



Approach and avoidant emotion regulation prevent depressive symptoms in children with an Autism Spectrum Disorder



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ABSTRACT

The prevalence of depression is high in children with Autism Spectrum Disorders (ASDs), but its etiology has not yet been studied in this group. Emotion dysregulation is a well-known contributor to the development of depression in typically developing (TD) children, which might also apply to children with ASD. In this study, we examined the longitudinal relationship between three different ways of emotion regulation (approach, avoidance and worry/rumination) and depressive symptoms in children with ASD and a group of TD children which were compatible with the ASD group (age 9–15-years old). Children filled out self-report questionnaires at 3 time points (with a 9-month break between each session). To account for missing data multiple imputations were used. A regression model with clustered bootstrapping was used to establish which factors contributed to depression and to identify possible differences between the ASD and TD group. Approach and avoidant strategies prevented the development of depressive symptoms in both respective groups, whereas elevated levels of worry/rumination in turn increased children's depressive symptoms. Besides differences in absolute levels (children with ASD scored higher on symptoms of depression and lower on approach strategies than the TD group), no other differences between the groups emerged.

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1. Introduction

Besides the diagnosis for an Autism Spectrum Disorder (ASD), children and adolescents with ASD often show comorbidity with other psychiatric symptoms and disorders. One of the more common disorders found in children with ASD is depression, with a prevalence rate that fluctuates between 15% and 24% (Kim et al., 2000; Leyfer et al., 2006; Quek et al., 2012). This prevalence is considerably higher than in typically developing (TD) children, where the prevalence lies between 0.4% and 8.3% (Birmaher et al., 1996). Impaired emotion regulation is an important underlying mechanism for depression in TD children (Galaif et al., 2003; Seiffge-Krenke and Klessinger, 2000; Wright et al., 2010). Recently, more attention is given to problems in emotion regulation in children with ASD (Mazefsky et al., 2012). The question is, can depression in children with ASD be explained by the same factors of emotion regulation which are observed in TD children. Detection

of these factors at an early age would be important for professionals in order to better treat depression in this clinical group. Therefore, the focus of this study is twofold. First, to obtain more insight into the developmental pathway of emotion regulation in children with ASD relative to a comparable TD group. Second, in order to enhance treatment for depression in children with ASD, it is crucial to better understand its etiology and examine the extent to which emotion (dys)regulation contributes to the development of these depressive symptoms.

1.1. Coping and depression

Emotion regulation includes all processes that refer to modulating the intensity or duration of internal feeling states or motivational states, aiming at social adaptation or achieving individual goals (Eisenberg and Spinrad, 2004). One particular type of emotion regulation is coping. Coping is a way to control or modify the arousal level in negative emotion-evoking situations (Miers et al., 2007). Adaptive coping strategies lower the arousal level and reduce stress. Yet, the same situation can evoke different coping strategies in different people, depending on their prior experiences, current capacities and their (social) goals (Frydenberg, 1997).

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Hence, what defines an adaptive coping strategy might be different for ASD and TD children in similar situations (Rieffe et al., 2003).

Coping strategies can be broadly divided into two types: approach and avoidant strategies (Fields and Prinz, 1997). Approach strategies, like seeking social support and problem solving, are the most common strategies (Zimmer-Gembeck and Skinner, 2011). These approach strategies can give a sense of control (Kort-Butler, 2009) and are associated with fewer depressive symptoms in TD children (Abela et al., 2002; Gross, 1999; Nolenhoeksema et al., 1994). Children with ASD reported less use of approach strategies than their TD peers (Pouw et al., 2013), and strikingly, their use was unrelated to the level of depression in the ASD group (Rieffe et al., 2011). In other words, these studies suggest that approach coping strategies that are effective in reducing the level of arousal for TD children, are less effective for children with ASD.

