

DYADIC INTERACTIONS AND THE DEVELOPMENT OF OBJECT USE IN TYPICAL DEVELOPMENT AND AUTISM SPECTRUM DISORDER

© Marietta KÉKES SZABÓ & © Ágnes SZOKOLSZKY
(University of Szeged, Szeged, Hungary)

kszmarietta@gmail.com

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Autism Spectrum Disorders (ASD) are a group of typically human developmental disabilities. ASD has been well-researched but we can find only a few studies on object manipulation and play by children with ASD. These investigations demonstrate that children with ASD are less involved in object use and play activities in general than typically developing (TD) children, their actions often being monotonous, repetitive, unusual, meaningless and non-goal directed.

Play has a very important role in life: it is a way to develop emotional-, cognitive-, physical-, language- and social abilities. Deficiencies of play activities have been acknowledged to have a seriously negative impact on development. In our research we compared six 2-7 years old TD children to six mentally age-matched ASD-affected children in child-parent interactions in semi-structured play situations recorded on video in the homes of the consenting families. The sets of objects offered for play presented possibilities of different degrees of complexity and type of play, and each set called for certain forms of object use (such as, for example, exploration, pretend play and imitation). We aimed to explore the interaction patterns of TD- and ASD child-parent pairs, focusing on the characteristics of object use and verbal communication. We used the Observer XT 8.0 and SPSS 15.0 for Windows Evaluation Version softwares for data analysis. Our results show that while parents in both groups were inclined to demonstrate object use forms that were less preferred by the child, demonstration was more pronounced in pairs of ASD-children, where the parents used more explicit verbal explanations and teaching-intentioned gestures. TD child-parent pairs performed more one-way and reciprocal imitation, thus canalizing the child's attention effectively to learn from the partner during play. Poorer performance and capabilities in pretend play and imitation stand as serious obstacles to the development of children with ASD.

Keywords: autism spectrum disorder, dyadic interaction, object use, communicative style, development

About Autism Spectrum Disorder

Different theories have been proposed in the past decades to explain the possible background of autism spectrum disorder, along with a great variety of suggested therapeutic methods. Most of them focused on cognitive impairments, but there is still no consensus on what causes autism, although this would be centrally important in order to plan more effective interventions for people living with ASD. It is difficult to define autism because there are no two children whose symptoms or reactions to the same therapies would be the same (Siri & Lyons, 2010). Historically, Bleuler (1911/1951) used the term „autism” to describe idiosyncratic, self-centered cognition while Kanner (1943) emphasized resistance to change and communication dysfunctions. Furthermore, he observed that (1) the disorder was more frequent in certain social classes, (2) it was related to problems of parent-child connection (3) and comorbid intellectual disabilities did happen in autism. Although he thought that autism primarily was a congenital disease, psychological factors were also assumed in the pathogenesis. The latter assumption was later disproved. Autistic children were found in families from all social classes, so the interactional problems seemed to be related to the child and not to the social situation. At the same time psychological tests confirmed unusually scattered abilities in autism (Volkmar & Kline, 2005).

Today, genetic vulnerabilities and environmental factors are equally thought to play an important role in the genesis of the disorder (Volkmar & Kline, 2005; Siri & Lyons, 2010). Unquestionably, comorbid intellectual disabilities often make it difficult to separate ASD from cases of mental retardation (Jordan, 2007). Two major diagnostical systems currently classify ASD under Pervasive Developmental Disorders (PDD): (1) the 4th edition of the American Psychiatric Association’s Diagnostic and Statistical Manual of Mental Disorders (DSM-IV, 1994), (2) and the 10th edition of the International Classification of Disease (ICD-10; World Health Organization, 1992) (Volkmar & Klin, 2005) (Table 1).

Table 1. The broad and heterogeneous class of Pervasive Developmental Disorders

ICD-10	DM-IV
Childhood autism	Autistic disorder
Atypical autism	Pervasive developmental disorder not otherwise specified (PDD-NOS)
Rett syndrome	Rett’s disorder
Other childhood disintegrative disorder	Childhood disintegrative disorder
Overactive disorder with mental retardation	No corresponding category with stereotyped movements
Asperger syndrome	Asperger’s disorder
Other pervasive developmental disorder	PDD-NOS
Pervasive developmental disorder, unspecified	PDD-NOS

Source: Volkmar & Klin, 2005:6

For the diagnosis of autism DSM-IV and ICD-10 defines the co-presence of the following six criteria, arranged in three categories: (1) social abnormalities with at least two criteria (for example, markedly impaired nonverbal behaviors, problems with peer relations, lack of shared enjoyment and/or social-emotional reciprocity), (2) impaired communication in at least one area (for example, stereotyped use or delay/lack of spoken language, usually compensated by the use of gestures, problems with conversational ability and impairments of symbolic play), (3) restricted, repetitive and stereotyped behaviour patterns also with at least one more criteria (for example narrow spectrum of interest and activities that are atypical in focus or intensity, nonfunctional behaviours and stereotyped and/or persistent preoccupation with parts of objects. These symptoms should be characteristic before age 3, the child thus displaying a delayed or atypical development, and should not be attributable to other types of PDD. These three areas of impairments in ASD are also well-known as the Wing-triad among the specialists dealing with autism. The first observable signs of the disorder in the first years are presented in Table 2.

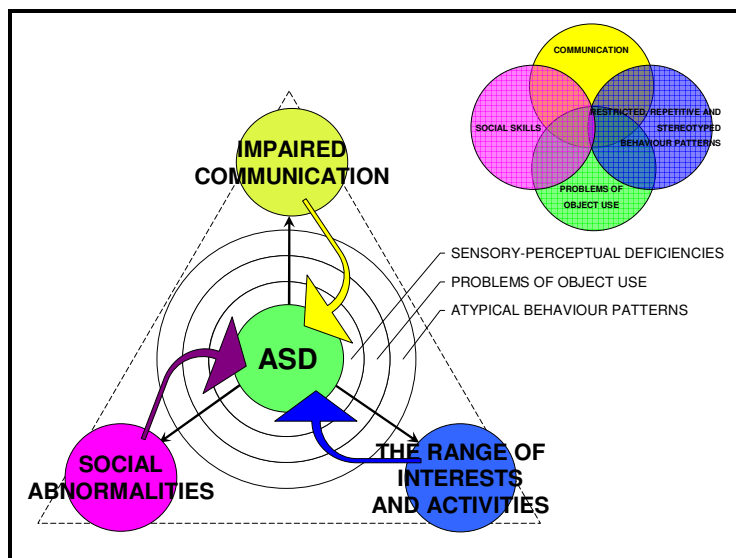
Table 2. Symptoms characteristic in autism

	Social Interaction	Communication	Stereotypical Behaviors and Repetitive Patterns
First year	Limited ability to anticipate being picked up Low frequency of looking at people Little interest in interactive games Little affection toward familiar people Content to be alone	Poor response to name Infrequent looking at objects held by others	Excessive mouthing Aversion to social touch
Second and third year	Abnormal eye contact Limited social referencing Limited interest in other children Limited social smile Low frequency of looking at people Limited range of facial expressions Limited sharing of affect/enjoyment Little interest in interactive games Limited functional play No pretend play Limited motor imitation	Low frequency of verbal or nonverbal communication Failure to share interest (e.g., through pointing, giving, and showing) Poor response to name Failure to respond to communicative gestures (e.g., pointing, giving, and showing) Use of other's body as tool Unusual vocalizations	Hand and finger mannerisms Inappropriate use of objects Repetitive interests/play Unusual sensory behaviors (hyper or hyposensitivity to sounds, textures, taste, visual stimuli)

Source: Chawarska & Volkmar, 2005:230

In addition to the above diagnostical systems, recent studies also focus on the lack of joint attention as a substantial symptom of ASD in the early years (Osterling & Dawson, 1994; Mars, Mauk, & Dowrick, 1998; Kasari, Freeman, & Paparella, 2001), on sensory-perceptual deficiencies (Bogdashina, 2003; Kékes Szabó & Szokolszky, 2012) and abnormalities of object use in autism (Frith, 1991; Jordan, 2007; Ungerer & Sigman 1981; Park 1983). It is easy to see that deficiencies of sensory-perceptual abilities and object use, as well as lack of joint attention are at the very root of gaining experiences in the world which can constrain development. The mutually interactive processes of perception, action and attention highlight why it is so important to deal with ASD from a systems-perspective view. These characteristics and their interactions are illustrated in Figure 1.

