

Environmental influences on early language development: The context of social risk

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Abstract

The impact of environmental risk on toddlers' cognitive and linguistic development was investigated in a longitudinal study of 78 high-risk families. The risk factors examined were family social status, mother's psychosocial functioning, and quality of dyadic involvement at 1 year of age (including measures of mother-infant interaction and infant-mother attachment security). Child outcome measures included the Bayley MDI (at 24 months) and the Preschool Language Scale (at 36 months). The data indicate that dyadic involvement was an important mediator in the relation between environmental risk and subsequent child competence. Specific relations among early interactive experiences, infant attachment security, and subsequent cognitive and linguistic gain were examined within a framework of risk and protective factors. The results suggest that secure attachment may operate as a protective factor, but only among the more extreme cases in this exclusively high-risk sample.

Studies of environmental influences on cognitive development report a consistent relationship between family social status and children's intellectual performance. 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 (Hess & Shipman, 1965; Robins, 1966; Rutter, 1985a; Rutter et al., 1974; Sameroff, Seifer, & Zax, 1982). While the statistical odds against children encumbered by environmental adversity are well-rec-

ognized, little is known of the processes by which environmental risk influences cognitive and linguistic development. One possibility, to be examined in this study, is that the potential impact of environmental risk is mediated by the quality of parent-child interaction.

Low socioeconomic status (SES) has been used as a marker for a constellation of educational, social, and economic disadvantages believed to have a negative effect on mother-child interaction (Bernstein, 1961; Maccoby, 1980; Olim, 1970; Smith, Flick, Ferriss, & Sellman, 1972). Group comparisons based on social status reveal that children from disadvantaged homes have fewer opportunities for verbal interaction with adults and are less likely to experience the type of verbal input associated with cognitive and linguistic gain among children from low-risk families (Cohen & Beckwith, 1976; Snow et al., 1976). Compared with mothers of higher social status, lower SES mothers are reported to be less stimulating and less responsive (Barnes,

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Gutfreund, Satterly, & Wells, 1983; Ramey, Farran, & Campbell, 1978; Tulkin & Cohler, 1973; Tulkin & Kagan, 1972), less sophisticated in language use (Hess & Shipman, 1965), more restrictive, more controlling (Bee, VanEggen, Streissguth, Nyman, & Leckie, 1969; Clarke-Stewart, 1973; Clarke-Stewart, VanderStoep, & Killian, 1979; Nelson, 1973), and less descriptive (Snow et al., 1976). A recent study by Hoff-Ginsberg (1989) indicated that social status differences in mothers' speech to children can not be accounted for by differences in interactive setting or mothers' beliefs about childrearing. 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.

There is ample evidence that the quality of early social-interactive experiences has important implications for children's mental development (Bee et al., 1982; Bradley & Caldwell, 1976a, 1976b; Clarke-Stewart et al., 1979). Stimulating and contingent parent-infant interaction has been associated with subsequent cognitive ability (Bradley & Caldwell, 1976a, 1976b; Elarado, Bradley, & Caldwell, 1975; Farran & Ramey, 1980), language (Clarke-Stewart et al., 1979; Elarado, Bradley, & Caldwell, 1977; Olson, Bates, & Bayles, 1984), and toddler's social skills (Clarke-Stewart et al., 1979). In contrast, highly controlling and directive parental input appears to have a negative impact on children's cognitive and linguistic development (Cross, 1984; Nelson, 1973; Snow, Midkiff-Borunda, Small, & Proctor, 1984).

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 10-36 months report positive relations between attachment security and some aspects of language, for example, complexity of gestural communication in infancy, observed vocabulary size, and percentage of sentence-types that are questions, but not others, for example, no significant relation between attachment and mean length of utterance, type-token ratio, or referential versus expressive language style (Bretherton, Bates, Benigni, Camaioni, & Volterra, 1979; and Connell, 1977, Main, 1973, Pentz, 1975, as reported in Bates, Bretherton, Beeghly-Smith, & McNew, 1982). Still others report that infant attachment classification is unrelated to longitudinal assessments of child language and cognition in the second year of life (e.g., Clarke-Stewart, 1973).

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, it would appear that most caregivers 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, 1989; Gersten, Coster, Schneider-Rosen, Carlson, & Cicchetti, 1986). In contrast to studies of low-risk families, they 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 (IS language). Cicchetti (1990) reported that the securely attached toddlers used proportionately more IS utterances, had a more elaborate IS vocabulary, and were more likely to use IS 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 together, 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 aim of the present study was twofold. The first objective was to examine the impact of environmental risk on toddlers' burgeoning cognitive and linguistic skill. Three conceptually related but theoretically independent sources of risk were determined at the outset. With respect to the child, the most distal level of risk 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 the quality of mother-child involvement assessed near the child's first birthday. Subsumed in this level of risk are observational assessments of mother-infant interaction, the home environment, and the social-emotional quality of the relationship as reflected by infant-mother attachment security. We expected that these proximal measures of dyadic involvement would mediate the relation between risk due to family demographics and mother's psychosocial functioning, and subsequent child outcome. In accord with previous research (Golden & Birns, 1968; Sameroff & Seifer, 1983; Slaughter, 1983), the influence of the social environment on children's developing cognitive and linguistic abilities was expected to be more readily apparent in assessments after the child's second birthday.

The second objective of the study was to

investigate the potential moderating effect of secure infant-mother attachment 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). Given that warm and responsive interpersonal experiences can influence young children's intellectual development (Belsky, 1981; Bretherton, 1985; Cohen & Beckwith, 1979; Escalona, 1982; Estrada, Arsenio, Hess, & Holloway, 1987), it is puzzling that studies of child competence and the affective quality of the infant-mother relationship, as measured by infant attachment, yield mixed results (Bates, Benigni, Bretherton, Camaioni, & Volterra, 1977). Recent advances in the areas of risk research and developmental psychopathology may shed new light on the conceptual links between attachment and child language. Researchers working with risk populations have proposed a transactional model of potentiating and protective factors to describe the relation between environmental and/or biological stressors, and child competence (Cicchetti & Rizley, 1981; Garmezy, Masten, & Tellegen, 1984; Rutter, 1979). According to this model, 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 of protective factors in children's responses to life stress and social disadvantage are promising. For example, research by Rutter (1985a) indicated that positive interpersonal relationships can act as a protective factor to mitigate the effect of extreme psychosocial stress on children's socioemotional functioning. In a similar sense, we propose that secure infant-mother attachment might buffer children's early linguistic and cognitive development but only for the most extreme cases in this high-risk sample.

