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BRIEF REPORTS

Making Sense of Self-Conscious Emotion: Linking Theory of Mind and Emotion in Children With Autism

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Self-conscious emotions such as embarrassment and shame are associated with 2 aspects of theory of mind (ToM): (a) the ability to understand that behavior has social consequences in the eyes of others and (b) an understanding of social norms violations. The present study aimed to link ToM with the recognition of self-conscious emotion. Children with and without autism identified facial expressions of self-conscious and non-self-conscious emotions from photographs. ToM was also measured. Children with autism performed more poorly than comparison children at identifying self-conscious emotions, though they did not differ in the recognition of non-self-conscious emotions. When ToM ability was statistically controlled, group differences in the recognition of self-conscious emotion disappeared. Discussion focused on the links between ToM and self-conscious emotion.

The recognition of emotion from facial expression is a vital part of social life (Keltner & Kring, 1998). From others' facial expressions, infants learn to avoid danger (Klinnert, Emde, Butterfield, & Campos, 1986), and romantic partners discern one another's commitment (Gonzaga, Keltner, Londahl, & Smith, 2001), to name two ways in which emotion recognition aids adaptation to the environment. By implication, sensitivities or difficulties in emotion recognition should relate to patterns of maladjustment. For example, abused children have been shown to be sensitive to facial expressions of anger (Pollak, Cicchetti, Hornung, & Reed, 2000), and poor recognition of self-conscious emotion is related to difficulties with social behavior regulation (Beer, Heerey, Scabini, Keltner, & Knight, 2003).

The present article explored the notion that deficits in social understanding, or theory of mind (ToM), are associated with difficulties in recognizing self-conscious emotions. We assessed the ability to identify embarrassment and shame, as well as other emotions, from photographs, in a population impaired in ToM, children with high-functioning autism (HFA), or Asperger's syndrome (AS). We expected HFA/AS children to have greater difficulty than comparison children in identifying facial expressions of self-conscious emotions and that group differences could be accounted for in a measure of ToM ability.

Self-Conscious Emotion and ToM

Embarrassment and shame are important in the regulation of social behavior. Both emotions tend to occur when rules have been violated. Embarrassment typically follows violations of social conventions (Tangney, Miller, Flicker, & Barlow, 1996); shame occurs when an individual violates standards of personal character (Wallbott & Scherer, 1995). The unpleasant experience of embarrassment and shame may deter future untoward behavior (Tangney et al., 1996).

The characteristic displays of embarrassment (controlled smiles, averted gaze, head movements down and away) and shame (lowered head, downcast eyes, diminished posture) help regulate social interactions (Keltner & Anderson, 2000). These displays resemble nonhuman appeasement displays (Keltner & Buswell,

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1997) and evoke forgiveness in others, bringing about reconciliation when social interactions have gone awry (Keltner & Anderson, 2000). Reliable recognition of such display is critical to appeasement and reconciliation.

The recognition of self-conscious emotion from facial expression, established in different cultures (Haidt & Keltner, 1999), is aided by two specific inferences (Keltner & Buswell, 1997). First, perceivers infer that the individual expressing embarrassment or shame has violated some rule, and second, that he or she risks negative evaluation from others (Eisenberg, 2000). Studies find that perceivers make these inferences when presented with photos depicting embarrassment and shame, but not other emotions (Keltner, Young, & Buswell, 1997). Accordingly, if the ability to reason about social norm violations and social evaluation is impaired, self-conscious emotion recognition ability is likely to diminish.

How might self-conscious emotion recognition relate to ToM? *ToM* refers to the ability to understand others' mental states and ranges in complexity from the relatively simple understanding that others may have different desires than oneself to the more complicated ability to theorize about others' beliefs, thoughts, and intentions (Flavell, 1999). ToM is closely tied to the understanding of others' speech, goals, social action, and social reasoning (Happe, 1993). Germane to our present interests, ToM also involves an appreciation of social norms and awareness of others' evaluations (Tager-Flusberg, 1999). Hence, deficits in ToM may relate to deficits in recognizing self-conscious emotion from facial expressions.

Autism and ToM

Autism is defined by a host of social difficulties, including problems with nonliteral communication, understanding others' social intentions, and linking speech and actions to social context, skills typically acquired by age 8 (Flavell, 1999). Consequently, numerous theorists have suggested that a central deficit of autism is difficulty with ToM (see Capps & Sigman, 1996).

