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How high-functioning children with autism understand real and deceptive emotion

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ABSTRACT Autism is associated with problems in understanding and expressing emotion. We compared the ability of eight high-functioning children with autism (i.e. those with IQ scores ≥ 70) and eight age- and gender-matched controls with similar oral language development, to understand the facial expression of real and deceptive emotion. Children with autism had limited understanding of socially derived emotion. Although they could relate emotions to standard facial expressions, they were less able than controls to indicate the real emotions story characters *feel*, the deceptive emotions they *express* in the face, or the *social reasons* prompting a deceptive facial expression. For high-function children with autism, facial expressions may function as lexical codes but not as forms of social communication that modify beliefs.

KEYWORDS *autism; deception; emotion; high-functioning autism*

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Introduction

Emotion concerns both what is experienced and what is communicated (Barnard and Teasdale, 1991; Campos et al., 1989; Izard, 1993; Johnson and Multhaup, 1992; Lazarus, 1984; Mathews and MacLeod, 1994; Mayer and Salovey, 1993; Scherer, 1993; Zajonc, 1980). The term *emotional communication* refers to the automatic, spontaneous expression of affect; the term *emotive communication* refers to the conscious, strategic modification of emotional expression for social communication (Arndt and Janney, 1991; Buck, 1994; Carroll and Russell, 1994; Harris, 1994).

Facial expressions express both emotional and emotive communication.

Distinct facial expressions, and particular components of facial expressions, are associated with different emotions that convey happiness, surprise, sadness, anger, fear and disgust (Darwin, 1872; Ekman, 1989; 1992; Ekman et al., 1982; Kearney and McKenzie, 1993; Pope and Smith, 1994).

Emotional and emotive communication may be discrepant; that is, an individual may feel one emotion but express another (Buck, 1994; Ross et al., 1994). This is because emotional communication is concerned with affect, and emotive communication is concerned with affect and belief. Emotive communication modulates emotional expression according to belief, through mechanisms involving social display rules about which facial expressions can be expressed, when they can be expressed, and who can express them (Ekman, 1972; Voeller, 1994). The ability to use display rules for emotive communication requires awareness of mental states in the person to whom the display is directed, but provides the opportunity for social deception.

Emotive communication, which involves mastery of display rules, is an important part of social cognitive development (Buck, 1991; Gnepp, 1983; Halberstadt et al., 1992; Harris, 1994; Vaughn and Hogan, 1990). Display skills are limited in toddlers and preschoolers (Cole, 1986; Harris et al., 1986; Lutkenhaus et al., 1985), gradually improving through early and middle childhood (Gnepp and Hess, 1986; Hala et al., 1991; Halberstadt et al., 1992; Harris et al., 1986) and being fully mastered only in adult life (Gnepp, 1983; Gnepp and Hess, 1986; Halberstadt et al., 1992; Harris et al., 1981; Saarni, 1979; 1988; 1990).

Narratives portray fictional characters involved in events that elicit emotions, which may be expressed directly or modulated according to context. Inferences about emotions in stories are often direct (Wierzbicka, 1992). For example, sadness is inferred on hearing a story about a pet dying. Understanding a story involves forming a mental representation of affective states (Gernsbacher et al., 1992), which then becomes the basis for modifying emotional expression according to context (Chandler and Greenspan, 1972). In this way, a character may feel an emotion but modulate or inhibit its display, or even express a deceptive emotion. Real and deceptive emotion in stories, therefore, provides a means of exploring the relation between emotion and belief, an issue of particular interest in individuals with autism.

The cognitive and social impairments of children with autism involve difficulties in the expression (Loveland et al., 1994) and understanding (Hobson, 1989) of emotion. Children with autism experience problems in discriminating facial affect; for example, matching pictures of faces showing emotion (Fein et al., 1992; Hobson, 1986; Tantam et al., 1989). They are limited in their expression of emotion in spontaneous speech. While they

may understand and express simple emotions, typically they do not express complex emotions, such as *surprise*, or speak of mental states involving knowledge, beliefs, pretence or deceit (Tager-Flusberg, 1992). Higher intelligence in autism moderates, but does not abolish, deficits in expressing and understanding emotion. Better understanding of simple emotions is associated with higher mental age (Hobson, 1986), higher cognitive level (Fein et al., 1992), and better social skills (Fein et al., 1992; Hobson, 1986). Higher intelligence increases facility with simple emotions, although not with more complex emotions, such as *pride* and *embarrassment*, or emotions that require appreciation of social context or beliefs (Capps et al., 1992; Ozonoff et al., 1990).

