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Toddlers' Language Development: Sex Differences Within Social Risk

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Sex differences in the association between environmental risk and language development were examined in a longitudinal study of 54 high-social-risk families. Measures of the environment included information about family stress and coping, opportunities for cognitive and linguistic stimulation, the nature of learning experiences, and the affective quality of the infant–mother relationship. Despite apparently similar family conditions and early experiences, there were significant sex differences favoring girls on observational measures of spontaneous language production at 20 and 30 months of age. For the group as a whole, sex differences on standardized tests at 24 and 36 months of age were nonsignificant. In addition, relations between aspects of the learning environment and children's language performance differed for boys and girls, supporting a moderator interpretation of the findings.

Despite widely held beliefs about differences in verbal ability between the sexes, the empirical evidence is mixed (Halpern, 1992). In what remains a highly respected compendium of the topic, Maccoby and Jacklin (1974) concluded that there is a female advantage in verbal performance. Their position was based on a review of nearly 100 studies that evaluated verbal abilities in infants, children, and adults. Of the reports that pertain to infants and children through age 17 years, 35% reported sex differences that favored girls, and about 13% reported differences favoring boys. Although a greater percentage of studies found a female advantage, the mean difference between the sexes, approximately one fourth of a standard deviation, is relatively small. A recent meta-analysis of 165 studies of individuals 4 years of age to adulthood also reported a slight female advantage in verbal ability as measured primarily by standardized tests (Hyde & Linn, 1988). However, unlike Maccoby and Jacklin, Hyde and Linn argued that the mean difference (equivalent to one tenth of a standard deviation) was so small, it was virtually nonexistent. Clearly, the answer regarding sex differences is not simple: Different methods lead to different conclusions. By a vote count, more studies report a female advantage, yet when the difference between the sexes is quantified, it appears negligible.

Regardless of one's interpretation of the comprehensive reviews of sex differences, it will be a mistake to assume that what is true on average is equally true for specific subgroups within the population. There remain many substantive questions about sex differences in verbal ability and their relation to a host of developmental, sociodemographic, psychological, biological, and experiential factors. Methods that collapse such variables are apt to ignore potentially important influences that interact with sex to determine individual differences (Block, 1976; Halpern, 1992; Seltzer, 1973). Indeed, there are strong theoretical and empirical reasons to believe that meaningful sex differences do exist in select aspects of verbal ability, at certain ages, and that such differences may be particularly evident among socially disadvantaged children.

Research with low-income families has repeatedly identified sex differences in young children's verbal ability. Two large-scale studies of 3- and 4-year-olds in Head Start programs reported that girls outperformed boys on many, though not all, language measures (Shipman, 1971, as reported in Maccoby & Jacklin, 1974). More recently, a study of preschool curricula that included 719 inner-city 4-year-olds found that girls earned higher communication and social skill scores and showed greater mastery of basic academic skills regardless of their type of school program (Marcon, 1991).

Studies of infant and toddler-age children (too recent to be included in Maccoby and Jacklin's [1974] review and excluded from Hyde and Linn's [1988] meta-analysis because of the participants' young age) report a female advantage in comprehension and vocabulary (Clarke-Stewart, 1973) and many aspects of conversation ability such as social initiations (Klein & Durfee, 1978), responsiveness (Gunnar & Donahue, 1980), verbal fluency (Heister, 1982; McGuiness, 1981), mean length of utterance, and length of longest utterance (Schachter, Shore, Hodapp, Chalfin, & Bundy, 1978). In addition, a three-site norming study of a parent-report inventory of infant and tod-

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dler language found a consistent, albeit small, advantage favoring girls in many aspects of comprehension, verbal, and nonverbal expression (Fenson et al., 1991). One reason to expect more consistent sex differences in measures of spontaneous language than in standardized tests is that developmental tests are often constructed to minimize differences between boys and girls (M. Appelbaum, personal communication, March 1993).

Explanations for sex differences in young children's language abilities are divided between those favoring psychosocial or biogenetic origins. An alternative, integrative view is the possibility that there are sex differences in the patterning of cognitive and personality characteristics (Block, 1976) such that seemingly similar social experiences have different consequences for boys and girls (Baumrind, 1971; Kagan, 1971; Martin, Maccoby, & Jacklin, 1981). For example, parent–child interaction may affect boys and girls to a different extent but in the same way. Clarke-Stewart's (1973) longitudinal study of infants from families of lower socioeconomic status support this intriguing proposition. She reported that girls received higher scores than boys on language competence despite their similar scores on multiple measures of maternal behavior, including verbal stimulation, responsiveness, and effective parenting.

Even in the absence of differences between mean scores obtained by boys and girls, investigators have identified sex differences in the intercorrelations among variables (Kagan & Moss, 1962). Studies since Kagan and Moss's report of the Fel's longitudinal data support this finding further. For example, Wachs (1979) found consistently stronger relations between inanimate stimulation in infancy and cognitive abilities for boys than for girls, yet no sex differences in overall intellectual performance. Similarly, Bradley and Caldwell (1980; Elardo, Bradley, & Caldwell, 1977) reported different patterns in the relations between subscales of the Home Observation for Measurement of the Environment (HOME) inventory and later intellectual development for boys than for girls. In addition, Bee, Mitchell, Barnard, Eyres, and Hammond (1984) found few sex differences in developmental ability or quality of mother–infant interaction from 4 through 48 months of age but many differences in the patterns of correlations between the home environment (as measured by father involvement and the HOME) and children's intellectual and language skills at 1 to 4 years of age.

In addition to differential effects of day-to-day aspects of the home, there is growing evidence of sex differences in children's responses to disruptive and unpredictable events. Experimental studies with infants show that boys have a lower tolerance for stimuli and stress (Hoyenga & Hoyenga, 1979), especially if they are unable to control the aversive stimuli (Gunnar-von-Gnechten, 1978). Similarly, studies of children's behavioral responses to family discord indicate that boys are more negatively affected by parents' disagreements than are girls (Block, Block, & Morrison, 1981). Compared with girls, boys show more behavior problems with increased family conflict and disruption (Rutter & Madge, 1976; Wolkind & Rutter, 1973) and more enduring problems following divorce (Hetherington, Cox, & Cox, 1979) or the birth of a sibling (Nadelman & Begun, 1982).

Current thinking of developmental psychopathologists has focused new attention on the interplay of organismic and environmental factors in response to risk conditions. Researchers, particularly those working with young children, have developed a transactional model of potentiating and protective factors to describe the relations among environmental and biological stressors and social and intellectual competence (Cicchetti & Rizley, 1981; Garmezy, 1983; Garmezy, Masten, & Tellegen, 1984; Rutter, 1979, 1985; Sameroff & Chandler, 1975). A basic tenet of the model is that biogenetic, psychosocial, and other intra- and extraindividual factors (e.g., social support, personal finances, and community violence) interact throughout development to produce variations in competence (Cicchetti, 1984) and that frequently those individuals who develop problems have suffered the accumulation of multiple risks over time (Sameroff, 1990). A second assumption is that attributes or experiences that reduce the impact of risk are not necessarily the same as those that promote development in the absence of the risk condition. Rather, the effect of "protective factors" (Rutter, 1985, p. 600) or "protective processes" (Rutter, 1990, p. 189) is indirect and depends on interaction with the risk variable.

In the present study, we applied a model of risk and protective factors to examine sex differences in the language ability of children at risk for poor language outcomes that are due to a variety of adverse social–environmental influences, including poverty, life stress and changes within the family, lack of social support, and deficient parenting skill. Working within this framework, we hypothesized that the very nature of the risk condition might alter relations among predictor variables and give rise to new connections among otherwise unrelated variables. It is in this vein that we anticipated sex differences in the relation between psychosocial risk and young children's developing language skill. Multiple assessments collected over the child's first 3 years of life were used to evaluate differences in the home environment, in maternal treatment of boys and girls, and in a range of language competencies from age 13 months through 36 months. Our goal was to provide answers to the following: (a) Within this exclusively high-risk sample, are there sex differences in children's language abilities, and do sex differences depend on age, the aspect of language measured, or method of assessment? and (b) What is the relation between the degree of environmental risk and child language and between quality of early interpersonal experience and child language, and do these associations differ for boys and girls?

