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# ***Predicting Children's Response to Prelinguistic Communication Intervention***

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*The present study tested the hypothesis that pretreatment level of play would predict the rate of increase in prelinguistic, intentional requesting during prelinguistic communication intervention. The participants were 8 children with developmental disabilities. A negative relation was found between the amount of person-only engagement observed during baseline sessions and later rate of change in the number of prelinguistic, intentional requests children made to interventionists during the intervention period. In contrast, a positive relation was found between the amount of transitional or symbolic play observed during baseline sessions and the rate of increase in the number of prelinguistic, intentional requests children directed to interventionists. The implications of the results for individualizing interventions and for predicting children's responses to prelinguistic communication intervention are discussed.*

It has long been known that there is a positive relationship between various types of play and language in children who are typically developing and in children who have developmental disabilities. For example, Bates, Bennigni, Bretherton, Camaioni, and Volterra (1979) found that combinatorial play (using two objects together) and symbolic play (using objects, actions, or sounds to represent something or some action) predicted later comprehension and production of language in children who are typically developing. Additionally, a relationship between symbolic play and later language has been found in children with autism (Ungerer & Sigman, 1980) and in children with mental retardation (Casby & Ruder, 1981).

However, there is much less support for

the relationship between play and early prelinguistic communication skills. That is, prelinguistic communication is a much less frequently studied correlate of play than are various aspects of linguistic communication. What evidence we do have for a relationship between play and future prelinguistic, intentional requesting is found in children who are typically developing (Bates et al., 1979). To date, no published studies support the relationship between early play skills and prelinguistic communication in children with disabilities.

In fact, showing a relationship between play and prelinguistic communication does not mean that pretreatment play level predicts who will and will not benefit from prelinguistic communication intervention. To date, there

is no reported evidence that pretreatment play level predicts change in prelinguistic, intentional requesting during intervention with children with disabilities. Nevertheless, theories about the relationship between play and prelinguistic communication encourage further investigation.

Two theories predict a relationship between play and prelinguistic communication. We will call them the "cognitive explanation" and the "social explanation." These are offered not as competing but as complementary explanations.

The cognitive explanation posits that the child's play level provides information about his cognitive developmental level which in turn may influence a child's communication development (see Rice & Kemper, 1984, for book-length review). For example, young children who engage in symbolic play frequently are probably more developmentally advanced than other young children who engage in symbolic play less frequently (Belsky & Most, 1981). Developmentally more advanced children are likely to learn a host of new skills more rapidly because they have more general knowledge on which to build. Empirical support for the link between cognition and later communication or language level is mixed (Rice & Kemper, 1984).

The social explanation suggests that it may be more difficult to engage children in the types of interactions that foster communication development when they do not show an interest or skill in object play. In contrast, it may be easier to engage in the types of interactions that foster communication development with children who engage frequently in high-level play. If these hypotheses are accurate, children with various levels of play skills should respond differently to communication intervention.

This social explanation is particularly appealing for predicting outcomes of early communication intervention. Such interventions,

like *prelinguistic milieu teaching* (Warren, Yoder, Gazdaz, Kim, & Jones, 1993), usually occur in contexts that center around playing with objects. Interactions that center around objects may be particularly important for early communication development for several reasons. First, objects provide the content of early requests (Rogoff, Mistry, Radziszewska, & Germond, 1992). Second, joint attention to objects is the most frequent context of many early communication behaviors (Bakeman & Adamson, 1986). Third, object play provides many opportunities for eliciting and naturally reinforcing requests (Jones & Warren, 1991).

