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Verifying Teacher Perceptions of the Potential Communicative Acts of Children with
Autism

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Abstract

We sought to verify teacher perceptions of prelinguistic behavior in 8 children with autism. Teachers were first interviewed using the structured protocol of the Inventory of Potential Communicative Acts (IPCA). The results showed that the teachers interpreted many of the children's gestures, body movements, and facial expressions as if these were forms of communication. Naturalistic and structured observations were then undertaken to verify whether these teacher-identified behaviors did in fact seem to serve a communicative function. Observational data provided evidence that teachers did indeed correctly interpret such acts as having a communication function. This suggests that the interview protocol may be one way to document the form and communication function of existing prelinguistic behaviors in children with autism who are at the early stages of communication development.

KEY WORDS: prelinguistic communication, communication assessment, autism

Verifying Teacher Perceptions of the Potential Communicative Acts of Children with Autism

Although communication impairment is a defining characteristic of autism (DSM-IV, American Psychiatric Association, 1994), rarely do these children lack any means of communication. While they may have limited speech and lack other formal or conventional means of communication, some children with autism do appear to acquire informal and idiosyncratic behaviors that are used to communicate basic regulatory functions such as requesting, rejecting, and commenting. Their informal prelinguistic acts might consist of facial expressions, body movements, and idiosyncratic gestures. For example, a child may move an adult's hand to the door to request assistance in opening the door (Carr & Kemp, 1989). Other children may develop problem behaviors that serve a communicative function. For example, a child may tantrum to gain access to preferred items (Carr & Durand, 1985).

These acts often are referred to as prelinguistic or nonsymbolic communication (Siegel-Causey & Guess, 1989; Wetherby & Prizant, 1992), but such terms imply that the behaviors do in fact have an intentional communicative basis, which they may not. It could be that others, such as teachers, merely attribute a communicative function to the child's behavior when in fact the child's behavior is not a form of communication. Instead, the behavior could be an orienting response, a postural adjustment, or even an involuntary movement. In addition, these terms do not adequately describe the possible use of seemingly more conventional forms of communication, such as signs, symbols, and child vocalizations. Although such forms may appear communicative to

others, they are not necessarily used by the child with any intent to communicate (Stephenson & Linfoot, 1996).

Recently, the term potential communicative act (PCA) has been used to describe behaviors that others might interpret as communicative, but where it is unclear whether the child is in fact attempting to communicate in any intentional manner (Sigafos et al., 2000). In typically developing children, it is thought that these early PCAs are shaped into intentional forms of communication when parents both interpret and react to the acts as if the child was in fact attempting to communicate, even though these actions may not initially have a communicative function or purpose (Bates, Camaioni, & Volterra, 1975).

Unlike those of typically developing children, the early PCAs of children with developmental disabilities are often so limited, subtle, idiosyncratic, and inconsistent that it may be difficult for parents, teachers and speech language pathologists, to recognize these as having any communicative potential. As a result the critical adult response may not occur and so these acts never develop into intentional and more conventional forms of communication. Developing such acts into effective forms of communication has thus become a focus of recent communication interventions for children with developmental disabilities (Drasgow, Halle, & Ostrosky, 1998; Reichle, Halle, & Drasgow, 1998; Sigafos, Laurie, & Pennell, 1996).

An initial first step in any such intervention effort would be to identify the existing PCAs in the child's repertoire and their communicative function, if any. Once identified, a teacher might then be able to occasion these acts by arranging appropriate communicative temptations. If these temptations were successful in evoking the

behavior, then the teacher would react to the child's communicative attempts in ways that would reinforce the presumed function of this act. This approach could, in turn, be used to shape more recognizable forms of communication. It would therefore seem important to undertake an initial assessment to identify PCAs in children with developmental disabilities prior to starting a communication intervention to develop their prelinguistic behaviors into more effective and conventional forms of communication.

