecting the situation, a high internal validity can be achieved, but the external and ecological validity of the research findings can be called into question (Crosland et al., 2012, Korkiakangas, 2011). Previous research has shown that context affects the behaviour of children with ASD and other disabilities (e.g., Holt & Yuill, 2013; Olsson, 2005; Roos, McDuffie, Weismer, & Gernsbacher, 2008), and thus, the children with ASD might have individual competencies that are not revealed without altering the research approach. This made us interested in investigating and understanding triadic interaction in relation to the context in which it naturally occurs (see Kidwell & Zimmerman, 2007; Wetherby, 1986). We also wished to consider the behaviour of the co-participants the child is interacting with because much of the research in this area has focused solely on the child, paying less attention to the immediate social context (Adamson, Bakeman, Deckner, & Nelson, 2012; Olsson, 2005; Stiegler, 2007).

Research on triadic interaction, or joint attention, has mostly been conducted using quantitative methods. With the use of a quantitative approach comes the need to strictly predetermine the behaviours of interest based on existing theory, instead of approaching the phenomenon in terms of the data and subjects. The downside of these theory-based coding schemes is that they can overlook the distinctive ways of interaction that children with ASD might have or define them as mere abnormalities (see Stiegler, 2007). Thus, the purpose of this paper is to provide an alternative perspective on the triadic interaction skills of a child with ASD by considering the related communicative competencies. We present findings from a pilot case study (Tuononen, 2012) that investigated a child with ASD's multiple ways of sharing attention via the use of multiple gestures including, for example, pointing and verbalisations. In this paper, we focus solely on the use of eye-gaze to acquire an understanding of it in relation to both the social and the physical contexts in which it occurs. By focusing on a child with very limited speech, the study aims to consider the communicative competencies of the children with so-called LFA, who are not often included in studies.

Methods

Research Design

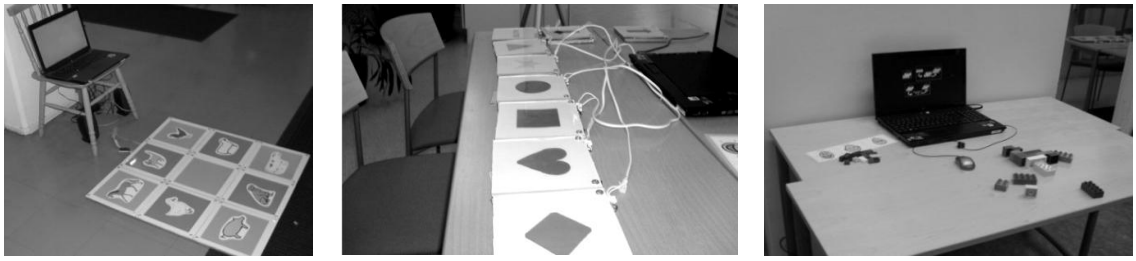
As a pilot study, the aim was to try out a new approach to acquire an alternative perspective to an extensively studied phenomenon of triadic interaction. A mixed-methods design was chosen to fulfil this aim. Quantitative methods were used to examine the use of eye-gaze in various contexts, which was followed by a qualitative micro-analysis. As a case study, the focus was on the phenomenon of triadic interaction. This focus was chosen to understand the behaviour of a particular child in context, not in

isolation, in order to individualise rather than to categorise (see Grove, Bunning, Porter, & Olson, 1999). Thus, our approach could be described as person-centred rather than variable-centred (Olsson, 2005). The choice to focus on a single child and his co-participants enabled a focus on contextual details. The extent that this study focused on the co-participants is similar to that of Alexandersson's (2011): they were part of the context in relation to which the child's behaviours are to be understood.

Research Setting and Participants

Research Setting. The study took place at the technology club sessions organised by the Everyday Technologies for Children with Special Needs (EvTech) project. In these club sessions, children with various special needs worked for approximately 10 to 15 minutes with their parents and club tutors at several technology-based action stations that were developed in the EvTech project. The working times at the action stations were fixed for each session. The EvTech club was designed as a leisure program, not a targeted intervention, and thus, the children were not forced to complete the game-based tasks if they did not want to.

Three of the action stations were selected for investigation: the dance mat station, the symbol matching station, and the LEGO® building station. They were chosen because the activities differed from one another, as the following descriptions will show.



Dance mat station Symbol matching station LEGO building station

Figure 1. Photographs of the technology action stations: Dance mat station, Symbol matching station, and LEGO building station.