Alternatively, avoidant strategies offer the possibility to shy away from the arousal-evoking situation or lower its importance, such as trivializing. The use of avoidant strategies seems associated with higher levels of depression in TD children (Seiffge-Krenke and Klessinger, 2000) but an opposite effect is found in children with ASD (Pouw et al., 2013). Possibly, avoiding a stressful situation might give children with ASD extra time at the onset of a stressor to gather resources, preventing the level of arousal to become too high. Yet, avoiding coping strategies might be helpful for children with ASD only as a short-term solution. The question is, if turning away from a stressful situation would also be of benefit for children with ASD on a long-term basis. A longitudinal design might shed further light on this issue, but to date studies on coping in children with ASD are all based on cross-sectional data.

1.2. Worry/rumination

Not everyone will approach a stressful situation in an adaptive way. Another kind of reaction toward a stressful situation is to worry or to ruminate. Worrying and ruminating refer to a maladaptive cognitive strategy that consists of thinking repeatedly about the arousal-evoking situation without coming any closer to a solution (Watkins, 2008). Some children can become immensely worried about what to do or what to expect, and think of all the possible worst-case scenarios. Worrying about being late, or about a lack of friends, does not help to decrease the level of a person's arousal. Still, it is a frequently observed reaction to an emotion-inducing situation in children (Fields and Prinz, 1997; Rieffe et al., 2007). Not surprisingly, worrying is associated with higher levels of depressive symptoms in TD children (Abela et al., 2002; Gross, 1999; Nolenhoeksema et al., 1994). To the best of our knowledge, only one study to date has examined this topic in children with ASD and found higher levels of social worrying in ASD compared a TD group (Russell and Sofronoff, 2005). It has been argued that children with ASD might worry to a higher degree, because their social impairments give them more situations to be worried about (Bauminger and Kasari, 2000; Kelly et al., 2008). Additionally, a limited repertoire for adaptive problem-solving coping strategies could also magnify higher levels of worrying and rumination. More worry and rumination, in turn, could contribute to the explanation for more depressive symptoms in children with ASD.

1.3. Current study

The aim of the current study was to examine the effect which the three common forms of emotion regulation (approach and avoidant coping strategies, and worry/rumination), mentioned above, have on the predictability of depressive symptoms in children with ASD over a time period (3 time points with intervals of 9 months). The age range of 9–15 years was chosen, because a child's capacity to

reflect on his own emotions increases sharply during this age period (Harris, 1989). Based on the previous research, we expected less use of approach strategies (Rieffe et al., 2011) and more symptoms of depression in children with ASD than in TD children.

Yet, our main question was the extent to which the three strategies of emotion regulation would uniquely contribute to the prediction of depressive symptoms; and whether these contributions would differ for children with ASD and TD children. First, approach strategies (Rieffe et al., 2011) were expected to decrease the level of depressive symptoms for TD children, but not for those children with ASD (Pouw et al., 2013). Second, although a cross-sectional study by Pouw et al. (2013) showed that avoidant strategies were related to lower levels of depressive symptoms in children with ASD, Pouw et al. argued in their discussion that this effect might not stay over time. We indeed support their view that avoiding the emotion-evoking situation might only be a short-term solution for children with ASD, and expected this effect not to be sustained across a longitudinal design. Third, we expected higher levels of worry/rumination to be associated with higher levels of depression for both groups (Abela et al., 2002; Gross, 1999; Nolenhoeksema et al., 1994).

2. Method

2.1. Participants

The group of children consisted of 81 high functioning children/adolescents diagnosed with ASD. Children with ASD were recruited from facilities that are specialized in treating and diagnosing autism. Diagnoses were based on the Autism Diagnostic Interview-Revised (Lord et al., 1994) administered by various child psychiatrists. Children with ASD had IQ indicator scores of 11.18 with a standard deviation of 3.17 (average 10). The differential diagnoses in the autism spectrum are presented in Table 1.

The TD group was composed of 131 children, which were recruited from primary and secondary schools in The Netherlands. TD children had IQ indicator scores of 10.59 with a standard deviation of 2.63 (average 10) and no diagnosed developmental disorders. The two groups did not differ in age, IQ indicator scores, or SES (see Table 1). The groups did differ substantially in the boy and girl ratio as could be expected (see Table 1), which was controlled for in the analyses.

