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

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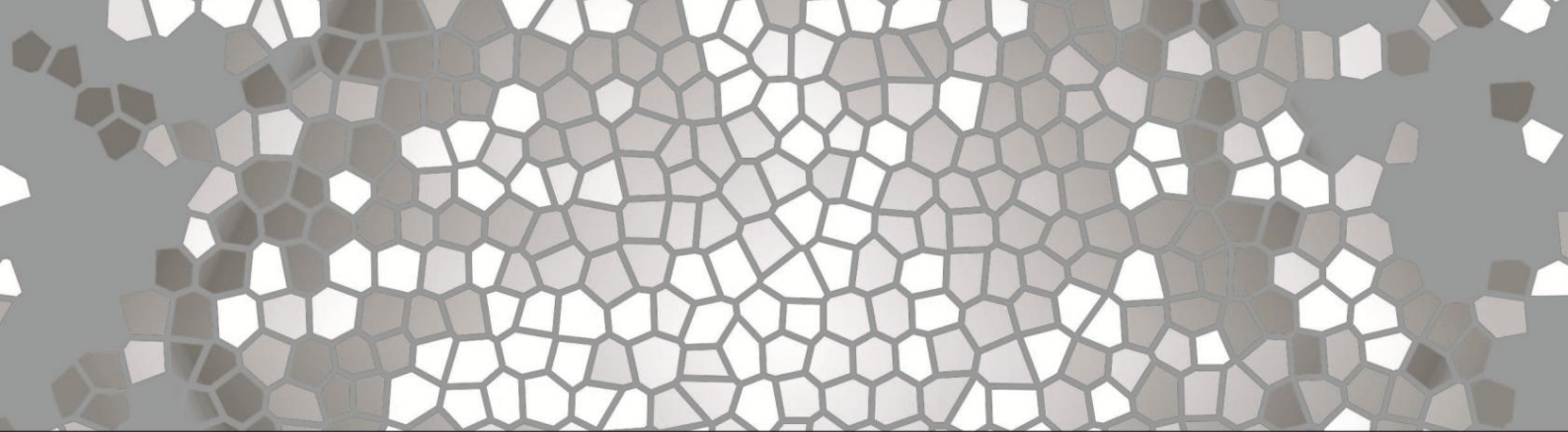


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Chapter 2

Emotion understanding, emotion regulation, and anxiety in boys with an autism spectrum disorder



Abstract

High levels of anxiety are a common problem in children and adolescents with an autism spectrum disorder (ASD), and frequently associated with a range of other internalizing and externalizing problems. Higher levels of anxiety are often linked to an impaired emotion regulation. In this study, we examined the extent to which emotion understanding and regulation contributed to the prediction of lower levels of self-reported anxiety in boys with ASD ($N=55$, $M_{age}=141$), compared to TD boys ($N=48$, $M_{age}=139$). The results showed that a greater understanding of one's own emotions was related to less anxiety in both groups, but understanding of other's emotions was only beneficial in TD boys. Shame was positively related with social anxiety and sense of coherence in both groups. However, only in boys with ASD, anger related positively to social anxiety, suggesting that impaired emotion regulation skills are a strong predictor for internalizing problems in these children. Future research should focus on the longitudinal relation between emotion regulation and internalizing problems.

Introduction

Internalizing problems and in particular anxiety disorders are very common in children with an Autism Spectrum Disorder (ASD) (Russell & Sofronoff, 2005; Simonoff et al., 2008; Stewart et al., 2006; Weisbrot, Gadow, DeVincent, & Pomeroy, 2005). A variety of issues, such as changes in routine and environment, and social interactions could evoke feelings of anxiety in this particular group (Attwood, 1998). Higher levels of anxiety in children with ASD are associated with a range of additional problems in (later) life, such as isolation, depression, and aggression (Tantam, 2000). Yet, little is known about possible underlying factors in the development of anxiety in children with ASD. In typically developing (TD) children, internalizing problems are often linked to several aspects of emotion regulation (Rieffe & De Rooij, 2012; Rieffe, et al., 2011; Southam-Gerow & Kendall, 2002; Suveg & Zeman, 2005). Therefore, in this study we aim to examine which factors of emotion regulation contribute to the prediction of anxiety in boys with ASD, compared to TD boys.

