

## **Affective Exchanges Between Young Autistic Children and Their Mothers**

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*This study examined autistic children's social behavior, affect, and use of gaze during naturalistic interactions with their mothers. Sixteen autistic children, 30 to 70 months of age, and 16 normal children, matched on receptive language, participated. Children and their mothers were videotaped during three situations: a free-play period, a more structured period during which communicative demand was made on the child, and a face-to-face interaction. In all three situations, autistic and normal children did not differ in the frequency or duration of gaze at mother's face. In the one condition (face-to-face interaction) during which affective expressions were coded, autistic and normal children also were not found to differ significantly in the frequency or duration of smiles displayed, and neither group displayed frowns. However, autistic children were much less likely than normal children to combine their smiles with eye contact in a single act that conveyed communicative intent. Autistic and normal children were not found to differ in the percentages of smiles they displayed to social versus nonsocial events. However, when autistic children's responses to mother's smiles specifically were examined, it was found that they were much less likely to smile in*

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*response to mother's smiles than were normal children. Finally, it was found that mothers of autistic children displayed fewer smiles and were less likely to smile in response to their children's smiles, when compared with mothers of normal children. These findings suggest that the autistic child's unusual affective behavior may negatively affect the behavior of others.*

Perhaps the most fundamental symptom of autism is an inability to form normal social and affective relationships with people. Difficulties in relating are evident in abnormal use of face-to-face gaze (Kanner, 1943), poor comprehension of social and emotional cues (Hobson, 1986), lack of social initiative and reciprocity (Rutter, 1983), and poor perspective-taking abilities (Dawson & Fernald, 1986). The developmental origins of these difficulties are poorly understood.

Several investigators (Dawson & Galpert, 1986; Dawson & Lewy, 1989; Hobson, 1989; Mundy & Sigman, 1989) have proposed that autistic children may have abnormal affective responses to people that may impair their ability to form normal social relationships. In a recent study of autistic children's affective behavior, Kasari, Yirmiya, Mundy, and Sigman (1986) found that, compared with mentally retarded children, autistic children showed more frequent displays of negative affect and emotional blends during social interactions with an experimenter. Similarly, Snow, Hertzog, and Shapiro (1986) found that young autistic children displayed less positive affect in social interaction with adults than did a mental and chronological age-matched sample of developmentally delayed children. Furthermore, Snow et al. reported that when autistic children did display positive affect they were less likely to display it to their social partners. To date, there have been few systematic observational studies of autistic children's affective behavior with a familiar caretaker. Such studies are important since it has been shown that autistic children are less socially responsive when they are unfamiliar with their social partner (Lord & Hopkins, 1986). In this study, we explored the communicative use of affect and eye contact by autistic and normal children when interacting with their mothers. Our intent was to observe interactive behavior as it naturally occurs with a familiar partner.

There were several unanswered questions about autistic children's social and affective behavior that we attempted to address. First, we were interested in whether autistic children actually spend less time than normal children socially interacting with their mothers when observed in a naturalistic situation, and whether the amount of time spent interacting with mother differs depending upon the communicative context (e.g., free play versus a task-oriented situation in which a communicative demand was placed on the child). Similarly, we were interested in whether autistic children actually make

less eye contact with their mothers and whether eye contact is affected by communicative context.

With regard to affective behavior, we explored whether autistic children express positive affect and use eye contact less frequently during face-to-face interactions with their mothers as compared with normally developing children. We hypothesized that the greatest difference between autistic and normal children's use of affect and eye contact might be a qualitative rather than a quantitative one; that is, we hypothesized that autistic children typically would fail to combine eye contact and affect in a manner that normally occurs when someone communicates his or her feelings to another person. Another qualitative difference that we anticipated was that autistic children would be less likely than normal children to smile in response to social stimulation provided by their mothers, and that, in particular, the autistic children would be less likely to smile in response to their mothers' smiles (empathic smiling).

Finally, we were interested in the possible effects the autistic children's unusual affective behavior might have on the affective behavior of their mothers.

## METHOD

### *Participants*

Sixteen children with autism (13 males and 3 females) between 30 and 70 months of age ( $M = 49.6$  months,  $SD = 12.1$ ) participated. Eight of the children were diagnosed autistic by the Division TEACCH (Treatment and Education of Autistic and related Communication-handicapped CHildren), Department of Psychiatry, University of North Carolina at Chapel Hill. The other eight autistic children were diagnosed at the Glenrose School Hospital, Edmonton, Alberta, Canada. Children's scores on the Childhood Autism Rating Scale (CARS) ranged from 35 to 70.