Along these lines, Sigafoos et al. (2000) described a structured interview protocol that is designed to identify PCAs in children with developmental disabilities. The protocol involves structured interviews with communicative partners (e.g., parents or teachers) using the Inventory of Potential Communicative Acts (IPCA) (Sigafoos et al., 2000). From the interview, information is obtained about the child's informal or idiosyncratic behaviors that these partners interpret as the child's attempts to communicate. An important issue is the extent to which these perceptions or interpretations are in fact valid. A teacher may think that the child's body movements or facial expressions are communicating a particular function or intent, but this could simply be an incorrect assumption or a type of teacher over-interpretation.

The present study asks whether the communicative forms attributed to 8 children with autism by their teachers could in fact be verified as having a communicative function by direct observation. If the teacher's interpretations proved to be verifiable through direct observation, it would provide some evidence that teacher-provided information can in fact represent a valid and efficient way of identifying the

communicative form of existing prelinguistic acts in children who are at the early stages of communication development.

Method

Participants and Setting

Eight children with severe autism participated in the study. All lived at home with their families and attended an educational program on a part-time basis. Patrick and Ian attended the same preschool class with two other children. Beth attended a preschool class for 12 children with developmental disabilities. Alex's preschool class consisted of 4 to 6 children with developmental disabilities. Dave, Seth, Jake and Rue attended a program for children with autism and were in the same classroom.

For descriptive purposes, standardized assessments were completed on language development, adaptive behavior, and problem behaviors. Language age equivalencies were obtained from the second edition of the Receptive-Expressive Emergent Language Scale (REEL-2) (Bzoch & League, 1991). This developmental checklist provides age scores from 0-36 months for both the expressive and receptive language domain. Adaptive behavior was assessed with a rating scale developed specifically for children with severe disabilities (i.e., the TARC Assessment System, Sailor & Mix, 1975). The device yields an overall standard score with a mean of 50 and a standard deviation of 20. Problem behavior was rated using the Developmental Behavior Checklist (DBC) (Einfeld & Tonge, 1994). The DBC is a 96- item instrument that yields a total behavior score, giving an overall measure of behavioral/emotional disturbance. Results from these standardized assessments and other descriptive data for each child are presented in Table 1.

<INSERT TABLE 1 ABOUT HERE>

The results from the initial standardized assessments showed that all 8 children had major deficits in expressive and receptive language and adaptive behavior functioning, which is consistent with their diagnosis of severe autism. None of the children had acquired speech or any other conventional or consistent means of communication (e.g., manual signs). All were functioning at or below the 9th month age level receptively and at or below the 6th month age level in expressive language development. Total scores on the DBC were translated into percentile rankings. Percentile rankings for the children in this study on the DBC ranged from the 54th to 97th percentile indicating severe levels of emotional and behavioral disturbance.

Interview Protocol, Procedures, and Analysis

The IPCA is an interview protocol designed for use with parents, teachers, or therapists of children with developmental and physical disabilities who have severe communication impairment (Sigafoos et al., 2000). It is designed to obtain information about children's informal or idiosyncratic behaviors that might be interpreted by others as forms of intentional communication. The version of the IPCA used in this study is described in detail elsewhere (Sigafoos et al., 2000). Briefly it includes a series of questions addressing the major communicative functions identified through an extensive literature review (see Table 2). For example, to assess the communicative function of Requesting an Object, informants are asked to "describe how the child indicates they want (a) an object (e.g., toy or book), (b) something to eat, (c) more of something, (d) TV or music, (e) other". For the communicative function of Reject/Protest, in contrast, informants are asked to

“describe what the child does if (a) their routine is disrupted, (b) they are required to do something they don’t want to do, (c) they don’t like something, (d) a favorite toy or food is taken away, (e) an adult terminates an interaction, or (f) other”.