2.2. Procedure

Participants were visited three times (with a 9-months' time interval) at home or their institution. They were asked to answer questions which were presented on a notebook. All items were presented one by one on the computer screen with the response categories listed underneath. Children could select the best response by clicking the computer mouse on one of the responses that were shown. Once the child had clicked one of the items, the following item was presented automatically. Children were ensured that their answers would be anonymous. Parents were also asked to complete questionnaires which are not included in this study, except for the information needed to obtain SES scores. The Ethics Committee of Leiden University granted permission for the study.

2.3. Measures

The Child Depression Inventory (CDI; Kovacs, 1985) is a self-report measure containing 26 multiple-choice items about specific symptoms of depression (for example: "I feel alone"; "I am happy with the way I look"). The item associated with suicide was removed from the questionnaire. The original version consists of three sentences per item. We converted these sentences to one sentence with three response categories, in order to put a lower demand on children's working memory (Theunissen et al., 2011). An example item is "I am tired", which children could answer on a 3-point response scale (1 = sometimes, 2 = often, 3 = always). Scores on positively formulated items were reversed. The internal consistency of the adapted version was good $\alpha > .7$ (Nunnally, 1978) (see Table 2). The CDI is widely used, and has good internal consistency, test-retest reliability, and concurrent validity (Masip et al., 2010). The adapted version that we used in this study has high correlations with the original version $r = .75$, $p = .000$ (Theunissen et al., 2011).

The Coping Scale (Wright et al., 2010) is a self-report measure which consists of 34 items. Children were asked what they would do if something bad happened. Two different coping strategies are assessed: 12 items that measured Approach (example items: "I tell a family member or a friend what has happened", "I try to find a solution for the problem"), and 12 items that measured Avoidant (example items: "I'll do something that makes me forget the problem", "I would say that I don't care"). Response categories were: almost never = 1, sometimes = 2, and often = 3. The internal consistency was good (see Table 2). The test-retest reliability is found adequate

Table 1
Profile of participants per group.

		ASD (n=81)	TD (n=131)		
Age mean in months (SD) test moment 1		141.14 (15.96)	140.10 (16.42)		
Age range in months test moment 1		109–178	100–177		
Gender – n (%)					
Male		72 (89%)(mean age 141.5)	59 (45%)(mean age 137.6)		
Female		9 (11%)(mean age 134.8)	72 (55%)(mean age 139.8)		
IQ indicator		11.18 (3.17)	10.59 (2.61)		
SRS		1.41 (.40) [*]	.43 (.22) [*]		
Subgroup ASD	n	M age	IQB norm	IQP norm	Depression
Autism	24	138.32	11.04	10.13	1.50
Asperger	9	136.38	12.56	11.22	1.42
PDD-NOS	33	139.70	11.65	11.9	1.40
MCDD	5	136.80	8.6	8.4	1.37

^{*} Indicates significant differences between ASD and TD children $p \leq .05$.

and also the Coping Scale shows expected correlations with depression and social anxiety supporting its concurrent validity (Wright et al., 2010).

The Worry/Rumination Questionnaire for Children (Rieffe et al., 2007, 2008) is a self-report measure, which is comprised of 10 items. Respondents are asked to rate the degree to which each item is true about them on a 3-point scale (1 = not true, 2 = sometimes true, and 3 = often true). The scoring is reversed for one item. The internal consistency in this study was good (Nunnally, 1978) (see Table 2). A validation study on this questionnaire supports a good concurrent validity. The Worry/Rumination Questionnaire showed the expected positive associations with other measures for circular thought processing (Jellesma et al., 2005).

An indicator of IQ was created by combining the norm-scores of 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 IQ indicator score is the mean of the norm-scores on the two subtests. Theunissen et al. (2013) found that the total score of the two subtests highly correlates with complete IQ test scores. This IQ indicator score was measured only at Time 2.

The social responsiveness scale (SRS) is a parent report questionnaire which consists of 65 items which measure autistic traits. An example of one of the items is: "Thinking or talking about the same thing over and over again", which parents could answer on a 4-point response scale (1 = never true, 2 = sometimes true, 3 = often true, and 4 = almost always true). The SRS has high discriminant validity (Constantino et al., 2003). The internal consistency was good (Cronbach's $\alpha = .90$).