The Reynell Developmental Language Scales were administered to all autistic children. Scores for autistic children ranged from 11 to 32 months on the Verbal Comprehension Scale ( $M = 18.6$  months,  $SD = 8.43$ ) and from 11 to 34 months on the Expressive Language Scales ( $M = 18.1$  months,  $SD = 8.5$ ).

A comparison group of 16 normally developing infants and toddlers and their mothers were recruited from the Chapel Hill area. The children consisted of 13 males and 3 females, and each child was matched individually to an autistic child on the basis of sex, race, receptive language age (as

measured by the Reynell Verbal Comprehension Scale), and mother's SES and educational level. The normal children's Reynell scores ranged from 11 to 33 months on the Verbal Comprehension Scale ( $M = 18.8$  months,  $SD = 8.47$ ) and from 11 to 39 months on the Expressive Language Scale ( $M = 18.9$  months,  $SD = 10$ ).

### *Procedure*

The autistic children who were diagnosed at the Division TEACCH, University of North Carolina, and all of the normal children and their mothers were seen at the Laboratory of Infant Behavior in the Psychology Department at the University of North Carolina at Chapel Hill. The autistic children who were diagnosed in Canada were seen in a room located at Glenrose School Hospital, which was arranged to resemble the Laboratory of Infant Behavior as closely as possible.

*Free Play (Low Communicative Demand).* All children and their mothers participated in a 10-minute free-play session during which mothers were instructed to play with their children as they normally would at home. A chair, two small tables, and several toys were in the room.

*Put Toys Away (High Communicative Demand).* At the end of the 10-minute free-play session, mothers were asked to have their children help them put the toys away in a toy box. Two remote-controlled cameras videotaped both the free-play and put-toys-away sessions.

*Snack Time (Face-to-Face Interaction).* The free-play and put-toys-away sessions were followed by a 10-minute snack time during which children sat in a large highchair with tray and their mothers were instructed to sit face-to-face with their children and provide a snack of juice and cookies. One remote-controlled camera videotaped the mother's face and another camera videotaped the child, thus allowing for split-screen monitoring of mother-child interactions.

### *Behavioral Coding*

*Free Play and Put Toys Away.* During the first 20 minutes (free play and put toys away), the child's behavior was coded at 5-second intervals from videotapes. First, the child's behavior was categorized as either social (i.e., behavior involved mother in some way) or nonsocial. If the behavior was coded as social, it was then categorized as interactive (e.g., the child was talking to, playing with, or touching mother) or noninteractive (the child was

only watching mother's actions). If the behavior was coded as nonsocial, it was then categorized as toy-directed or other-directed (e.g., staring at wall or running around room).

On a second pass through the videotapes, the frequency and duration of gazes at mother's face were coded in real time. Affective expressions were not coded during the free-play and put-toys-away sessions since it was felt that the split-screen videotape recordings during snack time would offer a better opportunity to code affective interactions.

*Snack Time.* During snack time, children's affective and gaze behavior and mothers' affective behavior were coded separately from the split-screen videotape recordings. Owing to the quality of the recordings, individual facial muscle action units could not be easily detected, precluding use of more sophisticated facial expression coding systems. Only smiling and frowning could be coded.

*Children's Affective and Gaze Behavior.* The frequency and duration of smiles and frowns and whether the smile or frown was accompanied by gaze at mother's face (eye contact) were coded. Frowns occurred so infrequently that statistical analyses were not possible; thus, they were not included in the analyses.

Each affect expression was categorized as elicited or nonelicited. An elicited affective expression was defined as one for which there appeared to be an immediately preceding event that elicited the expression, whereas a nonelicited expression appeared to be spontaneously generated by the child. For elicited expressions, the type of event that immediately preceded the expression was coded. The events were categorized as social (mother's verbalization, touch, facial expression, and/or gesture) or nonsocial (eating or drinking or playing with nonsocial objects, such as the chair). If the affective expression was immediately preceded by both a social and a nonsocial event, the event was coded as social. Nonelicited, spontaneous expressions were classified as communicative (not apparently directed at mother as indicated by gaze).

On another pass through the videotapes, children's gaze at mother's face was coded in terms of frequency and duration in real time.