The first author interviewed each child’s teacher at the school using the IPCA. Only teachers who had been involved in the child’s education for at least 3 months were interviewed. Three months was considered the minimum amount of time for teachers to acquire knowledge of the child’s behavior. A total of 4 teachers were interviewed using the IPCA. Patrick and Ian had the same teacher who had known Patrick for 3 months and Ian for 7 months. Seth, Jake, Rue, and Dave’s teacher had known Seth for 3 months, and the other students for 5 months. These students attended this program three times a week for approximately 5 hours. Alex’s teacher had known him for 3 months and saw him three times per week for approximately 3 hours per session. Beth’s teacher had known her for 3 months and sessions were held twice a week for 2 hours.

At the beginning of each interview, the teacher was provided with the list of behaviors shown in the Appendix and told that these and similar types of behaviors might possibly serve a communicative function for some children with developmental disabilities. The interviewer then asked the informant to answer each of the questions contained in the IPCA and recorded the informant’s responses by writing them directly on the interview protocol.

Data from the interviews were summarized to generate a list of each child’s behaviors that were interpreted by the teacher as serving a communicative function. Each combination of the form(s) (e.g., reaching) that were said to be used to achieve a

specific communicative function (e.g., requesting an object) represented a PCA. To illustrate, when asked to “describe how the child indicates he wants something to eat, Ian’s teacher said: “He takes my hand and leads it to the object or just reaches for it.” In Ian’s case then, leading the teacher’s hand to an object and/or reaching for an object were perceived by the teacher to be serving the communicative function of Requesting an Object. As another example, Beth was said to “scream, run away, or go rigid” to indicate she did not like something. This cluster of forms was therefore viewed by the teacher as Beth’s way of rejecting and protesting. Our study was aimed at attempting to verify whether the teacher’s were correct in their views.

Verification Procedures

We developed two types of verification procedures. One of these involved naturalistic observations and the other involved structured observations. Evidence suggests that naturalistic observations might capture examples of communication behavior that are difficult to evoke in more structured assessment tasks, whereas structured assessment tasks can be arranged to evoke specific types of communicative function (Iacono, Waring, & Chan, 1996).

Naturalistic observations. Naturalistic observations were conducted at the child’s school. For each child, three different activities that occurred within the child’s typical classroom routine were selected for observation. Activities were chosen if they met the following three criteria: (a) they were considered by the teacher to provide communicative opportunities for the child; (b) they lasted at least 10 minutes; and (c) they were scheduled at times and in locations that would allow us to videotape (e.g., toileting and other personal care routines were excluded). The activities selected

included therapy sessions (e.g., gross motor), small-group instruction (e.g., hearing a story), music, toy play, arts and crafts activities, and meal/snack times. A randomly selected period of 10 minutes during each activity was videotaped. This was repeated over 3 randomly selected days, providing a total of 90 minutes of videotape for each child.

These videotapes were analyzed for communicative form and function. Each tape was divided into 15-second intervals. The first author, a psychologist who was engaged in this research as part of her Ph.D. research and who had extensive experience in working with, and assessing, children with autism, acted as primary observer. The primary observer paused the tape at the end of each interval and recorded the presence of any potential communicative acts, using the following definition from Wetherby & Prutting (1984):

A communicative act began when the child initiated interaction with the adult or an object and was terminated when the child's attentional focus shifted or a turn was exchanged. (p. 369)

Each potential communicative act, as defined above, was then coded for communicative function according to the definitions given in Table 2. These definitions were the same as those used in the IPCA and derived from a review of the literature (Cirrin & Rowland, 1985; Coggins & Carpenter, 1981; Donnellan, Mirenda, Mesaros, & Fassbender, 1984; Dore, 1975; Drasgow & Halle, 1995; Halliday, 1975; Iacono et al., 1996; Linfoot, 1994; McLean & Snyder-McLean, 1987).

