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Early Recognition of Children with Autism: A Study of First Birthday Home Videotapes[1]

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Coded home videotapes of 11 autistic and 11 normally developing children's first year birthday parties for social, affective, joint attention, and communicative behaviors and for specific autistic symptoms. Autistic children displayed significantly fewer social and joint attention behaviors and significantly more autistic symptoms. In combination, four behaviors correctly classified 10 of 11 autistic children and 10 of 11 normal children. These behaviors consisted of pointing, showing objects, looking at others, and orienting to name.

Autism is a disorder that is not usually diagnosed in children until around the age of 4 years (Siegel, Pliner, Eschler, & Elliot, 1988). Yet, 50% of parents of a child with autism report that they suspected a problem before their child was 1 year of age (Ornitz, Guthrie, & Farley, 1977), and most parents initially express concern to their pediatrician by the time their child is 18 months of age (Siegel et al., 1988). This delay means that very young children with autism are rarely recognized by professionals. Thus, the early development of children with autism remains much of a mystery.

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One way that insight has been gained into the early development of children with autism is through retrospective research. A couple of retrospective studies involve reports from parents of children with autism about the children's development during the first years of life (Dahlgren & Gillberg, 1989; Ornitz et al., 1977). Parents reported that they had observed delays in motor, speech, communication, and social abilities in their infants. However, there are difficulties with these retrospective report data. The most obvious is that parent report of events 4 years in the past are likely to be clouded or inaccurate. Additionally, it is not clear that the delays reported are specifically related to autism or to a general cognitive delay.

One solution to some of the problems inherent in retrospective report data is to study the home movies that parents have taken of their children before they were diagnosed. This method was first used by Massie and Rosenthal (1975), who examined the home movies of children later diagnosed with some type of childhood psychosis, which included autism. They coded the behavior of the mothers and infants in the study. A control group consisted of normally developing infants and their mothers. This and other studies by Massie (1975, 1977, 1978) focused mainly on the mother's behaviors and the presence of "psychotic" behaviors in the infant. They found group differences in mother–infant eye contact, touch, and attachment behaviors. They also found a lower activity level in the infants beginning at 1 month of age. Later, Rosenthal, Massie, and Wulff (1980) used home movies to examine Piagetian sensorimotor development in 14 children who were later diagnosed with childhood psychosis, 6 of whom had a diagnosis of autism. The home movies included segments in which the child was up to 24 months in age. Compared to a control group of normally developing children, the psychotic group exhibited fewer age-appropriate behaviors.

More recently, in studies by Adrien et al. (1991, 1992), observers who were informed of the children's diagnosis rated autistic/pervasive developmental disorder (PDD) and normal children's behavior in home movies according to an infant behavior checklist. Abnormalities were detected in social, affective, motor, and attentional abilities during the infants' first year of life.

The most rigorous study of this kind was conducted by Losche (1990), who studied the sensorimotor development of infants, 4 to 42 months, who were later diagnosed with autism. The video segments were grouped by 8-month intervals, and coders were blind to the children's diagnosis. After 13 months of age, the development of the children with autism differed both quantitatively and qualitatively from the normally developing children. In general, the development of the children with autism seemed to be arrested in the earlier sensorimotor stages while the control children

continued to progress at a normal rate. This was particularly true for means–ends actions, with the autistic children continuing to focus on the means while the normal children developed actions that displayed mental representations of intended outcomes.

To date, the research using retrospective home videos to document the development of children with autism has had a number of methodological weaknesses. First, the role of mental retardation in the early identification of autism has not been addressed. Perhaps the differences found between the children with autism and the normally developing children are related to mental retardation and not autism. Second, no means have been employed to ensure that all the children's tapes are equally represented and that taping was done in comparable situations across children. Third, the systematic studies in this field have been more concerned with cognitive and sensorimotor development. Less attention has been devoted to the early social, communicative, and affective development of infants with autism.

This type of research can be used to address a number of different issues. Most important, the information gained through home videotape studies can aid in the identification of young children with autism so that diagnoses can be made earlier and more accurately. To accomplish this, the age at which the autistic infants' behavior differs from that of normally developing infants must be established and the specific types of behaviors that distinguish infants with autism at the different ages must be identified. Retrospective home video research can also help determine the validity of late onset autism. Professionals in the field of autism have found that 1 in 5 parents report that their autistic child developed normally as an infant and then lost skills and developed autistic symptoms around the age of 18 months. By studying home videos of children reported to have late-onset autism, the phenomenon of late-onset can be verified and better understood.

The purpose of the present study was to document, through home videotapes, the early behavior displayed by infants who are later diagnosed with autism as compared to that of normally developing infants. Four questions were addressed. First, are differences in autistic and normal children's behavior apparent at 1 year of age? Second, can we identify specific behaviors that distinguish autism? Third, does the early development of children with autism differ between those with and without later documented cognitive delay? Fourth, is there empirical support for the existence of late-onset autism?