The broad range in quality of parent-child interaction and in child competence, apparent even within samples of very high risk, maltreated children, suggests that the relation between interpersonal experience

and early cognitive and linguistic ability is not a simple one. While it has been proposed that environmental effects on early cognitive development operate through opportunities for varied experiences and warm, reciprocal social interaction (Mitchell, Bee, Hammond, & Barnard, 1985; Rutter et al., 1974), few empirical studies have examined this mechanism within families at high social risk. Thus it is not clear whether the social experiences reported to promote children's intellectual development operate more generally in the larger population. 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. With noted exceptions (e.g., Seifer & Sameroff, 1987), risk research tends to focus on links between markers of environmental risk (e.g., mother's lack of education or single parenthood) and aspects of child competence (e.g., quality of early relationships, social-linguistic interactions, or performance on standardized tests of development) at a single point in time. Consequently, relatively little is known of the processes over time by which social disadvantage is transmitted from the environment to the child.

The subjects of this longitudinal study were participants in a research project initially designed to test the relative effectiveness of two treatment models designed to prevent socioemotional 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.

Method

Subjects

The subjects were 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 non-mutually exclusive 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 ($\leq$ 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.

Table 1 summarizes the characteristics of the sample at intake. Study mothers were primarily white (90%) women from lower socioeconomic backgrounds who had not completed high school (50%), who were without partners (75%), and who were sup-

Table 1. *Sample characteristics*

Measure	<i>M</i> ^a	<i>SD</i>
Maternal characteristics (intake)		
Age	21.2	4.0
Education (yr)	11.0	1.5
Income ^b	2.4	1.9
Household size	3.4	1.7
Marital status: %Married	25	—
Race: %White	90	—
Employment: %Working	13	—
Risk factors (%)		
Alcohol, drugs	8	—
Psychiatric diagnosis	4	—
Maltreatment	3	—
Low education, low support	48	—
Young, low support	16	—
Low income, low support	67	—
Young, low education, low income	24	—
Child characteristics		
Apgar (5 min.)	8.9	0.6
Birthweight (gr)	3409.9	574.7
Gestational age (wk)	39.7	1.6
Sex: %Male	49	—
Birth Order: %Firstborn	50	—
Delivery Route: %Cesarean	22	—

Note: *N* = 147.

^aAll values are means, except where percentages are indicated under measures.

^bIncome scale: 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

ported 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 study infants (49% male; 50% firstborn) 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 1,500 g.

Between intake and age 1 year, 65% of the original sample was retained. Comparisons of those women who dropped out, 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%). Of the original 147 subjects recruited during pregnan-

cy, 95 mother-infant pairs were evaluated when the infants were 1 year of age; 72 of these participated in developmental assessments at 2 years, and 57 at 3 years. The mean scores of subjects with child outcome data at 2 and/or 3 years were higher than scores of those who dropped out for: social status (by 3 points; mean for original sample = 22.9), mother's age (by 1.5 years; mean for original sample = 21.2), and mother's conversational skills with adults (by 3 points; mean for original sample = 48.5). These differences, while marginal, are statistically significant. The types of assessments used at each age period are shown in Table 2.

Procedure

Demographic risk: Assessments of mother's demographic characteristics. Conceptually, mother's age, education, income, and social status constitute potential, yet distal,

Table 2. *Assessment by child's age*

Assessment	Prenatal	1-3 Mos.	12, 13 Mos.	24 Mos.	36 Mos.
Maternal demographics	X				
Maternal psychosocial characteristics and conversation skills		X			
Mother-child interaction			X		
Child-mother attachment			X		
Child language and cognition				X	X

Note: This table presents only selected assessments relevant to the present report.

markers of environmental risk. In this study, the mothers' mean age was 21.9 (± 4.3) years, and they had completed an average of 11.2 (± 1.6) years of schooling. Annual family income was rated on a 7-point scale derived for this study, ranging from (0) *none* to (6) \$15,000-19,000. Using this scale, the average income was approximately \$5,000-7,500 per year (in 1983 dollars); 75% 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 account occupation, education, sex, and marital status, averaged 24.3 (± 8.4). All demographic data were collected at intake, during the mother's second trimester of pregnancy.

Psychosocial risk: Assessments of mother's social skills and psychosocial functioning. Four measures were used to characterize mother's life stress, social, and psychological functioning: Negative Life Events as assessed by the Life Experiences Survey (Sarason, Johnson, & Siegel, 1978), the Adult Conversational Skills Scale (Barnard, Booth, Mitchell, & Telzrow, 1983), Social Support and Partner Involvement (Bee et al., 1982), and the Beck Depression Inventory (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961). These 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 3 months after the infant's birth, prior to the onset of conven-

tional communication; thus, they are likely to reflect a disposition the mother brings to interactions with her baby that is relatively independent of the baby's social behavior.

Negative Life Events refers to the negative change 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) reported significant correlations between the negative change score from the LES and anxiety, academic achievement, social desirability, and personal maladjustment. In addition, they summarized several comparative studies that demonstrate the superiority of the LES to the Holmes and Rahe Schedule of Recent Events, a widely used instrument in life stress research. In this study, the LES was completed by the mothers when their infants were 3 months of age.

The Adult Conversational Skills Scale (ACS; Barnard, Eyres, Lobo, & Snyder, 1983) is a 63-binary-item observational record of the mother's conversational skill with a female evaluator. 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 et al., 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). In this study, the ACS had an internal consistency (Cronbach's alpha) of .73; it was completed when the infants were 3 months of age.

