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Chapter 3

The link between emotion regulation, social functioning, and depression in boys with ASD

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Abstract
Symptoms of depression are common in children and adolescents with an autism spectrum disorder (ASD), but information about underlying developmental factors is limited. Depression is often linked to aspects of emotional functioning such as coping strategies, but in children with ASD difficulties with social interactions are also a likely contributor to depressive symptoms. We examined several aspects of emotional coping (approach, avoidant, maladaptive) and social functioning (victimization, negative friendship interactions) and their relation to depression symptoms in children with ASD (N=63) and typically developing (TD) peers (N=67). Children completed a battery of self-report questionnaires. Whereas all three coping strategies (approach, avoidant, and maladaptive), and social functioning (victimization, negative friendship interactions) were significantly correlated with symptoms of depression in children with ASD, only approach and maladaptive coping and victimization were correlated with depression severity in TD boys. It seems reasonable to speculate that symptoms of depression in some children with ASD may arise in part from the child’s perceived inability to effectively deal with stress evoking situations, and consequently, the avoidance and disengagement from social situations, but this remains a topic for future study.
Introduction

Autism spectrum disorders (ASD) are associated with a wide range of psychiatric symptoms and disorders, of which depression appears to be relatively common (Gadow, Guttmann-Steinmetz, Rieffe, & De Vincent, 2012; Kim, et al., 2000; Matson & Nebel-Schwalm, 2007b; Simonoff, et al., 2008). In non-ASD individuals depression is generally characterized by a diminished interest in activities, feelings of worthlessness or guilt, and a diminished ability to concentrate or make decisions. Kim and colleagues (2000) found higher levels of depression in children with ASD based on parent-report. Owing to phenotypic overlap (e.g., prefers to be alone) and atypical manifestation of depression in ASD, it is difficult to accurately recognize and diagnose depression in these children. For example, depression in children with ASD could also be accompanied and therefore indicated by aggressive behavior, hyperactivity, self-injurious behavior, and regression of previously learned skills (Magnuson & Constantino, 2011). Although there is no longitudinal research on childhood depression in children with ASD, we know that in TD individuals onset of depression during childhood is associated with antisocial behavior, substance use, and suicide in later life (King, Iacono, & McGue, 2004; McGee & Williams, 1988; Rao, Weissman, Martin, & Hammond, 1993). Given the relatively high rate of depression symptoms in children with ASD it is important to identify factors that may contribute to the development of depression as potential targets of intervention with the possibility of preventing later-onset mental health concerns.

Coping Strategies and Depression

In general, child self-reported symptoms of depression are strongly linked to certain aspects of emotion regulation such as coping strategies in both children with ASD and typically developing (TD) peers (Rieffe, et al., 2011; Wright, et al., 2010). Coping involves regulating the emotional impact of a stressful event (Lazarus & Folkman, 1984), which is a key element for adaptive functioning. Coping strategies can be divided into three categories; approach (e.g., seeking social support, trying to solve the problem), avoidant (e.g., cognitively restructuring a stressful event, distracting oneself from the problem, ignoring the problem), and maladaptive coping (internalizing, such as thinking something bad will happen again, or externalizing/acting out, such as screaming or hitting something). Whereas very young children mainly use avoidant coping strategies to distract or remove oneself from a stressor, older children are more likely to use approach strategies, such as problem solving (Fields & Prinz, 1997).

Research in TD children has shown that ineffective coping strategies and self-reported depressive symptoms are inter-related. For example, Abela, Brozina, and Haigh (2002) showed that one maladaptive strategy, rumination, was related to an increase of depressive symptoms in children (8-12 yrs.), whereas approach and avoidant strategies were not. Wright, Banerjee, Hoek, Rieffe, and Novin (2010) also found that approach (but not avoidant) strategies were associated with fewer self-reported depressive symptoms in TD children (8-13 yrs.), but the converse was true for maladaptive strategies. Importantly, a study by Rieffe and colleagues (2011) found that children with ASD (9-13 yrs.) used fewer self-reported adaptive strategies in terms of seeking social support and trying to find a solution, compared to TD children. Whereas adaptive strategies (e.g., approach strategies) were related to less depressive symptoms in the TD group, in children with ASD they were not. However, maladaptive strategies were related to more depressive symptoms in the ASD group.
Victimization and depression