Consistent with their difficulties with socially defined emotions, children with autism have difficulty with irony, false belief and deception (Baron-Cohen, 1992; Happé, 1991; Oswald and Ollendick, 1989; Russell et al., 1991; Sodian and Frith, 1992). For example, they can physically occlude an object, but not block someone's access to information about it (Baron-Cohen, 1992; DeVries, 1970; Gratch, 1964).

Deceptive facial expressions indicate awareness of the mental states of the person to whom the deception is directed, so facial deception is of interest in high-functioning children with autism (i.e. those with IQ scores ≥ 70). Such data bear on whether higher intelligence in autism is associated with better levels of social comprehension of affect, and also on the connection between understanding of emotion and awareness of false belief (Buitelaar and van der Wees, 1997).

This paper studies how high-functioning children with autism and age- and gender-matched controls understand emotion in narratives. High-functioning children perform better than lower-functioning children with autism on simple emotion matching tasks, but continue to have difficulty with contextual emotional expression, social emotions, and false belief and deception. This suggests that higher intelligence might mitigate some, but not all, of the reported impairment of children with autism on emotion comprehension tasks, but that deficits in emotive communication, including deception, are less affected by IQ. We hypothesized, therefore, that:

- High-functioning children with autism will be as skilled as age peers on emotion comprehension tasks involving understanding emotion labels and prototypical situations that elicit emotions (e.g. birthday = very happy).
- High-functioning children with autism will be less skilled than age peers on emotion comprehension tasks that require them to understand the emotions characters feel in social contexts, the emotions characters

express in order to be deceptive, and the social reasons for producing a deceptive facial expression.

- Within the group of high-functioning children with autism, measures of emotion comprehension in social contexts will be related to autism severity although not to general cognitive development; that is, emotion comprehension will be negatively related to autism severity but unrelated to IQ.

Method

Real and Deceptive Emotion Task

The Real and Deceptive Emotion Task (Dennis et al., 1998; adapted from Harris et al., 1986) evaluates children's understanding of real and deceptive emotion in short narratives. The task, which is mastered between the ages of 6 and 8 years in typically developing children (Dennis et al., 1998), represents an advanced assessment of *theory of mind* (Happé, 1994) in that it requires judgements about socially expressed emotion in the context of belief.

The test involves identification of *real* and *deceptive emotions* from 10 short narratives, each with a vignette about a hypothetical character, Terry, that describes why Terry would feel one way inside but show a facial emotion that was different. Participants listened to the stories and judged how Terry looked on her/his face and how s(he) felt inside. The instructions stressed that Terry might look one way on her/his face but feel a different way inside. For example, 'Terry wants to go outside, but (s)he has a tummy ache. (S)he knows that if (s)he tells her/his Mom that (s)he has a tummy ache, her/his Mom will say that (s)he can't go out. Terry tries to hide the way (s)he feels.'

Within the 10 narratives, *story valence* was either positive or negative. In the five positive valence narratives, the situation described (e.g. person wearing funny clothes) would typically elicit a positive emotion but the reason for deception (e.g. wearer would get angry) required that a negative or neutral emotion be displayed. In the five negative valence narratives, the situation described would typically elicit a negative emotion (e.g. protagonist feels sick) but the reason for deception (e.g. protagonist cannot go outdoors if mother knows she feels sick) required that a positive or neutral emotion be displayed. There are five basic measures:

1 *Understanding emotion labels* Participants match the lexical terms *happy* and *sad* to a face display (Figure 1), showing five gradations of happy, from very happy to very sad, by pointing to the face showing: very happy; a bit happy; not happy, not sad, just OK; a bit sad; and very sad.

