

DEFINING THE SOCIAL DEFICITS OF AUTISM: THE CONTRIBUTION OF NON-VERBAL COMMUNICATION MEASURES

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Abstract—Young autistic children were compared to normal and control samples on measures of non-verbal communication skills and object play skills. Deficits in non-verbal indicating behaviors best discriminated the children diagnosed as autistic from the other groups. Although the autistic children also exhibited deficits in object play behavior, these deficits did not add appreciably to the discriminant function based on the non-verbal communication behaviors. These results suggest that a deficit in the development of non-verbal indicating behaviors is a significant characteristic of young children who receive the diagnosis of autism.

Keywords: Autism, social deficits, non-verbal communication, social responsiveness

INTRODUCTION

THE ONSET of the syndrome of infantile autism occurs prior to 30 months of age and is marked by abnormal social development (Kanner, 1943; Rutter, 1978). In one contemporary diagnostic system, autistic deficits in social development have been described as "a pervasive lack of responsiveness to others" (American Psychiatric Association, 1980). However, the parameters of this social deficit have not been described with precision (Howlin, 1978) and appear to change with age (Rutter, 1978). In order to better understand the incipient social deficits intrinsic to this syndrome it is important to examine the extent to which young autistic children have mastered the developmental tasks of infancy (cf. Rutter, 1984). In this study the literature on normal infant development and non-verbal social-communication skills provided a framework for examining the types of social skill deficits which are characteristic of young autistic children.

At least three categories or functions of non-verbal social-communication acts have been described in the literature on infant behavior. Affiliation or *social interaction* behaviors involve the use of non-verbal acts (e.g. reaching to others) to elicit or maintain face to face interaction where the focus of the social partner is on the child. Joint attention or *indicating* behaviors involve the use of procedures (e.g. showing a toy) to co-ordinate attention between interactive social partners with respect to objects or events in order to share an awareness of the objects or events. Behavior regulation

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or *requesting* behaviors involve the use of procedures (e.g. reaching to toys) to co-ordinate attention between interactive partners with respect to objects or events in order to gain another person's aid in obtaining objects or events (Bruner & Sherwood, 1983; Seibert, Hogan & Mundy, 1982).

Behavioral development within each of these categories has been operationally defined. The development of affiliative behavior is marked by the increasing capacity to co-ordinate eye contact with acts such as reaching to or touching another person. Also, developments in behavioral organization lead to the capacity to engage in object turn-taking sequences with other people (Seibert & Hogan, 1982). The categories of indicating and requesting are marked by the increasing capacity to co-ordinate eye contact to a person while gesturing (referring) to an object or event (Sugarman, 1984) and by the increasing use and understanding of conventional gestures such as pointing, showing and giving (Bates, Camaioni & Volterra, 1975; Rheingold, Hay & West, 1976). Theoretically, these developments are linked to the emergence of social cognitive skills such as the ability to discriminate self and others and the ability to perceive others as agents of action and contemplation (Werner & Kaplan, 1963). Bakeman & Adamson (1984) also suggest that the types of behaviors involved in indicating and requesting may differ from affiliative behaviors in terms of attentional demands. According to this hypothesis, the attentional demands of social interaction behaviors are dyadic (self and other) while the attentional demands of joint attention and behavior regulation are triadic (self, other, object/event).

Elements of this tripartite taxonomy of non-verbal social-communication skills have been used in studies of autistic children. In a study of four autistic children Wetherby & Prutting (1984) found that these children exhibited requests for objects, actions and social routines but did not engage in gestural acts simply to indicate or share an awareness of an object's existence or properties. Similarly, Curcio (1978) reported that gestural requests were observed among all 12 autistic children in his study, but none of these children exhibited indicating gestures. A third study reported that autistic children exhibited significantly fewer gestural indicating behaviors and were less responsive to adult indicating acts than were normal and language-delayed children (Loveland & Landry, 1985).

