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Environmental influences on language development of high social-risk toddlers

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Environmental Influences on Language Development of

High Social-Risk Toddlers

by

Colleen Ellen Morisset

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Abstract

Environmental Influences on Language Development of
High Social-Risk Toddlers

by Colleen Ellen Morisset

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The effect of environmental risk on toddler's cognitive and linguistic development was investigated in a longitudinal study of 68 high-risk families. The risk factors examined were: family social status, mother's life stress and social and psychological functioning, quality of maternal input to the child's social experiences, and infant-mother attachment security. Child outcome measures included a parent-report vocabulary checklist (at 20 months), the Bayley MDI (at 24 months), observational measures of spontaneous language in conversation (at 30 months), and the Preschool Language Scale (at 36 months). The data indicate that quality of maternal input (as assessed by the HOME inventory and teaching and feeding assessment in the lab) is an important mediator between environmental risk and subsequent child competence. Specific relations among early interactive experiences and subsequent cognitive and linguistic abilities were examined within a framework of risk and protective factors. The results suggest that secure attachment operates as a protective factor but only among the more extreme cases in the exclusively high-risk sample. For the sample as a whole, significant sex differences favoring girls emerged for many language outcomes. The pattern of correlations between predictors and outcomes was different for boys than for girls and suggests that boys are more susceptible to the strengths and stresses in the early rearing environment.

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I wish to express my appreciation to Professsor Mark T. Greenberg for guidance in the preparation of this manuscript, for nurturing my interest in risk and protective factors, and for unceasing encouragement throughout my entire course of study. I am equally grateful to Professor Kathryn E. Barnard. Her dedication to bridge the distance between research and its practical application, thus improving the lives of infants and children, is an on-going inspiration. To Professors Philip Dale and Geraldine Dawson for giving generously of their time in serving on my committee and advising me over the past many years. To the John D. and Catherine T. MacArthur Foundation; its past, present, and future support has had an unparalleled impact on my training and professional development. My thanks also to the members of Nursing Research Programs for their assistance in the collection of the data reported herein, and to the families and children whose cooperation made this study possible.

CHAPTER I: BACKGROUND AND SIGNIFICANCE

Evidence gathered from more than two decades of research indicates that parent's emotional distress and lack of interpersonal, educational, and financial resources constitute potent risk factors for intellectual delay, school failure, and child psychopathology (Fendrich, Warner, & Weissman, 1990; Goodman & Brumley, 1990; Robins, 1966; Rutter, 1985a; Rutter, Yule, Quinton, Rowlands, Yule, & Berger, 1974; Sameroff, Seifer, & Zax, 1982). The results of these and other studies (e.g. Rutter, 1979; Sameroff, Seifer, Zax, & Barocas, 1987; Werner 1986) show that the incidence of developmental delay and maladjustment is significantly increased among children who experience multiple stress conditions. Although the odds against children growing up in adverse environments are well-recognized, little is known of the processes by which environmental risk influences early cognitive and linguistic development. With noted exceptions (e.g., Seifer & Sameroff, 1987), risk research tends to focus on associations at a single point in time between indices of risk (such as mother's lack of education or single parenthood) and one aspect of child competence (such as quality of social-linguistic interactions or performance on standardized tests of development). Consequently, relatively little is known of the processes over time by which social disadvantage is transmitted from the environment to the child. This study examines the role of parent-child interaction as a mediator of environmental risk for early language development.

The study of language development of high-risk children is important for several reasons. First, there is a close association between language and intelligence, and between language delay and low intelligence (Silva, 1981; 1988). In fact, tests of language and intelligence are often similar. For example, the

Weschler Primary and Preschool Scale of Intelligence (Weschler, 1967) consists of both verbal and performance subscales. Verbal subscales include direct assessments of child vocabulary, verbal comprehension, and sentence imitation. Likewise, standard tests of language tap many non-linguistic skills such as the ability to sustain attention over time, follow a series of directions, and perform logical operations such as grouping objects by size or function. Not surprisingly, correlations among IQ tests and tests of child language are quite high. Zimmerman and his colleagues report correlations of $\underline{r} = .66$ and .70 from two studies that compared the Preschool Language Scale (PLS) and the Stanford Binet Intelligence Scale (see Zimmerman et al., 1979). In addition to correlations with general cognitive ability, language skill is also one of the best predictors of school achievement, especially in reading (Tramontana, Hooper, and Selzer, 1988).

Longitudinal studies of language delay show that language difficulty at age three is associated with low IQ, reading problems, and behavior problems four to five years later (Silva & Williams, 1983; Stevenson & Richman, 1976). Language delay among preschool children is surprisingly common, recent studies report prevalence rates from 3 to 15 percent (Silva, 1988). Although lower family social status is frequently associated with preschool language problems (Golden, Birns, Bridger, & Moss, 1971), little is known about why this association exists (Dale, 1976). The goal of the present study is to examine the influence of environmental and experiential processes on language development of high-risk toddlers.

Studies of Parent-Child Language

Structural Features of Parents' Verbal Input

An important shift in theories of child language acquisition was prompted by detailed observations of natural-occurring mother-child conversation. The purpose of the initial studies was to examine the proposal that children, guided by innate skill, learned language solely on the basis of exposure to adult speech forms. Contrary to the assumptions of the time, adults' speech to children was found to be substantially different from that used among adults. Comparatively, mothers' speech to young children was reported to be more concrete, simple, redundant, and of higher pitch and exaggerated intonation contour (Ferguson 1977; Garnica 1977; Snow & Ferguson, 1977). These findings strongly suggested that the environment could offer more than just passive support to the task of language learning.

The exact role of a special "motherese" register in shaping early lexical and syntactic development continues to fuel a lively debate. Investigators have considered the predictive effects of many aspects of maternal speech including: the use of nouns and pronouns (Bloom, Lightbown, & Hood, 1975; Furrow & Nelson, 1984; Furrow, Nelson, & Benedict, 1979), sentence length and type, intelligibility, and structural complexity (Hoff-Ginsberg, 1990; Hoff-Ginsberg, 1986; Newport, Gleitman, & Gleitman, 1977). Evidence for a direct relationship between characteristics of motherese and child language acquisition is largely inconclusive and limited by a number of methodological problems such as the use of small sample sizes, wide ranges in developmental level, and varying procedures used to construct measures of child language gain. In recognition of these problems, Gleitman, Newport and Gleitman (1984), undertook a careful

reanalysis of the empirical data central to the motherese debate. They conclude that the structure of mothers' speech appears to have little direct effect on individual differences in language learning. Based on their findings, Gleitman and her colleagues have gone so far as to suggest that it is the child, rather than the mother, who plays a determinant role in when and what verbal input is utilized in language learning.

An alternative explanation for the simplification in mothers' speech to children is that mothers' want children to attend to and comprehend what is being said to them (Cross, 1977). In this sense, motherese can be considered an indirect measure of child failure, with less competent listeners eliciting more simple speech (Bates, Bretherton, Beeghly-Smith, & McNew, 1982; Newport et al., 1977). Snow (1972) suggests that the use of pitch modification, word-order, and topics in the "here-and-now" can highlight salient aspects of meaning and thereby, potentially reduce the information processing load on the infant. Such speech modifications have been observed with both boys and girls (Phillips, 1973), in many cultures, across social classes (Snow, 1977) and even by children as young as 4 years old (Shatz & Gelman, 1973; Sachs & Devin, 1976).

Although the simplification of verbal input may be a precondition for language learning, it cannot account for many other structural features of speech addressed to young children (Bretherton, Bates, Benigni, Camaioni, & Volterra 1979; Gleitman, et al., 1984; Hoff-Ginsberg & Shatz, 1982). Studies of mother-child conversation indicate that some aspects of input, such as syntax, may be less well-tuned to the child's degree of attention and understanding than would be expected if comprehension were the primary goal (Wells, 1980). Snow (1977) presents longitudinal data on maternal speech to infants ages 3-20 months;

contrary to what would be expected, she reports that mother's syntactic complexity (MLU) showed almost no change over the 15-month period, a period in which the child's level of comprehension increased dramatically. Likewise, mothers' use of interrogatives, declaratives, and imperatives were unrelated to linguistic changes in the child. Snow claims that the nature of mothers' speech reflects more than a desire for the child to attend and comprehend verbal input; it reflects mothers' desire to promote reciprocal communication. In Snow's view, mothers' motivation to keep conversation flowing can explain many more complex, but nonetheless common features of mothers' discourse, including the frequent use of interrogatives and other devices that pass the speaking turn on to the child such as tag questions, greetings and post-completers, e.g. "hmm?". Unlike measures of mothers' syntax, these aspects of mothers' discourse are more frequently found to correspond to the language level of the child (Cross, 1978; Moerk, 1974).

Functional Characteristics of Parents' Speech

McDonald and Pien (1982) provide further evidence that maternal speech is shaped primarily by communicative goals. Based on analyses of the functional meaning of mothers' utterances in conversation with toddlers, they conclude that the communicative intent of maternal speech differs systematically from a concern with directing the child's behavior to eliciting conversation. In a related investigation, individual differences in the functional intent of mothers' speech were found to be relatively stable over time (Olsen-Fulero, 1982). Arguments that favor communication, rather than language-teaching strategies as the source of maternal speech style do not negate the importance of adult input for language acquisition. To the contrary, a parental attitude that encourages

reciprocal verbal interaction and validates communicative overtures by acknowledging and elaborating children's topics of conversation is associated with early linguistic gains (Farran, 1982; Snow, Dubber, & DeBlauw, 1982). In contrast, highly controlling and directive parental input has a negative impact on language acquisition (Cross 1984; Nelson 1973; Snow, Midkiff-Borunda, Small, & Proctor, 1984).

Olsen-Fulero (1982) speculates that mothers' conversation style might directly effect children's language development. Suggestive evidence is provided by Hoff-Ginsberg (1985; 1986; 1990) who identified specific links between aspects of maternal speech and syntactic progress among two-year old children. Using residual gain scores to assess linguistic growth over a 6-month period, Hoff-Ginsberg reports that functional properties of maternal input, specifically the use of verbal reflective questions that repeat part of the child's prior utterance (e.g. you did?, it is good, isn't it?), were related to increases in children's use of auxiliary-verb phrases (e.g. can reach, is going, gonna drink, ought to do). In contrast, structurally defined aspects of maternal speech such as the frequency of self-repetitions and wh- questions were associated with increases in children's use of verb phrases.

It appears that the form and amount of parents' verbal input are highly related. Several studies show that mothers who vocalize more are more apt to provide semantically contingent speech (including the use questions and comments that follow the child's line of regard) and are less likely to use imperatives that function to cut off the child's speaking turn (Adams & Ramey, 1980; Barnes, Gutfreund, Satterly, & Wells, 1983; Olson, Bates, & Bayles, 1984). Wells (1980) reports that the amount of adults' speech to children correlates

highly with the amount of children's speech and, that the amount of speech (particularly the child's speech) is significantly related children's rate of language development. Frequency of maternal input has also been associated with children's acquisition of specific grammatical structures (Moerk, 1980), vocabulary size (Olson, Bayles, & Bates, 1986), and performance on standardized tests of language development (Kaye & Charney, 1981; McCartney, 1984).

A consistent finding of longitudinal studies is that rich and responsive verbal experience is related to subsequent child competence (e.g. Farran & Ramey, 1980). Clarke-Stewart, Vander-Stoep, and Killian (1979) report that in each of five different samples, stimulating and responsive maternal input was predictive of multiple child cognition (IQ), language (MLU) and positive interaction with mother. Wells' (1980) longitudinal study of children from 15 to 60 months revealed that parents' semantically contingent feedback was highly predictive of children's rate of syntactic development. In addition, several investigators have documented concurrent and predictive relations between mothers' involvement and verbal responsiveness, as measured by the HOME scale, and children's performance on standard measures of cognitive and psycholinguistic ability from 6 to 54 months of age (Elarado, Bradley, & Caldwell, 1975; Elarado, Bradley, & Caldwell, 1976a; 1976b).

The precise way in which parents' responsive and contingent verbal interaction aids children's language development is not fully understood. Cross (1984) suggests that a primary process in language learning is children's active comparison of their utterances with those of others. She argues that semantically contingent speech, which elaborates the child's verbal behavior,

provides the child with a meaningful match. In contrast, parental directives, which present unrelated information, do not. Alternatively, the impact of elaborating vs. controlling speech may indicate a more general effect of parents' interactive style. For example, a parenting attitude that encourages conversation through the use of contingent and facilitative speech could provide a social-emotional climate in which communication and thereby, further linguistic development, is valued and encouraged.

Interest in parental attitudes and parent-child communication began with the work of Bernstein (1960) and Hess (1964). They argued that social experience is mediated by parents' disposition toward encouraging children to interact with their environment on a verbal-cognitive level. In their view, the linguistic form of parent-child communication influences what and how the child learns. Bernstein (1960) identified two modes of parental verbal behavior that are similar in their conversation goals to the eliciting and controlling styles described by McDonald and Pien (1982). In Bernstein's terms, restricted codes rely heavily on status-oriented statements that tend to restrict conversation and thought. Sentences are often short, simple, and require little or no verbal reply. In contrast, elaborated codes reflect a style of interpersonal interaction that requires a wide range of linguistic and behavioral responses. For example, elaborated messages are more likely to provide information about intention and consequences, the "why" of behavioral requests. Hess and Shipman (1965) contend that elaborated messages benefit cognitive growth because they stimulate more complex cognitive-linguistic processes and promote continued dialog by engaging the child in reflection and active problem-solving.

Teaching

In addition to frequent and reciprocal adult-child communication, implicit and explicit teaching also plays a role in children's language acquisition (Moerk, 1974; 1976). Properties of maternal speech that serve indirect teaching functions include imitations, expansions, and recasts of child utterances. Expansions and recasts are utterances that preserve the semantic content of the child's prior utterance but alter the syntactic form. For example, the adult version "yeah, this is Mommy's juice" is an expansion of the telegraphic child utterance "Mommy juice". Newport et al. (1977) report significant positive correlations between mothers' use of expansions (with exact or partial imitations) and vocabulary growth. More frequently, parent's use of expansions and recasts have been associated with children's syntactic development, specifically the use of auxiliary verbs (Barnes, et al., 1983; Nelson, 1973; Newport et al., 1977).

The mechanism by which expansions facilitate language production is not known, although recent research suggests several, non-mutually exclusive possibilities. First, extending children's utterances (often with a questioning intonation, e.g. "you hurt your finger?") allows adults to check their interpretation of the child's intent and insures meaningful and reciprocal dialog (Wells & Gutfreund, 1980). Second, expansions, recasts, and repetitions can maintain a single topic across several conversational turns. Through their participation in dialog, children experience how individual utterances are woven together to form a larger, coherent whole. Such interactive experiences may be related to children's subsequent discourse skills including event descriptions and emergent literacy skill (Snow, unpublished). In addition, by sustaining a topic of interest, expansions and recasts may also benefit vocabulary growth. It is

presumed that children learn vocabulary best during periods of joint attention because, when the focus of attention is mutual, mothers are most likely to encode those aspects of the environment that are already salient to their children (Tomasello & Farrar, 1886; Tomasello & Todd, 1983). Finally, expansions may facilitate language development by eliciting children's imitations (Folger & Chapman, 1978). Studies of spontaneous imitations report that children tend to imitate forms that are beginning to emerge in their own spontaneous speech (Bloom, Hood, & Lightbown, 1974; Folger & Chapman, 1978). Bloom et al. (1978) suggest that children's selective imitation helps establish relatively new aspects of structural and lexical knowledge. As children become more proficient at speaking, the frequency of maternal expansions diminishes (Seitz & Stewart, 1975).

Observations of middle-class parents and their children during games and routines events show that adults also take advantage of opportunities to teach language directly (Messer, 1978; Murphy, 1978; Nino & Bruner, 1978). Attempts at direct instruction are most successful when the goal is to increase vocabulary (Wells & Gutfreund, 1987). One common approach to vocabulary teaching is deictic naming, in which adults isolate and name referents through pointing and naming, e.g. "those are kitties", "see the doggy?", or at older ages, through a questioning strategy, e.g. "what's the doggy say?" Nelson (1973) suggests that deictic naming is most effective when adults verbally encodes those aspects of the environment that match the child's dominant cognitive structures. The potency of deictic naming is illustrated by Newport et al. (1977) who report a correlation of $\underline{r} = .62$ between mothers' use of deixis and the vocabulary size of girls, ages 12-27 months. Verbal routines, naming games, and songs undoubtedly

derive their power for language teaching from features that sustain interaction including ways to establish and maintain joint attention, simple and redundant verbal exchanges, and specific devices such as interrogatives and fill-in-the-blanks that directly elicit the child's participation (Newport et al., 1977).

SES Differences

Socioeconomic (SES) differences have been found for many aspects of maternal speech thought to promote children's language acquisition. Compared with middle-class mothers, lower-class mothers are reported to be less stimulating and less responsive (Barnes et al., 1983; Ramey, Farran, & Campbell, 1979; Tulkin & Cohler, 1973; Tulkin & Kagan, 1972), less sophisticated in language use (Hess & Shipman, 1965), more restrictive, more controlling (Bee, Van Egren, Streissguth, Nyman, & Leckie, 1969; Clarke-Stewart 1979, 1973; Schachter, 1979) and less descriptive (Snow, Arlman-Rupp, Hassing, Jobse, Joosten, & Vorster, 1976). A recent study by Hoff-Ginsberg (1989) indicates that social status differences in mothers' speech to children can not be accounted for by differences in interactive setting or mothers' beliefs about child-rearing. Rather, she suggests that SES differences in maternal speech are due to more fundamental differences in mothers' conversational and social skills with both children and adults.

The relation between SES and parental speech style is often accounted for in one of two ways. Bernstein (1960), and others (Golden & Birns, 1968; Maccoby, 1980; Olim, 1970) propose that low SES is a marker for a constellation of education, social, and economic disadvantages that has a negative impact on parental functioning and the nature of parent-child communication. Alternatively, others speculate that social class differences in parenting style and

in child competence are due in part to the inclusion of high-stress, multi-problem families in studies of lower-class groups. For instance, Maccoby (1980) speculates that parenting styles would appear more similar across social strata if comparisons excluded high-stress, multi-risk families from lower-class groups. Conversely, arguments that favor a more general association between parental style and child competence would be strengthened if the same parental behaviors predicted child outcomes between and within social classes. This latter approach was taken by Bee et al. (Bee, Barnard, Eyres, Gray, Hammond, Spietz, Snyder, & Clark, 1982) in an longitudinal examination of child language and IQ within and across two levels of maternal education. They report that the quality of the home and ratings of parent-infant interaction in the first year of life were predictive of 4-year child outcomes in both high (more than high school) and low education (high school or less) subsamples. They found that qualitative differences in mother-child interaction predicted child outcome above and beyond the effect of social class as indicated by maternal education.

Studies of Infant-Mother Attachment and Child Language

The relation between the affective quality of early interpersonal experiences and children's language and cognitive development has also been examined within the framework of attachment theory. Significant positive relations between secure infant-mother attachment and preverbal communication were first noted by Bell and Ainsworth (1972) who found that responsive parenting in the first months of life was associated with infants' clear and extensive gestural communication at ages 9-12 months. Further attempts to elaborate the theoretical association between secure attachment and children's language have had mixed results. Studies of children ages 10 to 36 months report positive

relations between attachment security and some aspects of language, e.g., complexity of gestural communication in infancy, observed vocabulary size, and percentage of sentence-types that are questions, but not others, e.g., no significant relation between attachment and mean length of utterance, type-token ratio, or referential vs. expressive language style (Bretherton et al., 1979; Connell, 1977, Main, 1973, & Pentz, 1975 as reported in Bates et al., 1982). Other studies (e.g., Clarke-Stewart, 1973) found no association between infant attachment classification and longitudinal assessments of child language and cognition over the second year of life.

One possible explanation for the lack of consistent findings from studies of attachment and child language is that the results are limited by threshold effects (Bretherton et al., 1979). Bretherton and her colleagues speculate that the range of variability in attachment security and in maternal language style among the normal developing, low-risk dyads typical of this research is too narrow to reveal the theoretical association between attachment and language. In short, most caregivers may provide the necessary impetus to set language-learning on its way.

Researchers have recently reexamined the relation between attachment security and developing conversational skill among lower-SES maltreated and nonmaltreated toddlers (Coster, Gersten, Beeghly, & Cicchetti, in press; Gersten, Coster, Schneider-Rosen, Carlson, & Cicchetti, 1986). In contrast to findings from studies of low-risk families, these researchers report many attachment-related language differences in child-mother conversation. For example, independent of maltreatment status and SES, secure toddlers spoke more than insecure toddlers, made more meaningful contributions, and had a

larger, more diverse vocabulary. Analyses of the same sample by Cicchetti and Beeghly (1987) also revealed differences in the children's ability to discuss internal states and feelings. The capacity to label and share information about internal states (e.g. emotions, intentions, and thoughts) generally emerges during the second year of life and expands dramatically during the third (Bretherton & Beeghly, 1982). Studies of children at-risk suggests that secure attachment may influence this particular linguistic achievement. Cicchetti (1990) reports that the securely attached toddlers used proportionately more utterances that labeled or discussed internal states, had a more elaborate internal state vocabulary, and were more likely to use internal state language in reference to both self and other at each of three longitudinal assessments of mother-child play (at 24, 30, and 36 months of age). Taken in sum, the studies of attachment and language suggest that secure attachment may influence development in high-risk families, but have less impact in low-risk families.

The empirical investigation of clinical or "at-risk" populations provides a unique opportunity to challenge and extend our knowledge of environmental influences on early language and cognition gained primarily through research with healthy, socially advantaged children. Through risk research, it may be possible to separate those influences that promote optimal outcomes both in the presence and absence of adversity from those that can buffer children who grow up in poverty and extreme life stress. In addition, the study of normal developmental processes such as the acquisition of language can contribute to our understanding of the transactions that occur over time to potentiate risk conditions.

CHAPTER II: STUDY DESCRIPTION AND AIMS

The subjects of this study were participants in a research project initially designed to test the relative effectiveness of two treatment models designed to prevent socio-emotional disturbance, developmental delay, and attachment disorders in infants born to families at risk for these problems. All study mothers had initiated contact with public health department clinics during pregnancy. Mothers who met the study criteria were randomly assigned to one of two intervention programs. Due to ethical reasons, there was no control group from which intervention services were withheld. Description and preliminary findings of the prevention phase of the study, a comparison of home-based intervention programs conducted throughout pregnancy and the infant's first year, are presented elsewhere (see Booth, Mitchell, Barnard, & Spieker, 1989). The home and lab assessments presented here occurred when the children were 1, 2, and 3 years of age and thus followed the intervention phase of the project. Neither intervention group nor amount or type of nursing service was systematically related to any of the child outcome measures to be discussed. Thus, for purposes of this report, the intervention groups have been combined.

The major objective of the present study was to examine the impact of environmental risk on toddlers' cognitive and linguistic skill. Three conceptually related but theoretically independent sources of risk were determined at the outset of this investigation. The most distal level of risk to the child reflects the broad ecological context characterized by standard demographic variables such as family social status and mother's education. Less distal are aspects of the mother's general social-emotional functioning and life stress. The most proximal level of risk reflects maternal contributions to the child's social experience, and

the affective nature of the mother-child relationship. Subsumed in this level of risk are assessments of mother-child interaction, the home environment, and the social-emotional quality of the relationship as reflected by infant-mother attachment security (see Table 1). It was hypothesized that the most proximal level of risk, quality of affective and learning experiences, mediates the relation between more distal levels of risk (viz., family demographics and mother's psychosocial functioning) and subsequent child outcomes.

Within this overarching framework of distal and proximal influences, three specific questions were addressed. The first compares the effect of current risk conditions with that of enduring psychosocial stress. It was hypothesized that chronic environmental hardship would have a greater negative influence on child competence than risk measured at a single point in time. In accord with previous research (Golden & Birns, 1968; Sameroff & Seifer, 1983; Slaughter, 1983; Yeates, MacPhee, Campbell, & Ramey, 1983), the influence of the social environment on children's cognitive and linguistic skill was expected to be most pronounced in assessments made after the child's second birthday.

The second question concerns the potential differential effect of social experience on various components of overall language facility. Hinde (1976) has suggested that the roles of mother-as-nurturer and mother-as-teacher are theoretically independent. For example, mothers vary in the extent to which they engage in imaginary games and physical play with their children; likewise, they vary in didactic style. It is possible that these qualitative differences in mother-child interaction are related to different aspects of early language skill. For instance, formal aspects of language, such as vocabulary size or grammatical knowledge, may be more related to explicit or implicit maternal teaching and the

TABLE 1: PROPOSED SOCIAL INFLUENCES ON CHILDREN'S INTELLECTUAL DEVELOPMENT

distal	1.	Family Demographics (SES)
.		
.	2.	Family Risk Due to Mother's Life Stress, Lack of Personal Resources, and Emotional Distress
.		
.		
proximal	3.	Quality of Mother's Contribution to the Child's Interpersonal Experiences
		a. direct teaching, verbal input, frequency and variety of daily activities
		b. affective quality of their relationship as reflected by infant-mother attachment

intellectual character of mother's verbal input. In contrast, the ability to use language in casual social interaction may be more related to the affective nature of children's early interpersonal experiences. Thus it was hypothesized that mother's ability to provide rich and varied learning experiences would be related to more formal, structural aspects of child language, while the affective quality of the infant-mother relationship would more related to measures of the child's conversational skills (e.g., the quantity and content of mother-child conversation).

Third, the effect of early vocabulary ability on continued language and cognitive growth was examined. It has been proposed that children bring certain "self-righting" techniques to the task of language learning (Lieven, 1984). The emergence of first words, which commonly occurs around the first birthday, provides nearly all children with tools to more effectively elicit the types of social interaction that facilitate language learning. A toddler's proclivity to exercise developing communicative skills, to initiate and sustain interaction by repeating self and others, talking a lot, and asking questions, e.g. "up" and "whas dat?', could conceivably enhance the child's own linguistic environment. Thus it was predicted that individual differences in children's communication initiatives would have an indirect effect on linguistic competence in that highly initiating children would be more likely to procure the types of verbal exchanges that lead to further knowledge. In this way, the advantage of early entry into the linguistic community may be sustained over time.

A conceptual model of risk and protective factors was used to examine additional questions about the complex relations between social influences and child competence. Researchers working with risk populations have begun to

articulate a transactional model of potentiating and protective factors to describe the consequences and processes by which risk conditions can lead to both pathologic and normal developmental outcomes (Cicchetti & Rizley, 1981; Garmezy, Masten, & Tellegen, 1984; Rutter, 1979). This view of adaptation and competence is based on the assumption that the impact of risk depends on an individual's response to the risk condition. Factors that can modify the sequelae of stress and adversity include the nature of the stressor (chronic vs. acute; one vs. many) and numerous intra- and interpersonal factors that can exacerbate or attenuate the deleterious effect of the risk condition. Factors that increase the effect of stress (either through simple additive or catalytic interactions) are termed "vulnerability" factors; those that reduce the effect of stress are termed "protective" factors (Rutter, 1985a). A critical distinction between protective factors and more general positive influences on development is that protective factors exert their influence only in the presence of risk conditions (Rutter, 1985a). Initial studies by Rutter indicate (1970; 1975) that positive interpersonal relationships can act as a protective factor to mitigate the effect of extreme psychosocial stress on children's socio-emotional functioning.

In the present investigation, two hypotheses were drawn regarding risk and protective factors in children's early language and cognitive development. First, in light of Rutter's findings (1985a), it was hypothesized that secure infant-mother attachment might also buffer young children's cognitive development, but only among the most extreme cases of this high-risk sample. More precisely, it was hypothesized that secure infant-mother attachment would act as a moderator in the relation between environmental risk and child language and cognition (see Baron & Kenny, 1986, for a discussion of the distinction between

mediator and moderator variables). Second, it was hypothesized that environmental stress would have a greater negative influence on boys' development than on girls'. Although the reason for their greater vulnerability is unclear, boys consistently show more severe and prolonged behavioral disturbances in response to a variety of life changes including entry into daycare, the birth of a sibling, and parental discord and divorce (Hetherington, 1984; Rutter, 1970; 1979; 1985a; Wolkind & Rutter, 1973). The evidence for sex differences in intellectual development is less strong, but when differences in verbal ability have been reported, they generally favor girls and are more common among families of lower social status (Maccoby & Jacklin, 1974). Thus it may be the case that relatively similar social experiences have different consequences for boys and girls.

CHAPTER III: METHODS

Participants

The participants in this research were part of an initial group of 147 high social-risk women who sought prenatal services from any of four Seattle-King County Public Health Department clinics. A public health nurse interviewed all potential participants. Women who were 22 weeks pregnant or less and had one or more of the following characteristics were invited to participate (percentage of the sample in parentheses): (a) alcohol or drug addiction (8%), (b) psychiatric diagnosis (4%), (c) previous child maltreatment (3%), (d) low educational level ($\leq$ than high school) and low social support (48%), (e) young ($<$ 20 years) and low social support (16%), (f) low income and low social support (67%), and (g) low educational level, young, and low income (24%). Social support was assessed by asking mothers about their ability to share feelings and concerns and obtain emotional support during pregnancy.

At intake, the intervention group consisted of primarily white (90%) women from lower socioeconomic backgrounds who had not completed high-school (50%), who were without partners (75%), and who were supported by public assistance (75%). They tended to live chaotic and disorganized lives, to live in crowded conditions, move frequently, experience many crises, accidents, illnesses, and high levels of marital (or partner) discord. The infants (49% male; 50% first born) were primarily fullterm; the mean gestational age was 39.7 weeks. Six (5.1%) of the infants were born prematurely; however, none of these weighed less than 1500 grams.

Over the course of the intervention (between intake and age 1 year), 65% of the original sample was retained. Comparisons of those women who dropped of

the intervention with those who did not indicated that the groups did not differ on any of the intake demographic variables. The primary reasons for attrition were: infant factors, such as abortion, miscarriage, death, and adoption (8%); moving out of the area (10%); subject refusal (12%); inability to locate the subjects (3%), and other (2%).

The subjects included in this report are 68 mother-infant pairs who completed the intervention and participated in follow-up evaluations to at least age 30 months. The self-reports, interviews, observational measures, and developmental assessments used at each age period are shown in Table 2; they are described in detail in the next section. Of the 68 subjects seen through age 30 months, 66 were also seen at 12 months, 62 at 24 months, and 55 at 36 months of age. The mothers in this subset were slightly older (1.4 years) than those who dropped out of the original sample. The groups did not differ on any other intake demographics. Sample characteristics (demographics, family composition, and infant perinatal status) can be found in Table 3.