<INSERT TABLE 2 ABOUT HERE>

For the final step of the analysis, the primary observer referred to IPCA teacher-identified PCA forms as those used by the child to communicate each function communicated by the child and coded on the tape, according to definitions given in Table 2. Verification was recorded if the forms identified by the teacher and those observed on the tape for the same communicative function were identical. A partial verification occurred when there were fewer or more forms reported by the teacher for a particular function than those coded by the researcher. Non-verification was scored when the forms that the teacher said were used to achieve a specific function were different from the forms observed on the videotape. For example, during the IPCA interview, the teacher might have indicated that reaching and vocalizing were the forms used by a child to request an object. During naturalistic observation, if the child reached for an object in a way that met the Wetherby and Prutting (1984) definition for a communicative act and also met the definition for requesting an object (Table 2), but did not vocalize, then this would be recorded as only a partial verification.

Structured Observations

Structured observations took place in the child's classroom. To begin with, two or three examples of PCAs were selected from all the PCAs reported for each child from the teacher's IPCA. Selections were based on a number of factors. First, behaviors were chosen from at least two communicative functions for each child to provide verification opportunities across different functions. Second, the examples chosen needed to be easily replicated in the classroom over 10 opportunities. This eliminated many examples of commenting, as it would have been inappropriate to create opportunities for the child to indicate feelings such as fright and pain. Third, the

teacher was consulted about the choice of examples, because the assessment data from this study were to be used in a later intervention. Finally, the chosen examples were considered to be ones in which the child would be motivated to communicate, as they represented conditions under which the teacher reported the child had attempted to communicate in the past. Table 3 shows the examples selected for each child.

<INSERT TABLE 3 ABOUT HERE>

Ten opportunities were provided to observe the child's response to each chosen communicative function. A structured observation opportunity involved presenting a communicative opportunity to the child and waiting 10 seconds to see if the child would produce the anticipated communicative form associated with the identified function. For example, a communicative opportunity to request food involved the teacher sitting opposite the child during snack time with the child's food out of reach. All 10 opportunities were conducted at a time when the child would normally eat these snack foods. This was designed to create the need and opportunity for the child to communicate the relevant function, which in this case was to request food. Another example, the opportunity to request help, involved giving the child a sealed jar containing a highly preferred edible. This created the need and opportunity for the child to request help in opening the jar. Each set of 10 opportunities was presented in a single session on the same day.

An instance of verification was recorded if the child displayed the communicative form identified by the teacher on the IPCA and associated with that communicative function within the ten second time period for the structured opportunity. If the child did not respond within 10 seconds, or responded with a behavior other than the one

identified by the teacher, this was recorded and classified as an instance of non-verification. It should be noted that a waiting period of 30 seconds was allowed for 1 child (Ian) after presentation of an opportunity because initial observations indicated his response latency typically exceeded 10 seconds.

Inter-observer Agreement

In all instances, the primary observer was the principal investigator. The second observer was a doctoral student, experienced in teaching children with autism, and undertaking doctoral research involving the coding of prelinguistic behaviors. For the naturalistic observations, the second observer independently scored 33% of the videotapes for each child, randomly selected from each of the three activities, chosen according to the procedures outlined previously. The observer reviewed the coding definitions and any issues or confusions raised by her concerning the definitions were then clarified before she actually scored any of the videotapes. Reliability was calculated separately for each category (potential communicative act, function, and IPCA verification) using the formula: $\text{Agreements} / (\text{Agreements} + \text{Disagreements}) \times 100\%$. For the naturalistic observations, an agreement was counted when the two observers recorded the same information within each 15-second interval for that category. For example, to score an agreement on the occurrence of a communicative function, both observers had to assign the same function to the child's behavior. Percentage agreements for the identification of potential communicative acts ranged from 94% to 100% with a mean of 97%. For communicative function, mean agreement was 89%, and ranged from 79% to 95%. Percentage agreements for

verification of teacher responses to the IPCA ranged from 64% to 100% with a mean of 81%.

