Empathy and Empathy Induced Prosocial Behavior in 6- and 7-Year-Olds with Autism Spectrum Disorder

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Abstract The present study aimed to assess empathy and prosocial behavior in 6–7 year old children with autism spectrum disorders (ASDs). Results showed, first, lower levels of parent- and teacher-rated cognitive empathy, and similar levels of affective empathy in children with ASD compared to typically developing (TD) children. Second, emotion recognition for basic emotions, one aspect of cognitive empathy, in a story task was adequate in ASD children, but ASD children with severe impairments in social responsiveness had difficulties in recognizing fear. Third, prosocial behavior in response to signals of distress of a peer in a computer task was similar in ASD as in TD children. In conclusion, early elementary school children with ASD show specific impairments in cognitive empathy.

Keywords Autism spectrum disorder · Children · Cognitive empathy · Affective empathy · Empathy induced prosocial behavior

Introduction

Being able to share and understand emotions of others, referred to as empathy, is essential in managing successful reciprocal human relationships (Dziobek et al. 2008). A distinction is drawn between a cognitive and an affective component. Cognitive empathy refers to the capacity to take the perspective of others and the understanding of emotions. Affective empathy is defined as the observer’s experience of another’s emotional state (Baron-Cohen and Wheelwright 2004; Dadds et al. 2008; Dziobek et al. 2008). In general, empathy is thought to trigger a number of behaviors intended to benefit another like helping, sharing and comforting, together called prosocial behavior (Eisenberg et al. 2010). Deficits in both empathy and prosocial behavior have been considered in autism spectrum disorder (ASD) (Bons et al. 2013; Russell et al. 2012), a psychiatric disorder characterized by deficits in social skills and communication (American Psychiatric Association 1994—DSM-IV-Revised). However, results of studies are inconsistent and little is known about the age at which deficits in empathy and prosocial behavior might emerge. In order to develop adequate early interventions aimed at improving the social behavior of children with ASD, further understanding of empathy-related processes and prosocial behavior in young children with ASD seems relevant.

Although some studies in individuals with ASD have focused on empathy as a single construct (Auyeung et al. 2012; Johnson et al. 2009), most literature has demonstrated the importance of differentiating between a cognitive and an affective component of empathy. In recent years, growing consensus has been achieved regarding an imbalance between cognitive and affective empathy in ASD (Schwenck et al. 2012). First, impairments in cognitive empathy have consistently been found in studies using self- and other-report questionnaires in children and adolescents (Greimel et al. 2011; Pouw et al. 2013) and in adults with ASD (Dziobek et al. 2008; Rogers et al. 2007; Silani et al. 2008). On the other hand, the evaluation of affective empathy with questionnaires yielded mixed results. Most studies reported no differences between ASD and typically developing (TD)
peers in self-reports of affective empathic traits in children and adolescents (Pouw et al. 2013) and in adults with ASD (Dziobek et al. 2008; Rogers et al. 2007; Silani et al. 2008). Conversely, two studies did demonstrate impairments in affective empathy in adults (based on self-report) (Lombardo et al. 2007) and adolescents (based on parent report) (Greimel et al. 2011). To our knowledge, no studies examined affective empathic traits by means of parent report in younger children with ASD. In sum, studies of empathic traits in ASD using questionnaires consistently found deficits in cognitive empathy throughout development, whereas findings regarding impaired affective empathy in ASD thus far remain inconsistent, and the presence of deficits in affective empathy in young children with ASD remains unstudied.

Second, experimental paradigms have also been applied to evaluate cognitive and affective empathy in response to emotional stimuli in ASD. Numerous studies on cognitive empathy in adolescents and adults with ASD have shown impairments in emotion recognition as a component of cognitive empathy using a variety of pictures and short film clips of emotional facial expressions (see for a review, Bons et al. 2013). The only study on emotion recognition in young children, aged 5–7 years old, found difficulties in recognition of fear and anger (Rump et al. 2009). Furthermore, children with ASD aged about 12 years old showed deficits in understanding someone else’s emotions when they were asked to explain why a person felt as he did (Schwenck et al. 2012). However, findings are not always consistent and a recent review on impairments in emotion recognition in older children and adolescents with ASD suggested impairments mainly in complex emotions (Bons et al. 2013). On the other hand, studies of affective empathy that have applied emotionally loaded scenarios to induce an affect match found that ASD children (mean age ± 13 years) (Jones et al. 2010; Schwenck et al. 2012) and adults (Dziobek et al. 2008) reported to be as emotionally affected as their TD peers. In sum, studies using experimental paradigms to assess empathy seem to support impaired cognitive empathy, but not impaired affective empathy. Since research in young children with ASD on cognitive empathy is scarce and on affective empathy is lacking, it remains unclear how early in development cognitive empathy deficits emerge.