Procedure

Assessments of Demographics and Family Composition

Mother's age, education, income, and social status constitute distal markers of environmental risk. The mean age of mothers' in this study was 22 ($\pm$4.2) years; they had completed an average of 11.2 ($\pm$1.7) years of schooling. Annual family income was rated on a 7-point scale derived for this study where 0 = none and 6 = \$15,000 - 19,000. Using this scale, the average income was between \$3,000 and \$7,500 per year (in 1983 dollars); most of the sample were receiving welfare support. Family social status was based on Hollingshead's Four-Factor Index of Social Status (Hollingshead, 1975). The overall score, which takes into

TABLE 2: ASSESSMENTS BY CHILD'S AGE IN MONTHS

	PRENATAL	1-3M	12M	13M	20M	24M	30M	36M
FAMILY DEMOGRAPHICS								
Social Status	x		x			x		x
MATERNAL SOCIAL RISK								
Depression		x	x			x		x
Negative Life Events		x	x			x		x
Conversation Skills with Adults		x	x			x		
Personal Resources		x	x			x		x
Community Life Skills			x			x		x
QUALITY OF MATERNAL INPUT								
NCAT Teaching Scale			x			x		x
HOME Inventory			x			x		x
Mother's Conversation Style				x	x		x	
Infant-Mother Attachment				x	x		x	
CHILD LANGUAGE								
Standardized Test Scores					x	x		x
Conversation Measures				x	x	x	x	

TABLE 3: SAMPLE CHARACTERISTICS - DEMOGRAPHICS AND FAMILY COMPOSITION BY CHILD'S AGE AND PERINATAL STATUS

DEMOGRAPHICS	N	PRENATAL M (SD)	24M M (SD)	36M M (SD)
Mother's Age (years)	68	22.0 (4.2)		
Mother's Education (years)	68	11.2 (1.7)		
Family Income[a]	68	2.7 (2.2)		
Social Status	68,65,49[b]	24.1 (8.1)	26.1 (7.8)	27.0 (8.9)

Note. [a] Yearly Income Scale (in 1983 dollars): 0=none; 1=<$3,000; 2=$3,000-4,999; 3=$5,000-7,4999; 4=$7,500-9,999; 5=$10,000-14,999; 6=$15,000-19,999.

[b] Sample size for social status measured prenatally, at two, and three years is 68, 65, and 49 respectively.

FAMILY COMPOSITION	N	VALUE	BIRTH-24M PERCENTAGE OF SAMPLE
Parity (% Firstborn)	68		32.0
Number of Other Children in Household at Birth	68		
		0 others	59.0
		1 other	22.0
		2 others	15.0
		3 others	4.0
Number of Years Mother Without Partner - Intake to Age 2	68		
		0.00 years	40.0
		0.75 years	13.0
		1.00 years	4.0
		1.50 years	10.0
		1.75 years	6.0
		2.00 years	n/a
		2.50 years	26.0

PERINATAL STATUS	N	M OR %	(SD)
Gestational Age (Weeks)	53	39.7	(1.8)
Birthweight (Grams)	67	3450.2	(490.8)
Weight for Height Percentile	48	.8	(.2)
Sex (% Male)	68	52.0	
Apgar (5-Minute)	57	8.9	(.5)

account occupation, education, sex, and marital status, averaged 24.1 (±8.1) at intake and increased slightly over the next three years.

Thirty-two percent of the children were first born, and at birth, 59% were the only child in the household. By age two years, 60% of the mothers had spent at least 3/4 of a year without a partner (recall Table 3).

Assessments of Mother's Life Stress, Personal Resources, and Emotional Distress

Five measures were used to characterize mother's life stress, social, and psychological functioning; samples of each instrument are provided as Appendices A through E: the Beck Depression Inventory (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961), Negative Life Events as assessed by the Life Experiences Survey (Sarason, Johnson, & Siegel, 1978), the Personal Resources Questionnaire (Brandt & Weinert, 1981), the Adult Conversational Skills Scale, and Community Life Skills (Booth, Mitchell, Barnard, & Spieker, 1989). The data were collected during home visits by four female project evaluators all of whom were trained to criterion of at least 85% interobserver reliability on all measures. The assessments were completed within three months after the infant's birth, and again at ages 12, 24, and 36 months.

The Beck Depression Inventory (BDI: Beck et al., 1961) consists of 21 items each designed to represent an overt behavioral symptom of depression. The total score, which can range from 0 - 63, reflects both the increasing number and severity of symptoms. A score of 10 is the suggested cut-off for mild depression. Concurrent validity, based on comparisons of BDI scores and clinical assessments, ranges from .61 to .73 (Beck & Beamesderfer, 1974). The Beck Depression Inventory was designed for use in psychiatric populations and has

been validated on nonpsychiatric groups as well (Bumberry, Oliver, & McClure, 1978). In the present study, the BDI was completed by the mothers when their infants were 6-weeks and 12, 24, and 36 months of age.

Negative Life Events refers to the total negative life changes score from the Life Experiences Survey (LES: Sarason et al., 1978), a survey designed to assess both positive and negative life change. Respondents are asked to indicate which of 61 events occurred during the past year, label them as good or bad, and then indicate the impact of each event according to a 0 - 3 point scale. Sarason et al. (1978) report significant correlations between the negative change score from the LES and anxiety, academic achievement, social desirability, and personal maladjustment.

The Adult Conversational Skills Scale (ACS Booth et al., 1989), is a 63-binary-item observational record of the mother's conversational skill with a female evaluator that developed for the intervention component of this project. Items pertain to communication such as greeting, nonverbal signals and affect, verbal communication, and listening. The ACS was pilot-tested in a previous prevention study (the Newborn Nursing Models project; see Barnard, Booth, Mitchell, & Telzrow, 1988). In the Newborn Nursing Models project, mother's social skills were significantly associated with the quality of mother-child interaction and with child developmental outcomes (Mitchell, 1987). The ACS was completed when the infants were 3, 12, and 24 months of age.

The Personal Resources Questionnaire (PRQ: Brandt & Weinert, 1981) is a 25-item Likert scale designed to assess social support. It evaluates a person's ability to share concerns with another, intimacy, opportunities for nurturance, reassurance of self-worth, and assistance and guidance; the total score can range

from 25 to 175 points. The PRQ was completed by the mothers when their infants were 3, 12, 24, and 36 months of age.

The Community Life Skills Scale (CLS: Booth et al., 1989) is a 32 binary-item scale that the evaluator completed on the basis of maternal report. Like the Adult Conversation Skills scale, Community Life Skills was also developed for the larger intervention project. The CLS emphasizes the social skills necessary for participation in community living in the areas of transportation, budgeting, emergency services, community interests and hobbies, and regularity and organization in the routines of daily living. In a previous study (see Barnard et al., 1988), the CLS was pilot tested. In that study, mother's scores on the Community Life Skills scale were significantly and positively related to children's concurrent 24-month Bayley MDI. In this study, the scale was completed when the infants were 12, 24, and 36 months of age.

Quality of Maternal Input

Three measures were used to characterize the quality of mother's contribution to the child's social experience. These included her scores on a teaching task, the social environment subscales of the HOME inventory (Caldwell & Bradley, 1978), and a measure of mother's verbal style in conversation with her child during a snack.

Teaching and the home environment. Observational record of mother-child teaching occurred in the home when the infants were 12, 24, and 36 months of age. The teaching tasks were standardized situations evaluated live by female staff members trained in the use of the Nursing Child Assessment Teaching (NCAT) Scales (Barnard, Eyres, Lobo, & Snyder, 1983; Barnard et al., 1989; a sample scale is provided as Appendix F). The NCAT scale, a valid predictor of

later parent-child interaction and of child cognitive outcomes (see Barnard, et al., in press), measures maternal and child contributions to dyadic interactive quality. It consists of 73 binary items. Parent items are designed to assess sensitivity and responsivity to children's cues and parents' ability to promote social and cognitive development. Child items reflect clarity of cues and responsivity toward the parent. Only the parents' scores will be discussed in this report.

The HOME inventory (see Appendix G: Caldwell & Bradley, 1978) was also completed as part of the 12, 24, and 36 home visits. The HOME is a 45-binary-item inventory that assesses mother-child interaction patterns, family habits and lifestyle as described by the mother, and observed aspects of the orderliness and enrichment of the home. The total score indicates the overall quality of the child's animate and inanimate environment. Three subscales are direct measures of the child's social environment: Emotional and Verbal Responsivity of the Mother, Avoidance of Restriction and Punishment, and Maternal Involvement with the Child. In the present study, scores on these subscales were summed to form an overall "social" subscale. The internal consistency of the social subscale, based on Cronbach's alpha, was .45, .58, and .70 at 12, 24, and 36 months respectively.

Mother's verbal style. At 13, 20, and 30 months of age, the infants and their mothers were videotaped through a one-way mirror in a series of lab assessments including: free-play, mastery motivation tasks, a snack interaction, and a separation and reunion sequence. Of these lab procedures, only the latter two will be discussed.

The snack episodes, transcribed by a coder who was naive to all other mother and child assessments, were used for utterance-by-utterance analysis of mother-child conversation. Interaction during snack was selected for language analysis because mealtimes are routine events, unconstrained by situational demands, and represent naturally-occurring opportunities for conversations between adults and children (Barnes et al., 1983). The snack episodes ranged in length from 5 to 10 minutes. The average snack lasted about 8.5 minutes when the infants were 13 months of age, 5.5 minutes at 20 months, and 6.5 minutes at 30 months of age.

Mother's speech to her infant at 13 and 20 months of age was coded according to its functional intent to encourage or elaborate infant communication through the use of questions and comments, or to control or redirect the infant's behavior through the use of direct and indirect commands (Morisset, unpublished; see Appendix H for a copy of the coding manual). The coding criteria are similar to those used by McDonald and Pien (1982) who have demonstrated considerable independence of these two conversational goals, as well as short-term stability of maternal style (Olsen-Fulero, 1982). Interobserver agreement, based on Pearson product-moment correlation of the frequency of utterance-type across a representative 15% of the cases, was above .95 for each of the four utterance-types. The summary measure of maternal style used in this report was the proportion of mother's questions and comments relative to the proportion of her verbal commands.

At 30 months, the snack interactions were transcribed according to the conventions of CHAT (Codes for the Human Analysis of Transcripts), the computer-based transcription system of the CHILDES (Child Language Data

Exchange System) Project (see MacWhinney & Snow, 1985). The CHAT system facilitates automatic analysis of transcripts by a set of computer "CLAN" (Child Language Analysis) programs. Three traditional measures of maternal language were computed directly by CLAN programs. These included mean length of utterance in words, a measure of structural complexity based on the entire corpus (MLU), mean length of the longest five utterances (MLU-5), and a measure of lexical diversity known as Type-Token Ratio (TTR). In this study TTR was based on the mother's first 200 words. CLAN programs were also used to calculate the mean length of speaking turn in utterances (MLT). In addition to these computer-assisted analyses, the relative frequency, content, and attributional focus of language used to discuss internal states and feelings was coded by hand. The summary score used to reflect mother's internal state (IS) language was IS density: the proportion of mother's utterances that contained one or more IS words relative to her total number of utterances. The coding guidelines for all 30-month language measures are provided in Appendix I.

Infant-Mother Attachment Security

Mothers and children were videotaped in a modified version of the Ainsworth Strange Situation (Ainsworth et al., 1978) as part of the 13, 20, and 30-month lab visits. The procedure consists of a series of increasingly stressful, three-minute separations and reunions between mother and child, and between an unfamiliar adult and the child. In this study, the method of the Strange Situation was modified slightly: first, it followed other lab assessments such as the snack, and second, the stranger reunion (before the mother's second reunion) was omitted in order to save time.

All attachment coding was done by observers blind to previous attachment classifications. The 13 and 20-month Strange Situations were classified according to traditional patterns of attachment: avoidant ("A"), secure ("B"), and ambivalent ("C") (Ainsworth et al., 1978), with the inclusion of the new "D" (disorganized/disoriented-insecure) category described by Main and Solomon (1990). Disagreements were resolved by consensus among the coders. In addition to the A-B-C-D classifications, degree of infant attachment security was scored on a 9-point rating scale by converting the subclassifications directly to point scores (Spieker & Booth, 1988). Thus, this security rating reflects the extent to which the infant shows insecure behaviors such as avoidance, resistance, and disorganization (low scores) compared to proximity seeking and maintaining behaviors (high scores).

Thirty-month attachment was coded according to newly developed guidelines for classifying toddler-parent attachment behavior in the traditional Strange Situation (Cassidy, Marvin, with the MacArthur Working Group on Attachment, 1989). Conceptually, the toddler system retains four overall categories (avoidant, secure, dependent, and controlling) that are theoretically linked to the A-B-C-D classifications of infancy at the behavioral and representational level. The most noticeable difference between patterns of infant and toddler attachment is in children coded "D". In infancy, children coded "D" are disorganized and/or disoriented in their attachment behavior. By ages 3 and 4 years, the pattern consonant with infant "D" is one in which the child attempts to organize a disorganized attachment relationship by controlling the parent. The child's controlling behavior can be manifest as punitive or caregiving.

As with previous attachment classification systems, coding decisions are based primarily on the reunion behavior of the child toward the parent. Whereas specific identifying features of attachment patterns differ from those in infancy, they reflect general strategies of security, avoidance, dependence, and controlling. Among toddlers, attachment behavior can be expressed by physical contact and orientation toward the parent, content and manner of parent-directed speech, and affective tone. The 3- and 4-year classification system also includes a 9-point security rating scale. Unlike the security ratings used in this study at 13 and 20 months, the 30-month ratings constitute an integral part of the coding system. Security (and avoidance) ratings are made in the course of coding and are not entirely determined by subclassifications. In the present report, 30-month attachment will be expressed in terms of the superordinate A-B-C-D categories and the 9-point security rating.

Measures of Child Outcome

Standardized assessments of language and cognition. When the infants were 20 months of age, mothers completed the Early Language Inventory Part I (ELI, 1984 version: Bates, Bretherton, & Snyder, 1988). The 1984 version of the ELI is a 644-item vocabulary checklist that includes words in 19 semantic categories such as activities, household items, and people. Respondents are asked to indicate words the child uses spontaneously. Normative and validation data based on preterm, fullterm, and precocious samples indicate that this parent-report measure of child language is an accurate index of 20-month vocabulary (Dale, Bates, Reznick, & Morisset, 1989).

At 24 months, cognitive status was assessed with the Bayley Scales of Infant Development (Bayley, 1969). Many researchers have computed language

subscores based on the linguistic items of the Bayley Mental Scale (e.g. Hardy-Brown & Plomin, 1985; Bee et al., 1982). In this study, a language subscale was formed from 26 items including 10 expressive and 16 receptive items. The procedure was identical to that of Dale, Greenberg, and Crnic (1987); specific item-numbers that compose the language subscale are included in Appendix H.

At 36 months, children's language ability was assessed with the Preschool Language Scale (PLS: Zimmerman, et al., 1979), a screening and evaluation instrument that tests articulation, auditory comprehension, and verbal ability. Verbal ability items of the PLS include verbal imitation (digit-span), responses to open-ended questions, and simple conversation skills. In comparison, the auditory comprehension tasks tend to be supported by contextual cues and require only nonverbal responses such as pointing or manipulating test materials. The PLS yields Auditory Comprehension and Verbal Ability subscales as well as a combined Overall Language Ability quotient. The PLS has been used widely with children enrolled in Head Start and nursery school programs. Concurrent validity has been established with other language scales such as the Peabody Picture Vocabulary Test and the predominantly verbal Stanford Binet L-M (see Zimmerman, et al., 1979). Unlike many standard tests of cognitive and linguistic ability, the PLS was constructed such that age levels correspond to the age at which most children have achieved a given language competency. The authors of the PLS suggest that all children who score below age level on the instrument be considered "at risk" for language problems.

Language in conversation. At 20 months, few children demonstrated the degree of linguistic maturity necessary to calculate a production measure such as MLU. At 20 months, the children's utterances were typically one-word, multi-

word but partially unintelligible, or non-lexicalized bids that accompanied gestures. Thus, the summary measure used to describe 20-month communication during snack was child verbosity, a combined rate per minute of all verbal and gestural communication. The criteria for "communicative behavior" was restricted to lexicalized speech and conventional gestures such as those described by Bates and her colleagues, e.g. head nod or shake, pointing, reaching, and giving (Bates, Benigni, Bretherton, Camaioni, & Volterra, 1979).

At 30-months, child language analysis was extensive. Measures were chosen to reveal both structural and social-expressive aspects of conversational competence. To date, comparatively little developmental research has been done with the latter focus in mind. While the techniques used in this study were for the most part unique to this project, they draw heavily on several independent studies of language in social interaction (e.g. Brown, 1980; Bretherton & Beeghly, 1982; and, Snow, 1972). Coding guidelines and computational formulas for all 30-month conversation measures can be found in Appendix I. Many child measures are comparable to the 30-month maternal measures described earlier. These include: mean length of utterance (MLU & MLU-5), lexical diversity (TTR based on the child's first 50 words), mean length of turn (MLT), speaker dominance, and the density of internal state (IS) utterances. In addition, child speech was evaluated for intelligibility (the ratio of intelligible and partially intelligible utterances to total child utterances) and fluency (the ratio of speaker disfluencies, e.g. retraces, false starts, and trial-offs to total words).

Last, a coding scheme inspired by Brown's notion of mean length of episode (MLE) was developed to assess toddlers' emerging ability to use language

effectively in social interaction. According to guidelines outlined in Appendix I, each of the child's speaking turns was evaluated in terms of its function (to initiate, respond, or elaborate) and the degree to which it provided new and relevant information. Inter-rater reliability was computed for 18% of the cases (12 subjects). Cronbach's alpha, based on all 11 coding categories, was .87; the range was .73 to 1.0. Three summary measures derived from this "conversational relevance" coding scheme will be used in the present report: the percentage of codeable/classifiable turns, the percentage of turns that provided new and relevant information, and the percentage of spontaneous turns, regardless of content, that functioned to continue child-mother conversation.

CHAPTER IV: RESULTS

Descriptive Data

Descriptive statistics (means and standard deviations) for maternal and dyadic measures by child's age can be found in Appendices J and K.

Predictor Variables

Family social status, based on Hollingshead's Four Factor Index of Social Status (Hollingshead, 1975), averaged 24.1 ($\pm$ 8.1) points at intake, 26.1 ($\pm$ 7.8) points at age two years, and 27 ($\pm$ 8.9) points at age three. At each age, the majority of families earned SES scores that correspond to the lowest two of the five social strata defined by Hollingshead (unemployed and unskilled, vs. semiskilled laborers). Seventy-two percent of the sample were in the lowest two strata at intake, 69% at 24 months, and 63% at 36 months.

Scores on measures of life stress, and personal and social support indicate that the study mothers experienced many problems and had few resources. Compared with a normative sample of college women (Sarason et al., 1978), they reported many negative life changes including the incarceration of their partner, serious accidents, illnesses and deaths of close friends and family, personal illnesses, and frequent changes in residence. They tended to score high on the Beck Depression Inventory. The sample mean was frequently near the suggested cut-off for mild depression. Over the first two years of their baby's life, 17 - 20% of the mothers scored in the range of moderate to severe depression. They reported comparatively few personal resources; as many as half the women indicated that there was no one they could turn to for support and advice. They lacked social skills in face to face adult interaction as indicated by their greeting and conversation skills with a home visitor, and showed little involvement or

knowledge of their immediate community. For example, some mothers could not instruct someone on how to find their house. Many did not know the name of at least one neighbor, did not have a reliable form of transportation, or know the location of the nearest bus stop.

Repeated measures analyses of variance with time as the within-subjects factor indicated that family risk was somewhat less extreme by the child's third birthday. Multivariate tests were significant for maternal depression ($F(3,45)=4.13$, $p \leq .01$), negative life changes ($F(3,44)=2.97$, $p \leq .05$), and personal resources ($F(3,46)=3.52$, $p \leq .05$). Individual univariate tests for differences over time showed that mothers reported significantly fewer negative events and more personal resources when the infants were 12 months than when they were 3 months of age. By time 4 (at age 36 months), scores on maternal depression and negative life stress had significantly improved. In contrast, there was relatively little change in mothers' conversational skills with adults from 3 through 24 months.

Distributions of the 13, 20, and 30-month attachment classifications are provided in Appendix K. The relatively low proportion of study infants classified secure at 13 months (43%) is similar to that found in other high risk studies (Carlson, Cicchetti, Barnett, & Braunwald, 1989; Crittenden, 1985; Egeland & Sroufe, 1981; O'Connor, Sigman, & Brill, 1987; and, Radke-Yarrow, Cummings, Kuczynski, & Chapman, 1985) and less than that reported in studies of low-risk families (estimated proportions range from 52 to 73% secure: Ainsworth et al., 1978; Bell, 1970; Belsky, Rovine, & Taylor, 1984; and, Main & Weston, 1981). In this study, 52% of the infants were classified secure at 20 months and 63% were

secure at 30 months. Of those classified insecure, "D" was the largest category at each age.

Scores on the NCAST teaching task and the HOME Inventory are also included in Appendix K. Based on a normative sample, the suggested clinical cut-offs for parents' teaching scores with children ages 12, 24, and 36 months are 34, 38, and 39 points respectively (Barnard & Hammond, 1989). In this study, 47% of the mothers scored below the cut-off value at 12 months, 75% at 24 months, and 45% at 36 months. On the HOME, a total of 32 points is the suggested lower limit for scores within the normal range. This cut-off score reflects the 10th percentile in a normative sample of several hundred cases at ages 4 through 36 months (Barnard & Hammond, 1989). Using this criteria, there was a marked decline in HOME scores over time: 18% of the sample scored below the cut-off when the infants were 12 months of age, 32% were below the cut-off at 24 months, and 41% were below at 36 months of age.

Measures of mothers' speech during a snack with their 13 and 20-month infants indicate that approximately 70% of all utterances were of a "language facilitating style" in that they were attempts to engage the child in social interaction either through comments and labels or direct questions. Of the remaining 30%, the majority were attempts to influence the child's behavior through the use of direct and indirect commands.

In conversation with their children at age 30-months, mothers' averaged 4.1 words per utterance (MLU) and the mean length of their longest 5 utterances (MLU-5) was 10.3 words. These figures are roughly comparable to other reports of mother-to-child speech (Hoff-Ginsberg, 1986; Phillips, 1973; Snow et al., 1976). Mothers' average type-token ratio was .47, however 10 mothers did not

meet the required 200 words used to compute TTR. On average, 17% of all maternal utterances were used to describe internal states and/or feelings. The mean number of maternal utterances per speaking turn (MLT) was 2.1 and the range in MLT was 1.2 to 6.5 utterances. Two mothers had MLT scores that were outliers in the sample distribution. These two extremes were excluded from initial correlational analyses of MLT and were reduced to scores of 4.03 (equivalent to 2.5 standard deviations beyond the mean) for subsequent analyses.

Child Outcomes

Scores on standard tests of language and cognition are presented in Table 4. At 20 months, mothers reported an average expressive vocabulary of 145 words (range 6 to 477 words). This total score is somewhat, though not significantly, lower than that of other fullterm samples at age 24 months (Dale et al., 1989).

The mean score on the Bayley Mental Development Index (MDI) at 24 months was slightly above 100, the expected population mean ($\underline{M}$ = 105.6; sd = 15.7). The mean score on the Bayley language subscale, 20.2, was 1.8 points higher than that reported by Dale et al. (1987; $\underline{M}$ = 18.4) in a study of preterm infants at 24-months corrected age.

Test scores obtained one year later, on the Preschool Language Scale (PLS), suggest a relatively lower level of language ability. As stated by the authors, children who score below age level on (equivalent to a score of 100 points) should be considered "at risk" for language problems (Zimmerman, et al., 1979). At 36 months, 71% of the sample earned PLS scores lower than that expected of most children their age. Thirty-six percent of the study children scored below age-level on the Auditory Comprehension subscale (M = 107.63, sd = 17. 8) and

TABLE 4: SAMPLE CHARACTERISTICS - SELECTED CHILD MEASURES BY AGE

PERFORMANCE ON STANDARDIZED TESTS AGE AND ASSESSMENT	N	M (SD)	RANGE
20-Month Vocabulary	55		
Total Number of Words		144.5 (108.0)	6 - 477
24-Month Bayley	62		
Mental Development Index		105.6 (15.7)	77 - 150
Language Subscale		20.2 (3.3)	11 - 25
36-Month Preschool Language	55		
Overall Quotient		100.4 (14.0)	60 - 129
Auditory Comprehension		107.3 (17.8)	67 - 150
Verbal Ability		93.3 (16.5)	54 - 125

64% scored below on age-level on the Verbal Ability subscale (M = 93.3, sd = 16.5). Twenty-seven percent scored below age-level on both subscales. While there are no published norms for the PLS, the mean scores for this sample are slightly lower than those obtained by Erickson, Sroufe, & Egeland (1985) with similarly high-risk children and considerably lower than PLS scores reported by Mcloughlin and Gullo (1984) for a group of middle-class children.

Appendix L presents the sample means, standard deviations, and ranges for all conversational measures of child language. At 20 months of age, the mean rate of child communication (verbal or gestural) was 5.8 utterances per minute. The range, 0 - 12 attempts per minute, includes one child who made no effort to communicate with his mother during snack. At 30 months of age, the children's speech varied. Some children spoke primarily in two-word utterances (e.g. "more juice"); others were considerably more fluent (e.g. "I eat like the Cookie Monster"). MLU ranged from 1.2 to 4.0. The mean length of utterance, 2.3 morphemes, corresponds to Brown's stage II. MLU of 2.3 is in the predicted range for 30-month-olds (predicted MLU = 2.54, s.d. = .57) based on Miller and Chapman's data (1981) and is similar to that reported by Wells (1985) for a sample of 30-month children from working-class homes (M = 2.4, s.d. = .74). The mean upperbound on utterance length was 5.0 morphemes; in comparison, Wells reports a mean of 6.1. Approximately 90% of the children's utterances and turns were at least partially intelligible; intelligibility ranged from about 50% to 100%. Type-token ratio, based on the child's first 50 words, averaged .55; it ranged from .30 to .80. The mean rate of speech (intelligible and unintelligible utterances) was 7.2 utterances per minute. On average, the children spoke 7 to every 10 maternal utterances and they produced 1.3 utterances per speaking

turn. Appendix L provides additional descriptive data of the children's internal state (IS) language and the function and content of their conversational turns.

T-test comparisons of all child outcomes by parity (first vs. later-born) revealed no significant differences at $p \leq .05$. However, the direction of effects revealed a slight first-born advantage for 20-month vocabulary size (M = 172 words vs. 125), 24-month Bayley MDI (M = 108 vs. 103), Overall PLS (M = 102 vs. 99), and several of the 30-month conversation measures including: MLU-5 (M = 5.4 vs. 4.6), the rate of utterances per minute (M = 7.5 vs. 7.0), IS density (M = .08 vs. .06), and percentage of spontaneous turns (M = .47 vs. .42).

Data Reduction

Due to the large number of variables and multiple times of measurement, data reduction was necessary before examining the predictive relations between risk and child outcomes. Summary variables of hypothesized constructs were formed in one of three ways. First, family social status scores were recoded to correspond to Hollingshead's levels of social status. Second, a risk index was created to reflect the severity of family risk both within and over time. Third, factor analysis and reliability analyses were used to construct summary measures of the quality of maternal input at 13, 20, and 30 months, and summary measures of child language competence at 30 months. The method used to construct each predictor variable, the 30-month child language composites, and the simple correlations between predictors and outcomes follow. Variable labels and descriptions of all predictors are provided in Table 5.

Social Status (SES)

Social status scores were recoded to reflect the major social strata outlined by Hollingshead (1975). The continuum of total scores was divided into three

TABLE 5: VARIABLE LABELS AND DESCRIPTIONS FOR ALL PREDICTORS

PREDICTOR	VARIABLE LABEL	DESCRIPTION
Social Status	SES PRENATAL, SES 24M, 36M	Hollingshead scores recoded to a 3-point scale that corresponds to Hollingshead levels V, IV, and ≥III.
	SES PRENATAL-24M, SES PRENATAL-36M	Number of time SES was above level V. Scores range from 0 - 2 (prenatal - 24M) and from 0 - 3 (prenatal - 36 months).
Family Risk	RISK 3M, RISK 12M RISK 24M, RISK 36M	Number of extreme scores on measures of: depression, personal resources, negative life events, and conversation skills with adults. Scores range from 0 - 4 at 3 months (missing community life skills), 0 - 5 at 12 and 24 months, and from 0 - 4 at 36 months (missing adult conversation skills).
Attachment	13M RATING, 20M RATING	Degree of security derived by translating subclassifications directly to scores on a 9-point scale (1=low security, 9=high).
	30M RATING	Ratings correspond to the 9-point security scale of the MacArthur attachment classification system for 3 & 4-year olds.
	SECURE 13&20M, SECURE 13-30M	Number of times the dyad was classified secure at 13, 20, and 30 months of age. Scores range from 0 - 2 (13 & 20 months) and from 0 - 3 (13 through 30 months).
Quality of Maternal Input	MOM 12&13M, MOM 20&24M	Composite variables comprised of 3 scores: mother's teaching skill, conversation style in snack with the child, and the social subscales of the HOME Inventory. Measures were collected when the infants were approximately one and two years of age.
	MOM 12-24M	An average of MOM 12&13M and MOM 20&24M.
	30M TTR	Mother's type-token ratio, a measure of lexical diversity based on her first 200 words during a snack with her child at age 30 months.
	30M MLT	Mother's mean length of turn in utterances, the average number of utterance per speaking turn during a snack with her child at age 30 months.

groups that correspond to Hollingshead's level V (unemployed and unskilled laborers: computed scores 8 - 19), level IV (semiskilled workers: computed scores 20 - 29), and levels III - I (skilled workers to professionals: computed scores include ranges 30 - 39, 40 - 54, and 55-66). As a result of this recoding, the social status variable used in subsequent analyses was a 3-point scale in which higher scores represent higher social strata. Over time, the sample shifted slightly from the lowest to the next lowest stratum. An aggregated score was used to reflect the change in family social status over time. The aggregated score, based on SES at intake, 24, and 36 months, is the number of times SES was above the lowest social level; its range is from 0 to 3.

Family Risk Index

To examine the combined impact of multiple sources of family risk, measures of mother's life stress and personal resources were aggregated by creating a risk index. Each family risk measure (depression, negative life events, personal resources, conversation skills with adults, and community life skills) was dichotomized using established criteria (e.g., Beck depression score > 9 points) or the median score for the initial intervention sample (maximum N = 147). Risk index scores were then formed by counting the number of extreme scores obtained at each point in time. Assessments obtained when the infants were 3 months of age yielded a 3-month risk index that could range from 0 to 4 points (Community Life Skills was not included in the 3-month assessment). When the infants were 12 and 24 months of age, family risk index scores could range from 0 to 5 points. And, at 36 months, the risk index could range from 0 - 4 (Adult Conversation Skills was not included in the 36-month assessment). Subjects with

missing data were excluded from analyses that utilized the aggregated family risk variables.

Table 6 shows the frequency distribution for the risk (within time) index variables. Between 43 and 51% of the sample obtained 1 or 2 extreme scores at any single point in time. Intercorrelations (not reported here) were most often significant among maternal depression, negative life events, and personal resources. In general, these self-report measures showed little association with observational assessments of mothers' conversation and community life skills. At any single assessment time, few subjects (3 - 10%) obtained extreme scores on all measures of risk. Degree of family risk over time was relatively stable. Correlations among the 3-month, 12-month, 24-month, and 36-month risk indexes were all statistically significant; the median r value was .45. Family risk measured over time was represented by the number of assessment times in which a family earned two or more extreme scores. As an aggregated variable, "risk over time" from 3 through 24 months could range from 0 to 3 and "risk over time" from 3 through 36 months could range from 0 to 4. The frequency distributions for the two "risk over time" variables are also presented in Table 6.