In children with ASD, it is likely that impaired social skills and negative social experiences with peers (e.g., victimization, negative friendship interactions) also contribute to dysphoria (Rieffe, et al., 2012; Whitehouse, Durkin, Jaquet, & Ziatas, 2009). Victimization is often associated with self-reported anxiety and depression (Fekkes, Pijpers, & Verloove-Vanhorick, 2004; Klomek et al., 2007) and includes such behaviors as physical pestering, name-calling, backbiting, and ignoring. Children with ASD are victimized more often than their TD peers, possibly due to their difficulties with social interactions, atypical interests, and overreactions to provocations (Cappadocia, Weiss, & Pepler, 2012; Rieffe, et al., 2012). Whereas the relation between victimization and self-reported depression in TD children is well documented, Kelly, Garnett, Attwood, and Peterson (2008) did not find this to be the case in children with ASD. However, in their study both variables were assessed with parent-report, which may not be the best way to measure these constructs (Fekkes, Pijpers, & Verloove-Vanhorick, 2005; Moretti, Fine, Haley, & Marriage, 1985). For example, parents may be less able to distinguish typical adolescent mood problems from real depression. Furthermore, a large percentage of school-age children do not tell their parents if and when they are bullied (Fekkes, et al., 2005).

Negative friendship interactions and depression

Although friendships high in positive behaviors have a nurturing influence on children’s mental health, friendships high in negative interactions such as domination, conflicts, and rivalry are related to depressive symptoms in TD adolescents (Berndt, 2002; Kouwenberg, et al., 2012; La Greca & Harrison, 2005). Berndt (2002) hypothesizes based on his earlier study showing a longitudinal relationship between negative friendship interactions and disruptive behaviors, that negative friendship interactions can lead children to adopt this interaction style in other social interactions. Therefore, they have fewer social successes, which in turn could lead to internalizing problems.

Children with ASD are known for their difficulties in forming and maintaining peer relationships. For example, they score higher on self-reported negative friendship interactions such as conflict and betrayal compared to their TD peers (Whitehouse, et al., 2009). Deficits in communication and social insight may prevent them from developing strategies to overcome interpersonal difficulties and conflicts (Carrington, Templeton, & Papinczak, 2003). Moreover, Whitehouse and colleagues (2009) found that peer conflicts and betrayal are indeed associated with symptoms of self-reported depressive symptoms in adolescents with ASD.

Present study

The aim of this study is to examine the extent to which different aspects of self-reported emotional and social functioning are uniquely related to self-reported symptoms of depression in boys with ASD, as compared to TD boys. Specifically, we examined the interrelations among coping strategies, victimization, and negative friendship interactions. Based on previous research, we expected (1) more symptoms of CDI depression in boys with ASD compared to TD boys (Kim, et al., 2000; Matson & Nebel-Schwalm, 2007b; Simonoff, et al., 2008). Furthermore, we expected (2) less use of approach strategies in boys with ASD compared to TD boys (Rieffe, et al., 2011) but did not expect differences in the use of avoidant and maladaptive strategies (Rieffe, et al., 2011). Additionally, (3) boys with ASD were expected to score higher on victimization (Cappadocia, et al., 2012; Rieffe, et al., 2012) and
negative friendship interactions (Locke, Ishijima, Kasari, & London, 2010) than their TD peers.

In both groups, we expected higher levels of maladaptive strategies to be associated with higher levels of depression (Rieffe, et al., 2011; Wright, et al., 2010). Whereas in the TD boys we expected higher levels of approach strategies to be associated with lower levels of depression, in ASD boys we did not expect a relation between approach strategies and the level of depression (Rieffe, et al., 2011). We did not expect to find a relationship between avoidant strategies and depression in TD boys (Wright, et al., 2010), yet examining the relationship between avoidant strategies and depression in the ASD group was explorative. Furthermore, we expected positive associations between victimization and depression and between negative friendship interactions and depression in both groups of youth (Berndt, 2002; Hawker & Boulton, 2000; Kouwenberg, et al., 2012; Whitehouse, et al., 2009).

