Social attribution processes and comorbid psychiatric symptoms in children with Asperger syndrome

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Abstract

The factors that place children with Asperger syndrome at risk for comorbid psychiatric symptoms, such as anxiety and depression, remain poorly understood. We investigated the possibility that the children's emotional and behavioral difficulties are associated with social information and attribution processing. Participants were children with either Asperger syndrome ($n = 31$) or typical development ($n = 33$).To assess social information and attribution processing, children responded to hypothetical social vignettes.They also completed self-report measures of social difficulties and psychological functioning. Their parents provided information on social competence and clinical presentation. Children with Asperger syndrome showed poor psychosocial adjustment, which was related to their social information and attribution processing patterns. Cognitive and social-cognitive abilities were associated with aspects of social information processing tendencies, but not with emotional and behavioral difficulties. Results suggest that the comorbid symptoms of children with Asperger syndrome may be associated with their social perception, understanding, and experience.

Keywords

Asperger syndrome; comorbid symptoms; social information processing

In his original case descriptions, Asperger (1944) highlighted pervasive deficits in the children's capacity to understand social interaction, awareness of their social difficulties, and emotional symptoms, including anxiety and depression (Wing, 1981). Since then, emotional symptoms in adolescents and young adults with Asperger syndrome have been emphasized in a number of reports (Volkmar et al., 2000; Wolff and Chick, 1980; Wolff and McGuire, 1995; Wing, 1981). Recently, several empirical studies have documented comorbid psychiatric symptoms, such as anxiety and depression, in individuals with high-functioning autism (HFA) and Asperger syndrome (Ghaziuddin et al., 1998; Green et al., 2000; Hill et al., 2004; Howlin, 2000; Kim et al., 2000; Rinehart et al., 2002; Rumsey et al., 1985; Tonge et al., 1999). Disruptive and aggressive behavior has also been reported (Eaves et al., 1994; Muris and

Steerneman, 1998; Pomeroy, 1998; Rinehart et al., 2002; Tantam, 2000; Tonge et al., 1999). However, the factors giving rise to these comorbid psychiatric symptoms remain unclear.

Despite the often intense desire to do so, many individuals with Asperger syndrome find it extremely difficult to establish reciprocal relationships with others (Barnard et al., 2000; Green et al., 2000; Sigman and Ruskin, 1999). Limitations in the capacity for intersubjective contact with others (Hobson, 1992; Mundy and Sigman, 1989), coupled with repeated experiences of negative, unsuccessful social interactions (Bauminger, 2002; Frith, 1996; 2004; Klin and Volkmar, 2003; Tantam, 2000; 2003) may place children with Asperger syndrome at special risk for adjustment difficulties. This perspective was asserted by Asperger (1944) and later highlighted by Wing, who noted that 'clinically diagnosable anxiety and varying rates of depression … seem to be related to a painful awareness of handicap and difference from other people' (1981, p. 118). If this is the case, there may be variability among children with this disorder in their social perception, understanding, and experience, with implications for the development of comorbid psychiatric symptoms. One probable candidate for psychiatric symptom development and maintenance may be the manner in which children with Asperger syndrome interpret their social interactions.

Information processing in social situations

In their attempts to understand individual differences in psychopathological development among children, Crick and Dodge (1994) have suggested that the networks of processes involved in social interpretations, attributions, and responses often relate to children's psychological adjustment. According to this model, children engage in several steps when understanding social situations. First, they encode and then interpret social cues in order to make sense of the interaction, and next they consider potential behavioral responses. Children may exhibit specific processing styles, often based on negative experiences with peers, which serve to disrupt further social interaction. For example, a bias towards perceiving negative intent in ambiguous provocative situations, known as a hostile attribution bias, is a characteristic processing style related to aggressive behavior, withdrawal, and difficulty with peer relations.