Infant-Mother Attachment

To maximize the potential linear relation between degree of infant-mother attachment security and child competence, the 9-point security ratings were used to represent 13, 20, and 30-month attachment. The summary measure used to reflect the infant-mother attachment relationship over time was the number of times the infant was judged to be secure ("B") at multiple ages. Twenty-five percent of the children were secure at both 13 and 20 months and 33% were insecure at both ages. Twenty percent of the sample were classified secure at all

TABLE 6: FREQUENCY DISTRIBUTION FOR AGGREGATED FAMILY RISK VARIABLES

# EXTREME SCORES	3 MONTHS %	12 MONTHS %	24 MONTHS %	36 MONTHS %
0	21	15	12	18
1	25	26	22	20
2	23	15	22	23
3	21	21	28	32
4	10	20	8	7
5	[a]	3	8	[b]
N	61	61	64	44

# TIMES WITH ≥ 2 EXTREME SCORES	3-24 MONTHS %	3-36 MONTHS %
0	14	8
1	33	33
2	12	18
3	41	8
4	[a]	33
N	58	49

Note. Data are reported in % of the sample.

[a] Community Life Skills was not included in the 3-month assessment.

[b] Adult Conversation Skills was not included in the 36-month assessment.

three ages (13, 20, and 30 months); 35% were secure at two ages, 27% were secure at one age, and 18% were classified insecure at all three ages.

Quality of Maternal Input

Mother's contribution to the infant's social experiences was represented by three measures: (1) mother's (NCAST) teaching skills assessed when the children were 12 and 24 months of age (2) a composite of the HOME social subscales at 12 and 24 months, and (3) mother's conversation style during snack at 13 and 20 months. From this set of variables, one-year and two-year composites were formed by converting individual raw scores to standard z-scores and summing. Internal consistency based on Cronbach's alpha for the one-year composite (12 and 13-month variables) is .65; alpha for the two-year composite (20 and 24-month variables) is .62. Quality of maternal input was aggregated over time, from 12 through 24 months, by averaging the two composite scores. Subjects missing one composite score did not receive an aggregated 12 through 24-month score.

NCAST Teaching and HOME scores were not available at the 30-month assessment. At this age, the measures used to reflect quality of maternal input were features of her child-directed speech during snack. Correlations between maternal and child language measures at 30 months are presented in Appendix M. Of the set of maternal speech variables (mean length of utterance, type-token ratio, internal state density, and mean length of turn), correlations between 30-month child language and maternal type-token ratio and mean length of turn were the most robust. Consequently, mother's MLT (mean length of turn) and TTR (type-token ratio) were chosen to represent quality of maternal input at 30 months in subsequent analyses.

Child Language Outcomes

A list of variable labels and descriptions for all child language outcomes is provided in Tables 7a and 7b. The single score used to express 20-month child verbosity followed directly from the coding scheme: the rate per minute of all conventional verbal and gestural communication. Standard test scores were used to represent level of child language at 20, 24, and 36-months. Vocabulary at 20 months was represented by the total number of words endorsed by the mother on the Early Language Inventory (ELI). Two scores were derived from the Bayley Mental Scale of Infant Development (24 months): the overall Mental Development Index (MDI) and the number correct out of 26 language-related items. Three quotient scores from the Preschool Language Scale (36 months) were used: Auditory Comprehension, Verbal Ability, and Overall Language Ability (an average of the auditory and verbal subtests).

Principal components analysis with varimax rotation (Dunteman, 1989) was performed to construct summary variables from the 30-month child conversation variables. Three orthogonal factors with eigenvalues greater than 1.0 (4.37, 1.69, and 1.11 respectively) were identified (see Table 8). Taken together, these three factors accounted for 72% of the variance. The varimax rotation converged in 5 iterations. The first factor (FORM) reflects the intelligibility and grammatical structure of the child's speech and includes the following variables: proportion of intelligible utterances to total child utterances, proportion of classifiable turns, upperbound (MLU-5) in morphemes, and the relative lack of speaker disfluencies. The mean inter-item correlation for this set of variables is .47. Internal consistency, based on Cronbach's standardized alpha is .78.

TABLE 7A: VARIABLE LABELS AND DESCRIPTIONS FOR 20 THROUGH 30-MONTH CHILD OUTCOMES

AGE	VARIABLE LABEL	DESCRIPTION
20 MONTHS	VERBOSITY	Rate per minute of all conventional communication during snack with mother; includes vocal, verbal, & gestural behavior.
	VOCABULARY	Total score on the MacArthur Early Language Inventory Part I, a 644-item parent-report checklist of early vocabulary.
24 MONTHS	BAYLEY MDI	Mental Development Index from the Bayley Scales of Infant Development.
	BAYLEY LANGUAGE	Total number of items passed out of 26 expressive and receptive language items on the Bayley test of Mental Development.
30 MONTHS	COMPOSITE 1-FORM	A factor score that reflects the form and grammatical structure of child language in conversation with mother during snack. Includes: the percentage of intelligible utterances and speaker turns, mean length of the longest 5 utterances in morphemes and the relative lack of speaker disfluencies.
	COMPOSITE 2-AMOUNT	A factor score that reflects the amount of child conversation during snack. Includes: the ratio of the number of child to maternal utterances, the mean length of speaking turn (MLT), and the rate per minute of intelligible speech.
	COMPOSITE 3-CONTENT	A factor score that reflects the content of speech during snack. Includes: the percentage of turns that continue on-going conversation, the percentage of turns that carry new information, and the the percentage of utterances that mention internal states and feelings.
	TTR	Type-token ratio, a measure of lexical diversity based on the first 100 words in conversation with mother during a snack.

TABLE 7B: VARIABLE LABELS AND DESCRIPTIONS FOR 36-MONTH CHILD OUTCOMES

AGE	VARIABLE LABEL	DESCRIPTION
36 MONTHS	PLS - OVERALL	The Language Quotient of the Preschool Language Scale. The overall Language Quotient is based on the average of the PLS Auditory and Verbal scores. According to the authors of the test, children who score below age level (equivalent to $\leq$ 100 points) should be considered "at risk" for language problems.
	PLS - AUDITORY	The Auditory Comprehension Quotient of the Preschool Language Scale. Items that comprise this subscale reflect receptive language and classification skills.
	PLS - VERBAL	The Verbal Ability Quotient of the Preschool Language Scale. Items that comprise this subscale reflect verbal memory, the ability to label objects and use sentences in conversation.

TABLE 8: PRINICIPAL COMPONENTS ANALYSIS OF 30-MONTH CHILD CONVERSATION VARIABLES - ROTATED FACTOR MATRIX

	Factor 1	Factor 2	Factor 3
% Intelligible Utterances	.91	-.01	.14
% Intelligible Turns	.88	.19	.16
Upperbound (MLU-5)	.60	-.02	.60
Lack of Disfluencies	.45	.21	.12
Speaker Dominance	.13	.92	.11
Mean Length of Turn	.04	.84	.09
Rate of Intelligible Speech	.50	.64	.11
% IS Utterances	.14	.01	.89
% Continue Turns	.08	.47	.70
% New Information Turns	.53	.20	.61

The second factor (AMOUNT) reflects the quantity of child speech. It includes: speaker dominance (the ratio of child to mother utterances), rate per minute of intelligible speech, and the average number of utterances per speaking turn (MLT). The mean inter-item correlation of variables in this composite is .59 and standardized alpha is .81.

The third composite (CONTENT) represents the substance of the child's conversation. It includes the proportion of utterances that conveyed internal states and feelings, the proportion of spontaneous speaking turns that continued or elaborated an established topic, and the proportion of turns that contributed new and relevant information. The mean inter-item correlation for variables in Composite 3 is .51 and standardized alpha is .76.

The fourth summary measure, used to represent semantic knowledge, is type-token ratio. TTR was not included in the composite scores because only 58 of the 68 children met the required 50 words used to calculate TTR. The four summary scores (Composite 1-FORM, 2-AMOUNT, 3-CONTENT, and TTR) were used in all subsequent analyses of 30-month language outcomes.

Simple Correlations

Relations Among Language Measures

Intercorrelations among standard test scores at ages 20, 24, and 36 months and 30-month child language summary measures are presented in Tables 9a and 9b. Correlations over time among the standard test scores and between the test scores and observational assessments of child language are impressive. Two points are worth noting about the correlations between 20-month vocabulary and the 24-month Bayley scores (Table 9a). First, mothers appear to be relatively good informants on children's expressive vocabulary. The 20-month maternal

TABLE 9a: INTERCORRELATIONS AMONG CHILD LANGUAGE MEASURES - 20 AND 24-MONTH OUTCOMES

	VERBOSITY 20M	VOCAB. 20M	MDI 24M	LANG. 24M
20 MONTHS				
VERBOSITY	...	.399**	.159	.177
VOCABULARY	.399**	...	.385**	.482***
24 MONTHS				
BAYLEY MDI	.159	.385**	...	.775***
BAYLEY LANG.	.177	.482***	.775***	....
30 MONTHS				
FORM	.047	.425***	.378**	.530***
AMOUNT	.063	.086	.038	.090
CONTENT	.103	.468***	.282*	.481***
TTR	.335**	.412**	.507***	.507***
36 MONTHS				
PLS OVERALL	.187	.145	.483***	.535***
PLS AUDITORY	.280*	.198	.483***	.502***
PLS VERBAL	.019	.042	.259^{+}	.322*

Note. Sample size varies for individual correlations; the range is N = 45 - 63.

$^{+}$ $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$.

TABLE 9b: INTERCORRELATIONS AMONG CHILD LANGUAGE MEASURES - 30 AND 36-MONTH OUTCOMES

	FORM 30M	AMOUNT 30M	CONTENT 30M	TYPE-TOKEN 30M	PLS AUD. 36M	PLS VERB. 36M
20 MONTHS						
VERBOSITY	.047	.063	.103	.335**	.280*	.019
VOCABULARY	.425***	.086	.468***	.412**	.198	.042
24 MONTHS						
BAYLEY MDI	.378**	.038	.282*	.507***	.483***	.259^{+}
BAYLEY LANG.	.530***	.090	.481***	.507***	.502***	.322*
30 MONTHS						
FORM	1.000	.376**	.587***	.455***	.434***	.357**
AMOUNT	.376**	1.000	.437***	-.114	.244^{+}	.119
CONTENT	.587***	.437***	1.000	.311*	.267*	.344**
TTR	.455***	-.114	.311*	1.000	.443**	.107
36 MONTHS						
PLS OVERALL	.491***	.228^{+}	.376**	.371**	.827***	.793***
PLS AUDITORY	.434***	.244^{+}	.267*	.443***	1.000	.312*
PLS VERBAL	.357**	.119	.344**	.107	.312*	1.000

Note. Sample size varies for individual correlations; the range is N = 45 - 68.

$^{+}$ $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$.

report measure shows an impressive relation to Bayley language scores obtained 4 months later (r = .48). Second, the slight difference in the magnitude of the correlation between 20-month vocabulary and the Bayley MDI (r = .38) and with the Bayley language subscale (r = .48) suggests that the maternal report instrument is particularly sensitive to language ability; it is a better predictor of language than of overall mental performance.

The Bayley language subscale, a combination of expressive and receptive items, was significantly related to both components of the 36-month Preschool Language Scale. The correlation with the Auditory Comprehension subscale was r = .50 and the correlation with the Verbal Ability subscale was r = .32.

Inspection of Table 9b indicates that early vocabulary is also a potent predictor of subsequent conversation ability. Both 20-month vocabulary and the 24-month Bayley Language subscale showed significant and positive correlations with the structure, content, and diversity of 30-month child conversation. The magnitude of the correlations ranged from r = .41 to r = .53. In turn, several aspects of 30-month conversation ability were related to the 36-month PLS scores. Three conversation scores (Form, Content, and TTR) were significantly associated with both the auditory and verbal subscales of the PLS. Finally, there was a strong association between 20-month vocabulary and concurrent child verbosity, a simple measure of rate of verbal and nonverbal communication (r = .40); it seems that children who talked more, also talked better. Twenty-month verbosity was significantly related to one aspect of 30-month conversation, lexical diversity (TTR), and to the auditory component of the 36-month PLS.

SES and Child Language

Correlations between family social status and all child language measures are presented in Table 10. Few correlations were significant at $p \leq .05$. Of the multiple times of measurement, correlations were strongest with prenatal SES. Prenatal SES was significantly correlated with two standard test scores: the 24-month Bayley MDI and the 36-month Preschool Language Scale. As is apparent from Table 10, an increase in prediction was not gained by examining the cumulative effect of SES. Despite modest change in family SES over time, correlations with the prenatal measures always exceeded those with the aggregated SES variables.

Family Risk and Child Language

Correlations between family risk variables by age and child language outcomes are provided in Appendices N through Q. The results show the relation between single risk measures and child outcomes to be relatively weak; only 7% of the total number of correlations were significant at $p \leq .05$. Of the 13 significant correlations, 8 were found with the 12-month assessments (Appendix O). At this age, mothers' conversation abilities and community life skills were related to many subsequent child competencies including: 20-month vocabulary, 24-month MDI, 30-month conversation form, amount, and TTR, and the Auditory Comprehension subscale of the 36-month PLS. Of the five measures of family risk (including maternal depression, negative events, and personal resources), adult conversation skills and community life skills were most often related to child language ability both within and across time.

Correlations between the summary family risk index scores and child outcomes are presented in Table 11. Of the 4 times of measure, risk at 3 and 36

TABLE 10: CORRELATIONS BETWEEN FAMILY SOCIAL STATUS AND 20 THROUGH 36-MONTH CHILD LANGUAGE MEASURES

	SES PRENATAL	SES 24M	SES 36M	SES PRENATAL-24M	SES PRENATAL-36M
20 MONTHS					
VERBOSITY	.221+	.017	.310*	.207	.330*
VOCABULARY	.232+	.054	.115	.129	.163
24 MONTHS					
BAYLEY MDI	.335**	.186	.225	.165	.250+
BAYLEY LANG.	.226+	.212+	.158	.164	.312*
30 MONTHS					
FORM	.159	.005	-.017	-.018	-.086
AMOUNT	.008	-.024	-.070	.002	-.166
CONTENT	.088	.026	-.139	.087	-.009
TTR	.237+	.124	.026	.168	.120
36 MONTHS					
PLS OVERALL	.262*	.309*	.268+	.247+	.228
PLS AUDITORY	.313*	.297*	.271+	.306*	.260+
PLS VERBAL	.109	.186	.157	.076	.099

Note. Sample size varies for individual correlations; the range is N = 44 - 68.

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

TABLE 11: CORRELATIONS BETWEEN AGGREGATED FAMILY RISK AND 20 THROUGH 36-MONTH CHILD LANGUAGE MEASURES

	RISK 3M	RISK 12M	RISK 24M	RISK 36M	RISK 3-24M	RISK 3M-36M
20 MONTHS						
VERBOSITY	-.203	-.082	-.129	-.051	-.190	-.128
VOCABULARY	-.138	-.229	-.057	-.004	.243^{+}	-.104
24 MONTHS						
BAYLEY MDI	-.130	-.151	-.318*	-.039	-.250^{+}	-.154
BAYLEY LANG.	-.162	-.265*	-.255*	.009	-.291*	-.160
30 MONTHS						
FORM	-.197	-.377**	-.120	-.035	-.339**	-.209
AMOUNT	-.082	.011	-.088	-.164	-.125	-.157
CONTENT	-.069	-.186	-.086	.097	-.255*	-.143
TTR	-.114	-.197	-.217	.026	-.160	-.111
36 MONTHS						
PLS OVERALL	-.242^{+}	-.207	-.075	-.058	-.242^{+}	-.229
PLS AUDITORY	-.337*	-.345*	-.249*	-.296^{+}	-.407**	-.406**
PLS VERBAL	-.050	-.017	.147	.208	.026	.047

Note. Sample size varies for individual correlations; the range is N = 37 - 64.

$^{+}$ $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$.

months show few significant correlations. This finding is perhaps not surprising since the 3 and 36-month risk indexes are each missing one of the two maternal measures (conversation and community life skills) shown to be most consistently associated with the child language outcomes. Family risk at 12 and 24 months was associated with significantly lower scores on the 24-month Bayley language subscale and on the 36-month PLS Auditory Comprehension scale. Risk over time, from 3 through 24 months, was significantly and negatively correlated with the Bayley language subscale ($\underline{r}$ = -.29), with structural characteristics of 30-month conversation skill ($\underline{r}$ = -.34) and with the PLS Auditory scale ($\underline{r}$ = -.41). The addition of concurrent 36-month risk information to the aggregated risk-over-time index added little explanatory power; the magnitude of the correlations between the PLS scores and the 3 through 36-month risk index were no greater (and often less) than those obtained with the 3 through 24-month risk index.

Attachment and Child Language

The correlations between infant-mother attachment and all child language outcomes are presented in Table 12 (correlations with individual 30-month language outcomes are provided in Appendix R). Both the 13 and 20-month attachment security ratings showed a strong relation to 20-month child verbosity; higher security ratings were associated with more child-mother conversation in snack. The concurrent relation between amount of child conversation and attachment security at 30-months was in a similar direction although it was only marginally significant ($\underline{r}$ = .20, $p < .10$). Twenty-month security was also predictive of 30-month child TTR; higher security was associated with more diverse vocabulary. Security ratings at each age showed positive correlations

TABLE 12: CORRELATIONS BETWEEN ATTACHMENT SECURITY AND 20 THROUGH 36-MONTH CHILD LANGUAGE MEASURES

	SEC 13M RATING	SEC 20M RATING	SEC 30M RATING	SEC 13&20M # SECURE	SEC 13-30M # SECURE
20 MONTHS					
VERBOSITY	.347**	.391**	.202	.388**	.358**
VOCABULARY	.134	.056	.104	.057	.045
24 MONTHS					
BAYLEY MDI	.059	.231+	.075	.180	.203
BAYLEY LANG.	.070	.148	.065	.174	.148
30 MONTHS					
FORM	.118	.149	.089	.137	.158
AMOUNT	.141	.103	.204+	.129	.237+
CONTENT	.018	-.020	.070	-.109	-.051
TTR	.248+	.462***	.023	.304*	.249+
36 MONTHS					
PLS OVERALL	.377**	.279*	.174	.446***	.433***
PLS AUDITORY	.458***	.334*	.257+	.500***	.490***
PLS VERBAL	.142	.115	.015	.219	.207

Note. Sample size varies for individual correlations; the range is N = 51 - 67.

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

with the PLS Auditory scale. However, of the three ages, the 13 and 20-month ratings were more frequently and more powerfully related to child language ability. This pattern is particularly evident when the two aggregated attachment variables are compared. With the exception of 30-month verbosity, 30-month attachment status added little to the relation between 13 and 20-month attachment and 30 and 36-month language competence. This finding is particularly interesting in light of the relative instability of quality of attachment in this sample. Despite an apparent trend towards security over time, it appears that the history of the attachment relationship has a greater impact on child language, as measured in mother-child conversation and in standard test situations, than does the current nature of the child-mother relationship.

Maternal Input and Child Language

Table 13 presents the correlations between all summary scores of maternal input and measures of child language (correlations between individual maternal variables and child outcomes are provided in Appendices S through U). Relative to the strength of the correlations with other predictor variables, the correlations with maternal input were substantial. In most cases correlations with the aggregated 12 through 24-month variable were as strong or stronger than with the within-time maternal composites. Correlations with the aggregated 12 through 24-month variable were significant for: 24-month MDI (r = .42), the Bayley language subscale (r = .45), 30-month conversation form (r = .40), TTR (r = .32), and the auditory subscale of the PLS (r = .63). A slightly different pattern emerged for the 30-month maternal variables (mother's TTR and MLT). Like the earlier maternal input measures, mother's type-token ratio (TTR) was related to the form of the child's conversation (r = .39). However,

TABLE 13: CORRELATIONS BETWEEN QUALITY OF MATERNAL INPUT SUMMARY SCORES AND 20 THROUGH 36-MONTH CHILD LANGUAGE MEASURES

	MOM 12&13M	MOM 20&24M	MOM 12-24M	MOM TTR 30M	MOM MLT 30M
20 MONTHS					
VERBOSITY	-.018	.137	.088	-.126	-.116
VOCABULARY	.238+	.195	.263+	.260+	-.092
24 MONTHS					
BAYLEY MDI	.280*	.436***	.420**	.213	.180
BAYLEY LANG.	.325**	.421***	.449***	.295*	-.004
30 MONTHS					
FORM	.269*	.283*	.395**	.386**	-.204+
AMOUNT	-.041	-.004	.006	.195	-.582***
CONTENT	.157	.209	.219	.416***	-.238*
TTR	.144	.400**	.319*	.194	.095
36 MONTHS					
PLS OVERALL	.438***	.465***	.484***	.225	-.123
PLS AUDITORY	.534***	.608***	.634***	.211	-.102
PLS VERBAL	.1707	.1092	.1240	.1580	-.0950

Note. Sample size varies for individual correlations; the range is N = 46 - 64.

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

unlike the earlier maternal measures, 30-month TTR and MLT were not related to scores on the 36-month Preschool Language Scale. Mother's 30-month TTR and MLT were related to concurrent measures of the content of the child's conversation ($\underline{r}$ = .42 and $\underline{r}$ = -.24 respectively). And, mother's mean length of turn (MLT) was strongly related to concurrent measures of the child's amount of conversation ($\underline{r}$ = -.58); specifically, to the child's rate of intelligible speech ($\underline{r}$ = -.68) and number of child utterances relative to the number of maternal utterances ($\underline{r}$ = -.59).

Relations Among Risk Measures

As specified earlier, a primary goal of this study was to delineate the separate and combined effects of various environmental influences on language acquisition among high social-risk toddlers. Three levels of environmental risk have been discussed: 1) risk due to demographic status, 2) risk due to the family context as reflected by mother's life stress and lack of inter- and intra-personal resources, and 3) risk due to the quality of mother's contribution to the child's learning experiences and the affective nature of their relationship. Table 14 presents the intercorrelations among these conceptually distinct sources of social risk. Note that degree of family risk was unrelated to concurrent measures social status yet there was a significant negative relation between 3-month family risk and subsequent SES. Given the trend in this data for SES to increase slightly over time, one interpretation of this finding is that families at greater risk early on are least likely to make the life changes that lead to increased social status.

It is intriguing that of all four times of measure only the 3-month family risk index shows a significant negative correlation with attachment security. In comparison, family risk is consistently associated with the 1 and 2-year maternal

TABLE 14: CORRELATIONS AMONG RISK VARIABLES - FAMILY RISK WITH SOCIAL STATUS, ATTACHMENT, AND MOTHER-CHILD INTERACTION

	RISK 3M	RISK 12M	RISK 24M	RISK 36M	RISK 3-24M	RISK 3-36M
SES						
PRENATAL	-.157	-.053	-.031	.002	-.164	-.172
24 MONTHS	-.257*	-.096	-.104	-.145	-.182	-.229
36 MONTHS	-.342*	-.042	-.246^{+}	-.204	-.270^{+}	-.321*
ATTACHMENT						
13M RATING	-.392**	-.145	-.061	-.167	-.236^{+}	-.303*
20M RATING	-.201	-.187	-.181	-.287^{+}	-.163	-.253^{+}
30M RATING	-.065	-.034	-.113	-.284^{+}	-.002	-.178
# SECURE 13 & 20M	-.361**	-.212	-.222^{+}	-.350*	-.235^{+}	-.307*
# SECURE 13 - 30M	-.336*	-.195	-.246^{+}	-.379*	-.205	-.328*
MATERNAL INPUT						
12 & 13M	-.283*	-.323*	-.285*	-.318*	-.342*	-.423**
20 & 24M	-.228	-.330*	-.317*	-.330*	-.368**	-.328*
12 - 24M	-.279*	-.366**	-.355**	-.391*	-.407**	-.405**
30M TTR	-.083	-.097	.063	.065	-.202	-.085
30M MLT	.164	.140	.033	.082	.217	.223

Note. Sample size varies for individual correlations; the range is N = 42 - 64.

$^{+}$ $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$.

input composites. The correlation between risk over time and quality of maternal input from 12 through 24 months is $\underline{r} = -.41$.

Quality of Maternal Input and Infant-Mother Attachment

Associations between quality of maternal input and attachment are presented in Table 15. Although the correlations within time were relatively small, the aggregated variables revealed a significant and positive association between the history of infant attachment and the quality of maternal input over time ($\underline{r} = .40$, $p < .01$). Those that manage to score consistently high in one domain appear to do well in the other too.

Summary

In review, several points are worth emphasizing about the correlational findings. First, and most generally, the magnitude of many of the correlations is small to modest, quite possibly a consequence of restricted range in the risk variables and/or threshold effects. Recall that all subjects of this study met inclusion criteria which identified them as at-risk due to lack of social support and poverty, low-education, or young age. As a result, there is relatively little variability in some scores, such as education ($\underline{M} = 11.2$; $sd = 1.7$), and other scores are more extreme than would be expected in a non-selected sample. For example, the Beck Depression Inventory indicates that many of the study mothers were functioning beyond the clinical cut-off for mild depression. Despite these potential limitations, degree of family risk showed a significant negative relation with quality of maternal input and infant-mother attachment. And, each level of social risk (SES, family risk, and the interpersonal risk measures) was significantly related to at least one child outcome.

TABLE 15: CORRELATIONS AMONG RISK VARIABLES - ATTACHMENT WITH QUALITY OF MATERNAL INPUT

	SEC 13M RATING	SEC 20M RATING	SEC 30M RATING	SEC 13&20M # SECURE	SEC 13-30M # SECURE
MATERNAL INPUT					
12 & 13M	.229+	.132	.246*	.297*	.289*
20 & 24M	.324*	.265*	.218	.393**	.419**
12 - 24M	.283*	.294*	.297*	.399**	.407**
30M TTR	.171	.072	.047	.052	.068
30M MLT	-.237+	.021	-.234+	-.147	-.227+

Note. Sample size varies for individual correlations; the range is N = 52 - 67.

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

Second, of the three sets of risk variables, it is clear that the proximal, interpersonal measures constitute the best predictors of children's subsequent cognitive and linguistic performance. In comparison, SES and family risk were relatively weak indicators of child outcomes. While prenatal SES was related to the 24-month Bayley and the 36-month PLS, the magnitude of the correlations was notably less than with the interactive measures. With regard to family risk, the amalgamated variables (reflecting risk both within and over time) were better predictors than single risk measures. Comparisons of the two amalgamated measures showed that 36-month family risk added little predictive power once 3 through 24-month risk status was known. Correlations between dyadic variables and child outcomes also showed a consistent relation between early predictors and subsequent language gains. Quality of maternal input, aggregated over the first two years of life, was significantly and positively associated with: 20-month vocabulary, 24-month MDI and the Language subscale, the form and diversity of 30-month child conversation, and the Auditory subscale of the PLS. While concurrent maternal verbal behavior was also associated with features of 30-month child conversation, mother's TTR and MLT were not related to the child's performance on the 36-month PLS.

It is interesting that by 30 months, maternal language input was not related to children's subsequent test performance (PLS) but was related to children's contemporaneous conversation ability. This may be due to differences in the maternal measures; the 30-month maternal variables do not include an assessment of mother's teaching ability (NCAT) or the social features of the home environment (HOME). Alternately, greater associations with conversation than with test performance could reflect developmental changes in

child language ability. By age two-and-a-half, most children have made dramatic gains in spoken language. Perhaps by this age, spontaneous language has become more context dependent. Children of equal verbal capability could appear quite different as a function of mothers' communicative goals. For example, a predominance of parental directives and yes/no questions could inhibit the expression of the child's full range of linguistic ability.

Third, the data indicate considerable continuity in the ranking among the children's language abilities over time. A strong positive correlation among language measures was maintained from 20 through 36 months. Early vocabulary skill was reflected in higher Bayley language scores and in more sophisticated conversation ability at 30 months. Twenty-four month Bayley language scores were strongly related to conversation ability at 30 months and to the Preschool Language Scale ($\underline{r} = .53$). The stability in language performance from 2 to 3 years of age was similar, and sometimes greater, than the stability in SES, family stress, mother's teaching ability, and attachment over time. Taken together, these findings suggest that the second year of life is an especially important developmental period for laying the foundation upon which later language competency is built.

Fourth, the pattern of correlations between maternal variables, attachment status, and child language scores provides suggestive evidence for differential effects of interpersonal experience on overall language skill. In general, maternal input was more closely associated with standard test scores (MDI) and the structural aspects of conversational skill. In comparison, the affective nature of the infant-mother relationship was more often revealed in how much (not how well) the child spoke with mother in casual conversation. Both maternal input

(12 through 24 months) and attachment history (13 and 20 months) were related to 30-month TTR (r = .32 and .30 respectively) and to the Auditory subscale of the PLS (r = .63 and .50 respectively).

A final comment is the observation that the environmental risk factors were more frequently and more strongly related to the 30 and 36-month outcome scores than to the earlier scores. The magnitude of the correlations with the two standard developmental language assessments (viz., the PLS and the Bayley language subscale) suggest that environmental influences on child competence were more readily apparent at the later assessment. A similar finding is apparent in the work of Coster et al. (in press) and Gersten et al. (1986) who report comparatively more language-related findings in their study of child outcomes at age three years than in their study of children's language skills at age two.

Predicting Child Outcomes

In the next step of the analysis, three sets of hierarchical regressions (Cohen & Cohen, 1975) were used to examine the influence of demographic, psychosocial, and interactive-risk factors on cognitive and linguistic development. As described above, the large number of predictor variables were consolidated to a total of four: social status, family risk, attachment security, and quality of maternal input. Infant attachment and quality of maternal input were considered separately because of the hypothesized distinction between the role of secure attachment and language-facilitating experiences in promoting cognitive and linguistic development. The first set of equations examined the concurrent relations between risk and child outcomes. In the second set, the cumulative effect of risk over time was assessed. The third set of regressions

identified the developmental priority of the various sources on environmental risk. In these analyses, variables were considered according to a temporal, developmental priority. The set of potential predictors included all risk variables and early measures of child language ability.

In each set of regressions, the predictor variables entered in order of increasing proximity to the child's direct experiences: social status was entered on the first step of the equation, family risk on the second, attachment security on the third, and quality of maternal input on step four. This order of entry provided the most stringent test of the relative strength of dyadic variables as predictors of subsequent child outcomes. It was hypothesized that the interactive variables would account for the greatest share of the variance even when entered last in the equations. In addition, the impact of risk over time was expected to be greater than that due to the current risk conditions.