Lastly, because social deficits are a defining feature of ASD, we expected these variables to uniquely contribute to the prediction of depressive symptoms. In TD boys, we predicted that the relation between social problems and depressive symptoms is mediated by the child’s ability to effectively regulate his emotions (i.e., coping strategies) (Wright, et al., 2010).

Method

Participants
The ASD sample included 63 high functioning boys diagnosed with ASD (Mage = 139 months, SD = 15.1). Diagnoses were based on the Autism Diagnostic Interview-Revised (Lord, et al., 1994) administered by child psychiatrists. All boys had IQ scores above 80 and were recruited from facilities that specialized in treating and diagnosing children with ASD. The TD group was comprised of 57 typically developing boys (Mage = 138 months, SD = 15.4 ) and was drawn from primary and secondary schools in the Netherlands. TD boys had to have IQ > 80, and no diagnosed developmental disorders. Only boys who completed all self-report questionnaires were included in this study. Groups did not differ in age, IQ, and SES.

Procedure
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 (73 boys) gave their consent to participate in the study. The boys were visited at home or institutions and were asked to answer computer-presented questions in a notebook. Questions were presented on the screen with possible answers in boxes underneath. Participants could answer the questions by clicking on the laptop. Children were ensured that their answers would stay anonymous. Parents were asked to complete questionnaires. The Ethics Committee of the Centre for Autism granted permission for the study.

Measures
Depression. Depression was measured with an adapted version of the Child Depression Inventory (CDI) (Kovacs, 1985), which contains 26 multiple choice items about a specific symptom of depression (for example: “I feel alone”; “I am happy with the way I look”). We removed the item about suicide. The original version consists of three sentences per item. We converted these sentences to one sentence with three short possible answers, in order to make it easier for children with ASD (Theunissen et al., 2011). An example item is “I am tired”, which children could answer on a 3-
point scale (1 = *sometimes*, 2 = *often*, 3 = *always*). Scores on positively formulated items were reversed. The internal consistency of the adapted version was good (Table 1).

*Coping strategies*. Coping strategies were measured by the *Coping Scale* (Wright, et al., 2010) which consists of 34 items. Boys were asked what they would do if something bad has happened. Three different coping strategies are assessed: Approach Coping (example items: “I tell a family member or a friend what has happened”, “I try to find a solution for the problem”), (b) Avoidant Coping (example items: “I’ll do something that makes me forget the problem”, “I would say that I don’t care”), and (c) Maladaptive Coping (example items: “I get angry and I'll throw or hit something”, “I’ll think about it so much that I cannot sleep”). Response choices were *almost never*=1, *sometimes*=2, and *often*=3.

*Social functioning*. Victimization was measured by the *Bully Questionnaire* (Rieffe, et al., 2012), which consists of 20 items with a 3-point scale: 1 = *almost never*; 2 = *sometimes*, 3 = *often*). For this study only the 10 items concerning victimization were used. First, boys were given an elaborate introduction on bullying and informed that their answers would be kept secret. They were then asked if, in the last 2 months, they had been bullied (e.g., “Did someone say mean things to you?”, “Did someone say mean things about you behind your back?”).

Nine items referring to negative friendship from the Best Friend Index (BFI) (Kouwenberg, et al., 2012) were used to measure negative features such as conflict, dominance, jealousy, and betrayal (e.g., “I don’t like it when my friend does something better than I do”, and “My friend decides what we are going to do”). First, boys were asked whether they have a best friend (yes/no). Second, they were asked to write down their best friend’s name, after which they could answer the items on a 3-point scale (1 = *(almost) never* to 3 = *often*).

IQ. IQ 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. In a study from Theunissen and colleagues (2013) it is found that the total scores of the two subtests highly correlate with complete IQ test scores.