Certain methodological difficulties are posed by home videotape retrospective research. We addressed some of these issues in the current study. In particular, there tends to be a substantial amount of variability in the taping style of each family as well as the settings in which they chose to

film their children. Also, parents often have difficulty recollecting when specific footage was taken, so it is difficult to accurately estimate the child's age in each segment of film. To address these problems in the present study, footage of the children at their first birthday party was used. This strategy reduced the amount of variability in the type of setting in which each child was observed, and it ensured that the children were accurately age-matched.

METHODS

Subjects

Home videotapes of 11 children with autism and 11 normally developing children were collected. The children with autism were recruited through a subject pool maintained at the Autism Research Program at the University of Washington and the normally developing were recruited through the infant subject pool at the University of Washington. There were 10 boys and 1 girl in each of two groups. All children in the clinical group were originally diagnosed as having autism or pervasive developmental disorder, not otherwise specified (PDDNOS) by a university-affiliated diagnostic center (Child Development and Mental Retardation Center, Autism Research Program at the University of Washington, or TEACCH Division, University of North Carolina). Seven of the 11 children fulfilled DSM-III-R criteria for autism. One child was diagnosed as having PDDNOS according to DSM-III-R criteria. Three children were diagnosed based on an interdisciplinary evaluation conducted at TEACCH. Two of these children received scores on the Childhood Autism Rating Scale (CARS; Schopler, Reichler, DeVellis, & Daly, 1980) in the autistic range while one received a marginally autistic score of 29. One child in the group with autism was confidently reported by parents to have late-onset autism, and one other child's parents tentatively reported late-onset autism. The remaining children's parents reported that they observed autistic symptoms in the first year of life.

Cognitive test results from standardized assessments were available for all but one child in the clinical group. Four of the 10 children with autism or PDDNOS were cognitively delayed, while the other 6 had IQ scores above 75. The ages at which IQ tests (Bayley Scales of Infant Development, Merrill-Palmer Scales, Leiter International Performance Scale, Stanford-Binet Intelligence Scale-Fourth Edition, and the Wechsler Intelligence Scale for Children-Revised) ranged from 2 years 10 months to 6 years, with an average age of 3 years 9 months. No IQ scores were available for the normal group.

Behavioral Coding

An interval coding system was developed which documented the presence or absence of several developmentally appropriate and autistic-like behaviors. Typical social, affective, joint attention, and communicative behaviors were coded. Social behaviors consisted of looking at another's face, looking at the face of another while smiling, seeking contact with an adult, and imitating the behavior of another. Affective behaviors consisted of distress and tantrums. Joint attention behaviors consisted of pointing, vague pointing (reaching for something in a communicative way), showing an object to another, and alternating gaze between an object and another's face. Communicative behaviors included babbling, saying a word, using a conventional gesture such as waving good-bye, and following the verbal directions of another. Specific autistic behaviors included self-stimulatory behavior, covering ears, failing to orient to name being called, staring blankly into space, and blunt affect. The presence or absence of each behavior during each 1-minute period was coded by raters who were blind to the child's diagnosis.

The tapes varied in length from 3 to 29 minutes, with mean length of 10 minutes. There was no significant difference between the mean length of tape for each group, $t(20) = -1.30$, ns. However, to ensure that each child's tape information was equally represented, the number of times a child displayed a particular behavior was divided by the total number of minutes the child's behavior was coded.

The birthday parties varied in location and number of people in attendance. Therefore, each party was coded for location and number of adults and number of children in attendance to assess if there were any group differences. Additionally, the filming varied in terms of the number of minutes the child was alone on camera. Because the presence of another person on camera was needed to code a number of social behaviors, the number of seconds each child was alone on screen was tabulated.

Clinical Judgment

A developmental pediatrician, specializing in developmental disabilities and blind to each child's diagnostic status, viewed the videotapes and used her clinical judgment regarding whether each child was normally developing or autistic.

RESULTS

Interrater Reliability of Coders

Interrater reliability was assessed by double coding 27% of the tapes. Coder agreement could not be established on a few behaviors because they occurred too infrequently or not at all and were not entered into the reliability calculations. The kappa value between the coders was greater than .80 for the overall coding system which included the following behaviors: looking at the face of another, seeking contact, imitating the behavior of another, babbling, following the verbal directions of another, pointing, showing, vague pointing, covering ears, self-stimulatory behavior, and failing to orient to name. These behaviors were used in the analysis.