Children vary in the extent to which they attend to objects and in the skill with which they play with them. The current study distinguishes between three levels of engagement or play to describe these individual differences. Person-only engagement occurs when the child is actively attending to the adult, without showing attention to an object. Undifferentiated object exploration occurs when the child bangs, shakes, mouths, or examines an object that is not specifically designed for such actions (Belsky & Most, 1981). Transitional and symbolic play includes all types of children's play that combines two objects in functional and non-functional ways, uses objects in a manner appropriate for the toy, or uses an object in a manner that demonstrates that the child is pretending the toy is real or represents some other entity (Belsky & Most, 1981; Piaget, 1951). Cross-sectional (Belsky & Most, 1981) and longitudinal (Adamson & Bakeman, 1991, for review) research has shown that typically developing children demonstrate the following developmental sequence from earliest to most advanced level of play: person-only engagement, undifferentiated object exploration, transitional/symbolic play. In the current study, we did not expect the children to engage in symbolic play frequently because they were in the prelinguistic period of de-

velopment. Therefore, symbolic play and transitional play were combined into one category.

Children who frequently engaged in developmentally younger types of play (i.e., person-only engagement and undifferentiated object exploration) may be relatively less prepared to learn how to request. Additionally, children with frequent person-only engagement may have little interest or skill with objects. Therefore, one may predict that it will be relatively difficult to get children with little interest or skill in objects to engage in the types of play routines that are likely to facilitate prelinguistic requesting.

In contrast, children who engage in frequent transitional and symbolic play may be more cognitively ready to learn to request. Furthermore, children who are skillful in playing with objects may be relatively easy to engage in routines, which are a primary context for prelinguistic communication intervention.

The purpose of the present study was to examine if pretreatment play predicted the rate of increase in prelinguistic, intentional requesting during an intervention designed to increase such requests. Specifically, we tested three hypotheses. First, we predicted that children who engage in relatively more frequent person-only engagement before intervention would show relatively slower rates of change in their prelinguistic, intentional requests. Second, we predicted that children who engage in relatively frequent undifferentiated object exploration would show relatively slower rates of change in their prelinguistic, intentional requests. Third, we expected children who engage in relatively frequent transitional or symbolic play would show relatively rapid increases in their rates of prelinguistic, intentional requests during intervention. The dependent variable for the tests of these hypotheses was the rate of increase in prelinguistic, intentional requesting during a prelinguistic

communication intervention that takes place in joint attention play episodes centered around objects (Warren et al., 1993; Yoder, Warren, Kim & Gazdag, in press). The predictors were proportion of time spent in various play categories before the children began prelinguistic intervention.

## METHOD

### Participants

Eight children participated in the study. These children had participated in the studies of prelinguistic communication intervention described in Warren et al. (1993) and Yoder et al. (in press). Table 1 presents relevant characteristics of the children.

All eight children were enrolled in a university-based early intervention program for toddlers and infants. Three children had developmental delays due to unknown etiology, three to Down syndrome, one to microcephaly, and one to agenesis of the corpus callosum. None of the children had significant auditory or visual deficiencies nor did they exhibit any significant behavioral problems as indicated by school records, informal observation, and teacher consultation. Their

**TABLE 1**  
**Means, Standard Deviations, and Ranges for Subject Description Variables**

Pretreatment Variables	<i>M</i>	<i>SD</i>	Range
Chronological age in months	25.6	3.1	21–30
Mental age <sup>a</sup> in months	12	3.4	8–17
Mental development index <sup>a</sup>	52.8 <sup>b</sup>	4.0 <sup>b</sup>	<50–59
Rate of requesting <sup>c</sup>	.33	.23	0–0.71

<sup>a</sup> Bayley Scales of Infant Development (Bayley, 1969).

<sup>b</sup> MDIs < 50 were set to 50 to compute mean and SD.

<sup>c</sup> Taken from *Communication and Symbolic Behavior Scales* (Wetherby & Prizant, 1990).

age range was 21 to 30 months. Details for the selection criteria and recruitment procedure can be found in Warren et al. (1993) and Yoder et al. (in press).

### **Procedures**

*Overview.* In this study, we taped eight children during baseline sessions with project staff, coded these sessions for play level, and related the data to the rate of increases in prelinguistic, intentional requesting observed during samples of prelinguistic communication intervention sessions. The children also participated in two pretreatment standardized-testing procedures. The pretreatment standardized tests were used to describe the participants and to explore possible covariates of the play-requesting relationship.

