Emotion regulation in children with autism spectrum disorder : the link with social functioning and psychopathology

Pouw, L.

Chapter 4

Reactive/proactive aggression and affective/cognitive empathy in children with ASD

Published as: Reactive/proactive aggression and affective/cognitive empathy in children with ASD
Lucinda B. C. Pouw, Carolien Rieffe, Paul Oosterveld, Bibi Huskens, & Lex Stockmann
Research in Developmental Disabilities, 2013

Abstract

The main aim of this study was to examine the extent to which affective and cognitive empathy were associated with reactive and proactive aggression, and whether these associations differed between children with an Autism Spectrum Disorder (ASD) and typically developing (TD) children. The study included 133 children (67 ASD, 66 TD, *M*age = 139 months), who filled out self-report questionnaires. The main findings showed that the association between reactive aggression and affective empathy was negative in TD children, but positive in children with ASD. The outcomes support the idea that a combination of poor emotion regulation and impaired understanding of others' emotions is associated with aggressive behavior in children with ASD.

Introduction

Aggressive behaviors have been frequently observed in children with Autism Spectrum Disorder (ASD) (Bronsard, Botbol, & Tordjman, 2010; Farmer & Aman, 2011; Kanne & Mazurek, 2011), which are also related to more frequent mental health referrals (Mash & Barkley, 2003). Clinicians sometimes argue that aggressive behaviors in children with ASD should not be interpreted the same way as in typically developing (TD) children (Matson & Nebel-Schwalm, 2007a). In fact, despite the high prevalence of aggressive behaviors in young and/or intellectual disabled children with ASD, little research has been done to examine aggressive behavior in high-functioning young adolescents with ASD. In TD children, a lack of empathy is associated with higher levels of aggression (e.g.,Jolliffe & Farrington, 2006). Although children with ASD are known for their atypical empathic development (Jones, et al., 2010), it has never been studied in relation to their aggressive behavior. Therefore, in this study, the main aim was to examine the relationship between empathy (affective and cognitive) and aggression in children and young adolescents with ASD, as compared to their TD peers.

Aggression in children with ASD

Research is suggesting that aggression is a common problem in children with ASD (Farmer & Aman, 2011; Kanne & Mazurek, 2011). For example, young and older children with ASD exhibit various externalizing behaviors such as damaging others' belongings, tantrums, and self-injurious behaviors (Horner et al., 2002). Kanne and Mazurek (2010) investigated 1380 children with ASD from 4 to 17 years old and found that 68% displayed aggressive behavior towards a caregiver and 49% towards non-caregivers. However, these studies examining aggressive behavior in children with ASD mainly include intellectual disabled children with ASD. Despite this high prevalence of aggressive behaviors in this population of children with ASD, to date, little research is done on aggressive behavior in high functioning young adolescents with ASD. Furthermore, not much is known about possible causes or motives of these behaviors.

Aggressive behavior can be divided into reactive and proactive aggression. Reactive aggression is seen as defensive behavior in reaction to real or perceived external provocation without thought to personal gain (Crick & Dodge, 1996). It is a response to poor emotion regulation, feelings of anger, and hostile (mis)attributions or misunderstandings (Marsee & Frick, 2007). Proactive aggression refers to instrumental aggression, which children engage in to reach a certain goal (e.g., material or territorial gain or social control), without being provoked (Crick & Dodge, 1996). It has been argued that proactive aggression is not necessarily anger-driven (e.g., Crick & Dodge, 1996). However, Hubbard and colleagues (2002) showed that children who display higher levels of proactive aggression also report higher levels of anger. Yet, these children appear to be particularly skilled in controlling their anger expressions.

Since children with ASD are known for their poor emotion regulation especially in social situations (Laurent & Rubin, 2004), one would expect higher rates of reactive aggression in this group. Farmer and Aman (2011) analyzed parent reports on different subtypes of aggression in children and adolescents with ASD (from 3 to 20 years old) and indeed found higher instances of behaviors linked to reactive aggression, such as hot-headedness, impulsive reactions, and difficulties with cooling off (Farmer & Aman, 2011). Children and adolescents with ASD are also reported to use more physical aggression, such as pinching, biting, and throwing objects towards others, compared to children without ASD (Farmer & Aman, 2011). These behaviors

are especially seen in stress-evoking situations further emphasizing the intent of reactive aggression (Bronsard, et al., 2010). Note, however, that a higher intelligence is related to less reactive aggression (Brereton, Tonge, & Einfeld, 2006; Nas, De Castro, & Koops, 2005), and that the presently cited studies examined low functioning individuals with ASD.