These studies suggest that the disordered social development of autistic children is characterized by stronger deficits in indicating skills than in affiliative or requesting skills. In each of the studies, though, psychometric data indicated that a majority of the autistic children were functioning in the mentally retarded range of intelligence. Greenwald & Leonard (1979) have shown that for mentally retarded children, the development of non-verbal indicating skills may lag behind the development of other non-verbal communication skills. It is not clear, then, whether a deficit in the development of joint attention skills is specific to autism or whether this deficit is a general concomitant of developmental disorder.

To address these issues, the present study compared a sample of young autistic children with developmentally matched samples of young mentally retarded children and normal infants on measures of non-verbal affiliative, indicating and requesting behaviors. It was predicted that autistic children would exhibit some deficits in all types of non-verbal communication skills, but the deficits in joint attention skills would be most profound. That is, these behavioral deficits would best discriminate children diagnosed as autistic from mentally retarded and normal children.

Another goal of this study was to compare the utility of non-verbal communication measures and object play measures in discriminating among samples of young autistic, normal and mentally retarded children. It has been well established that autistic children exhibit marked deficiencies in playing with objects in a conventional or functionally appropriate fashion and in the use of symbolic acts in object play (Riquet, Taylor, Benroya & Klein, 1981; Sigman & Ungerer, 1984; Wing, Gould, Yeates & Brierly, 1977). This evidence suggests that play assessments may be an important component in the differential diagnosis of autism (Doherty & Rosenfeld, 1984). A corollary of the hypothesis of the current study is that measures of non-verbal communication skills, especially indicating skills, also comprise an important component in the differential diagnosis of young autistic children. Since the object play skills and non-verbal communication skills of young autistic children are not highly correlated (Mundy, Sigman, Ungerer & Sherman, in press), some combination of play and non-verbal communication variables may yield an optimal discriminant function of young autistic and other groups of children. Therefore, the present study was also designed to examine the individual and combined discriminant power of non-verbal communication and object play variables with respect to groups of autistic, mentally retarded, and normal children.

METHOD

Subjects

The autistic sample was composed of 18 children (14 boys and 4 girls) who ranged in age from 34 to 75 months.* The diagnosis of each child was made independently of the experimenters by psychiatrists at the UCLA Clinical Research Center for the Study of Childhood Psychosis according to APA (1980) criteria. Children with symptoms associated with organic brain dysfunction (seizures) were excluded from this study. The mentally retarded sample included 9 children with Down Syndrome and 9 children with unspecified etiologies. These children were selected to match individual autistic children on chronological age, mental age and on mother's level of education. A sample of 18 normal children was matched with individual autistic children on the basis of mental age and mother's level of education. The mean chronological ages for the autistic, MR, and normal samples were 53.3, 50.2 and 22.2 months, respectively. The mean Cattell/Binet mental ages (Merrill-Palmer MA in parentheses) for the autistic, mentally retarded and normal samples were: 25.7 (34.0), 26.0 (28.5) and 25.0 (36.6) months, respectively. The mean level of mother's education for the groups in the same order was: 13.8, 13.7 and 14.1 years, respectively.

Procedures

All of the assessments were administered in a 2.3 × 3.7 m room in the medical center. Each child was assessed individually in three sessions. During the first session the non-verbal social-communication measure and the Cattell Scales of Infant Intelligence or Stanford-Binet were administered by independent testers. Independent testers presented each child with an unstructured play task and the Reynell Language Scales during the second session and a structured play task during the third session.

Assessment of pre-verbal communication

Non-verbal communication skill was assessed using a form of the Early Social Communication Scales (ESCS, Seibert & Hogan, 1982). In this procedure a child and experimenter sat facing each other at a small table. A set of toys including a hat, a comb, a book, a ball, a car, 5 wind-up mechanical toys and 5 hand-operated mechanical toys including balloons were in view but out of reach of the child.

*An analysis of the correlates of language acquisition involving 16 of these autistic children has been reported elsewhere (Mundy, Sigman, Ungerer & Sherman, in press).

