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Linguistic communication skills in rural Appalachian preschoolers

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Linguistic Communication Skills in Rural Appalachian Preschoolers

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ABSTRACT

The impact of risk and protective factors on rural Appalachian preschoolers'
(4-years-old) language skills was explored in a longitudinal study of 85 high
socioeconomic risk families. Factors examined were family demographics and social
support status, mother-child attachment relationships, maternal personality and attitudes,
mother interactional behaviors, and infant and child temperament and behaviors. Child
language outcome measures included the Preschool Language Scale-3 and pragmatic
analyses of spontaneous speech. Data indicated that this population had significantly less
developed linguistic skills than other comparison groups, both standardized and low
socioeconomic (SES) risk. Differences in language skills for this sample can be predicted
from a combination of SES, mother, and child characteristics. Attachment status alone or
in combination with risk factors did not serve a protective function for linguistic
communication development in this group.

LINGUISTIC COMMUNICATION SKILLS IN

RURAL APPALACHIAN PRESCHOOLERS

In the past two decades, the role of environmental influences on the development of language has been the topic of much theoretical and empirical work (Baumwell, Tamis-LeMonda, C. S., Bornstein, M. H., 1997; Biringen, Robinson, & Emdi, 1994; Bowering, Malay, Ellsworth, & Byrne, 1996; Bretherton, Bates, Benigni, Camaioni, & Volterra, 1979 [review]; Bus & Van Ijzendoorn, 1988; Cantwell & Baker, 1987; Cicchetti & Beegly, 1987; Cohen, Davine, & Meloche-Kelly, 1989; Coster, Beeghly, Gersten, & Cicchetti, 1989; Fish, 1996; Fried & Watkinson, 1990; Gersten, Coster, Schneider-Rosen, Carlson, & Cicchetti, 1986; Hart & Risley, 1992; Hart & Risley, 1995; Hoff-Ginsberg, 1991; Klann-Delius & Hofmeister, 1997; Lucariello, 1990; Meins, 1998; Morisset, Barnard, & Booth, 1995; Morisset, Barnard, Greenberg, Booth, & Spieker, 1990; Morisset, Barnard, Spieker, & Booth, 1990; Olson, Bates, & Bayles, 1984; Roberts, Burchinal, & Durham, 1999; Rosenblum, Bénony, & Mazet, 1997; Slomkowski, Nelson, Dunn, & Plomin, 1992; Snow, 1983; Wells, 1985; Van Ijzendoorn, Dijkstra, & Bus, 1995 [review]). From these works, it appears that the development of language ability is a complex process that depends on several variables. The purpose of this present investigation was to explore the relative influence of child temperament and behavior, socioeconomic or environmental factors, mother-child interaction, and security of attachment on the development of linguistic abilities in a population of rural, low socioeconomic 4-year-olds.

Researchers have associated infant and toddler temperament with subsequent communication differences. Positive child temperament dimensions have been associated with both receptive (Slomkowski, et al., 1992) and expressive language competencies (Fish, 1996; Slomkowski, et al., 1992). In addition, significant behavior problems, including developmental immaturity, temper tantrums, defiant behavior, inattentiveness, and restlessness, have been associated with both receptive and expressive language delays (Bowering, et al., 1996; Cantwell & Baker, 1987; Cohen, et al., 1989).

Demographic or environmental factors have been found to be correlated with differences in language development by others. Female gender (Morisset, et al, 1995) and higher socioeconomic status (SES) (Hart & Risley, 1992; Hart & Risley, 1995; Hoff-Ginsberg, 1991; Morisset, Barnard, Greenberg, et al., 1990; Wells, 1985) have been correlated with greater language competence. Poorer language development was significantly associated with cigarette smoking after statistically controlling for confounding factors (Fried & Watkinson, 1990).

Several investigators have linked individual differences in communicative development to differences in quality of mother-child interaction. Various positive attributes of mother-child interaction have been directly correlated to such diverse language abilities as receptive language (Morisset, Barnard, Greenberg, et al., 1990; Olson, Bates, & Bayles, 1984), expressive language (Coster, et al., 1989), conversational skills (Biringen, Robinson, & Emdi, 1994; Lucariello, 1990; Wells, 1985), language

comprehension (Baumwell, et. al, 1997) and emergent literary skills (Bus & Van

IJzendoorn, 1988).

Studies relating the security of attachment with the child's communicative

development, however, have produced mixed results. In an early narrative analysis of

these studies, Bretherton and her colleagues (1979) discovered that, although some

investigators had obtained significant relationships between security of attachment as

assessed in the Strange Situation procedure and communicative variables, substantially

more researchers did not find these expected correlations. In addition, the positive

correlations between quality of attachment and language competence appeared to be

weaker than negative correlations, with more communicative variables showing no

association with security of attachment. Therefore, they concluded that there was a lack

of association between attachment as measured by the Strange Situation procedure and

language competence.

In a more recent meta-analysis of studies investigating the relationship between

communicative variables and the security of attachment (Van IJzendoorn, et al., 1995),

secure children appeared to be more competent in language skills than insecure children.

Also, these results were found not to be confounded in any significant way with

differences in intelligence. This later analysis was able to evaluate a more varied

database from which to derive conclusions. Whereas the previous analysis reviewed

studies of middle to upper class children, the more current analysis included children

from a low socioeconomic background. These studies of low SES children found a

highly significant correlation between language measures and security of attachment (Gersten, et al., 1986; Morisset, Barnard, Greenberg, et al., 1990). Additional studies of low SES children have reached similar conclusions (Morisset, et al., 1995).

These recent studies of the language abilities of low SES children suggest that the security of attachment does not become a significant influence in the development of language competence as long as quality social interaction from other sources is obtained. Bretherton and her colleagues (1979) and others (Bates, et al.,1982; Braunwald, et al.,1983; Pentz, 1975) have hypothesized that a threshold effect might exist, whereby most middle-class children receive adequate stimulation from a variety of sources for normal language development. It is possible that the security of attachment may act as a buffer for adequate language competence only in extreme at-risk populations (Bretherton, et al., 1979; Gersten, et al., 1986; Rosenblum, et al.,1997). Studies of at-risk populations, such as maltreated, low socioeconomic status children (Beeghly & Cicchetti, 1994; Cicchetti & Beegly, 1987; Coster, et al., 1989; Gersten, et al., 1986;), high social risk boys (Morisset, et al., 1995), and children of depressed mothers (Rosenblum et al., 1997), seem to support this hypothesis.

Another important aspect to consider in reviewing previous studies of the relationship between security of attachment and communicative abilities is that many of these studies measure communicative competence in children less than two years old. It is, however, between 2 and 5 years of age that children show the most rapid growth in their language abilities (James, 1990). Also, critical changes in language occur during the

3rd and 4th years (Greenberg & Speltz, 1988). The child is now able to symbolically

depict the external world, to contribute to an ongoing conversation (social organization of

discourse), to converse about topics outside of the here-and-now (decontextualization), to

distinguish and relate feelings, goals, intentions, and cognitions (internal state lexicon),

and to discuss needs, wants, and feelings of self and others (other-self differentiation).

Because of this growth period, it has been hypothesized that the effects of security of

attachment on language development will not be evident until language is well

established, such as in the preschool years (Bretherton, 1979). Many studies that

correlate the affective quality of the mother-child relationship and language competence

in children older than 24 months do find a significant positive association (Beeghly &

Cicchetti, 1994; Cicchetti & Beeghly, 1987; Gersten, et al., 1986; Klann-Delius &

Hofmeister, 1997; Morisset, et al., 1995; Morisset, Barnard, Greenberg, et al., 1990;

Morisset, Barnard, Spieker, et al, 1990).

Although the effects of environmental risk factors on syntax, morphology, and

semantics continue to be investigated, more recent studies have also explored pragmatic

language skills. The social aspects of language may be particularly at risk and related to

security of attachment (Bretherton, et al, 1979). Several studies have found an

association between insecure attachment and the inability to initiate or sustain

conversation (Beeghly & Cicchetti, 1994; Coster, et al., 1989; Klann-Delius &

Hofmeister, 1997; Morisset, et al., 1995). The pragmatic function of children's utterances

has also been associated with attachment. Insecurely attached children have been found

to use fewer internal state words (Beeghly & Cicchetti, 1994; Cicchetti & Beeghly, 1987) and to demonstrate less ability to describe relationships about an object, person, or event than securely attached children (Gersten, et al., 1986). Also, one of the most important linguistic abilities, decontextualization, which allows children to talk about nonpresent events, has been associated with the quality of mother-child social interaction (Beeghly & Cicchetti, 1994; Lucariello, 1990). Poor pragmatic language abilities in these areas may limit a child's use of language for social exchange, particularly in speaking about one's own actions and feelings or in sustaining conversation. For example, studies indicate preschoolers prefer playmates with higher social discourse ability (George & Krantz, 1981; Hazen & Black, 1989). In addition, several longitudinal studies of language-impaired children have reported a high rate of social impairments persisting many years after the language impairment was first recognized (Aram, Ekelman, & Nation, 1984; Fududis, Kovin, & Garside, 1979; Stark, et al., 1984).

The purpose of the current study was to identify both risk and protective factors, separately and combined, which impact preschool children's linguistic skills. Influences on syntax, morphology, semantics, as measured by the Preschool Language Scale-3, as well as pragmatic language skills, as measured in spontaneous speech, were explored. Few studies exploring influences on the development of language have targeted low socioeconomic preschoolers (Hart & Risley, 1995; Morisset, Barnard, Spieker, et al., 1990) and none have extended these studies to include the analysis of

pragmatic language skills. The present research uniquely targeted this population and measures.

This research addressed the following questions: 1) How do low SES rural Appalachian 4-year-olds' linguistic abilities compare to other populations? It is expected that the receptive and expressive language abilities will be significantly below average when compared to a normed sample. However, pragmatic language skills should be comparable to other populations. 2) Within a rural, low socioeconomic sample, are there differences in children's language abilities that correlate with family risk factors, maternal behaviors, child behaviors, or attachment status either separately or combined? It is expected that these children's linguistic abilities will correlate with various factors both separately and combined. 3) What are the predictors of preschool language competence for these children? It is expected that language competence, including competence in pragmatic skills, can be predicted from family risk factors, maternal behaviors, child behaviors, and attachment status. 4) What is the relation between degree of environmental risk, children's language abilities, and attachment status? For children at high psychosocial risk, it is expected that secure attachment status serves as a protective factor for language development.

Previous studies of high risk populations (Beeghly & Cicchetti, 1994; Coster, et al., 1989; Morisset, et al., 1995; Morisset, Barnard, Greenberg, et al., 1990) have found that the quality of the mother-child relationship impacts the child's linguistic abilities. Secure attachment, therefore, could serve as a protective factor for the development of

language competence, especially in high risk populations. The harmonious

communicative style that characterizes these relationships may enhance the child's

environment in such a way as to increase linguistic abilities. This impact may be most

notable in the various pragmatic skills of language.

Answers to these questions can help identify preschool children who are

particularly vulnerable for both academic and social failure. If appropriate prevention or

remediation is to occur, these children must be identified and targeted for intervention

programs.

METHOD

Participants

Subjects were participants in a longitudinal study of infant, care giver, and environmental influences on child socioemotional and cognitive development (Fish, 1998). Mothers were recruited from women in their third trimester of pregnancy receiving prenatal and well-baby care at a rural community health clinic in Lincoln County, West Virginia, from May 1992 through December, 1993. All women who were experiencing low risk pregnancies and planned to stay in the area during the course of the study were asked to participate. The acceptance rate was 69%. Of these, eight infants were excluded for medical reasons. Of the remaining 111 women enrolled prenatally, 24.3% either moved or declined to continue participation over the course of the study, resulting in a sample of 85 at 4 years. There were no significant differences between women who dropped out and those who stayed in the study on demographic variables, personality attributes, as measured by the *NEO-AC Personality Inventory*, or social support as assessed by the *Braiker and Kelly Index of Relationship Sentiments and Activities* and the *Crnic Questionnaire*.

All children were Non-Hispanic White; 53% were male; 28% were first born; 13% were only children at age 4; 33% attended preschool or Head Start at age 4. The mean age of the mothers at the birth of their children was 23 (only 13% were under 19); approximately 80% were married or living with partners; 54% of the mothers and 50% of the fathers were high school graduates; 90% of the mothers did not work or go to school

when their children were born; 63% continued this status when their children were 4

years old. Although pregnancies and neonates were considered to have low health risks,

this was a sample at risk due to low socioeconomic status (SES). All of the children were

from low socioeconomic status families and lived in a rural area in Appalachia.

Approximately 75% of the families reported annual family incomes of less than $10,000

and 69% of the families received public assistance in the form of either food stamps or

Aid to Families with Dependent Children (AFDC) or both.

<div align="center">Procedures</div>

The current focus of this longitudinal study was the language assessment of these

children at 4 years of age. The research questions were addressed using mother and

caregiving environment and child data obtained prenatally, and when the child was 4-, 9-,

and 15-months-old, and 4-years-old. All questionnaire measures were administered in an

interview format, with elaboration of items, if needed, and recording of responses

performed by a research assistant. Observational data were obtained in structured,

videotaped sessions. For this investigation, questionnaires completed prenatally, at 4

months, 9 months, and at 4 years were employed, along with behavioral ratings from

assessments at 9 months, 15 months, and 4 years.

Measures

Family Demographics and Social Support Status

Demographics

Information about maternal and paternal ages and education, race, family income,

occupation (scored 1 - 9 on the Hollingshead scale; Hollingshead, 1975), receipt of public

assistance, marital status, parity, household size, whether the pregnancy was planned, and

the mother's work status, were obtained in the prenatal interview. A measure of

socioeconomic status (SES) was derived by computing an average of the standardized

scores for mother's and father's years of education and occupational level and then

subtracting the parents' welfare status. Mothers also provided information about their

smoking status during pregnancy. Information was updated, where applicable, at

interviews when the child was 4-, 9-, and 15-months- and 4-years-old. In addition,

reports of major events in life were obtained. Also, the child's attendance in preschool or

Head Start and the child's number of books at home were noted at the 4-year-old visit.

Social Support and Relationship Satisfaction

Both general social support and partner relationship satisfaction were assessed

prenatally and again at 4 years. Thus, the support available to these low income mothers

was examined at 2 time points, as well as change in support.