Individuals with HFA/AS have normal language abilities, and many perform indistinguishably from comparison individuals on complex ToM or social reasoning problems (Happe, 1993). Even among HFA/AS individuals, however, ToM deficits exist, manifest in difficulty understanding complex social interactions (Tager-Flusberg, 1999). To assess deficits in complex social reasoning, a task entitled "Strange Stories" utilized social vignettes to capture participants' ability to understand white lies, jokes, pretense, indirect persuasion, and other ambiguous speech acts. For example, in one vignette, a child coughs throughout lunch. The child's father says, "Poor Emma, you must have a frog in your throat." Relative to comparison children, children with HFA were more likely to conclude that the ambiguous comments were literally true and used less mental state reasoning in their justifications (Happe, 1994). In other studies, children with HFA are impaired at interpreting others' perspectives and nonliteral behaviors (Capps, Yirmiya, & Sigman, 1992; Flavell, 1999).

Autism and Emotion

In light of the many social difficulties experienced by children with autism, researchers have been interested in emotional correlates of autism. For children with autism who are not high functioning, emotion-related deficits appear to be broad and pervasive, involving deficits in both understanding and recognition (Hobson, 1986; Ozonoff, Pennington, & Rogers, 1990). For individuals with HFA/AS, emotion-related deficits appear to be more specific. When prompted, HFA/AS children demonstrate relatively intact emotion concepts and recognition ability for happiness, sadness, fear, and anger (Capps et al., 1992; Ozonoff et al., 1990), although spontaneously, they may ignore the emotional properties of social stimuli, attending instead to more concrete, physical aspects (Hobson, 1986). Other studies suggest that HFA children may have difficulty understanding emotions involving contradictions between expectations and knowledge states, such as surprise (Baron-Cohen, Spitz, & Cross, 1993), and in relating emotional expressions to social context (Buitelaar & van der Wees, 1997).

Few studies have investigated embarrassment and shame among children with autism. In one study, HFA children had difficulty recounting experiences of self-conscious emotions, conveying factual rather than personal knowledge, whereas they did relate personalized accounts of non-self-conscious emotions. The authors concluded that self-conscious emotions are problematic for children with autism because of their decreased ability to engage in social referencing and perspective taking, central aspects of ToM (Capps et al., 1992). Moreover, self-conscious emotions may not arise spontaneously for children with autism. In one study, only situations in which norm violations were explicitly called to the child's attention, eliminating the need for ToM, did children with autism experience self-conscious emotion (Kasari, Chamberlain, & Bauminger, 2001). Although the preceding evidence strongly implicated ToM in self-conscious emotion understanding, no study has directly documented this relationship.

Present Research

To examine the relationship between ToM and the recognition of self-conscious emotion, we presented validated photographs of self-conscious and non-self-conscious emotions to HFA/AS children and to typically developing children. We then related emotion recognition performance to scores on a measure of ToM. On the basis of the foregoing reasoning, we predicted the following:

Hypothesis 1: HFA/AS children would not differ from comparison children in their ability to recognize non-self-conscious emotions from photos of emotional facial expressions.

Hypothesis 2: HFA/AS children would be impaired, relative to controls, at recognizing expressions of the self-conscious emotions, embarrassment and shame, from photographs.

Hypothesis 3: Group differences in the ability to recognize expressions of self-conscious emotion would be explained by scores on a ToM measure.

Method

Participants

Forty-six 8- to 15-year-old children participated in the present study, as part of a larger investigation of social understanding. Twenty-five children with diagnoses of HFA ($n = 10$) or AS ($n = 15$) comprised the HFA/AS group, and 21 typically developing children made up the comparison group. Diagnoses of either HFA or AS were confirmed using the Autism Diagnostic Interview—Revised (Lord, Rutter, & Le Couteur, 1994), an instrument that generates diagnoses on the basis of the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; American Psychiatric Association, 1994) criteria (see Pilowsky, Yirmiya, Shulman, & Dover, 1998). HFA/AS children were referred to the study by clinicians unaffiliated with the project. Comparison children were recruited via flyers placed in local schools. Children came from a comparable range of socioeconomic backgrounds and, with the exception of 2 HFA/AS children, participated in mainstream classrooms.