There is not much known about whether children with ASD display more proactive aggression than TD children. However, there are some studies examining bullying behavior in children with ASD, which could be seen as a form of proactive aggression, because bullies initiate aggressive behavior in order to dominate others (Camodeca, Goossens, Meerum Terwogt, & Schuengel, 2002). Furthermore, bullies show and report high rates of proactive aggression (Salmivalli & Nieminen, 2002). A study of Farmer and Aman (2009) investigated different subtypes of aggressive behavior in children with ASD and other intellectual/developmental disabilities and found that parents of children with ASD score their children higher on bullying, compared to children without ASD. Yet, other studies based on parents or self-report showed no differences in the frequency of bully behaviours between children with ASD and TD children (Montes & Halterman, 2007; Rieffe, et al., 2012; Twyman et al., 2010). Conclusively, there are no clear study results supporting children with ASD would display more proactive aggression compared to TD children.

Empathy in children with ASD

Empathy refers to the ability to accurately perceive and understand another person's emotions and to react to these emotions appropriately (Rieffe, et al., 2010). It is an important feature of human interpersonal behavior, necessary to interact effectively in the social world. Furthermore, empathy is a complex construct that exists of lower order (affective empathy) and higher order processes (cognitive empathy) (Leiberg & Anders, 2006).

Affective empathy, or contagion (Hoffman, 1987), is linked to mirror neurons in the parietal-frontal region of the brain. These mirror neurons are activated whilst observing another's goal directed action (Cattaneo & Rizzolatti, 2009), also creating arousal in the observer. Although earlier studies suggested mirror neuron abnormalities in children with ASD (Dapretto, et al., 2006), recent studies indicate that the mirror neuron system in children with ASD is intact (Fan, et al., 2010; Press, et al., 2010). Children with ASD are as emotionally aroused (based on skin conductance activity) when witnessing another's distress as TD children (Blair, 1999), and did not score lower than TD children on a self-report questionnaire measuring affective empathy (Jones, et al., 2010). Furthermore, children with ASD have been found to score equally to TD children on affective empathy tasks (Dziobek, et al., 2008).

Additionally, for an adaptive empathic response, the focus of concern should be other-oriented rather than self-oriented (Eisenberg, et al., 1996a). In other words, observers should recognize that their own arousal is a consequence of the other's emotion and not their own. When observers are unable to locate the source of the arousal and misinterpret its cause, this will cause personal distress in the observers. In TD children, personal distress can be observed in very young children, but it decreases naturally with age when children's skills for emotion regulation develop (Rieffe, et al., 2010). Furthermore, a certain level of cognitive empathy is required to decrease personal distress. Cognitive empathy refers to the ability to adopt another's point of view, and represent the other's thoughts, intentions, beliefs, and knowledge, which facilitates the observer to interpret and understand others' emotions. The ability to infer mental states, also known as Theory of Mind (ToM) (Blair, 2005), is the capacity to understand or predict others' behaviors based on the subjective desires and/or

beliefs of that person (Gordon, 1992). A ToM is typically established around the age of four. Children with ASD are known for their impairments in this domain (Baron-Cohen, et al., 1985; Dziobek, et al., 2008; Jones, et al., 2010; Rogers, et al., 2007), and in fact, seem well aware of this impairment and also score lower than TD children on self-report items that measure understanding others' emotions (Dziobek, et al., 2008; Jones, et al., 2010).

Empathy is supposed to cause prosocial behaviors, such as helping, sharing, comforting, in attempt to alleviate the other person's distress. Especially these kinds of behaviors seem overly absent or limited in children with ASD (Sigman, Kasari, Kwon, & Yirmiya, 1992). It is argued that the lack of prosocial behaviors is mainly caused by impaired cognitive empathy and poor emotion regulation. In other words, children with ASD are unable to regulate their own empathic arousal (contagion) because they fail to understand why the other person is upset. It appears that emotions of others are confusing and unpredictable for children with ASD, which causes distress and prevents them from behaving empathically (Blair, 1999; Jones et al., 2010; Smith, 2009).

Aggression and empathy

In TD children, reactive aggression is associated with lower levels of affective empathy (contagion). Children who become distressed by witnessing the negative state of another person, usually stop harming the other in order to reduce their own (empathic) distress (Mayberry & Espelage, 2007). Reactive aggression is also linked to lower levels of cognitive empathy. Rieffe and Meerum Terwogt (2006) argue that children who are more able to take another's perspective, react less aggressively. In contrast, personal distress could be expected to be positively related to reactive aggression, because personal distress is indicative for poor emotion regulation (Eisenberg, 2000). Whereas it is clear in TD children that reactive aggression is inhibited by both affective and cognitive empathy (Mayberry & Espelage, 2007; Rieffe & Meerum Terwogt, 2006), no studies have yet examined this linkage of reactive aggression and empathy in children with ASD.

Proactive aggression is associated with lower levels of affective empathy in TD adolescents (Lovett & Sheffield, 2007). Yet, the relation between proactive aggression and cognitive empathy is less clear. It has been argued that proactive aggression in the form of bullying is associated with higher levels of cognitive empathy compared to reactive aggression (Sutton, Smith, & Swettenham, 1999). However, others could not support this claim and found a negative association between bullying and cognitive empathy instead (Gini, Albiero, Benelli, & Altoe, 2007; Mayberry & Espelage, 2007; Rieffe & Camodeca). To our knowledge, no studies examined how proactive aggression is related to affective and cognitive empathy in children with ASD.