Anxiety in children with ASD

Anxiety is an emotional response to perceived or anticipated danger or threat. Anxiety includes physiological responses such as freezing, startle, heart rate, blood pressure changes, and increased vigilance, which prepare the individual to quickly and adaptively react, thus facilitating avoidant or defensive behaviors (Frijda, 1986). Anxiety becomes an anxiety disorder and thus maladaptive when it is characterized by a high negative affect combined with a sense of uncontrollability, hypervigilance, irritability, and an inability to concentrate on normal daily tasks, or sleep disturbance (Rosen & Schulkin, 1998).

High levels of anxiety in children with ASD are a well-documented problem (Farrugia & Hudson, 2006; Kim et al., 2000; Sukhodolsky et al., 2008). Van Steensel, Bogels, and Perrin (2011) reviewed 31 studies that examined the prevalence of high levels of anxiety in children and adolescents (under 18 years) with ASD and found that nearly 40% of the children with ASD are diagnosed with at least one anxiety disorder. Among the most common anxiety disorders in children with ASD are specific phobia (29,8%), generalized anxiety (15,4%), and social anxiety (16,6%) (van Steensel, et al., 2011). Despite of the high prevalence of anxiety symptoms in ASD, clinicians find it difficult to determine whether these anxiety symptoms are part of the ASD, or whether they should be conceptualized as an anxiety disorder in itself. Van Steensel and colleagues (2011) argue that this is mainly due to diagnostic overlap and the use of measures of anxiety, which are not always applicable to children with ASD.

In TD children, anxiety problems are strongly based in impaired emotion understanding and regulation (Carthy, Horesh, Apter, & Gross, 2010). Children with impaired emotion understanding and regulation skills are less able to access and use emotional information effectively in order to adaptively respond to emotional experiences (Mennin, Heimberg, Turk, & Fresco, 2002). Problems in the emotion understanding and regulation are also frequently noted in children with ASD (Laurent & Rubin, 2004), and could therefore also be an important factor in the etiology of anxiety in this group. The aim in this study is to examine the extent to which various aspects of emotion understanding and regulation contribute to the prediction of anxiety in children with ASD as compared to their TD peers.

Understanding and regulation of emotions

Frijda (1986) states that an emotion experience can only arise in its situational context. In other words, an emotion is related to an external event, to which one should quickly and adaptively react. Therefore, one has to recognize this fact that one's own emotion is a reaction to an external event, rather than that an emotion is merely an affective state that just appears out of nothing. The ability to analyze emotions in relation to the emotion-evoking situation, which denotes an external focus on emotion experience, is related to more effective emotion regulation (Barrett, Gross, Christensen, & Benvenuto, 2001). Apparently, understanding how and why an emotion arises provides important information about how to deal with the situation that is causing it. In addition, children who pay more attention to internal signals such as bodily arousal during an emotion experience, are less focused on the outside world (i.e., the emotion-evoking situation) and are most at risk for developing internalizing symptoms, such as anxiety (Rieffe & De Rooij, 2012).

Children with ASD find it more difficult to identify and describe their feelings in relation to the emotion-evoking situation (Hill, et al., 2004), and are less able to thoroughly analyze the emotion-evoking event (Rieffe, et al., 2007a), which also indicates limited ability for emotion regulation. Indeed, another study by Rieffe and colleagues (2011) confirmed a more internal focus during an emotional state in children with ASD compared to typically developing children. Although it appears that an internal focus on emotions, in children with ASD, is related to depression (Rieffe, et al., 2011), it is not yet clear whether an internal focus on emotions is also related to anxiety in these children.