Answers to these questions can help identify infants and toddlers who are particularly vulnerable to adverse home environments. If appropriate prevention or remedial action is to be taken, it is necessary to seek out mechanisms by which exogenous risk factors such as a family's social or financial hardship can impede young children's intellectual development.

METHOD

Participants

The participants were 54 mother–child pairs who took part in a nursing intervention study of 147 high-social-risk families. All of the mothers were recruited for the larger study through Seattle–King County (Washington) Health Department clinics during their second trimester of pregnancy. Findings from the prevention phase of the project, including a description of the two interventions conducted throughout pregnancy and the infant's first year, have been published previously (see Barnard et al., 1988; Mitchell, Magyary, Barnard, Sumner, & Booth, 1988).

Comparisons between mothers who did and did not continue through the 36-month assessment showed that those who remained in the study were on average 2 years older and had completed slightly more schooling (mean age at intake was 22.2 ± 4.4 years vs. 20.5 ± 3.7, $p < .05$; mean years of schooling was 11.4 ± 1.6 vs. 10.8 ± 1.5, $p < .05$). There were no differences in any other baseline family or infant characteristics.

At intake, most mothers were White (94%) and single (54%) or receiving public assistance (56%). Fifteen percent had not completed high school. Forty-eight percent of the children were firstborn, and 31 (57%) of the children were boys. All of the children were born healthy and full term. There were no significant differences between intervention groups for these or any other variables to be discussed.

Procedure

With the exception of demographic information collected at study intake, the procedures described here were conducted after the intervention phase, when the children were from 12 to 36 months of age. Specific assessments used at each age are summarized in Table 1 and described later. Home visits, conducted by one of six female project evaluators, occurred when the children were 12, 24, and 36 months old and included assessments of mother's life stress, social and psychological functioning, the overall quality of the home environment, and quality of maternal behavior in a teaching task and in conversation with her child. When the children were 13, 20, and 30 months old, mothers and children were videotaped in a variety of laboratory situations, including a snack break that was transcribed later for language analyses, and a series of separations and reunions used to assess the child's attachment security. Child language was assessed at 13, 20, 24, 30, and 36 months of age through observational measures, parent report, and standardized tests.

Measures

Family Demographics and Risk Status

Demographics

Information about maternal age, education, race, family income, household size, employment status, and marital status was obtained shortly after recruitment.

Risk: Mother's Life Stress, Depressive Symptoms, Social Skills, and Support

The following information was obtained from the mothers when their infants were 12, 24, and 36 months of age: the Life Experiences Survey (Sarason, Johnson, & Siegel, 1978), Beck Depression Inventory (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961), Personal Resources Questionnaire (Brandt & Weinert, 1981), Adult Conversational Skills Scale, and Community Life Skills Scale (Booth, Mitchell, Barnard, & Spieker, 1989).

The Life Experiences Survey (Sarason et al., 1978) is a survey of positive and negative stress-inducing life events. Mothers were asked to indicate which of 61 events occurred during the past year, label them as good or bad, and rate the effect of each according to a 0-to-3 point scale. The negative change score was used in data analyses. The Beck Depression Inventory (Beck et al., 1961) is a 21-item self-report designed to assess severity of depression. The total score, which can range from 0 to 63, reflects both the increasing number and severity of overt symptoms. The Personal Resources Questionnaire (Brandt & Weinert, 1981) is a 25-item self-report that measures social support in terms of opportunities for intimacy, nurturance, reassurance, and guidance.

Adult Conversational Skills and Community Life Skills are two binary-item scales developed explicitly for the larger intervention study. The Adult Conversational Skills is a 63-item observational record of the mother's communication skills with an adult (a project evaluator) during a home visit. The Community Life Skills is a 32-item instrument completed as an interview. It assesses the mother's knowledge of community resources, interests, hobbies, and routines to organize her household, hygiene, and health care (see Booth et al., 1989, for a further explanation of these scales).

Quality of the Child's Social Experiences

Opportunities for Cognitive and Linguistic Stimulation

Three observational assessments were used to characterize the quality of the child's verbal environment in terms of social activities in the home and one-to-one interaction with the mother. The specific measures included the Nursing Child Assessment Teaching (NCAT) Scale

Table 1
Assessments by Child's Age in Months

Variable	Age (in months)						
	Prenatal	12	13	20	24	30	36
Family demographics							
Mother's age, education, income, and marital status	x						
Family (maternal) risk							
Depression		x			x		x
Negative life events		x			x		x
Conversation skills with adults		x			x		
Personal resources		x			x		x
Community life skills		x			x		x
Social and emotional experiences							
NCAT Scale		x			x		x
HOME Inventory		x			x		x
Mother's conversation style			x	x		x	
Infant–mother attachment			x	x			
Child language ability							
Standardized tests					x		x
Conversation measures			x	x		x	
Parent report				x			

Note. NCAT = Nursing Child Assessment Teaching Scale; HOME = Home Observation for Measurement of the Environment.

(Barnard, Eyres, Lobo, & Snyder, 1983; Barnard et al., 1989), the HOME inventory (Caldwell & Bradley, 1978), and observations of mother-to-child conversation during a snack. Home visitors were trained and certified to use the NCAT and HOME scales by the Nursing Child Assessment Satellite Training (NCAST) program in Seattle, Washington. During the study, interrater reliability, established on a representative 10% of the cases, was above 85% for each scale.

Mother's ability as teacher. At 12 and 24 months, the NCAT scale (Barnard et al., 1983; Barnard et al., 1989) was used to evaluate mother–child interaction during standardized activities, such as building a tower of blocks or playing a game of "roll-the-ball." The NCAT scale is composed of 73 binary items that describe parent and child behavior. The 23 child items reflect clarity of communication and responsivity toward the parent. The 50 parent items assess sensitivity and responsivity to child cues and parents' ability to promote social and cognitive development through encouragement, praise, explanation, and description. Only the maternal subscale scores are discussed in the present report.

Learning environment. The HOME inventory (Caldwell & Bradley, 1978) was completed during the 12-, 24-, and 36-month home visits. The 45 binary items of the HOME assess mother–child interaction, family lifestyle and habits, opportunities for social interaction such as outings and visits with relatives, orderliness of the home, and the provision of age-appropriate toys.

Mother's conversational style. At 13, 20, and 30 months of age, mothers and their children were videotaped in a laboratory playroom in a series of structured and semistructured situations. Mother–child conversation during a snack break was transcribed from the videotapes by coders who were naive to all other mother and child assessments. The snack episodes ranged in length from 5 to 10 min. When the infants were 13 months of age, the average snack break lasted 8.7 min, the average was 5.6 min at 20 months, and 6.5 min at 30 months.

Mother's speech during the 13- and 20-month snack episodes was coded utterance by utterance 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, 1988). 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). Intercoder agreement, based on Pearson correlation of the frequency of utterance types across a representative 15% of the cases, was above .95 for each of the four coding categories. The summary measure used in analyses reported here was the proportion of mother's questions and comments in relation to the proportion of her verbal commands.