*Mothers' Affective Behavior.* Frequency and duration of smiles and frowns were recorded for mothers. However, frowning was not found to occur for mothers and thus was not included in the analyses. For each mother's smile, it was noted whether (1) the child was smiling before the mother's smile began, (2) the child smiled in response to mother's smile, or (3) the child did not smile before or after the mother's smile. The behavioral coding system used during snack time is outlined in Table I.

Twenty-five percent of the tapes were coded by two coders. Raters were blind to the diagnosis of the child, although it is likely that the child's diag-

**Table 1.** Behavioral Coding Scheme for Classifying Children's and Mother's Affective Behavior During Snack Time

Children (smiles/frowns)		
Type of smile	Elicited	Socially elicited Nonsocially elicited
	Spontaneous	Communicative Noncommunicative
Accompanied by eye contact vs. no eye contact		
Mother (smiles)		
Relation to Child's behavior		Child smiling before mother Child smiled in response to mother Child did not smile

nosis could be guessed from the child's age and behavior. Interrater reliability (Kappa) for all behavioral coding was at or above .80.

## RESULTS

All behavioral variables were corrected for amount of codable time, which varied according to whether the child and the mother were visible on the videotape. Note also that the number of subjects used in different analyses varied depending upon whether all subjects had codable data for a given variable and whether all subjects actually displayed the behavior of interest.

### *Free Play*

During the free-play session, autistic and normal children differed on only one variable; autistic children spent significantly more time than normal children engaging in nonsocial activities that did not involve toys (e.g., staring into space and self-stimulation) (mean proportion of time spent in nonsocial activities for autistic group = .014, *SD* = .011; mean for normal group = .005, *SD* = .008; matched *t* test:  $t = 3.82$ ,  $df = 15$ ,  $p < .001$ ). Autistic and normal children did not significantly differ in the amount of time spent interacting with mother or toys, or in the frequency or duration of gaze at mother's face. For autistic children only, it was found that the frequency of gaze at mother's face was significantly correlated with receptive and expressive language age, as measured by the Reynell Scales. (For autistic group,  $r$ 's = .60,  $p < .01$  for both correlations. For normal group,  $r$ 's = -.08 and -.11, respectively, both nonsignificant.) For autistic children, as language level increased, the frequency of gaze at mother's face increased.

### *Put Toys Away*

During the time when mother asked her child to help her put toys away, autistic and normal children significantly differed only in the amount of time spent watching mother's actions; normal children watched mother for a significantly greater duration of time compared with autistic children (mean duration per second for autistic group = .003,  $SD = .006$ ; mean for normal group = .015,  $SD = .014$ ;  $t = -3.70$ ,  $df = 14$ ,  $p < .002$ ). Normal and autistic children did not significantly differ in the frequency or duration of gaze at mother's face. Frequency of gaze at mother's face was significantly correlated with receptive and expressive language level for normal children only. (For normal children,  $r$ 's =  $-.52$ ,  $p < .05$ ;  $-.51$ ,  $p < .05$ , respectively. For autistic children,  $r$ 's =  $.16$  and  $.29$ , both nonsignificant.) As language ability increased, gaze at mother's face decreased for normal children. Normal children with better receptive and expressive language spent less time watching mother than those with less-developed language ( $r$ 's =  $-.57$ ,  $p < .05$ ;  $-.51$ ,  $p < .05$ , respectively). It was also found that, during the put-toys-away period, autistic children with better expressive language abilities spent less time engaging in nonsocial behavior than did those with less-developed language ( $r = -.50$ ,  $p < .05$ ).

### *Snack Time*

*Children's Affective and Gaze Behavior.* Both independent and matched  $t$  tests were carried out for all the analyses reported for the affective and gaze behavior during snack time. Both types of analyses yielded essentially the same results. During face-to-face interaction, autistic and normal children did not differ in the overall frequency and duration of smiling or gaze at mother's face. The mean numbers of smiles displayed by autistic and normal children are shown in the first two bars of Figure 1. However, as can be seen in Figure 2, autistic children were much less likely to combine their smiles with gaze at mother's face ( $t = -2.47$ ,  $df = 23$ ,  $p < .015$ ). This was true regardless of whether the smile was socially or nonsocially elicited (mean percentages of socially elicited smiles that were combined with eye contact for autistic and normal children were 25.6 and 63.4, respectively; mean percentages of nonsocially elicited smiles combined with eye contact for autistic and normal children were 0 and 63.9, respectively).