These three action stations (see Figure 1) enabled the child to choose from a variety of games. At the dance mat station[1], one of the games required the child to place his hands and legs on certain places on the mat, following the instructions given on the computer screen, to practice, for example, his motor skills and visual or auditory perception. The child's parent and the club tutor often followed the child, standing next to the dance mat.

At the symbol matching station[2], the games included matching the colour on the screen to a shape on the buttons and playing a memory game in which the child needed to memorise the symbol shown on the screen to practice, for example, visual search and sustained and divided attention skills. The child's parent and the club tutor often watched the child play by sitting next to him at the station.

At the LEGO building station[3], the child was presented with a block model on the computer screen. The child was instructed to recreate the image using commercial LEGO or DUPLO® blocks. The game could also be played as a memory game in which the model to be built had to be memorised. The child could practise, for example, his spatial perception, and with the memory game, he could practice memory-related skills. The parent and the club tutor typically sat next to the child at the station. Unlike at the other two stations, the parent and the tutor often took part in the activity with the child.

Participants

The child in this study was chosen because he was diagnosed with F84.0 autism (ICD-10 criteria: World Health Organization, 1992) and had limited speech. He was chosen to increase knowledge regarding children with LFA.

At the time of this study, the child was eight years old. According to the child's parents, his development had been typical until what they described as total verbal regression, or word loss, near his second birthday. He attended a school for children with special needs and needed comprehensive support for all daily activities. His medical documents stated that he had very limited functional speech but that he did occasionally use words, for example, in requests, and that he understood speech well. According to his parents, the child did not like loud noises, and it was suspected that he had over-sensitivity to sounds.

The medical documents also stated some skills that the child had. For example, his motor skills were assessed as good, and visual perception and visual memory were described as his strengths.

The co-participants in the study were the child's parent and two club tutors. One of the tutors was a Master's student in Special Education and the other was a teacher with training in Special Education. The child was familiar with the tutors because they had been working with him prior to the data collection. The child and his family were clients in the organisation responsible for the EvTech clubs due to the child's need for extensive care. The family was offered the chance to participate in the club. The participation was voluntary, and written informed consent was obtained from the participants prior to the start of the club. The child's parents reported that he enjoyed coming to the EvTech club meetings and that he was also interested in computers and other technologies at home.

Measures

The eye-gaze behaviours were observed from the videos, using a coding scheme developed for the study. The coding scheme was based mainly on the Early Social Communication Scales (ESCS: Mundy et al., 2003) with Roos et al.'s (2008) modifications and on the definitions of the Social Communicat.ion Assessment for Toddlers with Autism (SCATA: Drew, Baird, Taylor, Milne, & Charman, 2007). Because children with ASD vary greatly in their symptoms and skills, it was necessary to abandon some of the predefined definitions to capture the communicative competencies of the child studied, and hence the scheme was individualised for the purposes of this pilot. For example, the demand for actual eye contact or gaze towards the eyes of the other person is often highlighted (Mundy et al., 2003), instead of looking at the face area. Bypassing these other, more atypical ways of interacting would result in ignoring potentially communicative behaviour (see Olsson, 2004), and this potential was where we wished to target our study.

Various versions of the coding scheme were frequently commented on by professionals from the field of Special Education, and an inter-rater reliability study took place during the construction process. These procedures led to a coding scheme for various behaviours related to triadic interaction, via which the use of eye-gaze is investigated in this paper. The behaviour categories, along with operational definitions, data samples, and the theoretical background, are presented in Appendix.

Data Collection

The data pool of video recordings extended over the fall of 2009 and the spring of 2010. From these, six out of 18 club sessions were selected for further analysis covering total of seven months. The selection of the sample was based on the representativeness of the data (sessions covered both the fall and spring semesters, and all three action stations were included) and the quality of the data (videos were recorded from an angle that enabled the analysis). The data analysed contained 18 action stations sessions: six sessions at every action station, with 10 to 15 minutes of work at each. Interpretations made based on the video data were viewed against additional data that were either collected for this research or were accessible through the EvTech club: interviews with the child's parents and his speech therapist, field notes from the EvTech club, and the club tutors' written feedback, which was given after every club session.

Data Analysis

The analysis proceeded from the identification of the behaviours of interest (i.e., eye-gaze) to the examination of quantitative differences between the action stations in relation to these behaviours, and concluded with a qualitative micro-analysis. The behaviours were coded from the data via the coding scheme by using ELAN software (Max Planck Institute for Psycholinguistics, 2014). With this software, it was possible, for example, to synchronise the videos that were recorded from different angles and view them side-by-side on the computer screen (see Brugman & Russel, 2004). At time, the participants were only partially visible to the camera due to the naturalness of the setting, in which all possible movements and directions were impossible to estimate. Thus, at time, the coding of the eye-gaze was based on head position but only in circumstances where the eye-gaze direction could be inferred with a certainty (i.e. when someone enters the room and the child turns his head).