For the structured observations, the second observer independently scored occurrences of communicative forms and these data were compared to those obtained by the primary observer. Reliability data were collected for each child on at least 30% of the opportunities (range 30 – 100% with a mean of 50%). An agreement was counted if the two observers recorded the same communicative form or both recorded the absence of the form following an opportunity. Any discrepancy was recorded as a disagreement. A percentage of agreement was calculated at the end of each set of structured observations using the formula: $\text{Agreements}/(\text{Agreements} + \text{Disagreements}) \times 100\%$. Percentages of agreement ranged from 79% to 100% with a mean of 96%.

Results

The number of 15-second naturalistic intervals that included a communicative function for each child as a percentage of the total number of possible intervals were determined (see Table 4). Protesting/rejecting was the function most frequently observed during the naturalistic observations (mean 12%, range 2.5 to 34%) followed by requesting an object (mean 5%, range 1 to 12%), social convention (mean 3.2%, range 0 to 6%), and responding (mean 1.8%, range 0.3 to 4%). Protesting/rejecting, requesting an object, and responding were observed in every child. The functions of requesting action, attention to self, comment, and imitation were observed in some of the children, whereas requesting information was not observed in any of the children.

The least commonly observed function was imitation with a mean of 0.3% (range 0 to 1).

<INSERT TABLE 4 ABOUT HERE>

The percentage of communicative forms verified through naturalistic observation were calculated and are presented in Table 5. Verifications were determined by comparing the form of each potential communicative act coded from the videotapes with the results from the teacher's responses to the IPCA. When the teacher-reported PCA form and function were observed on the videotape, these matches were scored as verifications. When there were fewer or more teacher-reported PCA forms and functions observed by the researcher, these were scored as partial verifications. When the forms reported by the teacher for a function were different from those observed on the videotape, non-verification was recorded. Verification levels ranged from 4 to 26% with a mean of 14%. Partial verification ranged from 23 to 85% with a mean of 63%. Overall 77% of the potential communicative acts observed in the classroom during the naturalistic observations were consistent with those identified by teachers when they were interviewed. Non-verification ranged from 4 to 69% with a mean of 23%. The highest levels of non-verification occurred for Ian (69%) and Alex (32%). These two children also had the least number of observed potential communicative acts, 52 for Ian and 53 for Alex, compared with a range of 66-160 for the other children.

<INSERT TABLE 5 ABOUT HERE>

The percentage of opportunities where teacher-reported PCA forms and functions were observed in the structured assessments are shown in Table 6. Percentages ranged

from 0 to 100% with a mean of 70%. A score of 0% occurred for two children, Alex and Seth. For Alex, the teacher identified two behaviors for protesting and only one of these behaviors (trying to take the item back) was observed in 60% of the opportunities, while the other behavior (vocalizing) was not observed. Similarly, for Seth, two behaviors were identified by the teacher as his way of requesting help, but only one of these was observed during all (100%) of the opportunities. The other behavior was not observed during any of the opportunities. A similar pattern of verification of one behavior while the second behavior occurred less frequently was also evident in the results for Dave and Rue.

<INSERT TABLE 6 ABOUT HERE>

Discussion

Results from the interviews indicated that these teachers did in fact interpret many of the children's subtle and idiosyncratic behaviors as forms of communication. The subsequent observations, both naturalistic and structured, suggested that some of the communicative forms identified by the teachers were associated with the communicative functions that they specified. This data provides evidence that the teachers had in fact identified prelinguistic acts that were present in the children's repertoires.