Mother–child conversation during snack breaks at 30 months was transcribed following conventions of Codes for the Human Analysis of Transcripts (CHATS), the computer-based transcription system of the Child Language Data Exchange System (CHILDES) Project (see MacWhinney & Snow, 1985). CHAT facilitates automatic analysis of transcripts by a set of computer Child Language Analysis (CLAN) programs. Two measures of maternal language were computed directly by CLAN programs: mean length of utterance (MLU) in words and type–token ratio (TTR). The MLU, a traditional measure of structural complexity, was based on the entire corpus and the longest five utterances (MLU-5). The TTR, an index of lexical diversity, was based on the mother's first 200 words. Maternal verbosity (the mean number of utterances per minute) and the mean number of utterances per speaking turn (i.e, mean length of turn; MLT) were also computed.

Emotional Security: Infant–Mother Attachment

Mothers and children were videotaped in the Ainsworth Strange Situation (Ainsworth, Blehar, Waters, & Wall, 1978) as part of the 13- and 20-month lab visits. The Strange Situation was modified slightly in that it followed other lab assessments such as the snack episodes, and the stranger reunion was omitted. Infant behavior was classified as *insecure-avoidant* (A), *secure* (B), or *insecure-resistant* (C) according to the procedures of Ainsworth et al. (1978). *Insecure-disorganized/disoriented* (D) behavior was classified using guidelines by Main and Solomon (1986). Each tape was coded independently by two of four observers who were unaware of previous attachment classifications. For the 13-month classifications, agreement among each coder pair was between 78% and 79% before conferring; kappa was .67. For the 20-month classifications, agreement was 77% before conferring; kappa was .61. Coders resolved disagreements by reviewing the tapes and reaching consensus, by consulting other coders, or both.

The measure of attachment used in analyses reported here is a continuum of security formed from the A-B-C-D subclassifications. The security rating, which can range from 1 to 9, is based on the display of secure behaviors such as contact seeking and distal interaction, as compared with the presence of insecure behaviors such as avoidance, resistance, and disorganization (see Spieker & Booth, 1988, for specific scoring guidelines). The security rating was preferred for analyses over a dichotomous secure–insecure grouping because the continuum retains information about variation within the secure and insecure patterns of attachment (e.g., Cummings, 1990).

Child Language

Standardized Tests

Developmental testing by the Bayley Scales of Infant Development (Bayley, 1969) occurred in the home when the children were 24 months of age. A Language subscale was computed from 26 items on the Bayley Mental Scale, including 10 expressive and 16 receptive items (see Dale, Bates, Reznick, & Morisset, 1989, for specific items). At 36 months, the Preschool Language Scale (Zimmerman, Steiner, & Pond, 1979) was administered in the laboratory. The Preschool Language Scale is a screening and evaluation instrument that tests articulation, auditory comprehension, and verbal ability.

Child Verbosity

At 13, 20, and 30 months of age, amount of communication during snack was defined as the rate per minute of conversational opportunities created by the child. As the children grew to be more competent conversational partners, the definition of an *opportunity* became more stringent. At 13 months, verbosity represented all verbal and vocal behavior plus conventional gestures such as pointing, giving, and showing. At 20 months, verbosity was restricted to words, lexicalized vocalizations, and gestures accompanied by a look to the mother. By 30 months, it was restricted further to include only verbal behavior. At 30 months, child verbosity reflected the rate per minute of intelligible and partially intelligible utterances. To ensure that verbosity counts were accurate, we checked all transcripts (mother and child utterances) against the videotapes. Errors of omission and commission ranged from 0% to 5% per transcript.

Content of Spontaneous Speech

As part of the 20-month laboratory visit, mothers completed an early form of the MacArthur Communicative Development Inventory, the Early Language Inventory (Bates, Bretherton, & Snyder, 1988). The Early Language Inventory is a 644-word vocabulary checklist that includes words in 19 semantic categories such as animals, household items, and foods. Normative and validation data indicate the Early Language Inventory is an accurate index of 20-month vocabulary (Dale et al., 1989).

At 30 months, analysis of the transcript data was extensive. Measures were chosen to reveal both structural and social expressive aspects of conversational competence. As with the analysis of 30-month maternal speech, the child's MLU and TTR were computed using CLAN programs. The MLU in morphemes was computed for the entire corpus and for the longest five utterances (MLU-5). Because TTR is sample-size dependent (larger word counts yield smaller TTRs), TTR was computed from the child's first 50 words. Mean length of turn (MLT) was based on the average number of utterances per speaking turn.

In addition to these free-speech measures, a coding scheme inspired by Brown's (1980) notion of conversational relevance was developed to assess the toddlers' emerging ability to use language effectively in social interaction. The scheme focused on socioemotional aspects of communicative behavior that are, at least theoretically, distinct from traditional language measures such as vocabulary size and sentence length. Each of the child's conversational turns was coded for its functional intent (to initiate, respond, or continue an ongoing exchange) and the extent to which it moved the conversation forward by providing new and pertinent information, minimal information, or relatively little information in the form of self-repetition or imitation. We made the coding criteria independent of utterance length in an attempt to separate aspects of language skill from how language is used in casual conversation. Thus, even a grammatically simple turn (e.g., "I He-man") could receive the most sophisticated relevancy code, "new." Child turns that were not directed to mother (e.g., talking to the one-way mirror or talk accompanying solitary play) were not coded. Cohen's kappa, based on 18% of the transcripts, averaged .87; the range was .73 to 1.0 (see Morisset, 1991, for further information about the coding scheme). Two representative variables were chosen for analyses: (a) the percentage of spontaneous turns in which the child maintained conversation by elaborating the current topic or changing the topic without disrupting continuity (*continue*) and (b) the percentage of turns that contributed previously unspoken, relevant information (*new*).

Table 2
Descriptive Statistics for Family Risk Variables

Age/measure	*n*	*M*	*SD*
Demographics			
Prenatal			
Mother's age (years)	54	22.2	4.4
Mother's education (years)	54	11.4	1.6
Family income[a]	50	2.8	2.3
Mother's life stress, depression, social skills, and support			
12 months			
Depression	53	8.9	8.6
Negative life events	51	9.3	8.8
Conversation skills with adults	53	49.5	4.8
Personal resources	54	135.4	25.5
Community life skills	54	26.8	3.9
24 months			
Depression	51	10.3	7.2
Negative life events	51	9.6	7.8
Conversation skills with adults	51	48.9	6.5
Personal resources	51	129.0	23.7
Community life skills	51	27.6	3.2
36 months			
Depression	48	7.9	6.7
Negative life events	48	8.8	8.9
Conversation skills with adults	—	—	—
Personal resources	48	134.3	20.5
Community life skills	47	27.6	3.8

Note. Conversation skills with adults was not included in the 36-month assessment.
[a] Yearly Income Scale (in 1983 dollars): 0 = none; 1 = <$3,000; 2 = $3,000–$4,999; 3 = $5,000–$7,499; 4 = $7,500–$9,999; 5 = $10,000–$14,999; 6 = $15,000–$19,999.

RESULTS

Demographics and Family Risk Status

Descriptive statistics for demographic and family risk variables are provided in Table 2. Generally speaking, the findings depict families who experienced many stresses and had relatively few resources to cope with them. Mothers reported life changes such as the incarceration of their partner, serious accidents, illnesses and deaths of close friends and family, personal illnesses, and frequent changes of residence. They lacked social skills in face-to-face adult interaction with a home visitor and showed little involvement or knowledge of their immediate community. For example, some mothers could not instruct the home visitor on how to find their house. Many did not know the name of a neighbor, did not have a reliable form of transportation, or did not know the location of the nearest bus stop. Almost half indicated that there was no one they could turn to for support or advice. Over the 2nd and 3rd years of their baby's life, 13% to 22% of the mothers scored in the range of moderate-to-severe depression.