The statistical analyses were based on frequency counts of the coded behaviours at the action stations. The tests were non-parametric with Bonferroni corrections. The differences between the three technology-based action stations were analysed with a Kruskal-Wallis test (n = 18), which was followed by pair-wise comparisons with the Mann-Whitney U test (n = 12). The statistical analyses were conducted with PASW Statistics software. The Kruskal-Wallis test was chosen because we hypothesised

that the differences between the action stations would not be systematic across club sessions and we wanted to see whether the behaviours at the action stations differed overall.

The purpose of the data-driven qualitative micro-analysis was to understand the behaviour of the child by viewing the coded data systematically multiple times, paying attention to the context, that is, to the immediate antecedent and concurrent events of the eye-gaze behaviours. The analysis was guided by the identification of similarities and differences in occurrences of the behaviours. The declarative and imperative purposes of the behaviours were interpreted solely on the basis of the context of their occurrence (e.g. Schegloff, 1993), which is in contrast with more theory-based practices. The data were transcribed in part to create illustrative data samples, but the actual analysis was based on the visual, not the textual, content. The analyses were conducted by the first author, but they were overseen and critically discussed with the other authors. Interpretations were also re-examined against the additional data (see Data Collection).

Results

Quantitative Approach

The quantitative differences in the eye-gaze behaviours between the action stations were examined based on frequency counts at each of the six EvTech club sessions. Table 1 shows the means and standard deviations for the eye-gaze behaviours at the three action stations. The total frequency counts of all the studied eye-gaze behaviours are summarised in Figure 2.

Table 1. Means and Standard Deviations of Eye-Gaze Behaviours per Session at the Three Action Stations

	LEGO building station	Dance mat station	Symbol matching station
Behaviour category	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)
Gaze directed at the co-participant's face	2.00 (1.41)	0.67 (0.82)	7.00 (4.00)
Gaze directed at the co-participant's body or action	12.50 (6.16)	2.67 (1.75)	5.83 (5.27)
Shifting the gaze between the co-participant's face and an object	1.67 (1.86)	1.00 (2.00)	9.33 (5.72)
Following the co-participant's gaze	0.17 (0.41)	0	0
Gaze directed at people near the action station	1.83 (1.84)	0.83 (1.33)	13.67 (10.71)
Looking at an object or in a direction that is pointed out or otherwise presented	15.17 (6.56)	3.67 (5.24)	7.50 (5.13)

Note: Due to the lack of occurrence in two of the three contexts in *following the co-participant's gaze*, no further analyses were made