Concurrent vs. Cumulative Risk

Results of the regression equations based on concurrent and cumulative risk are presented in Tables 16 through 21. In many instances, both sets of equations were statistically significant; however, the set based on assessments of risk over time tended to account for a somewhat greater share of the variance. A comparison of Tables 16 and 17 shows the difference in the prediction of 20 and 24-month outcomes. Only the equation based on cumulative risk was significant in predicting child verbosity at $p \leq .05$ (Table 17); adjusted R^2 due to cumulative risk was 10% greater than that due to concurrent risk status. Both sets were significant in predicting the 24-month Bayley MDI and the Language subscale. The equation based on cumulative risk accounted for an additional 5% of the variance in MDI, while the difference in predicting the language subscale was

TABLE 16: PREDICTING CHILD LANGUAGE AT 20 AND 24 MONTHS FROM CURRENT RISK

20-MONTH CONVERSATION: Verbosity

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Social Status (24M)	.01	.00	.01	.00	-.05	.00
2.	Family Risk (24M)	-.12	.74	.12	.01	-.02	.37
3.	Attachment Rating (20M)	.40	8.94**	.40	.16	.39	3.27*
4.	Quality of Maternal Input (20&24M)	.14	.10	.40	.16	.05	**2.43^{+}**

20-MONTH ELI: Vocabulary Total

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Social Status (24M)	.02	.02	.02	.00	-.04	.02
2.	Family Risk (24M)	-.00	.00	.02	.00	.07	.01
3.	Attachment Rating (20M)	.03	.03	.03	.00	-.01	.02
4.	Quality of Maternal Input (20&24M)	.19	1.88	.21	.04	.23	**.48**

24-MONTH BAYLEY: MDI

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Social Status (24M)	.21	2.28	.21	.04	.07	2.28
2.	Family Risk (24M)	-.30	4.83*	.36	.13	-.17	3.64*
3.	Attachment Rating (20M)	.23	1.18	.38	.15	.09	2.83*
4.	Quality of Maternal Input (20&24M)	.45	5.89*	.49	.24	.35	**3.80****

24-MONTH BAYLEY: Language Subscale

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Social Status (24M)	.31	5.51*	.31	.10	.19	5.51*
2.	Family Risk (24M)	-.24	3.00^{+}	.39	.15	-.13	4.36*
3.	Attachment Rating (20M)	.15	.24	.39	.15	.00	2.94*
4.	Quality of Maternal Input (20&24M)	.43	5.02*	.48	.23	.33	**3.64****

Note. Verbosity n=55; Vocabulary n=47; Bayley n=53.

$^{+}p \leq .10$; $*p \leq .05$; $**p \leq .01$

TABLE 17: PREDICTING CHILD LANGUAGE AT 20 AND 24 MONTHS FROM RISK OVER TIME

20-MONTH CONVERSATION: Verbosity

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Social Status (Prenatal-24M)	.21	2.18	.21	.05	.07	2.18
2.	Family Risk (3-24M)	-.23	1.94	.29	.08	-.20	2.08
3.	Attachment Security (13&20M)	.46	8.45**	.48	.23	.51	4.34**
4.	Quality of Maternal Input (12-24M)	.09	2.37	.52	.27	-.24	**4.02****

20-MONTH ELI: Vocabulary Total

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Social Status (Prenatal-24M)	.12	.54	.12	.01	.12	.54
2.	Family Risk (3-24M)	-.21	1.64	.23	.05	-.12	1.10
3.	Attachment Security (13&20M)	.00	.31	.25	.06	-.20	.82
4.	Quality of Maternal Input (12-24M)	.27	2.04	.34	.11	.28	**1.14**

24-MONTH BAYLEY: MDI

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Social Status (Prenatal-24M)	.19	1.69	.19	.04	.06	1.69
2.	Family Risk (3-24M)	-.22	1.97	.28	.08	-.07	1.85
3.	Attachment Security (13&20M)	.21	.64	.30	.09	-.00	1.44
4.	Quality of Maternal Input (12-24M)	.43	5.40*	.44	.19	.39	**2.54***

24-MONTH BAYLEY: Language Subscale

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Social Status (Prenatal-24M)	.28	3.69^{+}	.28	.08	.14	3.69^{+}
2.	Family Risk (3-24M)	-.25	2.31	.35	.12	-.08	3.05^{+}
3.	Attachment Security (13&20M)	.26	.90	.37	.14	.02	2.33^{+}
4.	Quality of Maternal Input (12-24M)	.46	5.29*	.49	.24	.38	**3.25***

Note. Verbosity n=48; Vocabulary n=41; Bayley n=47.

$^{+}p \leq .10$; $*p \leq .05$; $**p \leq .01$; $***p \leq .001$

TABLE 18: PREDICTING CHILD LANGUAGE AT 30 MONTHS FROM CURRENT RISK

30-MONTH CONVERSATION: Form

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Social Status (24M)	.00	.00	.00	.00	-.09	.00
2.	Family Risk (24M)	-.12	.86	.12	.01	-.14	.43
3.	Attachment Rating (30M)	.12	.69	.16	.03	.03	.52
4.	Mother's Conversation Input (30M)		6.64**	.46	.21		**3.03***
	Type-Token Ratio	.35				.32	
	Mean Length of Turn	-.31				-.25	

30-MONTH CONVERSATION: Amount

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Social Status (24M)	-.01	.00	.01	.00	-.10	.00
2.	Family Risk (24M)	-.09	.47	.09	.01	-.09	.24
3.	Attachment Rating (30M)	.23	3.03^{+}	.24	.06	.09	1.17
4.	Mother's Conversation Input (30M)		19.29***	.66	.44		**8.86*****
	Type-Token Ratio	.16				.05	
	Mean Length of Turn	-.64				-.62	

30-MONTH CONVERSATION: Content

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Social Status (24M)	.02	.04	.02	.00	-.07	.04
2.	Family Risk (24M)	-.08	.41	.09	.01	-.11	.22
3.	Attachment Rating (30M)	.12	.69	.14	.02	.00	.38
4.	Mother's Conversation Input (30M)		12.08***	.56	.31		**5.15*****
	Type-Token Ratio	.37				.30	
	Mean Length of Turn	-.47				-.41	

30-MONTH CONVERSATION: Type-Token Ratio

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Social Status (24M)	.12	.82	.12	.02	.10	.82
2.	Family Risk (24M)	-.22	2.46	.24	.06	-.23	1.65
3.	Attachment Rating (30M)	.05	.00	.24	.06	.01	1.08
4.	Mother's Conversation Input (30M)		.99	.31	.10		**1.04**
	Type-Token Ratio	.15				.18	
	Mean Length of Turn	.06				.10	

Note. Child Language Composites n=63; TTR n=55.

$^{+}p \leq .10$; * $p \leq .05$; **$p \leq .01$; ***$p \leq .001$

TABLE 19: PREDICTING CHILD LANGUAGE AT 30 MONTHS FROM RISK OVER TIME

30-MONTH CONVERSATION: Form

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Social Status (Prenatal-24M)	.08	.28	.08	.01	-.13	.28
2.	Family Risk (3-24M)	-.25	2.85^{+}	.26	.07	-.02	1.57
3.	Attachment Security (13-30M)	.23	1.57	.32	.10	.06	1.58
4.	Quality of Maternal Input (12-24M)	.38	3.51^{+}	.41	.17	.34	2.13^{+}
5.	Mother's Conversation Input (30M)		8.09***	.64	.41		**4.60*** **
	Type-Token Ratio	.42				.28	
	Mean Length of Turn	-.40				-.38	

30-MONTH CONVERSATION: Amount

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Social Status (Prenatal-24M)	.08	.26	.08	.01	-.03	.26
2.	Family Risk (3-24M)	-.13	.65	.14	.02	.03	.45
3.	Attachment Security (13-30M)	.21	1.52	.23	.05	.14	.81
4.	Quality of Maternal Input (12-24M)	-.00	1.04	.28	.08	-.00	.87
5.	Mother's Conversation Input (30M)		17.58***	.71	.51		**6.90*** **
	Type-Token Ratio	.17				.06	
	Mean Length of Turn	-.70				-.68	

30-MONTH CONVERSATION: Content

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Social Status (Prenatal-24M)	.10	.41	.10	.01	.07	.41
2.	Family Risk (3-24M)	-.17	1.21	.19	.04	.02	.81
3.	Attachment Security (13-30M)	-.08	1.09	.24	.06	-.33	.91
4.	Quality of Maternal Input (12-24M)	.18	1.28	.30	.09	.32	1.00
5.	Mother's Conversation Input (30M)		10.98***	.64	.41		**4.65*** **
	Type-Token Ratio	.31				.14	
	Mean Length of Turn	-.51				-.56	

30-MONTH CONVERSATION: Type-Token Ratio

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Social Status (Prenatal-24M)	.21	1.78	.21	.04	.09	1.78
2.	Family Risk (3-24M)	-.19	1.12	.27	.07	-.10	1.45
3.	Attachment Security (13-30M)	.21	.66	.30	.09	.09	1.18
4.	Quality of Maternal Input (12-24M)	.32	1.43	.35	.12	.18	1.25
5.	Mother's Conversation Input (30M)		.29	.37	.14		**.90**
	Type-Token Ratio	.14				.10	
	Mean Length of Turn	.13				.08	

Note. Child Language Composites n=47; TTR n=41.

$^{+}p \leq .10$; $*p \leq .05$; $**p \leq .01$; $***p \leq .001$

TABLE 20: PREDICTING CHILD LANGUAGE AT 36 MONTHS FROM CURRENT RISK

36-MONTH PRESCHOOL LANGUAGE SCALE: Overall Language Ability Quotient

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Social Status (36M)	.21	1.76	.21	.04	.25	1.76
2.	Family Risk (36M)	-.00	.07	.21	.04	.08	.89
3.	Attachment Rating (30M)	.11	.80	.26	.07	.15	.86
4.	Mother's Conversation Input (30M)		2.24	.41	.17		**1.45**
	Type-Token Ratio	.09				.10	
	Mean Length of Turn	-.31				-.30	

36-MONTH PRESCHOOL LANGUAGE SCALE: Auditory Comprehension Quotient

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Social Status (36M)	.24	2.31	.24	.06	.22	2.31
2.	Family Risk (36M)	-.26	1.87	.32	.10	-.19	2.11
3.	Attachment Rating (30M)	-.13	.28	.33	.11	.09	1.47
4.	Mother's Conversation Input (30M)		.46	.36	.13		**1.04**
	Type-Token Ratio	.06				.11	
	Mean Length of Turn	-.10				-.09	

36-MONTH PRESCHOOL LANGUAGE SCALE: Verbal Ability Quotient

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Social Status (36M)	.10	.36	.10	.01	.18	.36
2.	Family Risk (36M)	.25	3.08$^+$	.29	.08	.32	1.73
3.	Attachment Rating (30M)	.05	.81	.32	.10	.15	1.42
4.	Mother's Conversation Input (30M)		3.44*	.50	.25		**2.34$^+$**
	Type-Token Ratio	.07				.04	
	Mean Length of Turn	-.38				-.38	

Note. PLS n=41.

$^+p \leq .10$; $^*p \leq .05$

TABLE 21: PREDICTING CHILD LANGUAGE AT 36 MONTHS FROM RISK OVER TIME

36-MONTH PRESCHOOL LANGUAGE SCALE: Overall Language Ability Quotient

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Social Status (Prenatal-36M)	.18	1.05	.18	.03	-.07	1.05
2.	Family Risk (3-36M)	-.22	1.38	.27	.07	.30	1.22
3.	Attachment Security (13-30M)	.47	6.11*	.48	.23	.37	2.99*
4.	Quality of Maternal Input (12-24M)	.48	4.53*	.58	.34	.57	3.63*
5.	Mother's Conversation Input (30M)		6.05**	.73	.54		**5.28*** **
	Type-Token Ratio	.06				-.06	
	Mean Length of Turn	-.36				-.50	

36-MONTH PRESCHOOL LANGUAGE SCALE: Auditory Comprehension Quotient

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Social Status (Prenatal-36M)	.28	2.65	.28	.08	.05	2.65
2.	Family Risk (3-36M)	-.46	7.66**	.51	.26	-.10	5.43**
3.	Attachment Security (13-30M)	.51	4.99*	.60	.37	.26	5.75**
4.	Quality of Maternal Input (12-24M)	.61	6.10*	.69	.48	.48	6.57***
5.	Mother's Conversation Input (30M)		.76	.71	.50		**4.56** **
	Type-Token Ratio	.00				-.12	
	Mean Length of Turn	-.12				-.15	

36-MONTH PRESCHOOL LANGUAGE SCALE: Verbal Ability Quotient

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Social Status (Prenatal-36M)	.02	.01	.02	.00	-.16	.01
2.	Family Risk (3-36M)	.09	.27	.09	.01	.55	.14
3.	Attachment Security (13-30M)	.24	2.98+	.31	.10	.32	1.09
4.	Quality of Maternal Input (12-24M)	.17	1.10	.36	.13	.42	1.10
5.	Mother's Conversation Input (30M)		8.77***	.69	.47		**4.05** **
	Type-Token Ratio	.10				.02	
	Mean Length of Turn	-.44				-.63	

Note. PLS n=34.

$^{+}p \leq .10$; $^{*}p \leq .05$; $^{**}p \leq .01$; $^{***}p \leq .001$

negligible. Both sets of equations were also significant in predicting the 30-month conversation skill composites (see Tables 18 and 19). Here, the set based on cumulative risk explained a much greater proportion of the total variance. The difference in adjusted R^2 ranged from .04 for Composite 2-Amount, to .18 for Composite 1-Form. Neither set of regressions was significant in predicting 30-month type-token ratio. Finally, there was a substantial difference in the ability of the cumulative and concurrent risk measures to explain variability in the 36-month PLS scores (Tables 20 and 21). Total adjusted R^2 based on cumulative risk was .39 for Auditory Comprehension and .36 for Verbal Ability; both equations were significant at $p \leq .01$. In contrast, the overall equations based on current risk status were not statistically significant.

In addition to the general finding that cumulative measures were more potent predictors of child outcomes, Tables 16 through 21 also reveal specific relations between type of environmental risk and child language performance. Not surprisingly, in view of the correlation patterns discussed earlier, the association between SES and the child outcomes was weak. Entered on the first step of each equation, SES (within and across time) was significant ($p \leq .05$) in predicting only one outcome (24-month Bayley Language). Family risk, entered on the second step of each equation, was significant in two outcomes. Family risk at age 12 months was negatively associated with 24-month Bayley MDI (change in adjusted R^2 was .11) and, family risk measured across all three years of life was negatively associated with the auditory subscale of the PLS (change in adjusted R^2 was .16).

Degree of attachment security was also significant in two child outcomes: attachment accounted for an additional 14% of the variance in 20-month

verbosity (based on adjusted R^2 change) and an additional 14% of the variance in the PLS Overall Language Score. Measured over time (from 13 through 30 months) secure infant-mother attachment explained an additional 9% of the variance in the PLS auditory subscale and an additional 6% in the verbal subscale.

Maternal input, measured concurrently and cumulatively, was the single best predictor of child language and cognition. Entered on the last step of each equation, maternal input accounted for a significant proportion of the variance in: 24-month Bayley MDI and the Language subscale, the form, amount, and content of children's conversation ability at 30-months, and both subscales of the PLS. Change in adjusted R^2 was greater than 10 percent in 9 of the 14 significant steps. The maximum change in R^2, 44%, was due to the addition of 30-month maternal input to the equation predicting the content of 30-month child conversation (see Table 19).

To understand further the separate and shared influences among the predictor variables, the order of entry in each regression equation was reversed. When the dyadic variables entered on steps one and two of the regressions, the additional contribution of social status and family risk was dramatically reduced and, in all but one outcome, was no longer statistically significant. Surprisingly, the reverse-order equation predicting the PLS Verbal Ability quotient revealed a strong and positive contribution due to cumulative family risk. Entered after attachment and maternal input, the 3 through 36-month family risk index accounted for an additional 18% of the variance in the PLS verbal scores ($p \leq .01$) and the associated beta weight was +.55. Additional information about this unexpected, positive relation between family risk and 3-year child language will

be presented in a later section. Aside from this puzzling exception, the findings of the reverse-order equations substantiate the earlier prediction that early interpersonal experience acts as a mediator of environmental risk. Within this high social-risk sample, the nature of the child's early interpersonal experience was a considerably better predictor of language and cognition than were relative differences in social status or family risk.

Adding Child Competence to the Set of Predictors

Next, additional regression analyses were used to determine a developmental model that: 1) included the potential contribution of early individual differences in child verbosity and vocabulary and, 2) identified the earliest point at which each of the independent variables (environmental risk and child competence) made a significant contribution to subsequent language skill. The goal, guided by an interest in prevention/intervention applications, was to reveal when different types of interpersonal experiences and individual strengths began to impact developing language abilities.

The statistical procedure used in these analyses combined hierarchical and stepwise regression techniques to select the order of entry apriori. Groups of predictor variables were entered hierarchically in steps; within each step, a stepwise procedure was used to determine the order and significance of entry. Variables were entered in groups by the child's age; within each group, variables entered in the same order as in the previous regressions (SES, family risk, attachment, and quality of maternal input). Child language ability, based on the assessments at the previous age point, was added as a fifth type of predictor variable and entered last within each group of variables. Thus, order of entry was guided by a temporal, developmental precedent that included the potential

contribution of the child and maximized the importance of distal environmental influences, namely SES and family risk. In order to optimize the number of degrees of freedom and limit the number of variables used in each equation, a variable did not enter the final equation unless it accounted for at least 5% of the variance. To achieve this, F-to-enter was set accordingly and varied from 2.0 to 3.5.

The regression results are presented in Tables 22 through 24. Several general patterns emerge in the relations among the predictor and outcome variables. Similar to previous findings, there was relatively little association between SES and child language. Prenatal SES added 5% to the explained variance in 20-month vocabulary and 6% to the variance in 30-month TTR; in each case, the associated R^2 was not statistically significant. The relation with family risk was only slightly stronger. Family risk, measured within the first year of life, contributed to the prediction of the Bayley language scores, 30-month TTR, and the Auditory subscale of the PLS. The contribution due family risk was statistically significant only in predicting TTR (adjusted R^2 change was .08).

Both the 13 and 20-month attachment rating entered the equation predicting 20-month verbosity. In combination, the security ratings accounted for an additional 14% of the variance (based on adjusted R^2). The 20-month security rating also made a significant contribution to the prediction of 30-month TTR and the Auditory Comprehension subscale of the PLS.

One and two-year maternal input made a significant contribution to the prediction of three standard assessments: the 24-month Bayley MDI, language subscale, and the auditory component of the 36-month Preschool Language Scale. In contrast, previous maternal input did not predict 30-month

TABLE 22: PREDICTING CHILD LANGUAGE AT 20 AND 24 MONTHS - DEVELOPMENTAL MODEL

20-MONTH CONVERSATION: Verbosity

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Social Status (Prenatal)	.23	2.71	.23	.05	.05	2.71
2.	Attachment Rating (13M)	.38	6.34*	.41	.17	.27	4.68**
3.	Attachment Rating (20M)	.35	3.24^{+}	.47	.22	.26	4.35**
4.	Child Vocabulary (20M)	.38	7.32**	.58	.34	.34	**5.55*** **

20-MONTH ELI: Vocabulary Total

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Child Verbosity (20M)	.40	9.63**	.40	.16	.40	**9.63****

24-MONTH BAYLEY: MDI

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Quality of Maternal Input (12&13M)	.24	2.54	.24	.06	-.04	2.54
2.	Quality of Maternal Input (20&24M)	.41	5.22*	.41	.17	.38	4.01*
3.	Child Vocabulary (20M)	.35	3.83^{+}	.50	.25	.28	**4.15***

24-MONTH BAYLEY: Language Subscale

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Family Risk (12M)	-.24	2.49	.24	.06	-.05	2.49
2.	Quality of Maternal Input (12&13M)	.42	5.84*	.43	.18	.30	4.32*
3.	Child Vocabulary (20M)	.50	9.76**	.59	.35	.42	**6.78*** **

Note. Verbosity n=49; Vocabulary n=53; Bayley n=42.

$^{+}p \leq .10$; $*p \leq .05$; $**p \leq .01$; $***p \leq .001$

TABLE 23: PREDICTING CHILD LANGUAGE AT 30 MONTHS - DEVELOPMENTAL MODEL

30-MONTH CONVERSATION: Form

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Child Vocabulary (20M)	.42	11.65***	.42	.18	.36	11.65***
2.	Mother's Conversation Input (30M) Type-Token Ratio	.36	4.99*	.50	.25	.28	**8.76*** **

30-MONTH CONVERSATION: Amount

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Mother's Conversation Input (30M) Mean Length of Turn	-.65	39.03***	.65	.42	-.65	**39.03*** **

30-MONTH CONVERSATION: Content

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Child Vocabulary (20M)	.47	14.90***	.47	.22	.39	14.90***
2.	Mother's Conversation Input (30M) Mean Length of Turn	-.46	11.56***	.60	.36	-.38	**14.72*** **

30-MONTH CONVERSATION: Type-Token Ratio

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Social Status (Prenatal)	.25	2.73	.25	.06	-.06	2.73
2.	Family Risk (12M)	-.30	4.76*	.40	.16	-.09	3.87*
3.	Attachment Rating (20M)	.49	6.64**	.53	.28	.47	5.14**
4.	Child Vocabulary (20M)	.44	10.33**	.66	.43	.42	**7.34*** **

Note. Child Language Composites n=55; TTR n=44.

* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$

TABLE 24: PREDICTING CHILD LANGUAGE AT 36 MONTHS - DEVELOPMENTAL MODEL

36-MONTH PRESCHOOL LANGUAGE SCALE: Overall Language Ability Quotient

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Attachment Status (13M)	.28	4.13*	.28	.08	.14	4.13*
2.	Quality of Maternal Input (12&13M)	.39	6.80**	.45	.20	.19	5.72**
3.	Bayley Language Subscale (24M)	.53	9.45**	.58	.34	.42	**7.67*** **

36-MONTH PRESCHOOL LANGUAGE SCALE: Auditory Comprehension Quotient

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Family Risk (3M)	-.30	3.79$^+$	.30	.09	-.13	3.79$^+$
2.	Quality of Maternal Input (12&13M)	.50	10.34**	.53	.28	.28	7.52**
3.	Attachment Status (20M)	.44	4.07*	.60	.35	.25	6.78***
4.	Bayley Language Subscale (24M)	.46	4.76*	.66	.43	.30	**6.79*** **

36-MONTH PRESCHOOL LANGUAGE SCALE: Verbal Ability Quotient

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Bayley Language Subscale (24M)	.32	5.53*	.32	.11	.30	5.53*
2.	Mother's Conversation Input (30M) Mean Length of Turn	-.27	2.97$^+$	.40	.16	-.23	**4.36***

Note. Overall Quotient and Verbal Ability n=39; Auditory Comprehension n=41.

$^+p \leq .10$; * $p \leq .05$; **$p \leq .01$

conversational skill. Here, concurrent maternal behavior was more indicative of child performance and was significant in equations predicting the form, amount, and content of 30-month child conversation.

Finally, there was an enduring connection between early vocabulary achievement and subsequent language abilities. In this set of regressions, the first order correlation coefficients between early and later language scores ranged from $\underline{r} = .32$ to $\underline{r} = .53$. The highest correlation ($\underline{r} = .53$), represents the strength of the relation between the Bayley language subscale and scores obtained one year later, on the Preschool Language Scale. Early vocabulary entered as a significant predictor of subsequent language abilities in all but one outcome (amount of 30-month speech). Change in R^2 due to 20-month vocabulary was statistically significant in 5 equations predicting 24 and 30-month outcomes; the maximum change in R^2 due to 20-month vocabulary was .20. The 24-month Bayley language score entered as a significant predictor of the auditory and verbal components of the 36-month PLS (change in R^2 was .07 and .09 respectively).

As a set, the best predictors of 20-month verbosity were prenatal SES, 13 and 20-month attachment security, and concurrent vocabulary. In combination these variables accounted for 27% of the explained variance in verbosity (adjusted $R^2 = .27$; overall $F(4,44)=5.55$, $p \leq .001$). Child verbosity was the only variable associated with 20-month vocabulary size ($\underline{r} = .40$). Despite links between attachment and verbosity, and between verbosity and vocabulary, attachment and vocabulary appeared to be unrelated. Vocabulary size and quality of maternal input (at one and two years of age) showed the strongest association with Bayley MDI. The best predictors of the Bayley language scale

were slightly different. They included 12-month family risk, one-year maternal input, and 20-month child vocabulary and accounted for a total R^2 of .30.

The only variables to enter equations predicting the 30-month child language composites were 20-month child vocabulary and 30-month maternal verbal behavior. There was a significant, positive association between mother's type-token ratio and the structure, or form, of child conversation, and a significant, negative association between mothers' mean length of turn (MLT) and the amount and content of child conversation ($\underline{r}$ = -.65 and - .46 respectively). It is doubtful that the negative relation between aspects of child conversation and maternal MLT was the result of mothers' "filling in" for less competent conversational partners. The contemporaneous correlation between maternal and child MLT (r = -.16) was weak; moreover, 20 and 24-month child language ability was unrelated to 30-month maternal MLT (recall Table 13). In contrast to the 30-month composite scores, child TTR at 30 months was associated with many early predictors including: prenatal SES, 12-month family risk, 20-month attachment security, and vocabulary size. As a set, these variables accounted for 37% (adjusted R^2) of the variance in child TTR. A similar relation emerged between the predictor variables and the 36-month PLS. While the auditory comprehension scale was associated with many early risk variables (including 3-month family risk, attachment, and quality of maternal input), 30-month maternal MLT was the only predictor (other than the child's Bayley language score) associated with PLS verbal ability.

To summarize, early child competence and proximal indices of the quality of mother-child interaction showed substantial relation to children's subsequent linguistic and cognitive abilities. There is growing evidence that specific aspects

of language competence may be associated with different types and/or times of interpersonal experience. In this study, 20-month verbosity and 30-month lexical diversity were associated with the history of affective experience as measured by infant-mother attachment, whereas standard measures of child performance (viz., 24-month Bayley scores and the Auditory Comprehension component of the PLS) were more related to the history of mother's ability as teacher and stimulating social partner. Measures of expressive language, in conversation at 30-months and as assessed by the PLS Verbal Ability subscale, were more related to mother's current style of interaction, especially to the richness of her conversation (TTR) and her tendency to pass the speaking turn on to her child (MLT).

Attachment as a Protective Factor: High vs. Low-Risk Comparisons within a High-Risk Sample.

Aside from a significant link between secure attachment and child verbosity, the results of this study offer relatively little evidence for a direct relation between attachment and child language competence. In fact, it may be unreasonable to expect a significant association between attachment and language when all subjects are considered together. Earlier it was proposed that the interplay of risk, attachment, and language could best be understood within a model of risk and protective factors such as that described by Cicchetti and Rizley (1981) and Rutter (1985a, 1985b). Specifically, it was proposed that secure infant-mother attachment operates as a protective, moderating factor against extreme social adversity. As a protective factor, one would not expect a "main-effects" relation between secure attachment and developmental

competence for all children; rather, one would expect a pronounced relation among only those children at extreme risk.

To test this hypothesis, the relation between secure attachment and child outcome was examined within high and lower-risk subsets of the sample. The aggregated 3 through 24-month family risk variable, described in the previous section, was used to form the risk subgroups. In review, the family-risk-over-time index summarizes a number of risk conditions (maternal depression, life stress, social skills with adults, personal resources, and community life skills) and multiple times of measurement (from the first few months of life through toddlerhood). Families who earned two or more extreme scores at three out of three assessment times comprised the high-risk subgroup (n = 24). Families with no extreme scores and those with extreme scores at one or two of three assessment times were considered lower risk (n = 39). Ten subjects were missing data such that their cumulative risk status could not be determined; these were not included in the analyses. Infant-mother attachment was represented by the number of times the infant was judged to be secure based on the 13 and 20-month attachment classifications. Previous regressions showed that 30-month attachment status added little predictive power once the 13 and 20-month classifications were known, thus the 13 and 20-month attachment variable was preferred to the 13 through 30-month aggregated variable in order to maximize the number of subjects in each cell.

The first stage of these analyses was a direct test of infant attachment status as a moderator variable. Moderator effects, in the case of two dichotomized independent variables, can be represented by a 2 X 2 ANOVA in which the moderation is indicated by the interaction term (Baron & Kenny, 1986).

Edwards (1985) has established that, for nonorthogonal designs with two factors and two levels per factor, unweighted means analysis of variance and multiple regression analysis yield equivalent sums of squares and tests of significance. In the present analyses, regression was preferred over traditional analysis of variance techniques because there was no assumption that the predictor variables were independent. In fact, based on other studies of high-risk samples (see Spieker & Booth, 1988 for a summary of the literature), it was expected that infant attachment security would be correlated with measures of family risk; this was shown to be true (recall Table 14).

Variables were entered in the regression equations hierarchically in the order specified by Edwards (1985) for nonorthogonal designs. The focal independent variable family risk (high vs. low), was entered on the first step of the equation, the hypothesized moderator, infant attachment status (secure 0,1 time vs. secure 2 times) was entered on the second step, and the cross-product term, the risk by attachment interaction, was entered on the third step. In general the findings, presented in Tables 25 through 27, support the prediction that secure infant-mother attachment operates as a protective factor for children at extreme risk.

The overall regression equations were significant for 20-month verbosity, 20-month vocabulary, and the Bayley Language subscale. The risk by attachment interaction term accounted for an additional, significant proportion of the variance in the 20-month vocabulary total and in the Bayley Language subscale. The overall equations predicting 30-month conversation form were also significant; the risk by attachment interaction term accounted for an additional 9% of the variance ($p \leq .05$). In addition, all three equations predicting the 36-

TABLE 25: TESTING ATTACHMENT AS A PROTECTIVE FACTOR - 20 AND 24-MONTH OUTCOMES

20-MONTH CONVERSATION: Verbosity

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Family Risk Status (3-24M)	-.19	2.04	.19	.04	-.21	2.04
2.	Number of Times Secure (13-20M)	.37	8.23**	.41	.17	.30	5.27**
3.	Risk by Attachment Interaction	.18	.46	.42	.17	.11	**3.63***

20-MONTH ELI: Vocabulary Total

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Family Risk Status (3-24M)	-.17	1.98	.20	.04	-.39	1.98
2.	Number of Times Secure (13-20M)	.03	.00	.20	.04	-.22	.97
3.	Risk by Attachment Interaction	.21	6.55*	.40	.16	.43	**2.91***

24-MONTH BAYLEY: MDI

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Family Risk Status (3-24M)	-.13	.90	.13	.02	-.26	.90
2.	Number of Times Secure (13-20M)	.20	1.87	.23	.05	.03	1.39
3.	Risk by Attachment Interaction	.23	3.40^{+}	.34	.11	.32	**2.11^{+}**

24-MONTH BAYLEY: Language Subscale

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Family Risk Status (3-24M)	-.13	.89	.13	.02	-.33	.89
2.	Number of Times Secure (13-20M)	.26	3.38^{+}	.28	.08	.00	2.16
3.	Risk by Attachment Interaction	.37	9.34**	.48	.23	.50	**4.79****

Note. Number of Times Secure is a binary variable where 0 = 0, 1 time secure and 1 = 2 times secure.

Verbosity n=56; Vocabulary n=49; Bayley n=53.

$^{+}p \leq .10$; * $p \leq .05$; **$p \leq .01$

TABLE 26: TESTING ATTACHMENT AS A PROTECTIVE FACTOR - 30 MONTH OUTCOMES

30-MONTH CONVERSATION: Form

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Family Risk Status (3-24M)	-.31	6.13*	.31	.10	-.47	6.13*
2.	Number of Times Secure (13-20M)	.15	1.09	.34	.12	-.07	3.62*
3.	Risk by Attachment Interaction	.15	6.72*	.46	.21	.40	**4.90****

30-MONTH CONVERSATION: Amount

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Family Risk Status (3-24M)	-.18	1.94	.18	.03	-.12	1.94
2.	Number of Times Secure (13-20M)	.24	.89	.22	.05	.18	1.41
3.	Risk by Attachment Interaction	.02	.39	.24	.06	-.11	**1.06**

30-MONTH CONVERSATION: Content

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Family Risk Status (3-24M)	-.25	3.85*	.25	.06	-.38	3.85^{+}
2.	Number of Times Secure (13-20M)	.05	.02	.25	.06	-.17	1.90
3.	Risk by Attachment Interaction	.07	3.11^{+}	.34	.12	.29	**2.35^{+}**

30-MONTH CONVERSATION: Type-Token Ratio

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Family Risk Status (3-24M)	-.15	1.10	.15	.02	-.31	1.10
2.	Number of Times Secure (13-20M)	.20	1.72	.24	.06	.02	1.42
3.	Risk by Attachment Interaction	.23	3.72^{+}	.36	.13	.36	**2.24^{+}**

Note. Number of Times Secure is a binary variable where 0 = 0 and 1 time secure and 1 = 2 times secure.