This study and its aims

This study was a first attempt to examine the link between empathy and aggression in children with ASD. We focused on the relationship of reactive and proactive aggression with affective and cognitive empathy. We chose to examine this relationship in middle childhood because from the age of nine, children's cognitive and emotional functioning develops fast and they are increasingly able to reflect upon their own emotions and behaviors (Harris, 1989). Self-reports were used to measure aggression and empathy. Additionally, children's ToM capacity was also indexed through an age-appropriate false belief task (Theunissen, et al., 2011). We added the level of self-reported daily anger as an index for emotion regulation.

First, differences between children with ASD and TD children in the level of self-reported reactive and proactive aggression and parent-report of externalizing behavior (CD and ODD) were examined. Differences in the level of empathy (contagion, personal distress, and understanding), ToM capacity, and emotion regulation (daily anger) were also examined. Based on previous studies, we expected to find higher rates of reactive but not proactive aggression in children with ASD compared to TD children (Farmer & Aman, 2011). We did not expect differences in rates of affective empathy between the two groups. However, we expected higher rates of personal distress and daily anger, and lower rates of cognitive empathy and their ToM ability in children with ASD compared to TD children, based on previous discussed literature (Baron-Cohen & Wheelwright, 2004; de Vignemont & Singer, 2006; Jones, et al., 2010; Laurent & Rubin, 2004).

Second, the relations of reactive aggression and proactive aggression with the different aspects of empathy and daily anger were examined, using group (ASD/TD) as a moderator. We expected negative associations of reactive aggression with affective and cognitive empathy and a positive association of reactive aggression with personal distress and daily anger. However, we expected a moderating effect of group on the relation between affective empathy and reactive aggression, in a way that the negative relation between affective empathy and reactive aggression is evident in TD children, but not in children with ASD. Previous studies indicate that the empathic arousal created by affective empathy, is not well regulated in children with ASD because of impaired cognitive empathy and emotion regulation (Blair, 1999; Smith, 2009). Therefore, it was expected that affective empathy does not have that inhibiting role in aggressive behavior, as it does in TD children.

Although literature is contradictory regarding proactive aggression (Crick & Dodge, 1996; Hubbard, et al., 2002; Mayberry & Espelage, 2007; Rieffe & Camodeca; Sutton, et al., 1999), we expected a negative association with affective and cognitive empathy, and a positive association with daily anger. We were unable to formulate expectations concerning moderating effects of group on the link between proactive aggression and empathy.

Method

Participants and Procedure

The ASD sample included 67 high functioning children (8 girls, 59 boys) diagnosed with ASD (*M*age = 139 months, *SD* = 15.1, age range: 109 - 176 months) based on the Autism Diagnostic Interview-Revised (Lord, et al., 1994) by child psychiatrists. The ASD participants met the inclusion criteria (i) IQ scores above 80, (ii) diagnosed with ASD of the *DSM-IV* (Association, 1995). Participants were recruited from 1. Centre for Autism, Leiden, the Netherlands; 2. Dr. Leo Kannerhuis, Doorwerth, the Netherlands; 3. C.P. Van Leersumschool, Zeist, the Netherlands. The children were diagnosed with

ASD by psychiatrists of these institutions. These child psychiatrists are specialized in treating and diagnosing children with ASD. A letter was sent to all parents of children with an ASD diagnosis between 9 and 15 years of age. A total of 73 parents of ASD children (63 boys) gave their informed consent to participate in the study. Only children who completed all self-report questionnaires were included in this study.
The TD group included 66 typically developing children (9 girls, 57 boys; *M*age = 138 months, *SD* = 15.5, age range: 109 – 176 months), and was drawn from primary and secondary schools in the Netherlands. The parents of the children gave their informed consent to participate in the study. Inclusion criteria for the TD group were (i) IQ above 80, (ii) no diagnosed developmental disorders. Again, only children who completed all self-report questionnaires were included in this study. The TD group was matched with the clinical group on sex and mean age. From four ASD children and seven TD children IQ scores could not be obtained. From 13 children with ASD and 17 TD children, parents did not answer questions concerning socioeconomic status and a total socioeconomic status could not be calculated. Of the remaining sample there were no differences found for IQ and SES scores. Children with ASD scored lower on language skills then TD children $t(119) = -2.23$, $p = .028$. However, language scores did not interfere with the outcomes of the regression analysis and were therefore left out in the final analyses. Demographic statistics of the participants are shown in Table 1.

The children were visited at home or their institutions. They were asked to answer questions in a notebook and were ensured that their answers would stay anonymous. Children were also informed before testing that they could ask questions if they did not understand a test question, and that they could withdraw from the test session at any moment without explanation. Test sessions were taped on video. Parents were asked to fill in questionnaires. The Ethics Committee of the Centre for Autism granted permission for the study.