When emotions are not well processed and reacted on, dysregulation of emotions can occur. Dysregulation of anger seems to play an important role in anxiety disorders (Zeman, Shipman, & Suveg, 2002). Suveg and Zeman (2005) examined emotion regulation in children with anxiety disorders and found that children with anxiety disorders reported more intense and dysregulated feelings of anger. In addition, anger dysregulation is found to be associated with more internalizing symptoms, such as anxiety and depression (Zeman, et al., 2002). Children with ASD are known for their impaired emotion regulation skills, in terms of hypersensitivity to environmental and social stimuli, and strong fluctuations in arousal level (see for review Laurent and Rubin, 2004). Furthermore, children with ASD are often faced with heightened level of anger (Sofronoff, Attwood, Hinton, & Levin, 2007). Although parents notice that anxiety in children with ASD is often released in an angry or aggressive way, the relationship between anxiety and anger has not been studied yet (Ozsivadjian & Knott, 2011).

Besides an impaired understanding of one's own emotions, misunderstanding of others' emotions could also create feelings of confusion and anxiety. Southam-Gerow and Kendall (2002) suggest a relationship between understanding causes for others' emotions, or so-called empathic understanding, and psychopathology. Or in other words, insight into and interest for how others' emotions work could be associated with better emotion regulation. However, to our knowledge, the direct relationship between empathic understanding and anxiety problems in TD children has not yet been studied yet. Children with ASD are less able to infer mental states and take another's perspective and therefore have a lesser degree of empathic understanding, compared to TD children (Baron-Cohen, et al., 1985; Jones, et al., 2010; Pouw et al., 2013; Rogers, et al., 2007). Difficulty in understanding others' emotions could create confusion about the (social) world around them. However, to date it is unknown to what extent impaired empathic understanding is indeed linked to more anxiety in children with ASD.

As children are trying to understand the other's emotions, they become more aware of other people's perspectives. A frequently denoted emotion associated with social anxiety in particular is shame. Shame underlies social anxiety whereas it induces fear of negative evaluation by others and nervousness for anticipated and actual interactions with others (Stein & Stein, 2008). Shame expression communicates an individual's awareness that s/he has jeopardized future acceptance and the intention to avoid the same happening again (Olthof, 2012; Tangney, 1991). Although shame is an adaptive emotion to keep people behaving within the norms and values of their cultural or social group, too much shame, or shame at inappropriate times can point at a self-awareness that is too strong, prohibiting the person to react adaptively, and thus, high levels of shame can become maladaptive.

Fergus, Valentiner, McGrath, and Jencius (2010) argue that shame proneness is an important underlying factor of anxiety disorders. Shame can be related to feelings of vulnerability, loss of social standing and rejection or criticism, and the concern about what others think about you, which could induce and maintain social anxiety (Gilbert, 2000). Although children with ASD report lower levels of shame compared to their TD peers (Rieffe et al., 2012), studies concerning the direct (longitudinal) relationship between shame and (social) anxiety in children with ASD are lacking. However, a strong relation is found between shame and social anxiety in TD adults (Gilbert, 2000), and in clinical samples diagnosed with an anxiety disorder (Fergus, et al., 2010).

Present study

The aim of this study was to examine the extent to which the same aspects of emotion understanding and regulation contribute to the prediction of anxiety in children with ASD and TD children. We included only boys in our study, because girls in the sample were too scarce in number to include them in the analyses. Three indices for anxiety were included: specific anxiety, social anxiety and sense of coherence (SoC). SoC refers to the extent to which negative situations are perceived as unstructured, unpredictable and therefore uncontrollable (Antonovsky, 1993). Children with a low sense of coherence have difficulty with understanding the meaning of situations, and find it hard to make sense of them, and controlling them (Jellesma, Rieffe, Terwogt, & Kneepkens, 2006). It can be expected that boys with ASD will score higher on specific and social anxiety, and lower on SoC. Because a multi-informant approach of measuring psychiatric symptoms in children (with ASD) has proven to be of great added value (e.g., Hurtig et al., 2009; MacNeil, Lopes, & Minnes, 2009), we used both boys and parents as informants to indicate differences in the levels of anxiety in boys with and without ASD.