Figure 1. Areas of deficiencies in ASD focusing on the abnormalities of the sensory-perceptual experience and its effect on quality of life of a person with ASD



Constrained development in Autism Spectrum Disorder

How can we grasp the relevant information surrounding us? Normally, our perceptual modalities effectively mediate this process. First of all, the relational experience of the world includes seeing and being seen. The person who is competent in gathering visual experience will not only be better in perceiving relevant aspects of the world, but he/she will be able to effectively present things visually to others. However, caregivers and interactions with caregivers seem to have a fundamental role in canalizing experiences about the word and our social environment is of primary importance in directing our attention. Joint attention is a precondition for mutual understanding of interests. Joint attention, as a fundamental social-communicative competency, emerges between 6 to 12 months in typical development and involves the triadic coordination among the child, the parent and the object or event present (Bakeman & Adamson, 1984; Leekam & Moore, 2001). The third important factor is emotional resonance, which allows participants to share their feelings and mood. The fourth factor is joint activity that makes relationships stronger. There are two ways to promote social interaction through joint activity: (1) adult-mediated approaches, and (2) peer-mediated approaches. In the first case an adult helps the autistic child to grow his/her skills that can be used in peer-interactions (McGinnis & Goldstein, 1990), while in peer tutoring a child living with autism is supported by another, older pupil via structured methods (Roeyers, 1996). Finally, the fifth factor, the „royal level of the art of human interactions” is the understanding of others’ motives and intentions. This is usually possible if the previous four preconditions are met (Bauer, 2012).

In autism spectrum disorder there are typically serious impairments of the above abilities. Atypical sensory-perceptual experiences in ASD have been demonstrated (Bogdashina, 2003; Henshall, 2008; Kékes Szabó & Szokolszky, 2012), and so was avoidance of social contact (Matson, Stabinsky, & Sevin, 1991). Children with ASD usually play alone (McClannahan & Krantz, 1999). Autistic traits were found to be in negative

correlation with extraversion (Wakabayashi, Baron-Cohen, & Wheelwright, 2006). Related to lack of joint attention in autism lack of adequate responding and imitating gestures of showing and pointing were observed, as well as the decreased level of following another's eye gaze and decreased orientation to faces and objects when pointed at. In fact, these behaviors are taken to be the first signs of autism (Osterling & Dawson, 1994; Mars, Mauk, & Dowrick, 1998; Kasari, Freeman, & Paparella, 2001). By imitating and observing emotional expressions a TD-child is able to understand the others' mood and feelings, but an autistic child has difficulties with the interpretation of diversified mental and emotional states.

According to the ideomotor framework of human action Iacobony (2009) suggested that there is a common representational format for action and perception, which facilitates imitation. Imitation and mimicry are also effective facilitators of empathy, which involves identification with others' emotions, thoughts and motives. Decety and Meyer (2008) claim that empathy, with its intertwining top-down and bottom-up information flow, is also related to intersubjectivity and social sharing of emotions. While the physiological mechanisms of mirroring can successfully promote mutual understanding in typical development, this process is malfunctioning in ASD. Dapretto and her colleagues (2006) reported lack of mirror neuron activity in the inferior frontal gyrus (pars opercularis) during joint attention activities in autism. The dysfunctional mirror neuron system stands in the background of the lack of the emotional resonance and other impairments in social cognition (Ricciardy et al., 2009).

At the highest level, social cognition requires the understanding of others' mental states, that is, a theory of mind (ToM). This ability is, to a great degree, based on the above discussed skills. „Mindblindness” includes behavioural deficits of appropriate emotional reactions based on the social partner's actual mental states (Baron-Cohen, 1995, Baron-Cohen et al., 2005). Ozonoff and Miller (1995) showed that although a training program using explicit systematic instructions can be effective in connection with the standard ToM tasks, results do not transfer to social behaviour in everyday life. Knowledge of the ToM principles does not necessarily generalize to everyday social competence, because (1) the application of the principles is not flexible enough, and (2) standard ToM tasks tap into certain theory of mind abilities that are much more complex in the real world (Chin & Bernard-Opitz, 2000). Pretend play is a popular field of research dealing with theory of mind, because it involves skills that are equally essential for pretense and for understanding mental states. Such skills include: (1) the capability to represent one object as two things at the same time, (2) the use of an object as it would be something else, and (3) the skill for establishing mental representations. All of these abilities emerge through the child's pretend play (Lillard, 1993). Therefore, pretend play and its limitations are of special interest in ASD.

Again, the role of the parent is important in this regard. There are several communicational characteristics observed in autistic child-mother dyads. Chin and Bernard-Opitz (2000) found more vigorous encouragement for the child's verbal statements by the parent to expand his/her earlier communication, but parallel with this, the use of short questions by the mother, which limited the possibility of the child's answers. Nind & Powell (2000) emphasized the significance of intensive interaction between the child and the parent in facilitating learning, because this naturalistic teaching contributes greatly to the development of sociability and communication. This kind of interactive process is prevalent in playful games and is also used in implicit pedagogy. While a typically developing infant is an active

and competent participant in his/her knowledge acquisition, and the learning process is based on reciprocity and interdependence of the individuals without outcome focus of the adult, there is a breakdown of this positive interactive cycle by child-mother dyads if the infant is living with autism. The normally developing child's mother is more into following the child, whereas the autistic child's mother, who detects the interaction problem, is prone to take greater part thereby giving less chance to the child for taking his/her part in the interaction.

The acquisition of conventional and unconventional object use must be placed in the context of the development of social skills. Can we grasp the characteristic differences between typical- and atypical development, focusing on child-mother dyads? Various types of object use facilitate typically developing children in the spontaneous imitation of actions with objects and the mothers' short and episodic instructions are enough for the child to attain these actions (Valsiner, 1987). In autism, however, intentional teaching and more explicit communication are needed for a similar effect (Kroeger, Schultz, & Newsom, 2007). Accordingly, different kinds of interactional patterns can be expected in typically developing and autistic dyads. Landa and her colleagues (1992) reported atypical pragmatic behaviours by parents of autistic individuals (such as disinhibited social communication, awkward/ inappropriate expression in certain situations and odd verbal interaction), which seemed to be similar to their ASD-son's/daughter's symptoms. Furthermore Toth, Dawson, Meltzoff, Greenson and Fein (2007) also found autistic features (lower level of language expression and susceptibility, IQ-scores below the control group, less successful adaptive- and social-communicative skills) in ASD-children's siblings, which can be another possible evidence for familial aggregation. These results draw attention to the importance of early intervention and support at the family level in the case of the child living with autism.

Language and object use in typical development and in ASD

One of the main signs for parents that something is not right with their son or daughter is atypical language development. It can be manifest in delayed language use or regression, but the social- and linguistic environment may greatly influence later outlooks. There are two significant subgroups among children living with ASD: (1) the first group has normal linguistic abilities (2) the second group has problems with language use, similar to persons with specific language impairments. In typical development infants usually express themselves by a variety of communicative behaviours (as shown in Table 3.). First they use simple gestures, than more complex ones, along with vocalization and speech. Conventional use of language begins around age of one year, when toddlers learn more and more words. The child's own activity and manipulation with objects support him/her to know the name of the objects and name the relation among them. Around 18 months the child can learn new words from his/her social environment without any explicit information and he/she understands the nature of words and is more and more able to understand others' intentions within the language context. Interrelationships among objects, people and actions will be known and verbally expressed around age two, using short sentences. Between 2 to 5 years more complex grammar and longer sentences will appear. The child begins to use the language flexibly but following the cultural conventions. Syntactic and semantic development goes on until the child will use complex

sentences and becomes able to identify relations among the elements of sentences and discourse (Tager-Flusberg, Paul, & Lord, 2005).