Hostile attribution biases have been observed among children with conduct disorder, depression, and paranoid ideation (Dodge, 1993; Quiggle et al., 1992; Turkat et al., 1990), and are associated with feeling threatened (Dodge and Somberg, 1987) and impulsivity (Dodge and Newman, 1981). Several factors such as past experiences, the child's own emotional style and capacity for self-regulation, their ability to encode the affective cues and signals of others, and their empathic responsiveness may all play important roles in children's social information processing tendencies (Lemerise and Arsenio, 2000).

Social attribution processes have rarely been studied in children with autism spectrum disorders, possibly based on the assumption of globally impaired social-cognitive abilities. Even though their intellectual level and verbal abilities are high relative to those with HFA, children with Asperger syndrome often display abnormalities in the domains of executive functions (e.g. planning and flexibility, and to a lesser extent inhibition), the ability to consider the beliefs and intentions of others (e.g. theory of mind, ToM) and emotional decoding (Capps et al., 1992; Dahlgren and Trillingsgaard, 1996; Klinger and Renner, 2000; Macdonald et al., 1989; Ozonoff and Griffith, 2000; Ozonoff et al., 1991b; Schultz et al., 2000). These abnormalities may contribute to social information processing impairments such as difficulty in detecting, interpreting and responding to inappropriate behavior demonstrated by adult actors in videotaped vignettes and providing socially relevant and appropriate explanations (Loveland et al., 2001). Yet, despite social-cognitive difficulties, children with Asperger syndrome may still attempt to interpret social information, even if these interpretations are

based on faulty information. The quality and nature of these interpretations may be relevant for the children's psychosocial adjustment.

Indeed, the tendency to make inferences about the actions of others as reflecting negative or hostile intention may be present among some children with Asperger syndrome. Barnhill (2001) has suggested that attributions about self or others may be closely linked to comorbidity in children with high-functioning autism. In another study, Blackshaw et al. (2001) found that individuals with Asperger syndrome scored lower on theory of mind and higher on a measure of paranoid attributions than controls. These authors reported that the paranoia was of an unusual quality, in that it stemmed from confusion or perplexity about social situations and involved heightened social anxiety and self-consciousness. Frith (2004) maintained that individuals with Asperger syndrome, due to limitations in their ability to appreciate multiple perspectives, may be prone to suspicion and hostile attributions. Thus, social-cognitive difficulties in Asperger syndrome may not preclude social interpretations and attributions but rather may predispose these children to imperfect social interpretations and attributions, hence contributing to the development of comorbid symptoms.

Hypotheses and predictions

Our principal hypothesis was that comorbid psychological adjustment difficulties found in children with Asperger syndrome would be associated with disturbances in information processing related to social attributions. To test this, we examined how individual differences in attributional thinking were associated with social competence, social distress, and psychiatric symptoms among children with Asperger syndrome. As two subsidiary sets of exploration, we also considered: (1) whether social-cognitive and cognitive skills were associated with performance on the social attribution measures; and (2) whether low empathy was specifically associated with aggression. Although it is likely that multiple factors contribute to the development of psychiatric comorbidity in Asperger syndrome, the purpose of this study was to explore the plausibility of a model in which social information/attribution processing tendencies might be associated with and reflect comorbid psychiatric symptoms in the children.

Method

Participants

Children with Asperger syndrome—Participants with Asperger syndrome ($n = 31$, 26 boys) were recruited for this study through a clinic database. Each of the children had previously received a clinical diagnosis of Asperger syndrome.The parents of children with Asperger syndrome participated in an extensive clinical diagnostic interview, which included a thorough developmental history, a DSM-IV criteria checklist (American Psychiatric Association, 1994), and diagnostic screening measures using Gillberg and Gillberg's (1989) along with Szatmari et al.'s (1989) criteria. All of the children with Asperger syndrome exhibited (1) marked abnormalities in reciprocal social interaction and non-verbal communication, alongside (2) restricted patterns of behavior and interests, but (3) without clinically significant delays in language or cognitive development.

Comparison group—Our comparison group comprised 33 children (24 boys) not affected by clinical features of autism or Asperger syndrome. Sixteen were referred through participation in ongoing university-based studies of typical development (not related to this project) or recruited through a university-affiliated elementary school and were reported to have no history of learning or emotional disturbance. Seventeen participants were recruited from a group of children receiving clinic-based psycho-educational assessments for academic (learning and attention) difficulties. Including this diverse range of children allowed us to create

a matched comparison group with regard to both verbal and non-verbal mental as well as chronological age (see Table 1).