Child Language Composites n=58; TTR n=48.

$^{+}p \leq .10$; * $p \leq .05$; ** $p \leq .01$

TABLE 27: TESTING ATTACHMENT AS A PROTECTIVE FACTOR - 36 MONTH OUTCOMES

36-MONTH PRESCHOOL LANGUAGE SCALE: Overall Language Ability Quotient

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Family Risk Status (3-24M)	-.23	2.64	.23	.05	-.37	2.64
2.	Number of Times Secure (13-20M)	.47	12.00***	.50	.25	.24	7.63***
3.	Risk by Attachment Interaction	.37	6.47**	.59	.35	.41	**7.87*** **

36-MONTH PRESCHOOL LANGUAGE SCALE: Auditory Comprehension Quotient

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Family Risk Status (3-24M)	-.30	4.39*	.30	.09	-.39	4.39**
2.	Number of Times Secure (13-20M)	.47	11.73***	.53	.28	.28	8.57***
3.	Risk by Attachment Interaction	.28	3.82^{+}	.58	.33	.32	**7.35*** **

36-MONTH PRESCHOOL LANGUAGE SCALE: Verbal Ability Quotient

STEP	COMPOSITE/VARIABLE	r	F-TO-ENTER	R	R^2	BETA	OVERALL F
1.	Family Risk Status (3-24M)	-.08	.27	.08	.01	-.20	.27
2.	Number of Times Secure (13-20M)	.30	4.16*	.30	.09	.12	2.23
3.	Risk by Attachment Interaction	.31	3.58^{+}	.40	.16	.34	**2.76***

Note. Number of Times Secure is a binary variable where 0 = 0, 1 time secure and 1 = 2 times secure.

PLS n=48.

*p ≤ .05; **p ≤ .01; ***p ≤ .001

month Preschool Language Scale scores were significant, however the risk by attachment interaction term made a significant addition only to Overall Language Ability quotient (8% increase; $p \leq .01$).

Next, the magnitude of the protective effect of secure attachment was assessed by t-test comparisons of children judged secure ("B" at both 13 and 20-months) with those judged insecure ("A", "C", or "D" at 13 and/or 20 months) within the high and low-risk subgroups. Within the high-risk subgroup, children judged secure at both ages earned significantly higher scores on 8 of the 11 subsequent measures of language and cognitive ability (see Table 28). The secure and insecure groups differed by 141 words on the 20-month vocabulary inventory, by 20 points on the 24-month Bayley MDI, and by 6 points on the Bayley Language subscale. The high-risk secure subgroup outperformed the high-risk insecure subgroup on two 30-month language measures (conversational form and TTR), and on the overall Language, Auditory, and Verbal quotients of the PLS. Differences in the PLS quotients for the secure and insecure groups ranged from 25 to 31 points (equivalent to nearly two standard deviations). In contrast, attachment status did relatively little to differentiate children in the lower-risk subgroup although two differences reached marginal statistical significance. Within the lower-risk subgroup, stable secure children spoke more with their mothers during snack at 20-months and they scored an average of 10 points higher on the auditory subscale of the PLS ($p \leq .10$ for both findings).

Sex Differences in Early Language Abilities: Male Vulnerability within a High-Risk Sample

Group comparisons revealed significant sex differences favoring girls on many child language outcomes (see Table 29). By maternal report, the average

TABLE 28: T-TEST COMPARISONS OF CHILD OUTCOMES BY HIGH AND LOW FAMILY-RISK SUBGROUPS ILLUSTRATING ATTACHMENT AS A PROTECTIVE FACTOR

	LOW FAMILY RISK WITH ATTACHMENT: 0,1 Time Secure		2 Times Secure			HIGH FAMILY RISK WITH ATTACHMENT: 0,1 Time Secure		2 Times Secure		
	M	(SD)	M	(SD)	p	M	(SD)	M	(SD)	p
20-MONTH										
Verbosity	5.66	(2.3)	7.40	(3.2)$^{+}$		4.60	(1.8)	7.40	(1.8)**	
Vocabulary Total	179.55	(125.0)	126.10	(93.2)		91.00	(84.1)	234.33	(146.6)**	
24-MONTH BAYLEY										
MDI	106.42	(16.1)	107.45	(16.3)		97.71	(13.7)	118.25	(18.7)*	
Language Subscale	20.25	(2.7)	20.27	(3.3)		17.93	(3.6)	24.25	(1.0)**	
30-MONTH CONVERSATION										
Form	.90	(2.6)	.37	(1.4)		-2.26	(4.2)	2.34	(2.1)*	
MLU5	5.37	(1.7)	4.84	(1.2)		3.79	(1.4)	7.00	(1.6)***	
MLU	2.37	(.6)	2.08	(.5)		1.91	(.5)	2.83	(.5)**	
Amount	.06	(2.0)	1.11	(3.5)		-.60	(2.7)	-.62	(2.6)	
Content	.61	(2.4)	-.34	(2.1)		-1.35	(2.8)	.55	(1.0)	
IS Density	.08	(.1)	.05	(.0)		.04	(.1)	.10	(.1)*	
% New Turns	.38	(.2)	.32	(.1)		.24	(.1)	.34	(.1)$^{+}$	
Type-Token	.55	(0.1)	.55	(0.1)		.49	(.1)	.61	(.0)**	
36-MONTH PLS										
Overall Quotient	100.28	(11.7)	107.75	(8.8)$^{+}$		89.41	(14.9)	117.61	(8.4)***	
Auditory Subscale	107.48	(17.4)	118.18	(15.8)$^{+}$		92.99	(12.1)	124.00	(6.7)***	
Verbal Subscale	92.89	(13.3)	97.20	(13.5)		85.83	(22.0)	110.89	(10.9)**	

Note. Sample size varies for individual t-tests. The range for low family risk with 0, 1 time secure is N = 20 to N = 26; for low family risk with 2 times secure, N = 10 to N = 11. The range for high family risk with 0, 1 time secure is N = 11 (30-month TTR only) to N = 17; for high family risk with 2 times secure, N = 3 (20-month vocabulary only) to N = 4.

One-tailed tests of significance used for tests of hypothesized differences between high-risk subgroups, two-tailed tests used otherwise.

$^{+}$ $p \leq .10$; *$p \leq .05$; **$p \leq .01$; ***$p \leq .001$

TABLE 29: GROUP COMPARISONS OF CHILD LANGUAGE OUTCOMES

	BOYS			GIRLS			
	M	(SD)	n	M	(SD)	n	p
20-MONTHS							
Verbosity - Rate Per Minute	5.7	(2.3)	33	5.9	(2.6)	30	ns
Vocabulary - Total Words	93.8	(63.4)	26	189.9	(120.0)	29	***
24-MONTHS							
Bayley - MDI	104.1	(16.8)	33	107.2	(14.3)	29	ns
Bayley Language Subscale	19.6	(3.8)		20.8	(2.7)		+
30-MONTHS							
Conversation - Form	-.85	(3.5)	35	.91	(2.3)	33	**
Percent Intelligible Utterances	.88	(0.1)		.94	(0.1)		**
Mean Length of Longest 5 - MLU5	4.57	(1.7)		5.36	(1.6)		*
Conversation - Amount	-.51	(2.5)	35	.55	(2.5)	33	*
Ratio of Child to Mother	.64	(0.2)		.77	(0.3)		*
Conversation - Content	-.62	(2.5)	35	.65	(2.3)	33	*
Percent IS Utterances	.06	(0.1)		.08	(0.1)		*
Percent New Turns	.29	(0.2)		.38	(0.1)		**
Conversation - TTR	.51	(0.1)	27	.58	(0.1)	31	**
36-MONTHS							
Preschool Language Scale	98.8	(14.0)	31	102.4	(13.9)	24	ns
Auditory Comprehension Quotient	105.5	(17.4)		109.6	(18.4)		ns
Verbal Ability Quotient	91.9	(16.1)		95.1	(17.2)		ns

Note. Tests of significance are one-tailed in accord with a directional hypothesis that favors girls.

$^{+}p \leq .10$; $*p \leq .05$; $**p \leq .01$; $***p \leq .001$

vocabulary size of girls at 20-months of age was twice that of boys; the average for girls was 189.9, for boys it was 93.8 ($p \leq .001$). At 30-months of age, girls outperformed boys on every measure of conversation ability. Among the individual measures of form and structure, significant differences were found for percent of intelligible utterances and MLU-5 ($\underline{M} = 5.36$ for girls, $\underline{M} = 4.57$ for boys). Girls spoke significantly more (relative to their mothers) although their rate of speech per minute was not greater than that of boys. Girls spoke more about internal states and feelings and made more contributions of new information. Type-token ratio indicated greater lexical diversity in the speech of girls. The average TTR for girls was .58, for boys it was .51 ($p \leq .01$). Girls also tended to score somewhat higher on the standard tests of language at 24 and 36 months although these differences were not statistically significant.

The sex differences in child language emerged despite seemingly similar family contexts and social experiences. $\underline{T}$-test comparisons revealed no significant sex differences in social status or degree of family risk at any age. Perinatal status (gestational age and 5-minute Apgar) did not differ for boys and girls although boys were slightly heavier at birth. There were no sex differences in family composition (parity, # of child in the home, or # of years mother was without a partner since the child's birth). Likewise, there were no sex differences at any age on measures of the home environment, quality of mother's teaching and conversation style, early child verbosity, or infant-mother attachment security.

When correlations between predictor variables and language outcomes were performed separately for boys and girls, different patterns emerged (see Tables 30a and 30b). In general, there were more relations between the risk measures

TABLE 30A: SIGNIFICANT CORRELATIONS BETWEEN PREDICTORS AND 20 - 30-MONTH OUTCOMES FOR BOYS AND FOR GIRLS

	BOYS Pearson r	GIRLS Pearson r
20 MONTHS		
Verbosity		
Family Risk (24M)	.08ns	-.39*
Attachment Rating (20M)	.36*	.42*
Vocabulary		
Family Risk (12M)	-.43*	-.13ns
Maternal Input (12-24M)	.43*	.13ns
24 MONTHS		
Bayley MDI		
Social Status (Intake)	.48**	.13ns
Family Risk (24M)	-.26ns	-.41*
Maternal Input (12&13M)	.39*	-.00ns
Maternal Input (20&24M)	.48**	.39*
Bayley Language Subscale		
Family Risk (12M)	-.48**	.08ns
Maternal Input (12&13M)	.38*	.10ns
Maternal Input (20&24M)	.46*	.43*
30 MONTHS		
Conversation - Form		
Family Risk (12M)	-.43**	-.31^{+}
Attachment Security (20M)	.33^{+}	-.18ns
Maternal Input (20&24M)	.46**	.09ns
Maternal Input - TTR (30M)	.39*	.36+
Conversation - Amount		
Family Risk (3M)	-.34^{+}	.26ns
Maternal Input - TTR (30M)	.37*	-.02ns
Maternal Input - MLT (30M)	-.47**	-.65***
Conversation - Content		
Family Risk (12M)	-.38*	.05ns
Attachment Security (20M)	.13ns	-.38*
Attachment Rating (20M)	.20ns	-.34*
Maternal Input - TTR (30M)	.54**	.22ns
Maternal Input - MLT (30M)	-.39*	-.41**
Conversation - TTR		
Family Risk (24M)	-.15ns	-.39*
Attachment Rating (20M)	.59**	.42*
Quality of Maternal Input (12&13M)	.38*	-.21ns
Quality of Maternal Input (20&24M)	.39^{+}	.54**

$^{+}p \leq .10$; $*p \leq .05$; $**p \leq .01$; $***p \leq .001$

TABLE 30B: SIGNIFICANT CORRELATIONS BETWEEN PREDICTORS AND 36-MONTH OUTCOMES FOR BOYS AND FOR GIRLS

	BOYS	GIRLS
	Pearson r	Pearson r
36 MONTHS		
PLS - Auditory Comprehension		
Social Status (Intake)	.23ns	.40*
Social Status (36M)	.52***	-.02ns
Family Risk (3M)	-.49**	-.10ns
Family Risk (12M)	-.49**	-.24ns
Attachment Rating (13M)	.27ns	.67***
Attachment Rating (20M)	.39*	.27ns
Attachment Security (20M)	.50**	.21ns
Maternal Input (12&13M)	.59***	.45*
Maternal Input (20&24M)	.57***	.72***
Maternal Input - TTR (30M)	.01ns	.46*
PLS - Verbal Ability		
Family Risk (3M)	-.32+	.38ns
Family Risk (12M)	-.19ns	.28ns
Family Risk (24M)	-.04ns	.42+
Family Risk (36M)	-.06ns	.59*
Attachment Security (13-30)	.40*	-.04ns
Maternal Input - MLT (30M)	-.46**	-.15ns

+p ≤ .10; *p ≤ .05; **p ≤ .01; ***p ≤ .001

and language performance among the boys. In particular, boys appeared more susceptible to risk within the first year of life. For boys, there were significant negative correlations between first-year family risk measures and: 20-month vocabulary, the 24-month Bayley Language Subscale, two of the three 30-month conversation skill composites, and the Auditory Comprehension scale of the PLS. It is interesting that, for boys, the only two language outcomes unrelated to first-year family risk (20-month verbosity and 30-month TTR) were also the only two measures that showed a significant positive correlation with 20-month attachment. For girls, the pattern between family risk and language was quite different. For girls, family risk in the first year of life was virtually unrelated to subsequent language ability. In comparison, family risk at 24 months of age was negatively related to several concurrent child outcomes (viz., 20-month verbosity, 24-month Bayley MDI, and 30-month TTR). Analyses of sex differences clarified the unexpected finding between 36-month family risk and PLS Verbal Ability; the correlation was strong and in a positive direction ($\underline{r} = .59$) for girls but not for boys ($\underline{r} = -.06$).

Differences in the correlations found for boys and girls were tested according to procedures outlined by Kleinbaum and Kupper (1978) where the test statistic has the general form of a ratio with the difference in $\underline{r}$ values in the numerator and the square root of the sum of their variances in the denominator (p. 106, Applied Regression Analysis). For the data presented here, a minimum difference of .40 was required for a test to be significant at $p \leq .05$. Correlations that differed significantly for boys and girls are presented in Table 31. Briefly, the statistical tests confirmed the patterns observed in Tables 30a and 30b. The relation with family risk was stronger for boys such that greater risk was

TABLE 31: CORRELATIONS FOR WHICH SEX DIFFERENCES ARE FOUND

	BOYS Pearson r	GIRLS Pearson r
24 MONTHS		
Bayley Language Subscale		
Family Risk (12M)	-.48	.08
30 MONTHS		
Conversation - Form		
Attachment Security (20M)	.33	-.18
Conversation - Amount		
Family Risk (3M)	-.34	.26
Conversation - Content		
Family Risk (12M)	-.38	.05
Attachment Security (20M)	.13	-.38
Attachment Rating (20M)	.20	-.34
Conversation - TTR		
Quality of Maternal Input (12&13M)	.38	-.21
36 MONTHS		
PLS - Auditory Comprehension		
Social Status (36M)	.52	-.02
Attachment Rating (13M)	.27	.67
PLS - Verbal Ability		
Family Risk (3M)	-.32	.38
Family Risk (24M)	-.04	.42
Family Risk (36M)	-.06	.59

Note. Tests for the equality of correlation coefficients are two-tailed; each test is significant at $p \leq .05$.

associated with lower language ability at 24, 30, and 36 months of age. In contrast, family risk in the first three years of life had relatively little negative impact on girls' ability, and in fact, some risk assessments were related to positive language outcomes. A similar relation was found for infant-mother attachment; secure attachment was related to better conversational skills among boys but not girls. Thus, in this sample of high-risk toddlers, it appears that the developing language abilities of boys were more susceptible to the strengths and stresses in their early rearing environment.

CHAPTER V: DISCUSSION

This research was motivated by an interest in how global factors such as poverty translate into characteristics of the social environment that influence young children's intellectual development. It was predicted that the quality of maternal input to the child's social experiences would mediate the relation between environmental risk and young children's cognitive and linguistic abilities. Within this framework, several questions were addressed. The first compared the effects of concurrent environmental risk conditions with that of enduring psychosocial stress on child language and cognition; the second concerned the potential differential effect of social experience on various components of children's overall language ability; and, the third assessed the importance of early individual differences in child vocabulary to language ability at 30 and 36 months. In addition to questions about the impact of social-risk on child language for the group as a whole, analyses based on a model of risk and protective factors were used to examine the relation among risk and child language ability for boys vs. girls, and for a subset of children at extreme social disadvantage. In this section, primary and secondary aims of the study will be discussed in turn. First, the relation among distal and proximal levels of environmental risk will be summarized for the sample as a whole. Then, findings regarding risk and protective factors will be addressed.

Distal and Proximal Influences on Child Language

A major finding was that the quality of early interpersonal experiences mediates the relation between environmental risk and young children's cognitive and linguistic abilities. Consistent with other samples of high-risk families, mothers' behavior in interactions with their children tended to reflect many

other influences in the mothers' lives (Barnard et al., 1983; Lyons-Ruth, Zoll, Connell, & Grunebaum, 1986). Family risk, aggregated over the first 2 years of the baby's life, was significantly and negatively related to the quality of social experiences in the home at 12 and 24 months (r = -.42 and -.32 respectively), mother's language-facilitating speech style (at 20 months, r = -.30), and secure 13 and 20-month attachment (r = -.27 and -.30 respectively). Although high levels of family stress and low SES were characteristic of the study families, these traditional risk factors appeared to have little direct effect on children's cognitive and linguistic development. When distal and proximal sources of risk were considered separately in regression analyses, the quality of interactive experience was generally a better predictor of cognitive and linguistic abilities than was family social status or other distal variables such as mother's life stress, social, or psychologic functioning.

The importance of maternal input to the cognitive and linguistic development of these high social-risk children was demonstrated in two ways. In analyses that assessed the impact of separate sources of environmental risk, the quality of maternal input was shown to mediate the relation between distal family background variables (SES and family risk) and child outcomes over the second and third years of life. That is, quality of maternal input explained a significant proportion of the variance in child outcomes even after controlling for differences due to SES and family risk. Second, regression analyses were used to determine a developmental model by selecting the best predictors of cognitive and linguistic outcomes from the total set of risk variables. In these analyses, maternal interactive variables entered seven of ten equations while SES and/or family risk variables entered only four. In equations where maternal input and

family risk were both identified as significant predictors of child outcome, the contribution due to maternal input was approximately 3 times greater than that due family risk status.

The findings of this study suggest that the types of stimulating and responsive social interaction shown to promote intellectual and linguistic development in low-risk samples exert a similar "main-effect" in less-advantaged samples. Within this exclusively high-risk sample, the provision of stimulating and positive interactive experiences was generally the best predictor of children's mental and linguistic abilities from 20 through 36 months of age, even after accounting for differences in family social status and mother's own level of stress, social, and personal resources.

In accord with investigations by Rutter (1979), Sameroff, and others (Sameroff, Seifer, Barocas, Zax, & Greenspan, 1987; Seifer & Sameroff, 1987), the effect of environmental risk on child outcome appeared to compound with multiple risks and with risk over time. Correlations with the family risk index variables showed a negative relation between the number of risk factors (both within and across time) and many child language outcomes. Comparisons of risk within and over time revealed that the cumulative effect of family risk over time had the greatest impact on child outcome.

In combination, distal and proximal environmental influences were more strongly related to measures of child outcome at 30 and 36 months than at 20 and 24 months. One possible reason for this finding is that tests of early development, such as the Bayley, may not sufficiently tap skills that are fundamental to later cognitive and linguistic development (Cicchetti & Wagner, 1990; Fagan & Singer, 1983). A second reason why environmental factors would

play a greater role at the later ages is that mental development may be differentially responsive to environmental effects. It has been proposed that development is highly canalized during periods of rapid maturation and that, in stages of rapid growth like the first two years of life, children are biologically buffered from all but extreme deviations in environmental input (Bretherton et al., 1979; McCall 1981; Rutter 1985a). According to McCall (1981) and others (Scarr & Weinberg, 1978), individual differences in mental development during the first two years of life are largely due to maturational forces. After the age of two, maturational differences stabilize and mental development becomes increasingly more related to both genetic and environmental factors. The findings presented here generally support this argument. First, individual differences in child outcomes were less stable prior to the child's second birthday. Recall that the 20-month language measures were substantially less predictive of subsequent language achievement than predictions based on the 24-month language scores. Second, the proportion of variance explained by the set of risk-over-time variables increased monotonically from 20 through 36 months of age. Taken together, these data endorse the proposition that the impact of environmental factors is more apparent at comparatively later and more vulnerable stages in development. Similar findings have also been reported in studies of maltreated toddlers (Coster et al., in press; Gersten et al., 1986). Two possible interpretations of the data must be considered. Environmental input may in fact have a greater impact at relatively later stages of development; or alternatively, environmental influences could work through latent effects on early development such that the impact on learning is

developmentally prior to its manifestation. The present data cannot differentiate these two hypotheses.

Relations Between Maternal Input and Child Competence

In this study, quality of maternal input was represented by a combination of mother's verbal behavior, her teaching skill, and the quality of social experiences she provided in the home. As would be expected, an active and responsive interactive style appeared to facilitate children's mental and linguistic development. It may therefor, seem counter-intuitive that mothers' mean length of speaking turn (MLT) showed a strong negative relation to children's language ability. In general, frequent adult verbal input is thought to benefit cognitive and linguistic development. However, the key ingredient appears to be the timing of the adult input (in the form of contingent feedback) and not its sheer volume (Rutter 1985b). The results of this study suggest that the manner of maternal turn-taking (or more specifically, turn-leaving) is also an important feature of adult-child discourse. Studies of conversations between mothers and young children show that early on, mothers spend a great proportion of their utterances attempting to elicit specific responses from babies. Gradually, as the child's communicative and conversational competence increases, length of maternal turn tends to decrease. By the age of two or so, interactions between mothers and children generally give the impression of adult conversation, both in terms of speaker-switching and the exchange of meaning (Snow, 1977).

In the present data, there was considerable variability in the length of mothers' speaking turns. Mean length of mothers' turns (at 30 months) ranged from 1.2 utterances to 6.5 utterances and mean length of children's turns ranged from 1.0 to 2.3 utterances. It is not clear why some mothers "held the floor"

longer than others. It is possible that differences in mothers' mean length of turn (MLT) reflect a general speaking style. Perhaps, as originally suggested by Bernstein (1960) and Hess (1964), some adults are more apt to use language to convey information than to encourage reciprocal communication. "One-way conversation" would thus be reflected by an imbalance in the mean length of turn between speakers, and a balance in speakers' MLT would be more characteristic of reciprocal exchanges. It is also possible is that maternal MLT reflects something specific to adults' conversations with children. For instance, given the data of this study, high maternal MLT could reflect a mother's misconceptions about her child's ability to pick up his end of conversation. These two explanations are not incompatible. More important is the fact that relatively long maternal speaking turns appeared to hinder children's language development. Recall that mother's MLT could not be explained as a response to a less competent conversational partner; there were no significant correlations between earlier measures of children's language ability and subsequent maternal MLT.

How might length of maternal turn interfere with language learning? In a discussion of maternal discourse features with linguistically advanced children ages 19 to 32 months, Cross (1977) suggests that the "provision of less that two utterances per maternal turn may enhance the perceptual salience of the linguistic information contained within any single utterance". This "cognitive-processing" hypothesis presumes that if too many utterances are fired in succession, the processing of the original utterance is interfered with as a function of the number of utterances in the speaking turn. A second possible explanation is that long adult speaking turns diminish opportunities for

reciprocal exchanges in which the adult and child work together to construct meaningful conversation. It is believed that such early "collaborate narrative" experiences facilitate children's ability to produce coherent and extended discourse (Snow, unpublished). The results presented here cannot address the "cognitive-processing" hypothesis, however there is some support for the second alternative. Recall that maternal MLT was negatively related to all three 30-month child language composites, and that these composite scores were constructed of multiple measures including those that tapped the ability to link utterances together to form intelligible and relevant conversational turns. Further, maternal MLT was not related to children's type-token ratio, a measure which assesses the diversity of individual words as opposed to the relation among utterances in conversation.

Individual Differences in Early Language Ability

In addition to maternal contributions to burgeoning language and cognitive skill, this study also examined the contribution of early individual differences in verbosity and vocabulary to later language abilities. Transactional theories of development posit a complex feedback system in which catalysts for change, originating with either the child or the environment, are incorporated into the family system by reciprocal processes (Sameroff & Chandler, 1975; Sameroff, 1980). One could speculate that individual child characteristics (verbosity, temperament, intellectual ability, etc.) might transactionally influence and thus modify the caregiving environment. Language is a powerful social tool available to nearly all children around one year of age. With the onset of first words, children can communicate their intentions more clearly through comments, questions, and requests. Compared with preverbal behavior, even these

rudimentary utterances provide better clues to meaning and impose stronger obligations on the adult to respond (Snow, 1981). Thus, early word use increases the likelihood that children's communicative bids will be recognized and responded to. It is reported that children who spend more time talking are more linguistically advanced than their less talkative peers (Wells, 1980; Harkness, 1972). Hoff-Ginsberg (1990) proposes that children, in talking, may aid their own language development by eliciting adult input and by influencing its properties. In this way, children may be able to initiate changes in their caregiving environments when important experiences are not readily available.

The results of this study indicate that early individual differences in verbosity and vocabulary should not be overlooked. Regression analyses used to identify the best set of predictors of subsequent child outcomes indicated that 20-month child verbosity (a non-evaluative index of communicative effort) was significantly related to contemporaneous vocabulary knowledge. In turn, early vocabulary (as measured by either the 20-month vocabulary inventory or the 24-month Bayley Language subscale) was a significant predictor of nearly every subsequent language measure. These data suggest that the children in this sample may have played an important role in facilitating their own development through more, and more capable, talk. This interpretation may however, be limited to the specific sample or age-range of children in this report. Scarr and Weinberg (1978) argue that once genetic influences are accounted for, most environments, except for extreme deviations, are functionally equivalent with respect to intellectual development. Thus, the results may not be paralleled in more advantaged samples where opportunities for stimulating and responsive verbal interaction are more readily available.

The Role of Attachment in Child Language and Cognition

Perhaps the most novel findings of the study pertain to the moderating role of infant-mother attachment in the relation between extreme psychosocial risk and children's developing cognitive and linguistic abilities. Although comparisons are not presently available for the 30-month attachment classifications, the relatively low proportion of study infants classified secure at 13 and 20 months (43% and 52% respectively) is similar to that found in other high-risk studies (Carlson, Cicchetti, Barnett, & Braunwald, 1989; Crittenden, 1985; Egeland & Sroufe, 1981; O'Connor, Sigman, & Brill, 1987; and, Radke-Yarrow, Cummings, Kuczynski, & Chapman, 1985) and less than that typically reported in studies of low-risk families (Ainsworth et al., 1978; Bell, 1970; Belsky, Rovine, & Taylor, 1984; and Main & Weston, 1981). Correlational analyses revealed that many of the same factors associated with poor quality mother-child interaction, particularly mothers' lack of social skills and depression, were also related to lower ratings of infant attachment security. Yet, despite the finding that similar environmental risk factors were associated with both quality of maternal input and infant attachment, secure attachment and language-promoting social experiences appeared to influence developing child competence via different pathways.

In discussing the theoretical associations between attachment and child language, Bretherton et al. (1979) speculate that an interactive framework of harmony and affective synchrony might promote language-learning in one of two ways. First, secure attachment might have a direct influence on child competence because mothers of secure infants would be more likely to engage their children in the types of play and verbal interaction shown to facilitate

language development (the "attachment-teaching hypothesis"). Alternately, the role of attachment might be indirect and mediated by the baby's sense of security. According to this "attachment-exploration hypothesis", secure attachment would provide a secure base from which the infant is free to explore and discover the world (and language) for himself. The same conceptual framework provided by these theoretical links between attachment and language can be used to examine the potential role of attachment as a protective factor in young children's language development. Although a direct test of the attachment-exploration hypothesis is not possible, the data presented here do not support the attachment-teaching hypothesis. To the contrary, there was considerable independence between secure attachment and mother's skill as teacher or conversational partner. Within any given age, degree of attachment security, aggregated across all levels of demographic and psychosocial risk, was only moderately related to quality of maternal input (recall Table 15). Although security over time was related to more optimum maternal behavior over time, the within time correlations are quite low and range from $\underline{r} = .09$ to $\underline{r} = .26$.

Hinde (1976) suggests that mothers' roles as teacher and as nurturer are theoretically separable. It is proposed here that the independence among component parts of the mother-child relationship enables secure attachment to function as a protective factor when other aspects of the child's social experience are jeopardized. In Rutter's view, the role of a protective factor is to modify the individual's response to adversity, not to foster normal development (1985a). In this study, secure attachment was related to children's subsequent cognitive and linguistic skill, but only among a subset of the sample at extreme disadvantage. A similar relation between risk and protective factors has been demonstrated by

Werner (1986) in the analysis of extensive longitudinal data collected on the island of Kauai. She reports that protective factors such as good parenting attitudes and low levels of family conflict did little to discriminate between good and poor child outcomes among low-risk families, but were strongly related to child outcome among poverty-level families with high levels of stress and few personal resources.

While environmental influences appear to affect social-emotional and intellectual development differently, the quality of early interpersonal relationships seems fundamental to both. Rutter (1985b) maintains that what is needed for optimum cognitive development is a combination of active learning experiences and a social context in which the style of interpersonal relationships promotes self-confidence and active interest in independent learning. His view is similar to that of Bretherton's attachment-exploration hypothesis: the quality of early interpersonal relationships plays an indirect role in promoting child competence by providing an affective context that fosters both security and independent learning.

The nonintellectual, affective context of mother-child interaction has been examined most extensively in studies of depressed women and their babies (Bettes, 1988; Cohn, Campbell, Matias, & Hopkins, 1990; Cox, Puckering, Pound, & Mills, 1987; Field, Healy, Goldstein, & Guthertz, 1990; Goodman & Brumley, 1990). Although these studies do not address the question directly, their findings suggest that parenting by depressed women is impaired or unusual in ways that might be disadvantageous for children's cognitive development. For example, depressed mothers are reportedly less likely to elicit social interaction, less likely to use the exaggerated pitch contours typical of "motherese", and are

slower to respond to children's overtures. The affective quality of the mother-child relationship and its consequences for cognitive development has also been examined non-psychiatric samples. Studies of infant-mother attachment report that secure children are more curious, persistent, and enthusiastic in problem-solving than insecure children (Bretherton, 1985) and, in mother-child book reading, securely attached dyads are more harmonious and the children more competent (Bus & van IJzendoorn, 1988). In addition, Estrada and others (Estrada, Arsenio, Hess, & Holloway, 1987) have demonstrated a consistent association between affect ratings of the mother-child relationship at age 4 years and children's cognitive performance at ages 4, 5, 6, and 12 years.