The naturalistic observations undertaken in this study were subjected to detailed analyses before assigning a communicative function to any of the children's observed behavior. Although labor intensive, this appears to be an appropriate way to judge whether any of the behaviors could be defined as communicative. While many of the behaviors observed did meet the criteria for communication and were consistent with

the results from the teacher interviews, it was also the case that many of the teacher-identified PCAs were only partially verified from this detailed analysis. This may reflect to some extent the rather strict criteria that had to be met to record a verification. For example, if a teacher identified reaching and vocalizing as the child's way of requesting an object, a partial verification would be scored if the child showed only one of these behaviors during an observation session. In addition, because the naturalistic observation involved a relatively short period of observation across only three activities (e.g., snack, therapy session, and toy play), the absence of some functions and forms that were identified by teachers in the interview could reflect a lack of opportunity to produce these functions during the videotaped observations (Iacono et al., 1996; Wetherby & Rodriguez, 1992). An increase in the number and range of observations conducted in any future research may help to address this issue. A low level of occurrence of certain PCAs and communicative functions during the naturalistic observations may also help to explain why some teacher-reported potential communicative acts were not verified through our detailed analysis of the videotapes. Recall that this was not evident in the non-verification of PCAs for Ian (69%) and Alex (32%) who were also observed to have many fewer potential communicative acts during the naturalistic observations when compared to the other children.

In an attempt to directly create the need and opportunity for a sample of PCAs identified by the teachers, we also implemented structured observations. Our data suggest that these structured observations were effective in evoking and therefore directly verifying at least some of the PCAs identified by teachers. For some individuals, however, only partial verification was achieved. For Dave and Rue, the

behaviors that occurred infrequently represented more symbolic forms (pointing to a photograph or signing) that may not yet be performed consistently because these behaviors were in the process of being taught. For others, the lack of verification may reflect inconsistent use of the behavior by the child. Again additional structured observation trials for each child sampling more communicative functions may be indicated in future research.

The somewhat low verification rates for some of the teacher interpretations found in the naturalistic and structured observations may also reflect difficulties associated with reliably identifying PCAs in children with severe communication impairments. Although this may be a difficult process, there could be important implications in pursuing this line for intervention purposes. von Tetzchner (1997), for example, has suggested the use of ‘structured over-interpretation’ where communication partners systematically interpret and react to behaviors that seem to indicate intentions related to interests, needs, and preferences. The procedures outlined in this study provide a starting point for selecting some PCAs that can be verified through a combination of interview and observation. The IPCA does appear to be a useful tool for identifying behaviors interpreted by teachers as communicative. Verifying these behaviors through observation provides the interventionist with greater confidence that these behaviors may in fact serve a communicative function.

Interestingly, while teachers identified seven different communicative functions in these children’s repertoires during the interview, the number of functions observed in the naturalistic verification procedure was more restricted. Again this could reflect lack of opportunity or over-interpretation on the part of the teachers. Studies of

typically developing children at the prelinguistic stage have generally revealed that they engage in many communicative functions related to behavior regulation (e.g., rejecting, rejecting/protesting), but also engage in more social forms of communication involving joint attention (Wetherby, Cain, Yonclas, & Walker, 1988). In this study, however, the most commonly observed functions were those associated with behavior regulation such as requesting an object or protesting/rejecting. The least commonly observed functions were those of a more social nature, such as commenting and requesting information. These results are consistent with studies suggesting that children with autism exhibit fewer purely social communication acts and might possibly lack the motivation to acquire such social communicative functions (McArthur & Adamson, 1996; Mundy & Willoughby, 1998). If this is the case, then perhaps teachers were attributing too much social communication to some of the children's acts, when in fact, these acts were mainly serving behavior regulation functions. Alternatively, it could be that behavior regulation functions, such as requesting and rejecting/protesting, are more readily observed through naturalistic observation or that the contexts in which the children were observed in this study provided fewer opportunities for more social communicative functions.