For autistic children only, the percentage of smiles combined with gaze at mother's face was significantly correlated with receptive language age level ( $r = .63$ ,  $p < .03$ ) and marginally related to expressive language level ( $r = .54$ ,  $p < .07$ ). Conversely, the percentage of smiles without gaze at mother decreased as receptive and expressive language levels increased ( $r$ 's =  $-.69$ ,

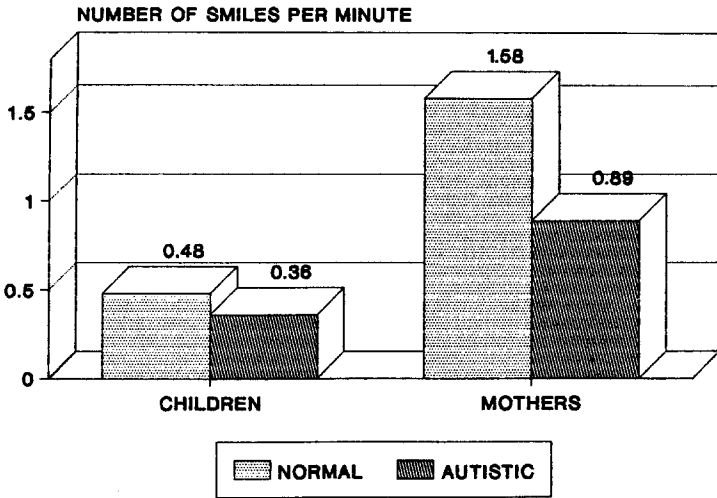


Fig. 1. Mean numbers of smiles (per minute of codable time) displayed by normal and autistic children and their mothers during face-to-face interaction.

$p < .01$ ;  $-.51, p < .09$ , respectively). For normal children only, the frequency of gaze at mother's face was significantly correlated with chronological age ( $r = .75, p < .001$ ), receptive language level ( $r = .76, p < .001$ ), and expressive language level ( $r = .72, p < .002$ ).

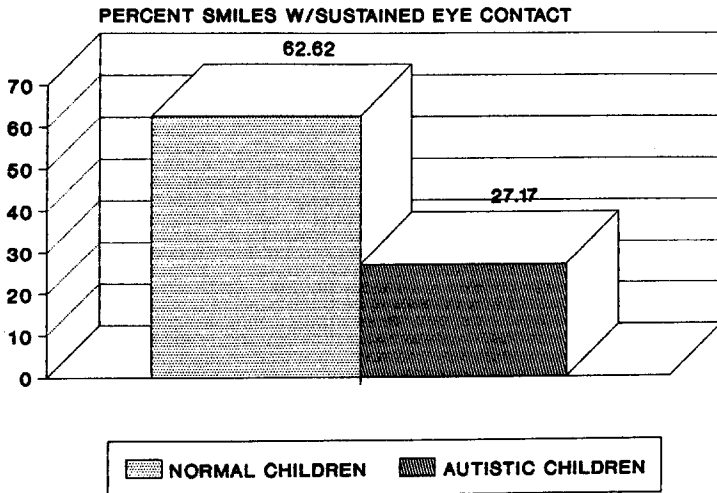


Fig. 2. Percentages of smiles combined with gaze at mother's face for normal and autistic children during face-to-face interaction with their mothers.



Autistic and normal children did not differ in the percentages of smiles elicited by nonsocial versus social events. For autistic children, the mean percentage of smiles to social events was 68.17,  $SD = 12.6$ , and to nonsocial events was 16.42,  $SD = 7.17$ . For normal children, the mean percentage of smiles to social events was 77.9,  $SD = 7.64$ , and to nonsocial events was 21.31,  $SD = 7.61$ . However, when children's responses to mother's smiles were specifically examined, it was found that autistic children were much less likely to smile in response to mother's smiles, as compared with normal children ( $t = 2.72$ ,  $df = 27$ ,  $p < .01$ ). These data are displayed in the first two bars of Figure 3. In fact, only 3 out of 15 autistic children ever smiled in response to mother's smile, whereas 10 out of 14 normal children did so. (Note that, in each group, one subject did not have codable data. Also, in the normal group, one subject's mother never smiled during codable segments and thus this subject was eliminated from the analysis.)

Autistic children tended to show a higher frequency of spontaneous, noncommunicative smiles as compared with normal children, although this difference did not reach statistical significance ( $t = 1.56$ ,  $df = 27$ ,  $p < .07$ ).