Social support. The *Crnic* (Crnic, Greenberg, Ragozin, Robinson, & Basham,

1983) *Interview Measure*, which covers both the amount of contact with others and the

respondent's satisfaction with that level of contact, was used. Because the majority of

mothers did not have telephones in their home, questions pertaining to telephone contact were omitted. Factor analysis of the remaining 23 items yielded 3 factors; friend support (neighborhood/community involvement, visiting with friends, having someone to talk to - 7 items, α .72), family support (having family nearby, visiting family, receiving help from family - 8 items, α .78), and intimate support (partner relationships and having someone to share private feelings with - 8 items, α .72). In addition, all scales were aggregated to form a measure of total social support (α .78). At 4 years respective coefficient alphas were .62, .77, .78, and .80.

Relationship satisfaction. Marital or relationship satisfaction (those women living with a partner were viewed the same as those who were married) was measured with the *Braiker and Kelly* (1979) *Index of Relationship Sentiments and Activities.* This is a 25-item measure of two positive (love and maintenance) and two negative (ambivalence and conflict) aspects of relationships. Internal consistency was .75 for the positive factor and .83 for the negative factor prenatally, and .84 and .87 at 4 years.

Mother-Child Attachment Relationships

Infant-Mother Attachment (15 months)

Attachment status was assessed using Ainsworth's (Ainsworth, Blehar, Waters, & Wall, 1978) Strange Situation, a laboratory assessment designed to accentuate infant attachment behaviors with a series of episodes in which the baby experiences a new place, interaction with a new person, and two short separations from mother. The baby's affective reaction to reunion with mother, proximity seeking and avoidance, contact

maintenance and resistance are all rated and used to classify infants' attachment relationship with the caregiver. Fifteen-month infant behavior was classified as insecure-avoidant (A), secure (B), or insecure-resistant (C), according to the procedures of Ainsworth, et al, (1978). Insecure-disorganized/disoriented (D) behavior was classified using guidelines by Main & Soloman (1986). Children were classified into these four categories by an independent expert coder, Donna Weston. A 6-point scale devised by Crittendon (1985) was also used to create a continuous variable for attachment security.

Child-Mother Attachment (4 years)

The Ainsworth Strange Situation (Ainsworth et. al, 1978) was modified slightly (see appendix) for the 4-year-old assessment such that episode 1, the initial free play session, and episode 7, the final free play session, were extended from 3 to 5 minutes to allow more observation of the mother and child during free play. Children were classified into five categories (secure-B, insecure/avoidant-A, insecure/ambivalent-C, insecure/disorganized-controlling-D, and insecure-other) and rated on a 9-point scale of security of attachment by a team of experienced coders at the University of Washington Attachment Coding Lab using the MacArthur Coding System (Cassidy & Marvin, 1992). Each tape was coded independently by two expert coders who were unaware of previous attachment classifications (percent agreement 77% for secure/insecure and 76% for A, B, C, D categories). Coders resolved disagreements by reviewing the tapes and reaching consensus.

Maternal Personality and Attitude Measures

Mother Personality (prenatal)

Positive affectivity (extraversion), negative affectivity (neuroticism), and self-esteem (the evaluative component of self-concept) were assessed. Measures were: 1) The 8-item scales for warmth and positive emotions (extraversion) and for hostility, anxiety, and depression (neuroticism) from the *NEO-AC Personality Inventory* (Costa and McCrae, 1978), and 2) the self-esteem index of the *Clinical Measurement Package*, 25 items assessing self-esteem problems (high scores indicate lower self-esteem) (Hudson, 1982). Internal consistency (α) was .75 for extraversion, .88 for neuroticism (subscales .75, .74, and .79), and .92 for self-esteem.

Maternal self-efficacy (4-months)

Maternal self-efficacy was measured with an 18-item scale covering concepts such as feelings of competence as a parent, support sought and experience in the parenting role, and ability to meet this infant's individual needs (Fish, Stifter, and Belsky, 1991). Internal consistency was .75.

Maternal responsiveness to crying (4 months)

Responsive attitude was assessed at 4 months by 7 items from the Crockenberg and Smith questionnaire (1982) dealing with promptness of response to crying and whether mothers feel babies can be spoiled (α .54).

Mother's attitude toward spanking (4 years)

To determine the mother's feelings about physical punishment, the 10-item *Attitude Toward Spanking Survey* was administered (Holden, Coleman, & Schmidt, 1995). This survey demonstrates high internal consistency (α .89) and convergent validity with daily reports of actual parent behavior. Internal consistency was .82 in this study.

Ratings of Mother Interactional Behaviors

At 9-months, mother interactional behaviors were videotaped and assessed during a 2 minute structured situation in which mothers were asked to get their infant to put plastic "cookies" in a milk bottle, a task developmentally beyond what the average 9-month-old can do. After a mild frustration/coping procedure, the infant and mother engaged in an 8 minute mother-infant free play.

Mother sensitivity (9 months)

Mother sensitivity (infant centered behavior) and over-controlling/intrusive behavior were coded by independent coders during free play with κ of .66 and .73, respectively. The milk bottle task was also rated for mother facilitation (activities which aided the infant in accomplishing the task) and feeling recognition (verbalizing the child's affect, in particular acknowledging that babies wanted to mouth or handle the plastic cookies, not put them in the bottle). Facilitation was rated on a 3-point scale (κ .86), while feeling recognition was simply recorded as occurring or not occurring (κ 1.00). From these values a composite variable for mother sensitivity was created which included

summing standardized scores for sensitivity during free play and facilitation and feeling recognition in the milk bottle task less the standardized score for over-controlling/ intrusive behavior.

<u>Mother coercion (9 months)</u>

Mother verbal (κ .67) and physical (κ .80) coercion in the milk bottle task were coded by an independent coder, using a 3-point scale, and the standardized scores summed.

As noted above, at 4 years, a modified Strange Situation was carried out. It was followed by a 2-minute clean-up period, and presentation of two puzzles of increasing difficulty (one with age-appropriate difficulty and one with a difficulty level usually requiring help from mother in order for the child to complete it). Finally, children were administered the Preschool Language Scale-3 by an experimenter, while mother was interviewed by another experimenter. Videotaped episodes of the 4-year-old Strange Situation, clean-up, and puzzle tasks were used to assess various maternal interactional styles. Trained coders who were blind to the attachment coding of each child and independent of child behavioral coders rated the videotapes. Fifteen percent of the videotapes were scored by an independent coder.

<u>Mother Involvement (4 years)</u>

The quantity of the mother's interaction with her child was rated on a 4-point scale during each 15 seconds of free play (defined as episodes 1, 4, and 7 during the Strange Situation) (κ .88).

Mother Sensitivity (4 years)

The degree to which the mother was responsive to the child's needs and interests

and accepted the child's activities was evaluated on a 4-point scale each 15 seconds

during free play. (κ .82)

Mother Intrusive/Over-Controlling Behavior (4 years)

This category of behavior involved poorly timed, intrusive, excessively

controlling behavior, ignoring the child's interests and agenda, interrupting and inhibiting

the child's activity or speech. Raters assessed the degree to which this behavior was

exhibited also on a 4-point scale during each 15 seconds of free play and the two puzzle

activities (κ .86).

Mother Facilitation (4 years)

Maternal behavior which provided scaffolding, supportive assistance, allowing the

child to succeed or improve his/her level of performance, was rated on a 3-point scale

during each 15-second interval of free play, clean-up, and the puzzle tasks (κ .85).

Mother Contingent Feedback (4 years)

The frequency of recognition and acknowledgment of the child's effort and

achievements during free play, clean-up, and the puzzle activities was scored (κ. 86).

Mother Unresponsive, Undercontrolling Behavior (Lack of Appropriate Involvement (4-years)

Instances in which the mother ignored her child's direct comment or question to her or failed to provide help when her child was struggling with an activity were recorded during free play, clean-up, and the puzzle activities (κ .80).

Mother Feeling Recognition (4 years)

Statements indicating an appropriate response to the child's affect during free play, clean-up, or the puzzle activity were tallied (κ 1.00).

Shared Positive Affect (4 years)

Mother and child interactions that demonstrated a shared positive affect were tallied during free play, clean-up, and the puzzle activities (κ .92).

Mother Negative Feedback, Affect/Control (4 years)

The number of instances where a mother indicated that what the child had done was wrong, without offering any positive suggestions, were scored as negative feedback and the number of instances when the mother used an unpleasant tone, argued, pulled on the child or an object in a power control situation, criticized the child, name called, threatened, acted annoyed with the child, or used physical force with the child, were scored as negative affect/control during free play, clean-up, and the puzzle activities (κ .83).

Observed Infant and Child Temperament Measures

At 9 months, the milk bottle structured activity and free play activity were also used by independent coders to rate child behavior (see Maternal Measures section).

Positive/Social behavior (9 months)

This composite measure consisted of summed standardized scores for free play social behavior and positive affect, plus positive affect during the milk bottle exercise. Social behavior was the totaled score from observations every 15 seconds on a 5-point scale (κ .74). Positive affect was the totaled score from observations every 15 seconds on a 3-point scale during free play (κ .74) and during the milk bottle task (κ 1.00).

Negative affect (9 months)

Standard scores for negative affect in free play, in the milk bottle task, and during the transitions/questionnaire period were summed to create a negative emotionality dimension. Negative affect was the totaled score from observations every 15 seconds on a 3-point scale during free play (κ .85), milk bottle task (κ .75), and transitions/questionnaire period (κ .82).

Infant temperament was also observed at 15 months. The infant's degree of sociability, responsiveness, and comfort with the stranger during the 15-month Strange Situation was rated by two independent coders viewing videotaped recordings. Sociability and responsiveness were scored in episode 2 and distress was scored in episodes 3-7.

Positive/social behavior (15 months)

During the first 2 minutes of episode 2, when an experimenter who was a stranger to the baby is in the room with the mother and infant, but not attempting to interact with the baby, social, positive behavior toward the stranger and wariness, discomfort were coded on 3-point scales every 15 seconds. In addition, the coder rated on a 3-point scale the infant's responsiveness to the stranger's direct social bids to play during the third minute of the episode. Reliabilities (κ) were .87, .94, and 1.00, respectively. The infant's summed social and positive behavior to the stranger, level of comfort (created by reverse scoring of the wariness/discomfort ratings), and responsiveness to the stranger's bids to play in episode 3 were summed as a measure of positive/social behavior.

Negative affect (15 months)

Distress was rated for each 15 seconds of episodes 3 through 7 on a 6-point scale (κ .88). Because separation episodes were stopped when infants cried for 30 seconds, and therefore ranged in length from 30 seconds to 3 minutes, a mean level of distress (total distress divided by the number of 15-seconds episodes) was computed.

Videotaped episodes of the 4-year Strange Situation were used for estimates of child temperament. In addition, some measures utilized videotapes of a clean-up period following the Strange Situation involving the mother and child, as well as a structured activity in which the child was asked to complete two puzzles in the presence of the mother, one with age-appropriate difficulty and one too difficult for the child to do without help.

Ratings of observed child behaviors were performed by trained coders. An

independent coder rated 15% of these assessments.

Social involvement with mother (4 years)

Ratings on a 4-point scale were made at 15-second intervals during free play,

which included episodes 1, 4, and 7. The child was scored on the degree to which he or

she initiated social contact or responded to the mother's social overtures (κ .85).

Stranger sociability/positive approach, interest (4 years)

Ratings were taken at 15-second intervals during episodes 2, 3, and 6. The degree

to which the child was willing to approach or interact with the stranger was rated on a 4-

point scale (κ .85).

Focused attention to toys and level of play (4 years)

The child's focused attention to toys and level of play were rated every 15 seconds

during all 7 episodes of the Strange Situation, using a 5-point scale (κ .68). A low score

indicated a child who had low attention, flitted from toy to toy, was easily distracted, and

seemed not at all absorbed with toys. The high end of the scale was represented by a

child who was absorbed and displayed sophisticated, sustained play with toys.

Child Positive Affect/Comfortableness (4 years)

The degree to which the child appeared positive, enthusiastic, and comfortable in

the situation was scored on a 5-point scale at 15 second intervals for all episodes of the

Strange Situation, clean-up, and puzzle tasks (κ .79).

Negative Affect (4 years)

Negative affect, including distress and sad, negative feelings, as well as angry speech and physical aggression, was rated on a 3-point scale at 15 second intervals in all episodes of the Strange Situation, clean-up, and puzzle tasks (κ .73)

Child Cooperation/Compliance with Mother during Clean-Up (4 years)

This scale assessed how cooperative or compliant the child was with mother's requests and direction. It was assessed during each 15 second interval of clean-up on a 5 point scale (κ .78).

<div align="center">Mother-Rated Infant Temperament, Child Behavior Problems</div>

Fussy/difficult and sociable/adaptable behavior (9 months)

Mothers completed the Infant Characteristics Questionnaire (ICQ; Bates, Freeland, and Lounsbury, 1979) at 9 months. The first two factors which emerged in a principal components factor analysis with varimax rotation were labeled fussy/difficult (9 items dealing with mood, fuss/cry behavior, and perceived difficulty, α .69), and sociable/adaptable (7 items dealing with positive affect, social response, and reaction to new people and experiences–all reversed scored to reflect more positive behavior, α .72).

Child Behavior Problems (4 years)

The *Child Behavior Checklist* (CBCL) (Achenbach, 1991) was completed by the mother during the 4-year-old interview. Besides assessing multiple clinical symptom domains, it measures broad scales (internalizing, externalizing behavior), and total behavior problems. The measure permits evaluation of these characteristics in relation to

same-age peers functioning adequately in everyday life. The CBCL has good test-retest

reliability (averaging .89 for its problem scales), has 1-year stability of .75 for

internalizing problems and .87 for externalizing problems, and discriminates children

referred for mental health services.

<div align="center">Language Measures</div>

Infant Communicative Development (15 months)

The *MacArthur Communication Development Inventory/Words and Gestures*

(CDI) was administered to assess communicative development. The CDI is a parent-

report instrument designed for use with 8- to 16- month old infants which provides scores

for the child's comprehension and production vocabulary as well as his/her use of

communicative gestures. Percentile scores for the four communicative skills were

obtained. This measure has demonstrated good internal consistency, test-retest reliability,

and convergent validity (Fenson, et al., 1994).