Social Support and Partner Involvement (SSPI; Bee et al., 1982) was pilot-tested in a previous longitudinal study of relatively low-risk families. In that study, social support, as measured by the SSPI during the baby's first month, was a potent predictor of later learning problems (Mitchell et al., 1985). The SSPI is based on the mother's responses to eight questions posed by an interviewer. The questions probe mother's positive and negative feelings about the emotional support and physical help she is receiving in caring for her child. The total score on the SSPI ranges from 0-9 points. Higher scores indicate that the mother's partner is the person who gives her the most emotional support and physical help. Lower scores indicate that a partner is not present or not involved as much as the mother wishes. The SSPI, completed in this study when the infants were 3 months old, had an internal consistency of .83.

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 ranges from 0-63, reflects both the increasing number and severity of symptoms. A score of 10 is the suggested cutoff for mild depression. Concurrent validity, based on comparisons of BDI scores and clinical assessments, ranges from .61-.73 (Beck & Beamesderfer, 1974). The BDI was designed for use in psychiatric populations and has been validated on nonpsychiatric groups as well (Bumberry, Oliver, & McClure, 1978); it is widely used and is included in the assessment battery of the NIMH Collaborative Program on the Psychobiology of Depression (Rabkin & Klein, 1987). In the present study, the BDI (Cronbach's alpha = .77) was completed by the mothers when their infants were 6 weeks old.

Dyadic risk: Assessments of mother-child interaction. Four measures, obtained when the children were 1 year of age, were used to characterize quality of mother-child inter-

action. These included a composite of three teaching and feeding tasks, the social environment subscales of the HOME inventory (Caldwell & Bradley, 1978), and measures of mother and child conversation during a snack.

Teaching at 12 months (in the home) and teaching and feeding tasks at 13 months (in the lab) were standardized situations evaluated by female staff members trained in the use of the Nursing Child Assessment Teaching (NCAT) and Nursing Child Assessment Feeding (NCAF) scales (Barnard et al., 1983; Barnard et al., 1989). The scales, valid predictors of later parent-child interaction and of child cognitive outcomes (see Barnard et al., 1989), measure maternal and child contributions to dyadic interactive quality. They consist of 73 (NCAT) and 76 (NCAF) binary items. The parent items are designed to assess sensitivity and responsiveness to children's cues and parents' ability to promote social and cognitive development. The child items reflect clarity of cues and responsiveness toward the parent. The teaching and feeding ratings yield compatible, highly correlated, parent, child, and total scores such that the three total scores were converted to *z* scores and combined for the purpose of data analysis.

The HOME inventory (Caldwell & Bradley, 1978) was completed as part of the 12-month home visit. 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. Bradley and Caldwell (1976a, 1976b) reported high correlations between HOME scores during the first two years of life and children's IQ scores at 3 and 4 years of age. 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 that is considered here among other

measures of dyadic involvement (internal consistency based on Cronbach's $\alpha = .65$).

One month after the home visit, at 13 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 the Ainsworth Strange Situation (Ainsworth, Blehar, Waters, & Wall, 1978). Of these lab procedures, only the latter two will be discussed.

The snack episode, transcribed by a coder who was naive to all other mother and child assessments, was used for utterance-by-utterance analysis of mother-child conversation. The snack episode was selected for language analysis because mealtimes are routine events, unconstrained by situational demands, and represent naturally occurring opportunities for conversation between adults and children (Barnes et al., 1983). The snack episodes ranged in length from 5 to 10 minutes. The average was approximately 8.5 minutes.

Maternal utterances during snack were coded according to their 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). The coding criteria are similar to those used by McDonald and Pien (1982), who 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. The summary measure used to describe infant communication during snack was the combined rate per minute of vocal/verbal behavior and gestural communication. The coding of infant gestures was

restricted to conventional gestures such as head nod or shake, pointing, reaching, and giving (Bates et al., 1979).

Infant-mother attachment security

Mothers and children were videotaped in the Ainsworth Strange Situation (Ainsworth et al., 1978) as part of the 13-month lab visit. This procedure consists of a series of increasingly stressful, 3-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. The Strange Situations were classified by three observers according to the traditional A-B-C categories (Ainsworth et al., 1978), with the inclusion of the new "D" (disorganized/disoriented-insecure) category as described by Main and Solomon (in press). The percent agreement among each pair of coders was between 78-79%. Disagreements were resolved by consensus among the coders. Eighteen tapes, some of which were suspected of being "D" classifications, were also coded by Main; percent agreement for these was 89%. 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 subclassification scores directly to point scores (Spieker & Booth, 1988). The 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).

Measures of child outcome (24 and 36 months). At 24 months, cognitive status was assessed with the Bayley Scales of Infant Development (Bayley, 1969). In addition, the total score on 26 language-related items of the Bayley was used to form a separate language subscale (Dale, Greenberg, & Crnic, 1987). At 36 months, children's

language ability was assessed with the Preschool Language Scale (PLS; Zimmerman, Steiner, & Pond, 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 contrast, 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 Verbal and Auditory subscales and a combined overall Language quotient. The PLS has been used widely with children enrolled in Head Start and nursery school programs. Concurrent validity has been established with other popular language scales such as the Peabody Picture Vocabulary Test and with the predominantly verbal Stanford Binet L-M (Terman & Merrill, 1960; Zimmerman et al., 1979).

Results

Descriptive statistics

Descriptive statistics and results of the child assessments are presented in Table 3. The mean score on the Bayley Mental Development Index (MDI), at 24 months, was slightly above 100, the expected population mean ($M = 104.7$; $SD = 15.9$). The mean score on the Bayley language subscale was 19.9, 1.5 points higher than that reported by Dale et al. (1987; $M = 18.4$) in a study of preterm infants at 24 months corrected age. Scores obtained 1 year later on the Preschool Language Scale suggest a relative lower level of child competence. At 36 months, 40% of the sample earned scores below what would be expected based on chronological age, with 63% below age level on verbal skills and 35% below on auditory comprehension. The mean overall Language quotient on the Preschool Language Scale was 100.8 ($SD = 14.0$); it reflects a mean Auditory Comprehension quotient of 107.5 ($SD = 17.5$) and a mean Verbal Ability quotient of 94.0 ($SD = 16.9$). While

there are no published norms for the PLS, these averages are slightly lower than those obtained by Erickson, Sroufe, and 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.