Colorful posters were hung on the walls of the room. The experimenter presented and activated the toys one at a time. Intermittently the experimenter also pointed to and looked at the wall posters, made simple requests of the child such as "Give it to me" and presented the child with social games and turn-taking opportunities. The child-experimenter interaction was videotaped to record the front-upper body view of the child and the upper body profile of the adult. The period of interaction with each child was approximately 25 min. Behavioral ratings were made from the ESCS videotapes by trained observers.

Observations of the child's non-verbal communication skills were grouped into three categories of behaviors: social interaction, indicating and requesting.* In rating the social interaction category the emphasis was on behaviors used by the child to elicit or respond to attention to self. In the indicating category the emphasis was on behaviors used to direct attention to an object or event, thus establishing a common focus of attention between the child and adult. In the requesting category the emphasis was on behaviors used to request aid in obtaining objects or events. Within each category the child was rated in both the role of initiator and responder. This resulted in the following six measures.

1. *Response to social interaction* measured the child's use of eye contact, acts such as reaching to the experimenter and combinations of eye contact and acts in response to pauses in social games of tickling, singing or making funny faces. Also measured was the ability to respond to adult-initiated object exchange games (turn-taking) with a ball, car, hat, comb and glasses.

2. *Initiates social interaction* measured the child's use of eye contact, acts and gestures to obtain attention, initiate social games or initiate object exchange games.

3. *Response to indicating* measured the child's ability to respond appropriately when the adult pointed to and gazed to the left, right or behind the child and said "Look" three times. The experimenter presented two pointing trials in each direction during the ESCS session. The experimenter elicited the attention of the child before each point.

4. *Initiate indicating* measured the child's ability to share attention by making eye contact with the experimenter while manipulating objects or alternating eye contact between the experimenter and an active mechanical toy. Also measured was the child's ability to use gestures to direct attention such as pointing to objects or showing objects.

5. *Response to request* measured the child's ability to inhibit to "No!" and respond appropriately to simple commands such as "Give it to me" with gesture (e.g. hand extended palm up) or without gesture.

6. *Initiate request* measured the child's ability to use acts, gestures and eye contact to request out-of-reach objects or assistance in reactivating mechanical toys.

The behaviors observed within each category of nonverbal communication skill have been ranked according to three ascending developmental levels (Seibert & Hogan, 1982; see Table 1). The validity of these developmental levels has been empirically confirmed (Mundy, Seibert & Hogan, 1984).

Each child received a frequency score for the various behaviors presented in Table 1. The interobserver reliability of the ESCS measures was assessed with generalizability studies of the independent paired ratings of videotape data from a randomly selected group of 19 children in this study. Generalizability studies are recommended for the estimation of the interobserver reliability of continuous data sets (Algina, 1978; Berk, 1979; Mitchell, 1979). A generalizability study, as applied to interobserver reliability, uses ANOVA to estimate the size of the variance components attributable to individual differences among subject scores (true score variance) and the variance attributable to rater differences (rater variance). The generalizability coefficient itself is an intraclass coefficient which directly represents the ratio of true score variance to the sum of true score variance plus the rater by true score interaction variance. Thus, the generalizability coefficient only approaches 1.0 when subject score variance is sufficiently large and the difference between raters is relatively small. All the interobserver generalizability coefficients for the frequency scores exceeded 0.65 (mean = 0.84, range 0.67-1.0) except for item 3 in the initiate social interaction category (see Table 1). This variable was excluded from further analysis.

Assessment of play

The play performance of the children was assessed in both a structured and unstructured setting according to procedures described in detail elsewhere (Ungerer & Sigman, 1981). In the unstructured setting the children were presented with a set of toys which included three different-sized dolls, doll

*The latter two categories are referred to as joint attention and behavior regulation in the ESCS. The terms used by Bruner & Sherwood (1983) for these categories were adopted herein for conciseness.