Table 3. Milestones in typical language- and play development

	12 to 15 months	18 months	24 to 36 months	3 to 4 years	4 to 7 years
Semantics	Average expressive vocabulary size at 15 months: 10 words Average receptive vocabulary size at 15 months: 50 words Comprehension strategies include attending to objects named, and doing what is usually done	Average expressive vocabulary size at 18 months: 100 words (± 105) Average receptive vocabulary size at 18 months: 300 words Comprehension strategies include acting on objects in the way mentioned, interpreting sentences as request for child action	Average expressive vocabulary size at 24 months: 300 words (± 75) Average receptive vocabulary size at 24 months: 900 words Comprehension strategies include interpreting sentences according to knowledge of probable events	Average expressive vocabulary size at 3 years: 900 words Comprehension strategies include supplying most probable missing information in answer to difficult questions	Average expressive vocabulary size at 6 years: 2,500 words Average receptive vocabulary size at 6 years: 8,000 words Comprehension strategies include overreliance on word order to process sentences that use unusual word order, such as passives
Syntax	First production are singleword holophrases; one word carries the force of a whole sentence	Average age of first word combinations: 18 months (normal range: 14 to 24 months) First word combinations express basic semantic relations with consistent word order	Average MLU at 24 months: 1.92 (± 0.05) Average MLU at 30 months: 2.54 (± 0.6) Average MLU at 36 months: 3.16 (± 0.7)	Average MLU at 4 years: 4.4 (± 0.9) Grammatical morphemes become more consistent Mature forms of negatives and questions develop	Average MLU at 5 years: 5.6 (± 1.2) Use of complex sentences increases from less than 10% to more than 20% of all utterances
Phonology	Most productions have CV or CVCV (consonant vowel/ consonant vowel combinations, e. g., "ba" or "mama") form Front stops and nasals are most frequent consonants	Back stops, fricatives, and glides are added to the consonant inventory CVC syllable shapes begin to be used 50% of consonants are produced correctly	9 to 10 different consonants are used in initial position; 5 to 6 in final; stops all places of articulation are used; liquids appear Two-syllable words and initial consonant clusters are used by a majority of children 70% of consonants are correct; speech is 50% intelligible	Most sounds are produced correctly Consonant blends are used Some phonological simplification processes may persist Speech is nearly 100% intelligible	Almost all sounds are produced correctly Phonological processes are no longer used; a few distortions on difficult sounds (<i>/s/, /l/, /r/</i>) may persist Phonological analysis skills are learned for reading and spelling
Pragmatics	Average rate of communications: 1 per minute Requests and comments are used; communication is accomplished by combining gestures with speechlike vocalizations	Average rate of communications: 2 per minute Request and comments are used; words predominate; gestural/vocal communication decreases	Average rate of communications: 5 per minute Request and comments are used; children begin to ask questions and convey new information; word combinations predominate	Talk about past and future events increases More options for politeness are acquired New communicative functions (projecting, narrating, imaging, etc.) are expressed	Language is used to predict, reason, negotiate
Play	Conventional, functional play	Symbolic play using self as actor	Pretend play involving others and using multiple schemes	Sequences of events are played out (preparing food, setting table, eating) Child engages in dialogues, talking for all children	Fantasy themes are played out Child or doll can take multiple roles Elaboration of planning and narrative story lines included in play

Source: Tager-Flusberg, Paul & Lord, 2005:338-339

Object use develops intertwined with these crucial linguistic skills. Objects are also the mediators of socialization and they support our integration into the culture and society. The child's basic activity involving object use is play, with various developmental periods. Play can be defined as the purposeful and joyful manipulation of objects in which exploration and practice seem to be major goals of the activity (Rogers, Cook, & Meryl, 2005). The most well-known theory dealing with both cognitive and play development belongs to Piaget (1962). He differentiated sensorimotor play as the opportunity for object manipulation and learning about action schemas from pretend play, which gives room for practicing and understanding the operation of the social environment (Rogers, Cook, & Meryl, 2005). This way pretend play looks like a mirror of the child's knowledge about culture and society. Next we turn to the empirical analysis of play, object use and communication, presenting our comparative study of child-mother dyads involving typically developing children and children with ASD.

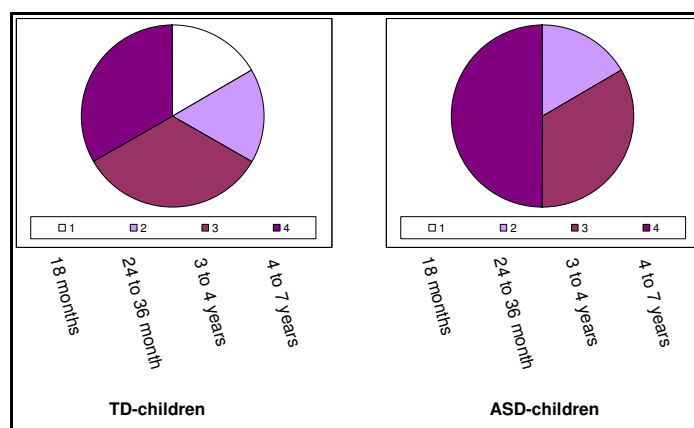
A comparative study of communication and object use in typical development and in ASD

We aimed to explore the characteristics of object use and communication in mother-child dyads in object use situations, in autistic and typical development. We compared the interactional patterns of the two groups by qualitative methods based on semi-structured observation. Our hypotheses were that: (1) ASD-affected children's creative object use is less developed than that of TD-children, (2) ASD-affected children show no or less pretend play compared to TD-children, (3) Understanding of more complex object use situations cause difficulty for ASD-affected children, (4) TD-children are more prone to imitate their partner's movements than ASD-affected children, and, finally, (5) ASD-affected children's mothers use more explicit methods to teach their son or daughter in object use situations than mothers of TD-children.

Participants

We compared six 2-7 year old TD children to six mentally age-matched ASD-affected children, in individual child-parent pair interactions. The basis of the matching were the ASD-children's data sheets, which were examined by the parents' permission. The chronological age of the participating children can be seen in Figure 2. We got in touch with available regional and provincial care centers, informed them about the aim of our research and requested help to contact families with ASD-affected children.

Figure 2. Child participants' chronological age



Materials

Videorecords were analysed by using Noldus Observer 8.0 software and then by SPSS 15.0 for Windows Evaluation Version. Coding was done by two independent observers, interobserver agreement was between 76-92%. Four types of object use were determined: (1) exploration, (2) creative object use, (3) adequate object use, and (4) imitation. Two further categories of characteristic behaviour were also explored: (4) removing the object from the partner's hand (5) and pointing/showing the object to the partner.

Verbal communication involving teaching gestures were listed into four categories: (1) explains, (2) instructs, (3) asks (4) and answers. In addition, verbal feedback was distinguished as: (1) encourages/praises, (2) disapproves, and (3) neutral feedback. Nonverbal feedback was classified

into three categories based on the expressed emotions: positive, negative, and neutral (see Table 4).

Table 4. The categories of our coding system

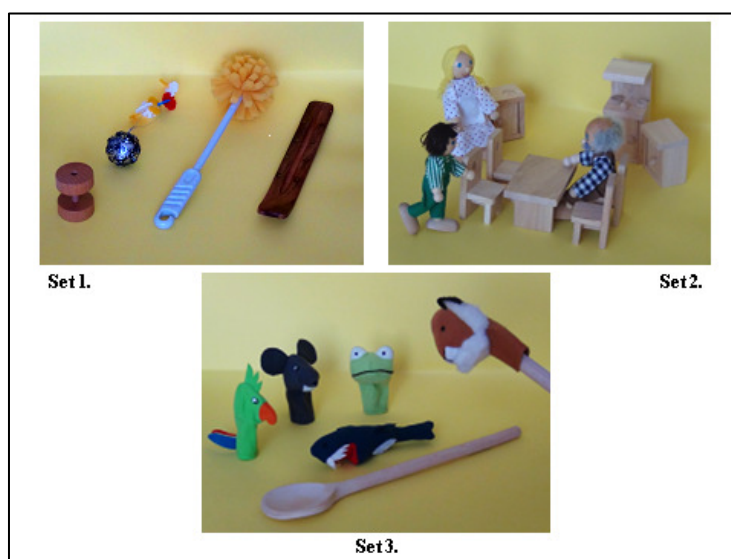
Object use				OBJECT USE	
Exploration	Adequate object use	Creative object use			IMITATION
		Pretend play	Other kind of creative object use		
Attention-orientation through the movements					COMMUNICATION
Remove the object from the partner's hand		Pointing/showing the object			
Verbal teaching				COMMUNICATION	
Explain	Instruct	Ask	Answer		
Verbal feedback (feedback through words)					
Encourage/praise the partner for sg/confirm	Disapprove of sg.	Neutral verbal feedback (e.g. „I do not know”)			
Vocalization (feedback without any words)					
Voice with positive emotion	Voice with negative emotion	Voice without +/- emotion			

Procedure and scoring

As a first step the first author of this research became acquainted with the consenting families and built confidential relationship with them, to establish an appropriate basis for the joint work. Once relationship has been established she visited the family and observed and video recorded semi-arranged object play situations involving the parent – child dyad in the naturalistic setting of the family home.