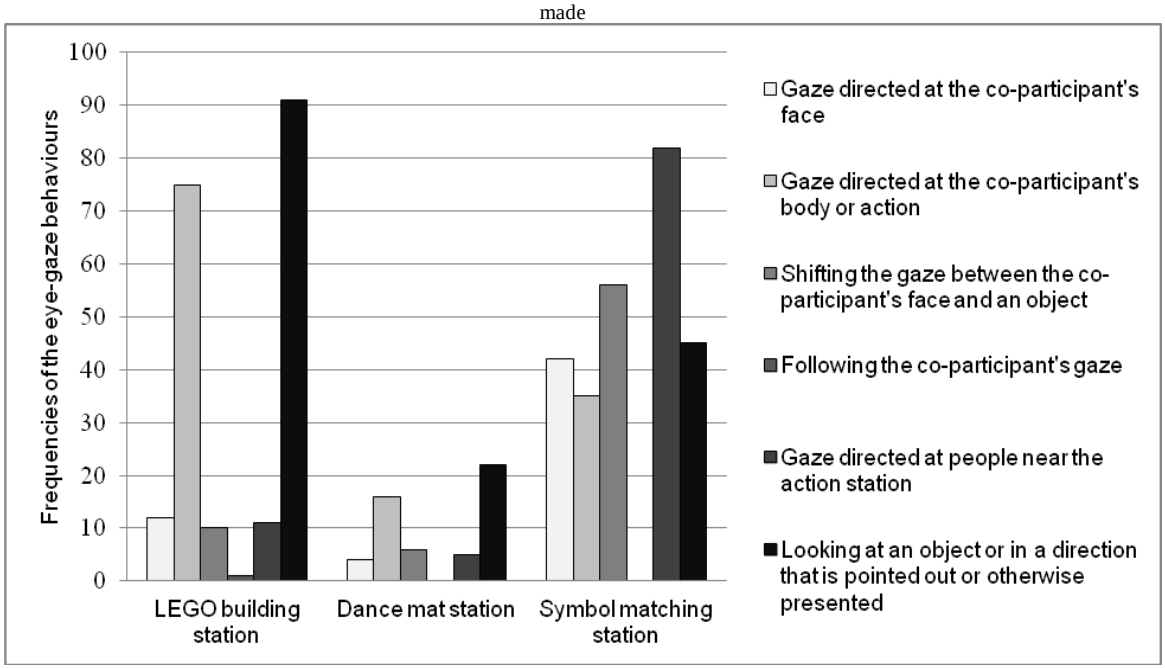


Figure 2. Total frequency counts of the use of the eye-gaze at the three action stations across club sessions.

The frequencies of these eye-gaze behaviours at each of the action stations during the six club sessions were compared with one another. There were statistically significant differences in the use of *gaze directed at the co-participant's face* when the three action stations were compared to one another (χ^2 = 11,946, p = .0005). When the child was working at the symbol matching station, he directed his gaze at the co-participant's face more frequently than while working at the dance mat station (U = 0,000, p = .002) or the LEGO building station (U = 2,000, p = .011).

In addition, the *gaze directed at the co-participant's body or action* showed statistically significant differences between the action stations (χ^2 = 7,287, p = .019). When the child was working at the LEGO building station, these directed gazes occurred more often than while he was working at the dance mat station (U = 1,000, p = .004).

The differences between the action stations regarding *shifting the gaze between the co-participant's face and an object* were also statistically significant (χ^2 = 9,192, p = .005). This kind of eye-gaze use occurred more often at the symbol matching station than at the LEGO building station (U = 3,000, p = .015) or dance mat station (U = 2,000, p = .009).

Also, the amount of *gaze directed at people near the action stations* showed statistically significant differences among the action stations (χ^2 = 9,967, p = .003). While working at the symbol matching station, the occurrence of this kind of eye-gaze use was more frequent than at the LEGO building station (U = 2,500, p = .011) or at the dance mat station (U = 1,500, p = .006).

In addition, the amount of *looking at an object or in a direction that is pointed out or otherwise presented* showed statistically significant differences among the action stations (χ^2 = 8,080, p = .011). There were more of these behaviours at the LEGO building station than at the dance mat station (U = 2,000, p = .009).

From Figure 2, one can see that *following the co-participant's gaze* was not observed at the symbol matching station or at the dance mat station, and it occurred only once at the LEGO building station. Thus, no further conclusions are made regarding this.

Qualitative Approach

The eye-gaze behaviours described above were further analysed with qualitative micro-analysis. In the examples below, the following abbreviations are used to indicate the child (C), the parent (P), and the club tutors (T1 and T2), as well as symbol matching station (S), LEGO building station (L), and dance mat station (D). Also, the number of the club session (1-18) and the time code (hh:mm:ss.ms) from the video recordings are presented.

Gazes directed at the co-participant's face and *shifting the gaze between the co-participant's face and an object* typically occurred at the symbol matching station, which as a context, seemed to support interaction with the co-participants. Thus, these behaviours were interpreted to relate, for example, to showing interest in one's social environment, such as the case in which the parent was talking with the club tutor.

> P tells T1 that C might be able to read. While this happens, C gazes at P's face (S, club session 9, 00:07:41.520–00:07:42.600).

> P talks to T2 while C plays the game. C gazes at P's face and then shifts gaze back to the computer screen (S, club session 7, 00:00:20.000–00:00:21.110).

A potential explanation of the major occurrence of *gazes directed at the co-participant's face* and the *shifting of the gaze between the co-participant's face and an object* at the symbol matching station was that their function was related to the possibility of feedback from the social environment. The child was skilled in playing the symbol matching games, and the experience of success and praise from the parent and the club tutor was interpreted to motivate the child to seek contact with them as the following sample from the symbol-matching station shows.

> C presses the correct button and looks at P (S, club session 15, 00:03:53.534–00:03:54.520).

Overall, the triadic nature of the behaviours was revealed through the analysis of the context of their occurrence, not through their form. The child was interpreted as enjoying watching the time line of the game, which showed how much time the child had left for the task at hand, decrease. Just before the time would finish, the child pressed the correct button and sometimes laughed. During this, he would often gaze at people near him, which was in some cases interpreted as desiring to impress them.

