Affective expressions during joint attention interactions with an adult: The case of autism

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ABSTRACT Deficits in nonverbal joint attention behaviours are a prominent feature of autism. Attempts to explain these deficits have called upon autistic children's inability to share affect with others. This study examined the affective expressions autistic children display during joint attention interactions with an adult. Sixteen children with autism were matched with 16 normally developing and 16 mentally retarded children on the basis of mental age. Children participated in a semi-structured nonverbal communication procedure consisting of situations designed to elicit joint attention behaviours. Children with autism engaged in joint attention less often than controls. Nonetheless, their affective expressions were not different from those of normal children. Similarly to normal, the autistic group shared more positive affect with the adult during joint attention acts than during other types of nonverbal behaviour. It is concluded that there is no strong evidence to argue that the joint attention skill deficits of autistic children are associated with a disturbance in affective sharing.

Key words: Affective expressions, Autism, Joint attention.

Within the first year of life, typically developing infants learn to communicate nonverbally through behaviours such as eye gaze, vocalizations, and prelinguistic gestures (Trevarthen & Hubley, 1978). These acts serve a number of important developmental functions; they serve to establish and maintain social interactions and they provide a means of expressing needs and sharing experiences (Adamson & Bakeman, 1985, 1991; Bates, Camaioni, & Voltera, 1975; Bretherton, 1991).

Joint attention (JA) is a form of nonverbal communication that refers to the ability to follow one's direction of eye gaze or quite simply "looking where someone else is looking" (Butterworth, 1991, p. 223). This occurs when infants notice that another person has turned their eyes or head in a certain direction and the infants follow suit, or when infants move their head or eyes in the same direction as someone is pointing. Besides this kind of responsive JA, infants can also initiate JA by holding up something for another person to see or by pointing at something themselves (Sigman & Kasari, 1995).

Autism is a severe developmental disorder characterized by a variety of social deficits (Frith, 1989; Happé, 1994). Young children with autism exhibit a specific disturbance in the ability to engage in JA. As early as 1978, Curcio (1978) published the results of a study about 12 autistic

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children without speech, aged between 4 and 12 years. He asked teachers to complete a questionnaire recording specific occasions on which the children used a gesture to achieve a social or non-social aim. He also observed each child for one hour in her/his classroom. What emerged from this study was that while all 12 children used nonverbal gestures to induce adults to help them attain a goal, not one of them was observed to show objects to an adult in a spontaneous way.

Wetherby and Prutting (1984) also investigated how autistic children at the prelinguistic and early stages of language development, use spontaneous communication through gestural, vocal and verbal means. They videotaped four autistic children while interacting with an adult during a free play situation and a structured situation designed to elicit communicative behaviour. In the structured condition, the experimenter, for instance, ate desirable food without offering any to the child. She also activated and de-activated a wind-up toy and looked at a book that belonged to the child. All four autistic children displayed a high frequency of gestures leading to behaviour regulation (requesting) but they rarely used gestures in order to direct the attention of the adult to an object or event.

Although suggestive, these early studies did not indicate whether JA skill deficits were specific to autism or were a more general effect of the mental retardation that is often associated with this syndrome (Frith, 1989; Happé, 1994). Subsequent research has, however, clearly documented that autistic children display a pronounced difficulty with initiating JA acts, relative to developmentally matched samples of children with mental retardation or children with other specific communication delays (Lewy & Dawson, 1992; Loveland & Landry, 1986; Mundy, Sigman, & Kasari, 1994; Mundy, Sigman, Ungerer, & Sherman, 1986; Wetherby, Yonclas, & Bryan, 1989). Furthermore, individual differences in JA development are related to parents' reports of the severity of symptom presentation as well as the variability in language acquisition among these children (Mundy, Sigman, & Kasari, 1994).