TABLE 1. BEHAVIORS MEASURED ON THE EARLY SOCIAL COMMUNICATION SCALES†

Social interaction	Joint attention	Behavior regulation
<p>Level 1. <i>Respond</i> (1) EC or (2) action directed to E when social game ceases. <i>Initiate</i> (1) EC with quiet, inactive E or (2) reach to quiet E.</p>	<p><i>Respond</i> (1) Fixates E's finger or face when E points. <i>Initiate</i> (1) Looks to inactive E while C examines object.</p>	<p><i>Respond</i> (1) C inhibits to "No!" and gesture. <i>Initiate</i> (1) C fusses when toy is out of reach or toy ceases.</p>
<p>Level 2. <i>Respond</i> (3) C combines eye contact and reach to E during pause in social game. <i>Initiate</i> (3) Combines EC with action to inactive E.</p>	<p><i>Respond</i> (2) 90° head-turn in correct direction on 50% of distal pointing trials. <i>Initiate</i> (2) EC to E and looks to toy while toy is active.</p>	<p><i>Respond</i> (2) C inhibits to "No!" without gesture. <i>Initiate</i> (2) C reaches to toy out of reach or toy ceases. (3) EC to E, toy moved out of reach, toy ceases.</p>
<p>Level 3. <i>Respond</i> (4) Returns ball or car in T-T game or (5) places hat, comb or glasses on E's head when E leans toward C and says "Can I play?" (Invitation). <i>Initiate</i> (4) C starts object T-T game or (5) teases E by engaging in prohibited activity while smiling at E.</p>	<p><i>Respond</i> (3) 90° head turn in correct direction on 66% of distal pointing trials, (4) follows 3 distal points in a row, (5) points in imitation. <i>Initiate</i> (3) C points to toys within reach or to fixed features of room, (4) C shows toys to E.</p>	<p><i>Respond</i> (3) Follows simple command (e.g. "Give it to me!" or "Sit down!") issued with a gesture. <i>Initiate</i> (4) C combines EC and give or reach to obtain aid when toy is out of reach, toy ceases. (5) C points to toy out of reach.</p>

†These behaviors comprise a subset of the original ESCS (see Seibert & Hogan, 1982).
 EC = eye contact; E = experimenter; T-T = turn-taking; C = child.

furniture, a tea set, a dumptruck, a garage, a telephone, a brush and a mirror. The play session began with the experimenter modeling four different symbolic acts with toys while the child sat on the mother's lap. Following the modeling of the play acts the experimenter and mother sat in diagonal corners of the room while the child was permitted to play alone with the toys for 16 min. The child's play behavior was recorded by the experimenter seated in the play room using a checklist which included behaviors frequently observed with this set of toys.

For the purposes of this study observations of play behavior were grouped into the following categories:

1. *Functional acts*, including the use of toys in self-directed acts such as brushing one's hair, doll-directed acts such as placing a spoon to the mouth of a doll, other-directed acts, such as holding a telephone receiver to the experimenter's ear, and object-directed acts such as pushing the toy truck into the garage.

2. *Symbolic acts*, including substitution play defined as the use of one object as if it were a different object such as substituting a sponge for food on a spoon to feed a doll, doll as agent wherein a doll was made to perform acts as an independent agent such as driving the truck or walking, and imaginary play defined as creating objects or people not in the immediate environment, as when a child makes pouring sounds while pretending to pour tea.

These types of play acts were also observed in the structured play sessions. In these sessions an experimenter structured the child's play by presenting the child with each toy individually and with groups of related items such as the brush and the mirror; a second experimenter observed and recorded the child's spontaneous play on a checklist. These sessions lasted approximately 30 min.

The play data used in the present study consisted of the number of different types of spontaneous acts recorded for the categories of functional and symbolic play in the structured and unstructured sessions. Two experimenters independently rated the play of 18 randomly selected subjects in this study. All of the interobserver generalizability coefficients for the different types of play acts exceeded 0.65 (mean = 0.86, range = 0.82–1.0).