A telephone screening conducted by clinical psychology graduate students ensured that none of the comparison children had prior psychiatric histories and the presence of HFA/AS was ruled out using the Pervasive Development Disorder Screening Test (Siegel, 1986), a parent-rated questionnaire. To control for differences in cognitive ability and ensure that all participants fell within the normal range on IQ, only children with current Verbal, Performance, and Full Scale IQ scores, measures using the Wechsler Intelligence Scale for Children—Third Edition (Wechsler, 1991), of 80 or higher were included. Groups were statistically matched on Verbal IQ, Full Scale IQ, chronological age, and gender (See Table 1). Because HFA and AS afflict boys at a higher rate than girls (Capps & Sigman, 1996), forming a target group comprised of 75% boys, the comparison sample likewise included more boys than girls. Children were tested individually by clinical psychology graduate students in a quiet, university setting.

ToM Task and Procedure

To assess ToM ability, the strange stories task, a set of 12 short vignettes in which children are asked to interpret the meanings of ambiguous speech, was administered. The vignettes describe common events (e.g., visiting a friend, engaging in pretend play, accidentally breaking something) in which story characters produce speech that is not literally true (for a description of the task as well as related ToM findings, see Happe, 1994). Participants listened while the experimenter read each story and were then asked whether the ambiguous statement within the story was

Table 1
Participant Characteristics Across Groups

Group	Comparison ($n = 21$)		HFA/AS ($n = 25$)	
	M	*SD*	*M*	*SD*
Verbal IQ	105.90	9.24	104.44	16.17
Full scale IQ	107.81	8.07	103.00	12.84
Chronological age	10.51	1.21	10.70	2.51
Verbal mental age	11.19	1.60	11.08	2.75
Gender	4 girls, 17 boys		5 girls, 20 boys	
ToM	19.40	2.89	15.25	3.72**

Note. HFA/AS = high-functioning autism/Asperger's syndrome; IQ = intelligence quotient; ToM = theory of mind.
** $p < .01$.

true (comprehension) and to describe why it had been said (justification).

The strange stories task was chosen for three reasons. First, the strange stories task was designed to present ToM scenarios in the naturalistic, linguistic fashion characteristic of those encountered during actual social interactions. Second, many HFA children, including all those in the present sample, perform identically to comparison children on typical ToM tasks, even relatively complex ones (Happe, 1993). The strange stories task is sensitive enough to differentiate ToM abilities among these groups (Happe, 1994). Third, strange stories has been shown to measure ToM ability (Happe, 1994).

ToM Scoring

Two raters coded the ToM data from transcripts ($\kappa = .87$). Children who generated correct answers to the justification questions and explained their answers with reference to story characters' mental state received 2 points. Those who generated correct answers and explained their answers by referring to incorrect mental states or to perceptual features of the story received a score of 1 point. Children who gave erroneous answers or said, "I don't know" received 0 points. Scores were summed, yielding a maximum score of 24 points (for a more detailed description of results with children in this sample, see Sobel, Capps, & Gopnik, 1999). Groups differed significantly on ToM (see Table 1).

Emotion Stimuli and Procedure

Participants were presented with nine color photos of a male actor posing the following facial expressions (with relevant action units from Ekman and Friesen's Facial Action Coding System in parentheses): anger (4,5,7,17,23,24), contempt (14), disgust (9,10,26,29), embarrassment (12,24,51,54,64), fear (1,2,4,5,20,26), happiness (6,12), sadness (1,4,15,17,24), shame (54,64), and surprise (1,2,5,27). The expressions were posed according to descriptions of prototypical expressions of emotion (Ekman & Friesen, 1975; Haidt & Keltner, 1999; Keltner & Buswell, 1997) and have been shown in previous studies to be reliably identified as the target emotions by American adult and college student observers as well as adults and students in India (Haidt & Keltner, 1999; Keltner & Buswell, 1997).

On the basis of concerns about forced-choice methods (Haidt & Keltner, 1999; Russell, 1994), a partly free-response method was used that allowed children either to choose an emotion word from a list of 10 (anger, contempt, disgust, embarrassment, fear, happiness, neutral, sadness, shame, and surprise) or to spontaneously generate labels for the emotion photographs. Participants were given the emotion word list and told that they might either choose a word from the list to describe each photo or generate their own. They were then asked to name the emotion portrayed in each picture. Photos were presented in random order, one at a time. Participants responded verbally. Responses were recorded, verbatim, by the experimenter.

Emotion Scoring

Responses were classified as either "correct" or "incorrect." For example, if a participant labeled a photo depicting anger with the words *anger* or *angry*, the response was considered correct. About half of the children (11 HFA/AS and 10 comparison) chose words exclusively from the list. However, 16% of participants' responses (37 unique words), generated by 14 HFA/AS children and 11 comparison children, did not appear on the emotion word list (e.g., frustrated, cross, and shy). To determine whether the response was correct, a group of five graduate students studying emotion independently classified children's responses into "the emotion category that best represents the response" (anger, contempt, disgust, embarrassment, fear, happiness, sadness, shame, surprise, and nonemotion; $\alpha = .89$). Coders' modal emotion category for each word was the "correct" answer. No more than two coders disagreed with the modal category for any word. A child's response was considered correct if the coders' classification of the response matched the emotion depicted in the photo.