Differences in the level of understanding and regulation emotions were examined. Based on previous studies, we expected lower levels on external focus on emotions and empathic understanding in boys with ASD compared to a TD group of boys (Jones et al., 2010; Rieffe et al., 2011). Furthermore, boys with ASD were also expected to score higher on anger (Sofronoff et al., 2007), and lower on shame (Rieffe et al., 2012) than their TD peers.

Second, the relations between anxiety, SoC, and emotion understanding and regulation were examined. We expected higher levels of external focus on emotions to be associated with lower levels of specific anxiety and social anxiety and positively associated with sense of coherence in both groups (Rieffe & De Rooij, 2012; Rieffe et al., 2011). We expected empathic understanding to be negatively associated with specific anxiety and social anxiety and positively associated with sense of coherence in TD boys (Southam-Gerow & Kendall, 2002). Because studies examining the link

between empathic understanding and anxiety in children with ASD are lacking, there were no expectations concerning this link. However, results of a previous study in children with ASD found that empathic understanding does not have a protective role in externalizing behaviors in children with ASD (Pouw, et al., 2013). Possibly, this also accounts for internalizing behaviors.

Anger was expected to be associated with more specific and social anxiety in both groups (Suveg & Zeman, 2005; Zeman, et al., 2002), but this relation was expected to be more evident in boys with ASD, because of their poor emotion regulation skills. Examining the link between anger and sense of coherence in both groups was explorative. Shame was expected to be associated with social anxiety, and not specific anxiety in both groups (Green & Ben-Sasson, 2010). Again, examining the link between shame and sense of coherence in both groups was explorative.

Method

The ASD sample included 61 high functioning boys diagnosed with ASD ($M_{age} = 141$ months, $SD = 16.1$, age range: 113 - 177 months) based on the Autism Diagnostic Interview-Revised (Lord, Rutter, & Lecouteur, 1994) by child psychiatrists. The ASD participants met the inclusion criteria (i) IQ scores above 80, (ii) diagnosed with ASD of the *DSM-IV* (American Psychiatric Association, 1995), and (iii) no other diagnosed psychiatric disorders. 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. These institutions 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 83 parents of ASD children (73 boys) gave their consent to participate in the study. Only children who completed all self-report questionnaires were included in this study.

The TD group included 59 typically developing boys ($M_{age} = 139$ months, $SD = 15.1$, age range: 116 – 176 months) and was drawn from primary and secondary schools in the Netherlands. 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 three ASD children and six TD children IQ scores could not be obtained. From 11 children with ASD and 12 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 age, IQ, and SES.

The children were visited at home or institutions. Children were asked to answer questions on a notebook. Questions were presented on the screen with underneath response buttons. Participants could answer the questions by clicking on the correct button. Children were ensured that their answers would be processed anonymously. Parents were asked to fill in questionnaires. The Ethics Committee of the Centre for Autism granted permission for the study.

Materials

Anxiety

Specific Anxiety was measured by a shortened version of the *Fear Survey Schedule for Children - Revised* (FSSC-R) (Ollendick, 1983). This self-report consists of 24 items that measure the intensity of children's (a) Fear of Failure and Criticism (e.g., "Getting a report card"), (b) Fear of the Unknown (e.g., "Dark places"), (c) Fear of Small Animals (e.g., "Lizards"), (d) Fear of Danger and Death (e.g., "Death, or dead people"), and (e) Medical Fears (e.g., "Getting a shot from the doctor"). Each item consists of a self-evaluation sentence with a score in the direction of severity from 1 (*not afraid*) to 3 (*very afraid*). As the questionnaire for Specific Anxiety consists of different subscales, the unidimensionality of the questionnaire was examined by means of a Principal Component Analysis (PCA). In order to test the unidimensionality of the total sum-score, a PCA with Oblimin restriction on the 24 items in the whole group (ASD and TD) was conducted. The outcome showed a two-factor model with Eigenvalues > 2. The items from the Fear of Failure and Criticism Scale loaded > .40 on a separate factor from all other items (Table 1). Because the Fear of Failure and Criticism could be seen as a measure for social anxiety rather than specific anxiety, it is decided to remove this scale in the total score for Specific Anxiety. A new total score for Specific Anxiety was computed existing of 20 items. The scale Fear of Failure and Criticism was not used further in this study, because we had no *a priori* hypotheses concerning this scale separately.