Repeated measures analysis of variance (ANOVA) with time as the within-subjects variable was used to assess change in the various sources of family risk from infancy through age 36 months. Multivariate tests were significant for the assessments of maternal depression, $F(2, 43) = 3.76$, $p < .05$, and personal resources, $F(2, 44) = 3.50$, $p < .05$. Individual univariate tests for differences showed that personal resources were significantly lower when the children were age 2 than age 1 year, $F(1, 45) = 5.59$, $p < .05$, and that, by the time the children were 3 years old, maternal depression had significantly improved, $F(1, 44) = 3.99$ $p < .05$. In contrast, there was relatively little change over time in the mothers' negative life events, community skills, or conversational skills with adults.

Because multiple psychosocial stressors are more likely to lead to lasting negative consequences than single stressors (Rutter, Maughan, Mortimore, Ouston, & Smith, 1979), we constructed summary scores that aggregated the 12-, 24-, and 36-month family risk assessments after establishing that scores on the component variables did not differ for boys and girls. To compute the summary scores, we dichotomized each of the five family risk variables (depression, negative life events, personal resources, conversation skills with adults, and community life skills) using established criteria (e.g., Beck depression score greater than 9 points) or the median score for the initial intervention sample. Risk index scores were then formed by summing the number of scores beyond the cutoffs at each point in time. Extent of family risk based on assessments when the infants were 12 and 24 months of age could range from 0 to 5 points. At 36 months, the risk index could range from 0 to 4 points (Adult Conversation Skills was not included in the 36-month assessment). The sample means were 2.1 (± 1.5), 2.2 (± 1.5), and 1.9 (± 1.3), respectively. A multivariate test for

differences, using z scores to equate the 4- and 5-point scales, showed that extent of family risk did not change appreciably over time.

Quality of the Child's Social Experiences

Opportunities for Cognitive and Linguistic Stimulation

Teaching and the HOME

Scores on the HOME and NCAT scales are presented in Table 3. Forty-two percent of the mothers scored below the established cutoff of 34 points at 12 months, and 71% scored below the cutoff of 39 points at 24 months (Spietz, 1994). The HOME scores also declined over the babies' 2nd year: 17% of the sample scored below the recommended cutoff of 32 points when the infants were 12 months of age, 35% were below the cutoff at 24 months, and 37% were below at 36 months of age (Barnard & Hammond, 1989).

Mother's Conversational Style

Descriptive statistics for the maternal conversation variables are also presented in Table 3. As described earlier, this information was obtained from transcripts of mother–child conversation during snack time when the children were 13, 20, and 30 months of age. At 13 and 20 months, approximately 70% of all coded maternal utterances were of a language-facilitating style in that they were attempts to engage the child in social interaction through questions, comments, and labels. At 13 and 20 months, the proportion of questions and comments were approximately equal.

When the children were 30 months old, mothers' MLU averaged 4.2 (± 0.60) words, and the mean length of their longest 5 utterances (MLU-5) was 10.5 words (± 2.0). Mothers' average TTR was .47 (± .04), and the range was .41 to .56. Nine mothers did not meet the required 200 words used to compute TTR. Mothers' average speaking turn (MLT) was 2.1 (± .84) utterances, and the range was 1.2 to 6.5 utterances. Two mothers had MLT scores that were outliers in the sample distribution. These two extremes were reduced to scores equivalent to 2.5 standard deviations beyond the mean for statistical analyses. In doing so, the two outliers retained their extreme status but did not carry undue weight in the analyses.

We consolidated the sets of 1- and 2-year predictors (the NCAT, HOME, and mother's conversation style) to create multifaceted summary scores of mothers' ability to provide linguistic and cognitive stimulation. Before doing so, components of the 1- and 2-year composites were examined for potential sex differences. Only one of six tests, the comparison of the 1-year HOME total, approached statistical significance. Because the magnitude of this difference was small, and because all other total and subscale scores were quite similar for boys and girls, we felt justified in combining the 1- and 2-year scores. We created the composites by converting individual raw scores to standard z scores and summing. Internal consistency based on Cronbach's alpha for the 1-year composite (12- and 13-month variables) was .64; alpha for the 2-year composite (20- and 24-month variables) was .61.

The NCAT and HOME scores were not available from the 30-month assessment. At this age, quality of social–linguistic input was based solely on mother's child-directed speech during the laboratory snack. Of the full set of maternal speech variables, there were significant positive correlations between mother's TTR and 30-month child MLU-5 ($r = .43$, $p < .01$) and between TTR and percentage of new turns ($r = .38$, $p < .05$).

Table 3
Descriptive Statistics for Quality of the Child's Social and Emotional Experiences

	12 or 13 months			20 or 24 months			30 or 36 months		
Measure	*M*	*SD*	%	*M*	*SD*	%	*M*	*SD*	%
NCAT Maternal subscale[a]	34.2	9.0		33.2	8.5		—	—	
HOME Inventory total[b]	36.1	4.5		33.3	4.9		33.3	6.3[c]	
Mother's speech to child[d]									
% language facilitating	72.0	14.0		68.0	12.0				—
MLU (words)	—	—		—	—		4.2	0.6	
MLU-5 (words)	—	—		—	—		10.5	2.0	
Type–token ratio	—	—		—	—		0.5	0.1	
MLT (utterances)	—	—		—	—		2.1	0.8	
Speaker dominance	—	—		—	—		0.7	0.3	
Infant–mother attachment[e]									
Secure B classification			45			55			—
Insecure A			17			2			—
Insecure C			11			6			—
Insecure D			26			37			—
Security rating (1 = *low*)	4.7	2.8		4.8	2.9		—	—	

Note. NCAT = Nursing Child Assessment Teaching Scale; HOME = Home Observation for Measurement of the Environment; MLU = mean length of utterance; MLU-5 = mean length of the longest five utterances; MLT = mean length of turn. Dashes indicate that data were not available. [a] $n = 53$ at 12 months and $n = 52$ at 24 months. [b] $n = 53$ at 12 months, $n = 51$ at 24 months, and $n = 46$ at 36 months. [c] The HOME was the only observational measure obtained in the home at 36 months. Although mother–child interaction at 36 months is not discussed in this report (because of missing cases and missing measures), scores on the HOME suggest relative stability in the children's social and physical environment from age 24 to 36 months. [d] $n = 53$ at 13 months, $n = 51$ at 20 months, and $n = 54$ at 30 months. [e] $n = 53$ at 13 months and $n = 51$ at 20 months.

There were significant negative correlations between mother's MLT and 30-month child verbosity ($r = -.67$, $p < .001$), percentage of new turns ($r = -.42$, $p < .01$), and percentage of continue turns ($r = -.45$, $p < .001$). The negative correlations between MLT and concurrent measures of child conversation suggest that mother's MLT may be an indirect measure of child failure, with mothers of less capable children "filling in" for them by talking more. Therefore, TTR was chosen for subsequent analyses because it reflects the richness of mother's conversation and, compared with her amount of talk, might be less influenced by the child's linguistic ability.

Emotional Security: Infant–Mother Attachment

Distributions of the 13- and 20-month attachment classifications are also provided in Table 3. Forty-five percent of the infants were classified as secure at 13 months, and 55% were classified as secure at 20 months. Of those boys and girls classified as insecure, D was the largest category at each age. At 13 and 20 months, the mean security rating was approximately 5, and the range was from 1 (*highly insecure*) to 9 (*highly secure*).

Child Language

Standardized Tests

The results of all child language assessments are presented in Table 4. The mean score on the 24-month Bayley Language subscale was 20 out of 26; the range was 13 to 25. These scores are slightly higher than that reported by Dale and his colleagues (Dale, Greenberg, & Crnic, 1987) in a study of preterm infants at 24-months' corrected age and appear consistent with a total Mental Development Index score within the normal range: sample $M = 105.0$ ($\pm$ 13.7).