The t test comparisons of the 24-month Bayley MDI scores and the 36-month Preschool Language Scale scores by gender and by parity revealed few differences. There was a tendency for girls to score 3–4 points higher on the MDI and PLS, but these differences were not statistically significant. Firstborn children outscored later born children by 7 points on the Bayley MDI (firstborn: $M = 108.6$; later born: $M = 101.3$; $p < .05$); however, there were no significant differences in their 36-month PLS scores.

Simple correlations

The correlations between the clusters of demographic, psychosocial, and dyadic-risk variables, and with the child outcome scores, are presented in Tables 4 and 5. Several points are worth emphasizing about these findings. First, the magnitude of the correlations among the risk factors 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 that 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 ($M = 11.2$; $SD = 1.6$), and other scores are more extreme than would be expected in a nonselected sample. For example, the BDI indicates that nearly half of the study mothers were functioning beyond the clinical cutoff for mild depression (45% scored 10 points or more; $M = 10.2$; $SD = 6.1$). Despite these potential limitations, mother–infant interaction at 1 year of age showed significant, positive correlations with social status, family income, mother's conversational skills, and significant, negative correlation with maternal depression.

Table 3. *Descriptive statistics and child outcomes*

Measure and Time of Assessment	N	M or %	SD
Maternal demographics			
Prenatal			
Social status	78	24.3	8.4
Age	78	21.9	4.3
Education (yr)	78	11.2	1.6
Family income ^a	72	2.6	2.1
Maternal psychosocial characteristics			
1-3 mos.			
Depressive symptoms	73	10.2	6.1
Negative life change	74	13.1	10.7
Conversation skills with adults	75	49.3	5.4
Social support	75	5.2	2.7
Dyadic measures			
12, 13 mos.			
NCAT total teaching (home)	75	49.0	10.1
NCAT total teaching (lab)	71	58.3	5.7
NCAF total feeding (lab)	71	58.0	5.9
HOME social composite	75	19.4	3.8
Mother's speech % language facilitating	72	72.4	13.2
Infant communication rate per minute	72	3.7	2.2
Attachment security			
% "B" classification ^b	72	45.8	
Rating (1-9; 1 = low)	72	4.7	2.8
Child outcomes			
24, 36 mos.			
Bayley MDI (24 mos.)	72	104.7	15.9
Language subscale	72	19.9	3.6
PLS (36 mos.)			
Overall language quotient	57	100.8	14.0
Auditory quotient	57	107.5	17.5
Verbal quotient	57	94.0	16.9

Note: This table presents only selected assessments relevant to the present report.

^aIncome scale: 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

^b%Insecure classifications: "A" = 19; "C" = 11; "D" = 24. See Spieker and Booth (1988) for an elaboration of attachment-related findings.

Second, of the three sets of risk variables, it is clear that the dyadic measures constitute the most potent predictors of children's subsequent cognitive and linguistic performance (see Table 5). Among the demographic measures, social status, mother's years of schooling, and family income were related to the 24-month Bayley and the 36-month PLS, although the magnitude of the correlations is notably less than that of the dyadic measures. With regard to aspects of mother's social and psychologic functioning, the ACS (mother's conversational skills with adults) was the only measure re-

lated to child outcome scores at both ages; the correlation between the ACS and the auditory component of the PLS is especially impressive ($r = .50$). Among the dyadic variables, measures of mother-child conversation during snack in the lab and the HOME social composite were significantly and positively related to both the Bayley MDI and the Bayley language subscale. In addition, every measure of dyadic involvement at 1 year (assessments of mother-infant interaction and the attachment security rating) was predictive of the PLS overall Language quotient. Pearson correlation co-