Table 1.
PCA loadings for the ASD and TD group together (N=120) on the Fear Survey Schedule for Children - Revised (FSSC-R)

Item	Factor 1	Factor 2
<i>Fear of failure and criticism</i>		
7. Getting poor grades		.68
13. Being called in by the teacher		.71
19. Getting a report card		.79
25. Making mistakes		.68
<i>Fear of the unknown</i>		
2. Thunderstorms	.58	
8. Going to bed in the dark	.50	
14. Being alone	.50	
20. Closed places	.53	
27. Dark places	.69	
<i>Fear of small animals</i>		
3. Lizards	.32	
9. Snakes	.66	
15. Spiders	.45	
22. Bats or birds	.41	
28. Worms or snails	.32	
<i>Fear of danger and death</i>		
4. Death or dead people	.60	
10. Getting lost in a strange place	.51	
17. Being hit by a car or truck	.59	
24. Falling from high places	.62	
29. Not being able to breath	.50	
30. Getting a serious illness	.60	
<i>Medical Fears</i>		
5. Having to go to the hospital	.59	
12. Getting a shot from the doctor	.60	
18. Going to the dentist or doctor	.47	
23. The sight of blood	.44	

Emotion Understanding and Regulation

Children filled in the *Emotion Awareness Questionnaire* (Rieffe, et al., 2007b), which consists of 30 items. For this study two scales of the questionnaire were used to assess the understanding of the own emotions; (a) Differentiation (e.g., “I’m often confused about what I’m feeling”), and (b) Bodily Awareness (e.g., “When I am afraid or nervous, I feel it in my stomach”). Items from the Bodily Awareness Scale were reversed. The 12 items from the two scales were summed and a mean score was calculated. The questionnaire, was designed with a 3-point scale (1 = *not true*, 2 = *sometimes true*, 3 = *often true*).

Children filled in the *Empathy Questionnaire* (Pouw, et al., 2013) which measures different aspects of empathy. For this study, only the scale Understanding, which consists of 5 items, was used to measure the extent to which children have an understanding of others’ emotions (e.g., “When a friend is sad, I usually know why”). The questionnaire was designed with a 3-point scale (1 = *not true*, 2 = *somewhat true*, and 3 = *true*).

To assess emotion regulation in the form of anger and shame in social situations we used an adapted version of the *Self –Conscious Emotions: Maladaptive and Adaptive Scales* (SCEMAS) (Ferguson et al., 2000). The current version of the questionnaire consists of five scales (Guilt, Shame, Anger, Happiness, Pride), of which only the Anger and Shame scales were used for this study. Ten scenarios were presented (e.g., ‘A classmate is not able to finish her project in time. She asks for your help. You don’t help her, because you don’t feel like it.’). Children were asked to read the short stories, each followed by the question how much anger and shame they would feel in these situations, which they could answer on a 3-point scale (1 = *not at all*, 2 = *a little*, 3 = *a lot*).

An indication of a nonverbal IQ norm-score was computed with 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). The mean of the norm-scores on the two subtests was used.

Socioeconomic Status Score (SES) was computed by adding up scores of questions concerning income, education and occupation of both parents/caregivers. 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. Psychometric properties of all questionnaires used in this study are shown in Table 1.