Comparatively, scores on the Preschool Language Scale were much lower. Although there are no published norms for this scale, Zimmerman et al. (1979) stated that children who perform below age level are at risk for language delay. With this criterion, 63% of the sample scored lower than most children their age. Thirty-one percent scored below age level in auditory comprehension, and 57% scored below age level in the verbal ability. Twenty-six percent of boys and of girls scored below age level on both subscales.

Verbosity and Content of Spontaneous Speech

The children were progressively more communicative over time, and yet considerable individual differences remained. At 13 months, the average rate of child communication per minute (verbal and gestural combined) was 3.5 ($\pm$ 2.0). At 20 months of age, the mean rate was 5.8 ($\pm$ 2.6). The range, which was 0 to 12 bids per minute, included 1 child who made no effort to communicate with his mother during the snack break. The average rate at 30 months was 7.2 ($\pm$ 2.6) utterances per minute, and the range was 2 to 14 utterances.

At 20 months, average productive vocabulary as measured by the Early Language Inventory was 143 ($\pm$ 111) words. The range was 6 to 477 words. The mean vocabulary size is somewhat, though not substantially, lower than that of other full-term samples at age 20 months (Dale et al., 1989).

Table 4
Child Language Ability

Age/measure	*n*	*M*	*SD*	Range
Standardized tests				
24-month Bayley	49			
Mental Development Index		105.0	13.7	81–145
Language subscale		20.0	3.0	13–25
36-month preschool language	54			
Overall quotient		100.5	14.1	60–129
Auditory comprehension		107.6	17.8	67–150
Verbal ability		93.3	16.7	54–125
Verbosity during snack with mother				
13-month rate/min	53	3.5	2.0	0.7–8.1
20-month rate/min	51	5.8	2.6	0.0–12.2
30-month rate/min	54	7.2	2.6	1.9–13.6
Content of spontaneous speech				
20-month ELI Vocabulary	44			
Total no. of words		143	111	6–477
30-month conversation during snack				
MLU (morphemes)	49	2.3	0.6	1.2–3.7
MLU-5 (upperbound)	54	5.0	1.6	1.8–8.8
TTR (first 50 words)	45	0.5	0.1	0.3–0.8
MLT (utterances)	54	1.3	0.3	1.0–2.3
% continue turns	54	45.0	12.0	11.5–73.7
% new information turns	54	32.0	15.0	5.9–71.4

Note. ELI = Early Language Inventory; MLU = mean length of utterance; MLU-5 = mean length of the longest five utterances; TTR = type–token ratio; MLT = mean length of turns.

At 30 months, the children's conversational skill was widely varied. Some spoke primarily in two-word utterances (saying, for example, "more juice"), whereas others were considerably more fluent (e.g., "where'd the cracker go, Mommy?"). Approximately 90% of the children's utterances and turns were at least partially intelligible; intelligibility ranged from 63% to 100%. The MLU was based on a minimum of 25 utterances. Five children (3 boys and 2 girls) did not have a sufficient number of intelligible utterances to compute MLU. The MLU ranged from 1.2 to 3.7; the mean was 2.3 ($\pm$ 0.6) morphemes. Upperbound (MLU-5), based on the longest five utterances, was computed for all of the children. The mean MLU-5 was 4.8 ($\pm$ 1.6) morphemes. The TTR, based on the child's first 50 words, averaged 0.54 ($\pm$ 0.1); it ranged from 0.30 to 0.80. Nine children did not meet the required 50 words used to calculate TTR. Seven of these were boys. On average, children spoke 7 to every 10 maternal utterances. Their average number of utterances per speaking turn (MLT) was 1.3 ($\pm$ 0.3), and the range was not large. One child spoke just 1 utterance per turn, and only 2 children averaged more than 2 utterances per turn.

Sex Differences

Child Language Ability

Multivariate analysis of variance (MANOVA) and *t* tests were used to examine sex differences in performance on standard-

ized tests, verbosity, and the content of child-to-mother conversation. To minimize the number of comparisons made within each domain of language ability, we excluded peripheral and redundant variables from the analyses. Means for boys and girls for the selected dependent variables and the corresponding F- and t-test comparisons are provided in Table 5.

Boys and girls did not differ significantly on either the Bayley Language subscale or the Preschool Language Scale. At 36 months, 65% of the boys and 61% of the girls earned auditory or verbal Preschool Language Scale scores below their age level; 26% of boys and of girls scored below age level on both Preschool Language Scale subscales. Likewise, boys and girls did not differ at any age in the rate of communication with mother during snack episodes. There were, however, significant sex differences favoring girls in spontaneous language as indicated by 20-month vocabulary and by conversational ability at 30 months. Homogeneity of variance tests showed that the variances for the 20-month vocabulary scores were not equal for boys and girls, thus, rather than including it with other measures of spontaneous language, we used a separate t test to compare vocabulary size. The test revealed that, at 20 months of age, girls' vocabulary was more than twice that of the boys', $t(42) = -3.84, p < .001$. A MANOVA test of differences among the remaining spontaneous language variables was also statistically significant, $F(4, 40) = 2.88, p < .05$. Univariate tests of differences were significant for 30-month MLU-5, $F(1, 43) = 6.96, p < .05$, and TTR, $F(1, 43) = 9.63, p < .01$, and approached significance for percentage of new turns, $F(1, 43) = 3.60, p < .10$. Boys and girls did not differ significantly in the percentage of continue turns. Boys' and girls' language abilities were not related to the style of intervention received in infancy.

Family Risk, Perinatal Health, and Quality of Social and Emotional Experiences

A MANOVA was also used to test the possibility that boys and girls differed in degree or type of risk. In the comparison of family demographics, mother's age, schooling, and income were dichotomized to accentuate differences between families at greater and lesser risk as a result of maternal age less than 20 years, less than high school education, and annual income of less than $3,000. The test of differences between boys and girls for these variables was not significant, $F(3, 50) = 0.92, p = .44$. Likewise, boys and girls did not differ significantly in parity (firstborn vs. later born) or perinatal status (Apgar, birthweight, or gestational age), $F(4, 33) = 1.73, p = .17$. There were no significant differences between boys and girls at any age in degree of psychosocial risk as measured by the family risk index, $F(3, 33) = 1.76, p = .18$; quality of the home environment, $F(3, 39) = 1.82, p = .16$; maternal teaching, $F(2, 48) = 0.31, p = .73$; mother-to-child conversation, $F(3, 38) = 1.43, p = .25$; or infant attachment security, $F(2, 47) = 0.34, p = .71$. Tests for sex differences were also nonsignificant when these dependent measures were treated as continuous (nondichotomized) variables.

Relations Between Sex and Other Predictor Variables

Additional analyses examined potential relations among child's sex, proximal social and emotional experiences, more distal sources of family risk, and language attainment. Before describing these, we must distinguish mediator and moderator variables. In the psychometric literature, the term *mediator* refers to a variable that accounts for the relation between the predictor and criterion. In contrast, *moderator* refers to "an independent variable that potentially enters into interaction with 'predictor' variables while having a negligible correlation with the criterion itself" (Cohen & Cohen, 1983, p. 323). Baron and Kenny (1986) made this distinction even more explicit: "Whereas moderator variables specify when certain effects will hold, mediators speak to how or why such effects occur" (p. 1176). In our analysis, we began with a mediator orientation

Table 5
Sex Differences in Children's Language Ability

Measure	Boys		Girls				
	M	*SD*	*M*	*SD*	*df*	*F*	*t*
Standardized tests					3, 45	1.19	
24-month Bayley language	19.4	3.3	21.0	2.4			
36-month PLS auditory	107.0	16.9	113.0	16.6			
36-month PLS verbal ability	93.1	5.2	96.9	16.4			
Verbosity					3, 46	0.41	
13-month rate/min	3.3	2.0	3.7	1.9			
20-month rate/min	5.8	2.3	5.9	3.0			
30-month rate/min	6.9	2.6	7.7	2.7			
Spontaneous speech							
20-month vocabulary total	88.8	60.0	205.6	125.0	42		3.84***
30-month conversation					4, 40	2.88*	
MLU-5	4.9	1.4	5.9	1.2	1, 43	6.96*	
TTR	0.5	0.1	0.6	0.1	1, 43	9.63**	
% new turns	32.0	14.0	39.0	12.0	1, 43	3.60†	
% continue turns	46.0	9.0	49.0	13.0	1, 43	0.88	

Note. The test statistic is Hotelling's T^2 except for the test of differences in 20-month vocabulary. Here, a t test was used because the vocabulary scores violated the equal variances assumption required for multivariate analysis of variance. Univariate tests are F tests; they are equivalent to t^2. PLS = Preschool Language Scale; MLU-5 = mean length of longest five utterances; TTR = type–token ratio.
†$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

and asked whether the observed sex differences could be explained by differences in family risk and mothers' interactive style. The results suggested further analyses that support a moderator interpretation of some of the relations among environmental risk, sex, and children's language ability.