Diagnostic screening—In order to ensure that the groups were markedly different with respect to clinical features of autism spectrum disorders, parents of children from both groups were asked to complete two screening checklists. Parents completed the High-Functioning Autism Spectrum Screening Questionnaire (ASSQ: Ehlers et al., 1999), a valid and reliable 27-item (score 0–2) parent report checklist. Scores for children with Asperger syndrome and those in the comparison group were: $M = 28.66$, SD = 10.41, range = 9–52 versus $M = 4.19$, SD = 4.54, range = 0–16, respectively. Parents also completed the Australian Scale for Asperger's Syndrome (ASAS: Attwood, 1998), another instrument that has been recommended for diagnostic screening of children with Asperger syndrome (Filipek et al., 1999). The ASAS is a 24-item checklist with a 0 (rarely) to 6 (frequently) scoring system for each item. Scores for children with Asperger syndrome and those in the comparison group were: $M = 96.59$, SD = 19.22, range = 53–142 versus $M = 15.31$, SD = 19.74, range = 0–75, respectively. Thus, the groups were significantly different on both measures, with almost no overlap in the distributions for scores.

Matching procedures—Verbal and non-verbal mental ages were assessed using a reliable abbreviated version of the Wechsler Intelligence Scale for Children–Third Edition (WISC–III: Wechsler, 1991). According to procedures outlined by Sattler (1992), children were administered two verbal (information and vocabulary) and two performance (picture completion and block design) subtests to obtain verbal and performance IQ estimates, and to calculate the children's estimated verbal and non-verbal mental ages.

Primary measures

Comorbid psychiatric symptoms

Child report: Participants completed the Behavior Assessment System for Children Self-Report of Personality (BASC–SRP: Reynolds and Kamphaus, 1998), with statements read by the child and marked as true or false. The mean of participants' standardized *T*-scores on the anxiety and depression subscales were used to provide an index of *self-report of comorbidity*.

Parent report: Parents of participants completed the Behavioral Assessment System for Children–Parent Report Scale (BASC–PRS: Reynolds and Kamphaus, 1998), a comprehensive and standardized measure of child social skills and problem behaviors. Items are presented as statements that could be answered on a 0 to 4 response scale as 'not at all' to 'very' descriptive of the child.The mean of participants' *T*-scores on the aggression, atypicality, anxiety, and depression scales was selected *a priori* and taken to provide a *parent report of comorbidity* composite.

Social functioning/awareness

Child report: To assess the children's perceived social functioning, we used two subscales from the Behavior Assessment System for Children Self-Report of Personality (BASC–SRP: Reynolds and Kamphaus, 1998).We subtracted the child's interpersonal relations standardized *T*-score (an adaptive scale, which includes items such as 'My friends are usually kind to me' and 'People think I am fun to be with') from the child's social stress *T*-score (a symptom scale, which includes items such as 'I am lonely' and 'I am bothered by teasing from others') to create a *social relations composite score*. Scores on these two scales were highly correlated within the Asperger syndrome sample ($r = -0.55$, $p < 0.01$). To assess for heightened sensitivity to social problems, we asked children to complete the Social Anxiety Scales for Children–Revised

(SASC–R: La Greca and Stone, 1993) 'fear of negative evaluation from peers' (FNE) scale.The FNE scale consists of seven items (e.g. 'I worry about being teased' and 'I'm afraid that others will not like me'). Children are asked to rate each item on a scale from 1 (not at all) to 5 (all of the time).

Parent report: Parents completed the Social Competence Inventory (SCI: Rydell et al., 1997). This 29-item questionnaire uses a five-step response scale ranging from 1 (doesn't apply at all) to 5 (applies very well) to assess child social skills. The SCI yields two factors: the prosocial orientation factor, which concerns empathy and emotional relatedness, and the social initiative factor, which focuses on the child's tendency to either initiate contact or withdraw in social situations.