Standardized language assessment (4 years)

The *Preschool Language Scale-3* (PLS-3) (Zimmerman, Steiner, and Pond, 1992)

was used to assess both receptive and expressive language communication, yielding

standardized scores for Auditory Comprehension and Expressive Communication

subscales and a combined overall Total Language Score. Semantics and language

structure are evaluated in each subtest but auditory comprehension tasks tended to be

supported by visual contextual cues and required only nonverbal responses such as

pointing or manipulating test materials, whereas expressive communication items

required responses to structured open ended questions or assessment of spontaneous speech. Evidence of the child's integration of language skills was also assessed by combining scores for items in each subscale that focused on tasks that evaluated thinking skills, such as the comprehension of conceptual relationships and expression of logical thinking. A Total Integrative Thinking Score was obtained by adding the raw scores of integrative thinking skills from each subscale.

The PLS is widely used by public school speech-language pathologists (Wilson, Blackman, Hall, & Elcholtz, 1991). Concurrent validity has been established with other popular language scales such as the Peabody Picture Vocabulary Test and Verbal Ability Quotient of the Stanford-Binet Intelligence Scale (Zimmerman, Steiner, and Pond, 1992).

Proximal PLS-3 Child Behaviors (4 years)

Proximal child behaviors were rated using videotaped PLS-3 test administration. Children were scored on the frequency of a variety of behaviors that indicated their verbal responsiveness, controlling behavior, attention or hyperactivity issues, and feeling expression (see Table 1). A principle component factor analysis by varimax rotation produced three factors described as Verbal Responsiveness (Factor 1), Controlling and Inattentive Behavior (Factor 2), and Seeking Mom (Factor 3). PLS-3 examiners also noted the presence of articulation and cooperation problems during the test.

Pragmatic language analysis of spontaneous speech (4 years)

Videotaped episodes of the 4-year-old Strange Situation in which the child was present with another adult, either the mother or the experimenter, were used for pragmatic analysis (approximately 22 minutes of observation, depending on the willingness of child to be separated from mother). A variety of developmentally appropriate materials were present. In addition, videotapes of a clean-up period following the Strange Situation involving the mother and child were also be utilized (approximately 2 minutes).

Complete language transcripts of these two situations were prepared by transcribers who were blind to the attachment classification of the children. The speech and language context of both the child and adult were recorded as adapted by Retherford (1993). An independent evaluator also transcribed 15% of the children. The mean unit-by-unit (morphemes) agreement index (Hegde, 1987) was 81%. Children with noted articulation problems were transcribed by the consensus of two transcribers simultaneously viewing the videotape. Children with less than 50 total utterances were not included in the study ($n = 1$) due to lack of a representative language sample (Miller, 1981).

The following pragmatic language measures were performed by a trained coder on these transcribed data. An independent coder rated 7% of these transcriptions to assess reliability. To determine reliability, either an utterance-by-utterance agreement index (Hegde, 1987) or a simple correlation was computed.

Measures of pragmatic language included the following:

General linguistic development

Four estimates of the child's general expressive linguistic development were calculated.

Total number of utterances Utterances were defined by rules formulated by Brown (1973). The total number of utterances were tallied for each child.

Child verbosity (Morisset, et al., 1995) Child verbosity was defined as the rate per minute of intelligible and partially intelligible utterances. Child verbosity was calculated by dividing the total number of utterances by the total time of transcription.

Mean length of turn (MLT) (Morisset, et., 1995) The MLT was the mean number of utterances per speaking turn. Calculation involved dividing the total number of utterances by the total number of turns. A turn included all those vocal-verbal utterances the child made until the next person (mother or experimenter) spoke ($r = .99$).

Mean length of topic (MLTC) Each group of utterances that related to the same topic was assigned a consecutive topic number ($r = .99$). The MLTC was calculated by dividing the total number of utterances by the total number of topics.   A topic was defined as describing the subject of conversation of a set of utterances related to the same subject matter.   The topic was defined by the general subject (e.g., type of toy), action related to the subject, and social content of the utterance. For example, all utterances which related to playing with the same toy were counted as one topic. A new topic would occur when the child started playing with a new toy or started a new action with the same

toy. For example, if a child had been playing with a toy but now started talking about wanting to take the toy home, the topic changed because the action related to the subject was changed. Also, if the child was playing with one person and another person entered the room and the child told that person what he or she had previously been doing instead of continuing to talk while playing, the topic was judged to have changed. In addition, if the child was talking to an adult and then started talking to the telephone or started talking for the figurines, the topic was assessed as changed. Topics initiated by the child, as well as type of child initiation, were noted (r = .92). The type of child initiation was coded as a new topic, a reintroduced topic, or an object or a pretend/social content (see description under social content of utterance) topic. The proportion of child initiated topics was computed by dividing the summed child initiated topics by the total number of topics.

Social content of utterance (Gersten, et al., 1986)

This captured the extent to which the child used vocalizations to communicate. The functional social intents of utterances were assessed as follows (agreement index = 97%).

Object: Utterances made while acting on, gazing at, or manipulating objects (if not also actively interacting with the mother or the stranger or pretending to interact with a toy).

Pretend/Social: Words or phases used in play that allowed pretend figures to interact (i.e., figures in the doll house)or made sounds (e.g., meow) or that allowed the

child to pretend to interact with a toy (i.e., talking to the stuffed bear). This category does

not include social interaction with the stranger or mother while engaged in pretend play.

Social: Words or phases used to imitate, interact, or respond to mother or the

stranger or to their prior vocalizations.

Conversational moves (turn taking)

The coding system was inspired by Brown's (1980) notion of conversational

relevance and Martlew's (1980) set of discourse categories. The child's social utterances

were coded in relation to their conversational relevance. Each conversational turn was

coded for its functional intent (to initiate/direct or respond/elaborate) (agreement index =

96%). In addition, the coding system included: 1) the method of initiating/directing

changing or introducing a topic, requesting information, requesting action, requesting

attention or acknowledgment, or intruding) and the grammatical form of the

initiating/directing utterance (imperative or command, interrogative or question,

including tag questions, and declarative or statement or assertion) (agreement index =

78%), and the 2) means of responding (acknowledging, simple affirmation or negation,

brief answer, repetition, sustaining topic, extending topic, or noncongruent information)

(agreement index = 79%) . For analyses, responses were aggregated into three categories:

1) responses with new information (brief answer and extending topic categories), 2)

simple responses without new information (simple affirmation or negation, brief answer,

repetition, sustaining topic), and 3) elaborations (extending topic.) Acknowledging and

noncongruent responses were rare. Therefore, they were not included in analyses. (See

Table 2).

Internal state lexicon (Beeghly & Cicchetti, 1994)

The ability to share information about intentions, thoughts, and feelings was

measured by the child's internal state lexicon. Ten semantic categories of internal state

(IS) words were rated (agreement index = 94%) (see Table 3). The proportion of IS

words was calculated by dividing the total number of internal state words by the total

number of utterances. The proportion of each category was computed by dividing the

number of IS utterances in each category by the total number IS utterances. In addition,

the diversity of IS words was estimated by calculating the number of IS categories

actually used by the child and dividing this number by the maximum possible (10).

Each IS word was further evaluated by self-other differentiation (unit agreement =

94%). In self-other differentiation, an IS word was classified as self if it was used to

describe self only and other if it was used to describe another person, toy, picture, etc.

The proportion of self IS utterances was calculated by dividing the total number of self

IS words by the total number of internal state words. Also, the degree of differentiation

between self and other was calculated by placing the proportion of IS words into three

categories: Category 1 = proportion of self to other IS words >2 ; Category 2 - proportion

of self to other IS words $\geq$ .5 but $\leq$ 2.0; Category 3 - proportion of self to other IS words

< .5 (Other-Self Differentiation Index).

Decontextualization

Decontextualization is a measure of the ability to discuss the remote and the abstract (Snow, 1983). Each utterance was evaluated for the presence (positive) or absence (negative) of decontextualization (unit agreement = 94%). The proportion of decontextualized utterances was computed by dividing the total decontextualized utterances by the total number of utterances for each child. The following criteria were used to evaluate decontextualization:

Positive: An IS word was classified as decontextualized if it referred to the ISs of nonpresent persons, or past, future (including immediate past and future), conditional, or hypothetical states, or if it occurred in questions or negations about the existence of ISs. Utterances other than those relating to IS lexicon were classified as positive for decontextualization if they made reference to absent (including pretend) objects, to past and future (including immediate past and future) activities, or hypothetical states. Pretend play was positive for decontextualization if the child created an imaginary object or situation   .

Negative: An IS word received a negative score if it only applied to the here-and-now. Utterances other than those relating to IS lexicon were classified as negative for decontextualization if they made reference to physically present objects or current activities.

Table 1

Coded behaviors during the Administration of PLS-3

| Factor | Behaviors in calculation (frequency counts) |

Factor 1: Verbosity

1. The number of auditory comprehension items (where child is asked to point to the correct choice) to which the also child verbalized (78%*);

2. The number of times child named other items on the page (79%);

3. The number times child elaborated on the topic of an item (70%);

4. Number times that child gave no answer-negative loading (75%).

Factor 2: Controlling/ Inattentive Behavior

1. Behaviors aimed at controlling the book or pencil (91%)

2. Climbing on furniture and leaving their chair (84%)

3. Getting into off-limits items in room (trash, sink, etc.) (100%)

4. Wandering around the room and refusing to sit (100%)

5. Times out of the chair (76%)

Factor 3: Seeking mother

1. Times the child asked about or looked for mother (92%)

2. Instances of leaving the room (98%)

Note. *Inter-rater agreement in parentheses.

Table 2

Conversational Moves with Letter Identification for Coding

INITIATING MOVES

    T: Topic Introduction or Restart-A new topic or a previous topic is reintroduced into the conversation.

    RI: Request for Information-Requests to solicit verbal responses for more information, such as descriptions, labels, explanations, or permission.

    RA: Request for Action-Requests to direct the other person's actions.

    RT: Request for Attention/Acknowledgment-Utterances that elicit the other person's attention, usually by specifying the attentional object, or utterances that seek acknowledgment from the listener permitting the child to continue speaking.

    I: Intrusion-The speaker intrudes into the conversation in an inappropriate manner or at an inappropriate time; a topic may be irrelevant or a turn out of place. (May also be coded as a noncongruent response.)

In addition, the following codes were added to the initiating/directing move where applicable:

    S: Declarative or Statement-Utterance used to state, assert, evaluate, or explain information.

    Q: Interrogative or Question-Utterances used to elicit more information, such as descriptions, labels, explanations, or permission, by using a question. Includes all forms of questions except tag questions.

    QT: Tag Question-Utterances that consist of a statement followed by a question.

    C: Imperative or Command-Utterances that demand or command a action or verbal response.

    IS: Indirect Statement- Utterances that use a statement that implies a verbal response or action.   (table continues)

Table 2 (continued)

Conversational Moves with Letter Identification for Coding

RESPONDING/ELABORATING MOVES (Responses include replies to other speaker's questions or comments as well as responses or elaborations of response to child's own verbalizations.)

A: Acknowledging - The previous speaker's utterance is acknowledged through brief remarks. For example, "I see," "That's it,""Really, and "I know that."

Y: Yes/No responses - Simple affirmation or negation of previous speaker's turn. Yes, no, okay, sure, and all right would be coded here.

O: Brief Answers - Brief responses (one or two words) contingent on previous speaker's utterance; 'sit' and 'sit down' would both be coded O in response to "What do you want him to do?" Brief responses that contain both the subject and verb are not coded here.

R: Repetition - The previous utterance (either child's or other person's) is repeated partially or wholly, with or without additional information. This **does not** include repetitions if they were an appropriate response to another question or comment.

S: Sustaining Topic - The topic is maintained by reformulating content without adding new information.

E: Extending topic - The topic is maintained but new information is added.

N: Noncongruent - The previous speaker's utterance is not acknowledged in any manner or the response is not relevant or appropriate in relationship to the previous utterance.

Note. Adapted from Marlew, M. (1980). Mothers' control strategies in dyadic mother/child conversations. Journal of Psycholinguistic Research, 9(4), 327-346.

Table 3

Semantic Categories of Internal State (IS) Words

IS Category	Brief Definition
Sensory perception	Words explicitly referring to sensory perception: vision, hearing, smell, taste, or touch, including pain and tactile sensation
Physiological states	Words explicitly referring to states of arousal, fatigue, sleep, hunger, thirst, or illness (feel sick)
Positive affect	Words explicitly referring to positive affect, affection, pleasure, or sympathy (e.g., like, love, be silly, have fun, be funny)
Negative affect	Words explicitly referring to negative affect, dislike, displeasure, or disgust
Affective behavior	Words explicitly referring to behavior denoting affective states (e.g., kiss, hug, cry)
Moral judgment	Words explicitly referring to moral judgment of persons
Obligation	Words explicitly referring to obligation or permission
Volition	Words explicitly referring to volition and desire
Ability	Words explicitly referring to ability and mastery
Cognition	Words referring to mental states or processes, even if used in routine (e.g., knowledge, thought, memory, uncertainty)

Note. From "Child Maltreatment, Attachment, and the Self System: Emergence of an Internal State Lexicon in Toddlers at High Social Risk," by M. Beeghly and D. Cicchetti, 1994, Development and Psychopathology, 6, p. 5-30. Copyright 1994 by the Cambridge University Press. Reprinted with the permission of Cambridge University Press.

RESULTS

The results are presented in five sections. First, descriptive statistics and results of child language outcome measures are presented. Next, associations between the language measures are assessed using simple correlations. Third, concurrent relationships between the 4-year child and mother measures are presented. Correlations, t-tests, and analyses of variance (ANOVA) were performed on these data. Proximal child and mother behavioral influences on language outcome measures, as well as the more distal child-mother attachment classification effects on concurrent language measures were investigated. Fourth, 4-year-old child outcome measures were predicted. Using hierarchical regression, variables were entered in the regression equations in the order to provide the most stringent test of mother personality, attitudes, and behavior as a predictor of subsequent child outcome measures. In addition, discriminant function analysis was performed to predict satisfactory or "OK" vs unsatisfactory or "Not OK" language performance as measured by the PLS-3. Satisfactory language performance was defined as PLS-3 standard scores within one standard deviation of the mean or greater. Previous communication measures (CDI), demographic, child and mother characteristics, and 15-month child attachment status were processed to discriminate 4-year-old language function. In the fifth and final section, a cumulative risk analysis was performed to predict "OK" vs "Not OK" PLS-3 classification. Chi-squares were observed to dichotomize this sample into high and low risk groups. Then Multivariate Analyses of

Variance (MANOVA) were performed to determine if sex and/or 15-month-old security of attachment status interact with risk status to predict PLS-3 scores.