The child's manipulation with objects was compared in three semi-structured play situations involving three sets of objects. The parent and the child were seated at a table or on the floor across each other, and the parent offered their son/daughter various objects. Pre-selected objects came in three sets: (1) strange objects (these were objects that were not familiar or did not have any conventional purpose), (2) a pretend play-set (a small wooden dining room set with appropriately sized wooden dolls), and (3) well-known objects presented in a new context (Figure 3).

Figure 3. The objects of the three sets

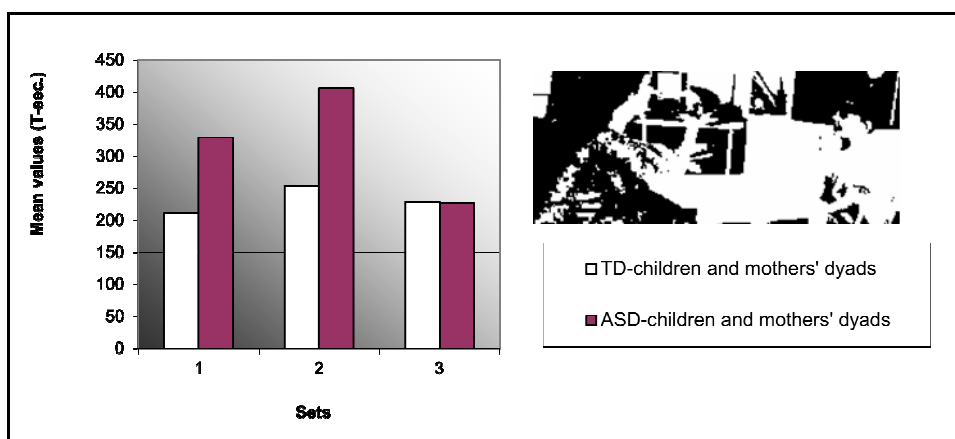


The first set contained five objects the use of which was not obvious (an unusual brush, a small plastic piece of a puzzle, a sphere, a wheel-like object, and an „oblong”). The mother handed over the objects to the child one by one and let him/her start engaging in any kind of activity with the object, thus obtaining experience about it. The second set consisted of wooden toys representing a complete small wooden dining room set and a nuclear family, calling for pretend play. In this play situation the child again was allowed to determine the course of the play, and the mother was asked to take part in the play accordingly. The third set contained two wooden spoons and five finger puppets. At the beginning of the episode the mother put a finger puppet on the handle of the wooden spoon and invited her child to play by handing over the other wooden spoon and another finger puppet. Dyadic interactions were recorded on video.

Results

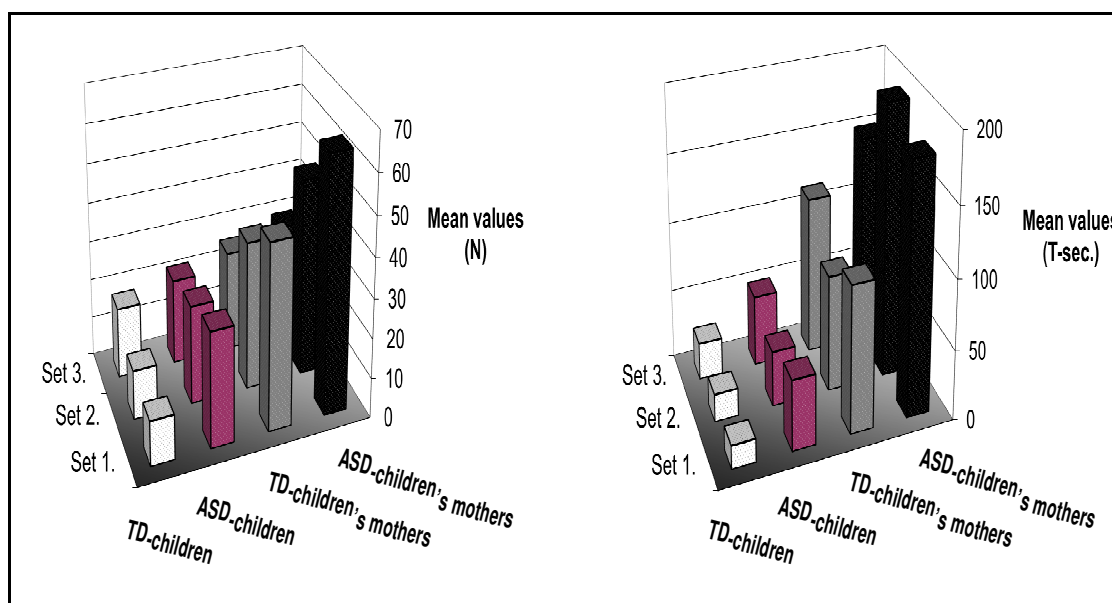
Length of play shows interest in the play set. Both TD and ASD child-mother dyads showed greatest interest in the pretend play set (second set), as shown by play duration. Interestingly, ASD pairs spent more time playing with objects both in the first and the second play set, while length of play with the spoon and finger puppets were of the same length in both groups (Figure 4).

Figure 4. Length of play in the three sets



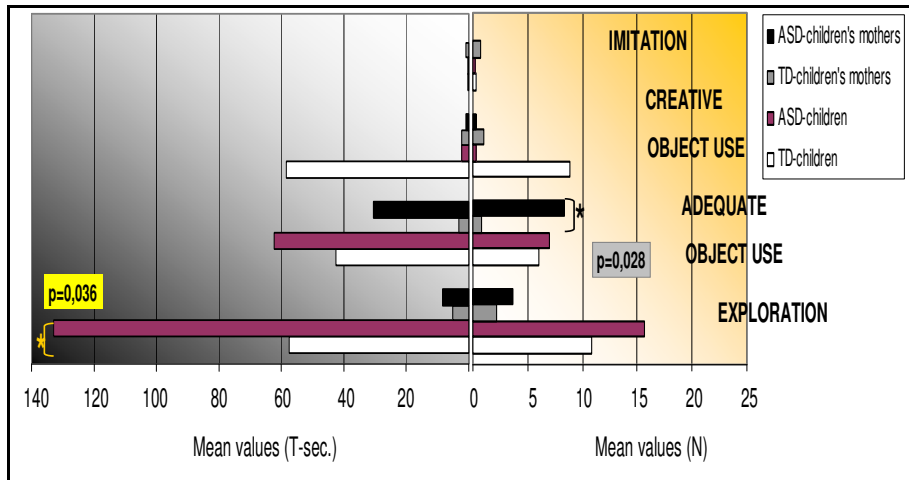
Frequency and length of looking at each other is a sign of social interest. Generally, we can say that ASD-children and their mothers more often, and for a longer time looked at each other in the sets, although difference between the two groups was statistically not significant (Figure 5).

Figure 5. The frequency (on the left) and the length (on the right) of the child's and mother's gaze at the partner in the three sets



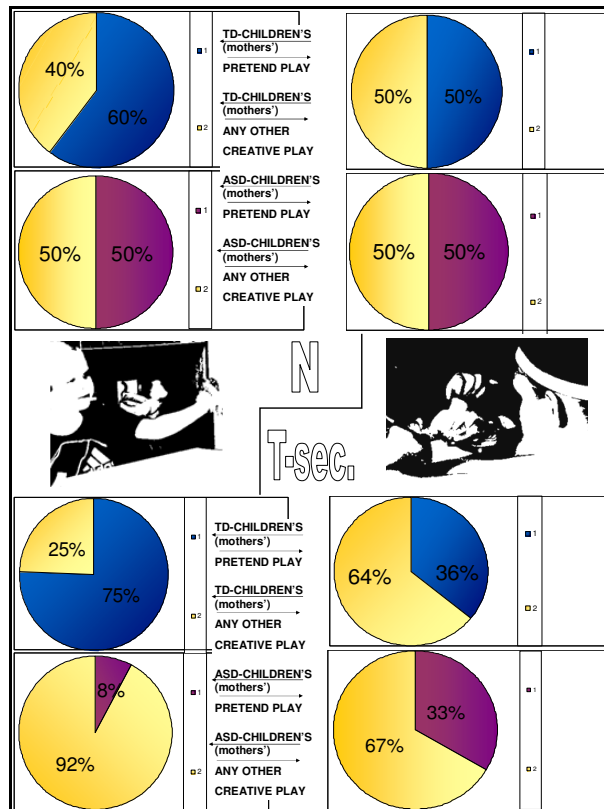
Set 1. Strange objects. In the first set, when unusual, strange objects were presented to the child by the mother time spent by exploration was significantly longer by ASD-children than by TD children, as shown by Independent Samples T test ($t(10)=-2,422, p=0,036$). However, ASD children often explored just one aspect of the given object. Thus, for example, one ASD-child was fascinated by the first-presented object (brush) and its use (rubbing) so much that he transferred this action (rubbing) to all of the later objects neglecting their own action possibilities (affordances). Mothers of autistic children demonstrated „proper” object use more frequently in this set than mothers of TD children and they spent significantly more time by demonstrating object use ($t(5,697)=-2,933, p=0,028$) (Figure 6).