Findings, therefore, clearly demonstrate that the JA impairment is a fundamental component of autism. This is not to say that it is necessarily a core deficit, in the sense that it may play a causal role in the syndrome. Rather it may be regarded as an important manifestation of the autistic social disorder. It follows that it is important to acquire a detailed understanding of the nature of this social impairment in autism (Baron-Cohen, 1989; Goméz, Sarria, & Tamarit, 1993; Mundy, Sigman, & Kasari, 1990).

Affect in joint attention

The explanation of the autistic child's difficulties with JA depends on the conceptualization of its role and function in normal development. Or to put it differently, what propels normally developing children to engage in JA exchanges with others? Several of the major theoretical accounts of JA assign some special role to affect[1] (Adamson & Bakeman, 1982; Bates, Camaioni, & Voltera, 1975; Bruner, 1983; Trevarthen & Hubley, 1978). For example, in Bates, Camaioni, and Voltera's (1975) account, joint attention marks the emergence of attempts to "seek a more subtle kind of adult response –laughter, comment, smiles, and eye contact" (p. 121) in reference to an object or event. Bruner (1983) also notes that there may be "some primitive mood marking procedure to distinguish indicating (i.e., joint attention) from commanding or requesting" (p. 67) among nonverbal acts of

Note 1. The term *affect* is often used interchangeably with the term *emotion.* At different times affect is used to denote the expressive or the subjective feeling component of emotion (Sroufe, 1995). Here affect will be used to refer to both the feeling and the facial expressive components of emotion.

communication. Adamson and Bakeman (1982) also posit that JA acts consist primarily of attempts to regulate the mutual attention and the reciprocation of positive affect between the child and the caregiver.

Theoretical accounts, thus, suggest that preverbal JA may involve attempts by young children to convey or share their affective experience of an object with others. In this respect JA acts are distinguished from other forms of protocommunicative gestures emerging at the same developmental period such as requesting. In requests, affective exchange with the other, when it appears, is the byproduct and not the primary function. A related study of 32 infants has provided evidence corroborating that joint attention is associated with the expression of positive affect to a greater degree than is nonverbal requesting (Mundy, Kasari, & Sigman, 1992).

If positive affect indeed differentiates JA from other forms of nonverbal communication, the question that arises is, whether autistic children's inability to share their attention with others is, in some way, related to an affective deficit. A recent theoretical hypothesis states that the social deficits observed in autism are direct sequels of a much deeper impairment which prevents the child from establishing affective relatedness with others (Hobson, 1989, 1993a,b). Following Stern (1985) and Trevarthen (1979), Hobson argues that it is through reciprocal affective relatedness with the caregiver that the infant differentiates persons from self and from things and embarks on an explicit understanding of the social world. An innate abnormality in the ability to perceive and respond to the affective expressions of others is postulated to result in the JA and other social difficulties observed in autism.

Supportive evidence for Hobson's hypothesis has recently been provided by a study of the degree to which JA and requesting behaviours are associated with displays of positive affect in young autistic, mentally retarded and normal children (Kasari, Sigman, Mundy, & Yirmiya, 1990). Its results indicated that children in the control groups displayed much more positive affect in conjunction with JA, rather than with requesting acts. In contrast, children with autism displayed much less positive affect along with JA behaviours than did the mentally retarded and normal children. Moreover, the amount of positive affect autistic children displayed did not vary in the two communicative contexts.

The findings of Kasari and her associates (1990) thus provide support for the argument that a disturbance in affective sharing may be implicated in the JA skill deficit of children with autism (Hobson, 1989, 1993a,b). Nonetheless, since these results have never been replicated, firm conclusions cannot be drawn from a single study. Furthermore, an important drawback of Kasari et al.'s study is that it was not from the outset designed to directly assess the influence of affective factors on the JA behaviour of autistic children. That is, these researchers employed their observation recordings from an earlier investigation (Mundy, Sigman, Ungerer, & Sherman, 1986), and reanalyzed them for the types of affect associated with JA and requesting acts. For these reasons, it was decided to undertake a new investigation of the frequency with which autistic children demonstrate positive affect during JA interactions with an adult.