Table 2.
Psychometric Properties of the Study Variables

Variable	<i>n</i> items	Cronbach's α		<i>M</i> and <i>SD</i>	
		ASD	TD	ASD	TD
Parent Report					
CSI Generalized Anxiety Disorder (Range 1-4)**	7	.79	.74	(<i>N</i> = 55) 2.14 (.60)	(<i>N</i> = 48) 1.37 (.36)
Child Report					
Specific Anxiety*	20	.89	.85	1.63 (.31)	1.48 (.31)
<i>Subscales Specific Anxiety</i>					
Fear of the unknown*	5	.73	.82	1.56 (.43)	1.40 (.41)
Fear of small animals*	5	.49	.73	1.37 (.33)	1.23 (.36)
Fear of danger and death*	6	.85	.78	2.01 (.67)	1.93 (.60)
Medical fears*	4	.72	.36	1.73 (.52)	1.56 (.34)
Social Anxiety	7	.71	.75	1.38 (.32)	1.39 (.35)
Sense of Coherence	6	.71	.67	2.26 (.40)	2.34 (.40)
External Focus	12	.79	.76	2.16 (.46)	2.45 (.42)
Empathic Understanding*	5	.70	.66	2.19 (.46)	2.45 (.42)
Anger	12	.71	.82	1.41 (.34)	1.45 (.38)
Shame**	12	.89	.77	1.87 (.48)	2.15 (.39)

Note. All questionnaires have a range from 1 – 3.

* $p < .01$ ** $p < .001$

Statistical analyses

The internal consistency of all the scales and questionnaires used in this study were examined with Cronbach's alpha. Second, in order to make a comparison of the prevalence of internalizing symptoms (self-report: Specific Anxiety, Social Anxiety, Sense of Coherence; and parent-report of Generalized Anxiety Disorder), External Focus on Emotions, Empathic Understanding, Anger and Shame between the ASD and TD group, *t*-tests were carried out. Third, relations between all variables, including age and IQ, were established by means of Pearson Correlations. Differences in the strengths of the correlations between the groups were tested using Fisher *r*-to-*z* transformation. Fourth, three hierarchical regression analyses were carried out separately for children with ASD and TD children with Specific Anxiety, Social Anxiety, and Sense of Coherence as dependent variable and External Focus on Emotions, Empathic Understanding, Anger and Shame as independent variables. The program Statistical Packages for the Social Sciences version 19.0 was used.

Results

Differences between groups on the study variables

In order to examine possible differences between boys with ASD and TD boys on the variables, *t*-tests were carried out comparing the group means (Table 2). Boys with ASD scored higher than their TD peers on Specific Anxiety ($t(118) = 2.31, p \leq .023$). Unexpectedly, there were no differences between the groups on self-reports for Social Anxiety and Sense of Coherence. Additionally, boys with ASD scored lower on Empathic Understanding ($t(118) = -3.23, p \leq .002$), and Shame ($t(118) = -3.49, p \leq .001$) than the TD peers.

Associations of emotion processing with three indices for Anxiety

Table 3 shows the correlations of Specific Anxiety, Social Anxiety, and Sense of Coherence with External Focus on Emotions, Empathic Understanding, Anger, and Shame. Correlations between dependent variables and Age and IQ were not significant and are not shown in the table. Separate correlations per Group are only reported when significantly different by means of Fisher transformations. As expected, External Focus was negatively correlated with Specific and Social Anxiety and positively with Sense of Coherence. Anger and Shame were positively related to Specific and Social Anxiety, and negatively with Sense of Coherence. Group differences also appeared; Empathic Understanding was positively correlated with Specific Anxiety and negatively with SoC for children with ASD, but not in the TD group.

Table 3.
Summary of (Inter)correlations between Study Variables

	Specific Anxiety	Social Anxiety	Sense of Coherence
External Focus	-.32**	-.35***	.51***
Understanding	.20*/-.23	.02	-.35**/.06
Anger	.18*	.23*	-.22*
Shame	.19*	.40***	-.39***

Note. Correlations are provided separately for ASD and TD respectively when these were found to be significantly different for the two groups. Otherwise one value for the total group is given.

