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Testing Predictive Validity of the Communication Composite of the Communication and Symbolic Behavior Scales

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This study tested the predictive validity of the Communication Composite of the Communication and Symbolic Behavior Scales as a predictor of expressive vocabulary. The Communication Composite consists of six clusters that measure specific aspects of communicative behavior. Participants were 58 children, 17 to 34 months of age, who were functioning at the prelinguistic stage of language development. All children had mild to moderate developmental delays but no sensory impairments. The Communication Composite was used to measure prelinguistic communication skills at the beginning of the study, and an unstructured play session was used to measure expressive vocabulary 1 year later. Results indicated that the Communication Composite was a significant predictor of later expressive language. In addition, all tested clusters were significant predictors of later expressive language.

Early identification of language delays and disorders is unquestionably important. Language delays and disorders can result in long-term negative effects on peer relationships (Baker & Cantwell, 1982), on behavioral and emotional development (Beitchman, Nair, Clegg, Ferguson, & Patel, 1986), and on school achievement (Silva, Williams, & McGee, 1987). Unfortunately, an historic lack of valid and reliable communication assessments for young children has resulted in language delays and disorders often not being identified early (McCathren, Warren, & Yoder, 1996). An instrument with good predictive validity, that is, an assessment instrument that can predict some future skill or ability (or disability) is particularly relevant to the identification of children in need of early language and communication intervention. Clinical de-

terminations about intervention services are often based on assessments, and using instruments with low predictive validity is likely to result in children receiving services they do not need, or being denied services they do need. This is particularly true in the area of communication because it affects social, cognitive, and academic achievement.

Developing valid prelinguistic assessments poses many difficulties. For example, identifying communicative behaviors that are predictive of later language development is challenging. Developing measurement strategies and assessment instruments that will motivate young children to engage in observable communication behaviors presents another challenge, and a related concern is the need for valid and reliable measurement strategies. A new generation of communication assessment

instruments, however, is attempting to address these problems.

In this study, we tested the predictive validity of Cluster scores and the Communication Composite score of the *Communication and Symbolic Behavior Scales* (CSBS; Wetherby & Prizant, 1993) as a predictor of later expressive vocabulary for a group of toddlers with developmental delays. The CSBS is not a screening instrument used with large groups of children, but an assessment instrument that provides detailed information about the communication skills of a young child. We studied children with developmental delay because they are a very important clinical population for which the CSBS is intended. We selected the CSBS because it measures early communication in a complex and thorough way.

The CSBS is an assessment instrument designed to be administered by trained clinicians to children from 8 to 30 months of age. The CSBS measures young children's communication skills during a set of interactions with adults and objects that allow a range of behaviors to be elicited and coded. This method of assessment allows a much more complex analysis of the children's communication than checklist type assessments (e.g. Hawaii Early Learning Profile, Parks et al., 1984; Receptive-Expressive Emergent Language Scale, Bzoch & League, 1978). The Communication Composite of the CSBS is derived from a series of situations designed to elicit joint attention (usually in the form of comments), behavior regulation (usually in the form of requests), and social interaction during games. The Communication Composite score is made up of six cluster scores: Communicative Means-Vocal, Communicative Means-Gestural, Communicative Means-Verbal, Social-Affective Signaling, Reciprocity, and Communicative Functions. Each cluster is composed of three or four scales that measure aspects of the relevant behavior. (See the Appendix for a list of the clusters and scales.)

Measurement Issues

On the face of it, there could be some problems with the metric used by the CSBS to represent communicative behaviors. First, the

CSBS assigns Likert scores to all scales, reducing the raw score variability between children. For example, in the Communicative Functions cluster, a child who uses joint attention 19 times in a session is assigned a 4 on the Likert scale, and the same score given to a child who uses joint attention 51 times. Although it is unclear whether the difference between 19 and 51 is clinically meaningful, such use of the Likert scale may mask differences in performance that are necessary for accurate prediction.