The present study had three goals. The first was to determine whether autistic children's ability to engage in JA with an adult is impaired relative to their ability to engage in other types of nonverbal communication such as requesting. In line with the findings of earlier studies, the predictions were that autistic children would be impaired in the amount of JA they display, but not in requesting. A next goal of the study was to assess the types of affect that are typically associated with JA behaviours. It was expected that JA would elicit greater sharing of positive affect than requesting acts. The last task of the present study was to determine the types of affect autistic children display along with JA behaviours. If autistic children are found to differ in the affect they display during JA situations but

not during requesting situations, this would lend support to the hypothesis that autistic children's JA skill deficits are causally linked to a disturbance in affective processing (Hobson, 1989, 1993a,b; Kasari, Sigman, Mundy, & Yirmiya, 1990; Mundy & Sigman, 1989).

The study was designed to compare the nonverbal behaviour of autistic, normally developing and mentally retarded children. This design will allow us to establish the normative pattern of affective expressions used in the context of JA and requesting interactions with an adult. The mentally retarded sample was employed to control for the effects of mental retardation on the autistic sample.

Method

Participants

Participants were sixteen autistic (3 girls and 13 boys[2]), 16 mentally retarded (7 girls and 9 boys) and 16 normally developing (6 girls και 10 boys) children. The mentally retarded group consisted of 8 children with Down syndrome and 8 children with retardation of unknown etiology. Down syndrome children were selected because they represent the most readily recognizable retardation diagnosis. However, to counteract the possible effects of the syndrome on the findings, an equal number of children with retardation of unspecified origin was also included in this sample. The diagnosis of autism was made by a licensed psychologist on the basis of DSM-III-R or DSM-IV criteria (American Psychiatric Association, 1987, 1994). These require the presence of social deficits, communication impairments, restricted activities or interests and an onset prior to 30 months of age.

The chronological age of children in the two clinical groups ranged from 4 years 2 months to 6 years 4 months. Normal children's chronological age ranged between 1 year 8 months and 3 years 5 months. The retarded and the autistic groups' chronological ages were statistically identical, $t(30) = 0.05$, $p = .80$. Furthermore, all three groups were matched on mental age, $F(2, 45) = 1.83$, $p = 0.71$. Mental age was assessed using the Stanford-Binet Intelligence Scale (Form L-M; Terman & Merrill, 1972).

The normally developing children were rec-

Table 1
Participant characteristics

Group [a]	Autistic	Mentally Retarded	Normal
Chronological age			
M (*SD*)	5.15[b] (0.67)	5.21[b] (0.60)	2.62 (0.60)
Range	4.20-6.41	4.31-6.00	1.75-3.50
Mental age			
M (*SD*)	3.32[c] (1.05)	3.57 (0.54)	3.05 (0.58)
Range	2.00-5.00	2.50-4.70	2.08-4.00

Note: *M* = Mean; *SD* = Standard Deviation; [a]*n* = 16 in each group; [b]Matched on chronological age; [c]Matched on mental age.

Note 2. The disproportionately large number of boys in the autistic sample represents the high boy:girl ratio observed in autism (3:1 to 5:1 boys:girls) (Lord, Schopler, & Revicki, 1982).

ruited from two public nurseries in the area of London, U.K. The mentally retarded and the autistic groups were recruited from several specialist schools for mental retardation and autism in the same city. Informed consent was obtained from parents prior to participation. The details of participant characteristics are summarized in Table 1 below.

Procedure

Children were seen individually in a quiet room at their schools in two different occasions. During the first occasion, the Standford-Binet scale was administered. In the second instance, the experimenter presented children with the Early Social Communication Scales (ESCS). The ESCS was developed by Seibert, Hogan, and Mundy (1982) specifically for use with young children with autism, and consists of situations designed to elicit JA and requesting acts. It has been extensively employed by Mundy and her associates in studies of nonverbal communication in normal development and in autism (Kasari, Sigman, Mundy, & Yirmiya, 1990; Mundy, Kasari, & Sigman, 1992; Mundy, Sigman, & Kasari, 1994; Mundy, Sigman, Ungerer, & Sherman, 1986).