2 *Understanding prototypical emotion situations* Participants match prototypical emotion-eliciting situations to the face display (Figure 1) according to how a hypothetical character, Terry, would either feel inside (10 items) or look on her/his face (10 items) in various situations (e.g. on her/his birthday; when her/his pet dog died).

3 *Understanding real emotion in socially complex narratives* Participants indicate by pointing to the face display how Terry would feel inside (e.g. 'How did Terry really feel when (s)he had a tummy ache?') and then to explain their response ('Why did Terry feel like that?'). The total possible 'feel inside' score is 20.

4 *Understanding deceptive emotion in socially complex narratives* Participants indicate by pointing to the face display how Terry would look on his/her face (e.g. 'How did Terry look on his/her face when (s)he had a tummy ache?') and then to explain their response ('Why did Terry look like that?'). The total possible 'look on face' score is 20.

5 *Understanding reasons for social deception* Participants were questioned about the situation ('What was the matter with Terry?') and the reason for deception ('What will Terry's Mom say if she knows Terry has a tummy ache?'). The total possible 'understanding deception' score is 20.

Participants

We studied two groups, each of eight participants: autism group (one female, seven male; test age mean 9.6 years, SD 1.7) and a typically developing control group (one female, seven male; test age mean 9.4 years, SD 1.6), individually matched for age and gender to the autism group. Because the study involves only higher-IQ children with autism, it was possible to select a control group matched for chronological age, avoiding problems such as the comparability of language experiences in older, lower-functioning children with autism and younger, normally developing children.

Autism group Inclusion criteria were: (1) diagnosis of DSM-IV autistic disorder or Asperger disorder on the basis of a 2 hour clinical interview by

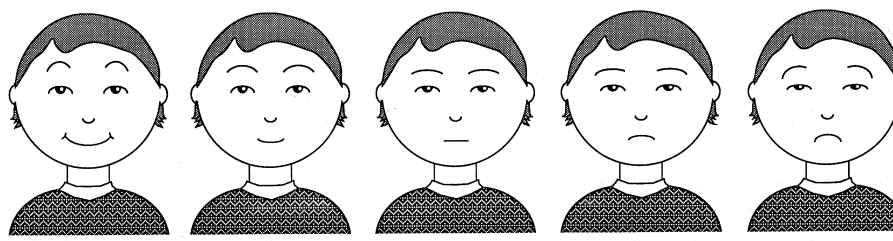

Figure 1 **Face display for emotion recognition task**

the child psychiatrist; (2) quantitative rating on the Childhood Autism Rating Scale (CARS), a diagnostic instrument with some specificity for autism (Schopler et al., 1988); and (3) IQ score ≥ 70 on the verbal scale of the Wechsler measures (WISC–III, Wechsler, 1993; or WISC–R, Wechsler, 1974). The Wechsler vocabulary subtest was used as a measure of oral language.

Eight participants were included. Four met DSM-IV criteria for autistic disorder (mean CARS rating 32.13) and four met criteria for Asperger's disorder (mean CARS rating 27.25). IQ scores for the eight participants were: full scale IQ mean 96.4, SD 24.5, range 65–140; verbal IQ mean 93.5, SD 24.5, range 71–146; performance IQ mean 99.9, SD 25.9, range 57–132.

Control group Inclusion criteria were: (1) English as a first language; (2) no known learning disabilities or neurological disorders; (3) typical school performance in the middle two quartiles of the class (i.e. within the average range) in language arts and reading within the same provincial educational system as the children with autism. Control children were matched on an individual basis for age and gender with the autism group. The oral vocabulary subtest of the Woodcock–Johnson test (Woodcock and Johnson, 1989) was used as a measure of oral language.

Results

Oral vocabulary

Oral vocabulary scores were in the average range (25–75 age percentile) for both groups, and did not differ statistically in the autism (mean 42.6, SD 32.8) and control (mean 62.0, SD 18.5) groups. However, as expected, the variance was greater in the autism group.

Understanding emotion labels and prototypical emotion situations

All control participants and seven of the eight autism participants were fully successful at these tasks, in that they used all five elements of the face display; the remaining subject used the positive and negative faces in the test proper, but not in the label and situation tests.