Social information and attribution processing

Paper-and-pencil task: Participants completed the Why Kids Do Things (WKDT) measure (Crick and Dodge, 1996). The children read a series of 10 hypothetical vignettes depicting provocation situations where peer intent is ambiguous and were asked to imagine the story happens to them (e.g. a peer breaks the participant's new radio while the participant is out of the room). For the first question, children were asked to circle one of four presented reasons for the provocation, two reflecting hostile and two benign intent (e.g. the kid was mad at me versus the radio broke easily). For the second question, children were asked to determine if the characters in the story were 'trying to be mean' or 'not trying to be mean'. On the third and final question for each story, children were asked to rate their feelings of distress, if the story were to happen to them (not at all, a little, or very). Children's responses to all three items were summed across the 10 stories to yield a single score for this measure. Intent attributions (both instrumental and relational) and distress (both instrumental and relational) were highly intercorrelated on this measure, justifying the use of a single score.

Video vignettes: Participants were presented with a series of 24 videotaped vignettes of social provocations (as described by Dodge et al., 1995). In these vignettes, children act out a variety of brief social interactions involving themes such as peer group entry, friendship initiation, peer rebuff, and object acquisition. After each vignette was presented, the participants were asked a standard set of questions designed to elicit attributions regarding the 'peer' behavior witnessed in the vignette, as well as information processing patterns related to attributions. All responses were videotaped and later transcribed and coded according to specific criteria outlined in the accompanying manual (Brown and Lemerise, 1990; Crick and Dodge, 1994; Dodge et al., 1995).

The ability to encode social cues was examined by asking the child, 'What happened in the story?' Responses received a 0 when they contained only information actually present in the video story as well as a mention of the provocation. They were scored as a 1 when information described was not actually in the video story or the provocation was not mentioned, and a 2 under circumstances where the child reported missing the entire story or gave only information not on the tape. A *social encoding score* was formed for each participant by summing the total response score across all 24 stories. Higher scores on this measure, thus, reflect greater social encoding errors. Inter-rater reliability for encoding errors (completed for 360 vignettes) was excellent (100 percent agreement).

Child intent attributions were determined by asking the child 'Why did this happen?' and providing a standard prompt when needed to ascertain the intent attribution. Any indication that the actor did the behavior on purpose or in order to be mean was coded as a 1 for hostile. Indications that the behavior of the actor was unintentional, accidental, or due to rule following were coded as 0 for non-hostile. Responses to this item were summed across the 24 vignettes

and divided by the number of vignettes seen to obtain a percentage of *hostile attributions*. Higher percentage scores, thus, reflected greater hostile intent attributions. Inter-rater reliability for hostile attributions (based on 360 vignettes) was substantial (kappa = 0.98).

The participant's behavioral responses were assessed by asking the child, 'What would you say or do if this happened to you?' Responses to this question were coded into one of three categories: aggressive, passive-inept, or assertively competent behaviors. Aggressive behaviors included any reported act of physical or verbal aggression, threats of retaliation, or turning to an adult for punishment. Passive-inept behaviors included unsuccessful strategies such as doing nothing, leaving the situation, or telling an adult. Assertive behaviors included compliments, mutual sharing, finding other peers to play with, or other responses that were relevant, prosocial, and assertive. Inter-rater reliability for category of behavioral response (360 vignettes) was very good (kappa = 0.68).

Subsidiary measures of executive/social-cognitive ability

We screened for competence in three domains of executive function: flexibility, verbal inhibition, and planning. Persons with HFA show consistent deficits in planning and flexibility, with inhibition more relatively spared (Ozonoff and Jensen, 1999). Flexibility was assessed using the planned connections subtest (similar to trail-making) of the Cognitive Assessment System (CAS: Naglieri and Das, 1997). Inhibition was measured using a modified Stroop color-word test, the expressive attention subtest of the CAS. To assess planning and organization, the mazes subtest of the WISC–III was administered. Participants' standard scores on each of these three subtests were used in subsequent analyses.