During the ESCS procedure, the child and the experimenter sat facing each other at a small table. A set of toys including a hat, a comb, a picture book, a ball, a car, three small mechanical toys and three hand-operated toys including balloons were in view, but out of reach of the child. Colorful pictures adorned the walls of the room.

Throughout the course of the ESCS, the experimenter presented the mechanical and wind-up toys one at a time. During presentation, each toy was activated on the table at least three times. The experimenter also presented two pointing trials. In each of these trials, she pointed to the left, to the right, and behind the child while emphatically stating the child's name. Several object turn-taking opportunities were also provided by the experimenter. These included presenting the child once with the opportunity to roll a car back and forth. Opportunities to take turns using a comb or hat in a functionally appropriate fashion were also provided.

Coding

The ESCS procedure was videotaped to record the front-upper body profile of the experimenter and a full face and upper body view of the child. The interaction with each child lasted approximately 25 minutes. From this time, a total of 8 minutes was selected for coding. The selection procedure was as follows. Four toys were chosen out of the several presented: the car, a mechanical bear, the ball and a wind up tortoise. Following the presentation of each of these toys, 2 minutes were selected for coding amounting to a total of 8 minutes.

Coding was done second by second in a three step procedure. The first step involved recording the time children attended at the experimenter. In the second step the aim was to determine whether a nonverbal communicative act did occur and the function it served (JA vs. requesting). The third step aimed at identifying the affective expressions the child displayed while interacting with the experimenter.

(1) *Attention:* During the interaction, all child looks towards the experimenter's face were recorded. Times when the child was attending to objects or was unfocused were also recorded.

(2) *Nonverbal communication:* To determine communicative function, nonverbal acts initiated by the child were grouped into two categories: requesting and joint attention. The requesting category included behaviours that were used to direct attention to objects or events in order to request aid in obtaining the object or repetition of an event (e.g., obtaining an object out of reach or reactivating a mechanical toy). More specifically, behaviours rated here included: reaching to toys out of reach; eye contact and reaching to toys out of reach; pointing to a toy that was out of

reach; and giving a toy to the adult, defined as extending a toy toward the experimenter's hand.

The JA category involved the coordination of the child's and the experimenter's attention to objects or events. However, the instrumental function of these behaviours was less apparent because the object was within reach or the event was ongoing. These behaviours included: eye gaze while holding a toy; alternating eye gaze between the experimenter's face and an active toy; pointing to toys within reach; and showing toys or extending toys towards the experimenter's face[3].

(3) *Affective expressions:* Affective expressions were coded using Affex (Izard, Dougherty, & Hembree, 1983). Affex is an objective facial-affect coding system that can reliably identify eight fundamental affective expressions: joy, interest, surprise, sadness, anger, fear, disgust, contempt, discomfort-pain, and combinations or blends of any two of them. This system relies on holistic judgements, resulting from analysis and integration of the information available from the facial muscle movements or appearance changes in three of the major regions of the face: brow, eye, and mouth. In applying Affex, the video segment to be analyzed was played until an appearance change was observed. At that time the slow-motion mode was used to determine the onset and offset times of the appearance change. All regions of the face were then examined for affect-related changes and information was classified directly, according to affect categories. The results from the three face zones were next submerged to translate into specific emotion categories.

Each measure of attention, nonverbal act and affective expression was coded independently from the others; in the analysis, however, results from the different categories were merged by time of occurrence.

Interrater reliability

A second independent coder scored 10 interactions at random. This coder was blind to the diagnosis of the participants and the hypotheses of the study. Interrater reliability was assessed via Generalizability analyses. Generalizability (*G*) procedures result in coefficients which represent the ratio of subject score variance over the sum of subject variance plus rater by error variance (Mitchell, 1979). The *G*-coefficient for attention towards the experimenter's face was 0.96. For JA and requesting, coefficients were 0.90 and 0.93 respectively. Finally, the *G*-coefficients for different affective expressions ranged between 0.88 and 0.95.