> C has waited (once again) for the time to react to run out, but just before that happens, C presses the button. C laughs and looks at T1 (S, club session 9, 00:05:30.760–00:05:37.860).

Thus, these behaviours could be described as often having a declarative purpose. Sharing an event or object was interpreted as their main function, especially when they were accompanied by smiles or laughter. Also, the symbol matching station, as an activity and environment, created situations relevant to the use of *gazes directed at people near the action station.* The child was good at playing these symbol matching games, and therefore, he often had a lot of spare time for observing his surroundings while waiting for the next task to appear on the screen.

> C follows P, who is leaving the situation, with his gaze. T1 says: *P will be back soon* (S, club session 15, 00:08:58.370–00:09:03.210).

> C turns his head and looks in the direction that P has left (S, club session 15, 00:09:05.476–00:09:07.600).

Without this micro-analytic approach, it would have seemed that the child was not interested in the activity at this action station, because his attention was quite often elsewhere than on the screen. When working at the LEGO building station, *gazes directed at the co-participant's body or action* were more characteristic of the child than when working at the dance mat station. This was interpreted as relating to the side-by-side working of the child and the club tutor because the club tutor was often building the same kind of model as the child. Thus, the way in which the activity was organised at this action station produced situations in which *gazes directed at the co-participant's body or action* were relevant, unlike at the dance mat station. The child often gazed at the club tutor's hand as she was using the computer mouse in situations in which the task was completed and he was ready to move on. Therefore, this kind of eye-gaze use was seen to serve an imperative purpose: to ask help in continuing to the next task. The following sample will illustrate this.

> T1 has selected a memory game as the next game. C has been given instruction to look at the computer screen and to try to remember the LEGO block model presented on it. C has gazed at the screen and then shifted his gaze to T1's hand that is on the computer mouse (L, club session 17, 00:03:20.320–00:03:21.400).

> T1 presses the mouse button, which makes the model, which C is supposed to replicate, disappear. C makes voices, smiles, and stiffens his hands against his chest. He looks at the computer screen (L, club session 17, 00:03:21.910–00:03:22.910).

Also, the imperative purpose of these behaviours was evident in situations in which the child's *gaze being directed at the co-participant's body or action* preceded an act of attempting to take, for example, the computer mouse from the club tutor's hand.

> T2 tries to start the game. C shifts his gaze to T2's hand that is using the computer mouse (L, club session 7, 00:06:52.800–00:06:53.860).

> C grabs T2's hand and tries to take the computer mouse. P interrupts and says: *Don't touch that* and takes C's hand away from the computer mouse. C looks at the mouse (L, club session 7, 00:06:53.870–00:06:56.190).

Looking at an object or in a direction that is pointed out or otherwise presented also occurred at the LEGO building station more often than at the dance mat station. Likewise, this can be attributed to the co-operative nature of the activity, which created possibilities for the child to respond to the triadic interaction bids of the co-participant. The activity in itself also seemed to be motivating enough for the child to be responsive. The following sample from the LEGO building station illustrates these.

> P grasps C's LEGO construction and lifts it next to the model presented on the computer screen. P: *Look, it's alike*. C turns to look. C makes sounds and claps his hands simultaneously (L, club session 9, 00:02:55.105–00:02:57.250).

None of the eye-gaze behaviours studied was characteristic of the dance mat station – it can even be stated that their absence was characteristic of the dance mat station. When these behaviours did occur, they often reflected the challenges encountered by the child while working at this action station and often thus carried an imperative purpose. For example, the *shifting of the gaze between the co-participant's face and an object* was sometimes present, especially in situations in which there were some unexpected difficulties with the use of technology. In these situations, the child was interpreted as asking for help by shifting his gaze between the co-participant's face and the event as in the following sample.

> C has tried to press the buttons of the dance mat with his feet multiple times, but the software does not respond. C looks at P's face (D, club session 7, 00:35:53.304–00:35:54.343).

In addition to the occasional difficulties with the functionality of the technology, the tasks at the dance mat station seemed challenging for the child. Thus, he would engage in activities that were somewhat disobedient in nature but would show enjoyment, for example, during declarative *gazes directed to the co-participant's face.* The following sample illustrates this.

> C laughs and looks at T1's face (after trying to shut down the computer) (D, club session 11, 00:03:41.900–00:03:43.752).

As the results above show, although most of the studied eye-gaze behaviours were observed occasionally at all of the three action stations, their occurrence and meaning was related to certain context-specific social situations.