Descriptive Statistics

Descriptive statistics and results of the child assessments are presented in Tables 4-7. Because of attrition and various technical problems, the 4-year-old sample was reduced in size in comparison to the 15-month population.

In Table 4, results from the CDI obtained at 15-months demonstrated that mean percentile scores for the four communicative skills scores ranged from 49.9 to 59.1. These results were similar to the norming sample, predominantly children from well-educated, middle class families.

However, at 4 years, results from the PLS-3 revealed standard scores (SSs) significantly below the average SSs of the norming sample. The SSs for the subscales, Auditory Comprehension and Expressive Communication, and the overall Total Language Scores were 83 ($\underline{SD}$ = 13), 82 ($\underline{SD}$ = 11), and 81 ($\underline{SD}$ = 12), respectively. For the PLS-3, SSs have a mean of 100 and a standard deviation ($\underline{SD}$) of 15. With a SS of below 85 defined as below average, 60% were below the average on the Auditory Comprehension subscale, 67% were below the average on the Expressive Communication Subscale, and 70% were below average on the Total Language Score.

The frequencies of summative 4-year child pragmatic measures are presented in Table 5. The total utterances ranged from 61-369, with 50% of the children producing more than 150 utterances. Therefore, these data are considered an adequate number of

utterances for representative language analysis (Miller, 1981). However, when they were alone with the stranger, 72% of the children produced fewer than 50 utterances, including 9 who produced none. Consequently, this distribution of utterances limited comparisons between mom and stranger language outcome measures.

Means, standard deviations, and ranges for 4-year child pragmatic measures are provided in Table 6. Proportion, rate, or average scores were used for all discourse measures to control for variations in the total number of utterances. As shown, there was considerable variability between children for all pragmatic measures. Child verbosity during free play with the mom was notably higher than when alone with the stranger. The vast majority of the utterances, however, were of social content ($M = .93$). Because of the low number of object and pretend social content utterances, the relative proportions of social content utterances produced by the child were not correlated with the other data.

In comparison with previously published results from a middle-class, 4-year-old population (Marlow, 1980), children in this study had a higher proportion of verbal initiating/directing moves and a lower proportion of verbal responding/elaborating moves (40% vs 26% and 54% vs 68%, respectively). The previous study did not include the child eliciting non-verbal actions as part of their initiating moves tally. Recalculating the proportion of initiating moves without these utterances, however, still yielded mean results above the mean of the previously reported middle-class population (36% vs 26%).

Group means, standard deviations, and ranges for the number of different internal state (IS) words produced at 4-years are given in Table 7. The highest percent of IS

words was found to describe sensory perception and volition (26% and 29%, respectively). A relatively high proportion of their internal state words related to ability and cognition (15% each). Other IS words were found much less frequently used, with <1% of their utterances describing affective behavior and moral judgment.

In comparison with nonmaltreated, low SES toddlers with a mean age of 31 months (Beeghly and Cicchetti, 1994), 4-year-olds in this study produced higher proportions of different types of internal state words. As previously reported, the majority of IS words described perception and volition. These 4-year-olds, though, were increasingly aware of their cognitions and abilities as evidenced by notable increases in observed IS words in these areas (compared to 3 and 10% in 31-month-olds). Also noteworthy is the relatively low proportion of negative affect IS words in this population (2%). In the previous study of an at-risk population, Beeghly and Cicchetti (1994) found that maltreated children had a significantly lower percentage of negative affect IS words than a comparison non-maltreated group (1.10% vs 3.69%).

The t-test comparisons of the language outcome results by gender and parity revealed some significant differences. First-born children were significantly more likely to have higher word production on the CDI at 15-months than later born children. Although no birth order effects were noted with the PSL-3 scores, parity effects were noted with the pragmatic language values. In general, first borns and only children were more verbose and exhibited significant differences in the percent of occurrences of certain

categories of IS words (see Table 8). Because of the low frequency of affective behavior IS words, this difference was probably not valid.

A few differences in language outcome measures by gender were present. Although there were no differences in CDI scores by gender, there was a trend ($p<.1$) for girls to have higher Auditory Comprehension and Total Language Scores. In the pragmatic measures, there was a trend ($p<.1$) for boys to have a higher proportion of initiating/directing moves. Girls were significantly higher ($p<0.05$) in the proportion of physiological state internal state words and the proportion of decontextualized utterances.

Relations Among Language Measures

The correlations between the child language outcome measures are given in Tables 9 - 11 to assess the association with different measures given at different times, different measures given at the same time, and different types of pragmatic measures assessed simultaneously.

Correlations between the 15-month CDI language measure and the PLS-3 were performed and the results illustrated in Table 9. Although no associations were found with the PLS-3 standardized scales, there was significant CDI correlation with PLS-3 items measuring integrative thinking. Expressive integrative thinking was associated with prior CDI scores of percentile for phrases understood ($p < .01$) and of percentile for words produced ($p < .05$). In addition, the Total Integrative Thinking Score was significantly correlated with the 15-month percentile for phrases understood ($p < .05$).

There was no significant correlation between the number of communicative gestures

produced at 15-months and language at 4-years as measured by the PLS-3.

In addition, the CDI was correlated with the 4-year-old pragmatic language measures. No

significant correlations were found except for those associated with the proportion of

decontextualized utterances. The proportion of decontextualized utterances

was inversely associated with both the percentile of words understood and the percentile

of communicative gestures produced at 15-months (both $p < .05$).

Correlations relating the children's pragmatic language measures with general

linguistic maturity as measured by the PLS-3 are presented in Table 10. Several

conversational turn measures were significantly associated with the standardized

measures of receptive, expressive, and total language abilities, as well as the mean scores

for the integrative thinking items. Interestingly, initiating and directing moves were

negatively correlated with standardized measures of general linguistic ability while

responding and elaborating moves were positively correlated with these same measures.

The strongest associations were with the proportion of responses with new information,

producing moderately strong correlations with both the auditory comprehension standard

scores (SS) and the total language standard score ($p < .001$), and the proportion of simple

responses with no new information, yielding moderately strong correlations with both the

expressive communication and total language standard scores ($p < .001$). There were no

significant correlations among the PLS-3 scores and the measures of internal state lexicon

and decontextualized utterances. There was a trend, ($p < .1$), though, for the proportion of

IS categories to be associated with both the Expressive Communication SS and integrative thinking score. There was also a trend ($p < .1$) for a higher Other-Self Differentiation Index Scores (a larger proportion of IS words relating to others than self) to be associated with the expressive communication integrated thinking score.

Intercorrelations among pragmatic language measures were examined to provide information on the extent to which these aspects of discourse covary (see Table 11). As expected, many of these measures were moderately to strongly correlated with initiating/directing moves and inversely correlated with responding and elaborating moves. Because the total child verbosity value exhibited a large range (1.96 - 12.77) depending on amount of utterances produced when alone with the stranger, it may be of particular interest to identify pragmatic measures found to positively correlate with it. Mean length of turn ($p < .01$) and mean length of topic and proportion of different IS categories ($p < .001$) are moderately strong in their correlations with total child verbosity.

There were fewer correlations between discourse measures and IS word and decontextualized utterance measures. It is noteworthy that the proportion of self IS words negatively correlated ($p < .01$) with measures found to negatively correlate with PLS-3 outcomes, such as mean length of turn, proportion of topics initiated by the child and proportion of commands. Also, the proportion of self IS words was positively correlated ($p < .01$) with measures positively associated with PLS-3 outcomes, including proportion of responses/elaborations and proportion of simple responses. The proportion of total IS words, however, was associated with an opposite pattern of correlation ($p < .01$.)

The proportion of decontextualized utterances was strongly associated with the mean length of turn ($p < .001$), suggesting that the number of decontextualized utterances in this evaluation were enhanced by less discourse from the mother. In addition, decontextualized utterances were significantly associated with the proportion of topics initiated by the child ($p < .05$) but negatively associated with topic elaborations (mean length of topic and proportion of responses/elaborations; $p < .05$), again inversely related to those measures with positive correlations with the PLS-3.   Note that the proportion of decontextualized utterances was also negatively correlated with the proportion of self IS words ($p < .05$) such that a higher frequency of decontextualized utterances in this assessment occurred in children who used a lower proportion of self IS words.

Concurrent Relations

Correlations of concurrent child behaviors with language measures are given in Tables 12 and 13. Children who sought their mother during the administration of the PLS-3 test had Standard Scores (SS) significantly below other children (Auditory Comprehension SS: $p = .01$; Expressive Communication SS: $p < .05$; Total Language SS: $p < .01$). There was a trend for Total Integrative Thinking Scores to be lower ($p < .1$.) In addition, t-test comparisons showed that children described by the examiner as uncooperative during the PLS-3 ($n=22$) had significantly lower scores on PLS-3 measures. The Auditory Comprehension SS Score was 10 points lower (86 vs 76; $p < .01$) and the Total Language SS Score was 7 points lower (82 vs 75; $p < .05$). Lack of

cooperation during the PLS-3 administration was also associated with lower expressive ($p < .05$) and total integrative thinking scores ($p < .01$).

Associations between child temperament during the Strange Situation and pragmatic measures were frequently what one would expect (see Table 13). Social involvement with Mom was associated with child verbosity and more elaborations ($p < .001$). Children who were more social also tended to produce a higher proportion of IS categories ($p < .01$, mom; $p < .001$, stranger). Child focused attention to toys was not associated with child verbosity but instead with a higher mean length of turn ($p < .01$, free play; $p < .05$, alone with the stranger), indicating fewer social exchanges with Mom. An increased focus on toys was also associated with a lower proportion of self IS words ($p < .01$). These children significantly referenced others more ($p < .01$) when using IS words as indicated by a positive correlation with the O-S Differentiation Index.

Child positive affect with the stranger correlated with more verbosity (see Table 13) as well as with more child topic initiations ($p < .01$) but fewer elaborations. The proportion of IS categories was also associated with the child positive affect with the stranger ($p < .05$). Child negative affect, interestingly, was not associated with the opposite effect on pragmatic language measures. In fact, it was not associated with any pragmatic measures except IS words. It was associated with both the proportion of IS words and the proportion of self IS words ($p < .05$).

Although articulation problems may occur in the absence of other language problems (Bishop and Edmundson, 1987), articulation problems in this sample ($n = 11$)

were associated with many indicators of poor general linguistic functioning. Using t-test comparisons, all PLS-3 SS scores were significantly below (p = .05) group means of those who did not have articulation problems (Auditory Comprehension SS -76 vs 85; Expressive Communication SS-75 vs 83; Total Language SS-82 vs 73). In addition, Expressive Communication and Total Language Integrative Thinking scores were significantly lower (p = .05) for those with articulation problems than for those without problems. Several pragmatic language measure correlations also revealed significant differences. Language transcription problems associated with poor articulation decreased the number of intelligible utterances for this group. However, children with articulation problems also exhibited significant differences (p = .05) in proportional results, including the proportion of elaborations (less) and the proportion of questions (more), than those without articulation problems.

T-tests of PLS-3 scores and pragmatic language measures by 4-year-old secure versus insecure attachment status produced no significant results. Because it was theorized that children with different categories of attachment status may demonstrate opposing patterns of pragmatic language usage, analysis of variance (ANOVA) was also performed with pragmatic language measures and category of attachment status (see Tables 14 - 20). As expected, children with different insecure categories of attachment frequently presented significant differences. Insecure attachment category D children (n = 8) exhibited significantly higher (p < .05) total number of utterances and child verbosity with the stranger than all other groups. They also produced higher mean length of turns

(associated with fewer social exchanges) than insecure attachment category C, and a higher proportion of internal state words than insecure groups A and C. Insecure attachment category A (n = 7) children also displayed significant differences ($p < .05$) relative to the other groups. Children with insecure attachment category A had a higher O-S Differentiation Index than all other categories. They also obtained a higher mean length of utterance than category C children , indicating fewer social exchanges for this group. This pattern of fewer social exchanges was also evident in a lower child verbosity rate with the stranger than secure attachment category B children. It was also found that insecure attachment category A children produced a higher proportion of physiological internal state words than insecure attachment categories B and D. Utterances in this category included references to bodily eliminations. It should be noted that insecure attachment category C children's pragmatic language measure mean scores frequently differed from those of other groups, but these differences were not significant. Lack of significant findings may be associated with the low number of children in this group ($n = 6$).

ANOVAs between 4-year child attachment category status and 4-year mother interactional behavior during the Strange Situation were performed. Only one concurrent mother interactional behavior was associated with group differences in attachment status. Mothers of securely attached children were significantly more ($p = .05$) facilitating than mothers of children in insecure attachment category D.

Correlations between 4-year mother behaviors during the Strange Situation, clean-up, and a puzzle activity immediately following clean-up were correlated to the PLS-3 Standard Scores (SS) and Integrative Thinking results. Two summative mother behaviors (behavior sums from all three situations) were found to correlate with these scores. Total negative behavior was inversely associated with all measures of integrative thinking (Auditory Comprehension $p < .05$; Expressive Communication and Total $p < .001$.) There was a trend ($p < .10$) for Expressive Communication SSs to negatively correlate with total negative behavior.   In addition, total over-controlling /intrusive behavior was also inversely correlated with Expressive Communication SSs, Total Language SSs, and Expressive Integrative Thinking scores ($p < .05$). There was trend ($p < .10$) for total overcontrolling/intrusive behavior to be negatively associated with Auditory Comprehension SSs and Total Integrative Thinking results.

In addition, t-test comparisons of 4-year mother interactional measures by gender were performed. Mothers were significantly more controlling with boys ($p < .05$). There was a trend ($p < .10$) for mothers also to be more facilitating with boys.