Results

Attention

As a preliminary analysis the amount of time (in seconds) children spent attending at the experimenter's face, at objects, or unfocused was examined. Data were subjected to a one-way ANOVA analysis followed by pairwise comparisons using Tukey's Studentized Range Test. Results showed a significant between group effect with respect to objects, $F(2, 45) = 7.34$, $p = .002$. Out of the total coded interaction

Note 3. The last two behaviour categories in the JA condition appear very similar to the respective two in the requesting context. However, there are inherent differences distinguishing them. Pointing to toys within reach, for instance, is different from pointing to toys out of reach since in the former case the child does not really aim at the assistance of an adult in getting the toy. 'Within-reach' pointing seems to express the child's intention to share the experience of the toy (or event) with the adult. Similarly, when a child brings a toy to the adult's face, the aim is to attract attention on the toy. In contrast, extending the toy to the adult's hand is assumed to indicate the child's claim for assistance in reactivating the toy.

time (480 secs), mentally retarded children spent less time (M = 381 secs) attending at the objects compared to autistic (M = 410 secs) and normally developing children (M = 404 secs) (Tukey *HSD* tests significant at α = .05). A group effect was also found for attending at the experimenter's face, $F(2, 45) = 18.84$, $p < .0005$. The mentally retarded participants spent significantly more time attending at the adult's face (M = 80 secs) than the normal (M = 48 secs) or the autistic (M = 43 secs) groups (Tukey *HSD* tests significant at α = .05). The latter two groups, however, did not differ significantly from one another (Tukey *HSD* test, *ns*). No group effect was found for the time children were unfocused, $F(2, 45) = 1.09$, $p = .34$.

Nonverbal communication

Next, results were analyzed for the time groups engaged in JA and requesting acts. A two-way ANOVA (3 x 2) with repeated measures on the last factor was performed on the data. The dependent variable was time (in seconds) and the independent ones were groups (autism vs. mental handicap vs. normal) and communicative contexts (JA vs. requesting). Both main effects were statistically significant. That is, there were significant between group differences in the amount of time groups spent on the two types of nonverbal communication, $F(2, 45) = 8.86$, $p = .001$. Moreover, within each group the time children spent displaying JA differed from the time they engaged in requesting behaviour, $F(1, 45) = 18.72$, $p < .0005$. Paired samples' t tests showed that autistic children engaged in requesting more often than in JA behaviours (requesting: M = 27.87 secs vs. JA: M = 8.75 secs), $t(15) = -6.45$, $p < .0005$. Similarly, mentally retarded children demonstrated more requesting than JA acts (requesting: M = 38.43 secs vs. JA: M = 27.18 secs), $t(15) = -2.67$, $p = .017$. Unlike the two former groups, the behaviour of normal children did not vary considerably within the two communicative contexts (requesting: M = 30.81 secs vs. JA: M = 27.87 secs), $t(15) = -.51$, $p = .616$.

To further examine group differences in the amount of time spent on requesting and on JA, one-way between group ANOVAs, followed by Tukey's pairwise comparisons, were performed. No group effect was found for requesting, $F(2, 45) = 1.94$, $p = .15$. That is, the autistic children engaged in requesting behaviours as often as the two control groups did. Significant group differences were found, however, in the JA context, $F(2, 45) = 15.67$, $p < .0005$. The autistic group engaged in significantly less JA acts than the mentally retarded (Tukey *HSD* = 9.75, significant at α = .01) or the normal samples (Tukey *HSD* = 11.13, significant at α = .01). The two control groups did not differ significantly from one another (Tukey *HSD*, *ns*). These differences are illustrated in Figure 1.

Affective expressions

The affective expression under assessment in this study was positive affect. Negative affect expressions did occur, but rarely (1%, 0%, and 3% of the time for the autistic, mentally retarded, and normal groups respectively). The rest of the coded interaction time was spent expressing either positive or neutral affect.