Figure 6. Types of object use in the first set



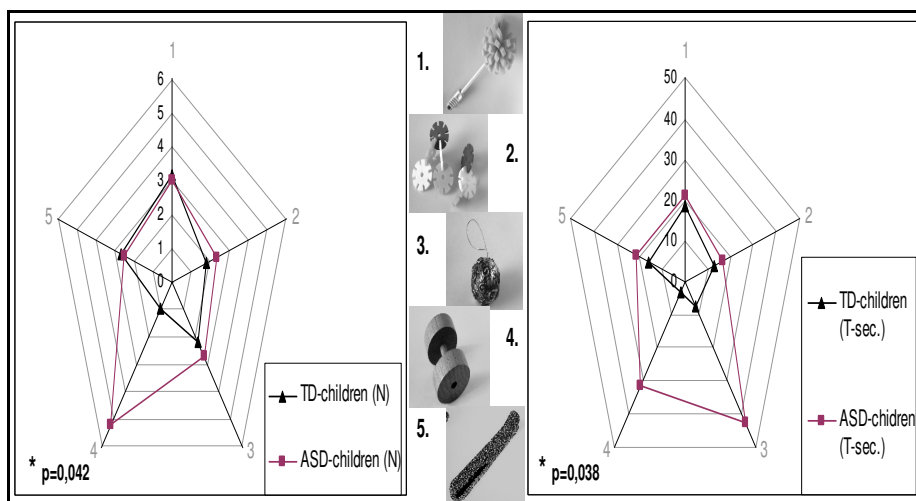
As of the creative use of strange objects, a higher rate of pretend play occurred in the group of TD-children. Mothers presented pretend play by strange objects at similar frequency in both groups, but ASD-children's mothers spent more time demonstrating other types of creative object use (Figure 7).

Figure 7. Types of creative object use in the first set



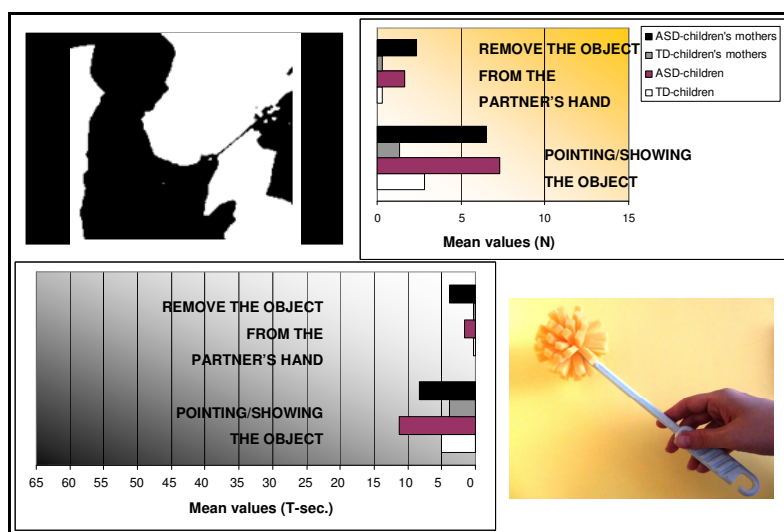
In the first set the wheel-like object, which could be rolled back and forth, was significantly preferred by ASD-children. They spent significantly longer time by manipulating (rolling back and forth) this object, as shown by the Independent Samples T test ($t(5,282)=-2,674, p=0,042$) (Figure 8).

Figure 8. Popularity of the strange objects in the first set



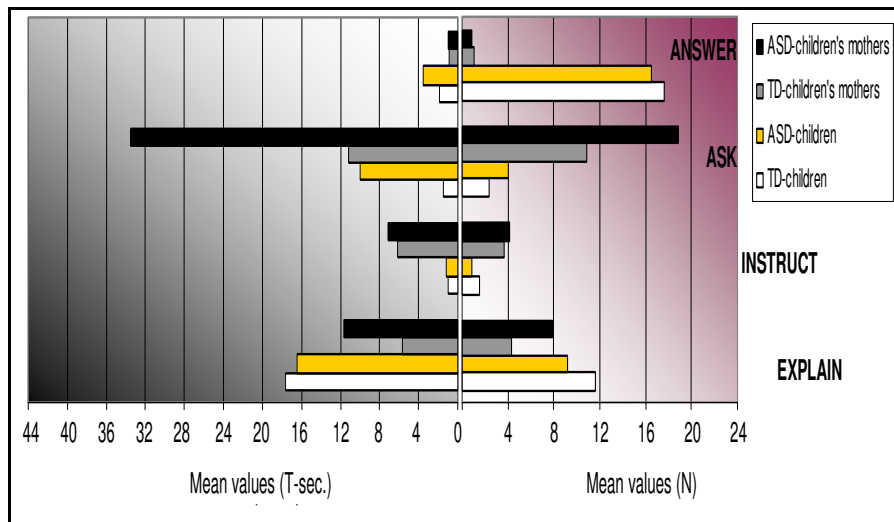
At the same time, ASD-children and their mothers' presented higher rates of attention-orienting gestures than children with typical development and their mothers (Figure 9).

Figure 9. Attention-orientation through gestures in the first set



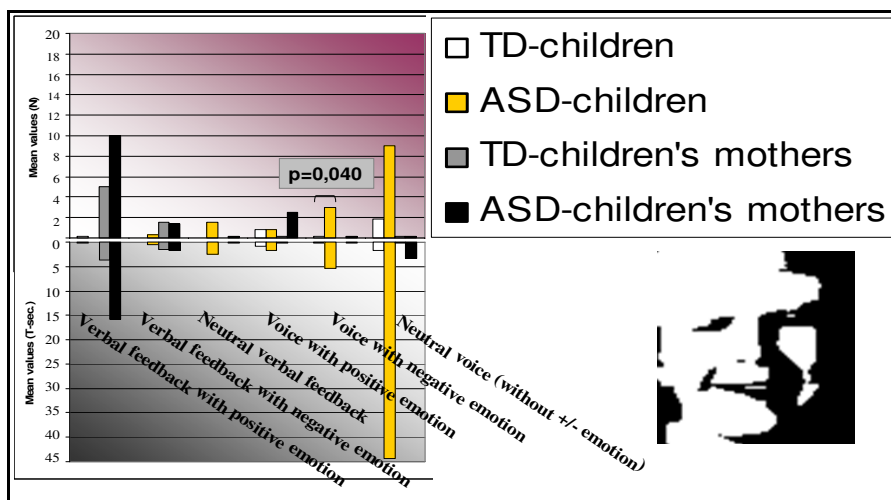
TD-children more often and for a longer time explained their actions to their mothers and these children also tended to express their desires to their parents in short instructions. ASD-children were more active in asking (simple) questions. The parents of ASD children used verbal teaching forms („explains”, „instructs” and „asks”) more often than parents of TD children.

Figure 10. Verbal teaching forms in the first set



Vocalization with negative emotion ($t(5,260)=-2,708$, $p=0,040$) and expression which could not be identified by the coders, as well as neutral feedback were found in higher rates in the ASD-group. At the same time, mothers of autistic children also shared positive emotions with their children stimulating the play and object use (Figure 11).