Although impairment in social interaction and behavior in ASD has been extensively reported as a main characteristic of ASD (see for a review, McConnell 2002), only a few studies have specifically focused on prosocial behavior in children with ASD, and results are inconsistent. First, by means of the prosocial subscale of the parent- and teacher-rated Strength and Difficulties Questionnaire (SDQ), three studies found reduced scores in children with ASD aged between 4 and 13 years old compared to TD children (Iizuka et al. 2010; Jones and Frederickson 2010; Russell et al. 2012). Second, in experimental settings children’s behavior was observed in response to situations where the experimenter either needed help (e.g., to put a heavy tray on the table while the table was covered with objects) (Liebal et al. 2008; Travis et al. 2001) or wanted to share something (e.g., food or photos) (Travis et al. 2001). Travis et al. (2001) found reduced helping and sharing behavior in children with high-functioning autism compared to a control group of older children and adolescents with developmental delay (mean age 13 years). Liebal et al. (2008) performed a similar experiment in a group of 2- to 5-year-olds where the experimenter could not reach a certain object (e.g., he dropped a pen), but found no significant differences between ASD and children with developmental delay. Similarly, the study of McDonald and Messinger (2012) was not able to find differences in prosocial behavior, defined as the child’s attempt to comfort or relieve parental distress, between toddlers at risk for ASD who eventually were diagnosed with ASD and the ones at risk who were not diagnosed (McDonald and Messinger 2012). In sum, despite indications based on parent report of reduced prosocial behavior in ASD, intact helping and comforting behavior in young children with ASD has been observed in experimental settings.

Several issues concerning empathy and empathy induced prosocial behavior in ASD require further clarification. First, most studies of empathic traits are based on self-reports (Dziobek et al. 2008; Lombardo et al. 2007; Pouw et al. 2013; Rogers et al. 2007; Silani et al. 2008). However, prior to about the age of eight, children are thought to lack the cognitive and/or verbal abilities to reliably report on their internal states (Dadds et al. 2008). Moreover, difficulties in perceiving inner psychological processes have been suggested in ASD (Lombardo et al. 2007), which might lead to inappropriate evaluation of one’s own empathic traits. Thus, in ASD reliability of self-reported empathic traits seems to be limited, as illustrated by findings of reduced parent report of empathic traits while adolescents themselves reported no empathy deficits (Greimel et al. 2011; Johnson et al. 2009). Furthermore, it has been suggested that teacher report is valuable in addition to parent report in studying children’s emotional and behavioral capacities, as teachers have greater opportunities to observe their pupils within the classroom or playground where social interaction abounds (Iizuka et al. 2010). It may be assumed that classroom situations are more likely to reveal empathy deficits than home situations, as social impairments of children with ASD are specifically pronounced in social interaction with peers (Frankel et al. 2011).

Second, in studying prosocial behavior, an important distinction can be drawn between prosocial behavior with knowable benefits to the actor versus prosocial behavior that offers the actor no knowable rewards. It is especially the
second category that seems to be related to empathy for the pain and distress of others (de Waal and Suchak 2010). However, most experimental paradigms thus far focused mainly on helping behavior in response to a situation without emotional distress (Liebal et al. 2008; Travis et al. 2001). Only in one study responses of ASD children towards actual distress of parents were examined (McDonald and Messinger 2012), and no studies have been conducted on prosocial behavior in response to peers. Furthermore, between the age of 4 and 12 years old a progression in the development of prosocial behavior in children with ASD has been suggested (Russell et al. 2012). While previous studies have examined either toddlers (McDonald and Messinger 2012), pre-schoolers (Liebal et al. 2008) or adolescents (Travis et al. 2001), research examining elementary school children is lacking.

Finally, children with ASD are a heterogeneous group, with differences in severity and symptom levels (Hu and Steinberg 2009). If deficits in empathy and empathy induced prosocial behavior play a role in problems in social responsiveness in various social situations, it is relevant to examine the association between empathy and empathy induced prosocial behavior on the one hand, and severity of problems in social responsiveness in ASD children on the other.