The following analyses examined the amount of positive affect groups displayed while attending at the experimenter during the two communicative contexts (JA vs. requesting). Because of the documented differences in the time groups engaged in JA acts, percentage scores of positive affect displays were used instead of absolute times. Obviously, autistic children, who demonstrated less JA behaviours than controls, would have been at a disadvantage if the absolute times had been analyzed. The formula employed to calculate percentages had as follows: Total duration of positive affect while looking at the experimenter during total duration of JA (or

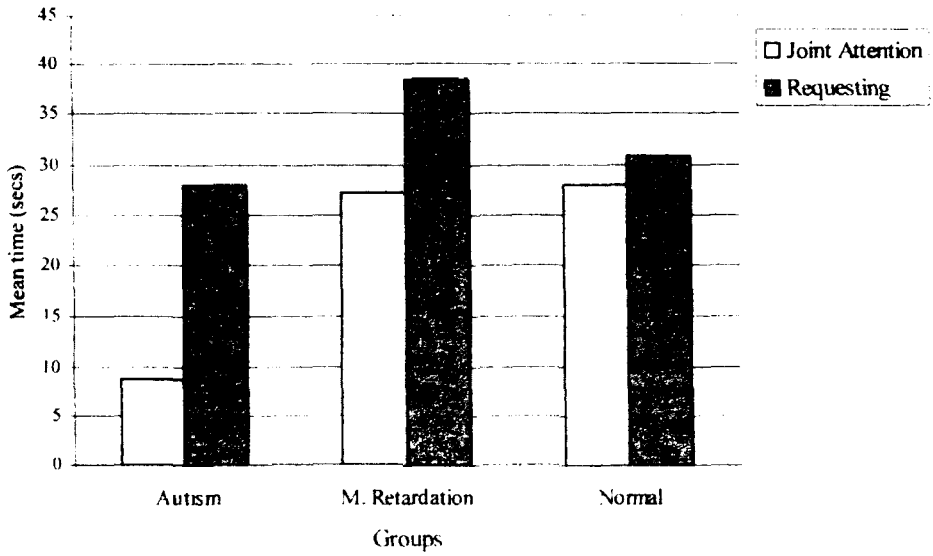

Figure 1
Mean time of nonverbal communicative behaviours exhibited by each group.

requesting) behaviour divided by the total duration of looking at the experimenter during JA (or requesting).

Table 2 summarizes the mean percentages and standard deviations of positive affect repeated under the contexts of JA and requesting.

As it can be seen from the standard deviations, the mean percentages of the three groups were somewhat dissimilar in variance. This is a frequent finding when proportions or percentages are used (Winer, 1971). In order to overcome this problem, an arcsin transformation was applied on the percentages. During this transformation each of the original observations is replaced by an angle whose sine is the square root of the original observation (Ferguson & Takane, 1989). The result of this transformation is that the new values will approximate the normal form of the binomial distribution more closely than did the original observations.

The new values were next subjected to a 2-way ANOVA (3 x 2) with repeated measures on

Table 2
Percentage of positive affect conditional on communicative context by group

Group[a]	Autism		Mental Retardation		Normal	
	M	(*SD*)	*M*	(*SD*)	*M*	(*SD*)
Joint Attention	28.37[c]	(38.28)	47.68[b]	(20.37)	44.50[c]	(24.48)
Requesting	11.18	(13.95)	37.81	(28.15)	15.69	(16.95)

Note: *M* = Mean; *SD* = Standard Deviation; [a]*n* = 16 children in each group; [b] = significant difference between groups; [c] = significant difference between contexts.

the last factor. The dependent variable was the transformed percentages of positive affect, and the independent ones were groups (autism vs. mental handicap vs. normal) and communicative contexts (JA vs. requesting). Both factors proved statistically significant. That is, there were significant differences between the three groups in the amount of positive affect they directed at the experimenter's face during the two communicative contexts, $F(2, 45) = 4.69$, $p = .014$. Furthermore, there was a significant difference in the percentage of positive affect expressed during requesting and the percentage of positive affect displayed along with JA, $F(1, 45) = 18.39$, $p < .0005$.