Potential Mediators in the Relation Between Child's Sex and Language Ability

Hierarchical regression was used to evaluate the magnitude of sex differences in those variables for which sex differences were found, after controlling for relative differences in potential mediator variables (namely, degree of family risk, mothers' interactive style, and attachment security). Each of the proposed mediators was measured at or near the time of the language assessment. Attachment security at 20 months was chosen over the 13-month data for an additional reason. In this sample, attachment security was highly unstable. Given this instability, the 20-month rating was preferred because it reflected the child's emotional security at an important time in language production, the transition to multiword speech.

For each of the four outcomes under scrutiny (20-month vocabulary size, 30-month MLU-5, TTR, and percentage of new turns), the association between sex and language was evaluated before and after controlling for family risk, mother's interactive style, and attachment security. To do so, child's sex was dummy coded (boys = 0, girls = 1), and thereby the regression coefficients associated with the sex variable can be interpreted directly as the average difference between boys and girls before and after statistical adjustment for potential mediators. The regressions confirmed the earlier MANOVA results. The magnitude of the sex differences changed little after controlling for relative differences in the proposed mediators (see Table 6). For example, the average vocabulary of girls was significantly larger than that of boys, both before (by 119 words) and after (by 122 words) the adjustment.

These results provide two lines of evidence against the hypothesis that family risk and early social and emotional experiences mediate the relation between child's sex and language ability. First, the multiple correlation between the predictors and child's sex was relatively low (multiple R ranged from .19 to .21), and, second, the unstandardized betas associated with child's sex diminished very little after the sets of independent variables were entered in the equations. In fact, for two of the four measures (20-month vocabulary and 30-month TTR), differences between boys and girls actually increased after the mediator variables were added to the model.

Assessing Moderator Effects

A final set of analyses was performed to examine the possibility that similar family circumstances and interpersonal experiences had different consequences for boys and girls. Considerable debate surrounds the method for evaluating and interpreting such relations between independent variables. As mentioned earlier, social scientists tend to use a multiplicative criterion for independence. Other fields, notably epidemiology, remind us that the interpretation of product-term coefficients depends on the mathematical structure underlying the model and that causal factors may combine in either a multiplicative or additive fashion (see, e.g., Rothman, 1986). Rutter (1983) expressed similar concern that the definition of interaction effects not be chosen on arbitrary statistical grounds. He delineated a number of ways in which variables could summate or combine, including two types that would be subsumed in Baron and Kenny's (1986) definition of moderation: disordinal and ordinal interaction. Both terms refer to circumstances in which the same environment has different effects on different people. In the case of ordinal interaction, situations affect individuals to different degrees; with disordinal interaction, their effects are opposite.

Table 6
Summary of Hierarchical Regressions Testing Mediator Effects

Age/dependent variable	Child's sex		Adjusting for risk	
	Total R^2	β	R^2 change	β
20 months				
Vocabulary total	.27***	119.25	.28***	122.44
30 months				
MLU-5	.12*	1.21	.08†	0.98
TTR	.17*	0.07	.23***	0.09
% new turns	.14*	0.12	.10*	0.10

Note. The betas can be interpreted as the average difference between boys and girls before and after adjusting for potential mediator effects of family risk, mothers' interactive style, and attachment security (as defined in the text). Comparison of betas in column 2 with column 4 shows relatively little difference between the values. MLU-5 = mean length of longest five utterances; TTR = type–token ratio.
† $p < .10$. * $p < .05$. *** $p < .001$.

In the present analysis, we used product terms to test whether family risk or early social or emotional experiences was a moderator in the relation between sex and child language ability from age 13 through 36 months. When results were statistically significant, sample data were plotted to determine the nature of the interaction. All possible interactions with child's sex were evaluated by multiple-partial F tests of three terms. The three interaction terms were computed by multiplying the values of the variables constituting the interaction (namely, Sex × Family Risk, Sex × Mother's Interactive Style, and Sex × Attachment Security). When the associated change in R^2 was at least .10 ($p < .10$), partial F tests were conducted to determine whether one or more of the product terms should be kept in the model. When the first test was found to be nonsignificant, the full model was simplified by removing the product terms entirely.

The final equations are provided in Table 7; 8 of the 11 were statistically significant ($p < .05$). When entered on Step 1 of the regressions, child's sex was significant in equations predicting 20-month vocabulary ($R^2 = .27$), 30-month MLU-5 ($R^2 = .12$), TTR ($R^2 = .17$), and percentage of new turns ($R^2 = .14$). Entered on Step 2, degree of family risk was significant in only one equation: that predicting 36-month Preschool Language Scale auditory comprehension (R^2 change = .14). Entered on Step 3, quality of early social and emotional experiences significantly increased the prediction of 24-month Bayley language, 36-month Preschool Language Scale auditory comprehension, 13-month verbosity, 30-month MLU-5, TTR, and per-

Table 7
Summary of Regressions Testing Moderator Effects

Age/dependent variable	Predictor variable: Child's sex R^2	Family risk ΔR^2	Socioemotional experience ΔR^2	Interaction ΔR^2	Overall R^2	F
Standardized language tests[a]						
24 months						
Bayley language	.04	.04	.19**	—	.28	3.75**
36 months						
PLS auditory	.01	.14*	.39***	—	.53	9.13***
PLS verbal ability	.03	.03	.12	.12[b]	.30	2.65*
Child's verbosity[c]						
13 months						
Rate/min	.01	.02	.17*	—	.20	2.70*
20 months						
Rate/min	.01	.00	.11†	—	.13	1.55
30 months						
Rate/min	.04	.00	.02	.14[d]	.19	1.63
Content of child's spontaneous speech[e]						
20 months						
ELI vocabulary	.27***	.00	.04	—	.32	4.09**
30 months						
MLU-5	.12*	.00	.15*	.08[d]†	.35	3.65**
TTR	.17*	.02	.33***	—	.51	7.67***
% new turns	.14*	.02	.15*	—	.31	3.94**
% continue turns	.01	.00	.07	.17[d]**	.25	2.26†

Note. [a]n = 44 at 24 months and n = 37 at 36 months. [b]Denotes a significant interaction between child's sex and 36-month family risk such that among families at greater risk, girls outperformed boys. [c]n = 49 at 13 months, n = 46 at 20 months, and n = 40 at 30 months. [d]Denotes a significant interaction between child's sex and the 20-month attachment security rating such that among children with higher security ratings, boys outperformed girls. [e]n = 40 at 20 months and n = 40 at 30 months, except n = 34 for TTR. PLS = Preschool Language Scale; ELI = Early Language Inventory; MLU-5 = mean length of longest five utterances; TTR = type–token ratio.
† $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

centage of new turns. The F tests of statistical interactions with sex were significant ($p < .05$) in 4 of the 11 regressions. The interaction of sex and 3-year family risk explained an additional 12% of the variance in 36-month Preschool Language Scale verbal ability. The Sex × 20-month Attachment Security accounted for an additional 14% of the variance in 30-month verbosity, 8% of the variance in MLU-5, and 17% of the variance in percentage of continue turns.