*Baseline sessions.* The adults conducting the baseline sessions were project staff members. The staff member engaged in parallel play activities of the same nature and developmental level as the child. The staff member followed the child's lead regarding the toys to play with and did not model new ways of playing with them. The toys used during the baseline sessions were selected from the same set of toys used for the intervention phase sessions. On the basis of experience with other children in this developmental period, we used two criteria in selecting toys. First, we selected toys we thought the children would enjoy. Second, the toys also afforded many opportunities for requests to open containers, turn on switches, and take turns with the adult.

*Pretreatment standardized testing.* Before the treatment began, all children received the Communication and Symbolic Behavior Scales (CSBS, Wetherby & Prizant, 1990). The CSBS is a standardized assessment of the pragmatic functions and communication forms that children use in the prelinguistic communication period through the early multiword com-

bination stage of language development (Wetherby & Prizant, 1990). The CSBS is designed to elicit requests and has a well-defined assessment protocol (Wetherby & Prizant, 1992). Trained project staff members administered the CSBS, from which the rate of requesting before treatment, indicated in Table 1, was derived.

All children's mental ages were estimated before treatment using the mental scales of the Bayley Scales of Infant Development (Bayley, 1969). A masters- or doctoral-level graduate assistant under the supervision of a licensed examiner administered the Bayley to the children. The mental ages are presented in Table 1.

*Intervention sessions.* Children engaged in 20-minute intervention sessions with a member of the project staff. The intervention sessions were conducted during the intervention phases of the Yoder et al. (in press) and Warren et al. (1993) studies. These sessions occurred 3 or 4 days per week. However, 10 minutes of one of these sessions were videotaped weekly. Therefore, the dependent variable for the study was derived from these weekly samples of the intervention sessions.

The intervention was *prelinguistic milieu teaching*. Details of this intervention are described in the Warren et al. (1993) and Yoder et al. (in press) papers. During this intervention, sustained joint attention to objects and routines around objects is supported to elicit and reward prelinguistic, intentional requests.

### **Measures**

*Play variables.* The purpose of the play code was to measure the relative frequency with which children engaged in various levels of play. The play coding system was a modified version of the Belsky and Most (1981) play scale. We collapsed Belsky and Most's 12

object-play categories into two categories (i.e., undifferentiated object exploration and transitional/symbolic play) and added *person-only engagement* and *uncodeable* categories. Table 2 illustrates the relation between our coding categories and those of Belsky and Most.

We collapsed the play categories from Belsky and Most's (1981) scale in this way because there would have been too few occurrences of several of the 12 categories in the Belsky and Most (1981) scale for a meaningful analysis. Table 3 presents the definitions and examples of our play categories.

The coding system reflects an expected developmental sequence for play progressing from person-only engagement to undifferentiated object exploration to transitional object or symbolic play. The empirical literature supports this developmental sequence in both typically developing (see Adamson &

**TABLE 2**  
***The Relationship of the Play Categories of the Present Study and Those of Belsky and Most (1981).***

Belsky and Most	Present Study
	0. Uncodeable
	1. Person-only engagement
1. Mouthing and	2. Undifferentiated object exploration
2. Simple manipulation	
3. Functional	3. Transitional play and symbolic play
4. Relational	
5. Functional-relational	
6. Enactive naming	
7. Pretend self	
8. Pretend other	
9. Substitution	
10. Sequence pretend	
11. Sequence pretend substitution	
12. Double substitution	

Bakeman, 1991; Rubin, Fein, Vandenberg, 1983, for reviews) and atypically developing children (see Rogers, 1988).

Coders observed the videotaped baseline sessions using an interval coding system. During a coding session, the coder heard a series of auditory signals that indicated the beginning and end of an alternating series of 10-second observation intervals and 5-second record intervals. During an observation interval, the coder observed the tape and made a judgment on the child's highest category of play that occurred in that interval. During record intervals, the coder wrote down the code for the highest category of play on the coding sheet next to the number for that interval.

The play variables were the proportion of total intervals (aggregated across baseline sessions) in which a particular category was coded. Research has shown that individual differences in play level and engagement are more stable with measures taken from multiple sessions than when play measures come from only one session (McWilliam & Ware, 1994). The play level scores were derived from an average of 6.13 10-minute baseline sessions ( $SD = 2.1$ , range = 4 - 10).