A second potential measurement problem is the use of behavior frequencies instead of rates. A frequency represents only a count of how many times a behavior occurs in a particular context. Frequency, however, does not consider amount of time. Rate, on the other hand, considers the frequency of behavior and within a time unit (e.g. rate = frequency divided by unit of time). For example, in our sample, the assessment for some children took nearly 30 minutes while for others it took only 11 minutes. Using only rate as the measure, the child who used a three point gaze 10 times in 11 minutes received the same score as the child who used a three point gaze 10 times in 25 minutes. It is unclear, however, whether both children demonstrated the same level of skill. Theoretically, the CSBS protocol structures the adult behavior so that each child is offered the same number of response eliciting situations. If true, a constant number of opportunities to respond may be more important than the amount of time the child takes to respond. The opportunities for some of the scored behaviors, however, are not clear (e.g. positive affect and gaze shift).

A third potential problem is the inclusion of scales that may not actually be valid predictors of later language development. Although the Communication Composite includes scales found to predict later language (e.g., frequency of behavior regulation and joint attention, Mundy, Kasari, Sigman, & Ruskin, 1995; consonant use, Whitehurst, Smith, Fischel, Arnold, & Lonigan, 1991), it also includes scales that lack empirical support as predictors of later language development (e.g., sociability of communicative functions,

isolated gestures, and episodes of positive affect). Perhaps including scales that are not predictive with scales that are predictive weakens the predictive validity of the Communication Composite score.

No research has yet established whether the Communication Composite, or any of the clusters, predicts later language development. It is possible that measuring communication development in various ways and creating an aggregate score, as the CSBS does, is more predictive of developmental outcome than focusing on one aspect of the communication domain. It is also possible that potential problems with the CSBS summary measures impede the effectiveness of the clusters or the Communication Composite as predictors.

The purpose of this study was to determine if the Communication Composite score, or any of the six cluster scores that contribute to the composite score, are predictive of later expressive vocabulary for young children with developmental delay. Three specific research questions were addressed. First, is the CSBS Communication Composite score positively correlated with later expressive vocabulary in toddlers with developmental delay? Second, are any of the six clusters (Communicative Means-Gesture, Communicative Means-Vocal, Communicative Means-Verbal, Social-Affective, Reciprocity, or Communicative Functions) positively correlated with later expressive vocabulary? And, third, does the deletion of non-predictive clusters significantly improve the correlation between the Communication Composite and expressive vocabulary?

METHOD

Participants

The participants in this study were part of a longitudinal intervention study being conducted by the second and third authors. In the larger study, the effects of two models of prelinguistic communication intervention were compared. Children were randomly assigned to either a one-to-one intervention or a group intervention. Both treatments were conducted 4 days a week, for 20 minutes, in the child's school. Children participated in the interven-

tion for 6 months. Follow-up testing was done 6 months after the end of intervention, or 12 months after the initial testing.

In the one-to-one treatment, a trainer worked with a child, utilizing milieu language teaching strategies to teach clear prelinguistic communication skills (Warren, Yoder, Gazdag, Kim, & Jones, 1993). The strategies included following the child's lead, imitating and expanding vocalizations and play, and modeling and prompting desired behaviors (i.e., conventional gestures, coordinated attention, vocalizations to the adult).

The one-to-one treatment contrasted with the play group condition which consisted of one adult and three children. In the play group, the adult was responsive to children's communication and behavior, followed children's leads, and commented on the children's play. The adult, however, did not imitate vocalizations or actions, or specifically prompt prelinguistic communication behaviors.

Because the results of the present investigation could have been influenced by different treatments the children experienced in the larger experiment, we tested the interactions between group assignment and predictor variables used in the present study. First, we tested whether the relationship between the Communication Composite scores or the individual cluster scores from the CSBS and later expressive language was different between groups. Second, we tested to see if there were group differences on the Communication Composite score, the individual cluster scores, or rate of expressive vocabulary. No differences between the groups on the variables of interest were found and the relationships of interest were not statistically significantly different between groups. Thus, the analyses used for the present study treat the children as one group.

Participants were 58 children, 34 boys and 24 girls, 17 to 34 months of age ($M = 22.6$, $SD = 4$) who were enrolled in community based early intervention programs. Of the 58 children, 24 were African American, 31 were Caucasian, and 3 were identified by their families as other. The children had Bayley Mental Development Indices (MDI; Bayley, 1969,

1993) ranging from 35–85 ($M = 54.3$, $SD = 13.5$). The Bayley does not provide MDIs below 50, thus for children who scored below 50, an estimated MDI was calculated by finding the regression equation at each age for the data provided in the Bayley manual and extending the regression line (see Naglieri, 1981 for similar application). Children with estimated MDIs below 35 were not included in the study. In addition, each study participant had to be observed demonstrating at least one instance of intentional communication prior to testing.