Table 1.
Demographic Profile of Participants

	ASD	TD
No. of children	67	66
Age, months, mean (SD)	139 (15.1)	139 (15.5)
Gender, no.		
Boy	59	57
Girl	8	9
Socioeconomic status, mean (SD)	12.6 (2.58)	13.1 (3.02)
	(N = 54)	(N = 49)
Socioeconomic score, range	5.7 – 18.3	5.33 – 19.0
Nonverbal IQ		
IQ normscore Picture Arrangement, mean (SD)	11.1 (4.01)	10.9 (3.33)
	(N = 64)	(N = 59)
IQ normscore Block Design, mean (SD)	11.2 (3.57)	10.9 (3.04)
	(N = 63)	(N = 59)

Materials

Self Report

Children rated their own aggressive behavior with the *Self Report Instrument for Reactive and Proactive Aggression* (IRPA) (Rieffe et al., in revision). Children were presented with six types of aggressive behavior (kicking, pushing, hitting, name calling, arguing, and saying bad things or lying about someone else). Children were asked to report how often they performed this behavior in the last four weeks on a 3-point scale from 1 (*(almost) never*) to 3 (*often*) for three reasons related to reactive aggression (I was mad; I was bullied; I was name-called) and three reasons related to proactive aggression (I wanted to be mean; I took pleasure in it; I wanted to be the boss). The questionnaire consists of 18 proactive and 18 reactive items.

In the validation study by Rieffe and colleagues (in revision) a Principal Component Analysis (PCA) on the questionnaire in a larger TD group (*N* = 587) showed good results. Furthermore, to help ensure ASD and TD children in this sample were also able to differentiate between reactive and proactive aggression, a PCA with Oblimin restriction on the 36 items with the factor count limited to the assumed two factors was used (Table 2). All items load >.30 on their keyed factor when both groups were included. PCA in the ASD group showed that all but three items failed to load sufficiently on the intended scale Proactive Aggression, which is still good given the relatively small sample size for a PCA. In the TD group, two items failed to load sufficiently on Reactive Aggression and two items for Proactive Aggression loaded higher on Reactive Aggression. Additionally, both scales showed good internal consistencies in the ASD and TD group (Table 2), so no items were removed from the

scales. The correlations between the two aggression scales were high (Table 3), but not to the extent that there was reason to suspect co-linearity.

The *Empathy Questionnaire* (Overgaauw et al., in prep.) with a total of 21 items filled in by the children, was designed with a 3-point scale (1 = *not true*, 2 = *somewhat true*, and 3 = *true*). In this study we used the three scales to measure: (a) Contagion (e.g., "When a friend cries, I have to cry too"), (b) Personal Distress (e.g., "I am afraid when someone is in a fight"), and (c) Understanding (e.g., "When a classmate is angry, I usually know why"). The Contagion scale refers to affective empathy. The Understanding scale refers to cognitive empathy.

The Anger scale of the *Mood Questionnaire (MQ)* (Rieffe, Terwogt, & Bosch, 2004) was used to assess children's self-reported feelings of anger, which is indicative for their emotion regulation. The children were asked to indicate how they had been feeling over the last four weeks ("I felt furious"). As a total the questionnaire consists of 20 items on a Likert-type scale (1 = *(almost) never*, 2 = *sometimes*, 3 = *often*). For the current study only the scale Anger Mood (four items) was used for analyses.

First, the participants were pre-selected on an IQ above 80 with help from the centers for autism. We only selected high-functioning children with an IQ above 80 and the TD children were on regular schools by which an IQ above 80 can be assumed. Second, in order to examine whether the children with ASD differed in IQ scores from TD children, we used two nonverbal subtests of the *Wechsler Intelligence Scale* (WISC) (Kort, et al., 2005; Wechsler, 1991): Block Design (copying small geometric designs with four or nine plastic cubes) and Picture Arrangement (sequencing cartoon pictures to make sensible stories). From the two subtests two norm-scores can be derived. The mean of the norm-scores on the two subtests was used.

In order to asses language skills two tasks of the Clinical Evaluation of Language Fundamentals – Fourth Edition (CELF-4) (Semel, Wiig, & Secord, 2003) were used; the Sentence Comprehension Task and the Narrative Comprehension Task. In the Sentence Comprehension Task children were presented with sentences and four multiple choice answers and were instructed to select the answers that matched with the sentence. In the Narrative Comprehension Task children were told short stories after which questions were asked. Of these two subtests two norm-scores can be derived. The mean of the two norm-scores was used in order to examine differences in language skills between the two groups.