A possible limitation of this research is the use of structured observations to assess only those forms and functions identified by the teacher on the IPCA. As it was the aim of this study to verify behaviors interpreted by the teacher as communicative, a number of PCAs were targeted for verification based on information obtained through the IPCA. An assessment of forms and functions not identified by the teachers, that is, forms and functions teachers believed the child did not exhibit, could have provided

interesting and important data about the child's communication profile. Furthermore, verification of communicative function, rather than focusing primarily on communicative form, could also have provided important data. These data may have contributed to the assessment of the validity of information obtained through the IPCA. A further concern regarding this research relates to the variability of inter-observer agreement across communicative functions and teacher responses. Similar concerns have been raised in other studies, particularly when coding pre-intentional communication in children with severe disabilities (Yoder, 1987; Yoder, Warren, Kim, & Gazdag, 1994). These findings highlight the difficulties inherent in consistently and reliably identifying communicative behavior in children with severe disabilities. Providing observers with more intensive training in coding procedures may help to address these issues in future studies of this kind.

Overall the results provide evidence that some of these teacher's interpretations proved to be verifiable through direct observation. This suggests that an initial interview with teachers, using a device such as the IPCA, can be a potentially valid and efficient way of initially identifying the forms and functions of existing prelinguistic acts in children with developmental disabilities who are at the early stages of communication development. The failure to verify some of the teachers' interpretations indicates that interview protocols such as the IPCA may need to be supported with observational data to provide a more comprehensive profile of the child's communicative behavior.

Previous research has suggested that teachers may not always respond to the PCAs of children with developmental disabilities, especially if these acts are highly

idiosyncratic and subtle or not easily discriminated, such as lip movements or grimaces (Houghton, Bronicki, & Guess, 1987). Results from the present study supports the contention that these teachers were in fact able to identify and apparently correctly interpret some of the communicative forms and functions of many of the children's prelinguistic behaviors, even though these behaviors were idiosyncratic, unconventional, and often highly subtle. Systematically cataloging the children's existing communicative forms and functions may alert teachers to the fact that these acts, although idiosyncratic and subtle, have considerable communicative potential.

Our data provide evidence that an interview protocol, such as that used in the present study, may be one way to identify and document the communicative forms and functions of existing prelinguistic behaviors among children with developmental disabilities. This approach appears to yield some valid information on the communicative function of the children's existing behaviors. Armed with this information, parents, teachers, and other educational professionals may be better equipped to create opportunities for communication and respond more consistently to prelinguistic communicative attempts in ways that are likely to enhance the child's overall communication development.

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Appendix

BEHAVIORS THAT MAY BE COMMUNICATIVE**VOCALIZATION**

sound
yell/scream
grunt
cry/whine
laugh

BODY MOVEMENT

move closer
move away
tensing
wriggling
repositioning
relaxing
head move
reaching
touching
pushing
pulling
pointing
running away

FACE/EYE MOVEMENT

lip purse
stare
eye open
eye close
eye shift
gaze away
gaze toward

BREATHING

rapid
slow
hold
air swallow
sigh
blow

CHALLENGING BEHAVIOR

aggression
tantrum
self-injury

STEREOTYPE MOVEMENT

flapping
repetitive vocalization
hand wringing
self-stimulation

MORE SYMBOLIC FORMS

word approximation
sign
gesture
nod yes/no
eye point
device

Table 1

Description of Participants

Child	Age (years:months)	TARC (overall standard score)	REEL-2 (in months)		DBC (percentile rank)
			Receptive	Expressive	
Patrick	4:5	28	6	4	91%
Ian	4:5	32	5	6	73%
Beth	3:7	17	9	5	93%
Dave	7:7	43	6	6	97%
Rue	4:11	31	5	4	76%
Jake	7:1	24	5	6	54%
Alex	4:6	34	6	3	60%
Seth	6:11	35	5	6	84%