To screen for theory of mind deficits, each child was presented with the standard M&Ms False Belief Task (see Ozonoff et al., 1991a; Perner et al., 1989) and a more difficult standard second-order belief attribution task (see Baron-Cohen, 1989; Ozonoff et al., 1991a; Perner and Wimmer, 1985).

We assessed emotion decoding difficulties using two measures. The Emotional Processing Task (EPT: Green et al., 1999) is presented via audio-cassette, as a test of ability to judge the emotion expressed in another person's voice. Participants also completed the Children's Test of Receptive Emotional Prosody (CTREP: Cohen et al., 1990), a measure of the comprehension of visual emotional gesturing (mute video presentation), auditory emotional prosody (audiotape without visual accompaniment), and a combined auditory and visual emotional presentation using videotaped vignettes of an actress presented with sound. A composite *affective decoding score* was subsequently formed by summing total correct from the EPT (0–45 possible) and total correct on the CTREP (0–45 possible) for a total possible score ranging from 0 to 90.

Results

Data were analyzed using parametric statistics for standardized instruments with normally distributed scores and non-parametric statistics for all other measures, where the ranges were limited and data tended to be skewed. Tests of significance were conducted at a two-tailed level. In cases where data were missing (see Table 2 for details), checks were conducted to ensure the groups remained similar on matching variables.

Between-group comparisons

Comorbid symptoms—Compared with the control group, children with Asperger syndrome were rated by their parents as exhibiting significantly greater overall behavioral-emotional symptoms ($U = 105.00$, $z = -4.49$, $p < 0.000$), with a mean score in the clinical range.

The children themselves also reported greater emotional symptoms ($U = 290.50$, $z = -2.0$, $p < 0.05$). The patterns were similar across each of the subscales (see Table 3).

Social functioning—Parent report on the SCI indicated that children in the Asperger syndrome group were impaired in both prosocial behavior ($U = 38.00$, $z = -5.72$, $p < 0.000$) and social initiative ($U = 54.00$, $z = -5.45$, $p < 0.000$). Children with Asperger syndrome were more likely than those in the comparison group to self-report social difficulties, as revealed by their BASC social relations scores ($U = 246.5$, $z = -2.69$, $p < 0.01$), and social anxiety, as shown by their higher SASC–R fear of negative evaluation scores ($U = 274.5$, $z = -3.05$, $p < 0.01$).

Social information processing—On the video measure, children with Asperger syndrome made significantly more encoding errors ($U = 272.50$, $z = -3.24$, $p < 0.0001$). By way of illustration, none of the children in the comparison group (compared with eight in the Asperger syndrome group) scored higher than 3 on this index. Children with Asperger syndrome gave more passive responses ($U = 257.5$, $z = -3.28$, $p < 0.001$), as well as significantly fewer assertive responses ($U = 214.50$, $z = -3.89$, $p < 0.000$). However, the groups were similar with regard to the propensity to make hostile intent attributions on the video (Asperger syndrome group, $M = 68\%$, SD = 12%; control group, $M = 66\%$, SD = 18%), and there was no evidence of a group difference in the propensity to give aggressive responses or make hostile attributions on the WKDT questionnaire.

Executive and social-cognitive skills—In relation to the comparison group, children with Asperger syndrome exhibited deficits in cognitive flexibility, $t(61) = -3.35$, $p < 0.001$, and theory of mind (ToM) ($\chi^2 = 11.08$, $p < 0.01$), and also made more errors on the emotion decoding composite, $t(60) = 2.38$, $p < 0.02$.

Within-group associations

Comorbid symptoms—Analyses revealed consistent evidence in keeping with our principal hypothesis that social information processing patterns would be related to comorbid symptoms. Parent report of child comorbidity was associated with social encoding errors on the video, $r(28) = 0.51$, $p < 0.001$; hostile intent attributions, $r(28) = 0.42$, $p < 0.05$; and the WKDT score reflecting hostile intent attributions combined with distress, $r(26) = 0.44$, $p < 0.05$. Child report of comorbidity was associated with social encoding errors, $r(27) = 0.39$, $p < 0.05$, and their WKDT scores, $r(26) = 0.50$, $p < 0.01$. Given the number of associations among the social information processing and comorbidity variables, we also examined relations among specific aspects of comorbidity and individual components of the social information processing scores. These results are presented in Table 4, and provide further evidence of a consistent pattern of associations between social information processing and comorbid symptoms.