RESULTS

Group comparisons: Early Social-Communication Scales (ESCS)

To examine group differences Multivariate Analyses of Variance (MANOVAs) were computed using the behavioral frequency scores from each category of the ESCS. These analyses revealed significant effects of group membership for the behaviors in the following categories: responding to social interaction, Wilk's $\Lambda = 0.44$, $F(10,94) = 4.83$, $P < 0.001$; initiating social interaction, Wilk's $\Lambda = 0.62$, $F(10,94) = 2.53$, $P < 0.01$; initiating indicating, Wilk's $\Lambda = 0.45$, $F(8,96) = 5.90$, $P < 0.001$; and initiating requesting, Wilk's $\Lambda = 0.50$, $F(12,92) = 3.21$, $P < 0.001$. These analyses were followed up with a priori orthogonal group comparisons (*t*-tests using the within-group variance estimates—see Table 2).

The data in Table 2 indicate that the autistic children were significantly different from the other groups on a variety of social interaction behaviors. However, these differences did not always reflect autistic behavioral deficits. The autistic children tended to show similar or even significantly higher frequencies of the relatively simple Level 1 social interaction behaviors than did the normal or mentally retarded children. These behaviors included: reach after tickle, eye contact after tickle and eye contact to quiet/inactive adult. The autistic children exhibited significantly lower frequencies of behavior in the responding to social interaction category only on the relatively complex Level 3 behaviors (i.e. maximum number of turn-taking with the ball and responding to invitations to place the hat, comb and glasses on the head of the experimenter).

In contrast, the autistic children exhibited lower frequencies on all of the behaviors within the initiating joint attention category, regardless of the developmental level

TABLE 2. GROUP COMPARISONS OF THE SOCIAL INTERACTION (SOCIAL), INDICATING AND REQUESTING BEHAVIORS†

Behaviors	Autistic	Mentally retarded	Normal
Response social			
Reach after tickle	3.1	0.6**	0.5**
Eye contact after tickle	4.9	5.4	2.9*
Reach and eye contact/tickle	2.0	2.0	1.2
Maximum # turns-taken	1.9	3.6*	3.7*
Invitation	0.5	1.5**	0.8
Initiates social			
Reach to quiet adult	1.7	1.1	0.3
Eye contact, quiet A	2.9	3.4	1.3**
Initiate turn-taking	0.7	1.0	0.9
Tease adult	1.0	1.2	0.7
Response indicating			
% correct, follows points	53	73	79*
Follows 3 points in a row‡	0.4	0.6	0.5
Points in imitation	2.3	3.0	2.5
Initiates indicating			
Eye contact—holding toy	3.8	6.6**	5.8*
Eye contact—toy active	1.4	5.4**	5.5**
Points	1.1	2.1	2.3
Shows	0.2	2.2*	0.9
Response request			
Inhibits to "No" (no gesture)	1.5	1.2	0.6
Simple command			
(+ gesture)	2.2	1.4	1.8
Simple command (no gesture)	1.8	1.8	1.5
Initiates request			
Reaches to toy	9.0	6.5*	7.4
Eye contact, toy out of reach or toy ceases	3.4	4.5	5.7*
Combines eye contact with reach to toy or give toy	2.3	2.9	2.8
Points, toy out of reach	1.4	3.7	6.7*

*Significantly different from the autistic group, $P < 0.05$.

** $P < 0.01$.

†Level 1 response to indicating and initiates requesting behaviors were excluded from these analyses because all children demonstrated level 2 behaviors within these categories.

‡Maximum score = 1.

of the behaviors. These group differences were especially strong on behaviors involving looking to the experimenter while the child held a toy, or alternating looking between an experimenter and an active mechanical toy. In these situations the autistic children tended to focus their attention on the toys rather than divide their attention between the toy and the experimenter as did the normal and mentally retarded children. The

autistic children also showed toys less often than did the mentally retarded children, and exhibited a tendency to point less often to objects within reach or fixtures in the room than the normal children ($P < 0.08$).