None of the participants showed evidence of autism or sensory impairments, and all had the motoric ability to rotate their torsos while engaged in object play. Of the 58 children in the study, 4 had Down syndrome, 4 were premature births with medical complications, 3 were diagnosed “failure to thrive,” and 2 were diagnosed with Pervasive Developmental Disorder. In addition, 6 children were each diagnosed with one of the following conditions: macroencephaly, microencephaly, Duane’s syndrome, neonatal meningitis, Fetal Alcohol Syndrome, and tuberous sclerosis. The remaining 39 had no identifiable etiology or diagnosis other than developmental delay.

At the beginning of the study, children were observed to have fewer than three productive, non-imitative words in their vocabulary. Each child’s expressive vocabulary was estimated using data from the initial CSBS testing session and teacher report. During the initial CSBS testing, 7 out of the 58 children used a total of five different words (mama, bye-bye, no, baby, and uh-oh). Two of the seven children spoke two words and the other five children each spoke just one word. The number of words and rate of words at the beginning of the study were skewed, making the median a better statistic for central tendency than the mean and standard deviation. The median number of words was 0 (range 0–2).

To assign socioeconomic status scores to families, we used the occupational status score developed by Stevens and Cho (1985). For our sample, the occupational status score, which is based on occupation, was lower than the mean national score of 34.5 ($SD = 18.0$)

reported by Stevens and Cho. Our sample was skewed, however, making the median of 23 (range 10 to 80) a better descriptor of central tendency than the mean. Educational level of participants’ head of household varied, 6 had a 7th to 9th grade education, 30 had a 10th to 12th grade education, 20 attended college, and 2 attended graduate school.

Procedures

CSBS testing. Project staff were trained to give the CSBS. Training consisted of observing the administration of the CSBS using both the training tapes that accompany the assessment instrument, and previously trained project staff. In addition, project staff participated in practice sessions conducted with children in the targeted age range who were not study participants. Practice sessions were videotaped and feedback was given by more experienced staff members. All testing sessions also were videotaped and the camera person doubled as an on-line coach. In addition, all testing sessions were coded and any discrepancies in administration were noted, discussed, and resolved.

The measures for this study were derived from two testing sessions, one at the beginning of the study and a second session 1 year later. Testing was done at each child’s school site. The Communication Composite section of the CSBS takes about 30 minutes or less to administer. Although the test manual encourages the use of parents in the assessment session, we used a staff member who was familiar with the child, rather than the child’s parent. We chose to exclude the parent from the procedure because we wanted to reduce between child differences in the extent to which the parent interacted with the child during the test session. There is strong evidence that adult-child interaction style influences children’s immediate performance on many pre-linguistic and linguistic measures (Lewy & Dawson, 1992). In addition, activities in the CSBS were selected to elicit communication from young children through engagement with interesting objects. The child sat in a safety seat at the end of the table facing the video camera. The adult sat across from the child or

on the child's left so the video camera could clearly capture the faces of both the adult and child.

The Communicative Composite consists of two sections: Communicative Temptations and Sharing Books. The Communication Temptations are seven situations designed to elicit comments and requests from young children. For example, in the first Communicative Temptation the adult winds up a small walking toy and puts it on the table within the child's reach. When it stops walking, the adult waits for the child to request the toy walk again and then rewinds the toy. If the child does not communicate, the adult implements a prompting procedure to elicit a response. First the adult simply asks, "Need help?" If this does not prompt a child communication, the adult holds an open palm 12 inches from the toy and asks again, "Need help?" If the child still does not respond, the adult moves his or her open palm closer to the toy (about 3 inches) and repeats the question "Need help?" If the child continues to not respond, the adult picks up the toy and repeats the initial action of winding the toy and putting it on the table within child's reach. The sequence of eliciting a communication request is repeated up to five times. On the first, second, and fifth attempt, the adult complies with the request and reactivates the toy, but on the third and fourth request, the adult does not immediately comply but rather comments or labels the toy and sets it down without reactivating it, and awaits a request. When the child communicates again, the adult activates the toy and then puts it away when it winds down. This procedure of complying with the first, second, and fifth request, but not the third and fourth request is repeated in each of the temptation situations. Materials used for other temptations are balloons, bubbles, blanket for peek-a-boo, blocks and a box, and a jar with cereal. In situations designed to elicit comments, the adult pauses and waits to see if the child comments. If the child does not, the adult continues with the test but does not provide a specific prompt.