Neither parent report nor child self-report of comorbid symptoms were significantly associated with IQ, chronological age, executive function scores, emotion processing ability, or ToM performance. Parent report of social competence was not related to parent or child report of comorbidity. Parent and child reports of comobidity were not significantly associated. Although not significant, we found some evidence of an association between child report of comorbidity on the BASC and child report of fear of negative evaluation (FNE) from peers on the SASC–R, $r(27) = 0.37$, $p < 0.06$. Further, child report of social difficulties on the BASC was significantly associated with child report of emotional comorbidity on the BASC, $r(27) = -0.59$, $p < 0.001$, although this particular observation may reflect shared measure variance.

Social functioning/awareness—The three social functioning/competence variables were not associated with verbal or non-verbal ability or with chronological age in the Asperger syndrome sample. The one exception to this was a non-significant negative association between chronological age and social initiative, $r(29) = -0.31$, $p < 0.10$, which suggests that children with Asperger syndrome may become less likely to initiate interactions as they get older. Children with Asperger syndrome who self-reported heightened sensitivity to rejection and teasing from their peers on the SASC–R FNE scale were rated by their parents as having fewer prosocial skills on the SCI, $r(29) = -0.38$, $p < 0.05$; however, parent report of social competence was not associated with the children's report of social relations on the BASC.

Social information processing—Verbal ability was associated with performance on the social information processing measures. Children with higher verbal ability made fewer hostile intent attributions, $r(31) = 0.39$, $p < 0.05$, and gave more assertively competent behavioral responses, $r(31) = 0.36$, $p < 0.05$. Non-verbal ability and chronological age were not associated with any of the social information processing variables.

With regard to social competence variables, participants who were described by their parents as higher in prosocial orientation (empathy) were less likely to produce aggressive responses to video vignettes, $r(29) = 0.40$, $p < 0.05$, but were more likely to provide responses that were passive-inept, $r(29) = 0.40$, $p < 0.05$. Parent report of social initiative was not associated with any of the social information processing variables. Children who described themselves as having poor social relations on the BASC were more likely to give behavioral responses that were aggressive on the video vignettes, $r(27) = 0.42$, $p < 0.05$. Self-reported fear of negative evaluation from peers on the SASC–R FNE was not linked with any of the social information processing variables. The social information processing measures were associated with performance on some of the executive and social-cognitive measures. For example, we observed an association between difficulty with verbal inhibition on the CAS expressive attention subtest and an increased likelihood of making hostile intent attributions, $r(31) = 0.49$, $p < 0.01$. The association remained significant, even after accounting for the variance contributed by verbal ability, partial $r = 0.37$, $p < 0.05$. Difficulty with emotion decoding was associated with social encoding errors on the video vignettes, $r(30) = 0.48$, $p < 0.01$, as well as non-significantly associated with attributions of hostile intent, $r(30) = 0.34$, $p < 0.07$. However, participants who passed both ToM tasks ($n = 12$) were no different than those who passed fewer than two ($n = 19$) on measures of social information processing.

Discussion

Results of this study reinforce the growing portrayal of children with Asperger syndrome as at significant risk for comorbid psychiatric disturbance. As in previous studies (Ghaziuddin et al., 1998; Kim et al., 2000; Rumsey et al., 1985; Tonge et al., 1999), parents of children with Asperger syndrome reported high rates of externalizing and internalizing symptoms among their children. In the current study, and consistent with an emerging literature (Gillott et al., 2001), the children themselves reported greater symptoms of anxiety and depression. Although parent and child report of comorbidity were not associated with one another in the Asperger syndrome group, there was only a non-significant correlation between parent and child report in the control group.