Comparison of Tape Segment Characteristics of the Two Groups

The groups did not differ significantly in terms of the average number of adults, $t(20) = 1.28$; ns, or children, $t(20) = 0.43$; ns, in attendance or in the location of the party, $\chi^2(1, N = 22) = 0.25$, ns). Nor did the groups differ in the average number of seconds the child was alone on screen, $t(20) = 0.91$, ns.

Group Differences in General Categories of Behaviors

The average frequencies with which the groups showed each of the behaviors are shown in Figure 1. A multivariate ANOVA was conducted for each of the general categories of behaviors. A significant main effect of diagnostic group was found for the category of social behaviors (looking at the face of another, seeking contact, imitating), $F(1, 20) = 5.30$, $p < .05$, and for the category of joint attention behaviors (pointing, vague pointing, showing), $F(1, 20) = 5.68$, $p < .05$, but not for the category of communicative behaviors (following directions, babbling), $F(1, 20) = 0.30$, ns. Children with autism also showed significantly more autistic symptoms (self-stimulation, failing to orient, covering ears), $F(1, 20) = 4.38$, $p < .05$.

Table I. Results of Discriminant Analysis of Variables Related to Prediction of Diagnosis[a]

Predictor variable	Standardized discriminant coefficient	Wilks's lambda	$F(1, 20)$
Pointing	.52	.882	2.69[b]
Showing	.54	.851	3.5[b]
Looking at the face of another	.44	.755	6.5[b]
Failing to orient to name	–.44	.792	5.24[b]

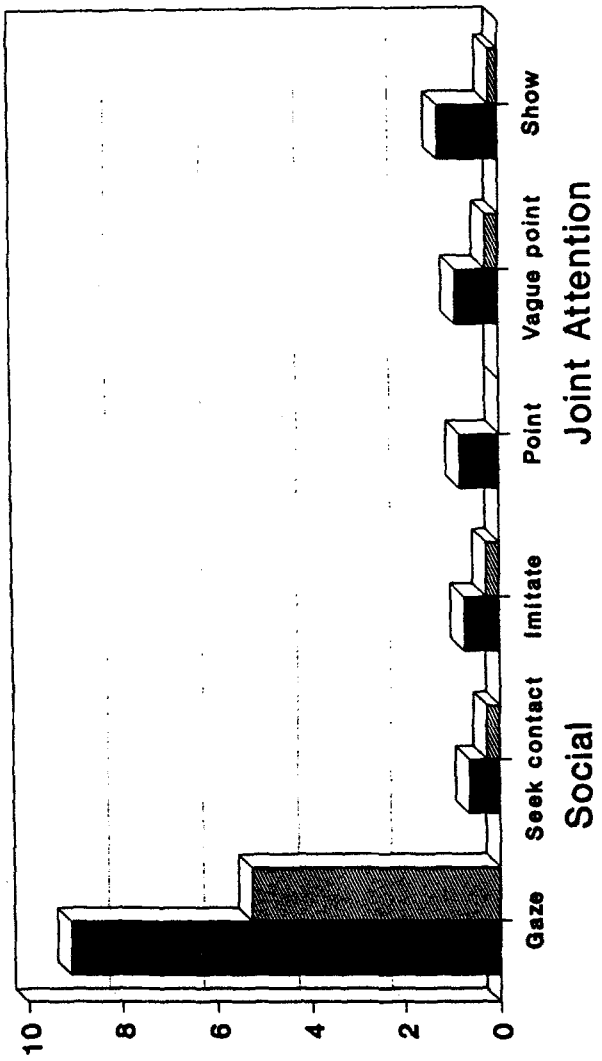
[a] For the function, Wilks's lambda = .56, distributed as a chi-square statistic with 4 degrees of freedom and equal to 10.58 ($p < .05$), and the eigenvalue = .8.
[b] $p < .05$.

Group Differences in Specific Behaviors

Group differences in specific behaviors were examined next. It is important to keep in mind that certain behaviors were very infrequent, making it difficult to obtain significant differences. Nevertheless, significant group differences were found for four specific behaviors. The children with autism failed to orient to their name being called more often than the normal children, $t(20) = 2.29$, $p < .05$. The normal group showed an object to another more often than the autistic group, $t(20) = -1.87$, $p < .05$, and those in the normal group looked at the face of another more often than those in the autistic group, $t(20) = -2.55$, $p < .05$. A t test could not be performed on pointing behavior because none of the children with autism pointed. A chi-square analysis, however, revealed that the two groups differed significantly in the number of children who pointed, $\chi^2(1, N = 22) = 4.88$, $p < .05$.