In the Sharing Books section, the child is offered 4 books. The child selects and looks

at any or all of the books for a 5 minutes testing period. The adult is to respond to the child's communications without directing or questioning the child.

Play Session

To measure children's expressive vocabulary, 15 minute, one-to-one play sessions with a familiar staff member were conducted. All play sessions occurred 1 year after the pre-intervention CSBS testing. Toys used during the play sessions were typical of toys found in early childhood settings and included: a baby doll, 2 baby bottles, a baby spoon, doll hairbrush, rattle, blanket, teapot with 2 cups and saucers, 4 colored cylindrical sticks, a large pink car, and a toy telephone. During the play session, the adult could imitate what the child was doing and comment on the play, however they were to avoid modeling higher levels of play. For example, if the child picked up the sticks and started banging on the table the adult would bang on the table with the other sticks and say, "We're banging on the table." Likewise, if the child put the bottle in the doll's mouth the adult might say, "The baby is hungry. She wants to eat." Each play session was videotaped for later coding. The child sat in a safety seat across from the adult or on the adult's right so the face of both the child and adult was visible.

Outcome Variable: Expressive Vocabulary

The outcome measure, expressive vocabulary, was quantified as the number of different non-imitative words used in the play session. Non-imitative was defined as a word used by the child that was not in the adult's previous utterance. Adult pronunciations or approximations of an adult pronunciation were included in this measure. Approximation was defined as vocalizations having the same number of syllables and at least one phoneme in common with the adult pronunciation. In addition, there must have been nonlinguistic support for determining the child was saying a word (i.e. child said "baby" while pointing to the doll). Words with an -ie (horsie) or -y (doggy) and words that are commonly shortened by young

Table 1.
Reliability Coefficients

Variable	g-Coefficient
Communicative Means—Gesture	.92
Communicative Means—Vocal	.96
Communicative Functions	.95
Reciprocity	.92
Social-Affective Signaling	.90
Communication Composite	.97
Expressive Vocabulary	.96

children (e.g., “sketti” for spaghetti and “nana” for banana) also were included, however, if a child said both horse and horsie they were credited for only one word. Finally, words had to be in the dictionary or on the list of symbolic sounds included in the MacArthur Communication Development Inventory/Infants (Fenson et al., 1991).

Coding

Coding of the CSBS session consisted of two separate passes through the data. On the first pass, communication acts were identified, assigned a communicative function, and relevant aspects of each communication act was noted (e.g. presence of a vocalization or gesture). A communication act was defined as a vocalization or gesture that was directed toward the adult (Wetherby & Prizant, 1993). The second pass through the data was to code the behaviors related to the Social-Affective Signaling cluster.

Reliability

Interobserver reliability for all variables was calculated on 22% of the data. Reliability samples were randomly selected. Reliability was reported using a generalizability or g-coefficient (McWilliam & Ware, 1994). Unlike other ways of calculating reliability, g-coefficients take into account more than one source of variability (Mitchell, 1979). G-coefficients approach 1 as the variance accounted for by the subjects is large in comparison with the variance accounted for by coders (Kasari, Freeman, Mundy, & Sigman, 1995). For example, if there was variance among subjects and no variance between coders the g-coeffi-

Table 2.
Means and Standard Deviations for CSBS Variables

	Mean	SD
Communicative Means—Gesture	7.1	2.6
Communicative Means—Vocal	11.0	2.1
Communicative Functions	8.6	1.8
Reciprocity	7.9	1.7
Social-Affective Signaling	7.6	2.0
Communication Composite	47.3	7.8

cient would be 1. Conversely if the scores of all the subjects were the same but the coders scored them differently the g-coefficient would be 0. Mitchell has (1979) suggested an acceptable range for g-coefficients is .5–.7. The reliability coefficients for all variables included in this study are shown in Table 1.