There were several indicators that children with Asperger syndrome were able to report experiences of social and emotional difficulties. First, the children's reports of social anxiety were systematically related to parent reports of impaired social competence. Second, the children's reported awareness of social difficulties was systematically related to aspects of their social information processing tendencies. Third, the children's self-reported emotional difficulties were systematically related to their social information processing tendencies. Each

of these observations suggested that the children with Asperger syndrome in this study had enough insight to self-report emotional and social problems. This is consistent with recent findings by others (e.g. Capps et al., 1995; Hill et al., 2004), suggesting that individuals with high-functioning autism spectrum disorders are able to report their own emotions on questionnaires.

Children with Asperger syndrome in this study reported high rates of social anxiety and social stress, as well as less satisfaction and competence in interpersonal relations. These data are consistent with other self-report data indicating that high-functioning children with autism report social worries and anxiety (Gillott et al., 2001), and observations that children with Asperger syndrome are aware of their social difficulties (Capps et al., 1995; Frith, 1996; Spicer, 1998; Tantam, 2000), sensitive to teasing and peer rejection (Pomeroy, 1998; Wing, 1981) and prone to negative self-evaluations and loneliness (Barnhill, 2001; Bauminger and Kasari, 2000).

Consistent with other new research on this topic (Barnhill, 2001; Blackshaw et al., 2001) the children with Asperger syndrome in this study did show the ability to interpret and make attributions about social situations, even though they displayed the syndrome typical pattern of social-cognitive abilities and difficulties on ToM measures. Hence it may be important to understand social-cognitive abilities and social attribution processes as potentially separable domains of activity. Consequently strengths and weaknesses on social-cognitive measures may not necessarily reveal how children with Asperger syndrome understand and cope with ongoing social situations (see Klin et al., 2003). Indeed, some of the children exhibited a negative attribution bias in response to ambiguous social vignettes.This bias was relevant for their emotional and behavioral functioning. Overall, children with Asperger syndrome displayed less competence in understanding a social scenario and generating adaptive responses on this type of task than the children in the comparison group.This processing style may be linked to strong emotions, self-focus, or inability to 'generate a variety of responses and consider them from all parties' perspectives' (Lemerise and Arsenio, 2000, p. 114). According to Lemerise and Arsenio's (2000) model, selecting a competent response is dependent upon the ability to consider the situation from multiple cognitive and affective perspectives. Inability to generate competent responses, poor perspective-taking ability, and strong emotional reactivity may thus be interrelated deficits that place children with Asperger syndrome at risk for poor psychological adjustment. Indeed, in the present study, significant associations were found between social information processing tendencies and both parent report and self-report of comorbid emotional and behavioral symptoms, as well as self-report of social difficulties among the participants with Asperger syndrome.

Among children with Asperger syndrome, then, symptoms of externalizing and internalizing behavior and emotional disturbance appeared to be related to the types of social information and attribution processes associated with these symptoms in other samples of children with non-autistic psychopathology (Crick and Dodge, 1996; Dodge et al., 1995). On the one hand, this observation suggests that some of the processes that contribute to internalizing symptoms (e.g. depression) and externalizing symptoms (e.g. aggression) in high-functioning children with autism spectrum disorders may not be syndrome specific. On the other hand, however, children with Asperger syndrome may be at particular risk for such difficulties, given a desire to gain access to interpersonal relationships and limitations in their ability to establish relatedness with others. For example, children who were described by their parents as lower in empathy were more likely to produce aggressive responses on the videotaped vignettes. In addition, children who gave more aggressive responses on the videotaped vignettes were more likely to be described as aggressive by their parents and were more likely to report having social difficulties. Social-cognitive weaknesses may yield further risk. A subsidiary prediction, that difficulty with emotion decoding may be linked with social information processing

tendencies, was also supported.Those children with difficulties recognizing explicitly presented simple emotions were more likely to make social encoding errors on the video vignettes.