Table 2.
PCA loadings for ASD/TD group, ASD group, and TD group on the Questionnaire for Reactive and Proactive Aggression

Item number	Reactive Aggression	Proactive Aggression	Reactive Aggression	Proactive Aggression	Reactive Aggression	Proactive Aggression
	ASD/ TD		ASD		TD	
Ag1a	.54		.56		.56	
Ag1b	.64		.78		.47	
Ag1f	.78		.81		.79	
Ag2a	.71		.74		.66	
Ag2b	.73		.70		.73	
Ag2f	.74		.75		.68	
Ag3a	.62		.60		.67	
Ag3b	.66		.75		.42	
Ag3f	.69		.77		.59	
Ag4a	.56		.58		.48	
Ag4b	.73		.74		.66	
Ag4f	.65		.71		.61	
Ag5a	.57		.61		.51	
Ag5b	.72		.81		.52	
Ag5f	.69		.76		.59	
Ag6a	.37		.51			
Ag6b	.31		.54			
Ag6f	.56		.74		.49	
Ag1c		.59	.37	.50		.72
Ag1d		.71		.81		.62
Ag1e		.90		.95		.88
Ag2c		.77		.86		.76
Ag2d		.62		.41		.68
Ag2e		.78		.68		.79
Ag3c		.64	.49	.43		.84
Ag3d		.74		.53		.77
Ag3e		.83		.82		.79
Ag4c	.36	.55	.62	.31		.77

Ag4d		.77		.67		.83
Ag4e		.84		.87		.83
Ag5c		.70		.51		.82
Ag5d		.65	.31			.84
Ag5e		.68		.30		.82
Ag6c		.67	.44	.44		.74
Ag6d		.51	.55			.72
Ag6e	.31	.31	.35		.45	.32

Theory of Mind Task

Two false belief tasks (Theunissen, et al., 2011) were used based on the principles of the Sally-Ann Task (Baron-Cohen, et al., 1985). In the Sally-Ann task, Sally has a basket and Anne has a box. Sally puts a marble into her basket. When Sally goes out for a walk, Anne puts Sally's marble in the box. The participant is asked where Sally will look for her marble when she returns to the scene. To correctly answer the question, participants need to take Sally's false belief into account and predict that Sally will look into her basket (Baron-Cohen, et al., 1985). The Theory of Mind tasks used in this study are based on the same principles of taking a false belief into account but more age-appropriate for the participants in this study. Children were first told they would be answering a few questions before watching two short video clips of Mr. Bean. In these short clips, Mr. Bean also created false beliefs in another story character. In an attempt to eliminate a possible confound of verbal ability, the video clips were free from sound or spoken word. After having watched a video clip, two questions were asked; one about the story character's false belief and a control question. Both questions had to be answered correctly in order to obtain one point for that particular task. In total, a score of two points could be obtained.

Parent Report

To examine parent-report on externalizing behaviors, the Child Symptom Inventory (CSI) (Gadow & Sprafkin, 1994) was used. The CSI is a behavior-rating scale designed to assess childhood disorders based on DSM-IV criteria. Eight items assessed the symptoms of Oppositional Defiant Disorder (ODD) (e.g., "Does things to deliberately annoy others", "Is angry and resentful") and 14 items assessed symptoms of Conduct Disorder (CD) (e.g., "Has deliberately start fires"; "Has run away from home overnight"). Parents were asked to rate each symptom on a 4-point scale (1 = never and 4 = very often). Table 2 shows how many parents filled in the questionnaire and psychometric properties of all the questionnaires.

Socioeconomic Status Score (SES) was computed by adding up scores of different questions concerning income, education, and occupation. The first question entailed what the net household income per year was (1 = *Less than 15.000 Euro*, 2 = *15.000 – 30.000*, 3 = *30.000 – 45.000*, 4 = *45.000 – 60.000*, 5 = *More than 60.000*, or 6 = *Do not know/want to say*). The second question involved the highest level of education both parents/caregivers had completed (1 = *No / primary education*, 2 = *Lower general secondary education*, 3 = *Higher general secondary education*, 4 = *Higher vocational education / University*, or 5 = *Do not know/want to say*). The final question was what the job of both parents/caregivers was (1 = *No job*, 2 = *Part-time job*, 3 = *Full-time job*, or 4 = *Do not know/want to say*). When one of the questions was not answered or the answer was unknown, no score could be computed and these data were omitted from the results. All questionnaires show moderate to good internal consistencies in both groups (see Table 3), except for the CD scale of the CSI, due to low occurrence.

Table 3.
Psychometric Properties and Group means of the Questionnaires for Aggression, Empathy, Anger Mood, Psychopathy, ODD and CD

	n items	Cronbach's α		*M* and *SD*	
		ASD	TD	ASD	TD
		Child Report			
Reactive Aggression	18	.94	.88	1.36 (.42)	1.38 (.32)
Proactive Aggression	18	.91	.96	1.12 (.24)	1.13 (.32)
Contagion	4	.77	.70	1.58 (.50)	1.60 (.47)
Personal Distress	6	.64	.68	1.64 (.42)	1.76 (.45)
Understanding	5	.67	.65	2.19 (.45)	2.48 (.41)**
Anger Mood	4	.90	.80	1.58 (.60)	1.52 (.47)
		ToM Task			
Theory of Mind *(Range 1-2)*	4			1.59 (.61)	1.78 (.45)*
		Parent Report			
Psychopathy	20	.73 (N=59)	.74 (N=50)	1.71 (.27)	1.34 (.19)**
CD (*Range 1-4)*	14	.58 (N=60)	.57 (N=51)	1.13 (.15)	1.03 (.07)**
ODD (*Range 1-4)*	8	.83 (N=60)	.80 (N=51)	2.21 (.53)	1.64 (.37)**