Discussion

The purpose of this pilot study was to examine the potential of communicative competence of a child with ASD to complement the existing research on the widely documented difficulties in the use of eye-gaze in triadic interactions. The study investigated whether the use of eye-gaze differed according to the context and examined these observed triadic interactions in detail. The contexts that were included in the study were three technology-based action stations of the EvTech club.

The fact that the contexts of the study were natural and the child was familiar with them differentiates this study from studies using more structured settings. These two are important qualities. Wetherby (1986) states that unfamiliar and challenging environments should be utilised only if one aims to study the deficits that individuals with ASD have. Our study supports the view that contextual elements are important in the identification of communicative competence. For example, the challenging nature of the activity at the dance mat station is intriguing because the main idea of the activities at this action station and the symbol matching station is the same: to match symbols. It was difficult for the child to complete the activities at the dance mat station because the mastery of the medium (i.e., the concrete dance mat) seemed to be demanding for him in itself. Also, at this action station, there were regular problems with the functionality of the technology, which caused the child to face additional challenges, unlike at the other two action stations, and these challenges seemed to cause the child to withdraw from seeking contact. Thus, differences not only in the content of the software but also in the realisation of the activity as a whole affected the child's behaviour.

It is not in the interest of this paper to attempt to deny the developmental challenges faced by children with ASD, but rather, to emphasise that although children with ASD show symptoms characteristic of their diagnosis, they may not do so independent of a specific context. Thus, various contexts should be used when assessing these children (see Roos et al., 2008) as an observed lack of behaviours in one context cannot be taken as an indicator of a more general deficit (see Holt & Yuill, 2013). These are to be considered in order to acquire an understanding of the role of the contextual factors. These may not be of a high importance in relation to the actual diagnosis but are valuable regarding the planning of the possible pedagogical and rehabilitative practices.

The findings of this study repeatedly showed that the studied child's use of eye-gaze was context-situated. The number of ways of using eye-gaze varied over the action stations. Both the social and physical environment of the child affected the child's behaviour (see also Alexandersson, 2011; Meadan, Halle,

Ostrosky, & DeStefano, 2008), and thus, the view of communicative competence regarding triadic interactions differed depending on the context in which the child was observed. These findings are in line with those of Holt and Yuill (2013), who noticed the striking difference in children's behaviours in different contexts. This provides a valid reason to conceptualise triadic interaction as a context-situated phenomenon and to use multiple settings when studying these skills (see Olsson, 2005).

Our aim was to understand the behaviour of the particular child studied, but the results highlighted the fact that in order to accomplish this, one should not focus solely on the child but also on the social context of the child's behaviours (e.g., Adamson et al., 2012; Grove et al., 1999). Thus, the child's triadic interactions and the communicative competence in these skills are not seen as something intra-psychological, but as outcomes of the interactional context and thus as inter-psychological phenomena (see Kidwell & Zimmerman, 2007; Korkiakangas & Rae, 2013). Recently, Conn (2013) has suggested this kind of context-thinking to be helpful for autism research in general. Overlooking the social context of the child's behaviour might provoke the tendency to view the observed difficulties as inner features of individuals with ASD making it almost a built-in quality of the research.

The perspective adopted in this paper emphasised the individual ways of interacting that the child used by taking into account behaviours that are often excluded from studies of triadic interaction or joint attention based on their seemingly less social nature, for example, *gazes directed at the co-participant's body or action*. Consequently, in order to capture the competencies, it was regarded as important to view all the behaviours as potentially meaningful and not to consider unusualness to be a deficit by default (e.g., Dinishak & Akhtar, 2013; Mottron, 2011; Olsson, 2004). This was achieved by individualising the coding scheme to include such behaviours. Also the use of a mixed methods approach enabled us to gain a view of the child's communicative competencies. With purely quantitative methods, one is able to identify situations in which certain behaviours occur but unable to say much about their relevance, significance, or meaning (Schegloff, 1993). Thus, the context in which the behaviours occurred revealed their triadic nature, which would not have been apparent with purely theory-based categories. Based on the results, it can be suggested that the term triadic interaction or joint attention is operationalized broadly enough. Individualising the coding scheme is not equal to giving up on detailed category definitions and making subjective interpretations but to allowing a greater variety of individual skills to be observed.

Implications

Although the findings are difficult to generalise to the heterogeneous group of children with ASD, the understanding gained on the individual level is important in itself. The skills of one child with ASD are still a meaningful sign of competence to be noticed and considered. Indeed, the understanding of the meaning of the context-situated elements of the behaviour of a particular child can help in supporting his or her communicative competence. From the pedagogical point of view, this study showed that with various contextual elements, it is possible to either enable or disable certain behaviours (see also Alexandersson, 2011; Holt & Yuill, 2013). Thus, designing and utilising contextual elements to support these children is vital, although, more research targeted on these elements is needed.