In addition, the autistic children were less likely to respond correctly when the experimenter pointed and said "Look!" (i.e. child's head turns 90° in the correct direction) than were the normal children. The difference between the autistic and mentally retarded groups on this variable approached significance, $P < 0.07$ (see the response-indicating category in Table 2). These results did not appear to be merely a function of an autistic deficit in following commands since there were no significant group differences in response to other simple command and gesture combinations such as "give it to me" accompanied with a palm-up gesture (see the response to request category in Table 2).

The data in Table 2 also indicated that there were significant group effects for behaviors within the initiating requests category. Again the autistic children displayed a deficit on pointing tasks. They pointed to toys which were out of reach (Level 3) significantly less often than did the normal children (the difference with the mentally retarded group approached significance, $P < 0.07$). The autistic children also exhibited less eye contact when a toy was moved out of reach or ceased (Level 2) than did the normal children. However, there were no group differences in the children's tendency to combine eye contact with reaching or giving (Level 3) to obtain object goals. Also, the autistic children reached more often than did the mentally retarded group to toys which were out of reach or to mechanical toys which had stopped moving (a Level 2 behavior).

Group comparisons: play measures

MANOVAs yielded a significant effect of group membership for the structured play variables, Wilk's $\Lambda = 0.597$, $F(14,90) = 1.89$, $P < 0.05$, but not the unstructured play variables, Wilk's $\Lambda = 0.652$, $F(14,90) = 1.53$, $P > 0.10$. In unstructured play the means for the total number of different functional acts produced by the autistic, mentally retarded and normal groups were 5.3, 8.9 and 8.3 respectively ($F = 1.50$, $P > 0.20$). The means for the total number of symbolic acts were 0.9, 3.4 and 2.4 respectively ($F = 2.45$, $P < 0.10$). In structured play the means for total functional play acts for the autistic, mentally retarded and normal groups were 12.3, 14.8 and 15.6 respectively ($F = 1.42$, $P > 0.20$). The means for the total number of symbolic acts were 1.0, 3.5 and 3.9 respectively ($F = 6.3$, $P < 0.005$). Orthogonal t -test indicated that the autistic groups significantly differed from each other group ($P < 0.01$). Although the autistic children consistently exhibited fewer different types of acts, the only significant group difference was obtained on symbolic play in the structured situation.

Discriminant analyses

To examine if a cluster of behaviors within a particular category of ESCS behavior best distinguished the autistic children from the other two groups, stepwise discriminant analyses were computed using all the individual ESCS behaviors. Play behaviors were also included in these analyses to determine if a combination of play and ESCS behaviors would yield the function which best discriminated the groups.

TABLE 3. DISCRIMINANT ANALYSES (JACKKNIFED CLASSIFICATION) OF THE AUTISTIC GROUP VS THE MENTALLY RETARDED AND NORMAL GROUPS: ALL ESCS AND PLAY BEHAVIORS

		Autistic vs Mentally retarded	Autistic vs Normal
Step 1.	ESCS category Variable % correct autistic % correct other	Initiates indicating Eye contact, toy active 94.4% (17/18) 61.1% (11/18)	Initiates indicating Eye contact, toy active 94.4% (17/18) 70.6% (12/18)
Step 2.	ESCS category Variable % correct autistic % correct other	Initiates indicating Shows 94.4% (17/18) 72.2% (13/18)	Initiates social Eye contact, quiet adult 94.4% (17/18) 72.2% (13/18)
Step 3.	ESCS category Variable % correct autistic % correct other	Response to social Reach after tickle 94.4% (17/18) 88.9% (16/18)	Initiates indicating Shows 94.4% (17/18) 94.4% (17/18)