The present study aimed to address these issues. First, we studied early elementary school children, since social demands in peer interactions rapidly increase at this age. We aimed to examine differences in cognitive and affective empathy between children with ASD and TD children using parent and teacher reports of empathic traits, as well as an experimental story task paradigm. In keeping with previous studies in school-aged children and adolescents, we hypothesized that cognitive empathy levels would be lower in the ASD group compared to the control group, while affective empathy would remain unimpaired. Second, empathy induced prosocial behavior in ASD children was examined using a computer-based ballgame that provides direct observation of children’s prosocial behavioral responses to emotional stimuli from distressed peers in a social context. We hypothesized that no differences in prosocial behavior between groups would be found. As an additional goal, we hypothesized that the severity of social impairment would be associated with parent- and teacher-reported cognitive empathy levels.

Methods

Participants

A sample of 27 children ranging from 6 to 7 years old with a previous clinical diagnosis of ASD was recruited at the Outpatient Clinic of the Department of Child and Adolescent Psychiatry, University Medical Center Utrecht. A clinical diagnosis of ASD was given, according to DSM-IV, by a child and adolescent psychiatrist. Patients were excluded from the study if a clinical diagnosis of ASD was not confirmed with the Social Responsiveness Scale (SRS) (Constantino and Gruber 2005) using a cut-off score of 60 (n = 2) or if they had an estimated IQ below 70 (n = 3) based on the vocabulary and block design subsets of the Wechsler Intelligence Scale for Children III-Dutch version (Kort et al. 2005; Sattler 1992). The final patient group for the analysis included 22 children with ASD. The TD control group consisted of 29 six- and seven-year-old children matched for gender from regular elementary schools in the vicinity of Utrecht who did not have a history of clinical diagnosis of ASD, and who had a total SRS score within the normal range (total SRS < 60) and an estimated IQ within the normal range (IQ > 70).

The Medical Ethics Committee of the University Medical Centre Utrecht approved the study. Parents gave written informed consent prior to participation.

Procedure

Parents completed the Griffith Empathy Measure (GEM) (Dadds et al. 2008) as well as the SRS (Constantino and Gruber 2005) at home and teachers completed the teacher version of the GEM. All child data were collected in a quiet room at the child’s own school. To assure participants were at ease, they first had a small talk with the experimenter and completed the two WISC-III subtests. Next, subjects were presented the Interpersonal Response Task (IRT) (Dadds and Hawes 2004) and the story task. Between each task, a short break was allowed and children received a sticker as a reward upon completing each task as well as a small gift upon completing all tasks.

Measurements

SRS scores were completed by parents. Total SRS scores have been shown to reliably distinguish children with ASD from those with other psychiatric disorders (Constantino et al. 2003) and the SRS has been shown to be strongly associated with the social deficits criterion of the autism diagnostic interview (ADI)—Revised (Murray et al. 2011). The 65 items are rated on a four-point scale from “not true” to “almost always true” and completed by the parents, based on the child’s behavior over the past 6 months. The SRS yields a total score that serves as an index of severity of social deficits in the autism spectrum. Gender-based T-scores are available derived from the general population, for 4–18 years of age, in the Netherlands (Roeyers et al. 2012). T-scores of 60 through 75 are in the
Empathy was measured using the GEM (Dadds et al. 2008) Griffith Empathy Measure scores. Based on the total SRS T-scores, patients were stratified into subgroups with low-moderate or severe SRS range. Based on the total SRS T-scores, patients were otherwise specified (PDD-NOS) and higher functioning conditions, such as Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS) and higher functioning children with Asperger’s Disorder (Constantino and Gruber 2005, p. 15). T-scores of 76 or higher are in the “severe” range. Based on the total SRS T-scores, patients were stratified into subgroups with low-moderate or severe SRS scores.