*Changes in prelinguistic, intentional requesting.* The dependent variable score was the slope of the increase in the number of prelinguistic, intentional requests per 10-minute session. Trained observers coded the number of prelinguistic, intentional requests from weekly videotapes of the intervention sessions. See Yoder et al. (in press) and Warren et al. (1993) for details of this coding system and procedure.

Intentional requesting was defined as asking for a specific object or action, using behavior that demonstrates coordinated attention between object and adult, a conventional gesture, or a symbol. An example of an intentional request that shows coordinated at-

**TABLE 3****Definitions and Examples of the Play Categories in Present Study**

Variables	Definition	Example
Uncodeable	Child is not actively engaged with a person or object and/or is crying or off-camera throughout the entire interval.	1) Child looks at a bottle, but does not touch it. 2) Child is making noises and looking at his/her shirt.
Person-only engagement	Child is actively engaged with adult (as determined by gaze shift, touching, or responding to adult's request accurately) without showing engagement with an object.	1) Child looks at the adult and laughs about the adult's previous action. 2) Child touches adult's hair.
Undifferentiated object exploration	Child bangs, shakes, mouths, or examines an object.	1) Child bangs the car on the table. 2) Child puts toy car in mouth.
Transitional play and symbolic play	Child uses (an) object(s) in an appropriate manner, puts 2 or more objects together, or approximates yet does not actually demonstrate pretend play. Child uses an object in a manner that demonstrates that she/he is pretending the toy is real or represents some other entity.	1) Child puts toys in wagon. 2) Child touches cup to lip without making drinking sounds.  1) Child picks up a toy phone and talks into it. 2) Child stirs with a spoon in a cup or on a plate (nothing is inside the cup or on the plate).

tion is a child who looks at the adult while reaching for the ball. An example of requesting with a conventional gesture is the child's pointing to a ball he wants. An example of intentional requesting with symbol use is the child's saying "bubble" while reaching for the bottle of bubble soap.

We computed each subject's slope for changes in prelinguistic, intentional requesting, using a simple regression equation with prelinguistic, intentional requests as the criterion variable and the number of intervention sessions as the predictor. The unstandardized regression coefficient was used to represent the slope, instead of the standardized regression coefficient. The former is easier to interpret for most readers (Pedhazur, 1982). Slope represents a more accurate estimate of the "true score" for change than do more commonly used methods of measuring

change (e.g., pre-post differences scores, residualized gain scores, and partialing out the pretreatment scores; Willet, 1989). We computed the slopes on the number of prelinguistic, intentional requests from all of the available taped intervention sessions. Using all available sessions maximized the basis for an accurate slope estimate (Burchinal & Appellaum, 1991). The number of taped intervention sessions varied from 10 to 18 ( $M = 15.6$ ,  $SD = 2.6$ ). A linear regression line fit the data better than did quadratic or cubic functions for all subjects.

### **Reliability**

Interobserver agreement estimates for play categories were calculated using 25% of the recorded baseline sessions. Agreement estimates for the number of prelinguistic, inten-

tional requests were calculated on 22% of the recorded intervention sessions.

We computed kappas on the play categories because the kappa estimates agreement while controlling for chance agreement. However, we used percentage agreement as the estimate of interobserver agreement for prelinguistic, intentional requests because the presence or absence of a request is not predetermined. The computation of kappa in situations where the presence of the act is not predetermined is questionable because the marginal totals for the two coders do not add to the same number, as they must when computing kappa (Cohen, 1960). Therefore, percentage agreement was used for prelinguistic intentional requests. Percentage agreement was computed as the number of agreements divided by number of agreements plus disagreements. In both types of agreement estimates, agreements and disagreements were determined point by point or interval by interval. To estimate agreement on specific play categories we pooled the data across subjects, because the number of instances of a particular category was very small for some categories within one session.