Although the data collected in this study were cross-sectional, they support a new perspective on the development of psychopathology in higher-functioning people with autism.Traditional views tended to perpetuate a monolithic view of autism as involving 'pervasive lack of responsiveness to others' (American Psychiatric Association, 1987) with very little self or social awareness.This perspective emphasizes only the social deficits of people with autism. However, it appears that people with autism vary in their self and social awareness and, unfortunately, greater social awareness and motivation may bring a clearer perception of one's own difficulties in these domains. This perception coupled with repeated experience of negative, unsuccessful social interactions may contribute to the development of comorbid aspects of psychopathology that further undermine the quality of life for these individuals (Bauminger, 2002; Frith, 1996; Tantam, 2000). This perspective provides a developmental picture of autism acknowledging that while improved self and social awareness may be a positive outcome for children with autism, it may also bring a potential cost of increasing the likelihood of development or exacerbation of secondary forms of psychopathology (e.g. anxiety).

Taken together, these data also suggest it may be reasonable and effective to bring to bear the rich literatures on intervention with attributions, self-concept, and social information processing in child psychopathology (Kazdin and Weisz, 1998; Pope et al., 1988; Shure, 1992) in developing interventions for comorbid presentation in high-functioning children with autism and Asperger syndrome. Bauminger (2002) recently presented outcome evidence suggesting that a treatment program targeting social-interpersonal problem solving among a group of high-functioning children with autism improved peer social interactions. Gutstein and Whitney (2002) describe an intervention program designed to foster the children's capacity for rewarding social experiences. Such therapeutic approaches have the potential to reduce the psychological distress associated with this condition.

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Table 1

Participant characteristics (age in years:months)

	Asperger syndrome (n = 31)	Comparison group (n = 33)
Chronological age:		
M	10:1	10:2
SD	1:9	1:9
Range	7:9 to 13:9	7:7 to 13:9
Verbal mental age:		
M	11:2	11:4
SD	2:11	2:1
Range	6:0 to 15:11	6:1 to 15:0
Non-verbal mental age:		
M	11:0	11:5
SD	2:11	2:4
Range	6:7 to 18:1	7:4 to 16:5

Table 2

Missing data for study variables

Measure	Asperger syndrome (n = 31)	Comparison group (n = 33)
Social functioning		
Social Competence Inventory[a]	3	7
Social Anxiety Scales for Children[b]	0	1
Executive functioning		
Planned connections[b]	1	0
Expressive attention[b]	0	1
Mazes	0	0
Theory of mind[b]	0	1
Emotion processing[b]	1	1
Social information processing		
Why Kids Do Things[b]	3	2
Videotaped vignettes[c]	0	1
Parent report of comorbidity[a]	3	7
Child report of comorbidity[b]	4	2

[a] Parents did not complete form.

[b] Child refused task or experienced test fatigue.

[c] Equipment failure, did not record.

Table 3

Descriptive data for BASC subscale *T*-scores: mean (SD)

	Asperger syndrome	Comparison group
Child self-report		
Interpersonal relations[a]	45.1 (12.6)	51.3 (9.6)
Social stress	51.6 (8.9)	46.7 (10.0)
Depression	50.7 (9.1)	46.2 (7.3)
Anxiety	51.6 (9.9)	48.0 (10.3)
Parent report		
Aggression	58.1 (11.8)	45.4 (8.4)
Atypicality	70.0 (18.3)	50.6 (14.1)
Depression	65.2 (12.6)	46.3 (11.5)
Anxiety	59.2 (11.7)	49.3 (11.8)

[a]Adaptive scale.

Table 4

Associations among indices of comorbidity and social information processing variables for children in the Asperger syndrome group

Comorbidity	Video		Responses			Paper and pencil
	Encoding errors	Hostile attributions	Assertive	Passive-inept	Aggressive	Why Kids Do Things
Aggression: parent report	0.36	0.43*			0.41*	0.40*
Atypicality: parent report	0.34					
Anxiety: parent report	0.53**	0.43*				0.45*
Depression: parent report	0.39	0.38*				0.39*
Anxiety: self-report						
Depression: self-report	0.48*					

Note: only correlations above 0.30 are reported here.

*
$p < 0.05$,

**
$p < 0.01$.