* $p < .05$ ** $p < .01$ *** $p < .001$

Table 4 shows three multiple regression analyses for the two groups separately. External Focus was positively associated with all three indices for anxiety in both groups, except for Social Anxiety in boys with ASD. Surprisingly, Empathic Understanding was negatively associated with Specific Anxiety in the TD group, but despite its high correlations with Specific Anxiety and SoC for the ASD group (Table 3), Empathic Understanding failed to contribute uniquely in the regression analyses for the ASD group. Post/hoc partial correlations revealed that Shame was highly correlated with Understanding ($r = .39, p = \leq .005$). The correlations between Specific Anxiety and SoC with Understanding were no longer significant when controlled for Shame ($r = .10, p \geq .439$; $r = -.20, p = .127$). Anger was only associated with Social Anxiety in the ASD group. Shame was positively associated with Social Anxiety and negatively associated with SoC in both groups.

Table 4.
Hierarchical Multiple Regression Analyses Predicting Specific Anxiety, Social Anxiety, and Sense of Coherence from Emotion Processing

	Specific Anxiety		Social Anxiety		Sense of Coherence	
	ASD	TD	ASD	TD	ASD	TD
Adj. R^2	.12*	.16*	.29**	.21*	.34**	.43**
β						
Ext. Focus	-.24*	-.24*	-.13	-.37**	.31**	.57***
Emp. Underst.	.12	-.22*	-.02	-.22	-.23	.16
Anger	.14	.03	.24*	-.08	-.11	.03
Shame	.10	.16	.42**	.28*	-.29*	-.27*

* $p < .05$ ** $p < .01$

Discussion

The aim of this study was to examine which aspects of emotion understanding and regulation contribute to the prediction of anxiety in boys with ASD and how this differs from TD boys. As in previous studies, self-report questionnaires again showed moderate to good internal consistencies in both groups, supporting the validity of using self-report measures for boys with (Hill, et al., 2004; Pouw, et al., 2013; Rieffe, et al., 2011).

First, when group means were compared, boys with ASD did not differ from TD children on social anxiety, the feeling that life is controllable (SoC), external focus on emotions, and anger. Yet, boys with ASD scored higher than TD boys on specific fear and lower on empathic understanding and shame. The finding that children with ASD reported more specific fear and were scored higher on generalized anxiety disorder by their parents compared to the TD boys, confirms previous studies that anxiety is a problem in these children (Farrugia & Hudson, 2006; Kim, et al., 2000; van Steensel, et al., 2011). The finding is that children with ASD report higher levels on social anxiety and sense of coherence than TD boys is confirmed by another study from Hallet and colleagues (2013). Possibly, it is difficult for boys with ASD to recognize social anxiety, as it is inherent to their ASD, and far less concrete as opposed to specific anxiety.

Second, we examined the relationships between self-reported anxiety (specific anxiety, social anxiety, and sense of coherence) and emotion understanding and regulation. All indices for emotion understanding and regulation were related to all indices for anxiety in both groups and in the expected directions except for empathic understanding. Unexpectedly, more empathic understanding was related to more specific anxiety and less sense of coherence in boys with ASD. However, when controlled for shame, these relations became non-significant. This interesting outcome will be discussed later. Furthermore, not all indices also contributed uniquely in the regression analyses for the prediction of anxiety. In fact, both the correlations and the regression analyses show the importance of the external focus during the emotion episode which is related in both groups to fewer symptoms of anxiety and a stronger feeling of control (SoC). Additionally, shame was important in the prediction of social anxiety and SoC. Yet, differences between the groups also occurred: more empathic understanding was related to less specific anxiety, only in the TD group. At last, anger contributed positively in the prediction of social anxiety only in boys with ASD.

The results concerning the strong link between an external focus on emotions and all three indices for anxiety in the TD group as well as in the ASD group, confirm the idea and results from previous studies, such that linking an emotion to an emotion-evoking situation and thus understanding one's own emotions is important in preventing internalizing problems (Rieffe & De Rooij, 2012). Furthermore, linking an emotion experience to the emotion-evoking situation was related to children's sense that their thoughts, feelings, and environment are controllable and predictable. Apparently, linking an emotion to a situation or an awareness of the cause of the emotion, offers the child a sense of control and a suitable set of options to react on the fear-evoking situation.