Kappas for play categories were as follows: (a) uncodeable, .90, (b) person-only engagement, .77, (c) undifferentiated object-explo-

ration, .86, (d) transitional and symbolic play, .87. It should be noted that a kappa of .70 is considered acceptable by most researchers (Cohen, 1960). Percentage agreement for prelinguistic, intentional requests was .94.

### Analyses

We estimated the magnitude and direction of relations between the predictor variable and the dependent variable with Pearson's product moment coefficients. Statistical significance of the relations was tested with *t*-tests. The alpha level used to interpret significance was .05, using a two-tailed test. A two-tailed test was used because it is more conservative than a one-tailed test.

## RESULTS

### Descriptive Statistics

Table 4 presents the relative amounts of engagement in the various play categories before the intervention. The number of intervals coded averaged 243 (*SD* = 66.5, range = 156-361).

The data in Table 4 show that person-only engagement occurred infrequently, transitional and symbolic play occurred second most frequently, and undifferentiated object exploration occurred most frequently. The

**TABLE 4**  
**Means, Standard Deviations, and Ranges for Play Levels in the Baseline Sessions**

Variables	<i>M</i>	<i>SD</i>	Range
Uncodeable intervals	22.7 (.10)	11.7 (.05)	12-43 (.05-.20)
Person-only engagement	13.8 (.05)	7.9 (.02)	2-27 (.009-.09)
Undifferentiated object exploration as highest category	130.5 (.52)	55.4 (.13)	61-221 (.17-.59)
Transitional or symbolic play as the highest category	78 (.37)	29.9 (.15)	36-137 (.20-.62)

Note. Numbers in parentheses are the proportion of intervals with the target play category as the highest observed in that interval. Other numbers are the number of 10-second intervals in which the target category is the highest level of play observed.



slopes for the rate of change in the number of prelinguistic, intentional requests during intervention were all positive. The average slope was .66 ( $SD = .42$ , range .29-1.72). A mean slope of .66 means that there was an average of a .66 increment in the number of prelinguistic, intentional requests for every taped intervention session.

### Tests of the Hypotheses

The results confirm two of the three predicted relations. Table 5 shows the correlations among the play levels and slope of increase in prelinguistic, intentional requesting.

As expected, children who exhibited frequent person-only engagement before the treatment were relatively slow to increase the number of prelinguistic, intentional requests they used during the intervention phase ( $R^2 = .58$ ). Also as expected, children who used transitional or symbolic play frequently before the treatment were relatively quick to increase the number of prelinguistic, intentional requests they used during the intervention phase ( $R^2 = .67$ ). Contrary to our prediction, knowing how often the children engaged in undifferentiated object exploration before the treatment did not help predict how fast they would increase their rate of prelinguistic, intentional requesting during the intervention period ( $p = .23$ ).

### Exploratory Analyses

Covarying variables may be responsible for the obtained relations between play levels and rate of increase in prelinguistic, intentional requesting. Therefore, we computed the coefficients among the play levels, the pretreatment requesting rate on the CSBS, the pretreatment mental age on the Bayley, and rate of increase in prelinguistic, intentional requesting during intervention sessions.

The only significant relation between play levels indicates that children who displayed transitional or symbolic play frequently displayed undifferentiated object exploration infrequently ( $r = -.84, p < .05$ ). This does not explain the relation between transitional/symbolic play and rate of increase in requesting, because rate of increase in requesting was not related to undifferentiated object exploration in this sample.

The significant relations between play and prelinguistic, intentional requesting cannot be explained by a common relation with pretreatment requesting rate as measured by the CSBS. Person-only engagement, transitional/symbolic play, and rate of increase in prelinguistic, intentional requests during intervention were nonsignificantly related to pretreatment requesting rate in this sample.

Additionally, pretreatment mental age could not account for the relationship between per-

**TABLE 5**  
**Pearson Coefficients for the Relationships Between Pretreatment Play and the Rate of Increase in Prelinguistic, Intentional Requesting During the Intervention Phase**

Variables	Number of Variable		
	2	3	4
1. Pretreatment person-only engagement	.04	-.55	-.76*
2. Pretreatment undifferentiated object exploration		-.85*	-.48
3. Pretreatment transitional or symbolic play			.82*
4. Rate of increase in the number of prelinguistic, intentional requests during intervention phase			

\*  $p < .05$ . Two-tailed test ( $n = 8$ ).

son-only engagement and increases in prelinguistic, intentional requesting. Mental age was not related to person-only engagement ( $r = -.24$ , ns).