Note. All questionnaires have a range from 1 - 3, except for the ToM Task and parent reports.
*$p < .05$ **$p < .001$

Statistical analyses

First, in order to make a comparison of the prevalence of externalizing behaviors (self-report: Reactive and Proactive Aggression; and parent-report: CD, and ODD), levels of empathy, ToM, and anger (Anger Mood) between the ASD and TD group, *t*-tests were carried out. The strength of the relations between the variables was established by means of Pearson correlations and regression analyses. Reactive and Proactive Aggression were the dependent variables, and aspects of empathy, the ToM task and Anger Mood, stood as independent variables. Group differences in the strength of the

relationships between the dependent and independent variables were tested with a multi-group approach to regression analysis (Rieffe, et al., 2011) using Structural Equation Modeling (SEM). In such an approach, first a model is tested with equality restrictions on the regression parameters over the groups, i.e., the null hypothesis states that the matrices of regression parameters contain identical values. Model fit can be evaluated by means of a chi-square test and several fit indices such as the Root Means Square Error of Approximation (RMSEA, which should not exceed the .80 level). If the test statistics reach significance, the null hypothesis of equal regression parameters is rejected. Second, univariate tests of specific parameters (the so-called modification indices) can be used to identify the specific differences. If the two sets of regressions parameter indeed differ, group membership had a moderating effect on the relation between the variables. The programs *SPSS* version 19.0 and *Lisrel 8.80* were used. In Figure 1 a schematic overview is given of the study variables and the examined relations.

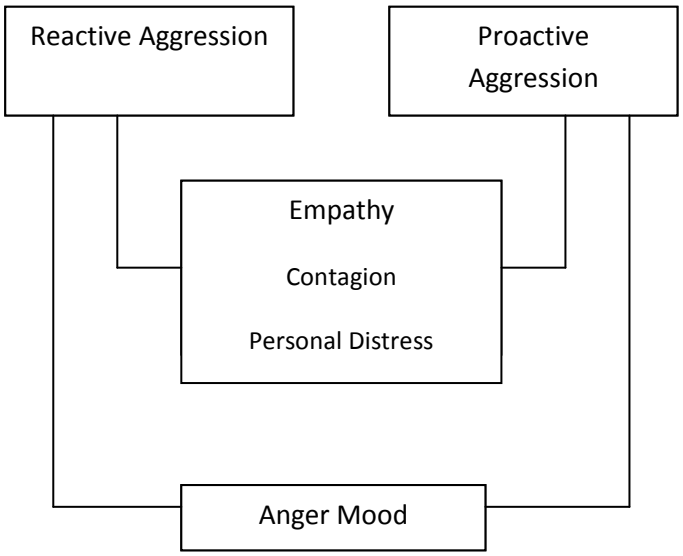

Figure 1. Schematic overview of study variables

Results

Differences between groups in externalizing behaviors, Empathy, ToM, and Anger

The mean scores in Table 3 show higher scores on parent reports ODD, $t(109) = 6.433$, $p \leq .001$ and CD, $t(109) = 4.192$, $p \leq .001$ in the ASD group compared to the TD group. The groups did not differ on the self-report measures for Reactive and Proactive Aggression, Anger Mood, or the empathy scales Contagion, and Personal Distress. Yet, children with ASD reported lower scores than their TD peers on the empathy scales of Understanding $t(131) = -3.866$, $p \leq .001$ and on the ToM task $t(131) = -1.993$, $p \leq .05$.

Relations between Reactive and Proactive Aggression with Empathy, ToM, and Anger

Table 4 shows the correlations between the Reactive and Proactive Aggression scales, Contagion, Personal Distress, Understanding, Theory of Mind, and Anger Mood. In both groups, all three scales of the Empathy Questionnaire were interrelated. In TD children, Contagion was negatively correlated with Reactive Aggression. In contrast, all empathy scales were positively correlated with both forms of aggression in children with ASD, except for Understanding with Proactive Aggression. Using Fisher transformation the correlation between Contagion and Reactive and Proactive Aggression differed significantly between the two groups ($p \leq .05$). Furthermore, the correlation coefficients between Reactive Aggression and Personal Distress and Understanding were significantly different between the two groups. Theory of Mind was negatively correlated with Reactive and Proactive aggression in children with ASD, and negatively correlated with only Proactive Aggression in the TD group. However, the correlation coefficients did not significantly differ between the two groups. Anger Mood correlated positively with both forms of aggression in both groups. In both groups reactive and proactive aggression were interrelated (ASD: $r = .64$, $p = \leq .000$; TD: $r = .42$, $p = \leq .000$). Correlations between age, IQ, and Reactive/Proactive aggression were also computed. Only age correlated with Proactive Aggression in the TD group ($r = -.27$, $p = \leq .05$).