The results, presented in Table 3, indicated that a subset of three ESCS behaviors alone yielded the most powerful combination which discriminated the autistic group from the mentally retarded group. This subset included two initiates indicating behaviors: eye contact to the experimenter while mechanical toys were active and shows, the former being the single best discriminant variable. (Only one autistic child exhibited this type of eye contact to the adult more than three times, 11 of the mentally retarded children exhibited this type of eye contact five or more times). The third variable (reach after tickle) was from the responds to social interaction category. Unlike the behaviors from the indicating category, the autistic children performed this social interaction behavior more often than did the mentally retarded children (see Table 2). A very similar discriminant function was obtained in the analysis of the autistic and normal groups. The two initiates indicating variables involved in this function were the same as those involved in the autistic mentally retarded discriminant function. Again, eye contact while a mechanical toy was active was the single best discriminator. (Twelve of the normal children exhibited this type of eye contact five or more times). However, this function included an initiates social interaction item—eye contact to quiet, inactive adult. The autistic children performed this social interaction behavior more often than did the normals (see Table 2). These results support the conclusion that, of the social behaviors sampled in this study, deficits within the initiates indicating category best discriminated the autistic children from the other groups.

Object play items did not significantly contribute to either of these discriminant functions (F -to-enter = 4.00). To examine the relative discriminant strength of the play variables, analyses involving only these variables were computed. The autistic/mentally retarded analysis yielded a function involving only doll as agent (symbolic play) in the structured situation. The resulting discriminant function correctly classified 83.3% or 15 of the autistic children and 61.1% or 11 of the mentally retarded children. The autistic/normal analysis yielded a function involving doll as agent in structured play (first variable to enter) and functional play on other in unstructured play. The resulting discriminant function correctly classified 83.3% of the autistic children and

72.2% or 13 of the normal children. Thus, in this sample, the discriminant functions based on object play behaviors were powerful but not so powerful as the discriminant functions based on the ESCS behaviors.

DISCUSSION

Consistent with the paradigm of developmental psychopathology (Cicchetti, 1984), the goal of this study was to define the characteristics of a distinct age group of children who had received the diagnosis of autism by examining the types of developmental tasks these children had mastered or failed to master.

Deficits specific to the autistic children in each of the three categories of non-verbal communication behaviors were indentified in this research. The autistic children exhibited significant deficits on several of the higher developmental items of the social interaction and requesting categories of the ESCS. In the social interaction category autistic children engaged in briefer turn-taking sequences than did the other children, and responded less frequently to invitations than did the mentally retarded children. In the requesting category the autistic children made eye contact to the experimenter less frequently than the normal children when a toy was out of reach or had stopped moving and pointed less often to objects out of reach than did the other groups of children.

Equally important was the finding that this sample of autistic children exhibited frequencies comparable to or in excess of mentally retarded matched control groups on several of the behaviors within these categories. In the social interaction category, for example, the autistic children did not exhibit deficits in frequency of eye contact and tended to respond more actively to being tickled than did the normal children. This is consistent with the clinical observation that autistic children "do not physically withdraw from people and may enjoy a tickle and rough and tumble" (Rutter, 1978, p. 9) and with the empirical observation that autistic children exhibit gestural requests for social routines (Wetherby & Prutting, 1984). In the requesting category the autistic children exhibited a level of competence comparable to the mentally retarded and normal groups on following simple commands and on combining eye contact and a gesture (reach or give) to elicit aid in obtaining a toy or reactivation of a toy. These results are consistent with earlier reports that autistic children are relatively competent on what Bates *et al.* (1975) have described as protodeclaratives (Curcio, 1978).

Evidently the autistic children in this study had acquired some competence in the management of non-verbal request and social interaction behaviors. In contrast the autistic children only exhibited deficits in the production of behaviors in the initiates indicating category. The relative strength of these deficits was emphasized in discriminant analyses which indicated that, of all the social behaviors assessed by the ESCS, those within the initiates indicating category best distinguished this sample of autistic children from developmentally matched samples of mentally retarded and normal children. These data support the hypothesis that a deficit in the development of indicating skills is a significant feature of pre-school children who are diagnosed as autistic. Since these skills normally develop in the first two years of life such a deficit likely reflects a primary psychological component of the pathology of autistic

children. Interpretations of the nature of this component depend on our understanding of the psychological factors involved in non-verbal indicating behaviors.