Results

Children in the present sample diagnosed with HFA were not statistically different from those diagnosed with AS on any of the variables measured. Therefore, we analyzed their data as a single group (HFA/AS). We conducted chi-square tests to examine differences between the HFA/AS and comparison groups for our first two hypotheses. We used logistic regression to test the relationship of ToM to self-conscious emotion recognition.

Non-Self-Conscious Emotions

For the non-self-conscious emotions (anger, contempt, disgust, fear, sadness, happiness, and surprise), we counted the total number of correct responses for each child, yielding a score that ranged from 0 to 7. A chi-square analysis comparing the total number of correct responses produced per group confirmed Hypothesis 1, that is, groups would not differ in their responses to the non-self-conscious emotion photos (see Table 2), $\chi^2(1, N = 46) = 0.85$, *ns*.

Self-Conscious Emotions

We computed self-conscious emotion scores for each child by tallying the number of correct responses to photos depicting embarrassment and shame. A chi-square test compared the total of correct responses in each group. Comparison children recognized self-conscious emotions significantly better than did HFA/AS children, $\chi^2(1, N = 46) = 6.39$, $p = .01$. Additional chi-square analyses showed that HFA/AS children performed significantly worse on embarrassment, $\chi^2(1, N = 46) = 4.28$, $p = .02$; and tended to perform worse on shame, $\chi^2(1, N = 46) = 3.36$, $p = .07$.

ToM as a Predictor of Self-Conscious Emotion Recognition

For both groups, ToM ability was uncorrelated with the recognition of non-self-conscious emotion (HFA/AS: $r = .24$, *ns*; comparison: $r = -.05$, *ns*). However, within each group, a significant relationship existed between self-conscious emotion recognition and ToM (HFA/AS: $r = .49$, $p = .011$; comparison: $r = .54$, $p = .012$).[1] To examine whether ToM ability accounted for group differences in self-conscious emotion recognition, we used group status (HFA/AS or comparison) as the criterion variable in a three-step logistic regression analysis. Stepwise logistic regression tests whether the predictive power of a model changes as terms are added. We entered children's IQ scores and ages at Step 1, $\chi^2(2, N = 46) = 63.26$, $p = .735$; Step 2 included ToM scores, $\chi^2(1, N = 46) = 51.85$, $p = .001$; and Step 3 included self-conscious emotion scores. After accounting for differences in ToM ability, the group differences in self-conscious emotion recognition disappeared, $\chi^2(1, N = 46) = 51.15$, $p = .400$, suggesting that ToM ability is an important aspect of the recognition of self-conscious emotion. In a complementary analysis, which reversed the present Steps 2 and 3, ToM retained its ability to predict group differences, over and above self-conscious emotion, $\chi^2(1, N = 46) = 51.44$, $p = .02$; supporting the idea that ToM may underpin the ability to recognize self-conscious emotions, although self-conscious emotion recognition represents only one aspect of ToM.

Table 2
Proportions of Emotions Correctly Identified by Group

Emotion	Comparison ($n = 21$)	HFA/AS ($n = 25$)	χ^2
Non-self-conscious	**.70**	**.67**	**.85**
Anger	.81	.76	1.56
Contempt	.37	.30	1.53
Disgust	.62	.54	1.35
Fear	.48	.36	2.32
Sadness	.76	.92	2.51
Happiness	1.00	1.00	—
Surprise	.86	.80	1.02
Self-conscious	**.64**	**.38**	**6.39***
Embarrassment	.81	.52	4.28*
Shame	.48	.24	3.36§

Note. Each emotion listed represents a single stimulus item. Items were scored as either correct (1) or incorrect (0). Each score in the table indicates the proportion of correct responses to the item. Composite scores were computed for *non-self-conscious* emotions and *self-conscious* emotions. These reflect the overall proportion of correct responses to photos in the composite. HFA/AS = high functioning autism/Asperger's syndrome; dash indicates that no chi-square test was conducted for this emotion.
* $p < .05$. § $p < .10$.