The affective nature of parent-child communication is fundamental to the conceptual and empirical origins of attachment theory (Ainsworth, Blehar, Waters, & Wall, 1978). Bowlby (1969) regarded babbling as one of the earliest infant attachment behaviors. In the service of attachment, the function of infant babbling and other "signalling" behaviors such as crying and smiling, is to draw the mother near. Bowlby hypothesized that the pattern of early and continued transactions between caretakers and infants form the infant's mental representation of self and of others. Within the first months of life, dyads who are later judged secure are believed to have established a pattern of communication in which the infant's preverbal signals are consistently acknowledged and affirmed. In contrast, the communicative bids of infants who are later judged insecure have less predictable consequences; their attachment signals often go unmet, or are responded to inconsistently.

In this author's opinion, secure attachment acts to buffer children's language development against environmental risk by providing a positive emotional

context in which the products of independent learning are valued and shared. This proposition integrates Ainsworth's notion of a "secure base" with recent ideas about parent-child communication and the development of the self. According to Bretherton (1988), because their communicative bids tend to go unmet, children in insecure relationships receive the implicit messages "I do not understand you" or "your communications are not meaningful or important". In this way, parents' response to communication throughout the first years of life plays a formative role in children's developing sense of self-efficacy and self-worth. Hypothetically, the internal representation of self (as more or less competent and loved) and of others (as more or less responsive) could affect infants' and toddlers' willingness to initiate and respond other people and objects in their environment. However, as the results of this study indicate, a warm and supportive emotional climate doesn't guarantee rich learning experiences. The correlations between quality of maternal input and secure attachment were quite low. Moreover, mothers of the "high-risk, secure" subset, used to demonstrate attachment as a protective factor, ranged in their abilities as teacher and conversational partner. Although some scores were above the group average, some were below; none were at the top. One must assume that these children acquired cognitive and communication skills outside the tutelage of their mothers, but how?

In Ainsworth's early studies, she made two important observations about attachment and children's natural curiosity to explore and learn from their environment. First, she noted that when attachment behavior was aroused, children's exploratory behavior diminished. Second, she observed that secure children used their mothers as base from which to explore their environment

(Ainsworth et al., 1978). Bretherton and her colleagues brought these findings together to formulate their "attachment-exploration hypothesis" (Bretherton et al., 1979). Presumably, when the goals of attachment go unmet, the attachment system remains activated. Consequently, preoccupation with attachment needs interferes with a child's ability to explore and learn about the world, and about language. In contrast, a child who is confident that a parent will be available can use the parent as a secure base from which he "can make sorties into the outside world and to which he can return, knowing for sure that he will be welcomed when he gets there, nourished physically and emotionally, comforted if distressed, reassured if frightened" (Bowlby, 1988; p. 11). Thus, in an impoverished social environment, secure attachment empowers children with the freedom to discover language on their own (through interactions with objects and others in their environment such as daycare workers or older siblings) and a warm emotional climate in which this inherently social behavior, can be practiced and shared.

Differential Effects of Social Experience on Language Ability

In addition to teasing apart affective and teaching components of mother-child interaction, this study also sought to identify aspects of children's communicative and conversational competence that might be differentially influenced by social experience. A number of researchers indicate that different aspects of linguistic knowledge may be more, or less, susceptible to environmental input. Cazden (1972) proposed a continuum of environmental influences on developing language abilities. She suggests that the acquisition of syntactic knowledge is relatively unaffected by social experience and thereby,

more similar across children. In contrast, the acquisition of more specific knowledge such as vocabulary depends more on social input, require more exposure to models, and show greater variability across children. Similarly, Berko-Gleason and Weintraub (1978) proposed that various functions of language may be differentially affected by social experience. According to their model, functions that reflect the way in which language is mapped onto social situations (e.g, the ability to carry on a meaningful conversation) are most likely to be influenced by children's interpersonal experiences.

In contrast to these models of environmental influence, it was suggested here that all aspects of early language development are susceptible to environmental input, but that different aspects of linguistic ability are affected by different types of social experience. Following the work of Cicchetti and others (1990), it was hypothesized that structural and grammatical aspects of verbal performance are more related to the quality of social and learning experiences while other aspects such as what young children talk about, are more reflective of the affective nature of the mother-child attachment relationship. Although preliminary, the data do support the hypothesized relation between various features of child discourse and separate components of early social relationships. In this study, secure attachment was more frequently related to the child's lexical diversity and amount of conversation with mother at 30 months, whereas quality of maternal teaching and language stimulation was more frequently related to aspects of structural complexity (viz., mean length of utterance), the content of child turns (viz., percentage of new turns and internal state density), and to the children's performance on standard test of language and cognition (recall Tables 12 and 13).

Sex Differences in a High-Risk Sample

In addition to analyses of the entire sample, this study also examined sex differences in child language ability and in the relation between risk and child outcome. Tests for sex differences in language ability revealed a consistent advantage for girls across the age-range of this study. Differences in maternal report of 20-month vocabulary and in the 30-month conversation measures were considerable. It is somewhat perplexing that sex differences on the Bayley and the Preschool Language Scale (PLS) did not reach statistical significance. One likely reason is that tests such as the Bayley and the PLS have been constructed to minimize sex differences. Second, the items on standardized tests of language typically do not sample the breadth of ability that can be captured by observational measures of spontaneous language or exhaustive inventories of productive ability. Typically, items on the Bayley and PLS probe aspects of linguistic knowledge that can be assessed non-verbally, or in one-word or simple multi-word responses to specific questions.

Environmental influences on child language and cognition appeared to be greater for the boys in this sample than for the girls. While observed sex differences in child outcomes were not associated with differences in overall family status, composition, quality of maternal input, or attachment status, it may be the case that the same overall family situations constitute a different stimulus for boys and for girls. That is, although their experiences appear similar, boys and girls may be differentially affected by environmental stress.

Although the reasons are unknown, males are more often afflicted with virtually every neurologic, psychiatric and developmental disorder of childhood. In the developmental disorders, sex ratios commonly range from 1.3: 1 for severe

mental retardation to 4.3 : 1 for dyslexia (Gualtieri & Hicks, 1985). Studies of mother-child interaction beginning with the first year of life describe boys as less positive (Clarke-Stewart, 1973), less socially competent (Klein & Durfee, 1978), less initiating, more likely to ignore their mother's vocal overtures (Gunnar & Donahue, 1980), and more likely to engage in forbidden acts in the home and in the laboratory (Maccoby & Jacklin, 1974). Boys are reportedly more likely to suffer from family conflict and disruptions in the home. Relative to girls, they show more problems in at home following divorce (Hetherington, Cox, & Cox, 1982) and more behavior problems with increased family stress (Rutter, 1970; Wolkind & Rutter, 1973).

The pervasiveness of male vulnerability has lead many investigators to posit biological origins for the observed sex-linked responses to psychologic and physiologic stresses. Severally non-mutually exclusive explanations have been considered. These include male inferiority due to males having 4-5% less genetic material and greater vulnerability due to the process of sex differentiation and due to a slower rate of maturation (Rutter, 1970). It is estimated that girls have a developmental advantage of approximately three weeks at birth and that this advantage reaches 5 years by the age of thirty (Taylor, 1990). In general, immature organisms are more susceptible to damage than mature ones. This relative immaturity means that males may be more receptive to environmental influences for a longer period of time (Rutter, 1970). In this study, tests for differences in the magnitude of the correlations between risk and language outcomes for boys and for girls showed that degree of family risk and attachment had a greater influence on boys' language skills. It must be emphasized that

these two variables represent both disadvantages and advantages available in the caretaking environment.

One final note. The positive correlation between degree of family risk (at 36-months) and girls' verbal ability (measured concurrently by the PLS) was a curious and unexpected finding. To learn more about this association, additional correlations between the PLS Verbal quotient and individual measures that comprise the 36-month risk index were performed. For the girls, the results showed a significant positive relation between the PLS Verbal quotient and mother's reported depression and negative life events and a significant negative correlation with mother's community skills and her conversational skills with adults. The correlations were not significant for the boys, although they were in the expected direction: opposite that of the girls. Because this pattern appeared with just one language outcome, it should not be over-interpreted. It is nonetheless, intriguing. Several researchers have noted that some individuals seem capable of drawing strength from stressful situations (Anthony, 1987; Rutter, 1985a). Rutter (1990), in a comment on a study of depression and child psychopathology (Fendrich, Warner, & Weissman, 1990), speculates that in the presence of other family risk factors parental depression seems to have a marginal protective effect on children's social-emotional health.

Garmezy (1983) has developed the concept of "required helpfulness" to describe one way in which the stress (in his example, the stress of living with a mentally ill parent) can have a positive effect on overall child competence. He proposes that if the stress is tolerable and gives rise to interactions that the child finds rewarding, the consequence of helping others (e.g., a sick parent or younger siblings) can increase the helpers' competence, morale, motivation, and

persistence and lead to the acquisition of problem-solving skills. The caveat here is that one must presuppose an initial level of skill to invoke. Although little is known of the relation between gender and the "steeling effect" (Rutter, 1985a) of parental depression, it is evident that the girls in this study had, from as early as 20 months of age, more language to invoke. It is of additional interest that sex differences have been reported in the behavior of depressed mothers toward their children. In an extensive study of parents with psychiatric disorders, Radke-Yarrow and her colleagues (Radke-Yarrow, Richters, & Wilson, 1988) observed that some depressed mothers engage in extended physical affection with their daughters but not their sons. The origin and long-range consequences of such gender-linked differences remains open to empirical investigation.

The importance of specific social experiences as a buffer against environmental risk is a growing area of research (see Rolf, Masten, Cicchetti, Nuechterlein, & Weintraub, 1990). As yet, relatively little is known about how protective factors exert their influence on intellectual development. For the preschool child, the interpersonal interactions which may offset environmental hardship are largely a consequence of interactions within the family. A formidable task for risk research will be to continue to differentiate among the hazards and consequences of environmental influences on child development. In addition to guiding future prevention/intervention efforts, the study of how at-risk children negotiate stage-salient tasks such as language can enrich normal developmental theory by revealing the buffers built into our social system that engender optimal development for all children.

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APPENDIX A: BECK DEPRESSION INVENTORY

APPENDIX B: NEGATIVE LIFE EVENTS SCALE

APPENDIX C: ADULT CONVERSATION SKILLS

soc skills -- 2 Subject No. _____

NONVERBAL SIGNALS	Yes	No
15. Mother maintains eye contact during interviewer's "turns" in the conversation.	☐	☐
16. Mother makes eye contact at least part of the time during her "turns" in the conversation.	☐	☐
17. Mother's eyes do not shift repeatedly around room, or back and forth.	☐	☐
18. Mother nods head in an appropriate manner at least once during interview.	☐	☐
19. No repeated "hand to mouth," face or ear posturing occurs during interview.	☐	☐
20. Mother's upper body is turned no more than 45^{o} from visitor at least 50% of the time (her shoulders are squared to the visitor).	☐	☐
21. Mother's lower body is turned no more than 45^{o} away from interviewer.	☐	☐
22. Arms are in "open" position (not crossed over chest) for majority of time.	☐	☐
23. Legs are in "open" position (not tightly clenched together or tightly crossed) for majority of interview.	☐	☐
24. Mother does not show any "tics" during interview (e.g., foot tapping, leg kicking, ring turning, head scratching, ear tweaking, or other repetitive motions).	☐	☐
25. Body musculature generally relaxed.	☐	☐
26. Mother leans backward away from interviwer no more than once.	☐	☐
27. Mother does not physically move her chair away from the interviewer, or move to another seat that is farther away.	☐	☐
28. Mother does not show clenched fist or clenched jaws during interview.	☐	☐
29. Mother does not pace or stand at inappropriate moments during the interview.	☐	☐
30. Mother sits in neutral or forward leaning position for most of interview (not leaning back or turned sideways).	☐	☐
31. Mother does not show hand or body tremor.	☐	☐
32. Mother shows no peculiar posturing of her body.	☐	☐
33. Mother has no unpleasant body odors.	☐	☐

soc skils -- 3 Subject No. _____

SPEECH AND CONVERSATION SKILLS	Yes	No
34. Mother uses varied voice inflection.	☐	☐
35. Mother's speech is smooth flowing without excessive use of flowbreakers (e.g., "uh" or "you know.")	☐	☐
36. Mother's voice is not shrill, squeeking, or abnormally high pitched.	☐	☐
37. Mother's voice is not louder than necessary for the interview context.	☐	☐
38. Mother's responses to questions are not rambling or excessively verbose.	☐	☐
39. Mother's responses are timely--not very slow to respond.	☐	☐
40. Mother's voice is not breathy, soft, or whispering.	☐	☐
41. Mother's voice is not slurred or incoherent speech.	☐	☐
42. Mother's speech is not excessively rapid or staccato.	☐	☐
43. Mother answers with more than one sentence (where appropriate in the interview) the majority of the time.	☐	☐
44. Mother initiates parts of the conversation by asking questions (at least once).	☐	☐
45. Mother initiates parts of conversation by making comments or initiating new topics (at least once).	☐	☐
46. Mother does not interrupt the visitor's speech more than once by talking (0 or 1 = a yes).	☐	☐
47. If the mother interrupts, as in #46, she excuses herself each time, or with a general apology.	☐	☐
48. Mother does not monopolize conversation.	☐	☐
49. Mother does not engage in idle, purposeless chatter.	☐	☐
50. Mother makes a joke or an amusing comment.	☐	☐
51. Mother volunteers an opinion on some topic (at least once).	☐	☐
AFFECT		
52. Mother laughs heartily at least once, as appropriate to content (if she does not laugh heartily at all, score no).	☐	☐
53. Mother laughs moderately ("social" laugh) more than once at appropriate times.	☐	☐

soc skills -- 4 Subject No. _____

AFFECT (continued)	Yes	No
54. Mother does not laugh inappropriately.	☐	☐
55. Mother grins at least once during interview at an appropriate time.	☐	☐
56. Mother smiles (moderate or social smile) more than 5 times (appropriate times).	☐	☐
57. Mother's face/posture shows pleasure/joy at least once during interview (open face, delight shown in some way).	☐	☐
58. Mother's face shows sadness at least once at a time appropriate to interview.	☐	☐
59. Mother's silences are comfortable most of the time.	☐	☐
COMMUNICATION SKILLS		
60. Mother summarizes something she has said at least once.	☐	☐
61. Mother clarifies something she has said at least once.	☐	☐
62. Mother asks for clarification of something the interviewer has said at least once.	☐	☐
63. Mother attends to the interviewer's questions 80% of the time.	☐	☐
TOTAL YESES	_____	

APPENDIX D: PERSONAL RESOURCES QUESTIONNAIRE

APPENDIX E: COMMUNITY LIFE SKILLS SCALE

SUBJECT NO. _____

Date _____

Interviewer _____

Reliability Case Yes No

Location of Interview:

_____

UNIVERSITY OF WASHINGTON
School of Nursing
INFANT & FAMILY FOCUS

COMMUNITY LIFE SKILLS SCALE

	Yes	No
I. ABILITIES		
1. Mother can complete relevant demographic entries, e.g., name, date, phone number, address, on forms given to her to complete at home.	☐	☐
2. Mother completed at least 3 of 6 questionnaires given her at her first visit correctly and fully without assistance.	☐	☐
3. Mother is home at agreed time for first home visit.	☐	☐
4. Mother can give directions to someone on how to find her house.	☐	☐
II. TRANSPORTATION		
5. Mother has some form of regular, reliable transportation to work or for her needs.	☐	☐
6. Mother can describe how to get to the grocery store, or to her doctor or clinic by some alternate method of transportation if her regular transportation is not available (e.g., if the car is broken down).	☐	☐
7. Mother knows the location of the bus stop nearest to her home.	☐	☐
8. Mother has a copy of the bus schedule for her local route, or knows that she can get a schedule over the phone.	☐	☐
III. BUDGETING		
9. Mother is able to pay bills (e.g., rent, utility) so that she is not bothered by collectors or threatened by service cut-offs. (No more than one such in past year.)	☐	☐
10. Mother plans her monthly spending so that there is some money left at the end of the month (or before she gets her next check) to pay for food and other essentials.	☐	☐
11. Mother has a bank account.	☐	☐
12. Mother plans purchases to take advantage of sales or lower prices (e.g., uses discount houses, coupons, etc.)	☐	☐
13. Mother makes no more than 3 visits per week to the food store.	☐	☐
IV. SUPPORT SERVICES		
14. Mother has the phone numbers of family or friends easily available in case of emergency or need.	☐	☐
15. Mother knows the name of at least one neighbor sufficiently to locate the name in a phone book.	☐	☐
16. Mother uses yellow pages to look up numbers or to find goods or services on some regular basis (approximately once a month).	☐	☐
17. Mother has emergency numbers easily available (e.g., 911, doctor, poison control center)	☐	☐
18. Mother knows where to obtain such needed services as drugstore for a prescription for someone in the family, a car repair shop, or a post office to mail a package.	☐	☐
V. SUPPORT-INVOLVEMENT		
19. Mother has a close friend with whom she visits at least once a week, by phone or in person.	☐	☐
20. Mother has attended a party or been a guest at a meal within the past 6 weeks.	☐	☐
21. Mother has invited a guest to her home within the past 2 weeks.	☐	☐
22. Mother initiates contact by phone or in person or by letter with at least one member of her own family with whom she does not live, within the past 2 weeks.	☐	☐
23. Mother has made a reciprocal agreement with a friend to exchange favors or services such as babysitting.	☐	☐
24. Mother reports that she has conversations with people she has not met before in such settings as the grocery store, the laundromat, in the doctor's waiting room, other mothers in a park, in church.	☐	☐
25. Mother belongs to a club or other organized group that meets regularly (on a regularly scheduled basis).	☐	☐
VI. INTEREST-HOBBIES		
26. Mother has some hobbies or recreational interests.	☐	☐
27. Mother reads some magazine (no matter what kind) at least once a month (she need not purchase it).	☐	☐
28. Mother has visited the public library or bookmobile at least once in the past month.	☐	☐
29. Mother keeps up with the news on TV or radio or reads a daily paper at least 3 times a week.	☐	☐
VII. REGULARITY-ORGANIZATION-ROUTINES		
30. Mother's clothes appear clean and reasonably appropriate for the occasion and time of day.	☐	☐
31. Mother usually dresses in the morning rather than spending the day in bathrobe or night clothes.	☐	☐
32. Mother eats meals at regular times at least once a day.	☐	☐
33. Mother eats at least one meal per day with partner, family, or friends at home.	☐	☐
34. Mother gets some regular exercise at least 3 times a week (15-20 min/day or 30-45 min. 3 times a week)	☐	☐
35. Mother has seen a doctor for a regular check-up (other than pregnancy or illness) within the past 3 years).	☐	☐
36. Mother has been to a dentist within the past 3 years.	☐	☐
37. Mother has a way of keeping track of obligations such as clinic appointments or home visits (e.g., a list or a calendar).	☐	☐

TOTAL YESES: _____

APPENDIX F: NURSING CHILD ASSESSMENT TRAINING TEACHING SCALE

APPENDIX G: HOME OBSERVATION FOR MEASUREMENT OF THE ENVIRONMENT

UNIVERSITY OF WASHINGTON
SCHOOL OF NURSING
NURSING CHILD ASSESSMENT SATELLITE TRAINING PROJECT

HOME OBSERVATION FOR MEASUREMENT OF THE ENVIRONMENT
(BIRTH TO THREE YEARS)

PERSON OBSERVED (CIRCLE)
MOTHER FATHER OTHER

MAJOR CAREGIVER (CIRCLE)
YES NO

MOTHER'S EDUCATION (CIRCLE)
6 YRS OR LESS 7-8-9-10-11-12-13-14
15-16-17-18-19-20+

MARITAL STATUS (CIRCLE)
MARRIED NOT MARRIED

INCAST ID NO. _____
CITY _____
CHILD'S FIRST NAME _____
CHILD'S AGE IN MONTHS _____
CHILD'S RACE _____

	YES	NO
I. EMOTIONAL AND VERBAL RESPONSIVITY OF MOTHER		
1. MOTHER SPONTANEOUSLY VOCALIZES TO CHILD AT LEAST TWICE DURING VISIT (EXCLUDING SCOLDING)		
2. MOTHER RESPONDS TO CHILD'S VOCALIZATIONS WITH VERBAL RESPONSE.		
3 MOTHER TELLS CHILD THE NAME OF SOME OBJECT DURING VISIT OR SAYS NAME OF PERSON OR OBJECT IN A "TEACHING STYLE."		
4. MOTHER'S SPEECH IS DISTINCT, CLEAR AND AUDIBLE		
5. MOTHER INITIATES VERBAL INTERCHANGES WITH OBSERVER—ASKS QUESTIONS, MAKES SPONTANEOUS COMMENTS.		
6 MOTHER EXPRESSES IDEAS FREELY AND EASILY AND USES STATEMENTS OF APPROPRIATE LENGTH FOR CONVERSATIONS (E.G. GIVES MORE THAN BRIEF ANSWERS)		
*7 MOTHER PERMITS CHILD OCCASIONALLY TO ENGAGE IN "MESSY" TYPES OF PLAY.		
8 MOTHER SPONTANEOUSLY PRAISES THE CHILD'S QUALITIES OR BEHAVIOR TWICE DURING VISIT.		
9 WHEN SPEAKING OF OR TO CHILD, MOTHER'S VOICE CONVEYS POSITIVE FEELING		
10. MOTHER CARESSES OR KISSES CHILD AT LEAST ONCE DURING VISIT.		
11. MOTHER SHOWS SOME POSITIVE EMOTIONAL RESPONSES TO PRAISE OF CHILD OFFERED BY VISITOR.		
SUBSCALE TOTAL (NO OF YES ANSWERS)		
II. AVOIDANCE OF RESTRICTION AND PUNISHMENT		
12. MOTHER DOES NOT SHOUT AT CHILD DURING VISIT.		
13. MOTHER DOES NOT EXPRESS OVERT ANNOYANCE WITH OR HOSTILITY TOWARD CHILD		
14 MOTHER NEITHER SLAPS NOR SPANKS CHILD DURING VISIT.		
*15. MOTHER REPORTS THAT NO MORE THAN ONE INSTANCE OF PHYSICAL PUNISHMENT OCCURRED DURING THE PAST WEEK.		
16 MOTHER DOES NOT SCOLD OR DEROGATE CHILD DURING VISIT.		
17. MOTHER DOES NOT INTERFERE WITH CHILD'S ACTIONS OR RESTRICT CHILD'S MOVEMENTS MORE THAN 3 TIMES DURING MY VISIT.		
18. AT LEAST TEN BOOKS ARE PRESENT AND VISIBLE.		
*19. FAMILY HAS A PET.		
SUBSCALE TOTAL (NO OF YES ANSWERS)		
III. ORGANIZATION OF ENVIRONMENT		
20. WHEN MOTHER IS AWAY, CARE IS PROVIDED BY ONE OF THREE REGULAR SUBSTITUTES.		
21. SOMEONE TAKES CHILD INTO GROCERY STORE AT LEAST ONCE A WEEK.		
22. CHILD GETS OUT OF HOUSE AT LEAST FOUR TIMES A WEEK.		
23. CHILD IS TAKEN REGULARLY TO DOCTOR'S OFFICE OR CLINIC.		
*24 CHILD HAS A SPECIAL PLACE IN WHICH TO KEEP HIS TOYS AND "TREASURES."		

	YES	NO
25. CHILD'S PLAY ENVIRONMENT APPEARS SAFE AND FREE OF HAZARDS.		
SUBSCALE TOTAL (NO OF YES ANSWERS)		
IV. PROVISION OF APPROPRIATE PLAY MATERIAL		
26. CHILD HAS SOME MUSCLE ACTIVITY TOYS OR EQUIPMENT.		
27. CHILD HAS PUSH OR PULL TOY.		
28 CHILD HAS STROLLER OR WALKER, KIDDIE CAR, SCOOTER, OR TRICYCLE		
29 MOTHER PROVIDES TOYS OR INTERESTING ACTIVITIES FOR CHILD DURING INTERVIEW.		
30. PROVIDES LEARNING EQUIPMENT APPROPRIATE TO AGE—CUDDLY TOY OR ROLE PLAYING TOYS.		
31. PROVIDES LEARNING EQUIPMENT APPROPRIATE TO AGE—MOBILE, TABLE AND CHAIRS, HIGH CHAIR, PLAY PEN.		
32. PROVIDES EYE-HAND COORDINATION TOYS—ITEMS TO GO IN AND OUT OF RECEPTACLE, FIT TOGETHER TOYS, BEADS.		
33. PROVIDES EYE-HAND COORDINATION TOYS THAT PERMIT COMBINATIONS—STACKING OR NESTING TOYS, BLOCKS OR BUILDING TOYS		
34. PROVIDES TOYS FOR LITERATURE AND MUSIC.		
SUBSCALE TOTAL (NO. OF YES ANSWERS)		
V. MATERNAL INVOLVEMENT WITH CHILD		
35. MOTHER TENDS TO KEEP CHILD WITHIN VISUAL RANGE AND TO LOOK AT HIM OFTEN.		
36. MOTHER "TALKS" TO CHILD WHILE DOING HER WORK.		
37. MOTHER CONSCIOUSLY ENCOURAGES DEVELOPMENTAL ADVANCE.		
38. MOTHER INVESTS "MATURING TOYS" WITH VALUE VIA HER ATTENTION.		
39. MOTHER STRUCTURES CHILD'S PLAY PERIODS		
40. MOTHER PROVIDES TOYS THAT CHALLENGE CHILD TO DEVELOP NEW SKILLS		
SUBSCALE TOTAL (NO. OF YES ANSWERS)		
VI. OPPORTUNITIES FOR VARIETY IN DAILY STIMULATION		
41. FATHER PROVIDES SOME CARETAKING EVERY DAY.		
42. MOTHER READS STORIES AT LEAST THREE TIMES WEEKLY.		
43. CHILD EATS AT LEAST ONE MEAL PER DAY WITH MOTHER AND FATHER.		
44. FAMILY VISITS OR RECEIVES VISITS FROM RELATIVES (APPROX. ONCE A MONTH).		
45. CHILD HAS THREE OR MORE BOOKS OF HIS OWN.		
SUBSCALE TOTAL (NO. OF YES ANSWERS)		

*ITEMS WHICH MAY REQUIRE DIRECT QUESTIONS

ENTER TOTALS FOR EACH CATEGORY:	
EMOTIONAL AND VERBAL RESPONSIVITY OF MOTHER	
AVOIDANCE OF RESTRICTION AND PUNISHMENT	
ORGANIZATION OF ENVIRONMENT	
PROVISION OF APPROPRIATE PLAY MATERIAL	
MATERNAL INVOLVEMENT WITH CHILD	
OPPORTUNITIES FOR VARIETY IN DAILY STIMULATION	
TOTAL SCORE (NO. OF YES ANSWERS)	

EXAMPLES OF SELECTED QUESTIONS FOR THE HOME (BIRTH-3 YEARS)

SECTION I. EMOTIONAL AND VERBAL RESPONSIVITY OF MOTHER

ITEM 7. MESSINESS. "DOES HE SOMETIMES WANT TO PLAY IN HIS FOOD OR IN HIS BATH? OR "DO YOU SOMETIMES LET HIM PLAY AND BE MESSY?

SECTION II. AVOIDANCE OF RESTRICTION AND PUNISHMENT

ITEM 13. DISCIPLINE. HOW DO YOU MANAGE HIS DISCIPLINE AT THIS AGE—WHAT WORKS THE BEST? IN GENERAL, DOES HE MIND PRETTY WELL, OR DO YOU HAVE TO OCCASIONALLY SLAP HIS HANDS OR PHYSICALLY PUNISH HIM IN SOME WAY?"
IF YES: PROBE FOR NUMBER OF TIMES IN THE PAST WEEK.

SECTION III. ORGANIZATION OF ENVIRONMENT

ITEM 20. "HOW ABOUT YOUR TIME OUTSIDE THE HOME AND AWAY FROM YOUR CHILD; DO YOU HAVE A REGULAR SITTER THAT YOU CAN COUNT ON OR DO YOU HAVE TO GET SOMEONE DIFFERENT EACH TIME?"
PROBE FOR: GROCERY STORE (ONCE A WEEK)
RELATIVES (MONTHLY)

ITEM 21 & 22. HOW ABOUT HIS TIME OUT OF THE HOME; WHERE ARE SOME OF THE PLACES YOU TAKE HIM AND ABOUT HOW OFTEN DOES HE GET OUT OF THE HOUSE EACH WEEK?"
PROBE FOR: GROCERY STORE (ONCE PER WEEK)
RELATIVES (MONTHLY)

ITEM 24. SPECIAL PLACE FOR TOYS: USUALLY ASK THIS AT THE END OF THE INTERVIEW SAYING, "I'M INTERESTED IN SEEING SOME OF YOUR CHILD'S TOYS, WHERE HE KEEPS THEM AND SOME OF HIS FAVORITE THINGS TO PLAY WITH."

SECTION V. MATERNAL INVOLVEMENT WITH CHILD (CAN ASK WHILE LOOKING AT CHILD'S TOYS).

ITEM 36. "DO YOU SOMETIMES FIND YOURSELF MAKING CONVERSATION WITH HIM WHILE YOU'RE WORKING AROUND THE HOUSE, OR IS HE USUALLY ASLEEP WHILE YOU'RE DOING YOUR HOUSEWORK)"

ITEM 37. "WHAT ARE SOME OF THE THINGS YOU'RE HELPING YOUR CHILD TO LEARN AT THIS AGE?"
PROBE FOR: DEVELOPMENT AGE APPROPRIATE THINGS, I.E. SELF-FEEDING, WALKING, ETC.

ITEM 38. "HOW DOES HE USUALLY GET STARTED PLAYING WITH A NEW TOY—DO YOU SHOW HIM HOW TO WORK IT AND TRY TO GET HIM INVOLVED WITH IT OR DOES HE USUALLY FIGURE IT OUT FOR HIMSELF?"

ITEM 39. "ON A DAY TO DAY BASIS, HOW DOES HE GET STARTED PLAYING WITH HIS TOYS? DO YOU SOMETIMES SIT AND PLAY WITH HIM OR DOES HE USUALLY GET STARTED BY HIMSELF AND PLAY ALONE?"

ITEM 40. "HOW DO YOU USUALLY DECIDE WHAT KINDS OF TOYS TO SELECT AND OFFER YOUR CHILD TO PLAY WITH AT THIS AGE—WHAT ARE SOME OF YOUR GUIDELINES?"

LISTEN FOR TOYS THAT WILL CHALLENGE CHILD TO DEVELOP NEW SKILLS.

SECTION VI. OPPORTUNITIES FOR VARIETY IN DAILY STIMULATION

ITEM 41 & 42. HOW ABOUT BOOKS, DOES HE HAVE SOME OF HIS OWN YET?"
PROBE FOR: NUMBER OF HIS OWN BOOKS.

"DOES HE SOMETIMES LIKE FOR YOU TO READ TO HIM?"
IF YES: "HOW MANY TIMES A WEEK DO YOU HAVE TIME TO DO THAT?"

ITEM 43. "WHAT DOES HE DO WHILE YOU AND YOUR HUSBAND EAT YOUR MEALS? DOES HE USUALLY EAT WITH YOU OR DOES HE EAT AT ANOTHER TIME?"

APPENDIX H: MOTHER-CHILD LANGUAGE CODING MANUAL: AGES 13 AND 20 MONTHS

Mother-Child Language Coding Manual

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Please note that this is a working draft (7/87) subject to change. The complexity of this scheme necessitates training by the author.