*Mother's Affective Behavior.* We next examined the mothers' behavior. As displayed in the last two bars of Figure 1, compared with mothers of normal children, mothers of autistic children displayed significantly fewer smiles ( $t = -3.00$ ,  $df = 27$ ,  $p < .005$ ). In addition, as shown in the last two bars of Figure 3, compared with mothers of normal children, mothers

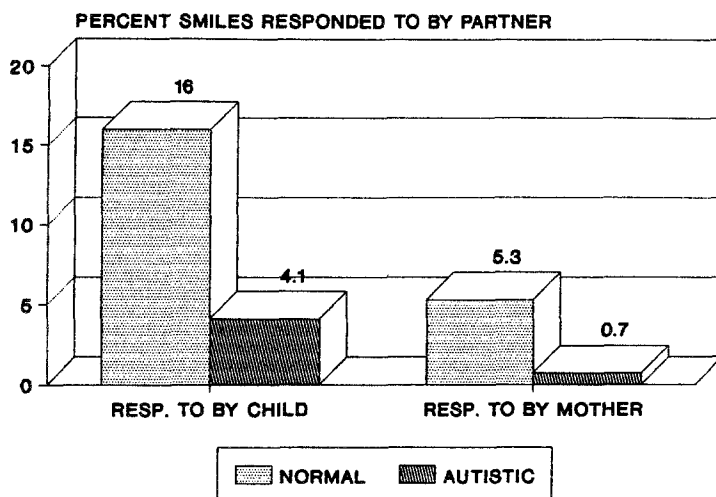


Fig. 3. First two bars display the percentages of mother's smiles responded to by normal and autistic children, respectively. The second two bars display the percentages of children's smiles responded to by mothers of normal and autistic children, respectively.

of autistic children were less likely to smile in response to their children's smiles ( $t = -2.55$ ,  $df = 27$ ,  $p < .02$ ). Mothers of normal and autistic children did not differ in the duration of smiling.

## DISCUSSION

Three kinds of interaction between children and their mothers were observed: a relatively unstructure free-play period, a more structured period during which a communicative demand was made on the child, and a face-to-face interaction. In all three situations, autistic and developmentally matched normal children did not differ in the frequency or duration of gaze at mother's face. In the one condition (snack time) during which affective expression (smiling and frowning) was coded, autistic and normal children also were not found to differ significantly in the frequency or duration of smiles displayed, and neither group displayed frowns. However, autistic children were much less likely than normal children to combine their affective expression with eye contact. These results suggest that the abnormality in the use of eye contact and emotional expression commonly observed in autistic children is not quantitative in nature. Rather, the abnormality appears to be a qualitative one: The autistic child often fails to combine emotion and eye contact in a single act that conveys communicative intent. The autistic child expresses emotion as frequently but does not readily communicate emotion to others.

Both autistic and normal children responded with smiles more frequently to social events than to nonsocial events. However, when autistic children's responses to mother's smiles were examined, it was found that they smiled much less frequently in response to mother's smiles than did normal children. Indeed, the majority of autistic children never smiled in response to mother's smile. This finding supports the notion that autism may interfere with the biologically based ability to respond empathically to others (Hobson, 1989). Dawson and Lewy (1989) have suggested that certain aspects of social interaction, including emotional expressions and language, may be overstimulating for autistic children because of the unpredictable and complex nature of these social stimuli. When overstimulated, the autistic child may respond by losing interest and even withdrawing from the stimulation. Extending this notion, the autistic child may often fail to sustain attention to the affect-laden behavior of others, rather than responding in kind with positive affect. Thus, the autistic child and his or her parent would have few opportunities for experiences during which they share a positive emotion, and the development of "affective attunement" (Stern, Hofer, Haft, & Dore, 1985) would be disrupted.

It is perhaps not surprising that we found that mothers of autistic children responded differently from mothers of normally developing children during social interactions with their children. We found that mothers of autistic children displayed fewer smiles and were less likely to respond to their children's smiles as compared with mothers of normal children. Given that autistic children rarely combined their smiles with gaze toward their mothers, it is likely that the children's smiles had little communicative value for their mothers. Thus, the autistic child is affected not only by an inability to easily assimilate and respond to social stimulation but also by the negative impact that his or her behavior may have on the social environment.

A limitation of this study is that it did not include a nonautistic mentally retarded comparison group. Since many of the autistic children in this study were also mentally retarded, it is uncertain whether the differences we found are specific to autism. This will be an important comparison in future research.

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