Table 4.
Correlations and regression coefficients for Empathy scales, ToM and Anger scale on Reactive and Proactive Aggression

	Contagion	Personal Distress	Understanding	ToM	Anger Mood
			Correlations ASD		
Reactive Aggression	*.50****	*.38***	*.27**	-.27*	.54***
Proactive Aggression	*.36***	.31*	-.02	-.30*	.50***
			Correlations TD		
Reactive Aggression	*-.32***	*.05*	*-.11*	-.08	.35**
Proactive Aggression	*-.09*	.05	-.18	-.39**	.40**
			Standardized regression coefficients (multi-group analysis, n=133)		
Reactive Aggression	*-.23**	.25*	*.17**	*-.17**	.51*
Proactive Aggression	-.04	.16	-.07	-.34*	.45*

*p < .05; ** p < .01 ***p<.001
Note. Using Fisher transformation, the correlations coefficients in italics denote significant group differences. The regression coefficients in grey/italics denote significant group differences.

Table 4 also shows the regression coefficients for the Empathy scales, the ToM task and Anger scale in both groups. The R^2 values are moderately high for Reactive and Proactive Aggression (.30 and .35 respectively). It can be seen that all three Empathy scales contribute to explaining variance in Reactive Aggression, but not in Proactive Aggression. Additionally, ToM contributes negatively and Anger Mood contributes positively to explaining variance in both dependent variables.

The equality of this regression model of the Empathy scales, ToM task and Anger scale on Reactive and Proactive Aggression was tested with a multi-group analysis with equality constraints on all parameters. The chi-square reached significance (χ^2 = 49.27, df = 28, p < .007), and also other fit measures show violations of equality (RMSEA = .094; GFI = .91) suggesting a misfit. This indicates that there are significant differences in the parameters between the two groups, but only for Reactive Aggression. The modification indices imply that removing the equality restriction in

the regression of Reactive Aggression on Contagion, Understanding and ToM will result in the largest decreases in chi-square value. The correlation coefficients in Table 4 indicate a negative contribution in the TD sample and a positive contribution in the ASD sample for Contagion to the prediction of Reactive Aggression. Additionally, the negative correlation with Understanding and the positive correlation with ToM seem only significant in the ASD group. However, when the equality restriction was removed for Contagion, this resulted in a good model fit (χ^2 = 27.37, *df* = 27, *p* < .44; RMSEA = .00; GFI = .95), whilst additional removal of the restrictions for Understanding and ToM did not significantly improve the model fit.

Discussion

Should we interpret aggressive behaviors in children with ASD the same as in their TD peers? The main aim of this study was to examine the extent to which affective and cognitive empathy are associated with reactive and proactive aggression, and whether these associations are moderated by group.

Before interpreting the outcomes of this study, it should be noted that the self-report questionnaires used in this study showed moderate to good internal consistencies in both groups, supporting previous studies in which self-report was also applied with good results in children with ASD (Hill, et al., 2004; Rieffe, et al., 2011). Additionally, the good factor structure of the PCA, given the relatively small sample size for this kind of analysis, confirmed that both groups of children had distinguished different motives for their aggressive acts while filling out this self-report.

First, when group means were compared, children with ASD did not report more aggressive behaviors than their TD peers as was partly expected (Farmer & Aman, 2009), even though their parents noted more symptoms on the measure we used for externalizing problems than parents of TD children (Gadow, DeVincent, Pomeroy, & Azizian, 2004). Whereas aggressive behaviors seem very common in low-functioning children with ASD, this study shows that this is less evident in high-functioning children with ASD. Children with ASD reported less cognitive empathy (understanding and ToM) compared to TD children. There were no differences in scores of affective empathy (contagion) and personal distress between the ASD group and the TD group. These findings support the view that although children with ASD are impaired in the cognitive aspect of empathy, they are not impaired in the affective aspect of empathy (Dziobek, et al., 2008; Jones, et al., 2010; Smith, 2009).

Second, we examined the strength of the relationships between affective and cognitive empathy (understanding and ToM), and the level of anger with reactive and proactive aggression, where group (ASD vs. TD) was used as moderator. Group indeed showed a moderating effect for reactive aggression, but not for proactive aggression. The correlations for the ASD group showed that higher levels of self-reported contagion, personal distress, anger mood, and a lower capacity for inferring mental states (ToM) were related to more reactive *and* proactive aggression. As personal distress and anger mood both refer to an impaired capacity for emotion regulation, this could suggest that both types of aggression in children with ASD could be explained by impaired emotion regulation. Surprisingly, a stronger focus on the understanding of others' distress was related to more reactive aggression in the ASD group, whereas their actual capacity to infer mental states (ToM) was negatively related to reactive aggression. We will discuss this paradoxical outcome later.