Table 2

Definitions of Communicative Functions

Communicative function	Definition
Requesting object	Behaviors initiated by the child that direct the receiver to provide an object to the child. Interest is on the object desired, on the <i>what</i> rather than the <i>how</i> . (e.g. child gets cup and gives it to the teacher; child tries to reach for an object that is out of reach).
Requesting action	Behaviors initiated by the child that direct the receiver to cause an action to occur. Interest is on the action itself, not the object or person that the child is directing. (e.g. child who needs help with a wind up toy gives it to the teacher and waits).
Attention to self	Behaviors used to call attention to the child. (e.g. child tugs at the teachers' clothes).
Comments	Behaviors that direct the listener's attention to some observable referent, such as an action or movement of an object, its appearance or disappearance. Expressing feeling. Labeling using a word or sign, while attending to an object or event. (e.g. child looks at a balloon as it deflates then looks at the teacher and laughs).
Social convention	Behaviors that occur in the context of a routine or convention. Greetings, responding to name and turn taking are included. (e.g. child turns to face the teacher when their name is called).
Reject/protest	Behavior that lets the listener know that the child doesn't want something suggested or initiated by another, disapproves of something or wishes to terminate an event that has already begun. (e.g. child throws toy given to it by the teacher onto the floor).
Responses	Behaviors produced in response to a question from another. (e.g. child reaches for the cup when the teacher holds the cup and asks if the child wants a drink).
Requesting information	Behaviors that direct the receiver to provide information or clarification about an object, action, activity or location.
Imitation	Repeating words or actions of another without waiting for a response.

Table 3

Communicative Forms and Functions Chosen for Structured Observation Trials

Child	Example 1	Example 2	Example 3
Patrick	Choice making Takes the one he wants, pushes away the one he doesn't.	Protest Hit, run away, kick, vocalize, throw objects.	Not chosen
Ian	Request food Take teacher's hand or reach for it.	Choice making Looks at the one he wants longer, takes the one he wants.	Request help Vocalize.
Beth	Request toy Reach for it.	Protest Scream, run away, go rigid.	Choice making Take.
Dave	Request help Give object, sign help.	Request food Tap teacher's hand, sign eat.	Choice making Point to photo of food, take food.
Rue	Respond to name Stop and look toward teacher.	Request food Tap teacher's hand, sign eat.	Choice making Point to photo, take item.
Jake	Request help Tap teacher's hand, sign help, give item to teacher.	Request food Tap teacher's hand, sign eat.	Choice making Point to photo, take item.
Alex	Request object Reach, vocalize.	Choice making Take one he wants.	Protest Vocalize, take item.
Seth	Request action Give object.	Request object Tap teacher's hand.	Choice making Point to photo, take item.

Table 4

Percentage of Intervals with each Communicative Function

Function	Patrick	Ian	Beth	Dave	Rue	Jake	Alex	Seth
Request object	5	2.8	7	2	6	12	1	3
Request action	2	2.8	0.8	0	0	0	0	0
Social convention	0	3	0	6	4	6	0.6	6
Attention to self	0	0	0.3	8	0	3.8	0.3	0.3
Protest	34	2.5	18	5	9	4	8	14
Comment	0	0.6	0.8	0	0	0.3	2	0.3
Respond	3	2	4	0.3	0.3	2	2	0.6
Imitation	0	0.8	1	0	0	0	0.8	0

Table 5

Percentage of Communicative Forms Verified through Naturalistic Observation

Verification Level	Patrick	Ian	Beth	Dave	Rue	Jake	Alex	Seth
Verified	4	8	26	19	12	15	13	16
Partially Verified	85	23	50	58	76	81	55	77
Not verified	11	69	24	23	12	4	32	7
# PCAs observed	160	52	115	75	66	88	53	88

Table 6

Percentage of Trials in which a PCA was Observed in Structured Assessments

Example	Patrick	Ian	Beth	Dave	Rue	Jake	Alex	Seth
1	50	100	100	80	50	100	80	100 (Give) 0 (Vocalize)
2	90	90	50	90 (Tap) 30 (Tap & sign)	100 (Tap) 10 (Tap & sign)	100	90	80
3	N/A	60	100	100 (Take) 30 (Photo & take)	80 (Take) 50 (Photo & take)	90	60 (Take back) 0 (Vocalize)	70

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