These differences were further subjected to one way-within group ANOVAs. The analyses revealed that children in the *normal* group displayed significantly more positive affect towards the experimenter in conjunction with JA acts than along with requesting, $F(1, 15) = 13.40$, $p = .002$. *Autistic* children too displayed more positive affect during JA than along with requesting behaviours. Although this difference was not as high as for the normal group (see Table 2), it did reach statistical significance, $F(1, 15) = 5.02$, $p = .041$. Finally, unlike the two former groups, *mentally retarded* children directed uniformly high levels of positive affect during the JA as well as the requesting context, $F(1, 15) = 2.14$, $p = .164$.

Between-group ANOVA tests were also applied to compare positive affect in the JA independently from the requesting context. Contrary to the initial predictions, the autistic group did not differ from the normal or the mentally retarded children in the amount of positive affect they displayed during JA interactions, $F(2, 45) = 2,39$, $p = .103$. In contrast, the positive affect displayed along with requesting behaviours resulted in a significant F, $F(2, 45) = 4.93$, $p = .011$. The mentally retarded children demonstrated higher percentages of positive affect during requesting than the autistic or the normal children (Tukey

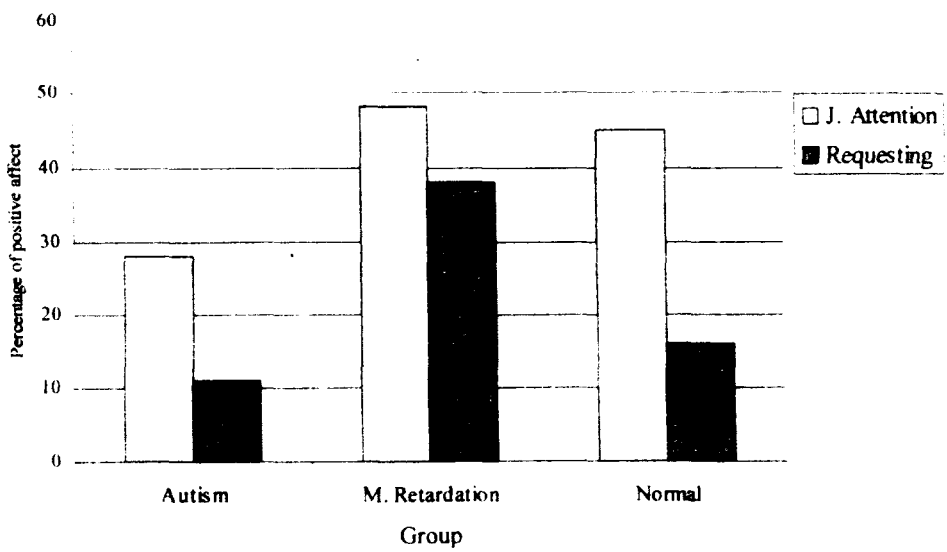

Figure 2
Percentage of positive affect exhibited by each group in conjunction with JA and requesting behaviours.

HSD tests significant at $\alpha = .05$). Figure 2 depicts these differences and similarities in the form of a histogram.

Discussion

The present study investigated autistic, mentally retarded and normal children's nonverbal communicative behaviours during a semi-structured play interaction with an unfamiliar adult. Two types of nonverbal acts were at test: joint attention and requesting. The results of this study showed that nonverbal attempts at request were made as frequently by the autistic as by the control groups. In contrast, there were significant group differences in the JA context. Autistic children engaged in JA behaviours less frequentlly than did the normal or the mentally retarded groups. These findings support earlier reports (Kasari, Sigman, Mundy, & Yirmiya, 1990; Loveland & Landry, 1986; Mundy, Sigman, & Kasari, 1990) showing that a disturbance in the development of nonverbal JA is a fundamental characteristic of the social disorder in autism.