Griffith Empathy Measure

Empathy was measured using the GEM (Dadds et al. 2008) which is a 23-item parent-reporting questionnaire, adapted from Bryant’s Index of Empathy for children and adolescents. In a previous study the GEM showed good reliability and validity across gender and age, and convergence with self-ratings of empathy and other aspects of child functioning (Dadds et al. 2008). The GEM assesses both cognitive empathy (e.g., “My child doesn’t understand why other people cry out of happiness”) and affective empathy (e.g., “My child becomes sad when other children are sad”, “My child gets upset when he/she sees an animal being hurt”) using a nine-point Likert scale (−4 = strongly disagree; +4 = strongly agree). A higher total score represents a higher level of empathy. In the present study the two subscores for cognitive empathy (6 items) and for affective empathy (9 items) were used for analysis. In addition, for the current study we adapted the scale to a teacher scale, omitting two CE-items that are not applicable to classroom or school situations. Internal consistencies in our total study sample for the parent reports were 0.73 for cognitive empathy and 0.82 for affective empathy, and for the teacher reports internal consistencies were 0.68 for cognitive empathy and 0.76 for affective empathy. No GEM scores of two patients and five TD controls were obtained from teachers.

Story Task

The story-narratives of the story task are based on the classic Feshbach Affective Situation Test for Empathy (Feshbach and Roe 1968). The task has been adapted to assess aspects of cognitive empathy (understanding and decoding of the events in the stories) as well as affective empathy (affect match between the participant and protagonist in the stories) (Albiero and Coco 2001). It consists of eight short stories in which the protagonist is involved in an event arousing angry, happy, sad or fearful emotions. Each emotion is represented by two stories. The version presented to boys involves scenarios with a boy protagonist; the version for girls involves a girl.

After each vignette, children were interviewed to assess whether they had been able to recognize and share the emotions depicted in the stories. Participants were asked how the protagonist felt (angry, happy, sad, fearful or neutral) and to what extent (a little, average, very much). They reported and indicated their responses on a card showing the emotional categories and intensity. Next, the child was asked how he or she felt after listening to the story, as a measure for AE. Again, the child could choose between the five different emotions and the three intensity levels.

Levels of affect match were evaluated on a four-point scale (0 = the child did not report an affect match; 1 = the child’s emotion was similar to his or her report of the character’s emotion; 2 = the child’s emotion was the same as the character’s emotion but different in intensity; 3 = both the child’s emotion and the intensity were the same as the character’s). This resulted in a continuous score for each emotion, computed by adding the scores on the two stories per emotion, ranging between 0 and 6 points.

Interpersonal Response Task

The IRT (Dadds and Hawes 2004) is a computer based task that assesses a prosocial behavioral response of subjects to emotional stimuli in a social context. Subjects play a ball-throwing computer game against two computer-controlled players. Subjects are assigned to choose towards which of two computer players they will play the ball. They are told that they will receive ‘money’ (reward) for throwing the ball to a particular player and that each player will show them their feelings through facial expression. The game consists of three rounds. In the first round (10 trials), both computer players keep a happy facial expression, regardless of whether the ball is passed to them or not. When subjects play the ball towards any of both players, they are displayed a coin rolling towards them on the computer screen with a simultaneous sound of coins rolling. In the second round (10 trials), one of the players has run out of money and doesn’t ‘give money’ (no rolling coins or sound). This player continues to show a happy face even when the ball is not thrown to him. In the third round (20 trials), each time the ball is not passed to the player that has run out of money, the player displays a progressively distressed facial expression. In the current study we used an adapted version of the IRT; the task could be performed twice, once with a girl and once with a boy showing distressed facial expressions.

As dependent variable for this study we used the number of times the participant threw the ball to the ‘sad’ player in the third round. This variable reflects behavior in response to the increasing distress of the computer player that does
not provide the child with a monetary reward. The variable yields a continuous score in which a higher score represents a higher sensitivity to sadness and distress and associated empathy induced prosocial behavior.

Analysis

Statistical analyses were performed using SPSS Statistics 20.0.0 (IBM Company, Chicago, Illinois). For the distribution of demographic variables between groups independent samples t-tests (age, estimated IQ and SRS) were performed. First, to analyze differences between ASD and TD in GEM scores two multivariate analyses of variance (MANOVA), separate for parent and teacher scores, were performed. Total cognitive and affective empathy scores were entered as dependent variables and GROUP was entered as a between-subjects variable with two levels (ASD and TD). In addition, the same analyses were performed to examine differences between TD and the severely affected ASD children (SRS score > 75). To examine the association between the severity of impairments in social responsiveness and empathy bivariate Pearson’s correlations were conducted between total SRS scores and parent- and teacher-rated cognitive and affective empathy within the ASD group. Second, to examine differences in emotion recognition on the story task between ASD and TD and additionally between severe ASD and TD, Fisher’s exact tests were performed. For differences in affect match non-parametric Mann–Whitney U tests were performed as distributions of mean scores across subjects failed to meet assumptions of normality. Spearman’s correlations were conducted within the ASD children to examine an association between scores on the story task and SRS scores. Finally, in the IRT, prosocial responses were examined for differences between ASD and TD and between severe ASD and TD with Mann–Whitney U tests, because results in both groups did not meet assumptions of normality. For the association between IRT scores and SRS scores Spearman’s correlations were conducted within the ASD group.