2.4. Statistical analyses

First, *T*-tests were conducted to assess differences in mean scores for Depression, Approach, Avoidance and Worry/Rumination between ASD children and TD children. These *T*-tests were conducted on the raw data.

One of the difficulties with longitudinal studies is that data is often missing. Common methods for data analyses assume that datasets are complete. Researchers

usually remove data post hoc to acquire a seemingly complete dataset. This can result in outcomes that are biased, unreliable and lack sufficient statistical power. In this study, we used multiple imputation (MI) (Van Buuren, 2012), which is a state of the art statistical procedure to solve this problem. 'Multiple imputation involves filling in the missing values multiple times, creating multiple 'complete' datasets (Azur et al., 2011, p. 41). The completed datasets can be analyzed using standard approaches.

Imputing missing data requires that the process for generating the missing values is assessed a priori. Data can be missing completely at random (MCAR), missing at random (MAR), or missing non-at random (MNAR). If data are MAR, MI prevents bias in the parameter estimates which would be a result of the missing data (Graham and Hofer, 2000; Nugent et al., 2012). Little's test pointed out that the missing pattern in our dataset was either MAR or MNAR (Little and Rubin, 2002). The difference between these two is difficult to test, because the missing pattern depends on data that are not observed in the MNAR condition. Therefore, it is most opportune to assume MAR and impute data.

The highest percentage of missing values was 33.6 (see Table 3 for an overview). These missing data consisted of 35 dropouts at Time 2, 36 extra dropouts at Time 3, and 3% non-responses. Missing values were imputed based on observed values for a given individual and the relations observed in the data for other participants (Schafer and Graham, 2002). In order to create a good estimate for each entered value, multiple imputations were made. Multiple imputations between 5 and 10 are seen as sufficient (Azur et al., 2011); in this study 10 imputation sets were made. Note that only scale means were imputed, as suggested by Graham (2009), because analyses were performed on the level of scale means.

Second, to assess the strength of associations between Depression and emotion regulation strategies in TD and ASD children, Pearson's correlations were computed based on the variables at Time 1. Additionally, differences in the strength of these relationships between the two groups were computed using Fisher's *r* to *Z* transformations. The *Z*-scores were tested, indicating equality of correlations.

Third, we examined the extent to which different emotion regulation strategies predict Depression in both groups. We used simple linear regression analyses with

Table 2
Psychometric properties of the measures for Depression, Coping and Worry/Rumination per group.

	Participants		No. of items	Cronbach's α		Mean scores	
	ASD	TD		ASD	TD	ASD	TD
Measurement 1							
Depression [*]	78	131	26	.77	.75	1.43 (.22)	1.34 (.20)
Coping:							
Approach [*]	79	131	12	.82	.84	1.97 (.43)	2.12 (.41)
Avoidant	79	131	12	.84	.78	1.89 (.44)	1.86 (.36)
Worry/rumination	75	131	10	.83	.84	1.97 (.43)	1.94 (.45)
Measurement 2							
Depression [*]	67	112	26	.74	.72	1.47 (.21)	1.34 (.18)
Approach [*]	67	111	12	.87	.87	1.95 (.45)	2.23 (.45)
Avoidant	67	111	12	.86	.86	1.86 (.41)	1.86 (.42)
Worry/rumination	66	112	10	.86	.86	1.87 (.48)	1.88 (.44)
Measurement 3							
Depression [*]	56	87	26	.84	.77	1.40 (.26)	1.31 (.20)
Approach [*]	56	87	12	.87	.87	1.96 (.45)	2.26 (.44)
Avoidant	56	87	12	.86 [*]	.82	2.00 (.43)	1.89 (.38)
Worry/rumination	56	86	10	.82	.76	1.78 (.43)	1.91 (.39)

^{*} Indicates significant difference between mean score ASD and TD groups on $p \leq .05$.

Table 3
Overview missing data analysis.