With respect to rehabilitation of these children, if the atypical behaviour of the children with ASD is not regarded merely as a deficit or difficulty, we can gain a better understanding of the reasons for their behaviour, which will enable us to better support them. Grove et al. (1999) interestingly pointed out that without assuming that there is the potential for communication, there will be no communication to discuss or to study. Also, a more individualised understanding should be widened from therapy settings to include the area of research as well (e.g., Fischer, 1994, 45). Such an approach would benefit, for example, the development of educational programmes, which do not always take advantage of the abilities of individuals with ASD. Instead, they often attempt to suppress their autistic features (Mottron, 2011). Not seeing a difference as a deficit but as a different way or style of doing things (e.g., Happé, 1999) could benefit not only research practices but also intervention planning.

The study has also important implications for research practises. It can be suggested that the unit of studies and interventions regarding ASD should not be the child in isolation but a co-participant-child dyad (e.g., Shotter, 1986) in order to understand interaction as a reciprocal and dynamic concept instead of a discrete and static one (see Grove et al., 1999). Thus, the child's interaction should be studied in relation to that of the co-participant (Kidwell & Zimmerman, 2007; Korkiakangas, 2011; Stiegler, 2007). This could be achieved methodologically by applying conversation analysis as a method of analysing the sequences identified with a coding scheme, such as the one used in this study. Although ASD has been

previously studied with conversation analysis (e.g., Geils & Knoetze, 2008; Korkiakangas, 2011; Korkiakangas & Rae, 2013; Stiegler, 2007), mainstream research on ASD has not yet adopted this kind of a methodology. Moving in this direction would be beneficial because traditional theory-based research seems to face challenges in identifying the small initiatives of the children with ASD. Also, strict theory-based operational definitions might not take into account individual ways of behaving. Applying a more rigorous conversation analytic framework and analysing both the immediate antecedents and the consequent events was not within the scope of this study, but would be the correct direction to pursue in the future.

Overall, this pilot study does not suggest that we should deny the objective challenges that children with ASD have but rather that we should support the genuine strengths. The aim of this perspective is not to replace deficit-orientation but to complement it (see Linley et al., 2006). This perspective on the skills of individuals with ASD has implications for the well being of these individuals, and on a general level, it allows the variety and individuality among children with ASD to be seen. Also, according to Grove et al. (1999), it is a matter of dignity and respect to recognise that a person can and does communicate.

Limitations of the Study

Regarding the fact that this study is a pilot, there are some limitations to be mentioned. The analysis of the behaviours of the parent and the club tutors were beyond the scope of the present study, and thus, no information regarding, for example, the number of prompts that the child did or did not respond to can be drawn from the study. Likewise, no further conclusions can be drawn regarding the *following of the co-participant's gaze,* which occurred only once. The lack of these behaviours is important in itself and may reflect the challenges this child had. There is also a methodological reason for the low number of occurrences that is related to the number of verbal instructions given to the child by the parent and the club tutor. It was extremely difficult to make conclusions regarding what could have been the cue that the child followed. Also, the systematic analysis of the eye-gaze behaviours' initiative or responsive nature was not within the scope of this study and remains as a future direction.

In addition, the study can be criticised for the very fact that the analysis of the use of eye-gaze was based on video data. Mobile eye-tracking technology would provide more accurate measures (e.g., Falck-Ytter, Fernell, Hedvall, Von Hofsten, & Gillberg, 2012; Noris et al., 2012), but its use would also demand careful planning and habituation periods for the children in order to keep the setting as natural as possible. Our future research has taken this direction and such a technology will be used. In addition, although the inter-rater reliability was assessed during the construction of the coding scheme to guarantee the reliability of the categories, the final analysis was conducted by the first author without another inter-rater reliability study. To avoid bias the analysis was discussed with Special Education professionals during the analysis process.

Because there was only one child in this study, comparisons to other children with ASD or with typical development could not be made. This case study approach should not be seen as a limitation in itself (see Flyvbjerg, 2006), but in the future, it would be useful to study the phenomenon also on a group level.

Acknowledgements and Funding

We are grateful for the Everyday Technologies for Children with Special Needs project and Honkalampi Foundation for their research collaboration.

We acknowledge the financial support of the Children with Autism Spectrum Disorders as Creative Actors in a Strength-based Technology-enhanced Learning Environment (CASCATE) project from the Academy of Finland (2011-2014) in preparation of this manuscript.