MOTHER-CHILD LANGUAGE CODING MANUAL

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Introduction

The following is a summary of measures used to describe mother-child conversational interaction and child linguistic competence during the second year of life.

At 13 and 20 months, mothers and their children were video-taped during an unstructured feeding situation. This "snack" was included as a break about halfway through a laboratory assessment of play, mastery motivation and attachment. The snack segments varied in length. A minimum of 5 minutes and a maximum of 10 was transcribed for language analyses. Measures included the amount of conversation the mother directed toward the child, the functional intent of her communication and her response to the child's communicative overtures. Child language was characterized by rate per minute of verbal/vocal and conventional nonverbal communication.

In addition to the assessments of mother-child interaction, two separate measures of the child's linguistic competence were obtained. During the 20 month video-taping, mothers completed the Early Language Inventory (Bates et al., 1984), a 644-item wordlist of early vocabulary. The total vocabulary score and three derived scores were calculated: the proportion of open and closed class words, and the proportion of internal state words. At 24 months, the Bayley Scales of Infant Development was used to assess infant cognitive status. Performance on 26 language-related items of the Bayley was summed to determine a language subscale (Dale, 1987).

Assessment Setting

The snack occurred as a break about halfway through a 90 minute lab visit. The mother was encouraged to join her child in the snack. At 13 months, the infant was seated in a highchair; the room was toy-free. The mother was provided with both an infant-style drinking cup and a bottle, apple juice and snack food: cheese, crackers and Cheerios cereal. At 20 months, the mother arranged an adult-size table and two adult-size chairs to her needs; the room contained toys remaining from a preceding free-play episode. Snack consisted of crackers and juice.

The snack sessions varied in length. For the most part, the end was determined by the mother who had been instructed to notify the examiner when she and her child had finished. In situations where adequate time had elapsed, the child's cues indicated that he/she was finished and yet the mother did not inform the examiner, the examiner interceded with "Do you think ___ is done now?"

Transcription

For the purpose of language transcription, the snack episode is considered to begin once the examiner has left the room after providing

all the snack materials. Transcription ends when the examiner re-enters to clean up, or after 10 minutes, or after 100 maternal utterances, whichever comes first.

Coders transcribe all intelligible maternal verbalizations using standard English orthography and marking utterance boundaries, unintelligible speech and contextual information according to guidelines established by Miller (1980). In addition, verbal and nonverbal responses to the child's communicative overtures are transcribed. Verbal/vocal and conventional gestural communication is recorded for the child.

Screen time (hour:minute:second) is noted at the beginning of the first utterance with each change of speaker and for each successive child overture. Utterance boundaries are determined by a shift in referent or a pause of at least 2 seconds. A speaking turn is considered to be a single or string of communicative behavior which is uninterrupted by the conversational partner. The topic of a single "turn" may be one or many.

Coders end the language transcription with concluding remarks summarizing the content and context of the interaction: whether snack was the main topic of conversation, to what degree the mother's attention was on the child, and noting any unusual events.

Interpretation

The interaction is quantified in terms of amount of communication. Total number of utterances (verbal only for the mother and both verbal and nonverbal for the child) and average rate per minute is calculated for both mother and child.

Maternal involvement is analyzed further for functional intent (based largely on research by McDonald and Pien, 1982) and semantically contingent responding (inspired by Rocissano and Yatchmink, 1984). This yields a language profile which portrays: the degree to which the mother uses language to elicit conversation versus control or influence the child's behavior; the extent to which the mother is "in synch" with her baby's communicative overtures; and finally, the distribution of verbal, verbal/nonverbal and nonverbal exchanges within the partnership.

Measures of Mother-Child Conversation Defined

Functional Characteristics of Mother's Speech

QUESTIONS (Q) This category reflects many types of questions (although these specific subcategories are not coded): real questions, action reflective questions, verbal/vocal reflective questions, test questions and repairs.

Real questions are information-seeking questions for which the speaker does not have the answer; they are requests for information. Typical topics include details of the child's actions outside the mother's view and information about the present state or intention of the child.

e.g. What are you looking for?

Action reflective questions describe or acknowledge the activity of the listener while passing on the speaking turn. They are usually tag questions with rising or falling intonation or yes/no questions. They are not requests for information about the child's activity but rather descriptions of it in question form. They are responses to the child's actions rather than to vocalizations.

e.g. Are you eating your snack?

Verbal/vocal reflective questions acknowledge the vocal activity of the listener while passing the speaking turn on, similar to action reflective questions. These questions acknowledge or signal comprehension of the previous utterance.

e.g. Oh, you don't say?

Report questions are comments to inform the child of an event or fact which may not be evident to the child. They are usually in the form of tag questions with a falling intonation. They provide new information to the listener.

e.g. That doesn't quite fit, does it?

Test questions are questions for which the speaker already has the answer. They are used to instruct the listener or demonstrate his/her knowledge. Test questions carry a high degree of constraint; often the child must provide a specific answer.

e.g. What is that, is that a cookie?

Repairs are devices for "repairing" the conversation once a breakdown has occurred. Repairs elicit a whole or partial repetition of the listener's previous utterance. They usually take the form of a wh-question.

e.g. You what?

COMMENTS (C) Comments are statements which interpret or describe the environment or on-going activity to the child and include: evaluative judgments, labels, rules, instructions or explanations, demonstrations and exclamations. As defined here, comments are declaratives and thereby may not take the form of a question. Social routines such as: thank you, bless you, etc. are excluded from this category.

Evaluative judgments, positive or negative, may be about the environment, child or child's behavior.

e.g. You're such a good boy.

Labels, such as:

e.g. That's good juice.

Rules function as comments when they supply information. If the intention is to directly influence the child's on-going behavior, it is

considered a directive, not a comment.

e.g. We eat at the table.

Instructions and explanations can also function as comments or directives depending on the context of the utterance. As a comment, the intention is to provide information, not to direct the on-going behavior of the child.

e.g. You need to be careful when you pour.

Demonstrations,

e.g. See, Mommy eats her cracker all up.

Exclamations and those which represent real words or objects,

e.g. Yum yum! Oh boy! Oh my! Mmmm [good]!

DIRECTIVES (D) (I) (DV) (IV) Directives are utterances which elicit and constrain the behavior of the listener; the mother expects compliance. Direct and indirect commands are coded separately.

Direct commands (D) carry heavy constraint on the listener's behavior. They are often marked by the deletion of a grammatical subject. Other forms specify the desired agent and behavior. Direct commands allow no alternatives or substitutions on the part of the listener.

e.g. Sit down.

Indirect commands (I) are softened or less specific; a verbal response may be substituted for physical action (unlike direct commands). Indirect commands include: requests, suggestions, complaints, demands and threats.

e.g.	Would you please just sit down.	[request]
	How 'bout eating your cracker?	[suggestion]
	Oh great, what a mess!	[complaint]
	I want you to eat that now.	[demand]
	You want a spanking?	[threat]

Eliciting verbal responses (DV) (IV) The command form is also used with infants and toddlers to teach vocabulary. Instruction usually takes the direct form: "Say ___" but may also appear as an indirect command in the form: "Can you say ___?" As such, these are not real questions; the mother is not expecting the baby to tell her yes/no but rather she is trying to elicit the production. DV and IV are used to indicate this special category of language-eliciting directives.

NAME-CALLING (+) (-) This category includes all positive and negative instances of name-calling where the mother labels the child or refers to the child by something other than his/her proper name or an obvious diminutive. All available contextual information and mother's

intonation is used to judge the intended connotation.

UNCODEABLE (0) There are of course many utterances which do not serve one of the described functions. These include social routines, songs and nursery rhymes, acknowledgments such as "mm-hmm", verbal behavior which serves to soothe or quiet the baby and unintelligible/uncodeables. For a sample of 85 at 13 months and 76 at 20 months (high-social risk dyads), the frequency of uncoded maternal utterances ranged from 0 to 19 and 0 to 21 respectively. The mean number of uncoded utterances at 13 months was 5.671 and at 20 months, 5.053. This corresponds to an average of less than 10% of the mother's total utterances. For this sample, the mean percentage of uncoded utterances relative to total maternal utterances was 7.90 at 13 months, and 7.70 at 20 months.

Mother's Semantically Contingent Responding

SYNCHRONOUS RESPONSES (SV) (SNV) A verbal or nonverbal response which occurs within 3 seconds of the child's overture and serves one of the following functions: maintain, elaborate, repeat the child's previous utterance, acknowledge, confirm, respond to a question, or clarify.

Synchronous verbal responses (SV) are generally comments or questions which remain with the child's topic and intention.

e.g. C "ca-ca"
M "Yes, that's a cracker."

Synchronous nonverbal responses (SNV) are nonverbal behaviors or vocalizations which follow the child's line of regard. This category includes mimicing the child's vocalization, laughing with the child or complying with a request.

e.g. C "juz" [holds out empty cup]
M [pours more juice]

ASYNCHRONOUS RESPONSES (AVIg) (ANVIg) (AVRed) (ANVRed) Verbal or nonverbal behavior within 3 seconds of the child's overture which does not follow the child's line of regard. Asynchronous responses include a lack of response or a response which is intended to redirect the child.

Asynchronous verbal ignore (AVIg) is an infrequently occurring category. This code is used to describe a situations where the mother speaks to the examiner within 3 seconds of a child's communicative bid, thus "missing" her opportunity to respond to the baby.

e.g. C "juz" [reaches for juice]
M "Could I have his bottle?" [to E]

Asynchronous nonverbal ignore (ANVIg) is coded when the mother's behavior does not acknowledge the child; mother ignores the child. She may continue with her own activity previous to the child's communicative overture, or she may begin a new, independent activity.

e.g. C "more please"
M [wipes tray]

Asynchronous verbal redirect (AVRed) codes a verbalization following a communicative bid which does not follow the child's line of regard. Redirects, unlike ignores, may serve one of the following functions: topic shift, direction of a new activity, mother's continuation of her own previous topic, negation or disapproval of the child's utterance.

e.g. C "Horsey"
M "No, it's time to eat."

Asynchronous nonverbal redirect (ANVRed) codes gestural responses which convey the same meaning as verbal redirects.

e.g. C "Horsey"
M [taps at cracker on tray]

Child Communicative Overtures

VERBALIZATIONS/VOCALIZATIONS (VO) All verbalizations and vocalizations are coded and those at least 3 seconds apart are considered to present separate opportunities for the mother to respond.

NONVERBAL COMMUNICATION (NVO) This category includes conventional communicative gestures such as pointing, reaching, pushing away or nodding. At 13 months these gestures are considered communicative whether or not they are accompanied by a look to mother. At 20 months, these gestures must be accompanied by a look to be considered intentional communication (to distinguish from intentional, but not necessarily communicative, behavior). Signs of self-expression such as whines, smiles and laughs are coded only if accompanied by a look to mother.

MOTHER-CHILD LANGUAGE
SUMMARY OF CODES USED WITH TRANSCRIPT

Functional Characteristics (of Mother's verbal turns only)

- Q = Question
- C = Comment
- D = Direct command (DV = language-eliciting direct command)
- I = Indirect command (IV = language-eliciting indirect command)
- \+ = Name-calling positive
- \- = Name-calling negative
- 0 = Uncodeable

Synchronous/Asynchronous Responding (Mother's behavior within 3 sec. of each child determined opportunity)

- SV = Synchronous verbal
- SNV = Synchronous nonverbal
- AVIg = Asynchronous verbal ignore
- ANVIg = Asynchronous nonverbal ignore
- AVRed = Asynchronous verbal redirect
- ANVRed= Asynchronous nonverbal redirect

Communicative Overtures (Child only)

- VO = Verbal/vocal overture
- NVO = Nonverbal (gestural) overture

MASTERY AND PLAY PROJECT
MOTHER - CHILD VERBAL INTERACTION, SNACK EPISODE

CODED SW
DATE 2/4/86
SUBJECT #: 835
AGE: 20 months
Identifying Characteristic: & whit shirt, lavender pants

start time: 14:15:34

15:34 M	1	Come up here first so you can get a cracker	D	
	2	Sit down.	D	
	3	Want some juice?	Q	
:42 C	4	uh uh [no]	VO	
43 M	5	Don't want no juice?	Q	SV
	6	Wanna cracker?	Q	
:58 C	7	X [whine]	VO	
:59 M	8	Come here.	D	AVRed
	9	Come here, look.	D	
:03 C	10	Toast.	VO	
:04 M	11	What?	Q	SV
:05 C	12	Eat.	VO	
:07 M	13	Cracker?	Q	SV
:08 C	14	(what got) [point]	VO	
:11 M	15	X a cracker?	Q	SV
:12 C	16	(juice) [points to juice]	VO	
:14 M	17	Crackers. [offers cracker]	C	AVRed
:15 C	18	[shakes head no]	NVO	
:16 M	19	Why?	Q	SV
:16 C	20	X juice [points to juice]	VO	
:17 M	21	Want some juice?	Q	SV
:20 C	22	hm mm [no]	VO	
	23	(I x juice) [shakes head no]	VO	
:22 M	24	Mmm, it's good.	C	AVRed
:23 C	25	(I want juice) [hits M]	VO	
:24 M	26	[laughs at C]		AVRed
	27			

7:00 minutes . 114 M utterances (total) . ÷ = n/a C MLU

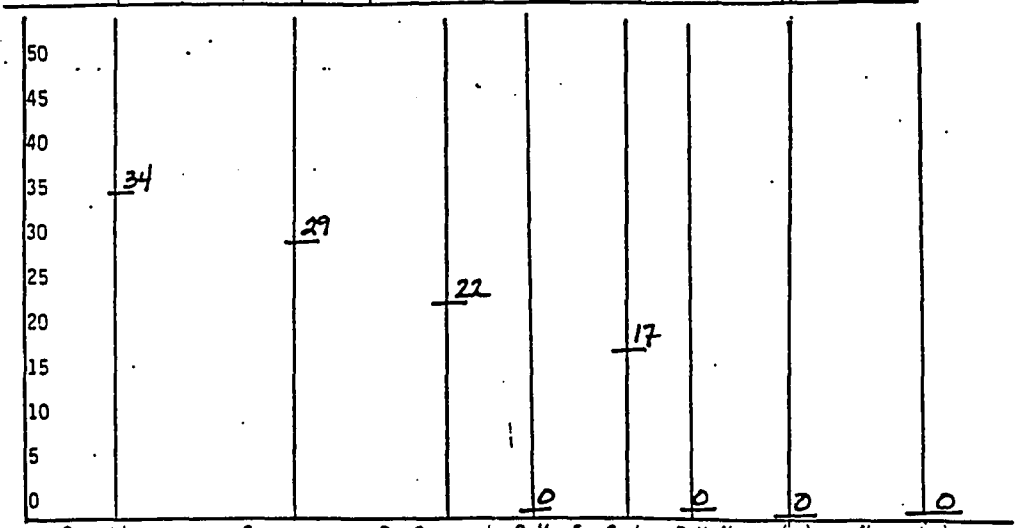
Snack ended with: ____ M ____ E ✓ ~~100~~ M utt ____ 10 min.

Snack topic: ____ some ____ most ✓ all

M's attn to C: ____ some ____ most ✓ all, if not "all" to : ____

2

MINUTES	1	2	3	4	5	6	7	8	9	10	TOTAL
M utt	15	24	11	24	9	16	15				114
C VO's	12	9	0	3	1	4	1				30
C NVO's	1	3	0	0	2	0	0				8



C \ M	SV	SNV	AVRed	ANVRed	ANVIa	AVIa	Mixed
II	17	1	8	1	1	1	6
VO							
	1	1	II		1		1

Validity

Concurrent validity of the 13 and 20 month mother and child communication variables was assessed by correlating them with a measure of dyadic interaction, the Nursing Child Assessment Feeding (NCAFS) and Teaching Scales (NCATS) (Barnard, Hammond et al., in press). The scales describe the repertoire of specific behaviors each partner brings to the interaction and their contingent responsiveness. The feeding and teaching scales are each made up of a number of binary items (76 and 73 items, respectively) organized into six conceptually-derived sub-scales, four of which describe the mother's behavior and two of which describe the child's behavior: (1) parent's sensitivity to cues; (2) parent's response to the child's distress; (3) social-emotional growth fostering; (4) cognitive growth-fostering; (5) child's clarity of cues, and (6) child's responsiveness to parent. Summary scores reflect the parent's total score and the child's total score. The tasks used for each assessment are quite different. The feeding interaction is a familiar situation which makes relatively few new demands. Items selected for the teaching assessment are age-appropriate motor performance items which can be considerably more stressful, particularly if the child does not perform.

The correlation of mother and child communication variables with the 13 month NCAFS provides a test of concurrent validity which utilizes the same feeding situation (Tables 1 and 2). The concurrent correlation was highly significant for both mother and infant communication.

Cross-episodic validity is described by the correlation between the 13 and 20 month communication variables and the corresponding NCATS (Tables 3 - 5). Despite differences in the snack and teaching episodes, the correlation between maternal performance suggests consistency in the quality of her contribution to the interaction. The correlation between rate of infant communication and the infant's NCAT score is less robust.

Predictive validity, represented by the correlation between 13 and 20 month infant communication and later (20 and 24 month) measures of vocabulary are presented in Tables 6 and 7. Stability over time, from the 13 to 20 month assessment, for characteristics of both mother and infant communication, is illustrated by Tables 8 and 9. Many of these correlations are significant at the $p \leq .001$ level.

Reliability

Interobserver reliability coefficients were computed through the use of correlational analyses for the each functional category and each response to infant communication. The results of these analyses (on a subsample of 23 cases at 13 months and 14 cases at 20 months) reflect a high degree of stability between observers (Table 10). Agreement for total number of maternal utterances and child's bids was above 95%. Reliability cases included subjects representing three samples: high-social risk, mothers and their very low birthweight (< 1500 grams) preterms and a group of fullterm, middle class children and their mothers. Correlation was used to assess interobserver reliability because analyses are based on the complexion of the sample as a whole, rather than utterance by utterance.

Assessments of Child's Linguistic Competence

20 Month Vocabulary

20 MONTH EARLY LANGUAGE INVENTORY The version of the ELI used by our project is the 644-item vocabulary checklist. Mothers completed the wordlist during the 20 month video-taping.

In addition to the total number of words indicated on the ELI, several categorical scores were derived. The words on the ELI are grouped semantically, i.e. animals, food and drink, clothing, etc. Computation of the following variables is based on the work of Bates, et al. but applied to this version of the ELI.

NOUNS:	Sections	1 (animals)	7 (household items)
		2 (vehicles)	8 (furniture)
		3 (food and drink)	9 (outside things)
		4 (clothing)	10 (places to go)
		5 (body parts)	11 (people)
		6 (toys)	14 (time)
VERBS:		12 (actions, games and verbs)	
ADJECTIVES:		13 (qualities and attributes)	
FUNCTION WORDS/ INFLECTIONS		16 (question words)	
		17 (prepositions and articles)	
		18 (quantifiers)	
		19 (auxiliaries or "helping verbs")	

REFERENTIAL STYLE = Nouns / Total Number of Words
PROPORTION REFERENTIAL = Referential / Total

OPEN CLASS STYLE = Nouns + Verbs + Adjectives / Total
PROPORTION OPEN STYLE = Open Class Style / Total
NOUN DENSITY = Nouns / Total
VERB DENSITY = Verbs / Total
ADJ. DENSITY = Adjectives / Total

CLOSED CLASS STYLE = Functions and Inflections / Total
PROPORTION CLOSED STYLE = Closed Class Style / Total

Referential/Expressive and Closed/Open Class distinctions are felt to reflect language learning styles. Bates, et al. (in press) have reported that early language learning is characterized by expansion of the Open Class words. At 13 months, they report a particular emphasis on nouns; at 20 months, a focus on verbs. At 28 months, the emphasis changes to the acquisition of the Closed Class words.

In addition to the grammatical categories outlined above, another score which can be derived from the ELI is the proportion of words referring to emotions, affect and internal states (e.g. good, hungry, wish, love, know, etc.). We have identified a 53-item internal state (IS) word subset of the ELI. The categories represented are identical

to categories specified by Bretherton and Beeghly and include words marking sensory perception, physiology, emotion and affect (both positive and negative), volition and ability, and cognition and moral judgment. Based on research with middle-class samples, the ability to talk about emotions is felt to emerge during the 2nd year and expand during the 3rd (Bretherton and Beeghly, 1982).

IS WORDS: Section 12 (actions, activities, games and verbs)

cry	look
hug	love
hurt	watch
kiss	wish
know	
no/not	
pretend	
see	
sleep	
smile	
taste	
think	
wait	

Section 13 (qualities and attributes)

asleep	mad
awake	naughty
bad	nice
better	quiet
blah	sad
cold	scared
dirty	sick
fine	sleepy
gentle	thirsty
good	tired
happy	yucky
hard	
hot	
hungry	
hurt	

Section 19 (auxiliaries or "helping verbs")

can	lemme/let
gonna	need to
gotta	ought
havta	should
	try/tryin to
	wanna

24 Month Language Skill

24 MONTH BAYLEY LANGUAGE SUBSCALE A subset of 26 items on the Bayley MDI have been identified as primarily linguistic in nature. Taken together, they have been used as a measure of language skill (Dale, 1987). These items can be further classified into 10 expressive and 16 receptive items.

Bayley Language Subscale:	Receptive Items		
	# 89	128	162
	90	132	163
	100	139	
	107	144	
	109	148	
	117	152	
	126	158	
	Expressive Items		
	#106	136	
	113	138	
	124	141	
	127	146	
	130	149	

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TABLE 1

Correlation Between 13 Month Maternal Communication Variables and Criterion Measure

13 Month NCAF Maternal Subscales:	Sens	Resp Dis	Soc	Cog	Total
DISTRIBUTION OF UTTERANCE TYPES AS PROPORTION OF TOTAL TYPES					
Individual Categories					
Questions	.20*	.00	.14	.15	.18*
Comments	.00	.31**	.29**	.36***	.34***
Direct Commands	-.20*	-.30**	-.40***	-.48***	-.50***
Indirect Commands	-.01	-.10	-.15	-.10	-.14
Summary Categories					
Language Facilitating	.18*	.30**	.40***	.47***	.49***
Behavior Controlling	-.18*	-.30**	-.40***	-.47***	-.49***
	(as proportions, these are reciprocals)				
UTTERANCE TYPES AS RATES PER MINUTE					
Individual Categories					
Questions	.13	.14	.36***	.42***	.38***
Comments	-.03	.26**	.36***	.45***	.37***
Direct Commands	-.16	-.20*	-.06	-.13	-.19*
Indirect Commands	.00	-.05	.13	-.04	.03
Summary Categories					
Language Facilitating	.05	.23*	.40***	.49***	.42***
Behavior Controlling	-.10	-.12	.07	-.08	-.07
Total Utterances/Minute	.03	.15	.38***	.39***	.35***
RESPONSE (VERBAL OR NONVERBAL) TO INFANT AS A PROPORTION OF INFANT COMMUNICATION					
Synchronous	.10	.29**	.41***	.38***	.43***
Asynchronous Redirect	-.17	-.17	-.06	-.02	-.16
Asynchronous Ignore	.04	-.21*	-.46***	-.45***	-.39***

Note: N=84; high social-risk sample only

* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$

TABLE 2

Correlation Between 13 Month Child Communication Variables and Criterion Measure

NCAF Child Subscales:	Clarity of Cues	Responsiveness	Total
RATE OF INFANT COMMUNICATION PER MINUTE			
Verbal/Vocal	.26**	.26**	.30**
Gestural	.01	.25**	.15
Combined Total	.26**	.33***	.34***

Note: N=84; high social-risk sample only

* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$

TABLE 3

Correlation Between 13 Month Maternal Communication Variables and Criterion Measure

13 Month NCAT Maternal Subscales:	Sens	Resp Dis	Soc	Cog	Total
DISTRIBUTION OF UTTERANCE TYPES AS PROPORTION OF TOTAL TYPES					
Individual Categories					
Questions	.02	.17	.04	.00	.09
Comments	.28**	-.06	.29**	.19*	.24*
Direct Commands	-.32***	-.08	-.33***	-.18*	-.32**
Indirect Commands	.03	.03	-.01	-.05	-.01
Summary Categories					
Language Facilitating	.28**	.09	.31**	.18*	.31**
Behavior Controlling	-.28*	.09	-.31**	-.18*	-.31**
	(as proportions, these are reciprocals)				
UTTERANCE TYPES AS RATES PER MINUTE					
Individual Categories					
Questions	.08	-.02	.19*	.29**	.22*
Comments	.17	-.08	.30**	.35***	.28**
Direct Commands	-.17	-.14	-.03	.09	-.07
Indirect Commands	.04	-.01	.15	.22*	.16
Summary Categories					
Language Facilitating	.15	-.06	.28**	.36***	.28**
Behavior Controlling	-.09	-.11	.05	.18*	.03
Total Utterances/Minute	.12	-.07	.27**	.37***	.27**
RESPONSE (VERBAL OR NONVERBAL) TO INFANT AS A PROPORTION OF INFANT COMMUNICATION					
Synchronous	.05	.03	.19*	.01	.10
Asynchronous Redirect	.03	-.01	.03	.18*	.10
Asynchronous Ignore	-.11	-.04	-.28**	-.20*	-.24*

Note: N=84; high social-risk sample only

* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$

TABLE 4

Correlation Between 20 Month Maternal Communication Variables and Criterion Measure

20 Month NCAT Maternal Subscales:	Sens	Resp	Dis	Soc	Cog	Total
DISTRIBUTION OF UTTERANCE TYPES AS PROPORTION OF TOTAL TYPES						
Individual Categories						
Questions	.03	.15		-.04	.25*	.19*
Comments	.30**	.18		.06	.24*	.28**
Direct Commands	-.27**	-.20*		-.09	-.42***	-.39***
Indirect Commands	-.05	-.20*		.01	-.23	-.21*
Summary Categories						
Language Facilitating	.29**	.29**		.02	.43***	.41***
Behavior Controlling	-.29**	-.29**		-.02	-.43***	-.41***
(as proportions, these are reciprocals)						
UTTERANCE TYPES AS RATES PER MINUTE						
Individual Categories						
Questions	.09	.32**		.04	.33**	.33**
Comments	.23*	.32**		.12	.25**	.34***
Direct Commands	-.12	.04		-.03	-.24*	-.15
Indirect Commands	-.01	.01		.01	-.11	-.05
Summary Categories						
Language Facilitating	.20*	.38***		.10	.34***	.40***
Behavior Controlling	-.12	.02		.02	-.20*	-.12
Total Utterances/Minute	.11	.29**		.14	.14	.25*
RESPONSE (VERBAL OR NONVERBAL) TO INFANT AS A PROPORTION OF INFANT COMMUNICATION						
Synchronous	.16	.10		.10	.25*	.24*
Asynchronous Redirect	-.12	.03		-.16	-.12	-.13
Asynchronous Ignore	-.06	-.14		.07	-.16	-.13

Note: N=76; high social-risk sample only

* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$

TABLE 5

Correlation Between 13 and 20 Month Child Communication Variables and Criterion Measure

NCAT Child Subscales^:		Clarity of Cues	Responsiveness	Total
RATE OF INFANT COMMUNICATION PER MINUTE (13 MONTHS)				
	Verbal/Vocal	.14	.18*	.19*
	Gestural	-.09	-.10	-.11
	Combined Total	.11	.15	.16
RATE OF INFANT COMMUNICATION PER MINUTE (20 MONTHS)				
	Verbal/Vocal	-.07	-.13	-.14
	Gestural	-.27**	-.14	-.21*
	Combined Total	-.13	-.15	-.17

^: for each correlation, the relevant 13 or 20 month NCAT measure was used.

Note: N=84 at 13 months, N=76 at 20 months; high social-risk sample

* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$

TABLE 6

Correlation Between Rate of Child Communication and Later Vocabulary

20 Month Early Language Inventory:	Nouns	Verbs	Adjectives	TOTAL
RATE OF INFANT COMMUNICATION PER MINUTE (13 MONTHS)				
Verbal/Vocal	.21*	.11	.09	.16
Gestural	-.23*	-.23*	-.20	-.23*
Combined Total	.14	.05	.04	.10
RATE OF INFANT COMMUNICATION PER MINUTE (20 MONTHS)				
Verbal/Vocal	.42***	.40***	.30**	.38***
Gestural	.16	.16	.14	.16
Combined Total	.41***	.40***	.30**	.38***

Note: N=60 at 13 months, N=63 at 20 months; high social-risk sample

* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$

TABLE 7

Correlation Between Rate of Child Communication and Later Vocabulary

24 Month Bayley Language Subscale:	Express	Recept	TOTAL LANG	MDI
RATE OF INFANT COMMUNICATION PER MINUTE (13 MONTHS)				
Verbal/Vocal	.06	.33**	.22*	.30**
Gestural	-.30**	-.19	-.29**	-.23*
Combined Total	-.02	.27**	.14	.23*
RATE OF INFANT COMMUNICATION PER MINUTE (20 MONTHS)				
Verbal/Vocal	.10	.12	.13	.16
Gestural	-.08	-.04	-.07	-.01
Combined Total	.07	.10	.10	.14

Note: N=66 at 13 months, N=64 at 20 months; high social-risk sample

* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$

TABLE 8

Correlation Between 13 and 20 Month Maternal Communication Variables

DISTRIBUTION OF UTTERANCE TYPES AS PROPORTION OF TOTAL TYPES		
	Individual Categories	
	Questions	.08
	Comments	.33**
	Direct Commands	.20*
	Indirect Commands	.05
	Summary Categories	
	Language Facilitating	.22*
	Behavior Controlling	.22*
	(as proportions, these are reciprocals)	
UTTERANCE TYPES AS RATES PER MINUTE		
	Individual Categories	
	Questions	.10
	Comments	.29**
	Direct Commands	.23*
	Indirect Commands	-.02
	Summary Categories	
	Language Facilitating	.50***
	Behavior Controlling	.42***
	Total Utterances/Minute	.50***
RESPONSE (VERBAL OR NONVERBAL) TO INFANT AS A PROPORTION OF INFANT COMMUNICATION		
	Synchronous	.19
	Asynchronous Redirect	.19
	Asynchronous Ignore	.38***

Note: N=71; high social-risk sample only

* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$

TABLE 9

Correlation Between 13 and 20 Month Child Communication Variables

RATE OF INFANT COMMUNICATION PER MINUTE		
	Verbal/Vocal	.40***
	Gestural	.36***
	Combined Total	.38***

Note: N=71; high social-risk sample

* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$

TABLE 10

Interobserver Reliability Estimates for Functional Characteristics of Mother's Speech and Response to Child's Communicative Bid

		13 Months	20 Months
DISTRIBUTION OF UTTERANCE TYPES FREQUENCY OF EACH TYPE ACROSS CASES			
	Questions	.9937	.9988
	Comments	.9971	.9957
	Direct Commands	.9867	.9770
	Direct Verbal Elicit	1.0000	1.0000
	Indirect Commands	.9906	.9763
	Indirect Verbal Elicit	.9873	.9940
RESPONSE (VERBAL OR NONVERBAL) TO INFANT FREQUENCY OF EACH CATEGORY ACROSS CASES			
	Synchronous	.9075	.9868
	Asynchronous Redirect	.9827	.9742
	Asynchronous Ignore	.9772	.9692
MEAN RELIABILITY COEFFICIENT FOR FREQUENCY OF EACH RESPONSE TYPE COMPUTED CASE BY CASE			
	To Verbal/Vocal Bids	.9848	.9970
	To Nonverbal Bids	.9976	.9830

Note: N=23 at 13 months, N=14 at 20 months; cases represent 3 distinct samples

* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$

APPENDIX I: MOTHER-CHILD LANGUAGE CODING MANUAL: AGE 30 MONTHS

Infant and Family Focus
Mother-Child Language Coding Manual: Toddler System

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Introduction

The purpose of this manual is to summarize a set of coding procedures used to describe conversations between mothers and toddlers. In the present study, all language measures were drawn from video-tapes of mother-child interaction during an unstructured snack when the children were 30-months of age however, the measures may be appropriate for speakers of all ages.