Understanding real emotion, deceptive emotion, and reasons for social deception

The level of performance on the emotion comprehension tasks differed in autism and control groups (Table 1). The autism group had significantly lower scores than the control group on the package of emotion

comprehension scores ($F(1, 14) = 6.1$, $p = 0.0269$) and on each of the individual tasks: feel inside ($F(1, 14) = 6.1$, $p = 0.0269$), look on face $F(1, 14) = 6.6$, $p = 0.0226$), and reasons for deception ($F(1, 14) = 5.2$, $p = 0.0391$). For all participants, positive valence stories (positive situation concealed with a neutral/negative expression) produced lower scores than negative valence stories.

The pattern of performance on the emotion comprehension tasks differed in the autism and control groups. When the correct choice was made for the felt emotion, the autism group but not the control group intensified, rather than attenuated, the displayed emotion (e.g. from a *bit happy* to *very happy*) in a context where social awareness would require them to avoid looking happy ($F(1, 14) = 7.0$, $p = 0.0192$). Two patterns of errors were considered. The 'feel inside incorrect and look on face correct' pattern has been termed a *phenomenalism* error (Flavell et al., 1983). The 'feel inside correct and look on face incorrect' pattern has been termed a *realism* error (Flavell et al., 1983). The phenomenalism pattern occurred with equal frequency in the two groups, but the realism pattern was more common in the autism group ($F(1, 14) = 3.3$, $p = 0.0901$).

Relations between emotion deception scores, IQ and severity of autism

Verbal IQ was unrelated to feel inside, look on face, or reasons for deception scores in the autism group. In contrast, CARS scores were significantly related to one score, look on face ($F(1, 7) = 6.6$, $p = 0.0424$), such that the higher the CARS score (i.e. the more autism items endorsed), the poorer the understanding of deception.

Discussion

High-functioning children with autism were able to understand emotion labels (i.e. they could match *happy* and *sad* with appropriate facial expressions)

Table 1 **Performance on emotion comprehension tasks: means (standard deviations)**

	Autism group ($N = 8$)	*Control group* ($N = 8$)
Feel inside	13.4 (4.3)	17.5 (1.9)
Look on face	11.4 (7.4)	18.2 (1.7)
Reasons for deception	13.6 (5.7)	18.2 (1.0)

and relate those expressions to prototypical situations, thus supporting the first hypothesis. Like controls and typically developing children, the autism group showed a story valence effect, whereby stories were more difficult if the situation elicited a positive emotion but the deception involved a neutral or negative facial expression. The data suggest that high-functioning children with autism can understand basic information about common emotional expressions and the contexts that elicit them, and, further, that they may undergo some forms of cognitive-affective development in the same sequence as normally developing children.

As predicted by the second hypothesis, high-functioning children with autism were less skilled than age peers on emotion comprehension tasks that required understanding emotions in social contexts. They were statistically poorer than controls in understanding felt emotions, deceptive emotions (which involve an intersection of emotion with belief), and the reasons for deception (which require awareness of mental states).

Research into autism provides information about the interface between cognitive and social-affective development (Bailey et al., 1996). Our high-functioning children with autism had problems understanding emotion in social contexts even though they each had a verbal IQ above 70; as a group, their verbal IQ scores were average for the normal population; and their verbal IQ scores were unrelated to any measure of emotion comprehension. Therefore, the ability of high-functioning children with autism to understand emotion in complex social contexts is at least partially independent of their verbal cognitive development.

Within this high-functioning group, understanding of deceptive emotional expressions (although not felt emotions or reasons for deception) was significantly related to autism severity, which provides partial support for the third hypothesis. Although larger groups are needed to understand the relation between severity of autism and difficulty understanding deception, the fact that CARS scores were specifically related to emotional deception suggests that inability to understand belief and deception may be tied more to the diagnosis of autism than to level of cognitive development.

Higher levels of intelligence in autism are associated with preservation of basic emotion recognition, but deficits are evident in the ability to recognize emotion in social situations, including those in which emotion intersects with belief. As a group, high-functioning children with autism appear to have limited understanding of socially derived emotion. For them, facial expressions are learned codes for particular emotions, but not forms of social communication that, through deception, can modify the beliefs of the person to whom the expression is directed.

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