RESULTS

Preliminary analysis was done on the data using the steps recommended by Tabachnick and Fidell (1989). According to their procedures, the outcome variable needed to be transformed. After a natural logarithmic transformation, no statistical assumptions were violated for the proposed analyses. For the sake of clarity, means and standard deviations are reported using the original scale.

Expressive vocabulary was calculated at the end of the study. In the play session all but 11 children used words. The average number of words used during the 15 minute session was 11.3 (range = 0–87; *SD* = 15.5). Because number of words used was positively skewed, the median number of words used (5.5) represents a better descriptor of central tendency than mean and standard deviation. During the 15 minute play session, the median number of words used was 5.5. Means and standard deviations of all CSBS variables included in the analysis are listed in Table 2.

The first question asked if the Communication Composite score was positively correlated with later expressive vocabulary. The Communication Composite was a significant predictor of later expressive vocabulary. The

Table 3.
Correlations Between CSBS Scores and Later Expressive Vocabulary

	Correlation	<i>p</i> Value
Communicative Means—Gesture	.355	<i>p</i> = .003
Communicative Means—Vocal	.387	<i>p</i> = .001
Communicative Functions	.365	<i>p</i> = .002
Reciprocity	.340	<i>p</i> = .005
Social-Affective Signaling	.283	<i>p</i> = .016
Communication Composite	.426	<i>p</i> = .000

correlations between CSBS variables and expressive vocabulary are presented in Table 3.

The second question asked which of the clusters were predictive. We were unable to test the predictive validity of the Communicative Means-Verbal cluster because there was insufficient variance, however, all tested clusters were positively correlated with later expressive vocabulary. Communicative Means-Vocal, Communicative Means-Gestural, Reciprocity, Social-Affective Signaling, and Communicative Functions were all statistically significant predictors.

The final question asked if removing the non-predictive clusters from the CSBS Communication Composite significantly improved the correlation. Because all tested clusters were significantly correlated with expressive vocabulary, this analysis was not needed.

Because MDI and mental age (MA) are often intercorrelated with communication and other behavioral skills, we conducted correlations to ensure our results were not simply bi-products of age and IQ. Pearson product-moment correlations were used to determine the relationship between MDI and later expressive vocabulary, and MA and later expressive vocabulary. Neither relationship was statistically significant ($r = .20, p = .12$; $r = .07, p = .59$, respectively).

A post-hoc analysis also was conducted to determine if any predictive clusters added unique variance when tested in a multiple regression with expressive vocabulary as the dependent variable and the predictive clusters as the independent variables. Although the equation was statistically significant, $F = 2.9, p = .02$, none of the clusters added significantly to the prediction.

DISCUSSION

This study tested the predictive validity of the CSBS Communication Composite when attempting to predict later expressive vocabulary for children with developmental delays in the prelinguistic stage of communication development. The Communication Composite did predict later expressive vocabulary, accounting for 18% of the variance. In addition, five of the six clusters; Communicative Means-Vocal, Communicative Means-Gesture, Reciprocity, Social-Affective Signaling, and Communicative Functions were predictive. The sixth cluster, Communicative Means-Verbal, was not tested. Because children in our sample were in the prelinguistic stage of development, and by definition, not yet talking, we did not expect the Communication Means-Verbal cluster to be predictive.

This study is important because it is the first to report predictive validity using the CSBS. It is especially important given that MA and MDI, two frequently used predictors of communication, were not related to later expressive vocabulary for this group of children. Because assessment results determine who receives services, it is imperative that assessment instruments have predictive validity for the populations who are likely to be assessed.

This study also presents new findings to the field. Before we discuss the results in detail, however, we note two caveats. First, before predictive validity can be fully established for the CSBS further study, which includes other populations of children (e.g., typically developing and children with autism), needs to be conducted. It may be that the CSBS has stronger predictive validity for some groups of

children than for others. Second, although there were no group differences on the relationships of interest, all children included in this study were part of an intervention study. Replications should be done with children participating in different types of intervention programs.