The main aim of this study was to test the affective expressions displayed by the three groups in the two protocommunicative contexts of JA and requesting. Normal children, in the presence of toys and an unfamiliar adult, were more likely to direct positive affect to the adult when they were indicating interest in or sharing the experience of an event or toy (JA) than when requesting assistance with toys. This finding expands on the results reported by Kasari, Sigman, Mundy, and Yirmiya (1990) as well as by Mundy, Kasari, and Sigman (1992). In those studies, too, positive affect was increased during JA situations. It is thus confirmed that the declarative and experience-sharing function of JA acts may involve conveyance of positive affect to a greater degree than is involved in the instrumental function of requesting behaviours.

The prediction for the autistic group, according to Kasari, Sigman, Mundy, and Yirmiya's (1990) findings, was that unlike the normal sample, they would fail to demonstrate increased amounts of positive affect in conjunction with JA behaviours. Contrary to expectations, however, autistic children were found sharing more positive affect with the adult during JA interactions than during requesting ones. Furthermore, the amount of positive affect that autistic children displayed in the JA context was not statistically different from that of normal children's.

The mentally retarded children also expressed high percentages of positive affect in the context of JA acts. Unlike normal and autistic children, however, they exhibited increased amounts of positive affect during requesting as well. This finding was one of the main conclusions in Kasari et al.'s (1990) study. The combined results of the two experiments demonstrate a specific profile of affective interactions within the mentally retarded population that is different from the normal and may warrant further investigation.

Recapitulating, the results of the present study yield two important findings with respect to affective sharing during protocommunicative interactions. First, the normative data indicate that nonverbal JA acts are more likely to be associated with displays of positive affect than are nonverbal requesting behaviours. Second, the autistic children do not differ significantly from the normal pattern, demonstrating increased levels of affect along with JA acts. Acknowledging that firm conclusions cannot be drawn from the present study, given its small sample size, the artificial context of the adult-child interaction as well as the limited observation time, this last finding indicates that an impairment in affective sharing may not be implicated in autistic children's JA skill deficit.

Affective sharing with an adult over an object or an event may indeed be one of the functions JA acts serve. However, this does not necessarily explain why autistic children fail to show JA behaviours as often as do normal children. Other relationships that involve affective sharing between infants and caregivers appear to also be unaffected in autism. For example, autistic chil-

dren show attachment behaviours similar to those of other, non-autistic, children with severe learning difficulties (of the same mental age) (Shapiro, Sherman, Calamari, & Koch, 1987; Sigman, Mundy, Sherman, & Ungerer, 1986).

An alternative explanation for the JA skill deficit in autism, that has recently been put forward, states that, JA may involve rudimentary symbolic or consciously monitored representations of self or others as agents who may share intentions with respect to an object or event (Baron-Cohen, 1989; Leslie & Happé, 1989). This formulation is part of the theory of mind hypothesis of autism (Baron-Cohen, Tager-Flusberg, & Cohen, 1993; Frith, 1989). It suggests that children with autism do not engage in JA acts because they fail to take account of their own and others' intentions during this type of nonverbal communication (Leslie & Happé, 1989).

This is a compelling suggestion and it has recently received some support in studies demonstrating that autistic children are specifically impaired, relative to mentally retarded and normal controls, in their ability to appreciate intentions as mental plans that a person makes before acting, and in distinguishing intentional from accidental outcomes (Misailidi, 1996; Phillips, Baron-Cohen, & Rutter, 1998). These findings provide preliminary evidence that a problem with understanding the mind, may underlie even the earliest of the social deficits in autism.

Future studies examining specifically the association between measures of JA and intention will be useful, because it is theoretically important to determine if these are indeed related aspects of the social deficit in autism. This article also highlights the need for longitudinal studies of JA development in autism. Conclusions regarding the causation of any hypothesized critical deficit for understanding the syndrome, will, in part, depend on whether this deficit is sustained or improves with older age. Since there is no evidence that autistic children's theory of mind capacities improve over time (Charman & Baron-Cohen, 1992), it would be interesting to ask whether there is some improvement in JA skills.

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