Graphs of the four equations with significant product terms were constructed to identify the nature of the Sex × Environment interactions. The plots were based on the prediction equations, rather than actual data, to statistically equate individuals who varied from each other on other independent variables (e.g., family risk, mothers' TTR, and attachment security). All four equations represent cross-over interactions, a form which satisfies the definition of interaction evaluated on either additive or multiplicative scales.

The plot of 30-month verbosity by attachment security (Figure 1a) illustrates Rutter's (1983) notion of "disordinal interaction" (p. 301). For equivalent levels of family risk and mother's TTR, insecure girls were more talkative compared with insecure boys. Yet, at the other end of the security continuum, the effect was reversed: Secure boys were more verbose. Figures 1b and 1c depict ordinal interactions. That is, the impact of the independent variable is greater for one sex than the other. Specifically, Figure 1b shows that attachment security had relatively little effect on the proportion of continue turns among boys but not girls. Insecure girls were twice as likely to continue ongoing conversation as were boys of similar attachment status. The reverse case was true for 30-month MLU-5 (see Figure 1c). Security had a greater, positive effect on the skill of boys than of girls. Among boys, the difference in MLU-5 between security ratings of 1 and 9 was approximately 1.5 standard deviations (sample M = 4.8 [1.6]). Figure 2 is a plot of Preschool Language Scale verbal scores for boys and girls at five different levels of 3-year family risk. Again, the pattern is of ordinal interaction. Whereas the predicted scores for boys changed very little, the scores of girls increased with increased family risk.

In summary, child's sex was strongly associated with multiple measures of spontaneous language ability: 20-month vocabulary, 30-month MLU-5, TTR, and percentage of conversational turns that contributed new and relevant information. Significant main-effect relations were found between family risk and the Preschool Language Scale Auditory Comprehension subscale. In addition, quality of social and emotional experience (as measured by mothers' interactive style and attachment security) was related to 13-month verbosity, the 24-month

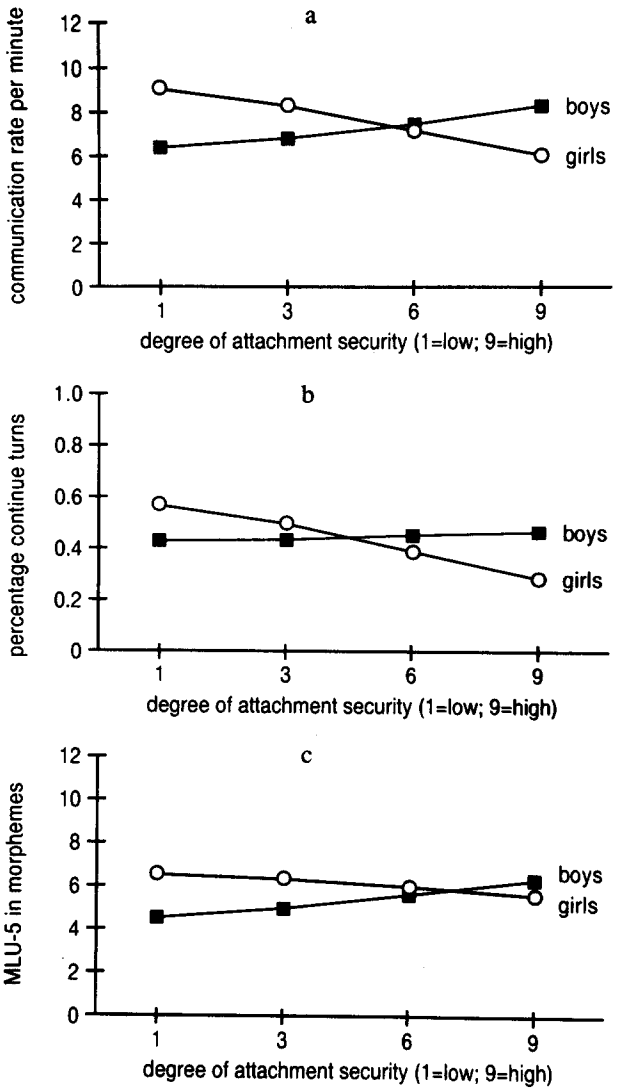

Figure 1. (a) Thirty-month communication per minute by 20-month security. Prediction equation for 30-month rate of communication: 1.33 + 3.48 (sex) + 0.08 (2-year risk) + 0.25 (security) + 9.30 (mother's type-token ratio [TTR]) − 0.62 (Sex × Security). (b) Proportion of continue turns at 30 months by 20-month security. Prediction equation for proportion of continue turns at 30 months: 0.15 + 0.18 (sex) − 0.0008 (2-year risk) + 0.004 (security) + 0.58 (mother's TTR) − 0.04 (Sex × Security). (c) Mean length of longest five utterances (MLU-5) at 30 months by 20-month security. Prediction equation for MLU-5 at 30 months: −3.59 + 2.45 (sex) − 0.01 (2-year risk) + 0.21 (security) + 15.80 (mother's TTR) − 0.34 (Sex × Security). All plotted values are based on sample means for 2-year risk (= 2) and mother's TTR (= 0.5).

Bayley Language and 36-month Preschool Language Scale Auditory subscale, 30-month MLU-5, TTR, and the percentage of new conversational turns. Significant interactions between child's sex and attachment security were found for three aspects of 30-month conversational skill: verbosity, the percentage of turns that continued an established topic, and MLU-5. A significant interaction was also found between degree of 3-year family risk and concurrent Preschool Language Scale verbal ability.

The interaction between child's sex and security in the regression on 30-month verbosity took the form of disordinal interaction. That is, among insecure children, girls talked more, whereas among secure children, boys talked more. The remaining three interactions were of the ordinal form. Security was positively related to MLU-5 among boys but not girls, and security was negatively related to the percentage of continue turns among girls but not boys. Finally, a greater degree of family risk was associated with higher Preschool Language Scale verbal scores among the girls but not the boys.

DISCUSSION

Many researchers have attempted to explain why developmental lags and poor school achievement are more frequent among low-income children. One approach is to identify characteristics that distinguish middle- and lower-income families with the assumption that factors more prevalent in middle-class families are those likely to facilitate language learning. In contrast, this study considered ways in which relations within high-risk families might differ from what is known about more socially advantaged families. Our approach draws on current studies in risk research and developmental psychopathology. It seemed possible, given the evidence of greater male vulnerability to neurodevelopmental stress, that the boys in our sample would have relatively poorer language skills because of greater susceptibility to psychosocial stress. Our second assumption was that language ability is too complex to be accounted for by one or two variables, so we collected a range of data in a variety of ways. In assessing social influences on children's language development, we gathered information on family stress and coping, opportunities for cognitive and linguistic stimulation in the home, the nature of structured and informal learning experiences, and the affective context for learning as indicated by infant–mother attachment. With regard to children's growing language abilities, we assessed several component skills, such as word knowledge and the frequency and goals of child-to-mother

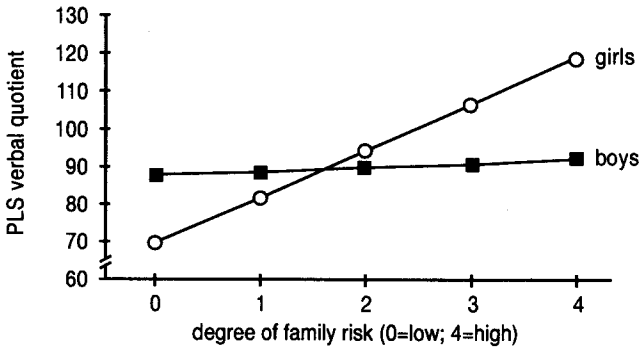

Figure 2. Preschool Language Scale (PLS) verbal quotient by 3-year family risk. Prediction equation for 36-month PLS verbal quotient: 82.37 − 17.95 (sex) + 1.23 (3-year risk) + 0.75 (security) + 2.85 (mother's type-token ratio [TTR]) + 11.18 (Sex × Risk). Plotted values are based on sample means for security (= 5) and mother's TTR (= 0.5).

conversation, through observational methods and standardized testing.