In the introduction we raised three possible problems related to the measurement strategies used in the CSBS. First, the CSBS assigns Likert scores to all scales, reducing the raw score variability between children. In our study, all tested correlations were statistically significant, thus use of Likert scores did not prevent us from finding the relationships in the data. This is an important finding because becoming reliable on Likert scores is much easier, less time consuming, and therefore less expensive than trying to develop and maintain reliability on the occurrence of each behavior. Having the Likert scores makes the CSBS a more user friendly, cost-efficient instrument than it might appear, given the complexity of the behaviors that are being assessed.

A second potential problem, use of frequencies rather than rates in an assessment that takes different amounts of time for different children, was raised. Again, given that all the tested correlations were statistically significant, this did not turn out to be a problem. Because the adult's behavior is structured (i.e., toys were offered a specific number of times, adult responses to child requests were prescribed), the amount of time the assessment takes may be of less importance. Some children in our sample took twice as long as others, however, we still found predictive relationships.

The third potential problem we raised was the inclusion of scales that may not be valid predictors of later language development. Although we did not test the predictive validity of each scale, the clusters composed of those scales did predict expressive vocabulary. If there were particular scales not predictive by themselves, they did not impede the predictive validity of the clusters or of the Communication Composite as a whole.

Predictive validity studies using groups of children with disabilities or who may be "at-

risk" are relatively rare. However, using the Early Social-Communication Scales (ESCS; Seibert & Hogan, 1982), researchers tested prelinguistic communication skills to predict language and IQ for young children with low birthweight (Ulvund & Smith, 1996). Both joint attention and behavior regulation were found to be predictive of both language and IQ measured 1, 2, and 4 years after the ESCS testing. Unlike our study, the mothers were included in the testing session for the ESCS. The magnitude of the significant correlations in the Ulvund and Smith study ranged from .19 to .37, while ours ranged from .27 to .43. Thus, it appears that our exclusion of the parent in the testing session may not have had a significant impact on the child's communication or on the amount of variance accounted for when predicting expressive vocabulary.

Many of the constructs included in the CSBS have support in the empirical literature as predictors of expressive language for typically developing children and children with disabilities. Both amount of vocalization and the use of consonants in the prelinguistic communication period are predictive of spoken language (Camp, Burgess, Morgan, & Zerbe, 1987; Kagan, 1971; Menyuk, Liebergott, & Shultz, 1986; Murphy, Menyuk, Liebergott, & Shultz, 1983; Roe, 1977; Stoel-Gammon, 1989; Whitehurst, Smith, Fischel, Arnold, & Lonigan, 1991). Use of pragmatic functions has been shown to predict later expressive language for typically developing children (Mundy et al., 1995), children with Down syndrome (Mundy, Sigman, Kasari, & Yirmiya, 1988; Smith & vonTetzchner, 1986) and children with autism (Mundy, Sigman, & Kasari, 1990). Children's overall rate of communication has also been shown to predict later expressive vocabulary (McCathren, Yoder, & Warren, 1999). For some of the other clusters there is not empirical support, but the importance of the behaviors is intuitively obvious. For example, scales that seem to be important in early communication, look at (a) how responsive the child is to adult communication, (b) positive engagement with a communicative partner, and (c) how determined the child

is to get across a message. Research, however, is needed to determine if these behaviors are predictive of some aspects of later communication.

The CSBS manual provides scaled scores and normed scores that can be used to meet state criteria for determining eligibility for services. In addition, because the CSBS engages young children in interaction, the information gathered is useful for identifying communication goals and strategies for intervention. This is important because many standardized tests do not provide information that is useful for program planning.

In conclusion, the CSBS is one of a new generation of prelinguistic assessment instruments that is much better than assessments available even 10 years ago. Overall, the Communication Composite and the five tested clusters of the CSBS were shown to be moderately powerful and valid predictors of later expressive vocabulary. The CSBS Communication Composite has great potential in identifying, in infancy, children who will be at risk for language and communication disorders later in childhood.

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APPENDIX

Communication Scales of the CSBS

Communicative Functions

1. *Behavior Regulation*—Communication acts used to regulate behavior of another person to obtain or restrict an environmental goal.
2. *Joint Attention*—Communication acts used to direct another's attention to an object, event, or a topic of a communicative act.
3. *Sociability of Functions*—Proportion of communication acts used for social interaction plus joint attention.