<u>Predicting 4-year child language outcome measures</u>

To determine the significant predictor variables of the 4-year-old PLS-3 and pragmatic language measure scores by hierarchal regression and of the PLS-3 "OK" vs "Not OK" classification by discriminant function analyses, preliminary analyses (t-tests, χ^2, and simple correlations) between conceptually related variables were performed.

Variables were entered into the regression equations predicting 4-year-old PLS-3 scores in these steps. First, the 15-month-old CDI significant score was entered. Significant child characteristics were entered on step 2. At step 3, significant mother characteristics were taken into account. (See Tables 21-26.)

From these regressions, the following variances were predicted:

Auditory Comprehension - 32% ($R^2 = 0.32$)

Expressive Communication - 27% ($R^2 = 0.27$)

Total Language Score - 33% ($R^2 = .33$)

Although many variable predicted all three scores, some differences between measures were noted as follows:

Auditory Comprehension	Expressive Communication	Total Language
words understood 15-mo.	words produced 15-mo.	phrases understood 15 mo.
articulation 4-yr.	articulation 4-yr.	articulation 4-yr.
externalizing behavior problems 4-yr.	externalizing behavior problems 4 yr.	externalizing behavior problems 4 yr.
seeking mother in PLS 4 yr.	seeking mother in PLS 4 yr.	seeking mother in PLS 4 yr.
mother prenatal smoking	mother coercion 9-mo.	mother sensitivity 9-mo.
mother sensitivity 9-mo.		

In these three scores, the largest increase in predicting variances was obtained when adding the child's characteristics into the regression (19%, 17%, and 22%).

After performing regression analyses of the Integrative Thinking Scores, the following results were obtained:

Auditory Comprehension (AC) Integrative Thinking - 24% ($R^2 = 0.24$)

Expressive Communication (EC) Integrative Thinking - 32% ($R^2 = 0.32$)

Total Language Integrative Thinking - 45% ($R^2 = 0.45$)

Although many variables predicted all three scores, differences were noted in integrative thinking scores as follows:

AC Integrative Thinking	EC Integrative Thinking	Total Integrative Thinking
communicative gestures 15-mo.	words produced 15-mo.	words produced 15-mo.
externalizing behavior problems 4-yr.	externalizing behavior problems 4-yr.	externalizing behavior problems 4-yr.
mother prenatal smoking	articulation 4-yr.	articulation 4-yr.
mother spanking attitude 4-yr.	PLS uncooperative 4 yr.	PLS uncooperative 4 yr.
	mother coercion 9-mo.	mother prenatal smoking
		mother spanking attitude 4-yr.
		mother coercion 9-mo.

Although the child's characteristics increased the predicted integrative thinking variance substantially (11%, 18%, and 25%, respectively), the mother's characteristics also increased the variance predicted by a sizable amount (7%, 6%, and 13%, respectively).

PLS-3 results were dichotomized into "OK" and "Not OK" based on a SS of ≥ 85 being classified as "OK" and discriminant function analyses was performed. In this analysis, the 4-year-olds were correctly classified "OK" or "Not OK" in Auditory Comprehension 78.05% of the time ("OK" 80.6%, "Not OK" 76.5% ; z=5.72, p=<0.0001, a rate 52.9% better than chance; χ^2=25.32, p=<0.0001) by a set of five variables, in Expressive Communication 76.54% of the time ("OK" 75.0%, "Not OK" 77.2%; z=3.33, p=<0.001, a rate 43.8% better than chance; χ^2=19.07, p=<0.01) by a set of five variables, and in Total Language correctly classified 76.25% of the time ("OK" 81.8%, "Not OK" 74.1%; z=2.94, p<0.01, 40.2% better than chance; χ^2=19.85, p<0.01) by a set of six variables.

In comparison to the regression analyses, many of the same variables were found to discriminate between the "OK" and "Not OK" groups. However, some different variables appear to be discriminating between the two groups as follows:

Auditory Comprehension OK	Expressive Communication OK	Total Language OK
words understood 15-mo.	words produced 15-mo.	words produced 15 mo.
articulation 4-yr.	articulation 4-yr.	articulation 4-yr.
child gender	externalized behavior problems 4-yr.	PLS uncooperative 4-yr.
externalized behavior problems 4-yr.	separation distress 4-yr. hostility	prenatal mother
PLS uncooperative 4-yr.	mother coercion 9-mo.	mother coercion 9-mo.
		security status 15-mo.

In determining the variables that predict pragmatic language measures, variables were again entered into the regression equations in the order that provided the most stringent test of mother personality, attitudes, and behavior as predictors of subsequent child language outcome measures (Tables 28 - 42).

First, socioeconomic (SES) information (calculated SES variable and mother's occupation) was entered first. Significant child characteristics were entered in step 2. At step 3, significant maternal personality and attitudes were taken into account. And last in step 4, mother interactional characteristics were entered. Except for SES information, if significant predictors were missing at any step, that step was omitted.

From these regressions, the following variances were predicted:

Pragmatic Language Measure	% Variance	R^2
Total child verbosity	23%	.23
Mean length of topic	29%	.29
Mean length of turn	26%	.26
Proportion of commands	44%	.44
Proportion of responses	39%	.39
Proportion of elaborations	34%	.34
Internal state (IS) language	29%	.29
Percent of IS categories used	26%	.26
Proportion of IS about self	31%	.31
O-S Differentiation Index	34%	.34

Pragmatic Language Measure	% Variance	R^2
Proportion of initiating/directing responses	12%	.12
Proportion of topics initiated by the child	29%	.29
Proportion of utterances contributing new information	25%	.25
Proportion of utterances not contributing new information	24%	.24

Both proximal and distal child and mother characteristics predicted pragmatic language measures as noted below (sign indicates direction of relationship):

Mother Characteristics:

Prenatal positive relationships:	- Proportion of commands
Prenatal self-esteem problems:	- Proportion of elaborations
4-month response to crying:	+ Proportion of internal state words
4-month self-efficacy:	+ Proportion of self internal state words - O-S Differentiation Index + Proportion of responses with new information
4-year spanking attitude:	- Mean length of topic + Proportion of decontextualized utterances
4-year relationship negative:	- O-S Differentiation Index

Proximal mother behaviors:

4-year sensitivity/free play:
- Mean length of turn
+ Mean length of topic
+ Proportion of responses
- Proportion of topics introduced by the child
+ Proportion of elaborations providing new information

4-year over-controlling:
- Mean length of turn,
+ Proportion of responses
- Proportion of internal state words
+ Proportion of self internal state words
+Proportion of responses without new information

- Proportion of topics initiated by child
- O-S Differentiation Index

4-year facilitation:
+ Proportion of elaborations

4-year feeling recognition:
- Mean length of topic
+ Proportion of decontextualized words

Child characteristics:

gender:
+ Proportion of decontextualized utterances

9 month sociable/adaptable:
+ Total verbosity
+ Proportion of responses with new information

9-month negative affect:
- Proportion of responses without new information

15-month sociability: + Proportion of IS utterances
                                         - Proportion of responses without
                                           new information
                                         + Proportion of internal state words

Proximal PLS behaviors:

Controlling, inattentive: + Proportion of commands
                                         + Child initiated topics
                                         - Proportion of responses

Verbal responsiveness: + Proportion of different internal
                                         state categories
                                         + Total verbosity

Seeking mom: - Proportion of elaborations

The relative distribution of variance predicted by the different steps varied

considerably among the different pragmatic language variables. Whereas more of the

variance of the PLS-3 scores was attributed to child characteristics, mother

characteristics generally predicted more of the variance in the pragmatic language

measures. The range of predicted variance for the different steps is as follows:

demographic variables 0 - 12 %; child variables 0 - 23 %; mother personality and

attitudes 0 - 22 %; mother interactional variables 0 - 17 %. Interestingly, the largest

single predictor of any pragmatic language measure was prenatal positive relationships,

which predicted 22 % of the variance of the proportion of commands produced by the

child. It is also of interest that only socioeconomic variables were found to predict the

proportion of initiating/ directing moves.

Cumulative risk analysis

A cumulative risk analysis was performed to predict the "OK"/ "Not OK" PLS-3 classification. Based on preliminary analyses (t-tests, χ^2s, simple correlations, and regression analyses), eight risk factors were identified. Each risk factor was dichotomized and the resulting scores summed. Categorical risk variables were scored 1 if present and 0 if absent. These risk factors included 1) family received public assistance at 4 years, 2) child was identified as having articulation problems at 4 years, 3) mother smoked prenatally, and 4) mother was scored as showing any coercive behavior in the 9-month milk bottle procedure. Risk variables with continuous scores were scored 1 if the score was above or below the median, indicating less favorable conditions. Risk factors with continuous scores included 1) externalizing behavior problems score at 4 years (above median), 2) the number of books mother estimated that the child had at 4 years (below median), 3) mother's score on the spanking attitude survey at 4 years (above median), and 4) mother's rated behavioral sensitivity at 9 months (below median). By observing the contingency tables and associated χ^2s, an obvious breakpoint for high vs. low risk was found between 3 and 4 risks. High risk within this population was defined as having ≥ 4 risk factors and low risk was defined as having ≤ 3 risk factors. Multivariate Analysis of Variance (MANOVA) was performed to determine if sex and/or security of attachment status interact with risk status to predict PLS-3 scores.

In reviewing the effects of high vs. low risk status in the "OK" vs. "Not OK" classification, there was a trend ($p<0.1$) for the SSs to be affected. However, there was a

significant effect of risk status on all integrative thinking skills (Auditory Comprehension

Integrative Thinking Score, p<0.0001; Expressive Communication Integrative Thinking

Score, p<0.05; Total Language Integrative Thinking Score, p<0.01) (see Table 42). In

addition, there was a significant effect of gender on risk status of the overall Total

Language Score (p<0.05). There was no evidence, though, that an interaction of gender,

security of attachment status, and risk status predicted any PLS-3 score.

Table 4

Descriptive Statistics for Child Language Outcome Measures

Measure and Time of Assessment	N	M	SD
MacArthur Communication Development Inventory/Words and Gestures [a] (15-months)			
Percentile of Phrases Understood	94	59.32	23.68
Percentile of Words Understood	94	49.73	24.93
Percentile of Words Produced	94	50.56	25.02
Percentile of Total Gestures	94	52.23	27.26
Preschool Language Scales - 3 [b] (4-years)			
Auditory Comprehension Subscale (SS) [c]	77	83	13
Expressive Communication Subscale (SS)	76	82	11
Total Language (SS)	76	82	12
Auditory Comprehension Subscale - Integrative Thinking	83	2.29 [d]	1.26
Expressive Communication Subscale - Integrative Thinking	83	2.63	1.43
Total Language - Integrative Thinking	83	4.92	2.26

Notes. [a] Fenson, L., Dale, P.S., Reznick, J.S., Bates, E., Thal, D.J., and Pethick, S.J. (1994). Variability in early communicative development. Monographs of the Society for Research in Child Development, 59 (5, serial no. 242).

[b] Zimmerman, I.L., Steiner, V.G., and Pond, R. E. (1992). Preschool Language Scale-3. San Antonio, TX: The Psychological Corporation.

[c] SS = Standard Score; [d] Integrative thinking means are the average number of integrative thinking items answered correctly.

Table 5

Frequency of Summative 4-year Child Pragmatic Measures (*n* = 76)

Pragmatic Language Measure	*M*	*SD*	Range
Total Utterances	171.07	71.72	61 - 369
Total Utterances - Free Play with Mom	129.82	48.58	49-267
Total Utterances - Alone with Stranger	31.54	25.49	0-92
Total Turns	113.14	42.69	45-195
Total Topics	50.43	19.60	18-102
Total Internal State Words	31.88	18.83	2-94
Total Decontextualized Utterances	17.62	14.93	0-63

Table 6

Descriptive Statistics for 4-year Child Pragmatic Measures (*n* = 76)

Pragmatic Measure	*M*	*SD*	Range
Total Child verbosity	6.10	2.57	1.96-12.77
Child Verbosity - Free Play with Mom	7.17	2.64	2.76-14.05
Child Verbosity - Alone with Stranger	4.62	4.15	0-13.86
Mean Length of Turn	1.53	.42	1.11-3.18
Mean Length of Topic	3.44	.93	2.08-6.80
Proportion of Topics Initiated by Child	.63	.12	.32-.89
Proportion of Social Utterances	.93	.08	.72-1.00
Proportion of Initiating/Directing UTTs [a]	.40	.10	.14-.62
Proportion of Command UTTs	.07	.04	0-.27
Proportion of Question UTTs	.23	.09	.04-.46
Proportion of Responding/Elaborating UTTs	.54	.11	.34-.85
Proportion of New Information Response UTTs	.33	.09	.13-.62
Proportion of Elaborating Response UTTs	.23	.08	.09-.58
Proportion of Simple Response UTTs	.20	.08	.06-.47
Proportion of UTTs with Internal State Words	.18	.07	.02-.34
Proportion of Self Internal State Words	.55	.18	.08-1.00
Proportion of Different Categories	.59	.17	.1-.9
Self-Other Differentiation Index [b]	1.88	.61	1.00-3.00
Proportion of Decontextualized Utterances	.10	.08	0-.34

Notes. [a] UTTs = Utterances; [b] See Methods Section for calculation.