Discussion

The recognition of self-conscious emotion involves the understanding of social norm violations and negative social evaluations, both important aspects of ToM. We examined emotion recognition and ToM in a population demonstrating impaired ToM, thereby linking self-conscious emotion with the ability to understand others' evaluations of the self with respect to social norms. In the present study, ToM ability accounted for the HFA/AS group's deficiency in the recognition of self-conscious emotion.

This finding does not appear to be related to perceptual deficits or more general emotion recognition deficits. Children in the HFA/AS group performed comparably to an age- and IQ-matched group of typically developing children with identifying non-self-

[1] No significant correlations existed in either group between ToM and developmental variables such as age (HFA/AS: $r = -.002$, *ns*; comparison: $r = .21$, *ns*), IQ (HFA/AS: $r = .17$, *ns;* comparison: $r = .13$, *ns*), verbal mental age (HFA/AS: $r = .22$, *ns;* comparison: $r = .27$, *ns*), and non-self-conscious emotion and age (HFA/AS: $r = .15$, *ns;* comparison: $r = .28$, *ns*), IQ (HFA/AS: $r = .12$, *ns;* comparison: $r = .04$, *ns*), verbal mental age (HFA/AS: $r = -.29$, *ns;* comparison: $r = .26$, *ns*), or non-self-conscious emotion (HFA/AS: $r = .15$, *ns;* comparison: $r = .07$, *ns*).

conscious emotions from photographs. It is unlikely that general face recognition difficulties lie at the root of this finding, as the identification of self-conscious emotion alone appears to have been affected. Moreover, the HFA/AS children did not simply confuse embarrassment with shame. HFA/AS children frequently described embarrassment as “happy” whereas they tended to describe shame as “sleepy.” There were no group differences in whether participants chose to respond to the items spontaneously, or to use the emotion list. Taken together, these findings suggest that self-conscious emotion deficits are linked to ToM ability (see Baron-Cohen et al., 1993). It is important to note, however, that differences in the number of stimulus items for the ToM and self-conscious emotion measures may have affected our results.

We did not find differences across the groups on surprise, an emotion previously related to false belief, one component of ToM. In one study, children’s ability to understand false belief related to their difficulty in identifying surprise (Baron-Cohen et al., 1993). Because all of our participants demonstrated facility with false belief, it is not unexpected that we failed to replicate this finding.

Another possible explanation of our results is that the self-conscious emotions are more difficult stimuli to interpret, for reasons other than those related to ToM, and that stimulus complexity hindered the recognition of our HFA/AS participants. Several results undermine this explanation. We included difficult expressions such as that of contempt in the stimulus set. Though children had difficulty recognizing contempt, both groups performed similarly to adults in previous studies. Moreover, people are about as able to judge self-conscious emotions from the face as other emotions, such as fear, sadness, or anger (Keltner & Buswell, 1997). Therefore, it seems that difficulties in recognizing self-conscious emotion from facial expression are fairly specific to HFA/AS children.

If the difficulty in recognizing self-conscious emotion were simply related to cognitive ability in general, one might expect self-concsious emotion recognition to be correlated with IQ, age, verbal mental age, or non-self-conscious emotion recognition. None of these correlations approached significance. We cannot, however, ignore the fact that HFA/AS participants may experience emotion difficulties that our measures did not detect, as the close match across groups on age and IQ may have precluded us from identifying existing differences (see Ozonoff et al., 1990).

The fact that we used only one photo of each facial expression is a limitation to our study. Clearly, it will be important to address whether the difficulty in judging self-conscious emotion displays associated with autism replicates, generalizing to other emotion photosets, dynamic displays and other channels of communication. We note, however, that our comparison children interpreted all the photos in the present set in a similar fashion as participants in other samples (e.g., Haidt & Keltner, 1999; Keltner & Buswell, 1997), and likewise for HFA/AS children’s non-self-conscious emotion interpretations (Haidt & Keltner, 1999). Thus, it would seem that the finding is not an artifact of the photoset itself driving the findings, rather it reflects the ability of HFA/AS children to interpret displays of self-conscious emotions.

Various scholars have noted the centrality of self-conscious emotion to social life (e.g., Eisenberg, 2000; Keltner & Buswell, 1997). Emotions such as embarrassment and shame motivate adherence to social norms, and their displays help individuals repair social relations momentarily jeopardized by social transgressions. These observations and our present findings point to a variety of ways in which the inability of children with autism to identify self-conscious emotions may have broader social consequences, disrupting the interactions and relationships of individuals with autism (for a broader argument, see Keltner & Kring, 1998).

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