Results

Descriptive Characteristics

Descriptive characteristics of the children in both groups included in analysis are shown in Table 1. Analysis showed a significant difference in age, such that the TD controls were on average 4 months older. However, since all children in our study were 6 or 7 years old, no influence on our data analysis was expected from this difference. No differences in estimated IQ were found. As expected, significant differences were found in SRS scores between the ASD and TD groups. In the ASD group eleven children had low/moderate SRS scores (60–75) and eleven children had SRS scores in the severe range (>75).

Griffith Empathy Measure

Table 2 demonstrates the results of parent and teacher scores on the GEM. Both analyses for parent and teacher scores on the cognitive and affective subscales of the GEM revealed a significant effect of GROUP (parents: F(2,48) = 15.17, p = 0.000; teachers: F(2,41) = 9.19, p = 0.001). Children with ASD were rated as less empathic compared to TD children by both their parents and teachers on the cognitive (parents: F(1,49) = 30.48, p = 0.000; teachers: F(1,42) = 18.25, p = 0.000), but not on the affective subscale (parents: F(1,49) = 1.36, p = 0.249; teachers: F(1,42) = 3.77, p = 0.059). An additional analysis to compare the group of ASD children with the most severe SRS scores to the TD children showed a similar pattern with differences between groups for cognitive empathy (both parents and teachers: p = 0.000) but not for affective empathy (parents: p = 0.063; teachers: p = 0.125). Finally, a significant negative correlation between parent-rated cognitive empathy scores and total SRS scores (r = −0.641, p = 0.001) was found within the ASD group, but not between teacher-rated cognitive empathy and SRS scores (r = −0.287, p = 0.208) nor between affective empathy and SRS scores (parents: r = −0.113, p = 0.617; teachers: r = −0.099, p = 0.671).

Story Task

Results of the story task are shown in Table 3. For emotion recognition, no differences were found between ASD and TD children using a Fisher’s exact test (all p > 0.05). When only severely affected children in the ASD group were compared to TD, a significant difference was found for fear recognition.
but not for recognition of any of the other emotions (all \( p > 0.05 \)). For affect match, a Mann–Whitney U test revealed no differences in AE between the ASD group and the TD children of between the most severely affected ASD subgroup and TD children (all \( p \) values \( > 0.05 \)).

Finally, no significant correlations between cognitive and affective empathy scores on the story task and total SRS scores were found within the ASD group (all \( p \) values \( > 0.05 \)).

### Interpersonal Response Task

Results of the IRT are shown in Table 4. Mann–Whitney U tests revealed no significant differences between the ASD and TD group (\( p = 0.125; p = 0.688 \)). Likewise, no significant differences in IRT scores were found between the severely affected ASD subgroup and the TD children (\( p = 0.103; p = 0.952 \)). Finally, correlations between total SRS score and IRT score within the ASD group were not significant (Spearman’s \( \rho = -0.140, p = 0.53; r = 0.132, p = 0.56 \)).

### Discussion

Results of the present study in 6- and 7-year-old children with ASD showed, first, lower levels of parent- and teacher-rated cognitive empathy and similar levels of affective empathy compared to TD children. Second, impairment in

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### Table 2 Griffith Empathy Measure