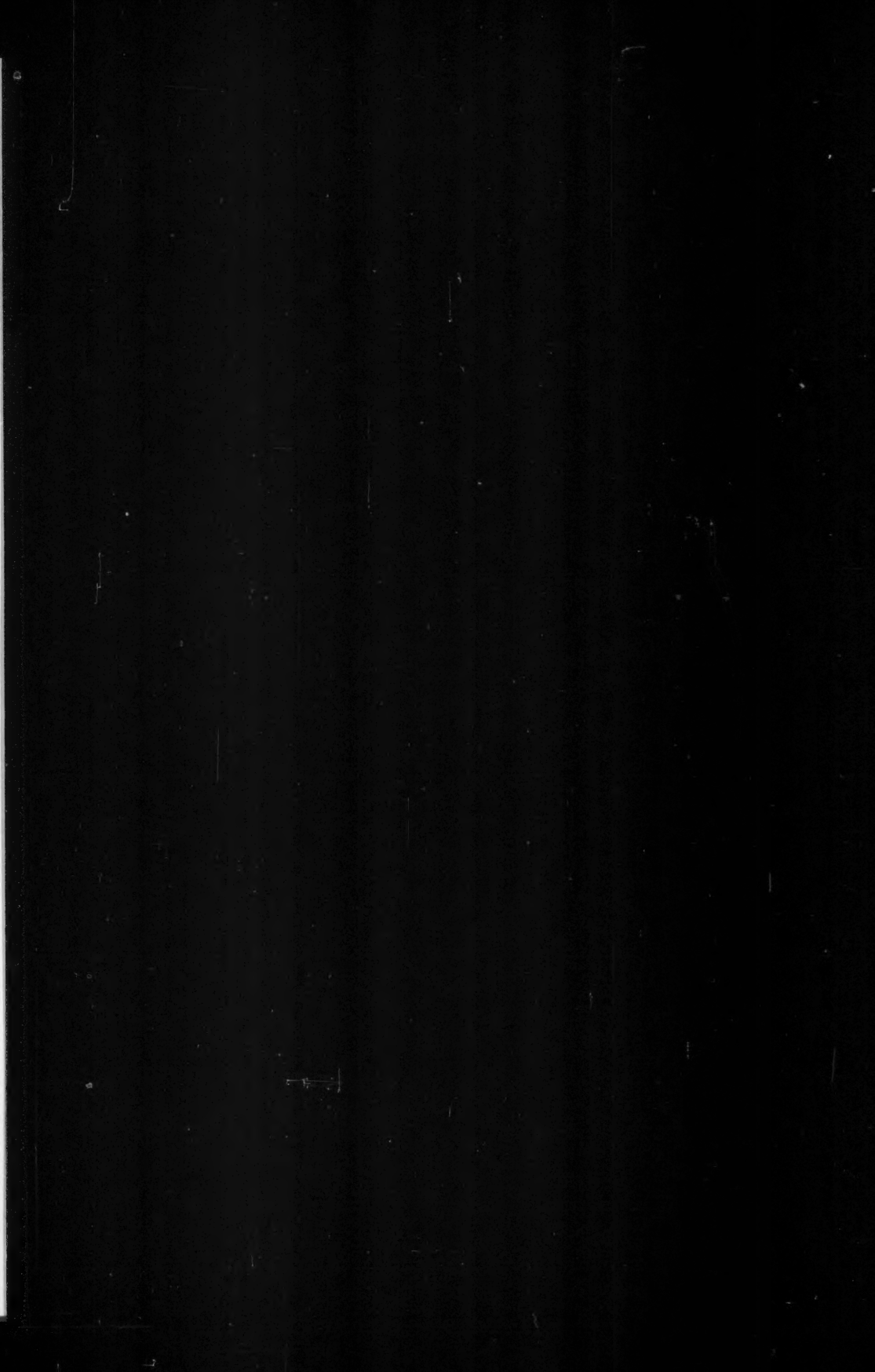


Table 4. *Correlations among demographic, psychosocial, and dyadic risk variables*

	Demographic Risk		
	Social Status	Mother's Age	Mother's Education
Psychosocial risk (Maternal assessments)			
Depression	.03	.08	.03
Negative life changes	.02	.07	.08
Conversation skills	.31**	-.13	.13
Social support	.15	-.21*	-.18 [†]
Dyadic risk			
NCAT/NCAF composite	.16	.23*	.30*
HOME social composite	.09	.20*	.22*
Mother's % language facilitating	.20*	.08	.06
Child's rate of communication	.21*	-.09	.10
Attachment rating (1-9)	.20*	.11	.13

[†] $p \leq .10$; * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$.

variables

	Family Income	Psychosocial Risk (Maternal assessments)			
		Depression	Negative Life Changes	Conversation Skills	Social Support
	.09	—	—	—	—
	.10	—	—	—	—
	.13	—	—	—	—
†	.14	—	—	—	—
*	.31**	-.21	-.00	.38***	-.08
*	.22*	-.15†	-.01	.33**	-.02
	.21*	.04	-.01	.17†	.14
	.29**	-.24*	-.05	.30**	.04
	.00	-.30**	-.02	.26**	.21*

Table 5. *Correlations between predictor variables and child outcomes at 24 and 36 months*

	24-Mos. Bayley	
	MDI	Language Subscale
Demographic risk		
Social status	.26*	.07
Mother's age	.11	.17†
Mother's education	.23*	.12
Family income	.20*	.17†
136 Psychosocial risk (Maternal assessments)		
Depression	.00	-.06
Negative life changes	-.07	-.00
Conversation skills	.12	.22*
Social support	.13	.06
Dyadic risk		
NCAT/NCAF composite	.14	.28**
HOME social composite	.29**	.39**
Mother's % language facilitating	.27*	.24*
Child's rate of communication	.23*	.14
Attachment rating (1-9)	.07	.10

† $p \leq .10$; * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$.

24 and 36 months

Scale	36-Mos. Preschool Language Scale		
	Overall Language	Auditory Comprehension	Verbal Ability
	.22*	.30**	.07
	.19 [†]	.14	.17
	.23*	.33**	.03
	.25*	.23*	.18 [†]
	-.17	-.24*	-.03
	.09	-.02	.17
	.36**	.50***	.09
	.12	.13	.06
	.51***	.51***	.31**
	.31**	.42***	.09
	.30**	.40***	.07
	.46***	.39***	.35**
	.40***	.46***	.18 [†]

efficients ranged from $r = .30$ with mother's language facilitating style during snack, to $r = .51$ with the combined teaching and feeding scores.

A final comment about Table 5 is the observation that the environmental risk factors were more frequently and more strongly related to the 36-month outcome scores than to the 24-month Bayley scores. Six of ten possible correlations between dyadic measures and Bayley MDI and language scores were significant at $p < .05$. All dyadic variables showed significant, positive correlation with the overall quotient of the PLS and, in particular, with the auditory comprehension component of the test. The magnitude of the correlations with the PLS, compared to those with the Bayley language subscale, suggest that environmental influences on language were more readily apparent at the later assessment. A similar finding is apparent in the work of Coster et al. (1989) and Gersten et al. (1986), who report comparatively more language-related findings in their study of maltreated children at age 3, than in their study of maltreated children at age 2.

Predicting child outcomes

In the next step of the analysis, hierarchical regression (Cohen & Cohen, 1975) was used to examine the influence of demographic, psychosocial, and dyadic-risk status on cognitive and linguistic development. Before doing so, the large number of predictor variables were consolidated to a total of four: demographic risk, mother's psychosocial risk, interactive risk, and infant attachment classification. Demographic risk was represented by the total score on the Hollingshead Four-Factor Index of Social Status. Mother's conversational skills with adults, as measured by the ACS, was chosen to represent degree of psychosocial risk. This decision was based in part on evidence presented earlier linking mother's conversational skill in general, to her speech to children in particular (Hoff-Ginsberg, 1989), and is supported by the finding that, in this data set, the ACS was the only

psychosocial-risk variable to show a significant, linear relationship with both child outcome scores (recall Table 5). The interactive-risk composite is a summary variable that was constructed by converting individual raw scores on measures of (1) mother-child conversation during snack, (2) the teaching and feeding composite, and (3) the HOME social composite to standard z scores and summing. Internal consistency, based on Cronbach's alpha, for the interactive-risk composite is .61. Finally, infant attachment status was included as a component of dyadic risk, but kept separate from the interactive-risk composite, because of the hypothesized distinction between the role of secure attachment and language-facilitating interactive experiences in promoting cognitive and linguistic development. Infant-mother attachment was dichotomized based on overall classification, secure ("B") versus insecure ("A," "C," or "D").