Table 7

Semantic Content of 4-Year-Olds Internal State Words (n = 76)

Internal State Category	M (%)	SD	Range (%)
Sensory Perception	26	16	0-71
Physiology	3	16	0-25
Positive affect	4	6	0-29
Negative affect	2	4	0-17
Affective behavior	<1	2	0-11
Moral Judgment	<1	2	0-16
Obligation	4	4	0-15
Volition	29	16	0-69
Ability	15	19	0-42
Cognition	15	16	0-100

Table 8

<u>Significant Parity Effects on Pragmatic Language Measures</u>

Mean Comparisons				
	First-born vs Later born		Only Child vs Child with Siblings	
Pragmatic Measure	First-born $n = 23$	Later born $n = 53$	Only Child $n = 11$	Siblings $n = 65$
Total verbosity	6.87	5.76+	N.S.[a]	
Verbosity with stranger	6.20	3.89*	N.S.	
Verbosity with mom	6.20	3.98+	N.S.	
Total utterances	200	158*	N.S.	
Mean length of turn	1.70	1.46+	1.79	1.49*
Proportion of child initiated topics	.67	.61+	.69	.61*
Proportion of response utterances	.50	.55+	N.S.	
Proportion of utterances with no new information	.17	.21+	.15	.20+
Percent of negative affect internal state (IS) words	3.49	1.52*	N.S.	
Percent of obligation IS words	5.26	3.10+	N.S.	
Percent of cognition IS words	9.93%	17.78%*	N.S.	
Percent of affect behavior IS words	N.S.		0.0	0.6*

[a]N.S. = not significant $+ p < .10$ $* p < .05$

Table 9

Intercorrelations Between Preschool Language Scale-3 (PLS-3) and MacArthur
Communication Development Inventory/Words and Gestures (CDI)

		CDI Category			
PLS-3 Category	N	PCTPHUND [g]	PCTWDUND [h]	PCTWDPRD [i]	PCTTGEST [j]
AUDCOMP SS [a]	77	.10	.13	.04	-.01
EXPRESS SS [b]	76	.15	.07	.13	.08
TOTAL SS [c]	76	.16	.10	.10	.06
ACINTHK [d]	77	.10	.09	.02	.13
EXINTTHK [e]	76	.30 **	.14	.23 *	.14
TOTINTHK [f]	76	.25 *	.14	.16	.16

Notes. [a] Auditory Comprehension Standard Score [b] Expressive Communication Standard Score

[c] Total Language Standard Score [d] Auditory Comprehension Integrative Thinking Score

[e] Expressive Comprehension Integrative Thinking Score

[f] Total Language Score Integrative Score

[g] Percentile of Phrases Understood [h] Percentile Words Understood

[i] Percentile Words Produced [j] Percentile of Total Gestures

$+ p<.10.$ $* p<.05.$ $** p<.01.$ $*** p<.001$

Table 10

Intercorrelations of Pragmatic Language Measures and Preschool Language Scale-3

Pragmatic Language Measures	Auditory Comprehension Standard Score	Expressive Communication Standard Score	Total Language Standard Score	Auditory Comprehension Integrated Thinking Score	Expressive Communication Integrated Thinking Score	Total Integrative Thinking Score
Total child verbosity	-.04	.10	<.01	-.03	.14	.07
Mean Length of Turns	.03	.14	.08	<.01	.07	.04
Mean Length of Topic	.18	.19	.22+	.17	.16	.01+
Proportion of topics child initiated	-.13	.16	-.02	-.21+	.02	-.10
Proportion of Initating/Directing UTTs[a]	-.34**	-.21+	-.32**	-.29*	-.10	-.23+
Proportion of UTT Commands	-.21+	-.05	-.13	-.17	-.04	-.12
Proportion of UTT Questions	-.25+	-.23+	-.28*	-.19	-.08	-.16
Proportion of Responding/Elaborating UTTs	.34**	.18	.33**	.33**	.06	.23*
Proportion of Responses with New Information	.41***	.33**	.44***	.30**	.18	.28*
Proportion Simple Responses with No New Information	.36**	.41***	.44***	.25*	.24*	.29*
Proportion of Internal State (IS) Words	.11	.22	.19	.08	.18	.16
Proportion of Self (IS) Words	-.07	-.11	-.12	-.01	-.15	-.10
Proportion of IS Categories	.17	.24+	.18	.05	.19+	.15
Other-Self Differentiation Index[b]	.06	.19	.10	.03	.20+	.14
Proportion of Decontextualized UTTS	.06	.19	.10	.03	.20+	.14

Notes. [a] UTTs = Utterances

[b] See Methods for calculation   +p<.10   *p<.05   **p<.01   ***p<.001   n = 76

Table 11

Intercorrelations Among 4-Year Child Pragmatic Measures ($n = 76$)

	1	2	3	4	5	6
1) Total child verbosity						
2) Mean length of turn	.38**					
3) Mean length of topic	.45***	.13				
4) Proportion of child initiated topics	.27*	.60****	-.01			
5) Proportion of initiating/ directing utterances	-.02	-.05	-.26*	.41***		
6) Proportion of commands	<.01	.08	-.01	.19	.44***	
7) Proportion of questions	-.03	-.08	-.16	.24*	.84****	.07
8) Proportion of responses/ elaborations	-.01	-.34**	.36**	-.62***	-.73****	-.40***
9) Proportion of responses with new information	.10	-.03	.42***	-.21+	-.53****	-.20+
10) Proportion of elaborations	.11	.04	.45***	-.03	-.37**	-.11
11) Proportion of simple responses	-.06	-.41***	.15	-.61****	-.46**	-.31**
12) Proportion of Internal State (IS) Words	.09	.13	.16	.29**	.24*	.15
13) Proportion of self IS words	-.02	-.23*	-.05	-.30**	-.13	-.38**
14) Proportion of different IS categories	.62****	.36**	.22+	.38**	.03	.04
15) O-S Differentiation Index	<.01	.22+	.17	.23*	.10	.36**
16) Proportion of decontextualized UTTs	.04	.46***	-.26*	.29*	-.15	-.07

(table continues)

Table 11

Intercorrelations Among 4-Year Child Pragmatic Measures ($n = 76$)

	7	8	9	10	11	12
1) Total child verbosity						
2) Mean length of turn						
3) Mean length of topic						
4) Proportion of child initiated topics						
5) Proportion of initiating/ directing utterances						
6) Proportion of commands						
7) Proportion of questions						
8) Proportion of responses/ elaborations	-.60****					
9) Proportion of responses with new information	-.53****	.72****				
10) Proportion of elaborations	-.40***	.51****	.81****			
11) Proportion of simple responses	-.29	.59****	.11	-.18		
12) Proportion of Internal State (IS) Words	.08	-.10	.17	.38**	-.34**	
13) Proportion of self IS words	-.02	.30**	.08	.06	.32**	-.08
14) Proportion of different IS categories	-.06	-.09	.12	.16	-.24*	.03
15) O-S Differentiation Index	.06	-.23*	-.02	.04	-.27	.40***
16) Proportion of decontextualized utterances	-.18	-.24*	-.11	-.03	-.19	-.08

(table continues)

Table 11

Intercorrelations Among 4-Year Child Pragmatic Measures ($n = 76$)

	13	14	15	16
1) Total child verbosity				
2) Mean length of turn				
3) Mean length of topic				
4) Proportion of child initiated topics				
5) Proportion of initiating/ directing utterances				
6) Proportion of commands				
7) Proportion of questions				
8) Proportion of responses/ elaborations				
9) Proportion of responses with new information				
10) Proportion of elaborations				
11) Proportion of simple responses				
12) Proportion of Internal State (IS) Words				
13) Proportion of self IS words				
14) Proportion of different IS categories	-.13			
15) O-S Differentiation Index	-.86****	.05		
16) Proportion of decontextualized utterances	-.23*	.23*	.23*	—

Note. [a] O-S = Other-Self Differentiation Index. See Methods for calculation.

$+ p<.1$ $* p<.05$ $** p<.01$ $*** p<.001$ $**** p < .0001$

Table 12

Concurrent Relations: Preschool Language Scale-3 (PLS-3) and Behaviors in that Situation

PLS-3 Category	N	Factor 1 Verbal Responsiveness	Factor 2 Controlling/ Inattentiveness	Factor 3 Seeking Mom
Auditory Comprehension Subscale (SS) [a]	77	.06	-.11	-.33**
Expressive Communication Subscale (SS)	76	.04	-.12	-.27*
Total Language (SS)	76	.02	.02	-.37**
Auditory Comprehension Subscale - Integrative Thinking	77	.02	-.06	-.21
Expressive Communication Subscale - Integrative Thinking	76	.08	.16	-.16
Total Language - Integrative Thinking	76	.06	.07	-.21+

Note. [a] SS = Standard Score

+ $p<.1$ * $p<.05$ ** $p<.01$ *** $p<.001$

Table 13

Concurrent Relations with Child Temperament and Pragmatic Language Measures
($n = 76$)

Pragmatic Language Measure	Child Focused Attention to Toys		Social Involve-ment with Mom	Stranger Sociability
	Free Play	Alone with Stranger		
Total Utterances (UUTs)	.12	-.04	.61	.56
Child Verbosity with Mother/Free Play	.11	-.07	.58****	.32**
Child Verbosity with Stranger	.14	-.08	.49****	.78****
Mean Length of Turn	.38**	.23*	.10	.20+
Mean Length of Topic	.05	-.07	.54****	.06
Proportion of Child Initiated Topics	.32**	.17	.07	.31
Proportion of Initiating/Directing UTTs	-.14	-.07	-.15	.17
Proportion of Command Utterances	.12	.06	-.06	.33**
Proportion of Question Utterances	-.21+	-.13	-.18	.02
Proportion of Responses/Elaborations	-.20+	-.09	.37**	-.18
Proportion of Elaborations	-.02	.08	.53****	.09
Proportion of Internal State (IS) Words	-.02	.01	.22+	.12
Proportion of Self IS Words	-.30**	-.19+	.04	-.06
O-S Differentiation Index[a]	.30**	.17	.07	.14
Proportion of IS Categories	.22+	.15	.37**	.45***
Proportion of Decontextualized UTTs	.26	.10	-.02	.11

(table continues)

Table 13

Concurrent Relations with Child Temperament and Pragmatic Language Measures
($n = 76$)

Pragmatic Language Measure	Child Positive Affect		Child Negative Affect	Cooperation with Clean-Up	Negative Affect with Puzzles
	Free Play	Alone with Stranger			
Total Utterances (UUTs)	.23*	.31**	.08	-.06	.33
Child Verbosity with Mother/ Free Play	.18	.19+	.06	-.06	.06
Child Verbosity with Stranger	.36**	.48***	.03	-.12	.12
Mean Length of Turn	.12	.31**	.19	.03	.18
Mean Length of Topic	-.07	-.08	-.13	-.06	-.12
Proportion of Child Initiated Topics	.04	.31**	.13	-.04	.13
Proportion of Initiating/Directing UTTs	-.01	.13	.10	-.02	.12
Proportion of Command Utterances	.08	.11	-.04	-.22+	<.01
Proportion of Question Utterances	-.06	.02	.05	.09	.04
Proportion of Responses	-.04	-.28*	-.12	-.03	-.21+
Proportion of Elaborations	-.02	-.06	-.08	-.10	-.04
Proportion of Internal State (IS) Words	-.20	-.01	.24*	<.01	.08
Proportion of Self IS Words	-.20+	-.01	.24*	.01	.08
Proportion of IS Categories	.11	.26*	.14	-.02	.18
Other-Self Differentiation Index[a]	-.13	.05	-.14	.07	-.03
Proportion of Decontextualized UTTs	.01	.11	.04	.02	.10

Note. [a] O-S = Other-Self Differentiation Index. See Methods for calculation.

+ $p<.1$ * $p<.05$ ** $p<.01$ *** $p<.001$ *** $p < .0001$

Table 14

Concurrent Relations: An analysis of variance for 4-year mother facilitation

Source	df	F Ratio	F Probability
Between Groups	3	2.82	.04*
Within Groups	72		
Total	75		

Attachment	Group	Count	Standard Mean	Standard Deviation
	Grp A	7	39.2857	12.6585
	Grp B	51	54.9608	20.7961
	Grp C	8	47.1250	14.2772
	Grp D	10	40.3000	13.7441
	Total	76	50.7632	19.5734

Mean	Group	A DC B
39.2857	Grp A	
40.3000	Grp D	
47.1250	Grp C	
54.9608	Grp B	*

group difference * $p<.05$

Table 15

Concurrent Relations: An analysis of variance for 4-year child total utterances

Source	df	F Ratio	F Probability
Between Groups	3	2.90	.04*
Within Groups	65		
Total	68		

Attachment	Group	Count	Standard Mean	Standard Deviation
	Grp A	7	146.7143	35.3634
	Grp B	46	170.8043	68.8298
	Grp C	6	127.6667	58.3427
	Grp D	10	223.7000	96.7850
	Total	69	172.2754	7302718

Mean	Group	C AB D
127.6667	Grp C	
146.7143	Grp A	
170.8043	Grp B	
223.7000	Grp D	* * *

group difference * $p<.05$

Table 16

Concurrent Relations: An analysis of variance for 4-year child proportion of different internal state word categories

Source	df	F Ratio	F Probability
Between Groups	3	3.20	.03*
Within Groups	65		
Total	68		

Attachment	Group	Count	Standard Mean	Standard Deviation
	Grp A	7	.4714	.1496
	Grp B	46	.6022	.1437
	Grp C	6	.4500	.1643
	Grp D	10	.6500	.2415
	Total	69	.5826	.1706

Mean	Group	C AB D
.4500	Grp C	
.4714	Grp A	
.6022	Grp B	*
.6500	Grp D	* *

group difference * *p<.05*

Table 17

Concurrent Relations: An analysis of variance for 4-year child mean length of topic

Source	df	F Ratio	F Probability
Between Groups	3	3.01	.04*
Within Groups	65		
Total	68		

Attachment	Group	Count	Standard Mean	Standard Deviation
	Grp A	7	3.9810	.8525
	Grp B	46	3.3153	.7247
	Grp C	6	2.7775	.7492
	Grp D	10	3.7937	1.3539
	Total	69	3.4054	.8900

Mean	Group	C B D A
2.7775	Grp C	
3.3153	Grp B	
3.7937	Grp D	*
3.9810	Grp A	*

group difference * $p<.05$

Table 18

Concurrent Relations: An analysis of variance for 4-year child verbosity alone with stranger

Source	df	F Ratio	F Probability
Between Groups	3	4.54	.006**
Within Groups	58		
Total	61		

** *p* < .01

Attachment	Group	Count	Standard Mean	Standard Deviation
	Grp A	7	1.9071	1.7424
	Grp B	43	4.9721	3.5929
	Grp C	6	1.7013	1.5465
	Grp D	8	7.8706	4.9541
	Total	62	4.7890	3.8689

Mean	Group	C AB D
1.7013	Grp C	
1.9071	Grp A	
4.9721	Grp B	*
7.8706	Grp D	* * *

group difference * *p*<.05

Table 19

Concurrent Relations: An analysis of variance for 4-year child Other-Self Differentiation
Index

Source	df	F Ratio	F Probability
Between Groups	3	3.48	.02*
Within Groups	58		
Total	61		