However, pretreatment mental age could account for the relationship between transitional/symbolic play and increases in prelinguistic, intentional requesting. Mental age was significantly related to both transitional/symbolic play ( $r = .87$ ,  $p = .004$ ) and to rate of increase in prelinguistic, intentional requesting ( $r = .71$ ,  $p = .05$ ). One can reasonably assume that the relation between transitional/symbolic play and rate of increase in prelinguistic, intentional requesting would no longer be significant if mental age were statistically controlled. This analysis was not conducted because the small sample size ( $N = 8$ ) would have violated the suggested ratio of subjects to variables in multiple regressions and ANCOVAs (Pedhazur, 1981).

## DISCUSSION

There was a positive relation between the frequency with which children used relatively sophisticated object-play skills before the intervention and the speed with which they increased the number of prelinguistic, intentional requests they directed to trainers. Additionally, there was a negative relation between the frequency with which children attended to and played with adults only, before intervention, and the speed with which they increased their prelinguistic, intentional requesting to trainers. Both of these variables accounted for more than 50% of the variance in the dependent variable. This magnitude of effect is unusual in psychological or educational research. The magnitude of these correlations and theoretical importance of these relationships warrant attention and future study.

The results of the present study respond to McWilliam's (1991) call for research show-

ing the relation between engagement and gains due to early intervention. Although we called the pretreatment measures levels of play, one can see much similarity between play levels in the present study and levels of engagement coded by McWilliam and Ware (1994). For example, McWilliam and Ware coded person-only engagement, symbolic play with materials, and differentiated play with materials (which we would call transitional play). Prior to this study, most research on engagement in young children *presumed* the relation between engagement in early intervention activities and development (McWilliam, 1991). Finally, the present study is the first to show that relatively high engagement with people only, in a context in which object-play is encouraged, is a negative indicator of child response to a prelinguistic communication intervention that takes place in object-centered contexts.

Although the results are encouraging, the nonexperimental research design used in the present study compromises the internal validity of the study. We cannot be confident that the play levels had any direct or indirect influence on rate of increase in prelinguistic, intentional requesting. Like any correlational study, unmeasured variables might account for the relationships. Additionally, the research design does not allow us to determine which explanation, cognitive or social, best fits the results. For example, it is possible that children with low play skills are also low in other cognitive skills not reflected in mental age (e.g., means-end) and that these cognitive skills influence how quickly children learn to request intentionally (see Rice & Kemper, 1984 for review). However, the finding that mental age accounts for the relation between transitional/symbolic play and increases in prelinguistic, intentional requesting is consistent with the cognitive explanation.

An experimental study that compares two communication treatments differing on

whether play level was also targeted might shed further light on the nature of the play-request relationship. If the intervention that also targeted play level produced superior results to the communication-only intervention, then the results would support a direct or indirect causal influence of play on rate of increase in prelinguistic, intentional requesting during the intervention phase. If the causal role of play skills was confirmed, then direct attention to play skills, either before or during object-play-based communication intervention, would be advisable.

The social explanatory model for these results suggests that play may predict other outcomes in object-play-based intervention. Hanlin and Fox (1993) suggested that object-play is the naturally occurring context for much early intervention programming. Children who play with objects easily probably have more cognitive resources available for learning new skills while playing (Snow, Nathan, & Perlmann, 1987).

In summary, the present study is the first to establish that pretreatment play levels predict rate of change in prelinguistic, intentional requesting during communication intervention with children who have disabilities. We need future studies to replicate the correlations with a larger sample of children with disabilities. Future experimental studies are needed to determine whether the relationship between play and prelinguistic, intentional requesting is causal. Both types of studies are needed before changes in educational and clinical practice are warranted.

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