	N	Missing		No. of extremes ^a	
		Count	Percent	Low	High
Age	212	2	.9	0	0
Age t2	180	34	15.9	0	0
Age t3	143	71	33.2	0	0
Iq block	193	21	9.8	0	1
Iq picture	192	22	10.3	2	0
Worry	206	8	3.7	0	0
Worry t2	178	36	16.8	0	0
Worry t3	142	72	33.6	0	0
Approach	210	4	1.9	0	0
Approach t2	178	36	16.8	0	0
Approach t3	143	71	33.2	0	0
Avoidant	210	4	1.9	0	1
Avoidant t2	178	36	16.8	0	1
Avoidant t3	143	71	33.2	0	2
Depression	209	5	2.3	0	7
Depression t2	179	35	16.4	0	4
Depression t3	143	71	33.2	0	6
Gender	212	2	.9		
Group	213	1	.5		

^a Number of cases outside the range (Q1 – 1.5 * IQR, Q3 + 1.5 * IQR).

^b t2 = measurement 2, t3 = measurement 3.

clustered bootstrapping. Linear regression could not be applied in a standard way because the repeated measurements on a single participant invalidated the independence assumption of linear regression. In order to obtain valid statistical tests we used a clustered bootstrap procedure (Sherman and Le Cessie, 1997). The bootstrap procedure solves the problem of dependent data, but another advantage is that the procedure makes few distributional assumptions, which makes this procedure especially suited for small sample sizes.

We differentiated between Time-constant covariates (diagnosis), and Time-varying covariates (emotion regulation strategies). Time-varying covariates can be decomposed in two variables, a mean score and a change score. These two scores reflect two different effects, a within and a between person effect (Hedeker and Gibbons, 2006). Consequently, a mean and a change score were computed based on the individual scores for Approach, Avoidant, and Worry/Rumination. The change scores show the change from the mean at Times 1, 2 and 3:

$$C_{it} = \bar{C}_i + (C_{it} - \bar{C}_i)$$

where C_{it} is the normal score, \bar{C}_i the mean score and $(C_{it} - \bar{C}_i)$ the change score.

To analyze the unique contribution of Age, Gender, Approach, Avoidant, and Worry on Depression we used multiple general linear models of the form:

$$D_{it} = \alpha + \beta_1 G + \beta_2 (T_{it} - 100) + \beta_3 \bar{C}_i + \beta_4 (C_{it} - \bar{C}_i) + \dots$$

The general linear model describes for each factor the contribution of Depression in a linear equation. Depression in the above model is comprised of an intercept α + factor * Gender + factor * Age + factor * mean score coping + factor * change score coping + ...

The models that were fitted (in R) are defined as:

Model 1 ← Depression ~ Age + Gender + Diagnosis + Mean Approach

+ Change Approach + Mean Avoidant + Change Avoidant + Mean Worry

+ Change Worry

Model 1 is a basic model in which Depression is predicted by Gender, Diagnosis, Approach, Avoidant, and Worry/Rumination. In Model 2, the interaction of Diagnosis × Avoidant was added, in Model 3 the interaction of Diagnosis × Approach was

Table 4
Correlations between all study variables at Time 1 for ASD and TD.

	Approach	Avoidant	Worry	IQ	Gender	Language	SES
Depression	-.27*	-.25*	.34*	.00	-.14	-.18	.02
Approach		-.00	.08	.06	.18	.14	.15
Avoidant			-.17	-.08	-.07	-.04	.05
Worry				-.08	.12	-.06	.17
IQ index					-.08	.39*	.00
Gender						.17	.03
Language							.03

* Indicates significance $p \leq .05$.

Table 5
Simple linear regression of model 1.

	Coefficient	Confidence interval (.95)
Age	0.001	(-0.001, 0.002)
Gender	-0.022	(-0.073, 0.029)
Diagnosis	0.066*	(0.014, 0.118)
M approach	-0.133*	(-0.186, -0.080)
C approach	-0.086*	(-0.135, -0.032)
M avoidant	-0.032	(-0.100, 0.038)
C avoidant	-0.059*	(-0.105, -0.014)
M worry	0.209*	(0.140, 0.279)
C worry	0.094*	(0.036, 0.154)

* Indicates significant contribution to Depression.

added, and in Model 4 the interaction of Diagnosis × Worry/Rumination was added. In order to decide which model fits best, added interactions should be significant. If not, the prediction of the added model is not better than the previous one.