Attachment	Group	Count	Standard Mean	Standard Deviation
	Grp A	7	2.5714	.5345
	Grp B	46	1.7826	.6294
	Grp C	6	1.8333	.7528
	Grp D	10	1.8000	.4216
	Total	69	1.8696	.6397

Mean	Group	B D C A
1.7826	Grp B	
1.8000	Grp D	
1.8333	Grp C	
2.5714	Grp A	* * *

group difference * $p<.05$

Table 20

Concurrent Relations: An analysis of variance for 4-year child proportion of
physiological state internal state words

Source	df	F Ratio	F Probability
Between Groups	3	2.9487	.04*
Within Groups	65		
Total	68		

*p < .05

Attachment	Group	Count	Standard Mean	Standard Deviation
	Grp A	7	.4195	.1406
	Grp B	43	.2502	.1625
	Grp C	6	.2529	.2320
	Grp D	8	.1918	.1104
	Total	62	.1918	.1104

Mean	Group	D BC A
.1918	Grp D	
.2502	Grp B	
.25291	Grp C	
.4195	Grp A	* *

group difference * p<.05

Table 21

Predictors of Auditory Comprehension Standard Score

step, predictors	F	R^2	$R^2 change$	$F change$	$t_{(6.64)}^a$
1) 15-month language	4.27*	06			
CDI number words understood					1.65
2) child behavior	5.37***	.25	.19	5.46**	
articulation problems					-1.93+
seek mother during PLS					-2.03*
externalizing behavior problems					-1.95+
3) mother characteristics, behavior	5.12***	.32	.08	3.73*	
smoking during pregnancy					-1.88+
9-month sensitivity					1.72+

^{a}in final equation, $^+$p< .10, *p< .05, **p< .01, *** p< .001

Table 22

Predictors of Expressive Language Standard Score

step, predictors	F	R^2	$R^2 change$	$F change$ $t_{(6,64)}$[a]
1) 15-month language	5.13*	.07		
CDI number words produced				2.40*
2) child behavior	5.19***	.24	.17	4.92**
articulation problems				-2.23*
seek mother during PLS				-1.26
externalizing behavior problems				-2.31*
3) mother characteristics, behavior	4.81*** .	27	.03	2.70
9-month coercion				-1.64

[a]in final equation, $^+p< .10$, $*p< .05$, $**p< .01$, $*** p< .001$

Table 23

Predictors of Total Language Standard Score

step, predictors	F	R^2	$R^2change$	$F change$ $t_{(6,64)}{}^a$
1) 15-month language	7.36**	.10		
CDI number phrases understood				2.78**
2) child behavior	7.43****	.31	.22	6.82***
articulation problems				-1.93+
seek mother during PLS				-2.43*
externalizing behavior problems				-2.33*
3) mother characteristics, behavior	6.22****	.33	.01	1.26
9-month sensitivity				1.12

ªin final equation, ⁺p< .10, *p< .05, **p< .01, *** p< .001, p< .0001

Table 24

Predictors of Auditory Comprehension Integrative Thinking

step. predictors	F	R^2	$R^2change$	$F\ change\ t_{(6,64)}$[a]
1) 15-month language	4.64*	.05		
CDI number communicative gestures				2.49*
2) child behavior	7.99***	.17	.11	10.77**
externalizing behavior problems				-2.67
3) mother characteristics, behavior	6.13*** .	24	.07	3.73*
smoking during pregnancy				-2.26*
attitude toward spanking				-1.62

[a]in final equation, $^+$p< .10, *p< .05, **p< .01, *** p< .001

Table 25

Predictors of Expressive Integrative Thinking

step, predictors	F	R^2	$R^2 change$	$F\ change\ t_{(6,64)})^a$
1) 15-month language	7.930*	.09		
CDI words produced				3.34**
2) child behavior	6.90****	.27	.18	6.05***
articulation problems				-2.45*
uncooperative during PLS				-2.04*
externalizing behavior problems				-2.40*
3) mother characteristics, behavior	7.20****	.32	.06	6.40*
9-month coercion				-2.53*

^{a}in final equation, $^+p< .10$, $^*p< .05$, $^{**}p< .01$, $^{***}\ p< .001$, $p< .0001$

Table 26

Predictors of Total Integrative Thinking

step, predictors	F	R^2	R^2change	F change $t_{(6,64)}{}^a$
1) 15-month language	6.41*	.08		
CDI number words produced				3.19**
2) child behavior	8.98****	.32	.25	9.17****
articulation problems				-2.81**
uncooperative during PLS				-2.70**
externalizing behavior problems				-2.65**
3) mother characteristics, behavior	8.40****	.45	.13	5.51**
smoking during pregnancy				-2.74**
9-month coercion				-2.57*
attitude toward spanking				-1.46

^{a}in final equation, $^+p< .10$, $^*p< .05$, $^{**}p< .01$, $^{***}\ p< .001$, $p< .0001$

Table 27

Predictors of Total Verbosity

step, predictors	F	R^2	R^2change	F change $t_{(4,61)}$[a]
1) Demographics	.21	.01		
prenatal SES				.97
4-yr. mother occupational level				.70
2) Child Behavior	4.44**	.23	.22	8.62***
9-mo. sociable/adaptable from ICQ				1.73+
verbosity during PLS3				3.64***

[a] in final equation, + $p < .10$, ** $p < .01$, *** $p < .001$

Table 28

Predictors of Mean Length of Topic

step, predictors	F	R^2	$R^2 change$	$F \; change \; t_{(5,66)}$ [a]
1) Demographics	2.04	.06		
prenatal SES				1.29
4-yr. mother occupational level				-.26
2) Mother Attitudes, Relationship Satisfaction	5.59**	.20	.14	12.04***
4-yr. attitude toward spanking				-3.30**
4) Mother Interactional Behavior	5.46***	.29	.09	4.43*
4-yr. free play sensitivity				2.15*
4-yr. free play feeling recognition				-2.30*

[a] in final equation, * $p < .05$, ** $p < .01$, *** $p < .001$

Table 29

Predictors of Mean Length of Turn

step, predictors	F	R^2	$R^2 change$	$F change$ $t_{(4,67)}$[a]
1) Demographics	3.42*	.09		
prenatal SES				-1.43
4-yr. mother occupational level				1.36
2) Mother Interactional Behavior	5.99***	.26	.17	7.88***
4-yr. free play sensitivity				-3.47***
4-yr. free play over-control/intrusive				-2.41*

[a] in final equation, * $p < .05$, *** $p < .001$

Table 30

Predictors of Proportion of Commands

step, predictors	F	R^2	R^2change	F change $t_{(4,46)}$[a]
1) Demographics	1.86	.07		
prenatal SES				-.64
4-yr. mother occupational level				-2.83**
2) Child Characteristics	4.46**	.22	.15	9.04**
controlling behavior, attention problems in PLS3				3.49**
3) Mother Attitudes, Relationship Satisfaction	9.02****	.44	.22	17.89****
prenatal relationship positive				-4.23****

[a] in final equation, ** $p < .01$, **** $p < .0001$

Table 31

Predictors of Proportion of Responsing/Elaborating Conversational Moves

step, predictors	F	R^2	$R^2 change$	$F\ change\ _{(5,62)}$ [a]
1) Demographics	7.81[***]	.19		
prenatal SES				1.50
4-yr. mother occupational level				2.37[*]
2) Child Characteristics	8.13[****]	.28	.08	7.26[**]
controlling behavior, attention problems in PLS3				-2.00[*]
3) Mother Interactional Behavior	7.93[****]	.39	.11	5.81[**]
4-yr. free play sensitivity				2.98[**]
4-yr. free play over-control/intrusive				2.21[*]

[a] in final equation, [*] $p < .05$, [**] $p < .01$, [***] $p < .001$, [****] $p < .0001$

Table 32

Predictors of Proportion of Elaborations

step. predictors	$\underline{F}$	$\underline{R^2}$	$R^2change$	$\underline{F\ change}\ t_{(5,62)}{}^a$
1) Demographics	5.85**	.15		
prenatal SES				-.02
4-yr. mother occupational level				2.84**
2) Child Characteristics	6.48***	.23	.08	6.71*
seeking mother, leaving room in PLS3				-2.71**
3) Mother Attitudes, Relationship Satisfaction	6.99****	.31	.07	6.78*
prenatal self-esteem problems				-2.02*
4) Mother Interactional Behavior	6.44****	.34	.03	3.23+
4-yr. free play facilitation				1.80+

^{a} in final equation, $^+p < .10$ $^*p < .05$, $^{**}p < .01$, $^{***}p < .001$, $^{****}p < .0001$

Table 33

Predictors of Proportion of Internal State Words

step. predictors	F	R^2	$R^2change$	$F\ change\ t_{(5,64)}$ [a]
1) Demographics	2.72[+]	.07		
prenatal SES				-.81
4-yr. mother occupational level				1.53
2) Child Characteristics	4.16**	.16	.08	6.59*
15-mo. positive/social behavior with stranger				2.68**
3) Mother Attitudes, Relationship Satisfaction	5.05**	.24	.08	6.65*
4-mo. responsive attitude to crying				2.60*
4) Mother Interactional Behavior	5.12***	.29	.05	4.35*
4-yr. free play over-control/intrusive				-2.09*

[a] in final equation, $^{+}p < .10$ $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$, $^{****}p < .0001$

Table 34

Predictors of Percent of Internal State Categories Used

step, predictors	F	R^2	$R^2 change$	$F\ change\ t_{(5,60)}{}^a$
1) Demographics	.12	.00		
prenatal SES				.15
4-yr. mother occupational level				1.21
2) Child Characteristics	4.35**	.22	.22	8.54***
15-mo. positive/social behavior with stranger				1.77+
verbosity during PLS3				2.64*
4) Mother Interactional Behavior	4.31**	.26	.04	3.46+
4-yr. free play unresponsive behavior				1.86+

^{a} in final equation, $^+p < .10$ $^*p < .05$, $^{**}p < .01$

Table 35

Predictors of Proportion of Internal State Words about Self

step. predictors	F	R^2	R^2change	F change $t_{(4,67)}{}^a$
1) Demographics	4.83*	.12		
prenatal SES				-1.09
4-yr. mother occupational level				4.12****
2) Mother Attitudes, Relationship Satisfaction	6.23***	.22	.09	8.03**
4-mo. maternal self-efficacy				2.27*
4) Mother Interactional Behavior	7.52****	.31	.09	9.16**
4-yr. free play over-control/intrusive				3.03**

[a] in final equation, * $p < .05$, ** $p < .01$, *** $p < .001$, **** $p < .0001$

Table 36

Predictors of Other-Self Differentiation Index[a]

step, predictors	F	R^2	R^2 change	F change $t_{(5,56)}$ [b]
1) Demographics	1.50	.05		
prenatal SES				.39
4-yr. mother occupational level				-2.55*
2) Mother Attitudes, Relationship Satisfaction	4.59**	.24	.20	7.36**
4-mo. maternal self-efficacy				-2.35*
4-yr. relationship negativity				-2.84**
4) Mother Interactional Behavior	5.77***	.34	.10	8.16**
4-yr. free play over-control/intrusive				-2.86**

[a] See Methods for description of calculation.

[b] in final equation, * $p < .05$, ** $p < .01$, *** $p < .001$

Table 37

Predictors of Proportion of Decontextualized Language

step, predictors	F	R^2	$R^2 change$	$F\ change\ t_{(6,65)}$[a]
1) Demographics	1.23	.03		
prenatal SES				.02
4-yr. mother occupational level				-1.54
2) Child Characteristics	3.58*	.14	.10	8.04**
child sex				2.61*
3) Mother Attitudes, Relationship Satisfaction	3.81**	.19	.05	4.03*
4-yr. attitude toward spanking				1.39
4) Mother Interactional Behavior	5.78***	.35	.16	8.09***
4-yr. free play contingent feedback				-2.56*
4-yr. free play feeling recognition				3.04**

[a] in final equation, * $p < .05$, ** $p < .01$, *** $p < .001$, **** $p < .0001$

Table 38

Predictors of Proportion of Initiating/Directing Conversational Moves

step, predictors	F	R^2	$R^2 change$	$F change\ t_{(2,69)}$[a]
1) Demographics	4.75*	.12		
prenatal SES				-1.77+
4-yr. mother occupational level				-1.91+

[a] in final equation, $^+\underline{p} < .10$ $^*\underline{p} < .05$

Table 39

Predictors of Proportion of Topics Initiated by Child

step. predictors	F	R^2	$R^2 change$	$F change$ $t_{(5,62)}$[a]
1) Demographics	3.76*	.10		
prenatal SES				-1.08
4-yr. mother occupational level				-1.42
2) Child Characteristics	5.11**	.19	.09	7.11**
controlling behavior, attention problems in PLS3				2.04*
4) Mother Interactional Behavior	5.08***	.29	.10	4.25*
4-yr. free play sensitivity				-1.96+
4-yr. free play over-control/intrusive				-2.51*

[a] in final equation, +p < .10 * p < .05, ** p < .01, *** p < .001

Table 40

Predictors of Proportion of Utterances Contributing New Information

step, predictors	F	R^2	R^2change	F change $t_{(5,64)}{}^a$	
1) Demographics	3.48*	.09			
prenatal SES					1.55
4-yr. mother occupational level					1.60
2) Child Characteristics	4.23**	.16	.07	5.28*	
9-mo. social/adaptable behavior on ICQ					1.40
3) Mother Attitudes, Relationship Satisfaction	4.48**	.22	.05	4.55*	
4-mo. maternal self-efficacy					1.86+
4) Mother Interactional Behavior	4.29**	.25	.03	2.97+	
4-yr. free play sensitivity					1.72+

^{a} in final equation, $^+p < .10$ $^*p < .05$, $^{**}p < .01$

Table 41

Predictors of Proportion of Utterances Not Contributing New Information

step, predictors	F	R^2	$R^2 change$	$F\ change\ t_{(6,62)}$[a]
1) Demographics	1.75	.05		
prenatal SES				.67
4-yr. mother occupational level				.35
2) Child Characteristics	3.19*	.17	.12	4.44*
9-mo. negative emotionality				-1.90+
15-mo. positive/social behavior with stranger				-1.52
3) Mother Interactional Behavior	3.20**	.24	.07	2.85+
4-yr. free play over-control/intrusive				1.62
4-yr. free play unresponsive behavior				-1.64

[a] in final equation, $^+p < .10$ $^*p < .05$, $^{**}p < .01$

Table 42

Multivariate Analysis of Variance: High/Low Risk Status Predictions

PLS-3 Language Score	F
Auditory Comprehension SS	3.85[+]
Expressive Communication SS	3.28[+]
Total Language Expression SS	3.47[+]
AC Integrative Thinking	13.97***
Expressive Integrative Thinking	4.17*
Total Integrative Thinking	11.42**

[+]$p< .10$, *$p< .05$, **$p< .01$, *** $p< .001$

DISCUSSION

The purposes of this study were: 1) to explore language abilities in rural, Appalachian preschoolers and 2) to assess caregiver (primarily mother) and child predictors of linguistic communication skills.