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Appendix

Behaviour Categories, Operational Definitions, Data Samples, and Theoretical Background

Behaviour category	Operational definition and data sample	Theoretical background
Gaze directed at the co-participant's face	The child looks at the co-participant's face. This includes reciprocal eye contact and a gaze directed towards the eyes or face of the co-participant. E.g., C finishes his LEGO building, and T1: *Finished, finished*. C turns to look at T1. T1 does not notice. (L, club session 14, 00:04:23.570–00:04:25.470)	Based on video data, it is difficult to analyse whether the child's gaze is directed at the eyes or face of the co-participant. Actual eye contact or gaze directed at the eyes of the co-participant are not presupposed by some authors (e.g., Clifford & Dissanayake, 2009), which is in contrast with the view of others (e.g., Drew et al., 2007; Mundy et al., 2003).
Gaze directed at the co-participant's body or action	The child observes the actions of the co-participant by directing his gaze towards his or her body or actions. E.g., P presses a button on the dance mat with his foot. C observes. (D, club session, 7, 00:35:55.596–00:35:57.204)	Drew et al. (2007) also define the purpose of a *look to the examiner without eye contact* as an attempt to monitor the co-participant's actions.
Shifting gaze between the co-participant's face and an object	The child shifts his gaze between an object and the co-participant's face (object-co-participant-object or co-participant-object-co-participant). This includes reciprocal eye contact and a gaze directed towards the eyes or face of the co-participant. E.g., T2 is about to leave. C looks at T2 and then returns his gaze to the computer screen. (L, club session 7, 00:06:49.730–00:06:51.100)	Wetherby et al. (2007) define *gaze shifts* similarly. Also, Drew et al. (2007) apply *gaze shift*, but they require, for example, the co-participant to not affect the child. When analysing a natural, unstructured setting, it is impossible to separate whether the child followed a verbal or non-verbal prompt.
Following the co-participant's gaze	The child directs his gaze towards the face of the co-participant and then follows his or her gaze to an object or in a direction that he or she is looking at. If the co-participant suggests this gaze shift by pointing, code as *looking at an object or in a direction that is pointed out or otherwise presented*. E.g., P says: *T1 is also building*, and gazes at T1's construction. C shifts his gaze to the construction. (L, club session 17, 00:01:26.580–00:01:26.800)	Mundy et al. (2003) describe *following the line of regard* as the child turning his head or shifting his eye gaze where the tester is pointing. Here, these are coded as *looking at an object or in a direction that is pointed out or otherwise presented,* and *following the co-participant's gaze* only includes following the actual gaze shift of another person (e.g., Sigman & Kasari, 1995).
Gaze directed at people near the action station	The child follows persons or events that are not in the immediate social context with his gaze. This includes situations in which the co-participant who has previously been the target of the child's	Drew et al. (2007) describe *monitoring* as a look that does not seek to engage a person but to see what is happening. Thus, it is non-social. On the other hand, Holth (2006) describes

	attention leaves the context, which results in the child looking in the direction in which the co-participant is heading or has already exited. E.g., C looks at the hallway where a person walked that was previously observed by C. (S, club session 15, 00:05:45.330–00:05:50.133)	*interactive monitoring* and notes that the child might *keep an eye on* a person nearby to detect their possible initiations. Here, these looks are regarded as potentially social.
Looking at an object or in a direction that is pointed out or otherwise presented	The child directs his gaze towards a direction that is pointed out or an object that is shown to the child. The co-participant might combine verbal prompts with these behaviours, but those occurring without pointing or showing are not coded. E.g., C sits on the dance mat and runs his fingers on the keyboard. T1 is next to him. T1 points at a target on the computer screen and says: *Click here, click here*. C turns his gaze to the target. (D, club session 17, 00:08:40.232–00:08:41.212)	Similar to the *turning head or shifting gaze in response to examiner verbal and gestural attention-directing cue* defined by Roos et al. (2008). See also Mundy et al. (2003) for *following the line of regard.*

Note: C = child, P = parent, T1/T2 = tutor1/tutor2, L = LEGO building, S = symbol matching, D = dance mat

Endnotes

[1] The software and materials used at the dance mat station were developed in the EvTech project

[2] The software and materials used at the symbol-matching station were developed in the EvTech project

[3] The software used at the LEGO building station was developed in the EvTech project but was built based on the LDraw™ open standard for LEGO CAD programs. The materials used at the station were commercial LEGO and DUPLO blocks.