Variables were entered in the regression equations in order of increasing proximity to the child's direct experiences. Family social status was entered on the first step of the equation, mother's conversational skills on the second, and the dyadic-risk factors (interactive risk and attachment status) on the third. This order of entry provided the most stringent test of the relative strength of mother-child interaction as a predictor of subsequent child outcome.

The results of the regression analyses are presented in Tables 6 and 7. Not surprisingly, in view of the correlation patterns evident in Table 5, the prediction of 24-month outcomes was relatively weak. In combination, the risk factors accounted for only 13% of the variance in Bayley MDI and 12% of the variance in the Bayley language score. In contrast, there was a strong association between risk and child language at 36 months of age. Of the three sources of environmental risk conceptualized at the outset of the study, dyadic involvement at 1 year was a far better predictor of overall PLS performance than was family social status or mother's conversational style. In combination, the risk factors accounted for

Table 6. Predicting child outcomes at 24 months from total risk

Step Composite/Variable	<i>r</i>	<i>F</i> to Enter	<i>R</i>	<i>R</i> ²	Beta	Overall <i>F</i>
24-mos. Bayley MDI						
1. Social status	.26	4.67*	.26	.07	.18	4.67*
2. Mother's conversation skills	.13	.18	.27	.07	-.04	2.39 [†]
3. Dyadic risk						2.29 [†]
Attachment status	.08	.00	.27	.07	-.001	
Mother-child interaction	.32	4.18*	.36	.13	.28	
24-mos. Bayley Language subscale						
1. Social status	.07	.28	.07	.004	-.07	.28
2. Mother's conversation skills	.22	2.81 [†]	.22	.05	.10	1.55
3. Dyadic risk						2.08 [†]
Attachment status	.14	.29	.24	.06	.07	
Mother-child interaction	.32	4.46*	.35	.12	.29	

Note: *n* = 66. Equations represent hierarchical regression with variables entered according to the hypotheses of this article; when entered on the first step, the dyadic risk variables account for 10.32% of the variance in the MDI score ($F = 3.62$; $p = .03$) and 10.90% of the variance in the Language subscale ($F = 3.85$; $p = .03$).

[†] $p \leq .10$; * $p \leq .05$.

Table 7. Predicting child outcomes at 36 months from total risk

Step Composite/Variable	<i>r</i>	<i>F</i> to Enter	<i>R</i>	<i>R</i> ²	Beta	Overall <i>F</i>
36-mos. Preschool Language Scale: Overall language ability						
1. Social status	.24	3.21 [†]	.24	.06	.08	3.21 [†]
2. Mother's conversation skills	.36	5.27*	.38	.14	.09	4.37*
3. Dyadic risk						6.57***
Attachment status	.38	2.51	.48	.23	.20	
Mother-child interaction	.54	8.51**	.59	.34	.40	
36-mos. Preschool Language Scale: Auditory comprehension						
1. Social status	.33	6.32*	.33	.11	.13	6.32*
2. Mother's conversation skills	.49	11.90***	.52	.27	.22	9.76***
3. Dyadic risk						10.68***
Attachment status	.39	2.35	.59	.35	.17	
Mother-child interaction	.60	10.35**	.68	.46	.40	
36-mos. Preschool Language Scale: Verbal ability						
1. Social status	.06	.22	.06	.004	.004	.22
2. Mother's conversation skills	.09	.29	.10	.01	-.06	.25
3. Dyadic risk						1.33
Attachment status	.23	1.02	.23	.05	.15	
Mother-child interaction	.27	2.35	.31	.10	.25	

Note: *n* = 55. Equations represent hierarchical regression with variables entered according to the hypotheses of this article. When entered on the first step, the dyadic risk variables account for 32.80% of the variance in the Overall Language Ability quotient ($F = 12.69$; $p < .001$); 39.46% of the variance in the Auditory Comprehension quotient ($F = 16.95$; $p < .001$); and 9.34% of the variance in the Verbal Ability quotient ($F = 2.69$; $p = .08$).

[†] $p \leq .10$; * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$.

34% of the variance in the PLS Overall Language quotient (of which 20% was unique to dyadic factors), 46% of the variance in the Auditory Comprehension quotient (19% unique to dyadic factors), and 10% of the variance in the Verbal Ability

quotient (9% unique to dyadic factors). When order of entry was reversed, and the dyadic-risk composite entered on the first step of the regressions, the additional contribution of family social status and mother's conversational skills was dramatically

reduced and was no longer statistically significant (see Tables 6 and 7). These findings substantiate our hypothesis regarding the role of early mother-child interaction as a mediator of environmental risk.

Attachment as a protective factor

High- versus low-risk comparisons within a high-risk sample. We proposed that the interplay of risk, attachment, and language can 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, we proposed that secure infant-mother attachment operates as a protective, moderating factor against extreme social adversity. As a protective factor, one would expect the relation between secure attachment and developmental competence to be most pronounced among children at extreme risk.

To test this hypothesis, the relation between secure attachment and child outcome was examined within high- and low-risk subsets of the sample. All four original measures of psychosocial risk (mother's negative life experiences, conversational skills with adults, social support, and Beck depression score) were used to form the risk subgroups. Children were assigned high- or low-risk status by comparing their scores on individual measures with those for the total sample. Each measure was dichotomized using established criteria (e.g., Beck depression score > 9 points) or the median score for the sample. Subjects whose scores on two or more of the measures were judged to be extreme constituted the high-risk group; those with zero or one extreme score were considered low risk. Subjects who had one low score and one missing score, and subjects who were missing two or more scores, were dropped from this analysis.

The first step of the analysis 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 2×2 ANOVA in which the moderation is indicat-

ed by the interaction term (Baron & Kenny, 1986). Edwards (1985) established that unweighted means ANOVA and multiple regression analysis yield comparable results. In the present analysis, regression was preferred over traditional ANOVA techniques because there was no assumption that the predictor variables were orthogonal. In fact, based on the other studies of high-risk samples (see Spieker & Booth, 1988, for a summary of the literature), we expected that infant attachment security would be correlated with measures of mother's psychological and social functioning; this was shown to be true (recall Table 4).

Variables were entered in the regression equations hierarchically in the order specified by Edwards (1985) for nonorthogonal designs. Psychosocial risk (high vs. low) was entered on the first step, infant attachment status (insecure vs. secure) on the second, and the risk by attachment interaction on the third. The findings, presented in Tables 8 and 9, support our prediction that secure infant-mother attachment operates as a protective factor for children at extreme risk.