<table>
<thead>
<tr>
<th></th>
<th>TD (n = 29)</th>
<th>ASD (n = 22)</th>
<th>( F^a )</th>
<th>( p ) value</th>
<th>Severe ASD (n = 11)</th>
<th>( F^b )</th>
<th>( p ) value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent scores</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CE mean (SD)</td>
<td>9.90 (6.3)</td>
<td>-0.91 (7.7)</td>
<td>30.48</td>
<td>0.000*</td>
<td>-6.18 (5.5)</td>
<td>55.55</td>
<td>0.000*</td>
</tr>
<tr>
<td>AE mean (SD)</td>
<td>1.31 (8.0)</td>
<td>-2.27 (13.8)</td>
<td>1.36</td>
<td>0.249</td>
<td>-6.00 (16.2)</td>
<td>3.68</td>
<td>0.063</td>
</tr>
<tr>
<td>Teacher scores</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CE mean (SD)</td>
<td>7.00 (4.2)</td>
<td>-0.75 (7.6)</td>
<td>18.25</td>
<td>0.000*</td>
<td>-3.30 (6.8)</td>
<td>29.08</td>
<td>0.000*</td>
</tr>
<tr>
<td>AE mean (SD)</td>
<td>2.00 (5.3)</td>
<td>-3.25 (11.9)</td>
<td>3.78</td>
<td>0.059</td>
<td>-3.00 (13.4)</td>
<td>2.49</td>
<td>0.125</td>
</tr>
</tbody>
</table>

**TD** typically developing controls, **ASD** autism spectrum disorder, **CE** cognitive empathy, **AE** affective empathy

* Significant difference  

a Comparison between TD and ASD  

b Comparison between TD and severe ASD

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### Table 3 Story task

<table>
<thead>
<tr>
<th></th>
<th>TD (n = 29)</th>
<th>ASD (n = 22)</th>
<th>( p ) value&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Severe ASD (n = 11)</th>
<th>( p ) value&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE: emotion recognition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Angry</td>
<td></td>
<td></td>
<td>0.844</td>
<td>0.800</td>
<td></td>
</tr>
<tr>
<td>Happy</td>
<td></td>
<td></td>
<td>0.341</td>
<td>0.061</td>
<td></td>
</tr>
<tr>
<td>Sad</td>
<td></td>
<td></td>
<td>0.383</td>
<td>0.479</td>
<td></td>
</tr>
<tr>
<td>Fear</td>
<td></td>
<td></td>
<td>0.066</td>
<td>0.021*</td>
<td></td>
</tr>
<tr>
<td>AE: affect match</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Angry</td>
<td></td>
<td></td>
<td>2.21 (2.5)</td>
<td>2.55 (2.6)</td>
<td>0.672</td>
</tr>
<tr>
<td>Happy</td>
<td></td>
<td></td>
<td>2.79 (2.0)</td>
<td>2.82 (2.4)</td>
<td>1.000</td>
</tr>
<tr>
<td>Sad</td>
<td></td>
<td></td>
<td>2.62 (2.3)</td>
<td>1.95 (2.4)</td>
<td>0.317</td>
</tr>
<tr>
<td>Fear</td>
<td></td>
<td></td>
<td>1.66 (2.1)</td>
<td>1.45 (2.1)</td>
<td>0.839</td>
</tr>
</tbody>
</table>

CE cognitive empathy scores: accurate emotion recognition in 0, 1 or 2 out of 2 presented story vignettes. AE affective empathy scores: mean (SD) scores based on the average of two stories for each emotion condition

* Significant difference  

a Comparison between TD and ASD  

b Comparison between TD and severe ASD

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### Table 4 Interpersonal Response Task

<table>
<thead>
<tr>
<th></th>
<th>TD</th>
<th>ASD</th>
<th>( p ) value&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Severe ASD</th>
<th>( p ) value&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>IRT (b)</td>
<td></td>
<td></td>
<td>5.45 (4.3)</td>
<td>3.36 (3.5)</td>
<td>0.125</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2.82 (3.2)</td>
<td>0.103</td>
<td></td>
</tr>
<tr>
<td>IRT (g)</td>
<td></td>
<td></td>
<td>5.69 (4.4)</td>
<td>5.91 (3.3)</td>
<td>0.688</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5.64 (3.6)</td>
<td>0.952</td>
<td></td>
</tr>
</tbody>
</table>

TD typically developing controls, ASD autism spectrum disorder, IRT (b) Interpersonal Response Task: playing against a boy, IRT (g) playing against a girl

a comparison between TD and ASD  

b comparison between TD and severe ASD

and the TD children of between the most severely affected ASD subgroup and TD children (all \( p \) values \( > 0.05 \)). Finally, no significant correlations between cognitive and affective empathy scores on the story task and total SRS scores were found within the ASD group (all \( p \) values \( > 0.05 \)).
social responsiveness according to parents was associated with reduced parent-rated, but not teacher-rated cognitive empathy in children with ASD. Third, emotion recognition for basic emotions, i.e., one aspect of cognitive empathy, in the story task was adequate in ASD children, but ASD children with severe impairments in social responsiveness had difficulties in recognizing fear compared to TD children. Finally, prosocial behavior in response to signals of distress of a peer in the computer task was similar in ASD as in TD children.