Prediction of Group Membership

A stepwise discriminate analysis was carried out using the child's diagnosis as the independent variable as illustrated in Table I. The discriminant function correctly classified 91% of the subjects. One normally developing child and 1 child with autism were incorrectly classified in the discriminant analysis. The weights, in order of greatest magnitude, corresponded to pointing, showing an object to another, looking at the face of another, and failing to orient to name. The variable, looking at the face of another, alone correctly classified 77% of the children.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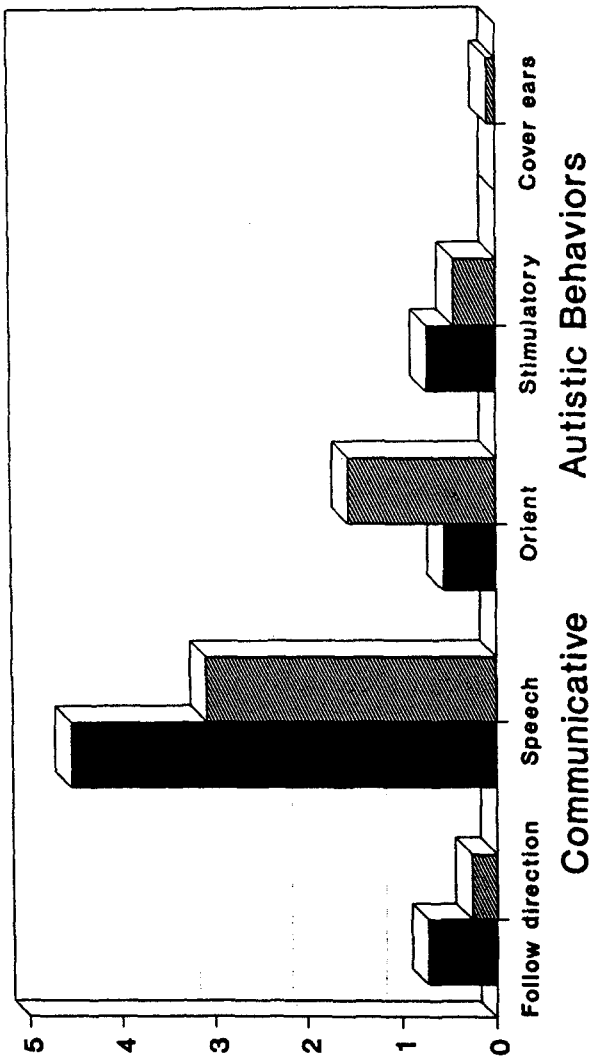

Fig. 1. Mean frequency of social, joint attention, communicative, and autistic behaviors shown by 1-year-old infants later judged to be normal or autistic.

Differences by Cognitive Delay Within the Autistic Group

When the autistic group was analyzed alone, the children's behavior did not differ according to whether or not the child with autism was later found to be cognitively delayed. There were, however, a small number of subjects in each group, which makes group differences difficult to detect.

Clinical Judgment of the Developmental Pediatrician

The developmental pediatrician correctly identified 82% of all children, and correctly identified all but one child with autism. The one autistic child incorrectly identified was the only child whose parents felt strongly that their child had late-onset autism. She also correctly identified 8 of the 11 normally developing children. The pediatrician indicated that she most often based her judgment on how socially responsive the child was, how often the child looked at the faces of other people, and the general affective tone of the child.

DISCUSSION

The results of the present study indicate that differences between normally developing *children* and children with autism can be identified by 1 year of age. Differences were found between the groups in three general categories of behaviors: social, joint attention, and certain autistic behaviors. How often a child looked at others was the single best predictor of a child's later diagnosis. When combined with the behaviors of showing, pointing, and failing to orient to name, 91% of the cases were correctly classified. The results suggest that professionals should pay particular attention to an infant's use of eye contact, joint attention behaviors, and orienting to speech when screening for autism.

Because only two children with autism were reported to have late-onset autism, no strong conclusions can be made about this issue. The developmental pediatrician only incorrectly identified one child with autism. This was also the only child whose parents confidently reported late-onset autism. This suggests that the construct of late-onset autism may be a valid one.

The behavior of the children with autism, at 1 year, was not found to differ according to whether or not a child was later found to be cognitively delayed. Moreover, differences were found between the normal and autistic groups even though the autistic sample was higher functioning

than the general population of people with autism, with 6 of the 11 children with autism having IQs above 75. This type of sample reduces, but does not eliminate, the possibility that the behaviors found to distinguish the two groups are related to cognitive delays and not autism. Currently, home videotapes of additional autistic and normally developing children and mentally retarded children without autism are being studied to further assess the impact of a cognitive delay on the early identification of autism.

The results of this study do not easily lend themselves to theoretical interpretations regarding a single primary deficit in autism. Impairments in both social and joint attention behaviors characterized children with autism by 1 year of age. The clinical implications of this study, however, are clear. It is likely that autism can be detected at ages much earlier than typically occurs. Efforts should be aimed at developing screening tools for identifying infants at risk for autism so that early intervention programs can be offered to very young children and their families.

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