With regard to 24-month Bayley outcomes, the regression equations were significant for both the MDI and the language subscale. In each case, the risk by attachment interaction term accounted for an additional 7% of the total variance ($p < .05$). The overall equations predicting 36-month Preschool Language Scale scores were also significant; however, the risk by attachment interaction term made a significant addition to the total explained variance only for the Verbal Ability quotient (6% increase; $p < .10$).

In addition, a comparable set of regressions was performed to test whether the quality of interactive experience also functioned as a moderator variable. For these, the sample was dichotomized (relatively good vs. poorer quality interaction) based on the median score of the interactive-risk composite described earlier. In contrast to the attachment-related findings, the additional contribution of the risk by interactive-risk interaction term to the overall equations

Table 8. *Testing attachment as a protective factor: 24-month child outcomes*

Step Variable	<i>r</i>	<i>F</i> to Enter	<i>R</i>	<i>R</i> ²	Beta	Overall <i>F</i>
24-mos. Bayley MDI						
1. Psychosocial risk (high vs. low)	.18	2.04	.18	.03	.95	2.04
2. Infant attachment status (insecure vs. secure)	.10	.14	.19	.04	.85	1.21
3. Risk × Attachment interaction	.12	4.71 [†]	.33	.11	-1.19	2.43*
24-mos. Bayley language subscale						
1. Psychosocial risk (high vs. low)	.20	2.56	.20	.04	.99	2.56
2. Infant attachment status (insecure vs. secure)	.16	1.20	.24	.06	.93	1.88
3. Risk × Attachment interaction	.17	5.20 [†]	.36	.13	-1.24	3.07 [†]

Note: *n* = 65. The effect of attachment as a protective factor is represented in Step 3 as the risk by attachment interaction.

[†]*p* ≤ .10; **p* ≤ .05.

Table 9. *Testing attachment as a protective factor: 36-month child outcomes*

Step Variable	<i>r</i>	<i>F</i> to Enter	<i>R</i>	<i>R</i> ²	Beta	Overall <i>F</i>
36-mos. Preschool Language Scale: Overall language ability						
1. Psychosocial risk (high vs. low)	.11	.66	.11	.01	.59	.66
2. Infant attachment status (insecure vs. secure)	.41	9.63*	.41	.17	.93	5.20**
3. Risk × Attachment interaction	.28	2.03	.45	.20	-.85	4.21**
36-mos. Preschool Language Scale: Auditory comprehension						
1. Psychosocial risk (high vs. low)	.25	3.60 [†]	.25	.06	.38	3.59 [†]
2. Infant attachment status (insecure vs. secure)	.40	8.05**	.44	.19	.55	6.07**
3. Risk × Attachment interaction	.40	.25	.44	.20	-.30	4.07*
36-mos. Preschool Language Scale: Verbal ability						
1. Psychosocial risk (high vs. low)	-.08	.31	.08	.01	.60	.31
2. Infant attachment status (insecure vs. secure)	.27	4.63*	.30	.09	.99	2.48 [†]
3. Risk × Attachment interaction	.07	3.32 [†]	.38	.15	-1.12	2.83*

Note: *n* = 54. The effect of attachment as a protective factor is represented in Step 3 as the risk by attachment interaction.

[†]*p* ≤ .10; **p* ≤ .05; ***p* ≤ .01.

was negligible (<0.1% in each case) and was not statistically significant.

In the next step of the analysis, the magnitude of the protective effect of secure attachment was assessed by *t* test comparisons of children judged secure ("B") with those judged insecure ("A," "C," or "D") within the high- and low-risk subgroups. Within the high-risk subgroup, children judged secure ("B") in infancy earned significantly higher scores on all subsequent measures of language and cognitive ability (see Table 10). Secure and insecure attachment groups differed by 10 points on 24-

month Bayley MDI (*p* < .05), 2.6 points on the language subscale (*p* < .01), and by 15–17 points (equivalent to 1 standard deviation) on the overall Language, Auditory, and Verbal quotients of the PLS (*p* < .01). In contrast, attachment status did little to differentiate children in the lower psychosocial-risk group.

Discussion

The results of this study suggest that the impact of environmental risk on young

Table 10. *T test comparisons of child outcomes by high and low psychosocial-risk subgroups: Illustrating attachment as a protective factor*

	High Psychosocial Risk with Attachment			Low Psychosocial Risk with Attachment		
	Insecure <i>M (SD)</i>	Secure <i>M (SD)</i>	<i>p</i>	Insecure <i>M (SD)</i>	Secure <i>M (SD)</i>	<i>p</i>
24-mo. Bayley						
MDI	98.4 (11.2)	108.3 (18.4)	*	111.7 (16.8)	104.8 (15.8)	n.s.
Language subscale	18.4 (2.6)	21.0 (4.3)	**	21.5 (3.1)	20.3 (3.2)	n.s.
36-mo. PLS						
Overall quotient	93.8 (15.2)	109.4 (11.9)	**	100.3 (11.7)	105.4 (11.0)	n.s.
Auditory subscale	98.7 (15.2)	113.2 (14.4)	**	107.7 (17.5)	117.6 (18.3)	n.s.
Verbal subscale	88.9 (20.0)	105.4 (12.4)	**	93.0 (12.2)	93.0 (15.1)	n.s.

Note: At 24 mos., high psychosocial-risk insecure $n = 22$, secure $n = 15$; low psychosocial-risk insecure $n = 13$, secure $n = 15$. At 36 mos., high psychosocial-risk insecure $n = 19$, secure $n = 13$; low psychosocial-risk insecure $n = 9$, secure $n = 13$. One-tailed tests of significance used for tests of hypothesized differences between high-risk subgroups, two-tailed tests used otherwise.

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

children's cognitive and linguistic competence is mediated by the quality of early mother-child interaction. Within this exclusively high-risk sample, the quality of interactive experiences at 1 year of age was more strongly predictive of child outcome than was family social status or mother's life stress, social, or psychologic functioning.