Figure 11. Verbal- and nonverbal feedback in the first set



Set 2. Pretend objects (small wooden dining room set with appropriately sized wooden dolls). In the second set adequate object use meant adequate pretend play with the pieces and figures of the small wooden dining room set (a kind of creative object use). Adequate pretend play occurred more frequently in the TD-group, while ASD-children showed exploration and creative object use which could not be identified as pretend play. Thus, autistic children were not receptive of the calling features of the miniature copies of real objects in this set. Rather, they built something by the available objects or manipulated them in an inadequate way, focusing on the physical properties and salient features of the given objects (e.g. stacking the rectangular cabinets on each others as if they were wooden building blocks). When a child did little pretend play, mothers in both groups were ready to engage in demonstration of the pretend use of the objects. ASD-children and

their mothers also seemed to be open for exploration in this set, too (Figure 12). Mothers of the ASD-children presented higher rates of pretend play than other types of creative object use compared to the parents of typically developing children (Figure 13).

Figure 12. Types of object use in the second set

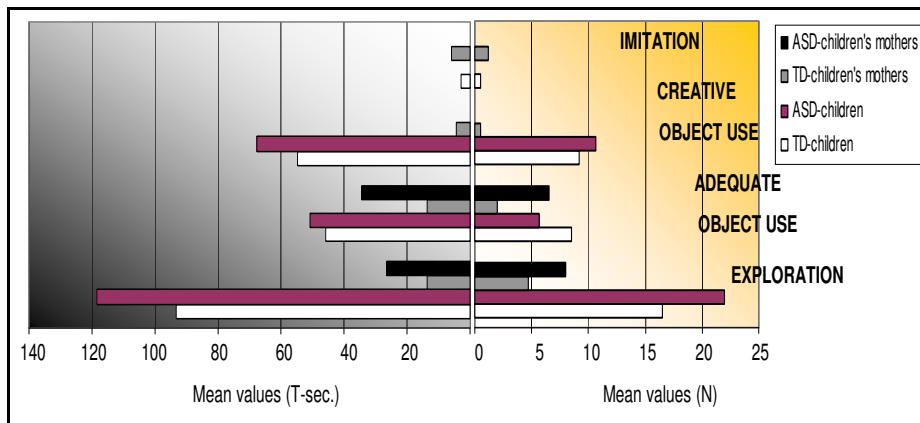
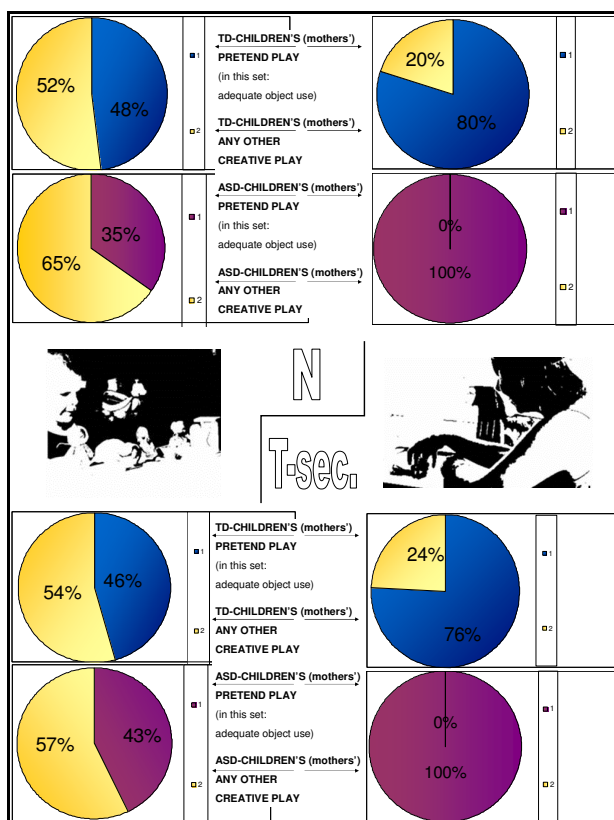
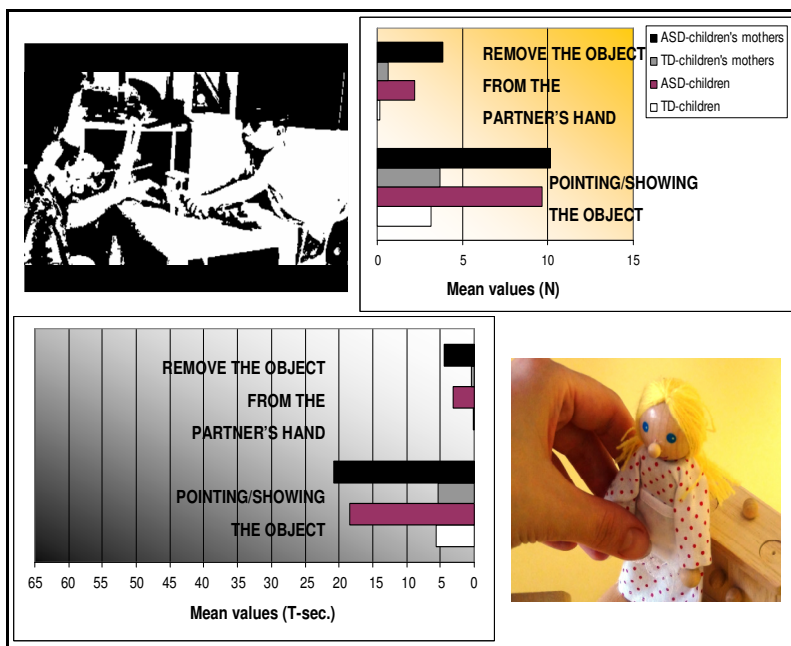


Figure 13. Types of creative object use in the second set



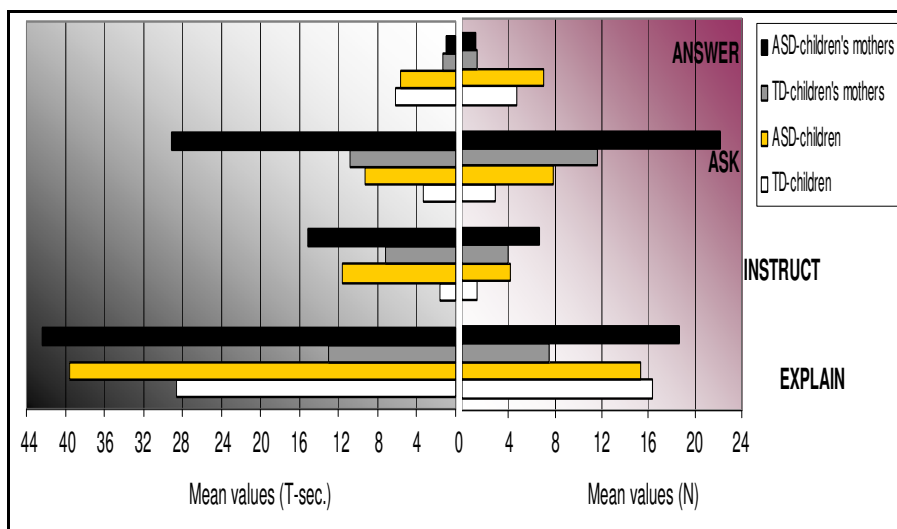
Explicit attention-orienting gestures (such as removing the available object from the partner's hand) were presented more frequently and for a longer time in the second set by ASD-children and their mothers, compared to the TD group (Figure 14).

Figure 14. Attention-orienting gestures in the second set



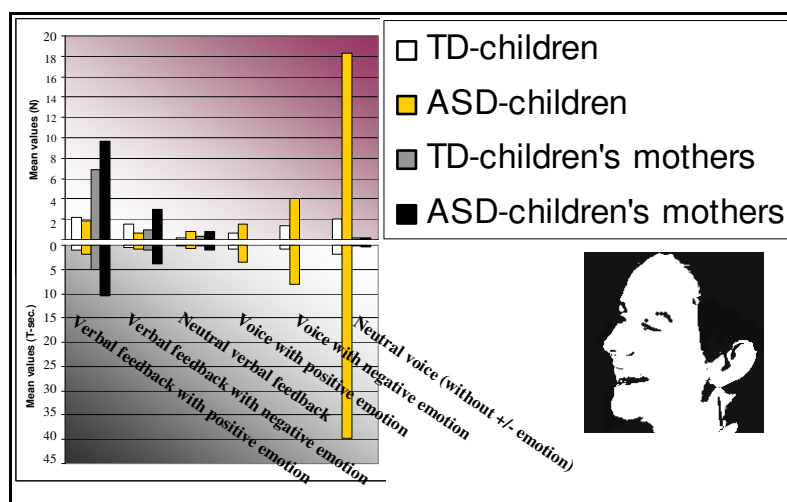
TD-children more often but briefly commented on their activities, while the other verbal communication forms were preferred by ASD-children. Mothers of typically developing children gave somewhat more answers during this set, while mothers of ASD-children's dominantly used other kinds of verbal teaching forms (Figure 15).