The coefficients for the regression model 1 were derived by computing a mean score on the coefficients of each imputed dataset. To acquire the non-parametric confidence intervals (.95), the coefficients of the 10 imputed datasets were combined and new confidence intervals were calculated.

3. Results

3.1. Comparing group means

Firstly, Table 2 shows the mean scores for all indices at Time 1, Time 2 and Time 3, indicating that children with ASD score are consistently higher than TD children on Depression and lower on Approach strategies at all three time points. No other differences between the groups emerged.

Secondly, the strength of the associations between the variables was compared for both groups. Fisher's r to Z transformations did not show differences between the two groups and the correlations are therefore collapsed over group in Table 4. Avoidant and Approach strategies correlated negatively with Depression. As expected, Worry showed an opposite association with Depression.

Thirdly, the predictive validity which strategies for emotion regulation had for the prediction of Depression was examined, using General linear modeling. The results of model 1 are shown in Table 5. This model has a mean explained variance over 10 imputed datasets of $R^2 = .255$ (range .213–.298). The interactions added in models 2, 3 and 4 were non-significant, providing no additional information for model 1. Therefore, only model 1 is reported.

The average use and the change in use of Approach strategies showed a reducing effect on Depression. For example, when the mean score of Approach was 1 point higher, the score for Depression decreased with .133 points. When the participant's change score increased with 1 point, the score for Depression decreased by .086.

For Avoidant strategies, only the change in use contributed to the prediction of Depression. The mean score had no influence on the estimated Depression score. Yet, when the change score of the participant increased with 1 point, the estimate score for Depression decreased by .059.

For Worry/Rumination, the opposite effect appeared. Both the mean score of Worry/Rumination and the change score contributed to higher levels of Depression. When the participant's mean score increased by 1, the Depression score also increased by .209. When the participant's change score increased by 1, the estimated Depression score increased by .094.

Since no interaction effects were significant, these patterns applied to both groups (ASD and TD). These outcomes were also confirmed without data imputation and when only boys were included in the model.

4. Discussion

For many children, depressive symptoms increase rapidly during adolescence, starting in late childhood. This development is even more stringent for children and adolescents with ASD (Kim et al., 2000). To prevent this or support children with ASD optimally, it is important to know if the etiology of their symptoms of depression compares to that in TD children. Previous studies showed that strategies for emotion regulation approaching the stressor are related to fewer symptoms of depression in TD children but not in children with ASD (Rieffe et al., 2011); whereas avoiding the stressor was related to fewer symptoms of depression in children with ASD only (Pouw et al., 2013). Yet, these data were based on cross-sectional results, and Pouw et al. argued that the use of avoidant strategies could be a short-term solution for children with ASD, which would not hold over time. In the present study, we tested this assumption longitudinally, and unexpectedly found that not only approaching but also avoiding the stressor were strategies that contributed to fewer symptoms of depression in both children with ASD and TD children. Note however, that avoiding strategies were only beneficial if they increased over time, but not if they remained constant. As was expected, and consistent with the current literature on TD children (Abela et al., 2002; Gross, 1999) the tendency to worry or ruminate about the stressor (i.e. thinking about the stressor repeatedly approaching a solution) contributed to more symptoms of depression in both groups. Group differences only appeared when we compared mean scores: children with ASD reported higher levels of depressive symptoms, but lower levels of approaching strategies, which applied to all three time points.

The present study generated a few unexpected findings that need further consideration. Firstly, the increase of avoidant strategies contributed to fewer symptoms of depression in both groups, which seems to contrast with other studies on TD children (Pouw et al., 2013; Seiffge-Krenke and Klessinger, 2000). In the coping literature, avoidant strategies are usually considered maladaptive. The items in the avoidant scale by Seiffge-Krenke and Klessinger (2000) indeed reflect unconstructive ways of avoidant coping. Items such as "I withdraw because I cannot change anything anyway" or "I expect the worst" imply helplessness or frustration. In contrast, the items that we used in the present study, derived from the scale by Wright et al. (2010), refer to avoidant strategies that aim to create some distance, distract oneself, concentrate on something else, and thus produce some space to calm down. Wright et al. showed that children who reported more symptoms of depression were less likely to think of avoidant strategies and approach strategies, which is consistent with the outcomes of our study.