In this study, the language samples ranged in length from 4.15 to 7.78 minutes (n = 68). The mean length was 6.44 minutes and the yield, on average, was 50 child utterances and 75 maternal utterances. The average rate of speech was 11.66 (s.d. = 2.7) maternal utterance per minute and 7.24 (s.d. = 2.6) child utterances per minute. On average, 99% of all maternal utterances and 91% of all child utterances were at least partially intelligible.

Assessment Setting

The snack occurred as a break about halfway through a 90-minute lab visit. It directly followed a prohibition task in which the child had to wait three minutes for a cookie. At the end of the prohibition task the mother was told she could give her child the prohibited cookie and that it was now time for a snack. Snack items (additional cookies or graham crackers and apple juice) were concealed in a box on a nearby shelf. In addition, the room contained an adult-size table, two chairs, two blocks, and a small plastic cookie container that was used in the preceding prohibition episode.

The snack sessions varied in length. For the most part, the end was determined by the mother who had been instructed to notify the examiner when she and her child had finished. In situations where adequate time had elapsed, the child's cues indicated that he/she was finished and yet the mother did not inform the examiner, the examiner interceded with "do you think ___ is done now?"

Transcription

Mother-child interaction is transcribed from videotapes according to CHAT, the transcription conventions of the CHILDES system (MacWhinney and Snow, 1985). Transcription follows the standards for minCHAT (CHAT manual version 0.8, October, 1987). Morphological marking is done on the main line, for the child only. Standard dependent tiers are used to include nonverbal information such as the actions (%act), gestures and proximics

(%gpx) of the speakers, and explanatory clues (%exp). Following transcription, coding of internal state language and conversation maintenance is done on separate dependent coding tiers (%cod). CLAN programs are then used to calculate the frequency of each code.

Summary of Language Measures

Brief descriptions of all language measures are provided below. Many follow directly from computer (CLAN) programs developed to run on transcipts in CHAT format and saved as ASCII computer files. For further information on the measures designated "from CLAN", please refer to the CHAT and CLAN manuals of the CHILDES project available from Brian MacWhinney, Ph.D., Department of Psychology, Carnegie Mellon University. In addition to the automated analyses provided by CLAN programs, two coding schemes were developed specifically for this project. Coding guidelines for these, the analysis of internal state language and the child's ability to maintain his/her end of the conversation, will be provided here. With the exception of conversation maintenance, all language analyses are performed separately for both mother and child.

I. STRUCTURAL COMPETENCIES

A. GRAMMATICAL COMPLEXITY

Mean Length of Utterance (MLU and MLU-5; from CLAN). MLU is an indirect measure of syntactic knowledge that makes use of the fact that, in the early stages, increasing grammatical complexity and utterance length are highly correlated. MLU is defined as the average length of the speaker's utterances in morphemes (the smallest meaningful units of spoken language), or in words. MLU-5, or "upper-bound" is defined as the average length of the longest 5 utterances. Compared with MLU, MLU-5 might be more sensitive to developmental gain beyond the early stages because it would be unaffected by later grammatical devices such as ellipsis, which result in more sophisticated but shorter utterances (Wells, 1985).

MLU and MLU-5 are calculated in morphemes and in words for the child and in words for the mother.

B. LEXICAL KNOWLEDGE

Type-token Ratio (TTR; from CLAN). Type-token ratio is found by calculating the total number of unique words used by the

speaker and dividing that number by the total number of words used. TTR is regarded as a rough measure of lexical diversity.

In this study, TTR is calculated based on the first 50 words of the child and the first 125 words of the mother.

C. FORM

Fluency (from CLAN). Degree of speaker disfluency is represented by proportion of false starts, speaker overlaps, trail-offs relative to the total number of words.

Intelligibility (from Clan). Intelligibility is represented by the proportion of intelligible and partially intelligible utterances relative to the total number of utterances.

II. SOCIAL-EXPRESSIVE COMPETENCIES

A. CONNECTED DISCOURSE

Mean Length of Turn (MLT; from CLAN). Mean length of speaking turn is the average number of uninterrupted consecutive utterances.

Speaker Dominance (from CLAN). Speaker dominance reflects the percentage of total communication attributed to the child and is based on the ratio of all child utterances relative to all maternal utterances.

Verbosity (from CLAN). Verbosity indicates the amount of speech per speaker. It is based on the speaker's rate of speech per minute.

B. CONTENT

Internal State (IS) Language (coding guidelines provided). Individual IS words are categorized by their content (sensory perception, physiology, emotion, etc.) and attributional focus (self vs. other) in accord with criterion established by Bretherton and Beeghly (1982).

Conversation Maintenance (coding guidelines provided). Each of the child's speaking turns is categorized by its primary function to initiate, respond to, or continue conversation. Turns coded as "initiations" introduce a new topic and take place either within an ongoing epoch or at the beginning of a new epoch of conversation. Turns coded as "responses" occur only in an obligatory context such as in answer to a request or command. In

contrast, speaking turns coded as "continuations" occur spontaneously and operate to keep established conversation flowing. Within each of these three functional categories (Initiate, Respond, Continue), the content of each speaking turn is rated according to its contribution of new information. No new information is provided when a turn is a self-repetition of the child's previous turn or an imitation of the mother's previous turn. Relatively little new information is provided by a minimal, one-word or obligatory turn (e.g., thank you, nope, okay). The largest contribution of new ideas/information is provided by a more elaborated, multi-word turn.

Coding Guidelines: Internal States and Feelings

The first step in analyzing the propensity to discuss internal states and feelings (IS language) is to build a lexicon of potential IS language. This is done by selecting IS candidates from the total lexicon obtained with the FREQ program of CLAN. The potential IS wordlist used in the present study is provided in the following pages.

Next, the transcript files are searched by speaker using the KWAL program and its +i and +w options. The +i option is used to create an include file of target IS words and the +w option is used to request a window around the target utterance so that its meaning can be assessed. Output from the KWAL analysis is saved in separate files for individual speakers; they contain only potential IS utterances and their associated windows. Next, each utterance is evaluated and coded. Each true IS word use is assigned a two-part code that indicates its content and attributional focus. Codes are placed on an dependent tier following the relevant utterance. False positives and all contextual utterances are then deleted from the file. The list of all possible codes and their assigned macros includes:

Key Stroke	Code	Category
<CTRL s> s	$self:sen	self:sensory perception
<CTRL s> p	$self:phy	self:physiology
<CTRL s> e	$self:eps	self:emotion positive
<CTRL s> n	$self:neg	self:emotion negative
<CTRL s> b	$self:beh	self:affect behavior
<CTRL s> v	$self:vol	self:volition and ability
<CTRL s> c	$self:cog	self:cognition
<CTRL s> m	$self:mor	self:moral judgement and obligation
<CTRL o> s	$othr:sen	othr:sensory perception
<CTRL o> p	$othr:phy	othr:physiology
<CTRL o> e	$othr:eps	othr:emotion positive
<CTRL o> n	$othr:neg	othr:emotion negative
<CTRL o> b	$othr:beh	othr:affect behavior
<CTRL o> v	$othr:vol	othr:volition and ability
<CTRL o> c	$othr:cog	othr:cognition
<CTRL o> m	$othr:mor	othr:moral judgement and obligation
<CTRL b> s	$objt:sen	objt:sensory perception
<CTRL b> p	$objt:phy	objt:physiology
<CTRL b> e	$objt:eps	objt:emotion positive
<CTRL b> n	$objt:neg	objt:emotion negative

<CTRL b> b	$objt:beh	objt:affect behavior
<CTRL b> v	$objt:vol	objt:volition and ability
<CTRL b> c	$objt:cog	objt:cognition
<CTRL b> m	$objt:mor	objt:moral judgement and obligation

Note: "self" refers to the speaker, "other" refers to the speaking partner (in this case the mother or child), and "object" refers to any nonpresent person, or any present or nonpresent object.

A sample coded file would look like:

```
*CHI: I-'m hungry Mommy.
%cod: $self:phy
*CHI: I like apple+juice.
%cod: $self:eps
*CHI: you want some more?
%cod: $othr:vol
*CHI: I think I can get one.
%cod: $self:cog $self:vol
*CHI: no let me have it.
%cod: $othr:mor
```

The FREQ program is then run on the small output files to calculate the frequency of IS codes per speaker. Last, totals are determined for the number of different IS words, total number of IS words, and number of utterances containing IS words. From these data, IS type-token ratio (# different IS words divided by # of total IS words used) and IS density (# IS utterances divided by total # of utterances) are calculated.

IS WORDLIST USED TO SEARCH 30-MONTH CHILD-MOTHER SNACK
(LIST DERIVED FROM FREQUENCY OF ALL WORDS USED IN SNACK)

all+right
all right
amaze-ed
angry
asleep
bad
beautiful
better
blue
bored
bruiser
bully
can
can't
can-'t
can-'nt
careful
care+ful
cares
clean
cold
comfortable
cool
could
could-'nt
cruel
cry
cry-ing
cute
dare
daring
dazzle-ing
dazzling
delicious
dirt-y
dirty
dirty-ed
dumb
easy
excited
fair
favorite
feel
feeling-s
fib-ing
figure
figure-ed
fine
forget
forget-ing
forgot
friendly
full
fun
funny
go-ing to
going
gon
gon (t)a
good
goofy
gotta
got to
great
gross
guess
happy
hard
have to
health-y
healthy
hear
hot
hungry
hurt
hurts
kind
kiss
kissed
know
laugh
laugh-ing
let
let-'us
let-ing
lie
like
likes

listen
lonely
look
look-ing
looks
love
love-ing
mad
may
maybe
mean
mess
messy
mess-y
might
mind
miserable
miss
must
neat
neato@n
need
need-ed
nice
nifty
night+night
ought
owie-s
owies
patient
pig
piggy
poor
practice
pretend
pretend-ing
pretty
prety
purpose
re#consider
real
remember
sad
saw
scare
see
serious-ly
shall
should
should-'nt
should-'ve
sick
sleep
sleep-ing
sleep-y
sleepy
slept
smart
smell
smell
smile
smile-ing
sneak-y
sorry
sound
sounds
starving
stingy
stubborn
suffer-ing
supposed
surprise
surprised
taste
tastes
taste-s
terrible
think
thirsty
thought
tired
tough
touch
trick
try
try-ing
ugh
ugly
understand
upset
wake
wakes
warm
watch
watch-ing
weird
weird-er
well
will
wish
wonder
yicky
yucky
yum
yummy

Coding Guidlelines: Conversation Maintenance

This scheme requires that the interaction be segmented into turns within epoches of conversation. Epoches are bound by a pause of at least 3 seconds and the cessation of any shared physical activity. The child's skill as a conversational partner is judged by the function and quality of turns within these demarcated epoches. A single turn is defined as one or more adjacent utterances or conventional communicatve gestures that occur less than 3 seconds apart. A turn is said to end when there is either a shift in speaker or a pause of 3 or more seconds with no continued shared physical activity (this would also mark the end of the epoch).

e.g.	time	speaker	utterance
	09:00:00	MOT	want a cookie?
	09:00:02	CHI	yeah.
	09:00:04	CHI	I eat like xxx.
	09:00:05	MOT	you what?
	09:00:06	CHI	eat like cookie+monster.
		%act:	M and C eat
	09:00:15	CHI	more.
	09:00:16	MOT	more what?
	09:00:18	CHI	more cookie.
	09:00:20	MOT	no # what do you say?
	09:00:21	CHI	please Mom.
	09:00:22	MOT	okay.

In this example, there are two epochs of conversation divided by a pause of 9 seconds. In the first epoch, the child takes two conversational turns. The child's first turn is two utterances in length, the second is one. In the second epoch, the child takes three turns each one utterance in length.

Each child turn is then assigned a two-part code inspired by Brown's notion of mean length of episode (1980). The codes correspond to the overall function and quality of new information each turn provides. Codes are entered directly into the original transcript as the last dependent coding tier following the last utterance of each child turn. A list of all possible codes and their assigned macros includes:

Key Stroke	Code	Category
<CTRL b> n	$b:new	bid:new
<CTRL b> m	$b:min	bid:minimum

<CTRL c> n	$c:new	continue:new
<CTRL c> m	$c:min	continue:minimum
<CTRL c> r	$c:rep	continue:self-repetition
<CTRL c> i	$c:imit	continue:imitation
<CTRL r> n	$r:new	response:new
<CTRL r> m	$r:min	response:minimum
<CTRL r> r	$r:rep	response:self-repetition
<CTRL r> i	$r:imit	response:imitation
<CTRL u>	$u:unc	unclassifiable:uncodeable

Definitions of each category and examples follow:

FUNCTION

Bids introduce a new topic or new treatment of an old topic. They can occur either within an epoch or as the first turn in a new epoch of conversation. By definition, bids must contribute new or minimal information. Self-repetitions and imitative turns are not bids.

Continues are spontaneous turns that elaborate an established topic. They can provide any type of information (viz. new or not new information).

Responses are obligatory replies to the conversational partner. Like continues, responses can provide any type of information.

Unclassifiable/Uncodeable turns are wholly unintelligible, partially intelligible but uninterpretable, or seemingly irrelevant.

QUALITY OF CONTRIBUTION

New turns move conversation forward by providing novel and relevant information. New turns tend to be multi-word utterances and/or multi-utterance turns.

e.g. *CHI: some+body-'is out there!
%exp: hears noise in hallway
%cod: $b:new

*MOT: mmmmm good cookies.
*CHI: they chocolate+chip.
%cod: $c:new

*MOT: this is for you.
*CHI: can I have it?
%cod: $c:new

*CHI: I want to sit Mom.
%cod: $b:new
*MOT: oh okay.
*CHI: sit by you Mom.
*CHI: sit right there.
%cod: c:new

*MOT: want some more juice?
*CHI: no I-'m all done.
%cod: $r:new

Minimal turns move conversation forward by providing the least amount of information possible to maintain polite and coherent conversation. They tend to be one or two-word turns or communicative gestures.

e.g. *CHI: Mom?
%cod: $b:min

*CHI: 0.
%gpx: points to shelf
%cod: $b:min
*MOT: what?

*MOT: all finished?
*CHI: huh?
%cod: $c:min

*MOT: those are good cookies.
*CHI: more please.
%cod: $c:min

*MOT: all finished?
*CHI: no.
%cod: $r:min

*MOT: did you have fun playing?
*CHI: 0.
%gpx: nods yes
%cod: $r:min

Self-repetitions provide little new information. In contrast to imitations however, the information orginates with the speaker.

They are exact or partial repetitions of the speaker's previous speaking turn.

```
e.g. *CHI:  more juice.
     %cod: $c:min
     *MOT: what?
     *CHI: more juice.
     %cod: $r:rep

     *CHI: blue.
     %cod: $r:min
     *MOT: no it-'is red.
     *CHI: no blue.
     %cod: $c:rep
```

Imitations provide no new information. They are exact or partial repetitions of the speaking partner's previous utterance.

```
e.g. *MOT: do you want this or this?
     *CHI: this.
     %cod: $r:min

e.g. *MOT: it's time to clean up.
     *CHI: clean+up?

     %cod: $c:imt
```

Unclassifiable/Uncodeable turns can not be interpreted because necessary information is unintellible or because the turn lacks relevance.

```
e.g. *MOT: put it right there okay?
     *CHI: not xxx.
     %act: stands on table
     *CHI: night.
     %cod: $u:unc

     *MOT: it spilled.
     *CHI: &bo.
     %cod: u:unc
```

After coding, the FREQ program is used to calculate the of frequency of the various conversation maintenance codes. Summary measures from this coding scheme include the total number of epoches of conversation, average number of conversational turns per epoch, average number of utterances per turn, the distribution of functional categories (initiations, responses and

continuations), and content (repetition/imitation vs. minimal or elaborated contribution) of each speaking turn.

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APPENDIX J: SAMPLE CHARACTERISTICS - MATERNAL MEASURES BY CHILD'S AGE

MOTHER'S LIFE STRESS, SOCIAL SKILLS, AND MENTAL HEALTH BY CHILD'S AGE	N	M (SD)
1-3 Months		
Depression	65	9.8 (6.1)
Negative Life Events	65	12.9 (10.7)
Conversation Skills with Adults	66	49.0 (5.6)
Personal Resources	64	131.9 (23.3)
Community Life Skills		...
12 Months		
Depression	64	8.6 (8.1)
Negative Life Events	62	9.6 (8.6)
Conversation Skills with Adults	66	49.4 (4.8)
Personal Resources	65	135.7 (25.9)
Community Life Skills	67	26.6 (3.8)
24 Months		
Depression	65	9.5 (7.2)
Negative Life Events	65	9.3 (7.7)
Conversation Skills with Adults	65	47.9 (7.2)
Personal Resources	65	131.3 (22.6)
Community Life Skills	65	27.1 (3.6)
36 Months		
Depression	55	7.5 (6.4)
Negative Life Events	55	8.3 (8.6)
Personal Resources	55	136.8 (20.8)
Community Life Skills	50	27.7 (3.8)

Note. Community Life Skills was not included in the 1-3 month assessment; Conversation Skills with Adults was not included in the 36-month assessment.

APPENDIX K: SAMPLE CHARACTERISTICS - DYADIC MEASURES BY CHILD'S AGE

MOTHER-CHILD INVOLVEMENT	N[a]	12 & 13M M (SD)	20 & 24M M (SD)	30 & 36M M (SD)
NCAST	66,63,55			
Teaching Scale (Mother)		34.7 (8.6)	32.9 (8.3)	37.9 (7.8)
HOME	66,64,49			
Total Score		36.1 (4.2)	33.4 (4.8)	33.0 (6.3)
Social Composite		19.4 (3.5)	16.9 (4.5)	16.9 (4.7)
Infant-Mother Attachment	65,64,67			
Security Rating (1-9)		4.6 (2.8)	4.8 (2.9)	5.8 (2.1)
% Secure "B" Classification		43.0	52.0	63.0
% Insecure "A"		20.0	5.0	15.0
% Insecure "C"		11.0	11.0	6.0
% Insecure "D"		26.0	33.0	16.0
Mother's Speech to Child	65,63,68			
% Language-Facilitating		.72 (.14)	.68 (.13)	
MLU (words)				4.1 (.60)
MLU-5 (words)				10.3 (1.88)
Type-Token Ratio				.47 (.04)
MLT (utterances)				2.1 (.80)
IS Density				.17 (.07)
Speaker Dominance - C:M Ratio				.70 (.26)

Note. [a] This column provides sample size for each measure at 12 & 13, 20 & 24, and 30 & 36 months respectively.

APPENDIX L: CHILD LANGUAGE - PERFORMANCE IN CONVERSATION WITH MOTHER

ASSESSMENT AND CHILD'S AGE	N	M	(SD)	RANGE
20-Month Verbosity	63			
Rate of Vocal, Gestural, &/or Verbal Communication		5.8	(2.4)	0 - 12
30-Month Conversational Skill	68[1]			
Form of Expressive Language				
MLU (morphemes)	61	2.3	(.6)	1.2 - 4.0
MLU-5 (upperbound)		5.0	(1.6)	1.0 - 8.8
% Intelligible Utterances		.91	(.10)	.51 - 1.0
% Intelligible Turns		.90	(.10)	.53 - 1.0
% Fluency (words)		.97	(.03)	.83 - 1.0
Lexical Diversity	58			
TTR (first 50 words)		.55	(.09)	.3 - .8
Speaker Dominance				
Number of Utterances		50.9	(17.6)	13.0 - 104.0
Rate of Intelligible Speech		7.2	(2.6)	
MLT (utterances)		1.3	(.3)	1.0 - 2.3
Ratio of C to M Utterances		.70	(.26)	.2 - 1.6
Conversational Turns - Function				
% Bid		9.1	(5.5)	0 - 27.9
% Continue		44.5	(12.1)	11.5 - 73.7
% Response		36.3	(12.7)	13.2 - 84.6
% Unclassifiable		10.2	(9.6)	0 - 47.2
Conversational Turns - Content				
% New Information		33.2	(14.7)	5.6 - 71.4
% Minimal Information		43.3	(12.9)	17.1 - 84.6
% Self-Repetition		8.3	(5.7)	0 - 23.9
% Imitation		5.0	(5.9)	0 - 31.3
Internal State Language				
% IS Utterances		6.8	(5.7)	0 - 22.2
# IS Utterances		3.4	(3.1)	0 - 12.0
# IS Self-Reference		2.1	(2.4)	0 - 9.0
# IS Mother-Reference		.8	(1.3)	0 - 8.0
# IS Object or Non-Present-Other		.6	(1.0)	0 - 4.0

Note. [1] For 30-month measures, n=68 unless otherwise noted.

APPENDIX M: CORRELATIONS BETWEEN 30-MONTH MATERNAL LANGUAGE AND INDIVIDUAL 30-MONTH CHILD LANGUAGE MEASURES

MATERNAL:	MLU	MLU-5	TTR	MLT	IS DENSITY
CHILD:					
FORM					
MLU-5	.217+	.137	.475***	-.153	.230+
% INTELL UTTERANCES	.205+	.121	.191	-.126	.150
% INTELL TURNS	.043	-.032	.326*	-.294*	.020
FLUENCY WORDS	-.069	.009	.206	-.079	.048
AMOUNT					
RATE INTELL UTTERANCES	-.016	.086	.081	-.569***	.009
MLT UTTERANCES	-.227+	-.352**	.236+	-.184	.064
RATIO C:M UTTERANCES	-.243*	-.240*	.195	-.742***	-.119
CONTENT					
% TURNS CONTINUE	.056	.050	.181	-.197	.056
% TURNS NEW INFO	.024	-.089	.376**	-.286*	.081
% IS UTTERANCES	.101	.058	.476***	-.094	.090
TYPE-TOKEN					
TTR	.070	-.073	.194	.095	.014

Note. Sample size varies for individual correlations; the range is N = 51 - 68.

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

APPENDIX N: CORRELATIONS BETWEEN 3-MONTH FAMILY RISK AND 20 THROUGH 36-MONTH CHILD LANGUAGE MEASURES

	NEG EVENTS	PERS RES	DEPRESS	SOC SKILL
20 MONTHS				
VERBOSITY	.012	.144	-.107	.212^{+}
VOCABULARY	.017	.025	-.081	.000
24 MONTHS				
BAYLEY MDI	-.151	.181	-.007	.073
BAYLEY LANG.	-.077	.128	-.027	.156
30 MONTHS				
FORM	-.319**	.177	-.253*	-.034
AMOUNT	-.151	.017	-.157	-.074
CONTENT	-.153	.073	-.073	-.109
TTR	.086	.218	-.035	.118
36 MONTHS				
PLS OVERALL	.040	-.007	-.187	.349**
PLS AUDITORY	-.040	.140	-.245^{+}	.493***
PLS VERBAL	.110	-.165	-.050	.069

Note. Sample size varies for individual correlations; the range is N = 52 - 65.

$^{+}$ $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$.

APPENDIX O: CORRELATIONS BETWEEN 12-MONTH FAMILY RISK AND 20 THROUGH 36-MONTH CHILD LANGUAGE MEASURES

	NEG EVENTS	PERS RES	DEPRESS	SOC SKILL	COMM LIFE
20 MONTHS					
VERBOSITY	.144	.106	-.072	.043	.210+
VOCABULARY	.065	.101	-.039	.037	.275*
24 MONTHS					
BAYLEY MDI	.108	.027	-.091	.135	.254*
BAYLEY LANG.	.133	.076	-.058	.274*	.193
30 MONTHS					
FORM	-.115	.214+	-.154	.165	.243*
AMOUNT	-.185	.019	-.082	-.324**	.017
CONTENT	-.043	.171	-.182	.098	.060
TTR	.228+	.162	-.197	.295*	.186
36 MONTHS					
PLS OVERALL	.094	.067	-.014	.257+	.305*
PLS AUDITORY	.069	.116	-.035	.356**	.344**
PLS VERBAL	.086	-.016	.018	.052	.144

Note. Sample size varies for individual correlations; the range is N = 52 - 67.

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

APPENDIX P: CORRELATIONS BETWEEN 24-MONTH FAMILY RISK AND 20 THROUGH 36-MONTH CHILD LANGUAGE MEASURES

	NEG EVENTS	PERS RES	DEPRESS	SOC SKILL	COMM LIFE
20 MONTH					
VERBOSITY	.082	.130	.066	.043	.122
VOCABULARY	.099	.045	.074	.069	.073
24 MONTH					
BAYLEY MDI	-.056	.010	-.046	.211^{+}	.229^{+}
BAYLEY LANG.	.097	.080	.039	.235^{+}	.223^{+}
30 MONTH					
FORM	-.064	.064	-.031	.083	.065
AMOUNT	-.170	.048	-.062	-.053	-.029
CONTENT	-.023	.141	-.155	.139	-.105
TTR	-.001	.105	-.138	.062	.085
36 MONTH					
PLS OVERALL	-.080	-.006	.042	.261^{+}	.125
PLS AUDITORY	-.072	.060	.004	.426**	.223
PLS VERBAL	-.056	-.076	.068	-.036	-.037

Note. Sample size varies for individual correlations; the range is N = 52 - 65.

$^{+}$ $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$.

APPENDIX Q: CORRELATIONS BETWEEN 36-MONTH FAMILY RISK AND 36-MONTH CHILD LANGUAGE MEASURES

	NEG EVENTS	PERS RES	DEPRESS	COMM LIFE
36 MONTHS				
PLS OVERALL	.191	-.033	.173	.232
PLS AUDITORY	.128	.069	.035	.325*
PLS VERBAL	.182	-.128	.250+	.037

Note. Sample size varies for individual correlations; the range is N = 52 - 65.

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

APPENDIX R: CORRELATIONS BETWEEN ATTACHMENT SECURITY AND INDIVIDUAL 30-MONTH CHILD LANGUAGE MEASURES

	SEC 13M RATING	SEC 20M RATING	SEC 30M RATING	SEC 13&20M # SECURE	SEC 13-30M # SECURE
FORM					
MLU-5	.126	.085	.128	.079	.100
% INTELL UTTERANCES	.140	.146	.115	.170	.197
% INTELL TURNS	.130	.258*	.140	.235+	.280*
FLUENCY WORDS	-.027	-.024	-.106	-.054	-.087
AMOUNT					
RATE INTELL UTTERANCES	.142	.008	.271*	.125	.215+
MLT UTTERANCES	.020	.198	.003	.066	.146
RATIO C:M UTTERANCES	.195	.058	.247*	.140	.248+
CONTENT					
% TURNS CONTINUE	-.094	-.115	.101	-.158	-.083
% TURNS NEW INFO	.089	.081	.027	.021	.061
% IS UTTERANCES	.051	-.017	.044	-.134	-.107
TYPE-TOKEN					
TTR	.248+	.462***	.023	.304*	.249+

Note. Sample size varies for individual correlations; the range is N = 50 - 67.

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

APPENDIX S: CORRELATIONS BETWEEN 12&13 AND 20&24-MONTH MOTHER-CHILD INTERACTION AND 20, 24 AND 36-MONTH CHILD LANGUAGE

	LANG FAC 13M	TEACH 12M	HOME SOC 12M	LANG FAC 20M	TEACH 24M	HOME SOC 24M
20 MONTHS						
VERBOSITY	-.010	-.149	.110	.208	.064	.084
VOCABULARY	.206	-.007	.309*	.184	-.001	.241+
24 MONTHS						
BAYLEY MDI	.270*	.080	.246+	.306*	.343**	.357**
BAYLEY LANG.	.268*	.174	.319*	.262*	.269*	.399***
36 MONTHS						
PLS OVERALL	.287*	.456***	.293*	.158	.462***	.509***
PLS AUDITORY	.424***	.433***	.415**	.317*	.547***	.553***
PLS VERBAL	.028	.306*	.050	-.065	.188	.235+

Note. Sample size varies for individual correlations; the range is N = 52 - 63.

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

APPENDIX T: CORRELATIONS BETWEEN 12&13 AND 20&24-MONTH MOTHER-CHILD INTERACTION AND INDIVIDUAL 30-MONTH CHILD LANGUAGE MEASURES

	LANG FAC 13M	TEACH 12M	HOME SOC 12M	LANG FAC 20M	TEACH 24M	HOME SOC 24M
FORM						
MLU-5	.255*	.298*	.331**	.143	.335**	.418***
% INTELL UTTERANCES	.254*	.247*	.123	.105	.101	.220+
% INTELL TURNS	.132	.161	.161	.115	.066	.276*
FLUENCY WORDS	-.063	.007	-.092	.048	-.144	-.089
AMOUNT						
RATE INTELL UTTERANCES	.061	.125	-.001	-.085	-.064	.215+
MLT UTTERANCES	-.084	-.104	-.204+	.028	-.129	.051
RATIO C:M UTTERANCES	-.081	-.074	-.169	-.109	-.126	.162
CONTENT						
% TURNS CONTINUE	-.009	.138	-.016	.059	.021	.161
% TURNS NEW INFO	.175	.140	.110	.148	.105	.319**
% IS UTTERANCES	.074	.068	.157	.139	.139	.278*
TYPE-TOKEN						
TTR	.055	.004	.298*	.253+	.286*	.352**

Note. Sample size varies for individual correlations; the range is N = 53 - 66.

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

APPENDIX U: CORRELATIONS BETWEEN 30-MONTH MATERNAL LANGUAGE AND 20, 24, AND 36-MONTH CHILD LANGUAGE MEASURES

	MLU	MLU-5	TTR	MLT	IS DENSITY
20 MONTHS					
VERBOSITY	-.097	.064	-.126	-.116	.010
VOCABULARY	.053	-.078	.260+	-.092	.056
24 MONTHS					
BAYLEY MDI	.171	.040	.213	.180	.267*
BAYLEY LANG.	.083	.098	.295*	-.004	.103
36 MONTHS					
PLS OVERALL	.232+	.203	.224	-.123	.285*
PLS AUDITORY	.264*	.219	.211	-.102	.312*
PLS VERBAL	.105	.105	.158	-.095	.145

Note. Sample size varies for individual correlations; the range is N = 46 - 63.

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

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PUBLICATIONS

Morisset, C.E., Barnard, K.E., Greenberg, M.T., Spieker, S.J., and Booth, C.L. (1990). Environmental influences on early language development: The context of social risk. *Development and Psychopathology*, 2(2), 127-149.

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1991. Postdoctoral Fellowship awarded by the John D. and Catherine T. MacArthur Foundation.

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1988. John D. and Catherine T. MacArthur Foundation. Transitions in cognitive and socio-emotional development from infancy to childhood: Relationships between risk status and competence in three samples. Node funds awarded to Kathryn E. Barnard, Cathryn L. Booth, Diane Magyary, Colleen Morisset, and Susan J. Spieker.

1987. John D. and Catherine T. MacArthur Foundation. Completion of coding and analysis of mother-child discourse from three longitudinal samples. Node funds awarded to Kathryn E. Barnard, Susan J. Spieker, and Colleen Morisset.