Several findings are worth emphasizing. First, for the sample as a whole, difficulties in language became increasingly apparent over the study period. Although the children were identified prenatally as being at risk for developmental problems, language delays were not manifest until sometime after 24 months of age. Recall that boys' and girls' 20-month vocabulary, 24-month Bayley Mental Development Index, and the Bayley Language subscale scores were within the range of normal development. Delays began to appear in the conversational ability of boys and girls at 30 months and were even more pronounced at the 36-month Preschool Language Scale testing. In addition, degree of family risk was not a significant predictor of language performance until age 36 months. These findings are consistent with the view of McCall (1981) and others (e.g., Barnard, Bee, & Hammond, 1984; Farran & Ramey, 1980; Golden, Birns, Bridger, & Moss, 1971; Yeates, MacPhee, Campbell, & Ramey, 1983) that individual differences in mental development are increasingly related to genetic and environmental factors after age 2 years.

Second, tests for group differences in language ability revealed a consistent disadvantage for boys compared with girls. Differences in maternal report of 20-month vocabulary and in many aspects of 30-month conversation ability were considerable. Observed sex differences were not an artifact of the size of the language samples of boys and girls. As measured during a laboratory snack with mother, boys and girls were equally communicative (at all three ages), and at 30-months were just as likely to continue an established conversation. Given the striking differences in quality of spontaneous language skill at 20 and 30 months, it is perplexing that sex differences were not also apparent on the 24-month Bayley or the 36-month Preschool Language Scale. The most likely reason is that the Bayley and the Preschool Language Scales were constructed to minimize sex differences (Psychological Corporation, personal communication, September 1993; Zimmerman, personal communication, September 1993).

Third, sex differences in vocabulary and conversational ability were apparent despite seemingly similar antecedent conditions and experiences. Tests for potential mediating influences of social experience showed that these differences could not be accounted for by variation in maternal teaching, conversation style, quality of the home, or infant attachment security. For boys and girls alike, quality of emotional and sociolinguistic experience was a significant predictor of 24- and 36-month language test performance and of 20- and 30-month measures of spontaneous language skill. This same set of predictors also related to 13-month child verbosity, but not 20- or 30-month verbosity. Tests for interactions with child's sex showed that boys' language attainment was particularly vulnerable to psychosocial stressors within the mother–child relationship, whereas girls at greatest risk because of family isolation and other difficult circumstances had the most advanced verbal skills as reflected by the Preschool Language Scale.

With regard to the generalizability of these findings, we are reminded that all study families had participated in an 18-month intervention project. The intervention study contrasted an experimental nurse home visitor program with a program of "usual care" available through Seattle–King County Public Health clinics in Washington. Thus, although all received intervention services, it seems reasonable to assume that women randomly assigned to the nonexperimental program were characteristic of mothers who seek and utilize public services to families in poverty. Although it is impossible to determine the ways in which the intervention experience may have changed the nature of the relations among the variables under investigation, the strong main effect of social experience on boys' and girls' language abilities suggests that the patterns found here are not grossly aberrant. That is, the same type of factors associated with language development in the general population (namely, opportunities for learning in the home and responsive mother–child interaction) were also operative in this high-risk group. These findings help clarify the process by which global risk factors such as poverty and lack of parental education give rise to early language delay. In addition to general effects of the quality of social experience on language attainment for all children, we learned that the language development of boys was particularly vulnerable to emotional insecurity. We suggest that future intervention efforts pay particular attention to these additional markers for poor language outcomes.

Although this study examined psychosocial influences on toddlers' language development, we cannot address either biomedical or psychosocial etiologies of the observed sex differences definitively. Biogenetic factors may be responsible, yet experiential hypotheses must also be considered. In this study, we found few differences in the behavior of mothers toward their children in prescribed teaching and mealtime situations. However, it may be that boys and girls develop similarly by taking advantage of different opportunities for language learning. For example, Wells (1985) reported that in a study of preschool children from working-class homes in England, girls spent more time talking with parents in the context of general activity and helping around the house, whereas boys spent more time talking with adults in play (Wells, 1985). It is quite likely that family stress exacts a greater toll on time for parent–child play than on meals and household chores. As a result, the boys of this study, more so than the girls, may have missed out on traditional opportunities for learning from adults.

The positive association between degree of family risk (at 36 months) and girls' verbal ability (measured concurrently by the Preschool Language Scale) was an unexpected finding. Because this pattern appeared with just one language outcome, it should not be overinterpreted. It is nonetheless intriguing. Several researchers have noted that some individuals seem capable of drawing strength from stressful situations (Anthony, 1987; Rutter, 1985).

Garmezy (1983) developed the concept of *required helpfulness* to describe one way in which stress (in his example, the stress of living with a mentally ill parent) can have a positive effect on overall child competence. He proposed that if the stress is tolerable and gives rise to interactions that the child finds rewarding, the consequence of helping others can increase the helper's competence, morale, motivation, and persistence and can 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, 1985, p. 600) of parental de-

pression, it is evident that the girls in this study had, from as early as 20 months of age, more language to invoke.

The relation between emotional insecurity and language performance of boys is more enigmatic. Although it is difficult to disentangle the direction of effect, sex differences have been observed in the way young children react to transitions in family life and in the association between behavior and the quality of parent–child relationships. Specifically, studies of firstborn children following the birth of a sibling note that behavior changes in boys more often take the form of withdrawal from mother or apathy (Dunn, Kendrick, & MacNamee, 1981; Nadelman & Begun, 1982). Similarly, Hinde and Stevenson-Hinde (1987) characterized the mother–child relationships of shy boys as less warm than those of not-shy boys. In the present study, boys in insecure mother–child relationships were significantly less conversant during the 30-month snack episode than were insecure girls, secure boys, or secure girls. The difference was apparent in a lower overall rate of speech and less mature grammatical skill. Perhaps these conversational indexes reflect the type of psychological distancing reported to be more common among boys in times of interpersonal conflict (Shure, 1985).

Children's language ability is traditionally measured by verbal IQ tests or standardized language assessments. Yet how language is actually used—to convey information, express wants and feelings, and negotiate successful social interaction—may be more essential to subsequent adaptive functioning than scores obtained in an artificial test situation would indicate. This view is supported by follow-up studies of early intervention samples that find initial gains in child IQ diminish over time, but long-term benefits, up to 10-years postintervention, are apparent in terms of better school attendance, peer relations, and fewer special education services (Darlington, Royce, Snipper, Murray, & Lazar, 1980; Schwinhart, Weikart, & Lamer, 1986; Seitz, Rosenbaum, & Apfel, 1985). The importance of verbal proficiency as a means to establish and maintain social relationships with peers and influential adults (e.g., teachers and coaches) suggests one pathway by which interventions that target early cognitive–linguistic gains could also achieve sociolinguistic benefits.

Some children in families with multiple problems develop normally, whereas others do not (Werner, 1986). Understanding the interconnections among various domains of development is crucial to illuminating the paths by which risk and protective factors can affect young children's development. The present study focused on the interpersonal matrix on which preschool language abilities develop. Doing so helped us identify important opportunities for intervention when optimal learning conditions are compromised by psychosocial and economic disadvantages.

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