The latter finding is most interesting since studies thus far have not addressed empathy induced prosocial behavior in peer-relationships using experimental designs in children with ASD. The present results are in line with the study of McDonald and Messinger (2012) who found that, while toddlers at risk for ASD had overall reduced empathic responding, their prosocial behavior, defined as the child’s attempt to comfort parent’s distress (after he/she pretended to got something in his/her eye), did not differ. Two other studies that used experimental settings (Liebal et al. 2008; Travis et al. 2001) investigated behavior that was less triggered by empathy-related responding to distress cues, but instead simulated situations where the experimenter needed help from a practical concern. One found reduced helping behavior in adolescents (Travis et al. 2001), whereas the other found no significant differences in 2- to 5-year-olds (Liebal et al. 2008). Although comparing experimental behavioral paradigms to a computer based task is difficult, we would argue that the IRT endeavors to trigger prosocial behavior that is more explicitly motivated by the desire to reduce actual distress of the opponent, i.e., that it is empathy induced. Our results that children with ASD did not significantly differ in their attempts to comfort the progressively sad player suggest ASD children’s intact affective empathic abilities.

Our findings of reduced levels of parent- and teacher-reported cognitive empathy, but intact affective empathy in 6- and 7-year-olds are consistent with previous research that has applied empathy questionnaires in older children and adults with ASD by means of self-report (Dziobek et al. 2008; Pouw et al. 2013; Rogers et al. 2007). This study is the first to assess parent-reported empathy in a sample of young children with ASD. A previous study in adolescents with ASD by Greimel et al. (2011) applied the parent version of the GEM as well as the original self-report questionnaire it is based on [Bryant’s Empathy Index (Bryant 1982)]. This allowed a comparison between parents’ perception of the empathic traits of their autistic child to the child’s own perception (Greimel et al. 2011). Interestingly, it was found that cognitive empathy as well as affective empathy was impaired according to parent ratings while self-reports did not show any deficits. Besides raising the possibility of inaccuracy of self-reports of empathic traits in ASD, the authors proposed that impaired parent-reported affective empathy could be explained by the fact that individuals with ASD do actually feel an affective response, but are less able to display their emotions. As a result, others (in this case their parents) tend to underestimate ASD children’s affective empathic traits (Dziobek et al. 2008; Greimel et al. 2011). Obviously, in our sample of young ASD children parents did rate adequate affective empathic responding.

The inverse correlation that we found between parent-rated cognitive empathy and severity of impairments in social responsiveness suggests that besides the consistent finding of impaired cognitive empathy in ASD, severity of social impairments is associated with severity of impairments in cognitive empathic understanding. It should however be noted that cognitive empathy and SRS scores were both based on parent report. Thus, common method variance may have been a source of measurement error. Correlations between impaired empathy and severity of social impairments, however, are in line with experimental and neurobiological studies (Dapretto et al. 2006; McDonald and Messinger 2012). McDonald and Messinger (2012) found that in toddlers at risk for ASD, the overall quality of the child’s empathic responding (which included observed empathic concern as well as prosocial behavior and level of arousal) was predictive for ASD severity. In addition, in an fMRI study about mirror neuron dysfunction in children with ASD, similar inverse correlations were found between autism symptom severity and activity of specific parts of the mirror neuron system, which is proposed to be involved in emotion processing (Dapretto et al. 2006).