Figure 15. Verbal teaching forms in the second set



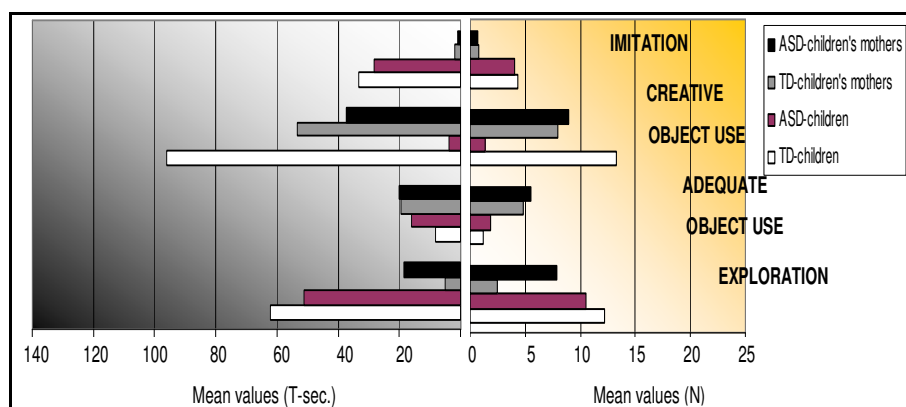
TD-children presented verbal feedback more frequently, but for a shorter period, as well as vocalization with well-expressed positive or negative emotions. ASD-children tended to share negative or less marked emotions vocally. Mothers of ASD-children were prone to use verbal feedback with positive and also with negative emotions (Figure 16).

Figure 16. Verbal- and nonverbal feedback in the second set



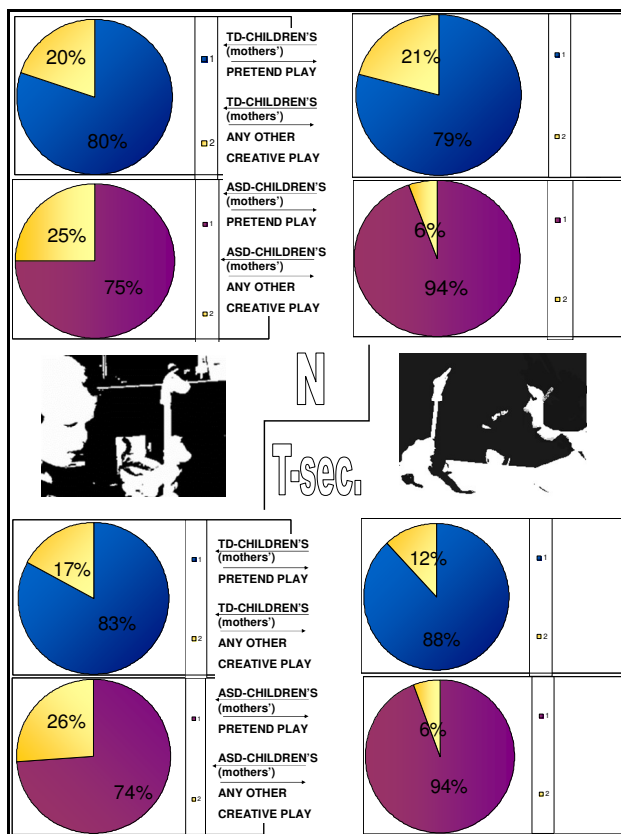
Set 3. Conventional objects in unusual context. In the third set children were presented a wooden spoon and a finger puppet after the mother showed how to put the puppet on the handle of the spoon and how to play with the figure this way. TD-children played with the objects willingly in the third set, which offered them individual and creative ways for object use. TD-children presented exploration and creative object use in the third set (e.g. told stories while playing with the puppets and imitated movements of their mothers). ASD-children, however, limited their actions at most to the conventional use of the objects and did not pay much attention to the unusual context (putting the puppet on the spoon handle). The parents of autistic children were more active both in exploration and in adequate object use, and they also tried to draw their children's attention to other possibilities with the objects by presenting brief creative play episodes.

Figure 17. Types of object use in the third set



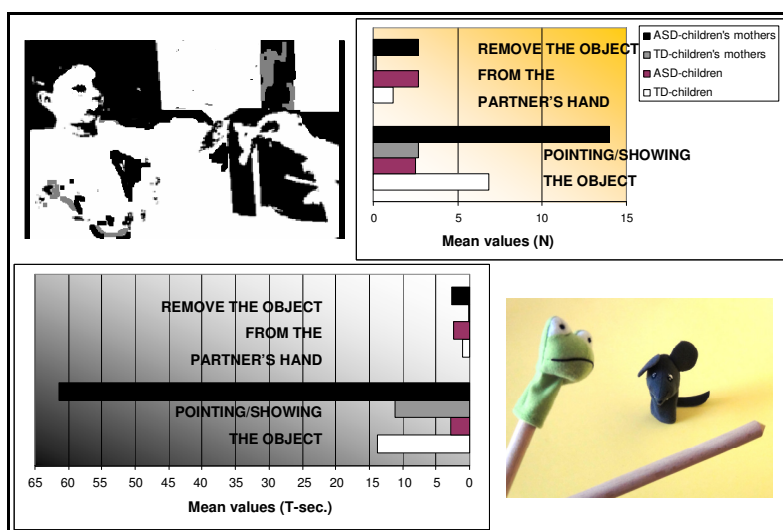
Again, there was a higher rate of pretence by TD-children in the third set. Furthermore, similar to the second set, mothers of the autistic children presented a higher rate of pretend play than parents of TD-children (Figure 13).

Figure 18. The deviation of the types of creative object use in the third set



TD children tended to show the objects at the focus of their attention to their mothers, while ASD-children more frequently removed the object from the mother's hand as a manoeuvre of attention-orientation. The parents of autistic children more often used nonverbal forms of attention-orientation in this set than mothers of TD-children (Figure 19).

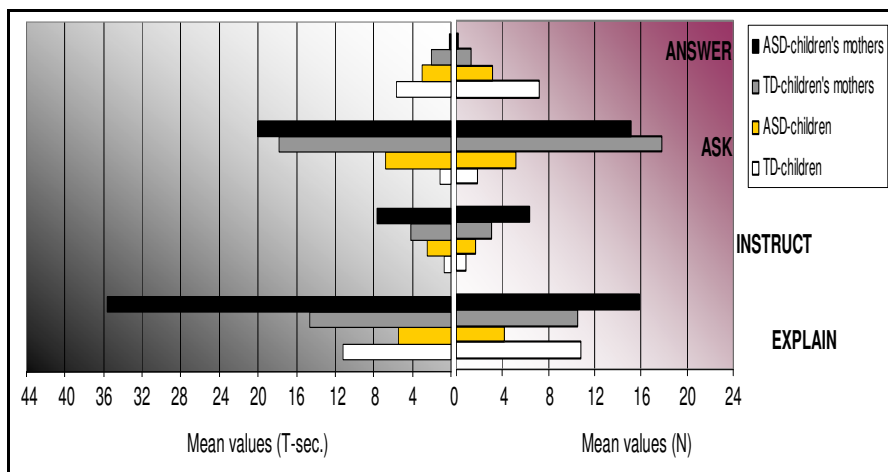
Figure 19. Attention-orientation through gestures in the third set



ASD-children more frequently and for a longer time instructed their mothers to do something and they also asked more questions. TD-children more often explained their actions,, sharing ideas, and answered their

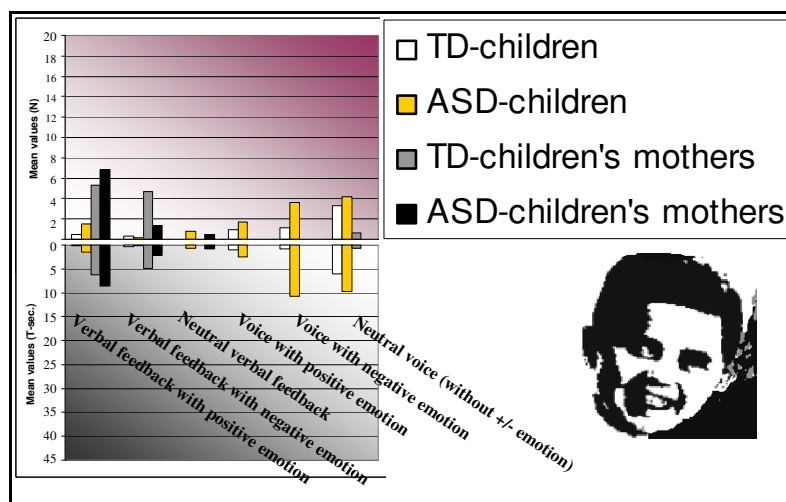
mothers' questions. Mothers of ASD-children more often and for a longer time explained their children what to do and instructed them how to do it. Questions and answers were more common by mothers of TD-children (Figure 20).