The same types of stimulating and facilitating adult input shown to promote language learning in low-risk samples were also related to developmental gains in this sample. Mother's ability to provide positive and responsive interactive experiences was in part, a function of her own level of stress and social skills. Commensurate with other studies of high-risk families, mother-infant interaction tended to reflect other negative influences in the mother's own life (Barnard et al., 1983; Lyons-Ruth, 1986). Mothers who reported a high level of depression, mothers observed to have few interpersonal and social skills, and mothers of lower social status were less likely to provide their infants with cognitive and linguistic stimulation in the form of a facilitating conversational style, sensitive caregiving interactions, and conducive animate and inanimate experiences in the home (recall Table 4). In turn, mother's tendency to provide stimulating and positive interactive ex-

periences was related to children's mental and linguistic abilities at both 24 and 36 months of age.

In general, environmental factors were more strongly related to measures of child outcome at 36-months (Preschool Language Scale) than to the 24-month Bayley scores. One possible reason is that tests of infant development, such as the Bayley, do 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 might play a greater role in development beyond the first two years of life is that development is highly canalized during periods of rapid maturation, and, in stages of rapid growth like infancy, children are biologically buffered from all but extreme deviations in environmental input (Bretherton et al., 1979; McCall, 1981; Rutter, 1985a). From this it follows that environmental factors would be more influential at comparatively later and more vulnerable stages in development. Preliminary evidence from studies of language development in maltreated toddlers support this proposition (Coster et al., 1989; Gersten et al., 1986).

It is somewhat perplexing that, within the 36-month outcome data, environmental

factors were more predictive of auditory comprehension, while tests of attachment as a protective factor revealed stronger relations with verbal ability. Several nonmutually exclusive explanations should be considered. First, concerning the risk-language findings, Bee et al. (1982) reported a similar pattern of results. In their study, environmental measures were also better predictors of receptive than expressive skills as measured by the Sequenced Inventory of Communication Development at 36 months of age. It is possible that many standardized assessments of language are better simply measures of toddler's receptive than expressive language abilities. At this age, receptive skills are more advanced than expressive skills, and, as a result, there may be more to measure. Alternately, auditory comprehension and verbal production may be sensitive to different types of social experiences; we may have tapped the antecedent conditions for language comprehension more fully. Finally, concerning the attachment-language findings, the verbal tasks of the PLS rely heavily on the child's willingness to attend to and cooperate with the examiner. The protective effect of secure attachment on language may pertain more to children's ability to use language in social interaction than to their acquisition of linguistic knowledge.

Methodological considerations aside, it could be the case that social-interactive influences on language are in fact keyed to the child's level of comprehension rather than their expressive skill. Studies of mother-child conversation have shown that adults are more attuned to what children can understand than what they can say (Cross, 1977; Snow, 1977). Wells (1974) speculated that it is the child's primary aim to derive meaning from social and physical experiences and that the parent-child context is instrumental to this task. If this is the case, increasing a parent's ability to read and expand his or her child's "level of meaning" may be an important target for future intervention with high-risk families.

Perhaps the most intriguing results 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. 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 at 13 months. The relatively low proportion of study infants classified secure (46%) 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; Radke-Yarrow, Cummings, Kuczynski, & Chapman, 1985) and less than that reported in studies of low-risk families (estimated proportions ranging from 52-73% secure; Ainsworth et al., 1978; Bell, 1970; Belsky, Rovine, & Taylor, 1984; Main & Weston, 1981). Yet, despite the finding that similar social risk factors were associated with both dyadic interaction and attachment, secure attachment and language-promoting experiences appeared to influence developing child competence via different pathways. Bretherton et al. (1979) speculated that an interactive framework of harmony and affective synchrony might promote language learning directly 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. In contrast, the data presented here indicate considerable independence between infant attachment security and high-quality mother-child interaction. Degree of attachment security, aggregated across levels of demographic and psychosocial risk, was only moderately related to the 1 year HOME social composite score ($r = .23$; $p < .05$) and was virtually unrelated to concurrent measures of mother-child conversation and the teaching/feeding composite score. Likewise, for the group as a whole, *t* test comparisons of secure versus insecure dyads revealed no differences on any of the interactive measures.

Hinde (1976) suggested that mothers' roles as teacher and as nurturer are separa-

ble. Admittedly, in low-risk samples, these parenting skills frequently co-occur. However, families burdened with multiple and chronic environmental stressors such as poverty, lack of education, and low social support may provide an opportunity to investigate the theoretical dissociation among various parts of the parent-child relationship. We propose that the independence among component parts of a relationship may enable secure attachment to function as a protective factor when other aspects of the child's social experience are jeopardized. In Rutter's (1985a) view, the role of a protective factor is to modify the individual's response to adversity, not to foster normal development. Our data show that secure attachment was related to children's subsequent cognitive and linguistic skill, but only for 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.

The importance of social and environmental variables as a buffer against environmental hardship 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 developing child competence. For the preschool child, the social relationships that may offer a source of protection (or increased vulnerability) are largely a consequence of interactions within the family. 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 multidyadic processes (Sameroff, 1980; Sameroff & Chandler, 1975).

One could speculate that protective factors insure optimal development by working within this type of dynamic framework to modify the caregiving environment. More specifically, children may be able to initiate changes in their own caregiving environments when important experiences are not readily available. For instance, the role of warm and responsive personal relationships in supporting early language development could be indirect, by increasing the likelihood that child-initiated attempts to elicit and sustain verbal interaction are met with success.

By utilizing standardized, global measures of child competence, we identified a statistically significant relation between social risk and the domains of language and cognition. One of the original aims of this study was to tease apart different aspects of environmental risk and examine their separate and combined contribution to developing child competence. In a similar vein, much could be gained from a more detailed examination of child outcomes. Neither language nor cognition is a unitary phenomenon. In order to understand relations between environmental influences and these domains more fully, it will also be necessary to separate aspects of linguistic and cognitive ability. It is possible that the various skills that comprise communicative competence are differentially liable to social experience. For instance, some structural aspects of verbal performance (and/or times of measurement) may be biologically buffered from environmental input, while recent work by Cicchetti and others (1990) suggested that other aspects, such as what young children talk about, may be particularly susceptible to early socioemotional experiences.

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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