Statistical Analyses

T-tests were conducted comparing the two groups of boys for level of CDI depression, coping strategies, victimization, and negative friendship interactions. Next, Pearson correlations were performed to assess relations among study variables. Age and IQ were not significantly correlated with any of the dependent variables and were therefore not considered in these or remaining analyses. As a rule of thumb for determining the magnitude of correlations, Cohen (1988) suggests the following: *r* >0.50=large, 0.50-0.30=moderate, and 0.29-0.10=small. Finally, two hierarchical regression analyses were carried out separately for each group of boys with CDI depression as the outcome variable and coping strategies and aspects of social functioning as predictors using SPSS version 19.0.
Table 1.  
Psychometric Properties of the Study Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>n items</th>
<th>Cronbach’s α</th>
<th>M and SD</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>ASD</td>
<td>TD</td>
<td>ASD</td>
</tr>
<tr>
<td>Depression*</td>
<td>26</td>
<td>.78</td>
<td>.71</td>
<td>1.42</td>
<td>.22</td>
</tr>
<tr>
<td>Approach coping</td>
<td>12</td>
<td>.83</td>
<td>.82</td>
<td>1.94</td>
<td>.43</td>
</tr>
<tr>
<td>Avoidant coping</td>
<td>12</td>
<td>.85</td>
<td>.71</td>
<td>1.91</td>
<td>.46</td>
</tr>
<tr>
<td>Maladaptive coping</td>
<td>10</td>
<td>.77</td>
<td>.55</td>
<td>1.54</td>
<td>.39</td>
</tr>
<tr>
<td>Victimization*</td>
<td>10</td>
<td>.81</td>
<td>.77</td>
<td>1.63</td>
<td>.39</td>
</tr>
<tr>
<td>Negative friendship features*</td>
<td>9</td>
<td>.72</td>
<td>.68</td>
<td>1.30</td>
<td>.30</td>
</tr>
</tbody>
</table>

Note. All questionnaires have a range from 1 – 3  
*p < .05

Results

Differences between groups on the study variables
All dependent variables showed moderate to good internal consistencies (Chronbach’s alpha) in both groups (see Table 1). There were no differences between the groups for the three coping strategies. Yet as expected, children with ASD had higher levels of self-reported symptoms of depression ($t(118) = 2.01, p \leq .05, d = .39$), victimization ($t(118) = 2.56, p \leq .05, d = .45$), and negative friendship interactions ($t(118) = 2.21, p \leq .05, d = .39$). The variables accounted for 55% of the variance.

Associations of Depression with Coping, Victimization, and Negative Friendship Features
There were moderate to strong correlations between self-reported depressive symptoms and all the other variables in the ASD group. In the TD group, only maladaptive coping and victimization correlated moderately with depression, and maladaptive coping correlated strongly with self-reported symptoms of depression in the TD group (Table 2).

Table 2 shows the regression analyses for ASD and TD groups separately. For boys with ASD, approach and avoidant coping negatively predicted symptoms of depression, but maladaptive coping positively predicted symptoms of depression. Independently of coping strategies, victimization and negative friendship interactions positively predicted symptoms of depression in ASD boys. These variables accounted for 52% of the variance in depression in the ASD group. In the TD group, only approach coping negatively predicted symptoms of depression, and maladaptive coping positively predicted symptoms of depression. These variables accounted for 37% of the variance in depression severity.
Table 2.  
Correlations and Hierarchical Multiple Regression Analyses Predicting Depression of Coping Strategies, Victimization, and Negative Friendship Features

<table>
<thead>
<tr>
<th></th>
<th>Depression ASD</th>
<th></th>
<th></th>
<th>Depression TD</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( r )</td>
<td>Adj. ( R^2 )</td>
<td>( \beta )</td>
<td>( p )</td>
<td>Adj. ( R^2 )</td>
<td>( \beta )</td>
</tr>
<tr>
<td>Approach coping</td>
<td>-.37\ (***)</td>
<td>.52\ (***)</td>
<td>-.36</td>
<td>.000</td>
<td>-.30\ (*)</td>
<td>.37\ (***)</td>
</tr>
<tr>
<td>Avoidant coping</td>
<td>-.34\ (***)</td>
<td>-.29</td>
<td>.002</td>
<td>-.12</td>
<td>-.13</td>
<td>.243</td>
</tr>
<tr>
<td>Maladaptive coping</td>
<td>.40\ (***)</td>
<td>.24</td>
<td>.025</td>
<td>.57\ (***)</td>
<td>.44</td>
<td>.001</td>
</tr>
<tr>
<td>Victimization</td>
<td>.54\ (***)</td>
<td>.26</td>
<td>.018</td>
<td>.43\ (***)</td>
<td>.20</td>
<td>.105</td>
</tr>
<tr>
<td>Negative Friendship</td>
<td>.37\ (***)</td>
<td>.25</td>
<td>.012</td>
<td>.05</td>
<td>.00</td>
<td>.986</td>
</tr>
</tbody>
</table>