The salient limitations of this study should be addressed. As previously noted (Fish, 1998), the results of this study may be limited in generalizability due to the size and characteristics of this sample (non-Hispanic white, rural, low SES). Second, this research may have lacked the optimal environment for evaluation of language abilities. The PLS-3 was administered following the Strange Situation, clean-up, and puzzle activities. The stress of separation and attention demands of the situation may have decreased both motivation and attention span necessary for optimal achievement. Previous studies (Klann-Delius & Hofmeister, 1997) noted differences in child language characteristics following a brief separation and reunion with the mother. In addition, pragmatic language analysis was confined to one setting with variable adult conversational input. Although there is great variability in how individual children will linguistically behave in any given situation (Kramer, James, and Saxman, 1979; Olswang and Carpenter, 1978; Scott and Taylor, 1978), Miller (1981) recommended sampling children in a variety of settings and keeping the adult questions to a minimum to allow for more complex utterances associated with spontaneous speech. However, the absence of any questions may not result in a representative sample. The variable interactional style of mothers and the lack of active participation required of the experimenter in the Strange Situation may diminish the quality of the sample. Bretherton and others (1986) also noted that certain categories of emotional words may occur less frequently in a laboratory setting. In

addition, the design of the situation did not provide for an ideal video recording of language. The microphone was stationary and several toys selected for the free play situation, although engaging, produced loud noises that interfered with understanding of speech. Third, this investigation was diffuse and designed to explore language skills in a previously unstudied population, rural Appalachian preschoolers. Although the PLS-3 test was standardized, the pragmatic measures were developed after a review of the literature. This lack of pragmatic language standardization limits definitive conclusions about results.

Although communication skills in rural Appalachian infants appeared similar to children from middle-class families, linguistic abilities of these same children were significantly below average upon later assessment, results that have been observed in several studies (Hart & Risley, 1992; Hart & Risley, 1995; Hoff-Ginsberg, 1991). One possible explanation for this discrepancy is that emerging language skills may be more dependent on genetic variables, while the course of language development may be more influenced by environmental factors. Another interpretation may relate to the children's relative lack of social contact with adults outside of their immediate and extended families. Many families in this sample had limited means of transportation. In addition, the majority (65%) of these 4-year-olds have not attended day care, preschool, or Head Start. Most of the children (63%) had mothers that are not employed outside of the home (63%) and, therefore, do not require child care services. Socially inexperienced children tend to perform poorly on standardized tests (Lamb, 1982; Lamb, Garn and Keating, 1981; Stevenson and Lamb, 1981).

No normative data exist for pragmatic language measures, despite recent attention in research (Retherford, 1993). However, data from research of restricted populations reveal some general trends in pragmatic language development. As children mature, their pragmatic skills continue to develop. They demonstrate a decreased tendency to introduce new topics (Brinton and Fujiki, 1984; Martlow, 1980), an increase in the number of topics maintained (Brinton and Fujiki, 1984), and an increase in alternating conversational turns. They further exhibit a decrease in disruptive utterances (Klann-Dellius and Hofmeister, 1997), an increase in the proportion of responses (Martlow, 1980), an increase in length and complexity of utterances (Brinton and Fujiki, 1984; Brown, 1973), an increase in use of decontextualized speech (Snow, 1983), and an increase in frequency, categories, and self-referenced internal state lexicon (Beeghly and Cicchetti, 1994; Cassidy, 1990). Children also increasingly develop the ability to reference others' internal states in their conversation (Beeghly and Cicchetti, 1994). Significant differences between children in these pragmatic language measures were found in this investigation. The degree of functioning in these areas can be to used to assess relative pragmatic language competency. This topic will be expanded in the discussion on predictors of language measures.

In contrast to a middle-class, 4-year-old sample (Martlow, 1981), a higher rate of initiations and a lower rate of responses characterized the children in this study (see Results section). Based on observed developmental trends (Brinton and Fujiki, 1984; Martlow, 1981), this sample exhibited less developed discourse skills than a comparison low SES risk group. Proportion of conversational initiations and responses may parallel general linguistic development, however, as evidenced by significant correlations ($p <$

.01) of these measures to PLS-3 Auditory Comprehension and Total Language Standard Scores.

Examining the predictors of language competence as measured by the PLS-3 revealed that risk factors were primarily identified and few protective factors found. It is reasonable that risk factors were better able to be identified because the majority of the sample had language standard scores significantly lower than average.

The variables that predicted language competence were often what one might expect. Proximal child behaviors, such as not being cooperative and seeking their mother during the test, would decrease test scores. However, more distal and situational child characteristics, such as externalizing behavior and articulation problems, were noted, suggesting more global child characteristics such as behavior and developmental problems influence language development. As reported in several other studies (Baumwell, et. al, 1997; Biringen, Robinson, & Emde, 1994; DeWolff & van IJzendoorn, 1997 [review]; Hart & Risley, 1992; Hart & Risley, 1995; Londerville & Main, 1981; Meins, 1998; Olson, Bates, and Bayles, 1984; Olson, Bates, Kaskie, 1992; Rosenblum, Bénony, & Mazet, 1997), mother interactional style predicted later language competence. Results of regression analyses indicated that increased mother hostility and coercion predicted lower language competence and increased mother sensitivity was predictive of higher language competence. It should be noted that 4-year interactional characteristics were not available when the regression analysis of the PLS-3 was performed.

Interestingly, mother smoking during pregnancy was a significant predictor of lower language competency. This predictive value may be highly confounded, a

conclusion supported by findings of a significant relationship between the mother

smoking during pregnancy with low positive personality, low positive feelings about their

partner, high likelihood of not graduating from high school, and greater likelihood of

receiving public assistance. However, one study found dose-related smoking during

pregnancy effects on language outcome measures, suggesting a direct physiological effect

(Fried & Watkinson, 1990).

A review of predictors of pragmatic language parameters obtained by hierarchal

regression indicated that the development of language is indeed a complex process

dependent on several factors, including socioeconomic factors, child characteristics,

mother personality and attitudes, and mother interactional qualities. Generally, no one

factor in isolation was a good predictor. In addition, many of the same factors predicted

several different measures. Reviewing this pattern revealed that three primary types of

pragmatic function were measured by this study, organization of discourse, usage of

internal state lexicon, and decontextualization of language. Therefore, each of these areas

will be discussed separately.

As previously mentioned, discourse skills, such as initiation and response in

conversation, correlate with general linguistic maturity. Many of the same characteristics

that predicted PLS-3 scores predicted discourse measures. However, there were notable

discrepancies, indicating that conversational skills are determined by many factors.

Although proximal child behaviors predicted conversational skills, child temperament

characteristics, both sociability and negative emotionality, were significant predictors.

Infant temperament has also been shown to predict toddler and middle childhood

standardized language results (Slomkowski, 1992). Taken together, these results indicate

that child temperament's influence on language is more than just a superficial enhancement of test performance, but a significant determinant on the process of language acquisition. The nature of this influence cannot be determined by this study but it may interact with maternal interaction to augment language development.

Both distal and proximal mother characteristics predicted discourse abilities. Negative attributes, self-esteem problems and increased acceptance of spanking, were negatively associated with conversation skills. Conversely, positive relationship satisfaction was associated with a decrease in proportion of commands, a conversational device that does not enhance verbal turn taking. This variable predicted a larger percent of the variance than any other predictor in the study. It can be speculated that a more harmonious home environment would decrease the need for the child to exert control. Another plausible interpretation is that children model the interactional style in the home, which may involve fewer imperatives when partners have a satisfactory relationship.

Mothers who were actively engaged with their children, whether in an over-controlling or sensitive manner, elicited more conversational moves from their children. However, more maternal positive attributes, such as sensitivity and facilitation, elicited more mature patterns of interaction. These results support earlier findings (Baumwell, et. al, 1997; Hart and Risley, 1995).

The relative amount of internal state word usage was predicted by both child and maternal characteristics that facilitate verbalization, both positive sociability by the child and responsiveness by the mother. Surprisingly, though, mother unresponsiveness was positively correlated with and predicted both the proportion and diversity of internal state words. Quantitative aspects of internal state production may be a function of the amount

of conversational time provided the child. This conclusion is supported by the correlation of the proportion of internal state words and the diversity of categories and total child verbosity and topics initiated by the child. Previous research associated amount and diversity of internal state word production and vocabulary (Beeghly and Cicchetti, 1994).

However, the development of the ability to use internal state words to reference self as well as others may be less dependent on general language development than other internal state measures and indicate an increasing awareness of other-self differentiation (Beeghly & Cichetti, 1994). In reviewing the pragmatic language intercorrelations, there were fewer discourse measures correlated with measures of referential internal state lexicon. Also, factors associated with the development of self-concept (Cassidy, 1991) were predictors of referential internal state measures. The mother's own sense of self, as evidenced by her self efficacy and positive relationship satisfaction, were found to predict the child's measures of differentiation of self and others.

Although development of decontexualized speech has been associated with positive maternal attributes (Snow, 1983), this study found conflicting evidence. One possible explanation of this finding is that the method used to assess the child's decontextualized language was biased. A significant gender difference for decontextualized speech was noted favoring girls in this sample. Much of the decontextualized speech in this sample was related to pretend play with the dollhouse and dishes. Although boys played equally with these toys, their style of interaction may be different with these traditionally female toys.

This study found significant correlates of security of attachment and pragmatic language measures. Because these associations were observed only in the categorical

classification, regression analysis could not be performed including 4-year attachment as

a predictor. This study, as well as others (Beeghly & Cicchetti, 1994; Cicchetti &

Beeghly, 1987; Gersten, et al., 1986; Klann-Delius & Hofmeister, 1997; Meins, 1998;

Morisset, et al., 1995; Morisset, Barnard, Greenberg, et al., 1990; Morisset, Barnard,

Spieker, et al, 1990), also found significant differences between the mother interactional

style and security of attachment. As likewise found in this study, positive attributes of

mother-child interaction have also been directly correlated to language abilities

(Baumwell, et. al, 1997; Biringen, Robinson, & Emdi, 1994; Bus & van IJzendoorn,

1988; Coster, et al., 1989; Lucariello, 1990; Morisset, Barnard, Greenberg, et al., 1990;

Olson, Bates, & Bayles, 1984; Wells, 1985). This pattern of association with language

development may indicate an indirect influence of attachment on language abilities that is

mediated by maternal-child interaction.

Attachment status was only a weak predictor of the "OK" Total Language Score.

Attachment status in lower SES children may be associated with many unknown

variables, a conclusion suggested by a recent meta-analysis (De Wolff & van Ijzendoorn,

1997). From this study's cumulative risk analysis, it also does not appear that attachment

status served a protective function in this group as previously reported in other samples

(Bretherton, et al., 1979; Gersten, et al., 1986; Rosenblum, Bénony, & Mazet, 1997).

Security of attachment's protective function was hypothesized to compensate for lack of

adequate environmental stimuli. Although this study explored a rural, low SES

population, this population may not share the deficiencies associated with other low SES

populations. In this sample, social support was stable from the prenatal period to 4 years

($r = .37$, $p = .001$). This stable social support, instead of security of attachment, may

have served a protective function in language development through enhancement of maternal-child interaction. This interpretation is supported by a positive association between 4-year mother involvement and social support (in free play $r = .27$, $p < .05$).

Partnership presence/support may also be higher in this population than other populations seen as high risk. At 4 years, 68% of mothers were married to or living with the same partner they had been with at 15 months; 69% of mothers lived with the child's father. The benefits to the child from having another stable adult interactional relationship may diminish the relative protective influence of attachment to the mother.

Results from this study support the following conclusions: 1) This population had significantly less developed linguistic skills than other comparison groups, both standardized and low SES risk. Differences were found in both language structure and well as pragmatic functioning. 2) Rural Appalachian children's language abilities intercorrelated with many influences, including socioeconomic, maternal and child attributes. 3) Differences in language skills for this sample were predicted from a combination of SES, mother, and child characteristics. 4) Attachment status alone or in combination with risk factors did not serve a protective function for linguistic communication development in this group.

This study's intent was to explore linguistic communication in rural Appalachian preschoolers. It was diffuse in nature and did not focus on any one area of language development. Further study needs to focus on qualitative differences in the language measures explored in this investigation. Pragmatic language assessment should be designed to focus on factors that affect the quality of interaction, such as the ability to give contingent feedback, the ability to make appropriate responses, or the ability to

adjust ones' speech to coincide with others' styles. In addition, the assessment of

language decontextualization may need to be accomplished in a situation specifically

designed to promote this characteristic. One such scenario may be a situation in which

the child shared knowledge about nonpresent things or situations with unfamiliar

partners. Also, situations designed to evoke negative feelings could be used to evaluate a

child's ability to express negative internal state affect words with others.

One obvious area of future study would be a continued longitudinal investigation

of this population. Hart and Risley (1995) found significant early childhood predictors of

school-age language competence. Findings of such studies could have important

implications for early childhood intervention strategies.

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APPENDIX

Modified Strange Situation

Episode	Time	Who is in the room
episode 1	5 minutes	Mother and Child
episode 2	3 minutes,	Experimenter, Mother, Child
episode 3	3 minutes	(first separation) Experimenter and Child
episode 4	3 minutes	(first reunion) Mother and Child
episode 5	3 minutes	(second separation) Child alone (language not evaluated)
episode 6	3 minutes	Experimenter and Child
episode 7	5 minutes	(second reunion) Mother and Child