The indicating behaviors assessed here included pointing, showing or making eye contact with others while holding an object or watching an object in motion. What are the common features of these tasks? Presumably one goal of these behaviors is to co-ordinate one's own focus of attention to an object or event with the attention of a social partner. Thus, the attentional demands of these types of behaviors may be triadic—divided between self, other and some object or event (Bakeman & Adamson, 1984). Perhaps the autistic children had difficulty with these behaviors because they are not proficient at triadic attentional deployment.

If a deficit in triadic attentional deployment was the only factor involved, however, why didn't the autistic children exhibit more difficulty with items in the initiates requests category such as combining eye contact and reaching to an object or giving objects to an adult? These behaviors also seemingly involve co-ordination between self, other and object or event. An important distinction is that these behaviors involved object goals and an appreciation of other as an agent of action capable of assisting with object goals. Alternatively, indicating behaviors appear to involve object goals to a lesser extent. Instead these behaviors appear to focus on the interpersonal goal of monitoring or acknowledging shared interest in an object or event (Rheingold *et al.*, 1976).

Rheingold and her colleagues have suggested that indicating behaviors comprise a developmental milestone which: (a) is normally achieved by 18 months of age, (b) is distinct from behaviors intended to direct attention to the self or request aid and (c) mark the child's developing awareness that other people can see and are interested in what they see. The latter point places the development of indicating behaviors within a social-cognitive perspective. Accordingly, deficits in indicating skills mark the young autistic child's failure to develop an adequate concept of others as "agents of contemplation" (Werner & Kaplan, 1963) who possess independent psychological states, such as interest in objects. An inability to understand that others have psychological states and the resulting deficits in indicating skills—more precisely the inability to engage in joint attention with another person *vis-à-vis* some object or event for the sole purpose of sharing the experience of the object or event—may be associated with what Kanner (1943) described as a deficit in affective or empathic contact with others. For example, although the autistic children intently watched the active mechanical toys, they infrequently demonstrated the joint attention behavior of looking between the toy and an adult. This behavior pattern may be interpreted in terms of a deficit in affective/empathic contact. That is, the autistic children acted as if they were not aware that the mechanical toys could hold a comparable level of interest for other people. However, whether deficits in indicating/joint attention skills and the presumed underlying deficit in social cognitive skills are a cause or consequence of autistic disturbances in affective/empathic contact remains to be determined.

Another finding of this study was that the play variables did not add appreciably to the discriminant power of the ESCS variables within these samples. Nevertheless, the data on play performance replicated the finding that autistic children exhibit fewer symbolic acts with objects than do mentally retarded and normal children of comparable mental age (see Riquet *et al.*, 1981; Sigman & Ungerer, 1984; Wing *et*

al., 1977). The specificity of the play deficit itself was strong. Discriminant analyses based on the play variables correctly indentified 15 of 18 autistic children. However, the false positive rate using only the play measures was appreciable. Seven mentally retarded and five normal children exhibited little if any symbolic play and, therefore, were indistinguishable from the autistic children on the basis of these measures. Thus, although the presentation of symbolic play by young children may make the diagnosis of autism less tenable, the absence of symbolic play may be of limited value to differential diagnosis in this age group of children (cf. Doherty & Rosenfeld, 1984).

This study attempted to provide a clearer picture of the nature of social deficits presented by children diagnosed as autistic. The data suggested that a disturbance in the development of non-verbal indicating skills is a significant feature of the social skills deficits exhibited by young autistic children. These data, along with those presented in Sigman, Mundy, Sherman & Ungerer (in press), contribute to the task of defining the parameters of autistic social behavior. This task, however, is far from complete. Inquiry into other domains, such as the effect of task difficulty on social behavior or the effect of disturbances in the expression and perception of emotion will be needed before the full picture of autistic social deficits can be realized.

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