\( *p<.05 \) \( **p<.01 \) \( ***p<.001 \)
Discussion

The aim of this study was to examine the extent to which aspects of emotional and social functioning are (uniquely) related to symptoms of depression in children with ASD, as compared to TD peers. Boys with ASD scored higher on depression, victimization, and negative friendship features than TD boys, which is consistent with prior research (Cappadocia, et al., 2012; Kim, et al., 2000; Rieffe, et al., 2012) and supports the notion that the social deficits associated with ASD influence social relations with peers. Furthermore, boys with ASD reported to use approach, avoidant, and maladaptive strategies just as often as their TD peers, which was only partly in line with our expectations.

Boys with ASD scored higher on depression, victimization, and negative friendship features than TD boys, which is consistent with prior research (Cappadocia, et al., 2012; Kim, et al., 2000; Rieffe, et al., 2012) and supports the notion that the social deficits associated with ASD influence social relations with peers. Furthermore, boys with ASD reported to use approach, avoidant, and maladaptive strategies just as often as their TD peers, which was only partly in line with our expectations.

We examined the strength of the relation of depression with the use of coping strategies and victimization and negative friendship interactions. Regulating the emotional impact of a stressful event by finding a solution or seeking social support (e.g., approach coping) was associated with less severe symptoms of depression in both groups. Additionally, maladaptive coping was related to more symptoms of depression, which confirms the idea that in children with ASD depression could be indicated by for example externalizing behaviour (Magnuson & Constantino, 2011). Yet, only in ASD boys, was avoidant coping correlated with higher levels of depression. Furthermore, being bullied or having low quality friendships also uniquely contributed to depression in children with ASD. Although victimization was also highly correlated to symptoms of depression in the TD group, this association was no longer significant in the regression model including also coping measures.

The fact that approach coping strategies were related to less symptoms of depression in both groups partly contradicts finding from the study from Rieffe and colleagues (2011). In their study they found that certain adaptive strategies such as acceptance (e.g., “I think that I can’t do anything about it”), and positive reappraisal (“I think I can learn from it”) were related to less depressive symptoms in TD children but not ASD. This contradicting finding could be explained by the use of different coping questionnaires. Whereas both coping questionnaires tap into adaptive strategies, the questionnaire used by Rieffe and colleagues (2011) only measures cognitive coping strategies (e.g., “I think of the best way to handle it”), whereas the questionnaire used in this study measures behavioural coping strategies (e.g., “I’ll do something that makes it alright again.”). The finding that behavioural but not cognitive coping strategies are beneficial in children with ASD might prevent them from regulating their emotions in situations that are beyond their control, thus in which behavioural strategies cannot be applied (e.g., with the death of a beloved person).

However, our findings also indicate that avoidant strategies are beneficial for children with ASD. Avoidant coping in TD children is often a consequence of appraising an emotion evoking situation as being uncontrollable (Rieffe, Meerum Terwogt, & Jellesma, 2008). In other words, when TD children encounter an emotion provoking situation that they perceive as being beyond their ability to successfully manage, they more often shy away from the problem without experiencing depressive symptoms (Wright, et al., 2010). This might apply to many situations for children with ASD, especially when they are social. Thus, avoidance may decrease the overarousal associated with a stressful situation in children with ASD. This idea is in alignment with a finding from a previous study by Rieffe and colleagues (2011) showing that hiding one’s own emotions is related to fewer emotional symptoms, such as worry and rumination in ASD children, whereas the opposite holds for TD peers. Again, this points to the idea that children with ASD seem aware (in terms of self-reported coping strategies) of the fact that turning away from a stressful situation or problem decreases discomfort and prevents inappropriate reactions to the stress
evoking situation. However, in the long term avoidant coping may be a risk for impaired social development. Future longitudinal research should examine how avoiding stressful situations influences social functioning in children with ASD.