Note, however, that a constant level of avoidant strategies did not cause a change in the level of depression, but only an increase of these strategies over time. This could imply that already existent avoidant strategies have no protective power here, but that newly acquired avoidant strategies make the difference. Metacognitive capacities that strongly increase during this age period (Veenman

et al., 2004) might create a better environment for young teenagers to calm down first and down-regulate the arousal, before acting. Alternatively, instead of expanding their existing repertoire, children might also increase the use of avoidant strategies which were already in place. Future studies could more elaborately look into these possibilities.

A second unexpected – albeit positive – finding was the protective function of approaching strategies in children with ASD, whereas previous studies failed to show this relation (Pouw et al., 2013; Rieffe et al., 2011). These former studies were based on cross-sectional data. The less frequent use of approaching strategies in children with ASD compared to their TD peers might thus explain, at least partly, the higher levels of depression reported by the ASD group. This new finding can have important implications not only for our understanding of the etiology of depressive symptoms in ASD, but also for professionals and others involved in the care or treatment for this particular group.

Nevertheless, a considerable amount of variance in depressive symptoms is still not accounted for by the strategies for emotion regulation, as used in this study. Other intrapersonal factors besides emotion regulation might also be essential to further enhance our understanding of how depressive symptoms develop in children and young adolescents. For example cognitive capacities may play an influential role. The fact that the children with ASD included in this study all had an intelligence level in or above the normal range might be an extra risk factor. Feeling different from the peer group will apply especially to children with ASD who have a higher level of intelligence. A better understanding of the limitations that the ASD symptoms might cause could further increase during the young teenage years for two reasons. Firstly, during this age period, children's capacity for meta-cognition develop more rapidly, thus also their capacity to reflect on their own condition. Secondly, at this age, children increasingly change their orientation from parents to peers when they need social support or want to share their intimate or inner thoughts. Increased awareness of their own limitations as compared to the peer-group could further enhance feelings of depression.

As well as these intrapersonal factors, interpersonal factors may also play a role in this process. Social problems, being part of their diagnosis, could have a unique contribution to the development of depressive symptoms in children with ASD as can be also observed in other clinical groups (Kouwenberg et al., 2011). Kouwenberg et al. (2011) found that impaired understanding of others' (emotional) actions were relevant for deaf children in the etiology of depressive symptoms, but not for normally developing children in the control group. This might also be the case for children with ASD, who also show an inability to sustain quality friendships (Kasari et al., 2011), and also have problems in understanding and interpreting the behaviors (emotional) of others (Senju, 2012). Future studies could also include measures for children's adaptive behavioral and social functioning.

5. Conclusion

The use of new statistical procedures like imputing and bootstrapping, enabled us to decrease bias. Both techniques are increasingly acknowledged as more reliable ways for analyzing data, which might help dealing more appropriately with smaller samples that many studies face testing clinical groups. This has two advantages. Firstly, children with ASD and their parents are often overloaded with requests for participation in research, which makes it extra valuable if they do cooperate. These new techniques open the possibility to study clinical samples without having to delete cases with missing values. Secondly, time restraints and limitations of other resources (such as financial) prevent

many researchers from obtaining large samples in clinical populations. Smaller samples enhance the risk on abnormal distributions. Techniques like bootstrapping and imputing make it possible to deal with biasedly answered research questions which would not have been possible otherwise, thereby increasing our knowledge about these groups.

The outcomes of this study show that emotion regulation is an important factor in the etiology of depressive symptoms for normally developing children and children with ASD alike. The results of this study suggest that apart from approach coping strategies, that avoidant coping also prevents the development of depressive symptoms in this age range. This can have important implications for clinicians working with these groups and create new ways for dealing with everyday stress, which will be especially relevant for young teenagers with ASD.

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