As far as affective empathic responding is concerned, no differences were observed between ASD and TD children in the extent to which children felt affected by the emotion of the child in the story. This is in line with previous studies that found children with ASD were equally affected in response to emotional stimuli as TD children (Dziobek et al. 2008; Jones et al. 2010; Schwenck et al. 2012). For cognitive empathy we found that, although empathic traits were perceived as less developed by their parents and teachers, children with ASD were equally capable in adequately recognizing the four basic emotions anger, fear, happiness and sadness, as compared to TD peers. In a recent review of Bons et al. (2013) impairments in emotion recognition were found in about 50% of the reviewed studies in juveniles with ASD, while in another review on emotion recognition of Harms et al. (2010) 70% of the studies reported impairments (Bons et al. 2013; Harms et al. 2010). Our findings of unimpaired recognition of basic emotions are in line with studies reviewed by Bons et al. (2013) that used simple basic emotional expression pictures (Piggot et al. 2004; Tracy et al. 2011), whereas...
studies that reported emotion recognition deficits mostly included stimuli that included blended emotions or low intensity of emotion and thus were more difficult to recognize (e.g., Bolte and Poustka 2003; Wallace et al. 2011). In the current study, we choose to examine basic emotion recognition, as we studied 6- to 7-year-olds. However, in adults (Golan et al. 2006) and adolescents (Golan et al. 2008) with ASD, recognition of complex emotions and mental states, e.g., annoyed, awkward, bitter, concerned, in film scenes has been shown to be impaired.

Interestingly, indications were found that a subgroup of ASD children with the most severe problems in social responsiveness showed deficits in recognizing fear, one aspect of cognitive empathy. In a study by Rump et al. (2009) recognition of the same basic emotional expressions were examined in a sample of 5- to 7-year-olds with ASD using dynamic, facial emotional stimuli that morphed from subtle to more explicit expressions (Rump et al. 2009). They found that children with ASD were able to accurately recognize most stimuli, but that specifically for fear and anger they needed significantly more time (i.e. more explicit facial expressions) compared to TD children. Likewise, studies that have carried out an emotion recognition paradigm in adults with ASD using morphing faces found that differences between ASD and TD controls were most obvious in the recognition of fear (Humphreys et al. 2007). An explanation that has been proposed for the particular difficulties in recognizing fear, involves the consistent finding that ASD individuals pay less attention to the eyes, while the most relevant parts of facial expressions of fearful emotions are situated around the eyes (Bons et al. 2013; Harms et al. 2010). Similarly, in a previous study conducted in the same sample of 6- to 7-year-old ASD and TD children, reduced facial mimicry specifically in response to fearful facial expressions was found in the most severely affected children with ASD (Deschamps et al. 2013).

Cognitive empathy and the understanding of emotions of others are closely related to a broader concept about inferring mental states in others, also described as the ability to take perspective of another person’s situation. This is also referred to as Theory of Mind, our ability to understand mental states such as intentions, goals and beliefs (Singer 2006), which has consistently been argued to be deficient in ASD (see for a review, (Gaigg 2012). Several studies in children and adolescents with ASD have interpreted impairments in first- and second-order false believe Theory of Mind tasks (“he thinks that she thinks”) as reduced cognitive empathy (Jones et al. 2010; Pouw et al. 2013).

A number of issues should be taken into account when interpreting our findings. First, participants were included based on their history of ASD diagnosis and parent-rated SRS scores within the clinical range (>60), while no ADI or autism diagnostic observation schedule (ADOS) was performed to confirm diagnosis. Second, the sample of participants used in this study was fairly small. Particularly in order to detect the influence of the severity of impairments in social responsiveness it would have been desirable to include more children with ASD and create larger groups with low/moderate and high SRS-scores. Third, as far as the affective empathy dimension of the story task is concerned, it should be noted that in ASD as well as in the TD group, more than half of the children did not report an affect match. Possibly, as the stories were fairly short and followed each other rapidly, little time was left to actually be able to empathize with the child in the story. Likewise, simply listening to a short story is less likely to trigger a corresponding emotion than for example viewing a film where emotions of the actor are more pronounced (Barnes et al. 2009). Fourth, the IRT that we used to examine empathy induced prosocial behavior has not been extensively validated and the outcome is likely to be related to other processes than empathy, like the tendency to depend on monetary versus social reward. We would argue that further development of an ecologically valid experimental paradigm that investigates empathy induced prosocial behavior, particularly in response to peers, is necessary. Finally, the results of the present study cannot be generalized to children with ASDs and intellectual disabilities. Further study is needed to examine the influence of general cognitive functioning on empathy and prosocial behavior in ASD.

In conclusion, the present study confirmed that cognitive empathy is impaired in early elementary school children with ASD as compared to TD children, according to both parent and teacher reports, while no impairments in affective empathy were reported. These cognitive impairments seem to be associated with severity of social responsiveness, which is supported by our finding of reduced emotion recognition for fear only in severely affected ASD children. Despite well-established social deficits in ASD individuals, we were unable to demonstrate differences in empathy induced prosocial behavior in young children with ASD.

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References


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