Although there were no differences found between the use of coping strategies between the two groups, outcomes show that boys with ASD score higher on victimization and negative friendship interactions than TD peers. Additionally, both indices for negative peer experiences contributed uniquely to more symptoms of depression, but this was not the case for TD boys. This illustrates the unique effect of social deficits in ASD (Rieffe, et al., 2012). Possibly, as a consequence of these negative experiences and accompanied feelings of depression children with ASD avoid social situations and therefore exclude themselves even more from social processes, which presents itself in higher levels of loneliness in children with ASD (Bauminger & Kasari, 2000). Again, these results point to the idea that whereas avoiding stress evoking social situations could be effective in the short-term, adopting avoidant coping strategies as a general strategy for managing social interactions could create social exclusion, feelings of loneliness, and therefore depressive symptoms in the long-term (Ottenbreit & Dobson, 2004).

Interestingly, whereas negative friendship interactions were associated with symptoms of depression in boys with ASD, in TD boys they were not, which contradicts the findings of a study by Kouwenberg and colleagues (2012). However, in the study from Kouwenberg and colleagues boys and girls were included, which could have led to other results. Possibly, negative friendship interactions have a differentially greater impact on girls in terms of developing depression. An explanation could be that in TD boys friendships are by nature characterized by more negative features, such as conflicts or competition. Whereas boys with ASD are more vulnerable to these negative friendships features due to impaired social understanding or overarousal, TD boys might be more accustomed to these kind of behaviours. In other words, conflicts and competitions in TD boys’ friendships do not necessarily have to lead directly to internalizing problems, because these behaviours are possibly more akin to the way TD boys interact with each other (Rose & Rudolph, 2006).

Strengths and Limitations
An important strength of the present study is the use of self-report measures. Most research in this area relies heavily on information obtained from caregivers. However, studies of TD youth indicate only modest convergence between parent and child self-report of depression (Epkins & Meyers, 1994). Although many youth with ASD have low intellectual ability posing a serious challenge to self-report, higher functioning youth appear to be able to provide reliable and valid information. For example, as in previous studies, self-report questionnaires showed moderate to good internal consistencies in both groups, supporting the validity of these measures for children with ASD (Hill, et al., 2004; Pouw, et al., 2013; Rieffe & De Rooij, 2012).

Because the present study was cross-sectional, we are unable to draw conclusions about the causality of reported relations among variables. Nevertheless, it seems reasonable to hypothesize that children who experience depressive symptoms such as a sense of hopelessness and reduced social motivation, tend to use fewer coping strategies such as problem solving and social support, but instead vent their stress through rumination or acting out which in turn could exacerbate depressive symptoms (Wright, et al., 2010). Furthermore, the relation between victimization and depression also appears to be reciprocal in a sense that children become more depressed as a consequence of being bullied, and that children with depressive symptoms are more withdrawn and less able or motivated to defend themselves, and
are therefore increasingly at risk to be victimized (Storch & Ledley, 2005). Future studies should further examine these causal relationships.

**Clinical Implications**

Based on the personal experiences of the first author during the testsessions, it seems that parents of children with ASD also apply avoiding strategies when their children are overaroused. A specific example during a test session is that of a child who did not want to continue playing a frustration-evoking puzzle and got mad and started yelling. The mother, who was in the room, picked up her child and turned him away from the table and told him to count to ten. Although this strategy was effective in the short-term, the long-term benefits of avoiding strategies in children with ASD are questionable. Both children with ASD and their parents seem aware of the child’s inability to effectively deal with a stressful situation. An alternative strategy for the child in this example is to teaching him/her to ask for help when he cannot solve a puzzle, thus prevention of being cut off from the social situation.

**Concluding Remarks**

The results of this study show that for children with ASD, aspects of emotion regulation as well as aspects of social functioning are related to symptoms of depression. It appears as if negative peer experiences and ineffective coping strategies contribute to or exacerbate social deficits and depression. Such children might benefit from learning alternative strategies that promote social interaction and ‘using’ their social environment for their own benefits. Hopefully these findings will encourage future research into better prevention and treatment trajectories for depression in children with ASD.