Although children with ASD reported less shame experiences during social situations, which denotes some moral impairments, shame was related to more social anxiety and less SoC in *both* groups, confirming previous studies (Green & Ben-Sasson, 2010). Apparently, in boys with and without ASD, shame is related to a fear of negative self-evaluation and social failure. The role of shame and thus the awareness of the other's judgment in boys with ASD should not be underestimated,

only because they experience less shame. This is because in children with ASD who *do* experience shame, it has the same association with social anxiety and the feeling of control as it has in TD children. Future research should focus on what the differences are between children with ASD who do and do not experience shame to a certain level and what this means for the development of anxiety and other internalizing problems. It could also be that shame means something else for children with ASD than for TD children. In typical development shame is dependent on projecting intentional states on to others, thus perspective taking skills. As high functioning children with ASD often are aware of the fact that they are different or do not belong to the world, this could induce feelings of shame which do not rely on perspective taking skills, but just acknowledging the fact that they are or behave differently from their TD peers (Henriksen, Skodlar, Sass, & Parnas, 2010). This could explain the finding that children with ASD score lower on empathic understanding and higher on shame compared to their TD peers.

The finding that empathic understanding was related to less specific anxiety only in TD boys, but not in ASD boys, confirms results from a previous study of Pouw and colleagues (2013) that empathic understanding does not play a protective role in psychopathology in boys with ASD, as it does in TD boys. Possibly, focusing on the emotions and thus the emotional arousal of others in terms of trying to understand why someone is feeling that way is not that beneficial for children with ASD, because they are unable to adequately react on the other's emotion, while in TD children empathic understanding might be related to a better understanding and regulation of emotions in general and therefore less specific anxiety.

The fact that significant correlations between understanding the others' emotions and specific anxiety/Sense of Coherence in the ASD group disappeared when controlling for shame indicates that the relation between more empathic understanding, and more anxiety and less SoC, is explained by the feeling that one is negatively evaluated. In other words, when children with ASD have a better understanding of the emotions of others, they are more aware of the other's evaluation, therefore creating more fear and less SoC. Alternatively, specific anxiety in children with ASD creates more sensitivity, attention, and caution for their environment, including the awareness of other people's emotions and (negative) evaluations. Future longitudinal research should offer more clarity about the direction of these relations.

Although anger was correlated with all three indices for anxiety in both groups, unexpectedly, only the association between anger and social anxiety in ASD boys remained in the regression analyses. An explanation could be that in the current study self-report experiences of anger during shame-eliciting social situations were examined, whereas Suveg and Zeman (2005) examined actual anger dysregulation in terms of questioning what the child would *do* when he/she is angry. Apparently, actual dysregulation of anger rather than only the experience of anger is important in specific anxiety disorder in both groups. However, social anxiety was explained by experienced anger during social situations in boys with ASD. Possibly, social anxiety and anger have a reciprocal relationship in children with ASD. Heightened levels of anger could lead to failures and rejection in social situations and therefore to more social anxiety. Alternatively or simultaneously, social anxiety could lead to awkward social interactions and therefore rejection, which in turn could evoke feelings of frustration and anger. Future research should focus on the long-term relationship between anger and social anxiety in children with ASD, since this could give important insights in the etiology of social anxiety in these children.

Concluding remarks

The outcomes of this study show that there is certainly overlap between boys with ASD and TD boys in the pattern for anxiety, concerning the role of external focus on emotions and shame. Yet, unique patterns arose for empathic understanding and anger. Apparently, understanding emotions of others make boys with ASD more aware of others' negative evaluations. Possibly, children with ASD benefit from therapy that is focused on both the improvement of the self-image of these children as well as perspective taking skills, whereas the risk for the awareness of negative evaluations by others increases with gaining more perspective taking skills. Furthermore, as anger plays a unique role in social anxiety in children with ASD, future intervention should focus on better emotion regulation skills which could in turn improve the regulation of anxiety. Furthermore, longitudinal research should focus on the causality between emotion regulation and the development of anxiety. For example, whereas extreme feelings of shame could induce social anxiety, social anxiety could also lead to more feelings of shame, because children become aware of their unusual anxious behavior in social situations.