Reactive aggression

The multi-group regression model showed that impaired emotion regulation (personal distress and anger mood) was related to more reactive aggression in TD children, consistent with the literature (Eisenberg, 2000; Marsee & Frick, 2007). However, contagion was related to less reactive aggression in this group. These outcomes emphasize unique or independent roles of impaired emotion regulation (i.e., personal distress and anger) and diminished compassion for others' suffering in the etiology of reactive aggression in typical development (Hubbard, McAuliffe, Morrow, & Romano, 2010; Rieffe, Faber, Kouwenberg, & Güroğlu; Rieffe, et al., in revision). Consistent with previous findings, our results further indicate an inhibiting role of empathy in reactive aggression in TD children (Mayberry & Espelage, 2007).

In contrast, unique for children with ASD was the positive contribution of contagion to reactive aggression. This outcome emphasizes that any kind of (empathic) arousal can be a trigger for an aggressive reaction in these children. Also a lower capacity to infer mental states (ToM) was related to more reactive aggression in children with ASD. Difficulties in social cognitions, thus misunderstanding the social world, seeing others as irrational human beings with unpredictable behaviors and emotions, could evoke aggressive behaviors towards others. Since the outcomes of this study are only cross-sectional, a longitudinal study could give more insight in the causality of this relationship and the underlying motives for this aggression in children with ASD.

Understanding others' emotions and/or behaviors was uniquely related to reactive aggression in children with ASD, but not for TD children. This finding seems to oppose the formerly discussed negative relationship with children's ToM capacity and reactive aggression. Yet, the ToM task employed in this study did not involve emotions. Instead, children were asked to predict false beliefs in a protagonist from short video clips that most of the children specifically enjoyed watching. Trying to understand another's distress as was required for responding to the items representing the scale Understanding Others' Emotions in the Empathy Questionnaire, might be problematic for children with ASD since they need to focus on an emotionally aroused situation.

A growing body of literature indicates children with ASD seem to point at impaired emotion regulation when focusing on an emotionally charged situation. These findings suggest that cognitive empathy (ToM) could be a problem for children with ASD that prevents them from reacting empathically, simply because they cannot handle their own level of arousal. As pointed out by Rieffe and colleagues (2010) in order to react adaptively to the emotion of another person, one needs to understand that their arousal is caused by the other person's emotional expression, rather than an event in relation to oneself. Additionally, one needs the capacity for down-regulating their own arousal, knowing that it will disappear once the other person is calmed again. In other words, the focus should be other-oriented and not self-oriented (Eisenberg, Spinrad, & Sadovsky, 2006). This outcome supports previous research (Blair, 1999; Jones et al., 2010), suggesting that problems in emotion regulation and impaired ability to infer mental states play a significant role.

Future studies should further confirm these preliminary outcomes and our interpretation of these results. We want to remind the reader that the moderating effect of group was most strongly evident for the relationship between contagion and reactive aggression, because the fit of the model was best when only this equality restriction was lifted. Therefore, the role of understanding others' emotions in relation to reactive aggression in children with ASD needs more investigation.

Proactive aggression

Unexpectedly, a lack of empathy was unrelated to proactive aggression in TD children. In children with ASD, those who reported engaging in more proactive aggression also reported more arousal when witnessing another's pain or stress. However, these associations did not hold in a regression model predicting the level of variance in proactive aggression. Yet in both groups, heightened levels of anger and a lower level of Theory of Mind contributed to the prediction of proactive aggression. As noted before, the design of this study is cross-sectional which prevents us from drawing conclusions about the causality of these relationships. Future research should focus on possible motives behind displaying proactive aggression in children with ASD, whereas it is still unclear whether these children are able to instrumentally apply aggression in order to reach a certain goal.

Limitations

This study was mainly based on self-report, because only participants could be expected to have direct knowledge of their own emotions and behavior. Although observational studies are reliable in examining actual aggressive behavior, they do not inform about motives for these behaviors. Distinguishing between reactive and proactive aggression in the observation and coding of behavior is difficult because reactive aggression could easily be mistaken for proactive aggression, and vice versa (Kempes, Matthys, de Vries, & van Engeland, 2005). Another way to differentiate between reactive and proactive aggression is through psychophysiological reactions, such as heart rate and skin conductance levels. Unfortunately, psychophysiological differences between proactive and reactive aggression have been minimally studied, and results are contradictory (Hubbard, et al., 2002). Future research should combine self-report, parent-report, observations, and psychophysiological measurements to give us insight in the motivational differences between reactive and proactive aggression, especially in children with ASD. Furthermore, due to a relatively small sample size we were unable to draw firm conclusions. Besides combining different methods, future research should also include a larger sample size.

Conclusions and implications

The outcomes of this study show that reactive aggression in children with ASD should not be interpreted the same way as in TD children. Reactive aggression in children with ASD seems mainly associated with impaired skills for emotion regulation or an over-stimulating environment. Intervention programs for children with ASD could focus on improving their capacity for emotion differentiation and regulation. Children with ASD might benefit from learning that to a certain level, emotions of others can also influence their own emotion arousal. Therefore, we need to develop and study ways in order to make children with ASD aware of the factors associated with observing others' emotions. Hopefully these findings will help to implement better prevention, counseling, and treatment trajectories for aggression in children with ASD.