Communicative Means-Gestural

4. *Conventional Gestures*—Gestural communication acts whose meaning is shared by a general community, including giving, showing, pushing away, open-hand reaching, pointing, waving, nodding head, and shaking head.
5. *Distal Gestures*—Gestural communication acts in which the child's hand does not touch a person or object (e.g. open-hand reaching, pointing at a distance, waving).
6. *Coordination of Gesture and Vocal Acts*—Communication acts that are composed of a gesture and a vocalization produced simultaneously or overlapping in time.

Communicative Means-Vocal

7. *Vocal Acts without Gestures* (Isolated Vo-

cal Acts)—Transcribable vowels or vowel plus consonant combinations that are used as a communicative act and are not accompanied by a gesture.

8. *Inventory of Different Consonants*—Total number of different consonants produced as part of communicative acts.
9. *Syllables with Consonants*—Vocal communicative acts that are transcribable vowel plus consonants combinations.
10. *Multisyllables*—Vocal communicative acts that contain two or more syllables; syllables may be a vowel only or a vowel plus consonant.

Communicative Means-Verbal

11. *Inventory of Different Words (Expressive Lexicon)*—Total number of different words (i.e. spoken or signed) in communicative acts; a word or word approximation must be used to refer to a specific object, action, or attribute and only that word class.
12. *Inventory of Different Word Combination*—Total number of different multi-word combination produced in communicative acts.

Reciprocity

13. *Respondent Acts*—Communicative acts that are in response to the adult's conventional gestures or speech.
14. *Rate*—Frequency of communicative acts displayed per minute.
15. *Repair Strategies*—Measure of the child's ability to repeat and/or modify a previous communicative act when a goal is not achieved.

Social-Affective Signaling

16. *Gaze Shifts*—Alternating eye gaze between a person and an object and back (i.e. either person-object-person or object-person-object).
17. *Shared Positive Affect*—Clear facial expressions of pleasure or excitement, which may or may not be accompanied by a vocalization, that is directed toward the adult with eye gaze.
18. *Episodes of Negative Affect*—Clear vocal expressions of distress or frustration that begin when the vocalization is initiated and continue until the child has recovered and has displayed a neutral or positive affect.

Investigator on Multicultural Influences on Child Development needed

The principal function of this position is to design and conduct research and evaluation in the area of early childhood care and education, with emphasis on multicultural influences and parent involvement. The investigator will study how families from different cultural backgrounds and early childhood programs for disadvantaged children (Head Start, Smart Start) and programs for children with disabilities influence child development. Among his/her responsibilities, the investigator will have a leading role in the design and conduction of studies focusing on the population of Hispanic/Latino children and families, whose enrollment is rapidly increasing in North Carolina. The investigator will formulate proposals for studies that will include the design of specialized instruments (for example, observational measures, interview protocols and rating scales), use of diverse psycho-educational tests, and qualitative methods such as focus groups and in-depth interviews. The investigator will be involved in the preparation of culturally appropriate research instruments and dissemination materials for parents and teachers, in both, English and Spanish (Bilingual English-Spanish fluency is required). The investigator will need to establish collaborative relationships with early childhood programs and community organizations to conduct the proposed studies. The investigator will supervise the data collection process and preparation of the databases, and conduct the data analyses using various statistical tests as needed (proficiency in using computer software such as SPSS and SAS for advanced statistical analyses is required). The investigator will write articles for publication of research findings in scientific journals and prepare reports for public dissemination. The investigator will also be required to present the results of the studies in academic seminars and scientific conferences, as well as at school and community organizations. At least 3 years of university teaching experience and additional experience conducting training programs for teachers and parents about child development are required. Previous experience working as investigator in a research center for child development is strongly desirable. Resume must include social security number. Education: B.Sc., Master and Ph. D. degrees in the fields of psychology and education. This is a full time position (40 hrs/week). Salary: \$44,129 year. Applicants may apply to the nearest Job Service Office or submit a resume to Job Service, 601 Valley Forge Rd., Hillsborough, NC 27278. Ref: Job order number 3103042 & DOT code 045.067-014.