Figure 20. Verbal teaching forms in the third set



Verbal feedback with positive or unidentified emotions were more frequent in the group of ASD-children. In addition, all kinds of expressions through voice were also more frequent in this group. TD-children's parents were prone to disprove their children's behavior if they did not agree with it, while ASD-children's mothers tended to reassure and encourage their children in order to make them continue their play activity (Figure 21).

Figure 21. Verbal- and nonverbal feedback in the third set



Discussion

The aim of our study was to explore the interactional patterns of TD- and ASD child-parent pairs, focusing on the characteristics of object use and verbal communication. In line with our expectations and other studies (Frith, 1991; Jordan, 2007; Ungerer & Sigman 1981; Park 1983; Beyer & Gammeltoft, 2000) we found atypical object use in ASD, as well as different patterns of communication between the child in autism and his/her mother, compared to the control group. Whereas TD-children demonstrated more

versatile use of the unfamiliar objects in the first set, ASD-children were prone to grasp a single characteristic feature (affordance) of the objects and they tended to manipulate that property often in a monotonious manner. This supports the observation that autistic children pay attention to the physical nature of the material world (Bogdashina, 2003), and confirms the presence of stereotypical and repetitive action patterns described among others by Chawarska and Volkmar (2005), who suggest this pattern as one of the first observable signs of the disorder and the basis of the ASD-diagnosis.

Play in the pretend play set was especially revealing in this respect. Containing replica objects commonly used in a well-known socio-cultural setting (a small wooden dining room with appropriately sized wooden dolls), the pretend play set required the evocation and application of everyday contextual information, which is, according to Chawarska and Volkmar's (2005) study, difficult for children living with ASD. After the exploration of the available objects (wooden figures and pieces of dining room furniture) ASD children still limited their attention and interest to the physical nature of the play objects. Occasionally, when doing pretend play, ASD children used self as actor instead of using doll figures as actors. However, characteristically, they showed interest in the objects as physical things, not as contextually placed socio-cultural objects. Meanwhile, TD-children presented adequate pretend play along with adequate and extended language use matching their age level, as expected (Tager-Flusberg, Paul, & Lord, 2005).

Linked to these observations, we should recall two essential facts: (1) in autism there are usually sensory-perceptual deficiencies, as well as the lack of sensory integration, which make it difficult to form a meaningful representation of the environment (Bogdashina, 2003; Kékes Szabó & Szokolszky, 2012), and (2) play activity (particularly pretend play) reflects and enhances the social knowledge of the individual (Rogers, Cook, & Meryl, 2005). The unbalanced operation of perceptual modalities and their deficits limit obtainable information in quantity and in quality, as well. Perceptually limited and modified experiences form a special basis for building relations both to objects and persons. In pretend play, which was more frequent in all of the sets by TD child-mother dyads, the child had to mobilize knowledge about the world. In line with Decety and Meyer's (2008) theory about empathy, earlier experiences about the material world (top-down processes) and the actual experiences in the play situation (bottom-up processes) form the child's representations during pretend play side by side. Pretend play is the best opportunity for practicing and understanding the operation of the social environment (Rogers, Cook, & Meryl, 2005).

Whereas typically developing children are spontaneously geared toward taking advantage of pretend play, thereby increasing their proficiency in various fields of everyday life, children with autism are not able to use this kind of practice and coping strategies. Children with ASD prefer functional play, utilizing some physical properties of objects and enjoying their perceptual features. TD children make an effort to involve their mothers in the play and often play out multiple schemes, sequences of events or fantasy themes. In some cases the typically developing child presented narrative storylines with obvious planning in connection with the story, which is in line with observations by Tager-Flusberg, Paul and Lord's (2005). This elaboration of contextually relevant information is completely missing in the case of autistic children. Related to this is weakness of joint attention, which is crucial for understanding person-object relations (Bakeman & Adamson, 1984; Leekam & Moore, 2001). Weakness of theory of mind (ToM) abilities

are consequences of these more basic limitations that cause difficulties in adaptive functioning in complex social situations.

Certain behaviors can be exercised and fixed by explicit instructions (Ozonoff & Miller, 1995), more complex behavioral demands, however, present great challenge to persons living with autism (Chin & Bernard-Opitz, 2000). Our third play situation, in which children were prompted to combine a well-known conventional object (the spoon) in an unusual way with a finger puppet, required flexibility in object use. Children are familiar with the conventional use of spoons but in this situation they had to disregard this knowledge and use the spoon quite differently (as a holder for the puppet). In this play set-up children just had to follow the mother's lead to demonstrate the unconventional use of the object. Typically developing children were good at this task, the strange context facilitated them to act out varied, exciting and fabulous adventures with the puppets and the spoons. ASD children, however, absolutely could not cope with this situation and did not perform one-way or reciprocal imitation. Our results confirm that poorer performance and capabilities in imitation and pretend play in general stand as serious obstacles to the development of children with ASD.

It is also remarkable, that while parents in both groups were inclined to push object use forms that were less preferred by the child, however, demonstration was more pronounced in pairs of ASD-children, where the parents used more explicit verbal explanations and teaching-intentioned gestures. Valsiner (1987) has already recognized that a TD-child has the capability to discover the world and learn about his/her environment on a self-guided manner. But self-guidance seems to be a meager support for an ASD-child in socially relevant complex situations. In accordance with studies by Roeyer (1996), Chin and Bernard-Opitz (2000), and Kroeger, Schultz and Newsom (2007) we found definite manifestations of the spontaneous use of well-structured teaching gestures and verbal communication forms by mothers of ASD-children, much more so than in the control group. This is the sign of the mother's recognition of the need for a more intensive didactic interaction with the child to support his/her development, as also mentioned by Nind & Powell (2000).

This interpretation is confirmed by the fact that while mothers of ASD-children used positive emotions in their verbal comments and tried to stimulate the child to continue object play, mothers of TD-children typically let the child to take the lead in the process without much intervention. It was also evident in some cases that children with ASD have difficulties expressing their wishes. They sometimes used their mothers' hand to show something or expressed unclear negative emotions. These disturbances of emotional communication evidently make it difficult for the interacting partner to understand the autistic person's motives, movements and desires. Mothers can probably more easily make use of idiosyncretic or unclear communication but this severe limitation is much harder to overcome by outsiders and can be a source of frustration for the affected person. Difficulties of verbal expression explains why gestures and facial expressions are intensified in ASD, as also observed by Chawarska & Volkmar (2005). Difficulties of verbal expression may be the reason why more eye-contact could be observed by parents and children in ASD-affected pairs. Gaze patterns of ASD children in social interaction are an important research area to explore in the future (Kliemann, Dziobek, Hatri, Steimke, & Heekeren, 2010; Nakanao et al., 2010).

Results from research on autism increasingly highlight the fact that our material world has a fundamental significance in our life. Dealing with the socio-psychical environment is a major aspect of human functioning. Action

and perception are intertwined and influence each other reciprocally, and play is a primary field of practicing developing action – perception skills. The importance of play and actions have long been recognized by many great psychologists, Piaget (1962) among others. This work aimed to focus on ideas and observations that can explore core aspects of autism. It is our conviction that object use in play is an aspect of autism that needs further attention so we can have an even deeper understanding of this disorder and can develop more effective new diagnostic and therapeutical methods and tools.

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